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Role of Physiotherapy in Haemophilia - an Evidence Based Practice

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ABSTRACT

Haemophilia is hereditary bleeding disorder due to absence or deficiency of clotting factors in the blood. Haemophilia is characterized by intra-articular bleeding, often requiring immobilization, which may result in muscle atrophy and impaired proprioception. Patients with haemophilia are at risk of haemarthrosis, soft-tissue haematomas, bruising, retroperitoneal bleeding, intra-cerebral haemorrhage, and post-surgical bleeding.

Knee, ankle and elbow joints are more commonly affected by haemophilic bleeding. People with haemophilia who have had many bleeds tend to develop a distinctive posture that may include: flexion deformities of the elbows, knees, and hips; an exaggerated arch in the back plantar-flexed ankles; pelvic asymmetry due to leg length differences; and varying amounts of muscle wasting. Physiotherapy is integral in the management of people with haemophilia. A key goal is to help maintain mobility, muscle strength, and balance. An individualized physiotherapy can raise the quality of life of a patient with haemophilia through increase of the physical function, pain reduction and prevention of bleeding.

The 80% of haemophilia patients have no access to pharmacological therapy and part of remaining 20% only receive treatment after a bleeding episode. In both cases, patients develop physical consequences before reaching adulthood require physiotherapy treatment to improve quality of life.

Keywords: Haemophilia, Role of physiotherapy.

INTRODUCTION

Haemophilia is "An incurable hereditary bleeding disorder due to absence or deficiency of clotting factors in the blood". Repeated spontaneous bleeds inside the joints and muscles of the patient, if not treated promptly lead to permanent disability. There are three types of Haemophilia.^{1,2}

Haemophilia A most common type & caused by clotting factor VIII.

Haemophilia B caused by lack of clotting factor IX.

Haemophilia C caused by clotting factor XI.

On the bases of severity there are again three types:

Mild in which level is 5-50% and only occasional bleeding occurs usually related to significant trauma or surgery.

Moderate in which level is 1-5% and spontaneous bleeding is uncommon but occurs after minor trauma or surgery.

Severe in which level is <1% and spontaneous joint and soft tissue bleeding occurs several times for several months.

Bleeding sites are neck, arm, hip, thigh, knee, ankle, head, shoulder, elbow, calf and the gastrointestinal, intracranial and hematuria are serious or life-threatening. And the level of clotting factor in the blood usually stays same throughout the life.^{1,2,3}

The bleeds can be treated with first aid as RICE

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(Rest, Ice, Compression, Elevation). Physiotherapy is important to make the muscles strong, improve flexibility, improve coordination and reflexes, increase protection of joints, quicker recovery time after bleeds, decrease joint bleeds, and continue with normal healthy lifestyle.^{1, 2, 3}

In physiotherapy these treatments are very important,

1. Traction
2. Mobilization
3. Muscle strengthening
4. Muscle stretching
5. Electrotherapy (Ultrasound, Pulsed SWD, TENS)
6. Proprioception, posture & gait training
7. Sports activity.

METHODOLOGY

The articles were taken from **International Journal of Osteoporosis, Journal of Rehabilitation Research and Practice, International Journal of Preventive Medicine, Journal of the American Physical Therapy Association, Journal of Haemophilia, The Egyptian Journal of Medical Human Genetics**, These articles were taken with reference to explain the role of physiotherapy in haemophilia.

DISCUSSION

In 2014, S. A. Paschou et al.⁴ conducted a study on Bone mineral density in men and children with haemophilia A and B: A Systematic Review and Meta-analysis in which they assessed Standardized Mean Difference (SMD) for Bone Mineral Density (BMD) in the lumbar spine, femoral neck and hip and Age, body mass index (BMI), level of physical activity and blood-borne infections were also recorded. They were included 13 studies in the systemic review and 10 in the main outcome. This study concluded that men with haemophilia present a significant reduction in both lumbar spine and hip BMD, which appears to begin in childhood.

In 2014, Vahid Mazloun et al.⁵ conducted a study to detect the influences of conventional exercise therapy and hydrotherapy on the knee joint complications in patients with haemophilia. Total 40

patients were randomized into 3 groups: Therapeutic exercise (N = 13), hydrotherapy (N = 14) or control (N = 13) for 4 weeks and they compare the effect of hydrotherapy versus exercise therapy. Pain and knee ROM were recorded by VAS and standard goniometer. This study concluded that hydrotherapy in addition to usual rehabilitation training can result in beneficial effect in terms of pain and knee joint ROM. However, it appears that hydrotherapy is more effective in reducing pain.

In 2013, Ruben Cuesta-Barriuso et al.⁶ conducted a study about the effectiveness of physical therapy procedures in treating chronic arthropathy of the ankle in patients with haemophilia. They included articles with at least one group undergoing any kind of physiotherapy treatment and with pre-test and post-test evaluation and the treatments lasted for 4 weeks, 16 weeks, 24 weeks, and 52 weeks; and the number of hours per week for each patient was 1 hour, 4 hours, or 5 hours. The study concluded that Hydrotherapy treatments, strength training and balance strength, balance training, and sports therapy have improved range of movement, pain, balance, and subjective physical performance but there is no rigorous evidence on the effects of the treatments.

In 2013, Mohamed A. Eid et al.⁷ conducted a study To investigate the effect of resistance and aerobic exercise program on BMD, muscle strength and functional ability in children with haemophilia. In this study 30 boys with age of 10-14 years were participated and divided in 2 groups (Control group=physical therapy + aerobic exercise in the form of treadmill training) (study group=same + resistance training program in the form of bicycle ergometer training & weight resistance) for 3 times/week for 3 months and BMD, muscle strength of knee flexors & extensors & functional ability were evaluated before and after the 3 months of treatment. This study concluded that Resistance and aerobic exercise training are effective in increasing BMD and improving both muscle strength and functional ability in children with haemophilia.

In 2013 Lilian A. Zaky et al.⁸ conducted a study to investigate the effect of partial weight bearing program on functional ability and quadriceps muscle strength in children with haemophilic knee arthritis. In this study 30 patients with age of 8-12 years were

participated and divided in 2 groups (The control group=quadriceps training exercise program,& study group=program of partial weight bearing added to the same exercise program of control group). Treatment was given 3 times/week, every other day, for six consecutive weeks. This study concluded that more significant improvement in quadriceps muscle strength, gained by adding partial weight bearing program to the quadriceps exercises program.

In 2010 Ruth Mulvany et al.⁹ conducted a study to examine the feasibility, safety, and efficacy of a professionally designed, individualized, supervised exercise program for people with bleeding disorders. In which 33=3 female, 30 male; 7–57 years of age with mild to severe bleeding disorders were enrolled. Measures included upper and lower-extremity strength, joint range of motion, joint and extremity circumference, and distance walked in 6 minutes. 6-week, twice-weekly, individualized, supervised exercise program was prescribed. This study concluded that Individualized exercise program is feasible, safe, and beneficial for people with bleeding disorders.

In 2001, T. Hilberg et al.¹⁰ conducted a study to investigate differences in proprioceptive performance and isometric muscular strength of the lower limbs in haemophilic subjects compared with control subjects. In this study 12 subjects were taken and their anthropometric data and proprioception tests were done. This study concluded that differences in static proprioceptive performance can be shown between the haemophilic subjects and controls, but the local proprioceptive performance of the knee as measured by the angle-reproduction test showed no difference.

In 1987, Joanne R Pelletier et al.¹¹ conducted a study to improve the guidelines in isometric exercise for the person with haemophilia. It was a case study and the subject was 12 year old boy. Temperature, range of motion, muscle strength, circumference (knee) was outcome measures and the study was done for 3 weeks (9 sessions). This study concluded that Isometric exercise may provide a viable and less destructive muscle strengthening program than isotonic or isokinetic exercise programs.

CONCLUSION FROM EVIDENCES

Physical training strengthens muscles and reduces

risk of recurring bleedings. Training also contributes to maintaining motility in the joints and suppleness in the muscles. After bleeding, physiotherapy is needed to replace lost functions. Participation in physical activity, and sports realizes numerous physical benefits as well as supporting the emotional and social well-being of patient with haemophilia.

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Ethical Clearance: From K.K. SHETH Physiotherapy College, RAJKOT.

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Treatment for Posterior Canal Benign Paroxysmal Positional Vertigo – A Critical Review

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ABSTRACT

Benign paroxysmal positional vertigo (BPPV) defined by Dix and Hallpike is one of the most common disorders causing vertigo and fortunately, is a very simple disorder to manage. BPPV is more prevalent in adults and in women. Canalithiasis describes free-floating particles within a SCC. Cupulolithiasis describes particles attached to the cupula. BPPV can be caused either by canalithiasis or by cupulolithiasis, and can affect any of the three SCCs. BPPV mostly develops in the posterior semicircular canal. The main symptom of BPPV is vertigo induced by a change in head position with respect to gravity. The Dix-Hallpike test is the most commonly used test to confirm the diagnosis of posterior canal BPPV. Treatment options for posterior canal BPPV are Epley's maneuver, Liberatory maneuver and Brandt-Daroff exercises. Objective of this review is to find out which intervention is most effective in relieving symptoms. There are evidences that suggest performance of any of the three maneuvers can be expected to give good results in the management of posterior canal BPPV than placebo. The Epley's maneuver is a safe, effective treatment for posterior canal BPPV with confirmed evidence level A. Epley's maneuver is also comparable to the Semont maneuver which is difficult to perform for elderly for posterior canal BPPV. Both (Epley's maneuver and Semont maneuver) are more effective than Brandt-Daroff exercises in the short term but evidence suggests that Brandt-Daroff exercises should be incorporated in the long term as a preventative measure or to promote functional recovery.

Keywords: Canalith repositioning maneuver, vertigo, nystagmus, Liberatory maneuver, Brandt- Daroff exercises, Dix-Hallpike test.

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) defined by Dix and Hallpike¹, is one of the most common disorders causing vertigo^{2,3} in adults and fortunately, is a very simple disorder to manage.^{4,5} The cause of BPPV is mostly idiopathic. It may develop secondary to various disorders that damage the inner ear, head trauma, infection, aging. Idiopathic BPPV is more prevalent in adults and in women, with women to men ratio of 2:1.^{6,7}

PATHOLOGY

Schuknecht, proposed the theory of cupulolithiasis in which degenerative debris from the utricle adhere to the cupula, making the ampulla gravity sensitive. A second theory, canalithiasis, was proposed by Hall and colleagues in which the degenerative debris is floating freely in the endolymph of the semicircular canal.^{5,8}

Movement of the head causes these otoliths to inappropriately trigger the receptors in the semicircular canals and send false signals to the brain, causing vertigo and nystagmus.⁹ Posterior canal BPPV has been said to account for 60-90% of all BPPV cases.^{10,11}

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SYMPTOMS

The main symptom of BPPV is vertigo induced by a change in head position with respect to gravity. Patients typically develop vertigo when getting out of bed, rolling over in bed, tilting their head back, or bending forward. The symptoms of BPPV may vary among patients, and may manifest with nonspecific dizziness, postural instability, lightheadedness, and nausea.^{12,13} The vertigo in BPPV is typically intermittent and positioning dependent, which usually resolves within 30 seconds in posterior canal BPPV.¹

DIAGNOSIS

The Dix-Hallpike test¹ is the most commonly used test to confirm the diagnosis of posterior canal BPPV. In this test, the patient's head is turned 45 degrees horizontally towards the affected side while the patient is in sitting position. The patient then quickly lies down with the head hanging over the edge of the treatment table approximately 30 degrees below horizontal. The examiner asks whether the patient has vertigo and observes for nystagmus. Right posterior canal involvement produces upbeating and rightward torsional nystagmus during right Dix-Hallpike test.

The side-lying test¹⁴ may be used as an alternative when the Dix-Hallpike test is inapplicable. In this test, the patient sits on the side of the treatment table. The head is turned 45 degrees horizontally towards unaffected side and then patient quickly lies down on the side opposite to the direction the head is turned. The examiner asks whether the patient has vertigo and observes for nystagmus.

TREATMENT

Epley's manoeuvre: Epley has introduced a procedure in which the posterior canal is rotated backwards close to its planar orientation, thus directing foreign material out of the canal into the utricle.¹⁵

Premedication with a vestibular sedative such as dimenhydrinate or prochlorperazine one hour before treatment is advisable in severely affected patients.

During the Epley's maneuver¹⁵,

- The patient first is moved from sitting into

the Dix-Hallpike position toward the side of the affected ear and then remains in that position until the nystagmus ceases. Then the head is shifted to the next position.

- The second phase is to rotate the patient's head toward the unaffected side so the head is below horizontal. Again, the patient stays in the new position until the nystagmus stops. If there is no nystagmus, the position is maintained for approximately 20 seconds.

- The patient is then rolled to a side-lying position with the head turned 45 degrees down and kept in that position for 20 seconds.

- Finally, keeping the head deviated toward the unaffected side, the patient slowly sits up.

A handheld vibrator placed on the mastoid in each head position may improve the migration of particles by reducing adherence to the membranous walls of the labyrinth.¹⁵

Usually patients are advised to keep their head fairly upright for 48 hours after treatment.^{15, 16} to prevent particles from re-entering the posterior canal.

Many researchers suggested that Epley's maneuver (CRP – canalith repositioning maneuver) is effective in reducing vertigo and response to the Dix-Hallpike maneuver.^{16, 17-21} Epley's maneuver is the only recommended method of treating PC-BPPV, with confirmed evidence level A according to the American Academy of Neurology.²² In one Cochrane review on The Epley maneuver for BPPV, studies showed a statistically significant effect in favour of the Epley maneuver over controls.²³

Even researchers made few changes in originally proposed procedure (e.g. no premedication, no mastoid oscillation, no postural restriction) to make the procedure easier without affecting outcome. They are considered as modified Epley's maneuver.

According to a recent meta-analysis of the modified Epley's maneuver for PC-BPPV, the treatment demonstrated a symptom improvement rate four times greater, and a nystagmus resolution rate five times greater than the placebo group.²³

PREMEDICATION

In contrast to the original procedure proposed by Epley, most reports do not mention medicating patients prior to treatment.^{16, 17, 21, 24-26}

MASTOID OSCILLATION

Few studies have failed to identify any difference in outcome when a vibrator is used or not.^{27, 28}

Even in a Cochrane review 2012 on Modifications of the Epley maneuver for posterior canal BPPV studies did not show any significant effect of mastoid oscillation during epley's maneuver to the epley's maneuver alone for any outcome measure.²⁹

POST-TREATMENT INSTRUCTIONS

Many research projects^{30- 36} concluded that there is no statistically significant effect of postural restrictions on the result of repositioning maneuvers.

In a Cochrane review 2012 on Modifications of the Epley maneuver for posterior canal BPPV studies found that postural restrictions in conjunction with the Epley maneuver are significantly more effective than the Epley maneuver alone.²⁹

Liberatory maneuver

The Liberatory maneuver was developed by Semont and associates.³⁷ It is performed as follows:

- The patient is told to sit sideways on the examination table, and the therapist turns the head 45 degrees to the unaffected side.
- The patient is quickly moved into side lying towards affected side while keeping the head turned unaffected side; the patient is kept in that position for 2 to 3 minutes
- The patient is then rapidly moved up through the sitting position and down into the opposite side-lying position, while the therapist maintains the alignment of the neck and head on the body. Thus, the final position will have the patient lying with the face at a 45 degree angle toward the table.
- Typically, nystagmus and vertigo reappear in this second position. If the patient does not experience vertigo in this second position, the head is abruptly shaken once or twice, through small amplitude,

presumably to free the debris. The patient stays in this position for 5 minutes.

- The patient then slowly moves into a seated position.

Semont's liberatory maneuver is also helpful in treating PC-BPPV³⁸ especially in patients who have difficulty extending the neck due to spinal disorders. It is somewhat less easy to perform, especially in elderly people.

Even many other researchers compared Epley treatment with the Semont manoeuvre. They found no difference between treatments in resolution of nystagmus at the seven day post-treatment found equally effective.^{37,39, 40}

Brandt-Daroff Habituation Exercises

Proposed by Brandt and Daroff,⁴¹ this treatment requires the patient to move into the provoking position repeatedly several times a day. It is performed as follows:

- The patient first sits over the edge of the table and turns his or her head 45 degrees toward the unaffected side and then is moved rapidly into the affected side-lying.
- The patient stays in that position until the vertigo stops and then sits up again.
- The patient remains in the upright position for 30 seconds, turns his or her head 45 degrees in the opposite direction and then moves rapidly into the mirror-image position on the other side, stays there for 30 seconds, and then sits up.
- The patient then repeats the entire maneuver until the vertigo diminishes.
- The entire sequence is repeated every 3 hours until the patient has 2 consecutive days without vertigo.

Brandt- Daroff exercise demonstrates superior treatment outcomes compared with placebo.⁴⁴ However, Brandt-Daroff exercises is less effective than Epley's maneuver in producing complete symptom resolution.^{19,22,42}

Amor dorado⁴³ compared Epley treatment versus Brandt-Daroff exercises and found an 80.5% resolution

rate in the Epley group versus 25% resolution in the Brandt-Daroff exercises group after seven days. There was no difference in resolution after one month.

Varela⁴⁴ also investigated subjects with confirmed BPPV and found that maneuvers (either Epley or Semont) were more effective in producing resolution than Brandt-Daroff exercises.

Toledo⁴⁵ found the Semont manoeuvre to be superior to vestibular rehabilitation alone at 15 days, however by three months a combination of Semont and vestibular rehabilitation was superior to either of the sole interventions. Same findings were confirmed by Chang⁴⁶ who compared CRP with vestibular rehabilitation versus CRP alone. They reported the combination promoted greater mobility skills than the CRP alone.

CONCLUSION

There are evidences that suggest performance of any of the three maneuvers can be expected to give good results in the management of posterior canal BPPV than placebo. The Epley's maneuver is a safe, effective treatment for posterior canal BPPV with confirmed evidence level A according to the American Academy of Neurology. There is evidence to suggest that post-Epley postural restrictions are more effective than the Epley maneuver alone. There is insufficient evidence to either recommend or refute the benefit of associated mastoid region oscillation and premedication in the Epley maneuver for BPPV.

Epley's maneuver is also comparable to the Semont maneuver which is difficult to perform for elderly for posterior canal BPPV. Both (Epley's maneuver and Semont maneuver) are more effective than Brandt-Daroff exercises in the short term but evidence suggests that Brandt-Daroff exercises should be incorporated in the long term as a preventative measure or to promote functional recovery, or both.

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Impact of Static v/s Dynamic Start on Results of 10 Metre Walk Test in Patients with Acute Traumatic Brain Injury

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ABSTRACT

Background: Deficits in gait are common after moderate-to-severe traumatic brain injury (TBI). The goal of physical therapy is to achieve a self-selected gait velocity sufficient for community based rehabilitation.

The 10 Meter Walk Test is a performance measure routinely employed in physiotherapy practice for assessment of functional mobility, gait speed, for comparison of the results and to maintain a record of improvement or deterioration in gait speed of patient.

It is also widely employed for clinical as well as research purpose, but never any consideration was given to the method of start whether “static” or “dynamic”, though the results differed in the two. So it is important to know whether by using the different start in same patients the results of the test vary or not.

Aims and Objective:

- To observe results of 10m walk test with static start in patients with TBI.
- To observe results of 10m walk test with dynamic start in patients with TBI.
- To compare the results of 10m walk test performed with static start and dynamic start in patients with TBI.

Material & Method: Study design is cross over study with sample size of 16 patients (32 observations), calculated by performing a small pilot study. (N-Master software 2.0 version).

16 Patients aged 18-65, with first episode of traumatic brain injury, able to ambulate independently and give an informed consent were selected. First 8 patients were assessed first for 3 trials of static start and then after 3 trials of dynamic start. Next 8 patients were assessed first for 3 trials of dynamic start followed by 3 trials of static start. Mean value of the trials was calculated and results of the both were compared.

Results: Mean values of both the start were analyzed using independent t-test. And the value for static start was (10.62 ± 2.58) and for dynamic start was (8.2 ± 1.74) with p-value 0.004 that is statistically significant. (R Software 2.15.2).

Conclusion: Results of 10 meter walk test (time taken to complete the distance) are significantly higher with static start as compared to the dynamic start.

Thus there is definitely the impact of start on the results of 10 meter walk test.

Keywords: 10 Meter walk test, Static, Dynamic, TBI.

INTRODUCTION

According to WHO, "traumatic brain injury (TBI) is a nondegenerative, noncongenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical and psychosocial functions, with an associated diminished or altered state of consciousness". [web MD : Mar 6, 2013]

Deficits in gait are common after moderate-to-severe traumatic brain injury (TBI) and may include reduced step length, increased medial-lateral movements of the centre of mass and reduced self-selected gait velocity among individuals with TBI in comparison to healthy controls^[8].

The 10 Meter Walk Test is a performance measure routinely employed in physiotherapy practice for assessment of functional mobility, gait speed, for comparison of the results and to maintain a record of improvement or deterioration in gait speed of patient.^{[1][2][12]}

The time taken to walk the 10m is measured using a stopwatch and walking speed is calculated by dividing the distance covered (i.e. 10 m) by the time taken^[9].

The 10MWT is a reliable measure, Intra-rater reliability Is Excellent ($r=0.95-0.983$) and Inter-rater reliability is excellent ($r=0.974-0.99$), [Van Hedel, Dietz & Wirz 2005, Scivoletto et al. 2011]^[11].

10 meter walk test is also widely employed for clinical as well as research purpose, but never any consideration was given to the method of start whether "static" or "dynamic", though the results differed in the two.

So it is important to know whether by using the different start in same patients the results of the test vary or not.

Aim of the study was to know the impact of static and dynamic start on the results of 10 meter walk test in patients with TBI.

Objectives of the study were

- To observe results of 10m walk test with static start in patients with TBI.

- To observe results of 10m walk test with dynamic start in patients with TBI.
- To compare the results of 10m walk test performed with static start and dynamic start in patients with TBI.

MATERIAL & METHOD

DESIGN AND PARTICIPENTS

- **Study Area:** Surgical wards of SSG Hospital Vadodara
- Study Design: Cross-over study
- Sampling Technique: Quota (Selective) sampling
- Sample Size: 16 patients (32 observations) [calculated by performing a pilot study using N-Master software 2.0 version]

INCLUSION CRITERIA

1. First TBI,
2. 18–65 years of age,
3. Within 6 months of their TBI,
4. Able to give informed consent,
5. Able to ambulate 10 meters without physical assistance from another person.

EXCLUSION CRITERIA

1. Participant unable to follow commands,
2. Prior brain injury,
3. Weight bearing restrictions due to concurrent orthopedic injuries that would make ambulating unsafe.

DATA COLLECTION AND MEASURES

- Total 16 patients with acute TBI, who fulfilled the inclusion and exclusion criteria were recruited for the study. This study was carried out at surgical wards of SSGH, Vadodara (Gujarat) with the help of trained physiotherapist. The consent of patients to participate in study was sought.
- Outcome Measure: 10 m walk test.

TESTING PROCEDURE

- 16 selected patients of TBI were assessed for 6 trials of 10 meter walk test (3 trials with static start and 3 trials with dynamic start), of which First 8 patients were assessed first for 3 trials of static start and then after 3 trials of dynamic start. Next 8 patients were assessed first for 3 trials of dynamic start followed by 3 trails of static start.

- Trails of walk test were taken in the lobby area of wards during ward timings in week days.

FINDINGS

STATISTICAL ANALYSIS AND RESULTS

- Mean value of 10m walk test (time taken to cover the distance) with static and dynamic start. [R Software 2.15.2]

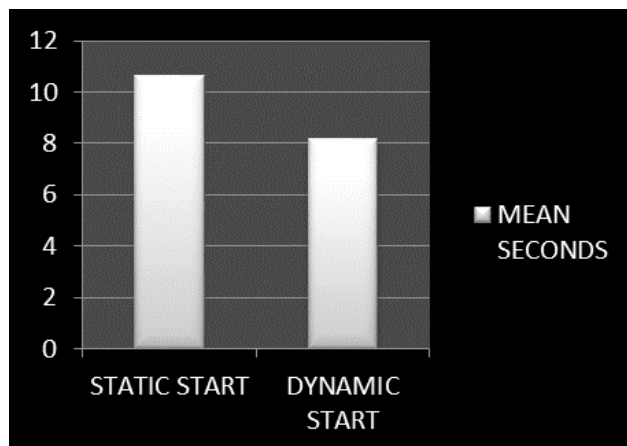
Table 1: Showing mean seconds for static and dynamic start.

Variable (Type of start)	Mean±sd (In seconds)
Static start	10.62±2.58
Dynamic start	8.2±1.74

- Mean values of both the start were analyzed using independent t-test.

- The result gave p-value 0.004 hence H₀ is rejected and H₁ is accepted.

- Thus statistically significant difference was found between two starts at 99% confidence limits. [R Software 2.15.2]



Graph 1: Showing mean seconds for static and dynamic start.

DISCUSSION

The present study assessed the impact of static and dynamic start on the results of 10m walk test. And Comparison of the results of 10 meter walk test (time taken to cover the distance) showed that the time taken with static start is higher than that compared with dynamic start, which is statistically significant. Thus based on the results obtained it can be said that dynamic start gives a better gait speed as compared to the static start.

One such similar study performed by G Scivoletto, F Tamburella, L Laurenza, C Foti, JF Ditunno and M Molinari, on spinal cord injury population showed that patients needed less time while performing the test with a dynamic start hence supporting the results obtained^[5].

Many of the studies are performed on the 10 m walk test on traumatic brain injury patients including the study performed by Mark A. Hirsch, Rossier P, Fritz N have not reported whether a standing or flying start was used during the 10MWT^[8].

One of the possible reason for the result is that dynamic start allows the body of patient to prepare by allowing a 2m acceleration zone and 2m deceleration zone, thus giving a less time duration to cover the required 10 m distance^[9].

As the literature suggest that this test has been widely employed for the research purpose so if different investigators uses different procedure then results would be abrupt. Therefore the test procedure needs some standardization for the start to be used giving better referral.

If standardization of the start is done then whenever implicating the test in physical therapy practice emphasis over training with the same start i.e. static or dynamic will be done.

By this result we also came to know that by giving an additional time for acceleration to patient during physical therapy better results can be obtained.

So whenever giving gait training or any training of walking always add an acceleration and deceleration time.

CONCLUSION

Results of 10 meter walk test (time taken to complete the distance) are significantly higher with static start as compared to the dynamic start.

Thus there is definitely the impact of start on the results of 10 meter walk test.

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Ethical Clearance: Study was carried out on human subjects in accordance with the ethical standards with permission and consent from IECHR Committee.

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Efficacy of Combination Therapy in Reliving Non-Specific Cervical Neck Pain

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ABSTRACT

Objective of the Study: to compare the efficacy of combination therapy ie cervical traction along with Infra red exposure simultaneously with cervical traction followed by infrared therapy exposure.

Study Design: Experimental.

Methodology: total of 52 patients were treated in which Group A –patients who received infrared exposure and cervical traction simultaneously for 20 min for 5 days.

Group B –patients who received cervical traction for 20 min followed by infrared lamp exposure for 20min for 5 days.

Results: There is statistically significant difference in terms of the VAS, NDI score. there is significant difference in the effect of treatment between in combination therapy and therapy given individually

Conclusion: cervical traction along with heat therapy given in combination is more effective rather than give two therapy individually.

Keywords: Menopause Rating Scale, Aerobic Exercises, Resistive Exercises.

INTRODUCTION

Neck disorders are common, disabling to various degrees, and costly. Mechanical traction is often used as part of a comprehensive program in outpatient rehabilitation. The value of this treatment has often been questioned because studies of its usefulness have generally been inconclusive and there are no data on cost-effectiveness ⁽¹⁻⁶⁾. Mechanical traction for the cervical spine involves a tractive force applied to the neck via a mechanical system. This can be applied intermittently or continuously. Indications for this type of intervention include herniated disc, degenerative disc disease and hypomobile facet joints ⁽⁷⁾. The physiological effects of such treatment may include separation of vertebral bodies, distraction and gliding of facet joints, widening of the intervertebral foramen, tensing of ligamentous structures, straightening of spinal curves and stretching of spinal musculature ⁽⁷⁾. Traction has also been reported to decrease pain by providing muscle relaxation, stimulation of mechanoreceptors

and inhibition of reflex muscle guarding ⁽⁷⁾. More definitive information about its effect on pain, function and patient satisfaction is needed for specific subgroups of disorders and symptom durations, to guide further clinical practice. ⁽⁸⁾

Non-specific neck pain can be defined as simple (non-specific) neck pain without specific underlying disease causing the pain. Symptoms vary with physical activity and over time. Each form of acute, subacute or chronic neck pain, where no abnormal anatomic structure; as cause of pain, can be identified, is non-specific neck pain. There are different opinions about duration of symptoms but according to Binder, neck pain can be acute (< 4 weeks duration), subacute (1-4 months duration) or chronic (> 4 months duration). ⁽⁹⁾

Clinical symptoms can be classified as local cervical syndrome, cervicobrachial syndrome, cervicocephalic syndrome and cervicome dullary syndrome according to where the pathological changes occur. Treatment modalities in cervical

syndromes consist of heat application, collar treatment, medication use, massage, electrotherapy and traction, and exercises¹). Cervical collar treatment is said to be effective at reducing the compression of the vertebral artery by fixing and distracting the cervical spine.¹¹

Several physical therapy interventions are commonly used in the management of CR, among these, the most effective physical therapy approach is still unclear. Of these, cervical traction has been considered as the therapy of choice.¹²

Cervical traction consists of administering a distracting force to the neck in order to separate the cervical segments and relieve compression of nerve root by intervertebral discs. Several techniques and different durations have been recommended in the literature. However, due to poor methodologic quality of the available data, there is currently little evidence to suggest that individuals with CR may benefit from physiotherapy combined with traction aimed at improving hand strength, neck discomfort and to decompress nerve impingement.¹³

It was concluded that (Nural ALBAYRAK AYDIN) Traction with regular physiotherapy modalities (hotpack, ultrasound, TENS) accompanied by home exercises for three weeks increased hand grip strength on the affected arm and reduced neck and arm pain substantially in C7 radiculopathy due to herniated disc¹³ study done by MA Shakoorkl concludes that improvement of the patients with chronic cervical spondylosis was more in CT plus exercise than analgesics. So, C T & neck muscle strengthening exercise may have some more beneficial effects than NSAIDs on chronic cervical spondylosis. Cervical traction and hot back both are used to treat patients for relieving pain in patients suffering from cervical spondylosis individually but no study has been done in which superficial heating modality like infrared lamp and cervical traction is given simultaneously.

Ibrahim M. concluded that The intermittent and the continuous cervical traction had a significant effect on neck and arm pain reduction, a significant improvement in nerve function, and a significant increase in neck mobility. However, the intermittent traction was more effective than the continuous type.⁶ Fater DC et al did a study to compare cervical vertebral

separation in the supine and seated positions using home traction units but no significant difference was found between the two techniques of cervical traction.⁷

Sample

Group A –patients who received infrared exposure and cervical traction simultaneously for 20 min for 5 days.

Group B –patients who received cervical traction for 20 min followed by infrared lamp exposure for 20min for 5 days.

Inclusion criteria

- Pain in neck
- Age group 20-35 years of either sex
- Clinically diagnosed cases of Non-specific neck pain
- Participants willing to participate in the study
- BMI (18-24.9Kg/m²)

exclusion criteria

- able to understand English
- diagnosed case of any neurological/psychiatric/skin /cardiopulmonary disorder
- patients with complaint of radiating pain
- Subjects with trigger point of trapezius muscle.
- Subjects with musculoskeletal disorder that would limit performance in these subjects
- Skin disorders which would irritate by either increase in warmth of the part or by the lubricants

which might be used, e.g. eczema.

- In presence of malignant tumours.
- In case of any previous fracture or surgery at neck.
- all contraindications of infrared lamp or traction Any kind of eye surgery as reported by subjects

Method of selecting & assigning subjects to groups

total of 52 subjects having were considered for this study. They were then screened to remove the subjects who did not fulfil the criteria for the study.

After screening, the subjects they were

randomly divided into two groups .each patient will get treatment for 5 consecutive days

Instruments and Tool used

1. infrared lamp
2. traction unit
3. stool

Research Design

It is an experimental design.

Variables

Independent variables- infrared lamp ,cervical traction unit , Age

- Height
- Weight

Dependent variables- Visual Analogue Scale., neck disability index, goniometry

PROCEDURE 1, 2

The procedure was explained to all the participants and after explaining and clearing all their doubts regarding study, participants were asked to sign a written consent. Patient were asked to fill neck disability index on first day before commencement of treatment (as per his group) and on sixth day along with this patients Vas score was also noted

The subject was seated on an adjustable stool with feet placed flat on the floor and arms resting comfortably on their thighs.

infra red lamp was placed

both the groups were asked to fill vas scale before and after the treatment session

Table No. 1 Age Distribution of the Subjects

Group	N	Mean	±SD
Group A	27	30.6	5.38
Group B	25	31.8	5.36

Table No. 2 Group A

Scales	PreMean ± SD	PostMean ± SD	T Value	P
VAS	7.3± 0.933	3.4 ± 0.640	379	< 0.0001
NDI	17.81± 1.551	10.1±1.476	379	< 0.0001

Table No. 3 Group B

Scales	PreMean ±SD	PostMean ± SD	T Value	P
VAS	6.9±0.78	4.1±0.860	325	< 0.0001
NDI	17.1 ± 1.50	11.40 ± 2.096	325	< 0.0001

Group A and Group B (TABLE 2 &3) for post-treatment VAS score, results showed significant difference in improvement in terms of VAS On comparing Group A and Group B for post- treatment NDI score, results showed significant difference in improvement in terms of NDI.

From the above findings, which suggest that there is statically significant difference between the groups A and B.

DISCUSSION

There are numerous studies dealing with the physiological effects of physical modalities. The analgesic effect of electrotherapy is probably based on enhanced microcirculation , an increase in muscle oxidative capacity local release of neurotransmitters such as serotonin , increased mitochondrial ATP production , increased release of endorphins or anti-inflammatory effects . The activation of the dorsal column is discussed as another mechanism. The pain input is interrupted by inhibition of the C-fibres (gate control mechanism) . Mima et al. found a decrease of human motor cortex excitability by using high-frequency TENS.

Topical heat increases small non-myelinated C-fibre activity that inhibits nociceptive signals in the spinal cord and increases proprioception. Heat therapy may also stimulate various regions of the brain, supporting psychosomatic effects . The benefit of the heat wrap is thus indirectly mediated in the brain via skin warming, combined with the physical support of body regions affected with pain.¹¹

There are several studies dealing with treatment of low back pain and musculoskeletal problems using different physical modalities as single treatment compared with other therapy options or placebo. For single treatment options there is varying evidence. In a Cochrane review Hayden et al. described an evidence level B for exercise therapy for the treatment of chronic low back pain. In another Cochrane review Furlan et al. described an evidence level C for massage therapy for the treatment of low back pain. Watson reviewed the current concepts in electrotherapy in the management of musculoskeletal and neurological problems and found that combined with other physical therapies it is likely to achieve the most significant results. Johnson et al. evaluated the effect of electrical nerve stimulation (ENS) on chronic musculoskeletal pain in a meta-analysis. The results indicate that ENS is an effective treatment modality. In a Cochrane review Gadsby et al. found evidence that TENS reduces pain and improves range of motion in chronic back pain patients, at least in the short term. Nadler et al. were able to show positive effects of continuous low-level heat wrap therapy versus oral pain medication in the treatment of acute nonspecific low back pain. The European Guidelines for the management of chronic non-specific low back pain recommend further investigation of combinations of physical treatments. Therefore, the aim of this study was to evaluate the effect of a treatment combination of several physical therapies in the treatment of musculoskeletal pain syndromes.^{11,14,15}

CONCLUSION

It is concluded that there is significant difference in the effect of treatment between in combination therapy and therapy given individually

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Methods of Handwriting Assessment in Occupational Therapy: A Quick Reference

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ABSTRACT

Handwriting constitutes one of the main means of communicating ideas in written form. The prevalence of handwriting problems in typically developing children has been estimated to range from 5% to 25%. Difficulty in handwriting may interfere with academic performance and may lead to many consequences as discussed below. A proper intervention in this regard requires a proper assessment of the handwriting skills. This article attempts to provide quick guidelines for occupational therapy assessment in handwriting.

Keywords: Handwriting assessment, Academic performance, Occupational therapy.

INTRODUCTION

Handwriting constitutes one of the main means of communicating ideas in written form. Despite advances in technology and access to computers, much of a child's school work in the elementary school years requires mastery of the printed word^{1, 2}. The prevalence of handwriting problems in typically developing children has been estimated to range from 5% to 25%. Studies have estimated that between 10 to 30 percent of elementary school children struggle with handwriting. Failure to achieve this foundational skill may have implications for the child's future academic performance³. Difficulty with handwriting requires greater attentional resources to be directed to letter formation, which can interfere with a child's confidence and competence. Poor legibility can interfere with teacher's perceptions and grading of students' written work. Academic

failure as well as lowered self-esteem can result from problems associated with poor handwriting^{2, 4}. Hence it is critical to evaluate the handwriting at the early stage to prevent the above consequences. This article attempts to give a quick review to address the associated variables of handwriting and the methods of assessment.

(a) Visual Perception: Visual Perception refers to the process of organizing and decoding visual information⁵.

Poor visual perception skills lead to Difficulty in scanning, copying and presence of letter reversals, demonstrates over spacing, under spacing, have trouble keeping within the margin & inconsistency in letter size.

ASSESSMENT OF VISUAL PERCEPTION

Informal Methods: Clinical observation of copying tasks, sorting & matching objects, directionality, differentiating foreground & background, the sequence of letters in a word & puzzle solving.

Formal Methods: Test of Visual Perceptual Skills, Developmental Test of Visual Perception

(b) Visual Motor Integration: The ability of the

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eyes and hands to work together in smooth, efficient patterns⁶.

Poor visual-motor skills can lead to difficulties with copying, reversals of letters or numbers, inconsistent letter formation and poor layout of writing on the page

ASSESSMENT OF VISUAL MOTOR INTEGRATION

Informal Methods: Clinical observation of the copying tasks, joining dots, mazes.

Formal Methods: Berry's Developmental Test of Visual Motor Integration and Bruininks Oseretsky Test of Motor Proficiency

(c) Postural Stability: Pelvic & shoulder girdles stability to sustain a good functional working position is required to free our arms for activity. Inability to maintain the upright erect position – may fatigue quickly when writing & may slump, lean their head close to table & spread their arms for support.

ASSESSMENT OF POSTURAL STABILITY

Informal methods: Clinical observation of for appropriate sitting posture

Formal methods: Postural grid and Bruininks Oseretsky Test of Motor Proficiency

(d) Fine Motor Skills: The use of smaller muscle groups to perform tasks that are precise in nature

Lack of finger co-ordination is often lead to messy writing and an awkward pencil grasp

ASSESSMENT OF FINE MOTOR SKILLS

Informal Methods: Clinical observation of manipulating objects within hand such as opening a cap of pen, adjusting a pen for appropriate grasp

Formal Methods: Bruininks Oseretsky Test of Motor Proficiency, O'Connor Tweezer Dexterity Test, Purdue peg board

(e) Ergonomics: The applied science of equipment design, as for the workplace, intended to maximize productivity by reducing operator fatigue and discomfort.

Ergonomics for writing: Good sitting position

– in a chair; Feet supported – flat on floor / footrest; Knees at 90 degrees; Chair seat depth will fully support thighs and Lower trunk is touching the back of chair.

Can lean slightly forward – optimum position 30 degree from upright; Forearms placed on table; Table height – approximately 5 cm above the level of bent elbow;

Angled writing surface may be required – optimal 20 degree for more efficient position⁷.

(f) Pen Grasp: Mature Grasp - Dynamic Tripod grasp is required for writing.

An immature grasp tends to be more fisted and tight, and finger movement is restricted⁸.

OTHER COMMON VARIABLES ASSOCIATED WITH WRITING⁹

- **Vision:** allows scanning the printed line, sustaining visual regard, focusing on stationary text and formation of letters

- **Cognition:** allows sustaining the attention and the working memory to read and write over time.

- **Proprioception:** gives information regarding grasp of writing tool and surface

- **Kinesthesia:** provides feedback related to extent, direction of movement, allowing appropriate pencil/pen pressure

- **Praxis:** influences capacity to plan, sequence and execute letter forms and arrange letters to build words.

EVALUATING ACTUAL TASK OF HANDWRITING⁹

- **Domains:** writing the letters from memory, copying, Dictations, Composition

- **Legibility:** letter formation, alignment, spacing, size.

- **Writing Speed:** rate of writing or the number of letters per minute.

- **Ergonomic factors:** writing posture, upper extremity stability and mobility and pencil grasp.

CONCLUSION

In conclusion, a proper assessment of all the variables necessary for handwriting is prerequisite for an intervention with maximum outcome. The informal methods discussed above are handy and could be used in a clinical set-up. Intervention planned based on these assessments could be seen as better performance in academics.

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Tremor Assessment - on Disability Scale and Functional Performance Test

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ABSTRACT

Tremor is the most common movement disorder. The objective of the current study was to find correlation between disability due to tremor (daily living score) with the functional performance tests like nine-hole peg and box and block. A total of 100 subjects with tremor, categorized in seven diagnostic groups fulfilling the respective diagnostic criteria studied. Clinical assessment using activities of daily living scales (ADL-T24) and tremor severity score done on each patient. The nine-hole peg score (in seconds) and box and block score (number of blocks in 60 seconds) calculated in each. We found that tremor severity was proportionate to ADL-T24 score and had a positive correlation with the disease duration. Overall, there was a moderate positive correlation between ADL-T24 score and 9-HPT score ($R^2 = 0.52$) whereas a strong negative correlation between ADL-T24 and BBT score ($R^2 = -0.66$). An inverse pattern was observed between 9-HPT score and BBT score with a moderate negative correlation ($R^2 = -0.58$). It was concluded that the functional performance tests correlate well with the daily living scores. Thus the tremor severity can be quantified on time based measures and are useful for tremor assessment.

Keywords - Tremor; Disability scale; Functional performance test.

INTRODUCTION

Tremor defined as “a rhythmic, involuntary oscillatory movement of a body part.” It is repetitive and stereotyped that distinguishes it from other involuntary movements like chorea, athetosis, ballism, tics, and myoclonus.¹ Tremor impacts the performance of fine motor skills such as feeding, dressing, drinking, writing, body care, and fine object manipulation thereby leading to social embracement.^{2,3} Measures of health related quality of life are increasingly used as outcome indicators

in patients with neurological disorders.⁴ The severity of tremor can be measured with a variety of clinical eg rating scales, quality-of-life questionnaires, spirometry (Archimedes’ spirals) and functional performance tests eg nine-hole peg test (9HPT) and box and block test (BBT). Various rating scales were designed specifically for the assessment of tremor, impact on activities of daily living (ADL) and quality of life.⁵ Effect of tremor on daily living activities can be evaluated using specific questionnaires such as the ADL-T24, which has a good inter-session reproducibility.⁶ The 9-HPT and BBT are simple, low-cost, and efficient test of gross manual dexterity with a high inter-rater reliability ($r = 0.96$, $r = 0.99$ respectively) and good test-retest reliability ($r = 0.69$, $r = 0.94$ respectively).^{7,8} The purpose of this study is to correlate disability due to tremor (daily living score) with the functional performance test.

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DESIGN/METHODS

A total of 100 patients, more than 12 years of age, having different kind of tremors that presented to a tertiary care hospital in New Delhi, India between April 2012 to September 2013 were prospectively analyzed for clinical details and functional performance tests. This study was carried after ethical clearance and permission of the institute. A written informed consent was taken from subjects (parents in case of a minor), after adequate explanation.

All patients were subjected to general physical and detailed neurological examination. Clinically, patients were divided into seven diagnostic groups fulfilling the respective diagnostic criteria; Parkinson's disease (PD) ⁹ (n= 45), Essential tremor (ET) ¹⁰ (n=33), Psychogenic tremor¹¹ (n=07), Valproate induced tremor (n =07, those patients in which the tremor developed after the initiation of sodium valproate monotherapy), Cerebellar tremor¹⁰ (n =03), Primary writing tremor¹⁰ (n =03) and Rubral tremor¹⁰ (n = 02). Assessment of disability was done using ADL-T24 scale (Activities of Daily Living scales).⁶ Tremor severity in most affected upper extremity was assessed on the basis of difficulties encountered while doing activities of daily living.¹² Tremor severity were divided into mild, moderate, severe, and incapacitating - Mild (1) - able to do the activity without difficulty, Moderate (2) - able to do the activity with a little effort, Severe (3) - able to do the activity with a lot of effort and Incapacitating (4) - cannot do the activity by himself.¹² A particular tremor rating scale was not chosen as there were different diagnostic groups. So to make uniformity among different types of tremor groups a daily living scale (ADL – T24) used. The functional performance tests performed were – 1.) 9-HPT ⁷- The time taken (measured in seconds) during placing and removing nine pegs in a pegboard and 2.) BBT ⁸– It consists of moving, one by one, the maximum number of blocks (2.5cm³) from one compartment of a box to another of equal size within 60 seconds. These tests were used because they had good test-retest and inter-rater reliability. Demographic data, ADL- T24 score, and functional performance test scores were recorded and analyzed using SPSS v20.0 software. Values were expressed as mean $\pm$ SD or mean $\pm$ SE. The Pearson's correlation coefficient (r) calculated and considered as poor if $r < 0.3$ and moderate if $0.3 < r < 0.5$ and strong

if $r > 0.5$.

RESULTS

One hundred patients with different types of tremor were clinically evaluated and classified as PD (n= 45) and ET (n=33), psychogenic (n =07), valproate induced (n =07), cerebellar (n =03), primary writing (n =03) and rubral (n = 02) tremor. Sixty nine patients were males and 31 females (M: F ratio=2. 22:1). Their mean $\pm$ SD age was 48.91 ± 18.2 years (range 13-91 years). (Table 1)

Forty-five patients had PD tremor, the mean $\pm$ SD age was 54.48 ± 13.39 years (range 13 - 75 years) with male: female ratio was 1.65:1 and mean disease duration was 3.45 years. The rest and postural tremor both were present in 91.11 % patients and either type of tremor in 4.44 % each.

Thirty-three patients had ET, the mean $\pm$ SD age was 51.51 ± 19.04 years (range 15 to 91 years) with male: female ratio was 10:1 i.e. males more common than females and out of which five (15.15 %) had positive family history. Their mean disease duration was 3.93 years. Phenomenologically tremor was mainly action/postural in 90.9 %, remaining had a rest and intention type also.

Among other diagnostic groups, seven patients with psychogenic tremor having symptom duration 6 months to 6 years (mean 20 months) and obvious stressors, four males and three females with mean $\pm$ SD age 37.28 ± 17.71 years. The tremor was present in all limb positions. Seven patients (two males and five females) with epilepsy on monotherapy with valproate (duration of treatment was 6 months to 2 years, mean duration of treatment was 0.93 years, mean $\pm$ SD dose of valproate was 1500 ± 500 mg daily) developed tremor and all had action / postural tremor only. The mean $\pm$ SD age was 24.28 ± 7.45 years. Three patients had cerebellar tremor with mean $\pm$ SD age 31.0 ± 16.7 years, the tremor was present in all limb positions except at rest. Three male patients had a primary writing tremor involving dominant hand at the time of writing with mean $\pm$ SD age 60.33 ± 14.01 years and mean disease duration was 3.17 years. Two of rubral tremor, both post-operated cases of hypothalamic hamartoma with a mean $\pm$ SD age 17.0 ± 5.65 years and tremor was present in all limb positions.

Among all patients, 42 % had mild tremor severity, 37 % moderate, 9% severe and 2% incapacitating type. The mean ADL – T24 score was 3.40 in mild, 8.46 in moderate, 14.89 in severe and 23.0 in incapacitating type of tremor. (Figure 1) The mean ADL-T24 score was highest for rubral tremor (23.0 ± 2.82) and lowest for primary writing tremor (3.66 ± 2.08). The mean ADL-T24 score for ET (4.42 ± 4.72) and valproate induced tremor (3.71 ± 2.91) was almost the same whereas for PD tremor (8.04 ± 5.99), it was higher.

The mean disease duration had positive correlation with the ADL-T24 score in different types of tremor except primary writing and psychogenic tremor in which there was a negative correlation. (Figure 1)

The time taken during 9-HPT was highest for rubral (121.36 ± 14.26 seconds) and lowest for ET (16.06 ± 4.52 seconds) whereas reverse pattern was seen with the BBT score. (Table 1)

Overall a positive correlation between ADL-T24 score and 9-HPT ($R^2 = 0.52$) but a negative correlation between ADL-T24 and BBT score ($R^2 = -0.66$). (Figure 2) Same pattern seen in each diagnostic group. A negative correlation was seen between 9-HPT score and BBT score. The correlation coefficient between them was -0.58.

DISCUSSION

The ADL – T24 score was proportionate to tremor severity. The mild to moderate tremor was more common than severe and incapacitating type. All of the tremor diagnostic groups had mild to moderate tremor severity except rubral that had severe type of tremor. The PD tremor had higher mean ADL – T24 score as compared to ET (8.04 ± 5.99 , 4.42 ± 4.72 respectively), this could be due to other confounding factors like bradykinesia or rigidity in PD. Clinically the ET resembles valproate induced tremor as both having predominant postural tremor and their mean ADL-T24 scores were also almost the same (4.42 ± 4.72 , 3.71 ± 2.91 respectively). A study by Karas BJ et al also found the clinical resemblance between ET and valproate induced tremor.¹³ The mean ADL-T24 score was highest for rubral tremor (23.0 ± 2.82) and lowest for primary writing tremor (3.66 ± 2.08). This shows that rubral tremor had severe type of tremor and had much difficulty in doing daily living

activities. There was a positive correlation between the disease duration and mean ADL-T24 score except psychogenic and primary writing tremor. This shows that as the disease progress, the daily living activities become more difficult. In psychogenic tremor there are inconsistency and variability of symptoms, thus the tremor severity does not correlate well with a daily living score. The primary writing tremor is a task specific tremor that may not affect other functions of daily living except writing even if the disease is progressing, hence the tremor severity may not parallel with overall ADL – T24 score.

We found a Mean $\pm$ SD score of 28.20 ± 6.80 seconds in PD tremor on the hole peg test. Associated rigidity and bradykinesia could be contributory for the greater time score. Almost similar results were found by Earhart GM et al¹⁴ 31.4 ± 15.7 seconds and Ellis T et al¹⁵ 32.2 ± 12.4 seconds. Bradykinesia and freezing of gait scores predicted significant portions of the variance in 9-HPT time in patients with PD, even then this test appears to be a clinically useful measure for assessing upper extremity function with good test-retest reliability ($r = 0.88$).¹⁴ The 9-HPT score was lowest for ET (16.06 ± 4.52 seconds) whereas highest for rubral tremor (121.36 ± 14.26 seconds) and vice-versa for the BBT score, which was highest for ET (45.31 ± 8.94) and lowest for rubral tremor (9.25 ± 4.64). A study by Héroux ME et al found that ET patients had measurable disability on time-based measures of upper-extremity function (9HPT, BBT).¹⁶ Various studies showed that the pegboard test can be used for treatment assessment in patients with ET. In these patients, a short-term resistance-training program of the upper limb can improve fine manual dexterity as determined by a significant increase in the pegboard test score.^{17, 18} Cerebellar tremor had a score of 18.13 ± 3.64 seconds on hole peg test. The pegboard test can accurately reflect the severity of the cerebellar function.¹⁹

Overall, there was a moderate positive correlation between ADL-T24 score and 9-HPT score ($R^2 = 0.52$) whereas a strong negative correlation between ADL-T24 and BBT score ($R^2 = -0.66$). (Figure 2) This signifies that those having higher ADL-T24 scores will take longer time to complete 9-HPT and lesser number of blocks be transferred in one minute. Similar results of positive and negative correlation were found in each diagnostic group separately. A study by Girimaldi

G also found a positive correlation between ADL-T24 score and 9-HPT score ($R^2 = 0.89$) and a negative correlation between ADL-T24 and BBT score ($R^2 = -0.66$).²⁰ Reciprocal pattern was seen between 9-HPT score and BBT score with a moderate negative correlation ($R^2 = -0.58$), similar to study by Girimaldi G ($R^2 = -0.75$).²⁰ The comparative study of ADL-T24, 9-HPT score and BBT score with different types of tremor had not been reported previously. Thus the tremor severity correlates well with the functional performance tests. The limitation of our study was that there were less number of patients in other

diagnostic groups except ET and PD tremor. The correlation coefficients between ADL-T24 score and 9-HPT score, BBT score of rubral tremor could not be calculated.

CONCLUSION

The severity of tremor can be measured with the help of quality-of-life questionnaires as well as with functional performance tests, e.g. the 9-HPT and BBT. The functional performance tests correlate well with the tremor severity and can be used to quantify it.

Table 1. Demographic, clinical and functional performance tests data of patients with tremor

Diagnosis	Sex		Total	Age Mean $\pm$ SD (years)	Symptom duration in years (Mean)	Tremor phenomenology	ADL- T 24 Mean $\pm$ SD	9 Hole-peg score in seconds (Mean $\pm$ SD)	Box and block score (number of blocks) (Mean $\pm$ SD)	Correlation coefficients	
	Female	Male								ADL - T24 Vs 9-Hole peg test	ADL - T24 Vs Box and block test
Parkinsonian tremor	17	28	45	54.48 $\pm$ 13.39	3.45	R P	8.04 $\pm$ 5.99	28.20 $\pm$ 6.80	29.54 $\pm$ 8.70	0.49	-0.7
Essential Tremor	3	30	33	51.51 $\pm$ 19.04	3.93	P K I	4.42 $\pm$ 4.72	16.06 $\pm$ 4.52	45.31 $\pm$ 8.94	0.78	-0.83
Psychogenic tremor	3	4	7	37.28 $\pm$ 17.71	1.67	R P	8.71 $\pm$ 6.64	16.83 $\pm$ 3.99	40.14 $\pm$ 5.82	0.59	-0.69
Valproate induced tremor	5	2	7	24.28 $\pm$ 7.45	0.93	P	3.71 $\pm$ 2.91	19.64 $\pm$ 8.33	40.57 $\pm$ 10.52	0.46	-0.52
Cerebellar tremor	2	1	3	31.0 $\pm$ 16.7	3.00	P K I	6.0 $\pm$ 1.63	18.13 $\pm$ 3.64	43.66 $\pm$ 9.07	0.42	-0.81
Primary writing tremor	0	3	3	60.33 $\pm$ 14.01	3.17	T	3.66 $\pm$ 2.08	25.20 $\pm$ 5.87	28.00 $\pm$ 4.93	0.29	-0.47
Rubral tremor	1	1	2	17.0 $\pm$ 5.65	1.00	R P K I	23.0 $\pm$ 2.82	121.36 $\pm$ 14.26	9.25 $\pm$ 4.64	-	-
Total	31	69	100								

R – Rest, P – Postural, K – Kinetic, I – Intention, T-Task- specific, ADL-T24 = Questionnaire of tremor-induced difficulties encountered during daily life

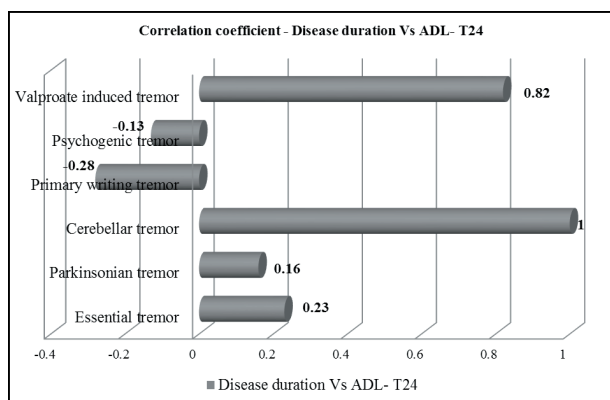


Figure 1. Correlation between mean disease duration and ADL-T24 score.

The correlation between ADL- T24 score and 9-Hole peg score **The correlation between ADL-T24 and Box and Block test**

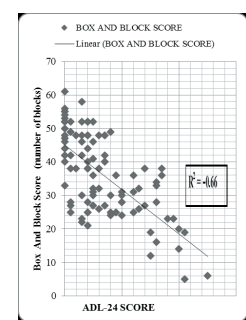
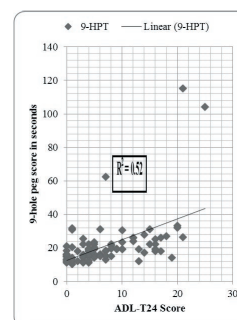


Figure 2. Correlation between ADL- T24 score and 9- Hole peg test score, Box and Block test score

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Effect of Body Positions on Peak Expiratory Flow Rate Following Abdominal Surgery

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ABSTRACT

Postoperative pulmonary complications following abdominal surgery are frequent and are associated with increased morbidity and mortality and hospital length of stay¹. The manipulation of abdominal cavity during upper abdominal surgery (UAS) decreases lung volume and capacity. This leads to shallow and rapid breathing, absence of deep breaths and paradoxical abdominal movements, which may cause pulmonary complications with altered ventilation-perfusion or pulmonary shunts that result in hypoxemia and atelectasis². The basic mechanism of PPCs is a lack of lung inflation that occurs because of a change in breathing to a shallow, monotonous breathing pattern with out periodic sighs, prolonged recumbent positioning and temporary diaphragmatic dysfunctions³.

Mucocilliary clearance also is impaired postoperatively, which along with the decreased cough effectiveness, increases risks associated with retained pulmonary secretions⁴. Atelectasis occurs regularly during general anesthesia induction, persists postoperatively and may contribute to significant morbidity and additional healthcare costs⁵. Two major causes of post operative Atelectasis are breathing with a rapid and shallow pattern of breathing and a reduced functional residual capacity, which in turn affects the gas exchange properties of the lung by increasing the ventilation / perfusion (v/q) mismatch, the situation may be further aggravated by hypoventilation due to sedation, pain and increased mechanical load⁶.

Body positioning has potent and direct effects on various steps in the oxygen transport pathway in health and in disease. Body position has been shown to affect lung volumes and muscle biomechanics⁷. Subjects will be divided randomly into 3 groups with 20 in each group.

Group A- Long sitting position ,Group B- Three-quarter sitting position ,Group C- Chair sitting position. Patient in each specific group is made to sit comfortably in the above mentioned position. Routine chest physiotherapy including deep breathing exercises and incentive spirometry is given to all the 60 patients. Peak expiratory flow rate and thoracic excursion measurements of all the subjects were taken on 2nd and 7th post-operative day in their respective positions.

Results of the study showed significant improvement in PEFR and Thoracic excursion measurement in all three positions like Three quarter sitting, Long sitting, Chair sitting position. The results observed in the study has shown that the chair sitting position is most effective position for expiratory maneuvers for any physical therapy intervention following abdominal surgery compared to the other two positions like three quarter and long sitting. The more upright the patient is positioned the greater the neurological arousal and greater the stimulus to breathe, and increase alveolar ventilation and perfusion and hence augments V/Q matching⁸. This is noted with the significant improvement in PEFR and Thoracic excursion measurements.

Keywords: Post-operative pulmonary complications, Atelectasis, General anaesthesia, Body positioning, peak expiratory flow rate, Thoracic excursion measurements.

BACKGROUND

More than 4 million abdominal surgeries are performed in the India every year. Patients undergoing abdominal surgery are at increased risk for pulmonary complications postoperatively with increased morbidity and mortality and hospital length of stay¹. The main reason for this is a severe and prolonged alteration in the pulmonary mechanics caused by these surgical incisions; thereby causing impaired ventilation and ineffective expectoration. This results in failure in expansion and collapse of the particular lung segment, thus providing an excellent chance for chest infection⁹. Dysfunction of the respiratory muscles due to surgery may lead to a reduction in the vital capacity and tidal volume, total lung capacity and thus, insufficient cough. This may cause atelectasis in the basal lung segments and a decrease in functional residual capacity, which in turn affects the gas exchange properties of the lung by increasing the ventilation / perfusion (v/q) mismatch².

Body positioning has potent and direct effects on various steps in the oxygen transport pathway in health and in disease¹⁰. Peak expiratory flow rate is considered a surrogate for the forced expiratory volume in 1 second (FEV1). Peak expiratory flow rate is an objective measure of airflow resistance in the lungs. Studies have shown good correlation between peak expiratory flow rate measured by portable flow meter and FEV1 measured by spirometry in patients with asthma¹¹.

MATERIAL & METHOD

Adjustable Couch, Chair (with back rest), Pillows, Peak flow meter with Disposable Mouth piece, Measuring tape, Sphygmomanometer, Stethoscope, Marker.

Subjects will be divided randomly into 3 groups with 20 in each group.

Group A- Long sitting position

Group B- Three-quarter sitting position

Group C- Chair sitting position

Patient in each specific group is made to sit comfortably in the above mentioned position.

Routine chest physiotherapy including deep breathing exercises and incentive spirometry is given to all the 60 patients. Peak expiratory flow rate and thoracic excursion measurements of all the subjects were taken on 2nd and 7th post-operative day in their respective positions.

FINDINGS

At the 7th post operative day, chair sitting position (Group C) showed significant ($p < 0.001$) improvement in PEFR of 312.45lts /min with SD 41.29, compared with PEFR of 241.70lts/min with SD 41.24 on the 2nd postoperative day. The 2nd best position is long sitting position in which PEFR on 7th postoperative day is 272.25lts/min with SD 43.42 compared with 200.40lts/min with SD 40.04 on 2nd post operative day. Three quarter sitting position shows 251.70lts/min with SD 60.8 on 7th post operative day and PEFR is 181.49lts/min with SD 55 on 2nd postoperative day.

Thoracic excursion measurements showed significant ($p < 0.001$) improvement in 7th postoperative day in comparison with 2nd postoperative day, for both upper thoracic excursion and lower thoracic excursion.

For upper thoracic excursion 5.39cms with SD 1.09 in Chair sitting on 7th postoperative day, while 2.47cms with SD 0.64 on 2nd postoperative day. Long sitting position shows 4.45cms with SD 1.15 on 7th postoperative day and 1.96cms with SD 0.48 on 2nd postoperative day. Three quarter sitting shows mean of 4.83cms with SD 1.19 on 7th postoperative day, while 2.46cms with SD 0.90 on 2nd postoperative day.

Lower Thoracic excursion measurements in Chair sitting position showed significant ($p < 0.001$) improvement with the mean of 5.36cms with SD 1.17 on 7th postoperative day, while 2.66cms with SD 0.57 on 2nd postoperative day. Long sitting position shows 4.58cms with SD 1.09 on 7th postoperative day and 2.39cms with SD 0.47 on 2nd postoperative day. Three quarter sitting shows mean of 2.95cms with SD 1.36 on 7th postoperative day, while 2.07cms with SD 0.71 on 2nd postoperative day.

CONCLUSION

The results observed in the study has shown that the chair sitting position is most effective position

for expiratory manoeuvres for any physical therapy intervention following abdominal surgery compared to the other two positions like three quarter and long sitting. The more upright the patient is positioned the greater the neurological arousal and greater the stimulus to breathe, and increase alveolar ventilation and perfusion and hence augments V/Q matching. This is noted with the significant improvement in PEFr and Thoracic excursion measurements

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Comparison between Isokinetic Quadriceps and Hamstring Strength and Clinical Outcomes after Single Bundle and Double Bundle ACL Reconstruction in Sportspersons

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ABSTRACT

Existing studies suggest the advantage of rotational stability in DB ACL over SB ACL. However, the contribution of strength parameters need to be evaluated further. Muscle strength deficit is one of the consequences after ACL reconstruction. The aim of this study was to evaluate any possible differences in isokinetic hamstring and quadriceps muscle strength and functional outcome after SB and DB ACL Reconstruction in sportspersons. We tested 30 sportspersons (15 SB and 15 DB) after primary reconstruction of ruptured anterior cruciate ligament at angular velocities of 60°/second and 120°/second using isokinetic dynamometer, functional testing was done using Lysholm and IKDC score. Overall, there was statistically significant difference in flexion and extension strength parameters at 60°/sec as compared to 120°/second in both SB and DB groups. There was no significant difference in isokinetic strength of quadriceps and hamstrings between SB and DB groups. Clinical evaluation done by Lysholm and IKDC score also showed no significant difference. However, in both groups maximal muscle strength is more than muscle endurance.

Keywords: anterior cruciate ligament, single bundle, double bundle, isokinetic testing.

INTRODUCTION

Tears of anterior cruciate ligament (ACL) are relatively common in sports involving pivoting. The aim of ACL reconstruction is to replace the torn ACL with a graft that reproduces the normal kinetic function of the ligament. Arthroscopic ACL reconstruction is the commonest method of treating a complete ACL rupture, in which the torn ligament is completely replaced with an autograft or allograft¹. ACL consists of two bundles, small anteromedial (AM) and bulky posterolateral (PL). Oblique position of PL bundle provides more rotational control than provided by AM which is more axial in position. In single-bundle (SB) ACL

reconstruction only AM bundle is reconstructed while in double-bundle (DB) the normal anatomy of ACL is replicated reconstructing both AM and PL bundles, giving it more rotational strength. Proper reconstruction for restoring the functional capacity and an intensive rehabilitation program is essential for ACL injuries². ACL patients can encounter many complications such as muscle atrophy, limitation of range of motion and degenerative changes of the knee joint³. Muscle strength deficits have usually been found after ACL reconstruction⁴⁻¹¹. Mikkelsen et al showed that the subjects with good quadriceps torque after ACL reconstruction were able to return to their previous activity earlier and at the same activity level as before injury¹². American society for sports medicine recommends that the patient first undergoes isokinetic testing, after ACL reconstruction, after 10-12 weeks². During the later stages of knee rehabilitation, the difference of the peak torque between injured and uninjured sides

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should be maintained at less than 10% and Esselman et al reported that the evaluation of peak torque in isokinetic testing was the most objective and useful of all techniques¹³. Comparison Between Single- and Double-Bundle Anterior Cruciate Ligament Reconstruction, A prospective, Randomized, single-Blinded Clinical Trial by Paolo Aglietti et al showed better VAS, anterior knee laxity and final objective IKDC scores than SB¹⁴. However, longer follow-up and accurate instrumented in vivo rotational stability assessment are needed. Comparison between single and double bundle reconstruction, A randomized clinical trial by F. Giron et al showed that DB reconstruction offered better knee stability and better objective results than the 10.00 o'clock SB¹⁴. A Systematic review of single-bundle versus double-bundle anterior ligament reconstruction by Umile Giuseppe Longo et al showed similar subjective patient evaluation for SB and DB¹⁵. With the current evidence available, a simple SB ACL reconstruction is a suitable technique, and it should be not abandoned until strong evidence in favour of DB ACL reconstruction is produced. The objective of this study, therefore was to compare isokinetic strength of quadriceps and hamstring muscle and clinical outcomes after SB and DB in sportpersons.

MATERIALS & METHOD

Subjects

All Subjects were Sportpersons who underwent ACL reconstruction at SIC, SJH, New Delhi. An informed consent was taken from all of them. There were a total of 30 patients divided into 2 groups of 15 SB and 15 DB. The cause of injury were 22 cases of sporting activity and 8 cases of accident. The associated injuries amounted to 8 medial meniscus tears and 4 lateral meniscus tears. All of them had undergone 6 months of post surgery rehabilitation program at SIC.

Inclusion criteria-

1. Active sportsperson (athlete)
2. Age 25-45
3. Male or female
4. With or without medial or lateral meniscus tear

Exclusion criteria –

1. Multiligament injury

2. Revision surgery
3. Long time illness (neurological)

METHOD

All surgeries were performed by the same surgeon with standard surgical technique. Knee portals were created for arthroscopy. Any meniscus or articular pathologies were addressed. Both gracilis and semitendinosus autografts were harvested from the operated leg.

Isokinetic testing was done 6 months after the surgery. It included measurement of height, weight, review of medical records such as cause of injury, associated injury.

Each subject underwent tests to measure isokinetic muscle strength at knee while performing flexion-extension movements with both involved and uninvolved lower limbs. The tests were carried out using a Cybex 6000 computer controlled isokinetic dynamometer.

Subjects were seated with backrest positioned at 90° angle and were instructed to grip the sides of the seat during testing. The thigh, pelvis, and trunk were stabilized with straps. The axis of rotation of the dynamometer arm was positioned just lateral to the lateral femoral epicondyle. Gravity corrections torque at 45° (0° = straight leg) were calculated by the computer software.

The tests were carried out on both lower limbs, beginning with tests on the uninvolved limb. Concentric peak torques, and total works of knee extensor (quadriceps) and flexor (hamstring) muscle groups were measured by maximal voluntary contractions for the torque test at 60°/sec (3 repetitions) and 120°/sec (3 repetitions). Tests on different velocities were conducted because maximal muscle strength was reflected more on testing at low velocity, while muscle endurance was more related to the high velocity test. These test protocols were chosen because they are the common test protocols suggested by Cybex and have been widely used by clinicians and researchers.

During the tests the subjects were encouraged verbally to produce maximal efforts.

Rehabilitation protocol

Rehabilitation started the first day after ACL reconstruction. The rehabilitation protocol consisted of range of motion, flexibility, proprioceptive, endurance and balance exercises (Table 1). Both the groups performed the rehabilitation at the SIC,SJH.

Table 1: Standard rehabilitation protocol for both groups followed after ACL reconstruction

Time	Exercise
0-2 weeks	- Passive knee extension exercises - Active knee flexion exercises - Electrical muscle stimulation (if unable to contract quadriceps and/or hamstring)
2-6 weeks	- Patella mobilization (if needed) Gait training - Closed kinetic chain exercise (quadriceps and hamstrings) - Hamstring training (gradually isokinetically proprioceptive and balance training) - Stationary biking (when 100° of the knee flexion)
6-12 weeks	Functional exercises (stair walking, skip the rope, “skating” on a slide board)
3-4 months	Jogging straight ahead on an even surface
4-6 months	- Jogging and running on an uneven surface - Jogging with turns 90°, 180°, 360° Cutting with 45° changes of direction - Acceleration and deceleration running Sport-specific exercises

STATISTICAL METHOD

SB vs DB ACL groups were compared using unpaired t-test. Comparison between 60° vs 120° flexion and extension and operated vs non-operated knees,lysoholm and IKDC pre and post op in each SB and DB ACL groups were made with paired t-test.All statistical tests were conducted at a 2-sided alpha level of 0.05 and confidence intervals were calculated at 95%, 2-sided in IBM SPSS 20.0.

FINDINGS

SB Vs DB comparison: Mean extension 60°/sec was 93 and 105; flexion 60°/sec was 66 and 72 in right knee of SB and DB patients respectively. Mean extension 120°/sec was 57 and 51; flexion 120°/sec was 36 and 33 in right knee of SB and DB patients respectively (Table 2).

Table 2: Comparison of Single-bundle(SB) and Double-bundle(DB) ACL Patients - Right Knee

Right Knee	Bundle	N	Mean	Std. Deviation	p-value	95% confidence interval
Extension 60°/sec	SB	15	93.1	43.20	0.431	-42.02, 18.42
	DB	15	104.9	37.39		
Flexion 60°/sec	SB	15	66.3	31.52	0.592	-28.67, 16.67
	DB	15	72.3	29.03		
Extension 120°/sec	SB	15	56.8	48.05	0.667	-23.29, 35.83
	DB	15	50.5	28.54		
Flexion 120°/sec	SB	15	35.9	26.74	0.762	-15.97, 21.57
	DB	15	33.1	23.33		

Mean extension 60°/sec was 93 and 105; flexion 60°/sec was 62 and 75 in left knee of SB and DB patients respectively. Mean extension 120°/sec was 50 and flexion 120°/sec was 32 in left knee of SB and DB patients respectively (Table 3).

Table 3: Comparison of SB and DB ACL Patients - Left Knee

Left Knee	Bundle	N	Mean	Std. Deviation	p-value	95% confidence interval
Extension 60°/sec	SB	15	92.5	43.46	0.404	-44.18, 18.31
	DB	15	105.5	40.01		
Flexion 60°/sec	SB	15	62.3	28.64	0.218	-33.06, 7.86
	DB	15	74.9	26.00		
Extension 120°/sec	SB	15	50.0	43.38	0.964	-26.40, 27.60
	DB	15	49.4	26.93		
Flexion 120°/sec	SB	15	31.6	26.82	>0.999	-16.32, 16.32
	DB	15	31.6	15.27		

Flexion and extension 60°/sec of both right and left knees were more in DB as compared to SB patients and it were more in 120°/sec SB as compared to DB patients. However these differences were not statistically significant (Table 2 and 3).

Mean extension 60°/sec was 93 in both knees and mean extension 120°/sec was 57 and 50 in right and left knee of SB patients respectively. Mean flexion 60°/sec was 66 and 62 in right and left knee and mean flexion 120°/sec was 36 and 32 in right and left knee of SB patients respectively (Table 4).

60°/sec Vs 120°/sec flexion and extension comparison:

Table 4: Comparison of Flexion and Extension 60 and 120°/sec in SB ACL Patients

SB ACL	n	Mean	Std. Deviation	p-value	95% confidence interval	
Right Knee – Extension	60°/sec	15	93.1	43.20	0.003	14.50, 58.04
	120°/sec	15	56.8	48.05		
Right Knee – Flexion	60°/sec	15	66.3	31.52	<0.0001	17.35, 43.45
	120°/sec	15	35.9	26.74		
Left Knee – Extension	60°/sec	15	92.5	43.46	0.001	19.86, 65.21
	120°/sec	15	50.0	43.38		
Left Knee – Flexion	60°/sec	15	62.3	28.64	<0.0001	19.30, 42.03
	120°/sec	15	31.6	26.82		

Mean extension 60°/sec was 105; mean extension 120°/sec was 50 in both knees of DB patients respectively. Mean flexion 60°/sec was 73 and 75 in right and left knee and mean flexion 120°/sec about 32 in both knees of DB patients respectively (Table 5).

Table 5: Comparison of Flexion and Extension 60 and 120°/sec in DB ACL Patients

Double-bundle ACL	n	Mean	Std. Deviation	p-value	95% confidence interval	
Right Knee – Extension	60°/sec	15	104.9	37.39	<0.0001	35.79, 72.87
	120°/sec	15	50.5	28.54		
Right Knee – Flexion	60°/sec	15	72.3	29.03	<0.0001	24.67, 53.73
	120°/sec	15	33.1	23.33		
Left Knee – Extension	60°/sec	15	105.5	40.01	<0.0001	41.35, 70.79
	120°/sec	15	49.4	26.93		
Left Knee – Flexion	60°/sec	15	74.9	26.00	<0.0001	30.61, 55.93
	120°/sec	15	31.6	15.27		

Flexion and extension 60°/sec was significantly more ($p < 0.0001$) as compared to 120°/sec of both knees of SB and DB patients (Table 4 and 5).

Operated Vs Non-operated Knee comparison:

Mean extension and flexion 60°/sec was 93 and 64 in both operated and non-operated knee of SB patients respectively. Mean extension 120°/sec was 51 and 34; flexion 120°/sec was 34 in operated and non-operated knee of SB patients respectively (Table 6).

Table 6: Comparison of Operated and Non-operated Knee in SB ACL Patients

SB ACL	Knee	n	Mean	Std. Deviation	p-value	95% confidence interval
Ext 60°/sec	Operated	15	92.3	41.85	0.888	-14.84, 12.97
	Non-operated	15	93.3	44.77		
Flex 60°/sec	Operated	15	63.8	28.67	0.814	-9.97, 7.97
	Non-operated	15	64.8	31.62		
Ext 120°/sec	Operated	15	51.2	42.46	0.346	-14.08, 5.29
	Non-operated	15	55.6	49.01		
Flex 120°/sec	Operated	15	33.7	25.75	0.986	-8.30, 8.16
	Non-operated	15	33.8	27.95		

Mean extension 60°/sec was 104 and 107; mean extension 120°/sec was 51 and 31 respectively in operated and non-operated knees of DB patients.

Mean flexion 60°/sec was 70 and 77; mean flexion 120°/sec was 31 and 33 respectively in operated and non-operated knees of DB patients (Table 7).

Table 7: Comparison of Operated and Non-operated Knee in DB ACL Patients

DB ACL	Knee	N	Mean	Std. Deviation	p-value	95% confidence interval
Extension 60°/sec	Operated	15	103.8	38.65	0.666	-16.01, 10.54
	Non-operated	15	106.5	38.75		
Flexion 60°/sec	Operated	15	70.1	24.55	0.070	-14.80, 0.67
	Non-operated	15	77.1	29.88		
Extension 120°/sec	Operated	15	51.3	29.44	0.542	-6.33, 11.53
	Non-operated	15	48.7	25.88		
Flexion 120°/sec	Operated	15	31.3	17.41	0.591	10.13, 5.99
	Non-operated	15	33.4	21.76		

Extension 60°/sec and flexion/extension 120°/sec were same in both operated and non-operated knee of SB patients. However extension 120°/sec was more in non-operated knee as compared to operated knee of SB patients.

Flexion and extension 60°/sec of were slightly less in operated knee as compared to non-operated knee of DB patients and it were slightly more in

120°/sec in operated as compared non-operated knee of DB patients. However these differences were not statistically significant (Table 6 and 7).

Overall, there was statistically significant difference in flexion and extension 60°/sec as compared to 120°/sec in both SB and DB patients. Flexion and extension 60°/sec was significantly more ($p < 0.0001$) as compared to 120°/sec of both knees of SB

and DB patients. However there was no statistically significant difference in flexion/ extension of SB patients as compared to DB patients; and operated compared to non-operated patients.

Comparison of knee scores SB vs DB:

Mean lysoholm score was 41 and 81, mean IKDC

score was 38 and 86 respectively for pre operative and post-operative SB ACL; mean lysoholm score was 41 and 82, mean IKDC score was 39 and 86 for pre operative and post-operative DB ACL (Table 8 and 9).

Table 8: comparison of pre and post-op lysoholm score between SB and DB ACL Patients

	SB N=15 mean	Std. Deviation	DB N=15 Mean	Std. Deviation	T value (Significant 0.01 level)
Lysoholm (pre)	40.87	9.523	41.00	7.181	0.043 NS
Lysoholm (post)	81.13	4.868	81.60	4.896	0.262 NS
D1(difference between post and pre- op lysoholm score)	40.266	8.146	40.600	7.048	0.120 NS

NS- not significant

Table 9: comparison of pre and post -op IKDC score between single bundle and double bundle ACL patients

	SB n-15 Mean	Std. Deviation	DB n-15 mean	Std. Deviation	T value (significant 0.01 level)
IKDC(pre)	37.58	4.895	38.32	4.777	0.419 NS
IKDC(post)	85.86	4.952	86.35	4.108	0.299 NS
D2(difference between post and pre-op IKDC Score)	48.27	4.423	48.02	4.766	0.145 NS

NS – Not significant

Overall, there was statistically no significant difference in lysoholm score and IKDC score of SB as compared to DB ACL Patients.

CONCLUSION

In our study, we have noted that Strength deficit in quadriceps and hamstring postoperatively were comparable in both groups. clinical knee scoring as well as Isokinetic quadriceps and hamstring muscle strength were also comparable after SB-ACL and DB-ACL. However, in both groups maximal muscle strength is more than muscle endurance. This implies

more effort should be made to improve postoperative rehabilitation regime. Studies which compare the rotational stability of knee is suggested to further establish the utility of DB ACL over SB.

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Efficacy of Sciatic Nerve Mobilization in Lumbar Radiculopathy due to Prolapsed Intervertebral Disc

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ABSTRACT

Objectives: To evaluate the Efficacy of Sciatic Nerve Mobilization in Lumbar radiculopathy due to prolapsed intervertebral disc.

Study Design: It was Quasi Experimental design. Non Probability Purposive sampling technique was used for sample collection.

Study settings & participants: Total of forty four patients with lumbar radiculopathy due to prolapsed intervertebral disc were included in this study, out of which 22 were females and 22 were males. The mean of the ages of total patients was 41.89 years. They were in single group. Patients were required to have symptoms that referred distal to the buttocks, thigh or leg, positive straight leg raise test.

Interventions: Participants had received OPD based three treatment sessions per week for consecutive 3 weeks. The pre and post-test were designed to assess the efficacy of sessions where dependent variable was pain level and independent variable was Neurodynamic techniques.

Outcome measures: Numeric Pain Rating Scale (NPRS) and assessment form. The 11-point NPRS ranges from 0 (no pain) to 10 (worst pain imaginable) and was used to indicate the intensity of current pain. Assessment form includes standardized history and diagnostic tools.

Results: Total of forty four patients were included in this study, out of which 22 were females and 22 were males. Average of pre- assessment score was 6.95 and post-assessment score was 1.86 on NPRS, the paired sample t-test gives the significance in pre and post assessment scores with $p < 0.05$.

Conclusions: Findings of this study exposed the fact that short term treatment sessions of Sciatic nerve mobilization/ Neurodynamic by concerning pain and restoring the mobility of nerve has been beneficial in the management of disc prolapsed patients. But more research is in need to see the long term effects of treatment on lumbar radiculopathy.

Keywords: Low back dysfunction (LBD), Lumbar radiculopathy, Disc prolapsed, Neuropathic pain, Sciatica, Straight leg raise (SLR), Neural mobilization, Neurodynamics.

INTRODUCTION

Lumbar spine disorders rank fifth among disease categories in the cost of hospital care and account for higher costs resulting absent from work and disability than any other category. Disability

associated with low back dysfunction continues to rise, contributing to a substantial economic burden that exceeds nearly 50 billion annually in the United States alone. Health care expenditures among individuals with LBD are also 60% greater than those without LBD with 37% of the cost a direct increase of

Physical therapy services. Physical therapists utilize a wide range of interventions in the management of LBD; however, evidence for the effectiveness of these interventions is limited. Intervention in patients with a disease requires that the intervention has to be more beneficial, safer, and cost effective compared with the untreated natural history. Intervention should occur after accurate diagnosis and consideration of prognostic findings. This dilemma is particularly important in patients with low back dysfunction (LBD) with or without radiculopathy. The SLR test is frequently used in the assessment of patients presenting with lumbar spine dysfunction and is one of the few indicators that has been shown to identify the degree of impairment from LBD. Further, it has been suggested that improving the range of SLR has a beneficial effect in restoring normal movement and reducing the degree of impairment due to low back dysfunction. Unfortunately, there is no research evidence to support these conjectures. The movement of SLR induces posterior pelvic rotation and thereby flexion of the lumbar spine as well as flexion of the hip.¹

Low back pain and leg pain commonly occur together. Multiple factors can cause low back related leg pain; therefore, identification of the source of symptoms is required in order to develop an appropriate intervention program. The patient in this case presented with low back and leg pain. A patho-mechanism based classification is described in combination with the patient's subjective and objective examination findings to guide treatment. The patient's symptoms improved marginally with intervention addressing primarily the musculoskeletal impairments and with intervention addressing primarily the Neurodynamic impairments. Full functional improvements were attained with a manual therapy intervention directed at both mechanisms simultaneously².

The prevalence of lumbar radiculopathy found from different studies is 1.2% to 43%. In United States the prevalence is 10%, in Germany 20% to 23% and in Netherlands 0.5% to 1%. As far as my knowledge is concerned there is no study conducted to know the prevalence of lumbar radiculopathy in Pakistan³.

Lumbar radiculopathy is chronic pain which occurs in the lower back and legs. It is caused by

damage to the lower spine which causes compression of the nerve roots which exit the spine. A variety of conditions can lead to compression of the nerve roots. Sensations of pain caused by lumbar radiculopathy are variable. Some people just experience some numbness and tingling, which often grows more severe over time. Others experience dull aches or shooting pains which run down their legs. These pains are known as "sciatica," a term which refers to the sciatic nerve which runs from the lumbar spine down to the legs. Some people experience especially severe pain in specific positions which put pressure on the nerve roots, such as bending or twisting⁴.

The causes of lumbar radiculopathy includes Disc prolapse, Stenosis, Spondylolisthesis, Piriformis Syndrome and Obturator Syndrome. Disc prolapse is the most frequent cause of lumbar radiculopathy and it is the condition in which there is a tear in the outer fibrous part of the intervertebral disc, i.e. the annulus fibrosus which allows the central soft part of the disc, nucleus pulposus to bulge out. The bulging disc may compress on nearby structures such as nerves coming out from the spinal cord. It is a common condition that usually affects people between the age of 30 to 50 years.^{5, 6, 7}

Peripheral neuropathic pain, most common symptom of prolapse intervertebral disc is the term which describes the situations where nerve roots have been injured by mechanical or chemical stimuli that exceeded the physical capabilities of the nervous system. Its clinical manifestations are often divided in to positive and negative symptoms.

Positive symptoms include pain, paresthesia and spasm, and the negative ones include hypoesthesia or anesthesia and weakness⁸.

There are many conservative management tools used to treat lumbar radiculopathy due to the prolapse intervertebral disc. But it is proposed that nerve mobilization techniques can be effective in addressing musculoskeletal presentations of peripheral neuropathic pain.

Nerve mobilization is an innovative tool which involves conservative decompression of nerves. And for this purpose various neural mobilizing techniques and patients education techniques are available⁹.

Neural mobilization was implemented using the nerve gliding technique designed to facilitate the enhancement and restoration of nerve mobility through the numerous nerve beds. Nerve gliding is strategic joint movements designed to elongate the nerve bed at one joint while simultaneously reducing the length of another nerve bed at an adjacent joint. Nerve gliding exhibits greater excursion of the nerve through the nerve bed than nerve tensioning. Nerve gliding is theorized to apply less tension to the affected nerve because of the segmental partitioning of the nerve beds to minimize the ectopic axonal discharge (i.e. fibrillations, dysesthetic pain) and to permit extravasation of intraneural edema and reduce symptoms¹⁰.

METHODOLOGY

Total of forty four patients with lumbar radiculopathy due to prolapsed intervertebral disc were included in this study, out of which 22 were females and 22 were males. The mean of the ages of total patients was 41.89 years. They were in single group. Patients were required to have symptoms that referred distal to the buttocks, thigh or leg, positive straight leg raise test. Participants had received OPD based three treatment sessions per week for consecutive 3 weeks. The pre and post-test were designed to assess the efficacy of sessions where dependent variable was pain level and independent variable was Neurodynamic techniques.

Inclusion criteria:

1. Patients with lower lumbar radiculopathy.
2. Patients with SLR positive.
3. Patients between the ages of 25-65 years.
4. Both male and female patients will be included.
5. Prolapse intervertebral disc without physical disabilities.
6. Patients should not be on medications.

Exclusion criteria:

1. Patients with other pathologies.
2. Patients with SLR negative.
3. Patients below 25 and above 65years.
4. Prolapse intervertebral disc with physical disabilities.

5. Patients on medications.

RESULTS

Total of forty four patients were included in this study, out of which 22 were females and 22 were males. Average of pre- assessment score was 6.95 and post-assessment score was 1.86 on NPRS, the paired sample t-test gives the significance in pre and post assessment scores with $p < 0.05$.

According to the pain grades on NPRS 31.8% had a moderate level of pain and 68.2% had a severe level of pain prior to the treatment (pre assessment). After the treatment with Sciatic nerve neural mobilization, pain grades percentage has changed as 25% of patient had resolved pain completely having 0 score on NPRS, 68.9% were on mild level, 4.5 were on moderate and 4.5% on severe levels of pain.

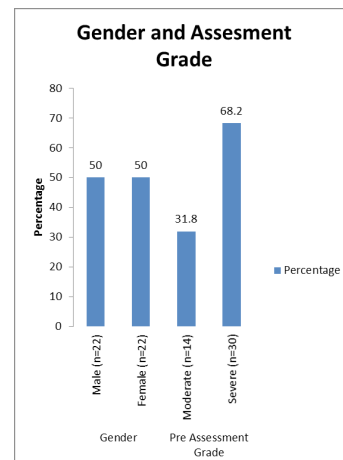


Fig 1: Gender and Assessment Grade

Table 1: The Comparison of Pre and post Assessment between means and standard deviation of Numeric Pain Rating Scale

	Mean	SD	p-value
Pre Assessment Score	6.95	1.18	<0.01*
Post Assessment Score	1.86	2.03	
*P<0.05 considered as significant using paired t-test			

The paired t-test was used between the pre and post treatment scoring of NPRS, the mean and standard deviation before the treatment was 6.95 ± 1.18 , after the treatment reduced to 1.86 ± 2.03 which was significant at 5% level of significance (p -value < 0.001).

DISCUSSION

This study was designed to evaluate the efficacy of Sciatic nerve mobilization (Neurodynamic) in the management of patients with intervertebral disc prolapse. The study shown significant results with Neurodynamic techniques and supported the role in management of sciatica resulted from disc prolapse concerning pain and restoring mobility of nerve root. When the nerve root compressed and microcirculation compromised, there is the pressure received by the nerve will affect the edema and the demyelination, Neurodynamic is the technique consist of short oscillatory movements and was sufficient to disperse the edema, thus alleviating the hypoxia and reducing the associated symptoms. In addition, there is hypothesis that nerve movement within pain-free variations can help to reduce nerve compression, friction and tension which eventually decreases its mechanosensitivity. Therefore, a Neurodynamic technique seems to be a better procedure of treatment when compared with other conventional interventions.¹¹

The study conducted by Sahar M. Adel to investigate the effect of lumbar mobilization techniques and neural mobilization technique on sciatic pain and of degree of nerve root compromise in chronic low back dysfunction (LBD) which concluded that straight leg raise SLR stretching in addition to lumbar spine mobilization and exercise was beneficial in improving pain, reducing short term disability and promoting centralization of symptoms compared to lumbar spine mobilization and exercise without SLR stretching.^{1,12}

Richard F. Ellis et al suggested in a systemic review at RCTs investigating neural mobilization yielded 11 studies that met the inclusion criteria for this review. Perspective Analysis of these studies indicates that 8 of the 11 studies had significant outcomes with neural mobilization in the treatment of altered Neurodynamics or Neurodynamic dysfunction. Three of the 11 studies had no difference with neural mobilization or more beneficial than standard treatment or without treatment. Due to the heterogeneity in respect to the neural mobilization interventions used in these RCTs, it is difficult to conclude regarding neural mobilization as a general therapeutic tool. Over all, six different categories or

types of neural mobilization treatments were identified but there was limited evidence to support the use of active nerve and flexor tendon gliding exercises of the forearm, cervical contralateral glides, and Upper Limb Tension Test 2b (ULTT2b) mobilization in the treatment of altered Neurodynamics or Neurodynamic dysfunction. Similarly, limited evidence available for the procedure of slump stretches with combinations of neural mobilization techniques.¹³

Dheeraj et al revealed that the mechanical traction in combination with neural mobilization significantly increases the pain relief and PROM more quickly compared to only conventional treatment.¹⁴

Talebi GA et al concluded that neural mobilization techniques can increasingly useful in treatment of abnormal neural tension and chronic radiculopathy symptoms.¹⁵

Scrimshaw et al investigated the effects of neural mobilization following lumbar dissection, fusion, or laminectomy. The outcome of a 12-month follow-up demonstrated the neural mobilization was less significant to the traditional postoperative care. However, the SLR was within normal range suggested that neural mobilizations on patients with a normal SLR have less beneficial in decreasing pain and disability. There was no significant difference between post test results of Neurodynamic techniques and post test result of mobilization on H-reflex.¹⁶

This study has been significantly an effective tool in the management of lumbar radiculopathy due to prolapsed intervertebral disc.

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Conflict of Interest: Nil

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To Compare the Effect of MWM v/s MWM along with Neural Tissue Mobilization in Case of Cervical Radiculopathy

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ABSTRACT

Cervical radiculopathy is a pathological condition of the cervical nerve root that may lead to chronic pain and disability. The symptoms of cervical radiculopathy typically include severe neck pain with radiation of the pain to the back of shoulder, shoulders, arm, or hand. Numbness or tingling in the arm can also be present. Mulligan's other spinal manual therapy treatment techniques involve the concurrent application of both therapist applied accessory apophyseal joint gliding and end range active physiological movement on the part of the patient. Neural tissue mobilization uses specific positions and movement of neck and arm to reduce nerve mechanosensitivity, restore function and resolve symptoms. Many of the evidences are existed which says that mulligan alone and ULTT (upper limb tension test) alone have the effective in cervical radiculopathy. So in this study want the effect of mulligan mobilization along with ULTT on pain and functional scale is being checked. **Procedure :** Group A (n=15) received conventional therapy as IFT (Interferential Current Therapy) and neck exercises and along with that mulligan mobilization. Group B (n=15) received conventional and mulligan mobilization along with neural tissue mobilization. Outcome will assess in terms of VAS (Visual Analogue Scale) and NDI (Neck Disability Index). Treatment analysis will be done in between the groups and within the groups by using statistical test. The level of significance seen at 0.05. **Conclusion:** The study concludes that MWM along with neural tissue mobilization leads to better improvement on pain and functional performance as compared to MWM alone is given as a manual therapy.

Keywords: Mobilization with movement (MWM), neural tissue mobilization, cervical radiculopathy.

INTRODUCTION

- Cervical radiculopathy is a term used to describe the degenerative aging process that encompasses a sequence of changes in the intervertebral discs, vertebral bodies, facet joints, and ligaments of the cervical spine⁽¹⁾.

- An epidemiologic survey showed the annual age-adjusted incidence of radiculopathy to be 83 per 100,000 persons⁽²⁾. Persons reporting radiculopathy were between 13 and 91 years of age, and men were affected slightly more than women.

- Although the causes of radiculopathy are varied (e.g., acute disk herniations, cervical spondylosis, foraminal narrowing), they all lead

to compression and irritation of an exiting cervical nerve root.

- Cervical radiculopathy is a neurologic condition characterized by dysfunction of a cervical spinal nerve, the roots of the nerve, or both.

- It usually presents with pain in the neck and one arm, with a combination of sensory loss, loss of motor function, or reflex changes in the affected nerve-root distribution⁽³⁾.

- Cervical radiculopathy leads to neck and radiating arm pain or numbness in the distribution of a specific nerve root. Often, this pain is accompanied by motor or sensory disturbances

- Physical therapy interventions often used for the management of cervical radiculopathy include cervical traction, postural education, exercise, electrical modalities like IFT and TENS, and manual therapy applied to the cervical spine and thoracic spine.

- Studies indicate that some combination of these interventions may result in improved outcomes for patients with cervical radiculopathy.

- Brian Mulligan's concept of mobilizations with movement (MWM) is the logical continuance of this evolution with the concurrent application of both therapist applied accessory and patient generated active physiological movements.

- MWM is concurrent application of a sustained accessory mobilization applied by therapist and an active physiological movement to end range applied by patient. Passive end of range over pressure of stretching is the able to be delivered without pain as a barrier^(3,4)

- Neurodynamic tests challenge the physical capabilities of the nervous system by using multijoint movements of the limbs and/or trunk to alter the length and dimensions of the nerve bed surrounding corresponding neural structures.

- Guidelines have been proposed to assist clinicians in identifying a 'positive' response to a neurodynamic test that would be considered suggestive of increased mechanosensitivity in neural tissues.

- Neural tissue management is one physiotherapy intervention advocated nerve related neck and arm pain.

- Neural tissue mobilization uses specific positions and movement of neck and arm to reduce nerve mechanosensitivity, restore function and resolve symptoms⁽⁵⁾

MATERIALS AND METHODOLOGY

Material

- Pen, paper and pen
- Treatment table
- IFT machine
- Examination table
- Chair
- Data collection sheet
- Consent form
- Visual analogue scale
- Neck Disability Index

Methodology

- sample size: 30 sample size and are randomly divided into two groups.

- Study design : experimental study
- Sampling method: simple random sampling

Inclusion criteria

- Subject with unilateral cervical neck pain and tingling-numbness present at upper limb.
- Subjects having Age group from 30 to 60 years.
- Males and females both were included
- Subject spurling test positive.
- Subjects with ULTT-1 positive.

Exclusion criteria

- Systemic disease
- Spondylolysis
- Spondylolithesis
- Severe Osteoporoses
- Tumor
- Thoracic outlet syndrome
- CTS
- Cervical spine fracture
- Canal stenosis

Method

- Group A(n=15) received conventional therapy as IFT over affected and radiating upper limb 15 min once a day(6days/week) for 12 days and Isometrics neck exercise given twice in a day. Once in the department and for the second time, patient was

taught to do exercise at home

- And here mulligan mobilization with movement in which SNAG is given to the patient. The dosage is 10 MWM in one set, 3 sets per session were given for 12days⁽⁶⁾

- Group B(n=15) received conventional therapy as group A and mulligan mobilization with movement.

- Here along with that neural tissue mobilization is also given(15 repetition or for 30seconds) for 12 days.



Figure-1(A): Mulligan Mobilization

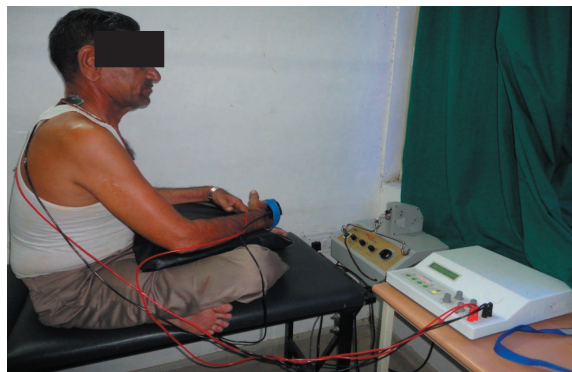


Figure-1(B): Ift



Figure-1(C): Ultt

Outcome Measures

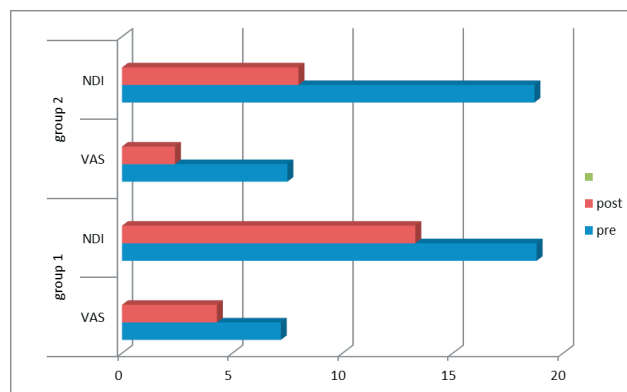
- VAS for pain measurement
- Neck disability index(NDI).for functional disability.

RESULTS

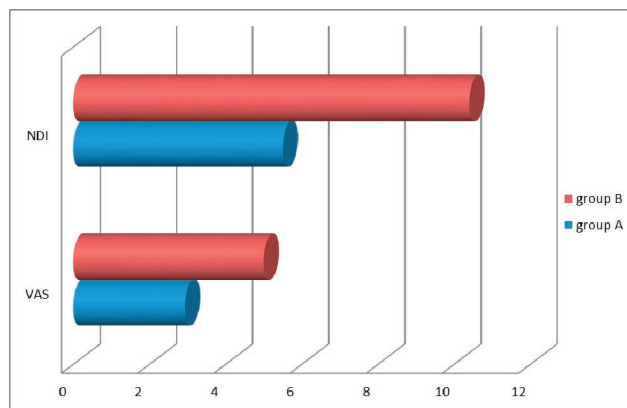
- Results were analyzed by SPSS.
- Results were analyzed by paired t-test within the groups.

Both group A(mean for VAS=2.93 and NDI=5.5) and group B(mean for VAS=5.0 and NDI=10.4) shows a significant difference in analysis but group B shows significant improvement than group A.

Unpaired t-test was performed ($p < 0.001$) in between the groups and both shows significant improvement



Graph-1(A): Mean difference of pre and post treatment of vas and ndi in Group A and B



Graph-1(B): Mean difference of vas and NDI in group A and Group B

DISCUSSION

- A randomized control trial was done To compare the effect of mulligan mobilization and

mulligan mobilization with neural mobilization on pain and functional disability in patient with cervical radiculopathy.

- Here both the groups have shown significant improvement in VAS and NDI(functional scale) as compared on 1st day and 12th day.

- But when statistical analysis was done in between group A(MWM) and group B(MWM with neural tissue mobilization), Group B has shown significant improvement as compared to group A

- Mulligan's spinal manual therapy treatment techniques involve the concurrent application of accessory apophyseal joint gliding and end range active physiological movement on the part of the patient.

- As these techniques are sustained at the end of available pain-free range and still follow the plane of the apophyseal joints under treatment that is SNAG⁽⁷⁾

- Mulligan postulates a positional fault model to explain the results gained through his concept⁽⁸⁾ as when a corrective mobilization is sustained, pain free function is restored & several repetitions will begin to bring lasting improvement.

- Another reason that seems to confirm the position hypothesis is that the MWM is nearly always at right angles to the plane of the movement taking place & will only work in one direction. Neural tissues respond to movement through the development of strain, excursion, and stress in a non-uniform fashion⁽⁹⁾

- Consequently, neural structures will be subjected to different mechanical loads depending upon the order of joint movement during neurodynamic testing⁽¹⁰⁾ and the testing sequence has been shown to alter the mobility and/or symptom response during median nerve biased ULNT⁽¹¹⁾

- Exelby and Wilson postulate a neurophysiological rationale for the success of Mulligan's MWM (Movement With Mobilization) approach.⁽¹²⁾

- Robert J. Nee and David Butler has concluded that neurodynamic mobilization techniques can be effective in addressing musculoskeletal peripheral neuropathic pain states.

- And when both the manual therapy are given together shows a significant improvement on outcome measures.

CONCLUSION

- The study concludes that MWM along with neural tissue mobilization leads to better improvement on pain and functional performance as compared to MWM alone is given as a manual therapy.

Limitations

- The small sample size in each group may limit generalization of the results of this study.
- Failure to blind fold.
- There was no long term follow up.

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Perspective of Neuro Therapeutic Approaches Preferred for Stroke Rehabilitation by Physiotherapists

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ABSTRACT

Background: There are various neurophysiological approaches like Proprioceptive neuromuscular facilitation technique i.e. PNF, Bobath's neurodevelopmental approach i.e. NDT, Brunnstrom's technique and Rood's approach. But there is a lot of variation of use of these approaches depending on the therapists. We wanted to find the what approach is used the most, what was the reason behind the selection, and were the physiotherapists trained in it.

Material and Method: It is questionnaire based survey, validated by 3 clinical experts, created using Google docs and was emailed to more than 2000 therapists across India. Out of which 412 therapists willingly participated in the survey. Ten incomplete questionnaires were excluded. Final sample size was 402. The questionnaire was based on the neuro therapeutic approaches. Physiotherapists holding BPTH and MPTH degrees were included in the study. After the reception of responses the data was analyzed through descriptive analysis.

Results: Out of all the respondents, 15% of them were on-going masters students while rest all of them were clinicians. This included 39% from south and west region each and 13% from north and 9% from east region of India. The study shows that 96% therapist show good awareness about the approaches, despite this 73% faced difficulty practicing it. Although PNF, sensory integration, CIMT, MRP are found to be most commonly taught at graduation level followed by Rood, NDT/Bobath and Brunnstorm, PNF and CIMT are most commonly preferred and practiced approaches, followed by NDT/Bobath and Brunnstorm. The least preferred and practiced approaches were found to be Roods and Motor Relearning Program. It was found that the therapists misunderstood sensory integration with sensory re-education. PNF and CIMT were more preferred because they are easy to learn and practice and are also evidence based. Only 13% of therapists were found to have received training in some approaches. Surprisingly, 90% of them were found to be interested in attending additional training in these approaches.

Conclusion: 96% of therapists are well aware of neuro approaches, but face difficulty practicing them. PNF and CIMT are most commonly preferred and practiced approaches, followed by NDT and Brunnstorm and Roods and MRP. There is a mix pattern of practice of traditional approaches such as PNF, Brunnstorm and NDT and the task specific training such as CIMT. This study suggests that the physiotherapists are still practicing more of traditional approaches than task specific approaches such as CIMT and MRP. The study further shows that majority of the therapists i.e.87% have not had any additional training and that 90% are keen on acquiring additional knowledge about these approaches through some workshop or a seminar.

Keywords: Stroke, Neuro Approaches, Current practice.

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INTRODUCTION

Rehabilitation of a stroke patient begins as soon as any impairment is perceived and comprises traditional exercise programmes and neuropsychological approaches with the primary aim of restoring mobility and function of patient¹.

Neuro- physiological approaches are based on neurophysiological principles of motor control and recovery. Each of these therapies have advantages and limitations. Studies comprising traditional exercise programs and neurophysiological techniques have failed to show distinct differences in outcome^{2,3}. None of these therapies have any proven superiority over others^{4,5}. Each of these techniques try to facilitate recovery of motor control through different strategies. These approaches stress on enhancement of the natural recovery process. Various neuro therapeutic approaches include Proprioceptive Neuromuscular Facilitation technique⁶, Bobath's/ NDT Neuro developmental approach⁷, Brunnstrom's approach and Rood's approach which are based on reflex hierarchical theory of motor control and task specific approaches like Motor Relearning Program⁸ and CIMT^{9,10} which has a significant improvement on neurological function of brain ischemia. Each approaches has their own merits and demerits. There is always a dilemma about which approach to use in clinical practice and this leads to a lot of variation in use of these approaches. There can be variations in training, understanding and clinical practice of neuro therapeutic approaches. Need for this analysis is to find the perspective of different neuro therapeutic approaches amongst the physiotherapists from different regions of India. IN other words, this study is looking to answer questions such as what approaches are the physiotherapists using in clinical practice and what is the reason of preferring them? Are these therapists trained in any of these approaches? So this study was conducted to know the perspective of approaches amongst the therapists.

MATERIAL & METHOD

This study was a questionnaire based survey. It was a self designed questionnaire based on the neuro therapeutic approaches which was validated by 3 clinical experts in neuro rehabilitation . It comprised of 12 questions. All clinical therapists who have completed their BPTh and MPTh from different regions of India were included in the study. Study was performed by creating a survey through Google docs and was emailed to more than 2000 therapists across India and link was also put up on social networking sites which contained various physiotherapy groups. Out of which 412 therapists willingly participated in the survey. Ten incomplete questionnaires were excluded. As a result total 402 responses were analyzed. The respondents had an

average 5.3 years of experience treating patients with stroke. The respondent data sheet (RIS) was elaborated to the respondents about objective of research. Our questionnaire did not contain any personal questions. Therefore, it posed no threat to the participants' confidentiality in any way. However an identification number was still assigned to each survey to protect the data and privacy. After the reception of responses the data was analyzed through descriptive analysis.

FINDINGS/DISCUSSION

Despite of advances in the acute management of stroke, a large proportion of stroke patients are left with significant impairments. Over the coming decades the prevalence of stroke-related disability is expected to increase worldwide and this will impact greatly on families, healthcare systems and economies. Effective neuro-rehabilitation is a key factor in reducing disability after stroke³.

In this study, only 20% therapists were found to be working in acute set-up, 30% were found to be engaged in treating chronic conditions and approximately 74% of therapists were working in both the set ups. Out of all the respondents, 15% of them were on-going Masters students while rest of them were clinicians. This included 39% from South and West regions each and 13% from North and 9% East region of India.

This study analyzes perspective of different neuro therapeutic approaches amongst the physiotherapists from different regions of India. Nearly all respondents, (96%) show good awareness about the approaches. Despite of having good awareness, majority of the respondents i.e. 73% faced difficulty in practicing the neuro-physiological approaches on patients. One of the reasons for this can be that the approaches are not well taught to the students during their professional education^{14,15}. When asked which techniques were they taught in their professional learning program and which approaches according to them are most used in clinical practice, the responses are shown in the Figure below. It is noteworthy that the respondents were allowed to choose multiple treatment approaches for the question. It was found that PNF, CIMT and NDT were the most preferred techniques where as Brunnstorm, Roods were moderately practiced and MRP was not put much into the practice.

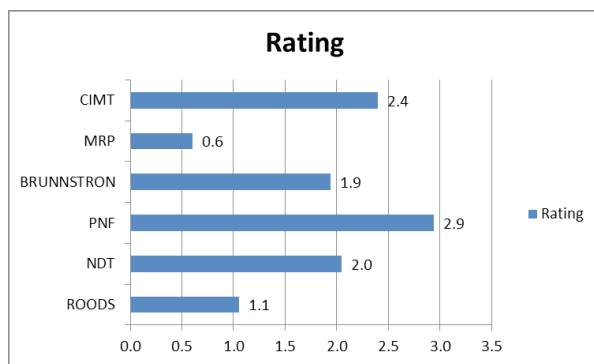


Figure 1 : Which technique is used the most according to you?

The therapists were asked to rate the approaches as per the use in descending order. The response obtained was that PNF is comparatively a simple technique and its easy application makes it the most commonly practiced approach amongst the therapists. But there seems to be a misunderstanding with the option of sensory integration. Therapists perceived it to be as sensory re-education. They got confused between the two. The study shows a positive sign of CIMT being put more into practice as it is an evidence based practice that gives good results.

The practice of approaches amongst the therapists is in following order:

PNF and CIMT are most commonly preferred and practiced approaches, followed by NDT and Brunnstorm where as the least preferred and practiced approaches are Roods and MRP. There is a mix pattern of practice of traditional approaches such as PNF, Brunnstorm and NDT and the task specific training such as CIMT. This suggests that the therapists are still practicing more traditional approaches compared to the task specific approaches which are CIMT and MRP. If we look at the training at the graduation level we found that most of them were well trained at PNF and CIMT. Although they mentioned that they were trained in MRP but still this is not the preferred method of practice. NDT and Brunnstorm were less preferred in terms of training.

When asked why these approaches are less used, some of the most common reasons mentioned by respondents were.

The therapists had poor/inadequate practical knowledge about the approach. MRP is comparatively less used as it is a newer technique and so there is insufficient knowledge and awareness about it¹⁰.

Due to lack of evidence of the newer techniques, these approaches are not practiced much frequently. Some of the therapists reported to not have learnt a few approaches. They also mentioned that the selection of an approach depends on the evaluation of the patients and it was found that Roods, MRP and Brunnstorm were not appropriate for their patients as they thought that PNF and CIMT are easier to apply and were effective in their response, so they were widely put into practice. Majority of them still follow the age old technique because many of the therapists have not taken keen interest in well versing themselves with the newer technique.

Other therapists mentioned that their concepts about some of the approaches were unclear, and hence there was hesitation in the use of these approaches.

The respondents have also mentioned that few approaches were not included in the syllabus and were not emphasized on while teaching and hence the hands on skill of the therapists remains non-refined.

When asked why are PNF and CIMT the most used approaches, their replies were:

PNF is used primarily for two reasons, first since it is easy to treat on the basis of recovery. Secondly, PNF being a basic technique, it is easy to understand and implement and is also very result oriented. Moreover, the material is easily available for the study of this approach, and it is also frequently included in the syllabi all over the country and is thus given more emphasis in teaching. It also has lots of variations with easier application and quick results. CIMT is more effective as it is task specific and is an evidence-based practice. However, it is known to be difficult to practice and is more time consuming. However, it is still a preferred choice amongst the therapists as it has given satisfactory results to the patients.

Majority of the clinicians i.e. 87% specified that they have not received any additional training specific to the neuro approaches and they were all keen on acquiring additional knowledge about these approaches through some workshop or a seminar. About 85% of them acquire their information regarding these approaches over the internet, which is considered to be a very unreliable source of information. 27% of the therapists reported to have referred to the textbooks to gain knowledge while 31% of them were referring to the journals. So,

more number of therapists should start referring the textbooks as well as the journals being more reliable and evidence based. This shows the need of using textbooks which are easily available now a days to gain adequate knowledge about the approaches. Also reading journals will help the therapists to gain evidence based knowledge and will be able to apply this knowledge clinically. This will help in the effective treatment of the stroke patients.

CONCLUSION

This study shows that 96% of them are well aware of neuro approaches, but face difficulty practicing them. PNF and CIMT are most commonly preferred and practiced approaches, followed by NDT and Brunnstorm and Roods and MRP. There is a mix pattern of practice of traditional approaches such as PNF, Brunnstorm and NDT and the task specific training such as CIMT. This suggests that they are still practicing more of traditional approaches than task specific approaches such as CIMT and MRP. The study shows that majority of the therapists i.e.87% have not had any additional training and 90% of them said that they are keen on acquiring additional knowledge about these approaches through some workshop or a seminar.

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Making Physical Therapy a Holistic Service to the Patient

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SUMMARY

Rehabilitation focuses on the restoration of function to individuals with impairment, functional limitation or disability. Physiotherapy is a rehabilitation profession concerned with identifying and measuring movement disorders and maximizing movement potential through evaluating, designing and implementing appropriate therapeutic strategies and improvement of psychological health of an individual¹. Outcome studies have shown that rehabilitation programs are effective in improving long-term functional status and decreasing institutionalization. Medical rehabilitation affects fundamental recovery, and it almost certainly affects adjustment processes, learning of compensatory strategies, self-care and motivation of clients². The most successful rehabilitation programmes are those that have adopted a holistic approach (i.e. one that supplements physical therapy with psychological strategies to facilitate recovery). Rehabilitation from injury involves not only physical, but psychological considerations.

Aims: This paper aims at highlighting the notable place of psychological considerations in rehabilitation and to equip physiotherapists and health professionals with necessary knowledge that may assist them in coping with setbacks that may occur in patient management.

Objectives: The objectives of this paper are to critically examine the psychological well-being of the patient and incorporate same to the physical therapy management.

Keywords- Rehabilitation, psychological, therapeutic, strategies, holistic, approach.

INTRODUCTION

In psychology, emotion is the generic term for subjective, conscious experience that is characterized primarily by psycho- physiological expressions, biological reactions, and mental states. Emotion is often associated and considered reciprocally influential with mood, temperament, personality, disposition, and motivation, as well as influenced by hormones and neurotransmitters. Emotion is often the driving force behind motivation, positive or

negative. Emotions have been described as discrete and consistent responses to internal or external events which have a particular significance for the organism. Emotions are brief in duration and consist of a coordinated set of responses, which may include verbal, physiological, behavioral and neural mechanisms³.

Another obvious descriptive component of emotion is the set of behaviors that may be performed and observed in conjunction with an emotion. These behaviors are of two general types: gross behaviors of the body and emotion expressions. The gross body behaviors may have no apparent adaptive value, e.g., wringing and rubbing the hands or tapping a foot, or they may be directed towards a goal, e.g., striking something or running away. The facial and bodily behaviors called "emotion expressions" are indicators of emotion, as opposed to effecting some action or achieving some goal. These expressions

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can differentiate one emotion from another^{4,5}. A less obvious component of emotion is the set of internal bodily changes caused by chemicals secreted by the body's various glands which are activated during emotion to act in diverse ways on the nervous system and other organs. This component includes some actions that can be observed, such as the constriction or dilation of the iris of the eye, possibly piloerection and sweating, blanching and flushing of the skin and other responses that are relatively hidden such as heart rate, stomach activity, and saliva production⁶.

Environment either affects one positively or negatively. Environmental factors such as the physical and social, influences how people behave. These along with the common environmental stressors (e.g., noise, climatic extremes), including such cognitive stressors as stimulus overload, and the state of a person's immediate environment have a profound impact on behavior⁷. Up to 45 % of personality trait is attributable to environment and 80 to 90% of that is attributed to non-shared within-family influences⁸. Eldest children are more conscientious and seek parental favor and they act as surrogate parents toward younger siblings. They are more responsible, conservative, and defensive. Middle children have broader interests and tend to be more independent, innovative, risk tolerant, rebellious and open to experience but suffer from lower self-esteem. Youngest siblings are less ambitious, less conscientious, and more socially oriented. They are sometimes described as popular, easy going, lazy or spoilt. Lastborns often enjoy considerable parental investment, though without the burden of parental expectations of 'success' (which is usually placed on firstborns). They also enjoy considerable support from older siblings, though this attention is often ambivalent^{9, 10}. Research has identified numerous behavioral and cognitive outcomes as a result of environmental factors including physical illness, feelings of helplessness and attention fatigue. Humans can change their physical or social settings to create more supportive environments (e.g., smaller scaled settings, territories) where they can manage the flow of information or stress inducing stimuli. People can also endure the stressful period, incurring mental costs that they deal with later in restorative settings (e.g., natural areas, privacy, and solitude). People tend to seek out places where they feel competent

and confident, places where they can make sense of the environment while also being engaged with it. Preserving, restoring and creating a preferred environment are thought to increase sense of well being and behavioral effectiveness in humans¹¹.

Culture is one of the major factors affecting how we live, eat, talk, dress, relate with and treat people. Culture is that complex whole which includes knowledge, belief, art, law, moral, customs, and any other capabilities and habits acquired by man as a member of a society. Culture is the full range of learned behavioral patterns of a group of people¹². The ways in which people develop are shaped by social experience and circumstances. Each person is born into a social and cultural setting—family, community, social class, language, religion—and eventually develops many social connections. The characteristics of a child's social setting affect how he or she learns to think and behave by means of instruction, rewards and punishment, and example. This setting includes home, school, neighborhood, and also, perhaps, local religious and law enforcement agencies. Then there are also the child's mostly informal interactions with friends, other peers, relatives, the entertainment and news media. How individuals will respond to all these influences, or even which influence will be the most potent, tends not to be predictable. Furthermore, culturally induced behavior patterns, such as speech patterns, body language, and forms of humor, become so deeply imbedded in the human mind that they often operate without the individuals themselves being fully aware of them^{12, 13, 14}. What is considered to be acceptable human behavior varies from culture to culture and from time period to time period. Every social group has generally accepted ranges of behavior for its members. Some normal behavior in one culture may be considered unacceptable in another. The world has a wide diversity of cultural traditions.

One's self-concept and self-identity are linked to body image and are often seen as conscious, social derivatives of it¹⁵. However, self-concept and self-identity may be discordant for many individuals with visible disabilities. The sense of self-identity which is privately owned and outwardly presented may be denied in social interactions with others who respond to the person as "disabled" first (i.e., focusing on appearance rather than identity), thereby losing

sense of the person's real self¹⁶. The person's self-esteem, representing the evaluative component of the self-concept, gradually shows signs of erosion and negative self-perceptions following such encounters. A common feature in rehabilitation is anxiety which is characterized by a panic-like feature on initial sensing of the nature and magnitude of the traumatic event. It reflects a state of situationally determined response and is accompanied by confused thinking, cognitive flooding, and a multitude of physiological symptoms including rapid heart rate, hyperventilation, excess perspiration, and irritable stomach^{17, 18}.

Finally, patient undergoes a period of adjustment. This reaction is referred to as adaptation, reorganization, reintegration, or reorientation and comprises of several components, viz: an earlier cognitive reconciliation of the condition, its impact, and its chronic or permanent nature; an affective acceptance, or internalization, of oneself as a person, including a new or restored sense of self-concept, renewed life values, and a continued search for new meaning; and an active behavioral pursuit of personal, social, and/or vocational goals, including successful negotiation of obstacles encountered during the pursuit of these goals¹⁸. Physiotherapists are in an excellent position to identify whether a patient is adjusting poorly to injury or not. However, without an understanding of the psychological reactions to injury, important signs of problematic adjustment may be missed, thus prolonging recovery. In this respect there should be close observation for the following:

- Evidence of anger and confusion.
- Obsession with questions such as "when can I go back to work again?"
- Denial, reflected in remarks such as "The injury is no big deal."
- Dwelling on minor physical complaints.
- Remarks about letting their family down or guilt at not being able to contribute.
- Over-dependence on the physiotherapist or other health personnel.
- Withdrawal from others, such as the physiotherapist, family or friends.
- Rapid mood swings or striking changes in behavior.

- Statements indicating helplessness, such as "it doesn't matter what's done, I won't recover"¹⁹.

CLINICAL IMPLICATIONS

The percentage of patients or clients who experience difficulties adjusting emotionally or behaviorally to injury furnishes evidence of the need to consider psychological factors in planning, implementing and evaluating rehabilitation protocols. Rationale for incorporating psychological aspects into treatment is provided by the abundance of psychological factors associated with injury rehabilitation outcomes and the demonstrated efficacy of psychological interventions in producing desirable injury rehabilitation outcomes. Also psychological disorders can stem from lack of incorporation of psychological consideration and interventions early in the rehabilitation protocol. Evaluation of the adjustment or adaptation of the clients to their specific conditions should be incorporated from the beginning of rehabilitation and continued intermittently in order to aid clients adaptation and to identify those coping poorly or at risk of developing psychological disorders and thus ensure early referral to the appropriate specialists^{1,20, 21}.

Physiotherapists are psychologically affected in rehabilitation. Physiotherapists work in emotionally-laden situations, such as those involving difficult behavior on the part of a patient or caregiver and deteriorating conditions in patients with whom a good rapport has been established with negative effects on the physiotherapist. Prospects for rehabilitation increase if the therapist conveys a positive attitude and shows belief in the client's potential to achieve rehabilitation goals—particularly goals that the client is able to control, such as adherence to treatment requirements, exercise, and self-care. The experience of anxiety related to job demands and of distress related to an inability to find meaning or purpose in professional and personal life is frequently mentioned amongst health practitioners. Relevant remedies to this include giving opportunities (in meetings or conferences, for example) to these practitioners to evaluate the causes of stress, to develop ideas, to share ideas with peers, and to create opportunities to honor or encourage members of the team. Some ways to divert attention from stress are to seek humor in experiences; to learn from patients; to accept

limitations while remaining professional in demeanor and presentation; and to take appropriate time away from work to rest and engage in leisure activities ²⁰.

RECOMMENDATIONS

- Rehabilitation programmes should endeavor to consider both the physical and psychological aspects of injury in order to ensure successful rehabilitation.
- Physiotherapists should have an understanding of the processes and issues involved in coping with disabilities.
- Physiotherapists should evaluate the adjustment or adaptation of their clients to their specific conditions.
- Physiotherapists should be encouraged to seek advice from psychologists especially when dealing with complex cases.
- The need for rehabilitation psychologists within hospitals should be made known to the Government, the general public and the health care sector.
- Physiotherapists should also endeavor to engage in rehabilitation psychology research in order to contribute to the existing body of knowledge.

CONCLUSION

There are many psychological factors that can influence recovery in rehabilitation. An understanding of the expected responses or reactions to injury or disabling conditions; coping strategies and interventions will form solid bedrock for maximization of rehabilitation interventions. From the foregoing, it is obvious that effective rehabilitation can only be undertaken when the psychological makeup of the patient/client is incorporated into the management. A careful determinate study of the patient will help in proffering the appropriate protocol that will assist in restoration of function in the patient. This may just be the expected lead way much sorted for in these days of evidence based practice. We submit that physiotherapy management devoid of this will result in poor compliance from the patient. Other health professionals may also need to take this into consideration and appreciate the fact that a merry heart make medicine to work. Evaluation of the adjustment or adaptation of the clients to

their specific conditions should be incorporated from the beginning of rehabilitation and continue intermittently in order to aid clients adaptation and to identify those coping poorly or at risk of developing psychological disorders and thus ensure early referral to the appropriate specialists.

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Immediate Effect of Pursed-lip Breathing while Walking During Six Minute Walk Test on Six Minute Walk Distance in Young Individuals

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ABSTRACT

Background: Dynamic hyperinflation is known to occur in the course of even submaximal level of physical performance which may be the limiting factor for that activity. PLB is known to reduce this dynamic hyperinflation and thereby improve performance in COPD. The study was conducted to answer the research question of whether PLB would affect submaximal performance in normal individuals as well.

Aim: To study the immediate effect of pursed lip breathing while walking during six minute walk test (6MWT) on six minute walk distance (6MWD) in young individuals. **Method:** 6MWT was performed according to ATS guidelines. Participants were randomly divided into two groups using computer generated random number table. One of the two groups performed 6MWT with PLB on first day and then without PLB on next day and remaining group performed 6MWT by reversing the order of performing 6MWT. **Statistical analysis:** Statistical analysis was done using Wilcoxon matched-pairs signed-ranks test as data was not distributed normally. **Results:** The mean 6MWD while walking with PLB was 652m as compared to 6MWD without PLB which was only 620m i.e. the mean 6MWD improved by 32m with PLB. **Conclusion:** Pursed lips breathing is shown to have beneficial effect as seen with improved 6MWD hence it can be used as an ergogenic aid or as an energy conserving technique in normal individuals as well.

Keywords used: Pursed lip breathing, PLB, Dynamic hyperinflation, six minute walk test, Pursed lip breathing, dynamic hyperinflation.

INTRODUCTION

Physical activity and exercise are part of life of every individual. Evidence suggests that an acute bout of short term as well as prolonged exercise results in increased residual lung volume hence

reduced alveolar ventilation during the exercise.^[1] This adversely affects the oxygen diffusion thus limiting the functional capacity in normal individuals also.

Pursed-lip breathing (PLB) is a way of exhaling air out of the lungs such that it is let out through the pursed lips (voluntarily puckered lips). This manner of exhalation creates a back pressure in the airways throughout expiration, thereby producing a stent like effect to help maintain the patency of the airways during expiration, assisting complete emptying of the lung.^[2]

The study is designed to see whether expiration through pursed lip while walking during 6MWT would affect the 6MWD covered in healthy young

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individuals. Here the walking will be considered as a quantified exercise.

MATERIAL & METHOD

The Ethical clearance was obtained from Institutional Ethical Committee. Informed consent form was obtained from the subjects involved in the study.

Study design: It was Randomized Cross over experimental study.

Sample size and sampling strategy: Sample size was calculated from the pilot study in which standard deviation of 6MWD with and without PLB was 80 and the average of difference between 6MWD with and without PLB was 37 meters. The above values were put in the N-Master software version 1.0 which gave the sample size of 100. Considering 10% drop out rate the total sample size came to 110 subjects.

Material used during 6MWT



Fig:1

Method: 6MWT was performed according to ATS guidelines^[1]. Participants were randomly divided into two groups using computer generated random number table. One of the two groups performed 6MWT with PLB on first day and then without PLB on next day and remaining group performed 6MWT by reversing the order of performing 6MWT.

6MWT with and without pursed lip breathing



Fig:2



Fig:3

Statistical Analysis:

Statistical analysis was done using Graph pad prism version 6.03 (trial). Parameters like distance, RPE, RPP, dyspnoea, HR, RR, SBP with and without PLB were analyzed with help of Wilcoxon matched-pairs signed-ranks test as data was not distributed normally (According to Kolmogorov and Smirnov test). Statistical significance was set as $p < 0.05$.

Table 1: Demographic data

Mean Age (Years)	Sex		Mean Height (Cm)	Mean Weight (Kg)	Mean Bmi (Kg/m ²)
	Male	Female			
21.59	21	89	156.53	53.63	21.8

RESULTS

- Table 2 shows the mean of 6 MWD and the difference of distance with PLB and without PLB. It shows that there was a statistically significant difference between the two groups.

Table 2: Mean distance with PLB and without PLB

Column Title (Distance)	Mean	Sd	P-value
With Plb	652	66.284	<0.0001
Without Plb	620.32	63.018	

- Also there was improvement in the mean speed with PLB found as 108m/min compared to 103m/min without PLB.

Table 3: Mean speed with PLB and without PLB

Column Tittle (Speed)	Mean	Sd	P-value
With Plb	108.68	11.047	<0.0001
Without Plb	103.39	10.503	
Difference	5.29	4.761	

- The mean rate of perceived exertion and dyspnoea was less while walking with PLB than walking without PLB which was 0.97 and 1.2 respectively.

Table 4: The mean RPE and Dyspnoea with PLB and without PLB

Column Tittle (RPE And Dyspoea)	Mean	Sd	P-Value
With PLB	0.972727	0.8696	<0.0001
Without PLB	1.2136	1.087	
Difference	-0.2409	0.6123	

- There was reduction in mean rate pressure product with PLB which was 15,880 compared to RPP without PLB which was 16,495 due to fall in heart rate or blood pressure or both.

Table 5: The mean RPP with PLB and without PLB

Column Tittle (RPP)	Mean	Sd	P-Value
With PLB	15880.39	3783.5	<0.0119
Without PLB	16495.99	3929.8	
Difference	-615.6	2488.7	

Other parameters like respiratory rate (RR), heart rate (HR) and systolic blood pressure (SBP) was also compared with and without PLB.

- There was less rise in respiratory rate (RR) when test was performed with PLB as compared to without PLB. The difference of mean change in RR from baseline with PLB was 5.92 and without PLB was 9.14.

Table 6: Showing the mean change in RR with PLB and without PLB

Column Tittle (Rr)	Mean	Sd	P-Value
With PLB	5.92	3.239	<0.0001
Without PLB	9.14	3.855	
Difference	-3.218	3.042	

- Also there was less increase in heart rate (HR) when test was performed with PLB as compared to without PLB. The difference of mean change in HR from baseline with PLB was 43.46bpm and without PLB was 53.07bpm.

Table 7: Showing the mean change in HR with PLB and without PLB

Column Tittle (HR)	Mean	Sd	P-value
With PLB	43.46	19.45	<0.0001
Without PLB	53.07	25.8	
Difference	-9.609	17.1	

- The similar effect was observed in systolic blood pressure (SBP). There was less increase in SBP when test was performed with PLB as compared to without PLB. The difference of mean change in SBP from baseline with PLB was 17.12mm Hg and without PLB was 22.29mm Hg.

Table 8: Showing the mean change in SBP with PLB and without PLB

Column Title (SBP)	Mean	Sd	P-value
With Plb	17.12	9.032	<0.0001
Without Plb	22.29	11.28	
Difference	-9.6	17	

DISCUSSION

The purpose of the study was to find the immediate effect of pursed-lip breathing while walking during six minute walk test on six minute walk distance in young individuals.

Improvement in 6MWD, SPEED, DYSPOEIA,

RR, HR AND RPE:

There was statistically extremely significant improvement in mean 6MWD during 6MWT using PLB as compared to mean 6MWD without PLB.

Evidence suggests that, an acute bout of short or prolonged exercise causes decrease in tidal volume and increase in residual lung volume, the causative factor being closure of the small peripheral airways and an increase in venous return resulting in an increase in thoracic blood volume, effected by exercise which displaces air from the lungs which compromises the tidal volume and prevents complete emptying of the lung^[1]. This phenomenon is known as dynamic hyperinflation^[3]. Pursed lip breathing is a technique whereby exhalation is performed through a resistance created by constriction of the lips. This manner of exhalation creates a back pressure in airways during expiration, thereby producing a stent like effect within the airways to help maintain their patency, assisting complete emptying of the lung. This prevents early airway closure and improves tidal volume, this results in improved ventilation thereby improving exercise tolerance^[2]. Because of its above effect, PLB is known to be beneficial in patients with chronic obstructive pulmonary lung disease (COPD) and in normal individuals also as proved by **Spahija et al** in 1996^[9]. This pattern of breathing is employed spontaneously by many patients with chronic obstructive pulmonary disease during rest and during physical activity to control obstruction. This technique of breathing improve control of breathing and breathing pattern, results in prolonged expiration hence decrease in RR at rest and during activity also improves dyspnea and SpO₂ as shown in various studies^[2-10,18-24,26,27].

Also it is known that cardiac output is a product of stroke volume and heart rate, hence during the maximum exercise cardiac output can be increased to be about 90% of maximum which that person can achieve. However the Pulmonary ventilation measures only up to 65% of maximum^[12]. This explains why cardiovascular system is much more limiting on VO₂max than is the respiratory system, because the oxygen utilization by the body can never be more than the rate at which the cardiovascular system can transport oxygen to the tissues^[12-14]. Therefore it is frequently stated that the level of athletic performance

that can be achieved by marathoner depends on the performance capability of his/her heart, because this is the most limiting factor in the delivery of adequate oxygen to the exercising muscles^[12].

Cardiac output (defined above as the product of heart rate and stroke volume which is reported in liters per minute) is commonly identified as one of the main limiting factor to oxygen delivery and VO₂max (Bassett & Howley 2000)^[12,14]. In fact, some researchers have concluded that 70-85% of the limitation in VO₂max can be attributed to maximal cardiac output^[12]. Hemodynamic predictors that is RPP (HR*BP) correlate well with myocardial oxygen requirement (MVO₂) (Fredarick et al in 1978)^[15] hence it can be said that there is less MVO₂ requirement when there is less rise in RPP as found in present study, which shows there is less increase in HR, SBP and hence RPP when 6MWT was performed with PLB than without PLB. Hence it can be said that PLB resulted in improvement in cardiovascular parameters (i.e. less rise in HR, SBP and RPP also improved SpO₂) as shown by **Ramos EMC and Y. Sano et al, Dr. Fateme and Rossi RC et al** in their study, which could also be contributing to improved performance while walking during 6MWT with PLB^[16,17,24,25].

CONCLUSION

We conclude that although the increase in 6 MWD with PLB was statistically significant, it was not clinically significant hence PLB does not significantly alter the exercise performance in healthy young individuals.

But the reduction in RPE, dyspnea, RPP and an increase in speed while walking with PLB in spite of increase in 6 MWD suggests that PLB is beneficial in healthy individuals to improve tolerance to exertion.

Scope of the Study: Application to improve sports performance needs to be studied in different sports.

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Manipulation in Coccydynia: A Case Study

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ABSTRACT

Background: Coccydynia is a throbbing or aching pain in and around the area of the tailbone (coccyx); however, there is insufficient information on the efficacy of manipulation in the management of coccydynia.

Objective: The purpose of this study was to explore the efficacy of manipulation in the management of coccydynia.

Methodology: A 38 year old female patient was referred to physiotherapy department of Aminu Kano Teaching Hospital, kano, for management of symptomatic pain in and around the coccyx, visual analogue scale(VAS) and functional disability scale were used to assess the pain level and status of functional ability of the patient respectively, pre and post management. The diagnosis of the condition (coccydynia) was made based on history, examination as well as dynamic radiographic imaging which revealed a hypermobile coccyx. Maigne's technique of coccygeal mobilization was employed. The technique was administered thrice per session, once a week for three consecutive weeks.

Results: There was marked reduction in pain and improvement in functional abilities following three sessions of treatment as well as decrease in mobility to the normal range on radiographic imaging.

Conclusion: It was concluded that maigne's technique of coccygeal manipulation is effective in management of coccydynia and it should be incorporated as one of the treatment modalities for the management of coccydynia.

Keywords: Coccydynia; management; manipulation.

INTRODUCTION

Coccydynia, tailbone pain is a fairly rare and poorly understood condition that can cause persistent low back pain. It is pain in and around the coccyx, typically described as discomfort felt while sitting and especially while rising from the sitting position¹. It constitutes of all non traumatic complains of the spine².

The most common etiology for a coccyx injury is trauma to the coccyx from a fall or a direct blow during contact sports, bike riders after prolonged pressure to the area, childbirth, often times coccydynia is idiopathic in nature. Some less common causes are pudendal nerve injury, pilonidal cyst, obesity and piriformis pain³. Obesity, which decreases pelvic rotation when the patient sits, is three times more common in patients with coccygodynia than in the

normal population³.

Frequency of pain can range from paroxysmal to constant. Occurrence of pain can be idiopathic, positional or activity related^{4,5}. According to Thiele⁶, Fogel⁷ and Patel⁸, women are five times more commonly affected than men. Coccydynia could present as either luxation, hypermobility, immobile or normal mobility¹.

Many different treatment options have been proposed for the management of coccydynia and these range from medical (NSAIDS, laxatives, sacrococcygeal injection etc), surgery to physiotherapy (hot baths, use of ring shaped cushions, ergonomic adaptations and manipulation^{9,10,11}). According to Thiele⁶, Carpar¹², Trollegaard¹³, Patel⁸, conservative management is successful in approximately 90% of patients. The need for the study became mandatory

due to the scarcity of data especially in Nigeria on the effectiveness of manipulation in the management of such condition.

CASE REPORT

Patient's Clinical History: A 38yr old female teacher (G6P6006), presented with coccyx pain of eleven months duration which was progressive in nature. Patient sustained injury at the tail end of the back bone secondary to a fall directly on the buttocks. Patient received traditional intervention twice with no beneficial effects resulting in increase in symptoms. Five months after, she received medical attention (prescribed NSAIDs) with temporary relief. Finally, patient sought for physiotherapy. The pain is aggravated on prolonged sitting, sitting on hard surfaces and standing up after sitting and relieved by lying, standing. Nil history of uterine fibroids, ovarian cysts, colon, cervical or other intrapelvic malignancies. Patient reported nil history of significant change in body mass and also there was no history of blood per rectum, abnormal vaginal bleeding, fevers or chills.

ASSESSMENT PROCEDURE

Examination And Evaluation: On physical clinical examination in July, 2012, there was no soft tissue masses, nil skin discoloration, mild tenderness over the coccyx, nil radiating pain, nil lower limb numbness and weakness. Straight leg raising was painful and restricted (50°). Muscle power of bilateral hips and knees were 4/5. Nil neurologic involvement.

Pain: Pain index assessment for low back pain was conducted using the visual analog scale (VAS)¹⁴. The patient was asked to indicate the level of pain on the scale in the low back pre and post treatment.

Trunk Mobility Test: Lumbopelvic flexion which was found to be reduced and is performed by measuring the distance between the fingertips and the floor with a tape ruler, the measurement was taken with the patient's feet together and with the knees locked.

Functional Ability: Functional disability was determined using modified Oswestry Low Back Pain Disability Index (ODI) which has high reported validity and reliability^{15,16}.

Investigations: Pre and post dynamic x-ray was performed, in which the position of the coccyx is evaluated in sitting and standing positions, revealed a hypermobile coccyx (28°), that is coccygeal flexion exceeding 25° when the patient is in sitting position.

Diagnosis: Chronic coccydynia secondary to trauma

TREATMENT

Prior to the manipulation, Informed consent for internal rectal-approach coccyx manipulation was obtained, the patient was educated on the procedure.

Pre-treatment procedure: Patient was disrobed from the waist down and draped and was instructed to be in a comfortable sidelying position, knees flexed, pillow under the head, and the back toward the researcher.

Treatment procedure: The researcher sat on a low stool at the side of the patient near the buttocks, facing toward the patient's head. KY jelly was applied to the index gloved finger of the researcher. The following procedure was performed, the index finger was inserted into the anus, slowly and gently following the normal contours of the rectum until the finger touched the coccyx. The coccyx which had deviated toward the anterior, was pulled firmly posterior with counter pressure applied externally by the outside hand. The anterior face of the coccyx and sacrum was massaged to improve circulation. The entire adjustment was repeated for a total of three times while increasing the pressure slightly each time within the comfort level for therapist and the patient. The patient was offered tissues and access to a bathroom after the procedure in case insertion of the finger into the anus induces peristalsis. The patient was advised to use pillows such as donut cushions, which have a circular hole in the middle, or wedge cushions, which have a triangular wedge cut out posteriorly to protect the coccyx from further trauma.

Post-treatment evaluation: The patient was regular on follow up and reported marked improvement, the pain intensity was re-assessed and reported to be 9 the day she reported with the symptoms was 4, 2 and 0.5 following the first, second and third week respectively using the VAS. Oswestry

Low Back Pain Disability Index(ODI) was found to be 70%, 20% and 8% following the first, second and third treatment sessions respectively. Pain-free SLR increased from 60 degrees to 100 degrees bilaterally. Trunk flexion improved by the fingertips failing to reach the floor by 11 inches before treatment to being able to freely touch the floor after treatment.

DISCUSSION

The primary purpose of the study was to determine the effect of coccygeal manipulation in coccydynia secondary to trauma. Internal and external contact coccygeal manipulation has been performed with different methods by orthopedics, osteopaths, and chiropractors for many years^{17,18}. The purpose of the study was to determine the effect of manipulation in the management of coccydynia. The findings of the study supports the work of Thiele⁶, Carpar¹², Trollegaard¹³ and Patel⁸ that reported the effect of manipulation in this condition however using different manipulation approaches such as levator anus and coccygeus massage⁶, joint mobilization with the coccyx in hyperextension stretching the levator anus¹⁹, and repeated joint mobilization with circumduction of the coccyx²⁰, or with the patient under general anesthesia¹⁹. Other techniques use external maneuvers such as thrust manipulation applied to the coccyx^{21,22} or sacroiliac thrust manipulation¹, though previous studies were reported on individuals having variations in the cause as well as the severity of the condition. The procedure was reported to be painful. However, subsequently some hours after manipulation, there was marked decrease of initial reported symptoms.

CONCLUSION

The study concluded the remarkable positive effectiveness of internal coccygeal manipulation in the management of coccydynia secondary to trauma.

Recommendation: Manipulation (Maigne's technique) should be implemented in the management of coccydynia and further studies should be carried out on larger samples to make generalizations.

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Entrepreneurial Aptitude among the University Students of MBBS, BDS and DPT

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ABSTRACT

Purpose: This study aims to see the entrepreneurial aptitude among the final year students of MBBS, BDS and DPT studying at University Level by measuring their personality characteristics and attitudes.

Method: Entrepreneurial Aptitude Quiz from Self Employment Model (SEM) made by Knowledge Institute consisting of 25 highly structured questions was used to collect data from one hundred and fifty four students of final year of MBBS (Bachelor In Medicine And Bachelor in Surgery), BDS (Bachelor of Dental Surgery) and DPT (Doctor of Physical Therapy) selected through purposive sampling out of two hundred and forty one students in The University of Faisalabad.

Result: On the basis of personality characteristics and attitude of students results showed that 60.86% students of DPT final year, 30% students of BDS final year and 27.69% students of MBBS final year had strong entrepreneurial aptitude while most of the students of the three departments lie in second level of entrepreneurship i.e., having entrepreneurial aptitude with need of skills improvement.

Conclusion: Students of final year of DPT showed strong aptitude towards entrepreneurship than final year students of MBBS and BDS. There is variation in the entrepreneurial aptitude level among students of different departments but attitudes towards entrepreneurship were significant.

Keywords: Entrepreneurship, Entrepreneurial aptitude, MBBS, BDS, DPT, Students, University.

BACKGROUND

Entrepreneurship had appeared as the most powerful economic force that world has ever practiced ¹. Cantillon, a French economist gave the concept of entrepreneurship. He was the first one who created the notion of entrepreneur and established the association between entrepreneurial attitude of an individual and a specific economic system ². Generally, entrepreneurship can neither be initiated nor be successful without inspiration and enthusiasm. A definitive approach to measure entrepreneurship is the personality approach,

which evaluates and investigates characteristics and traits. However, Low and MacMillan (1988) argued that entrepreneurship requires diverse behavior, which can be related to specific personality traits ³. A positive relationship between personality traits and entrepreneurial intentions has been reported in previous trials ⁴. Moreover, Gartner (1988) says that entrepreneurs are individuals with specific and distinctive personality traits ⁵.

Individual's characteristics are most important factors in shaping the way towards entrepreneurship. The study of psychological features and individual characteristics of an entrepreneur is the most researched area in the field of entrepreneurship. Until now, individual characteristics either they are natural or acquired weighted at top i.e., 36% in determining

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the aptitude for entrepreneurship. Second important determining factor was practice and experience that weighted 34%. Academic and technical knowledge weighted 30% in factors determining entrepreneurial potential ⁶.

There is a controversial issue regarding decision about which factors really influences entrepreneurial intentions. Some researchers find it as result of cultural and demographic factors while on the other hand some researchers described it as there exists some inherent characteristics that are important in defining a true entrepreneurial intention. Previous researches on entrepreneurial attitudes has argued whether entrepreneurial attributes are innate but modern researches supported the idea that psychological characteristics linked with the entrepreneurship can be ethnically and experientially acquired ^{7,8}.

There are six main entrepreneurial intention models, which describe the basics of entrepreneurship phenomenon. **Theory of Planned Behavior** defined by Ajzen (1991) with the premise that any kind of behavior needs a certain amount of planning which can be anticipated by the intention to adopt such behavior ⁹. The result of this theory explains the formation of intention by three elements (1) a person's attitude towards the behavior, (2) subjective norms such as the perception of other people's views about proposed behavior, (3) a person's perception of behavioral control. Kreuger and Carsrud. (1993) studied the relationship between entrepreneurial intentions and attitudes by using a scale to permit flexibility in the analysis of external influences, attitudes & intentions and they introduced **Basic Intention Model** ¹⁰. According to this, it is an intentional process to start a new business that can be influenced by behaviors and attitudes.

Many studies verge towards 'pull' factors in explaining the entrepreneurship, especially the desire for success, essence of control and desire for profit ¹¹. But, 'push' factors have equally found to be relevant particularly unemployment, career setbacks, saturation in the existing entrepreneurial environment and low family income ¹².

METHODOLOGY

Data were collected from students of The University of Faisalabad studying in final year

of MBBS, BDS and DPT who gave consent for participation in research study. Purposive sampling technique was adopted to assemble data through survey questionnaire named Entrepreneurial Aptitude Quiz from Self Employment Model (SEM) made by knowledge institute which consisted of 25 highly structured questions each having a response in three categories either, yes, may be or no. It presents multiple behavioral characteristics that may add up to being triumphant at self-employment and entrepreneurial ventures, and show the conclusions in a quantitative score with the total of 100 scores. If score is between 100 and 81, it shows strong aptitude for self-employment. If score is between 80 and 61, it shows aptitude but with need to improve skills in weaker areas by looking for training or hiring someone with the desirable skills. If score is between 60 and 41, it means the person may not have the potential to become entrepreneur alone. If score is less than 40, it shows no potential for self-employment. The total number of participants in this study was 154 of which 65 were from MBBS department, 20 were from BDS department and remaining 69 were from DPT department at the University of Faisalabad.

The advantages of using this questionnaire were that large information could be gathered from large number of people in a brief period of time and it was cost effective. Information obtained from this Questionnaire was used in determining the level of entrepreneurial aptitude among final year students of MBBS, BDS and DPT in The University of Faisalabad.

Statistical analysis was done using Microsoft Excel. Parameters of study were put in excel work sheet and their tables and graphs showing frequencies and percentages of students were obtained.

RESULTS

Through data collection, analysis and interpretation following results were obtained in form of tables and graphs to determine the entrepreneurial profile of the final year students of MBBS, BDS and DPT.

Table 1: No. of students of each department falling in each level of Entrepreneurial Potential

DEPARTMENT	LEVEL OF ENTREPRENEURIAL APTITUDE			
	Strong Aptitude	Have Potential But Need Skill Improvement	Can't Start Clinic Alone. Need A Partner	No Potential For Self-Employment
MBBS	18	41	4	2
BDS	6	12	2	0
DPT	42	27	0	0

Out of 65 students of the final year MBBS, 18 students scored for 'strong aptitude', 41 'needed skill improvement', 4 students 'needed partnership for self-employment' and 2 students had 'no potential for self-employment'.

Out of 20 students of the final year of BDS, 6 students had 'strong aptitude', 12 'needed skills improvement' and 2 students fall in the third level that was 'the need of a partnership'. None of the

students of the BDS final year showed 'no potential for self-employment'.

Out of 69 students of DPT final year, 42 students scored for 'strong potential', 27 'needed training and skill improvement before starting their own enterprise'. All students of DPT fall in first two levels of entrepreneurial aptitude, none of the students scored for the other two levels.

Table 2: Percentage of students of each department falling in each level of Entrepreneurial Potential

DEPARTMENT	LEVEL OF ENTREPRENEURIAL APTITUDE			
	Strong Aptitude	Have Potential But Need Skill Improvement	Can't Start Clinic Alone. Need A Partner	No Potential For Self-Employment
MBBS	27.69%	63.07%	6.15%	3.07%
BDS	30%	60%	10%	0%
DPT	60.86%	39.13%	0%	0%

A total of 27.69% students of MBBS final year have scored for 'strong aptitude' while 63.07% needed 'skills improvement'. Moreover, 6.15% showed a 'need of partnership' and only 3.07% students showed 'no potential for self-employment'.

BDS final year students appeared with little more percentage as compare to MBBS students and showed 'strong aptitude for self-employment' that was 30% and 60% of students had potential for self-employment with 'need of skills improvement'. A group of 10% students fall in third category of self-employment that is 'with partner'.

DPT final year students showed more Entrepreneurial talent as compare to MBBS and BDS students that was 60.86% scored for 'strong aptitude' for their own employments and 39.13% of students had aptitude, which 'needed training to improve their

skills before self-employment'. None of the students showed potential for third and fourth levels.

DISCUSSION

Findings of this trial suggest that the 60.86% students of final year of DPT, 27.69% of MBBS and 30% of BDS had strong entrepreneurial potential. The reason for having strong entrepreneurial potential is personality traits and attitude of students towards entrepreneurship measured through questionnaire.

A study was conducted among undergraduate students in Malaysian Public University to examine whether environmental factors and personality traits influence students potential to become entrepreneurs. The results showed personality traits are more important than environmental factors in influencing students' intention to become entrepreneurs¹³.

The findings our study were further reinforced by an analysis conducted in United States on total of 216 undergraduate students through the entrepreneurial attitudes orientation (EAO) survey exhibited that majority of the students possessed strong entrepreneurial aptitudes measured by their attitude towards entrepreneurship¹⁴.

In context of literature evaluation, we had understood that Entrepreneurial Intention Models explain the entrepreneurial phenomenon. Among the six Entrepreneurial Intention Models we decided to support our study based on 'Theory of Planned Behaviour'⁹ and 'Basic Intentional Model'¹⁰.

Theory of planned behavior explains that a person's attitude, subjective norms and perceived behavioral control form the basis of entrepreneurial intentions. A study conducted by Tkachev and Kolvereid (1999) on a sample of 512 Russian students from three different universities in St. Petersburg on self-employment intentions showed somewhat similar results to our study that the theory of planned behavior and entrepreneurial intentions determine the employment status that whether a person enters in an occupation as self-employed individual or salaried one¹⁵. Kolvereid (1996) tried to determine the employment status choice of 128 Norwegian undergraduate business students¹⁶. The results provide strong support to this theory and found that demographic characteristics had influenced the employment status choice intentions only indirectly through their effect on attitude, subjective norm, and perceived behavioral control.

Basic Intentional Model also explains that intentional process to start a new business is influenced by behaviors and attitudes which perfectly relate to our study in which attitudes and behaviors determine entrepreneurial potential. Autio et al. (2010) concluded similar result in their study on students of universities of UK, USA, Sweden and Finland¹⁷. This international comparison indicates that the perceived behavior control and attitude proved to be the most important determinant of entrepreneurial intention.

Outcomes of this study exposed that students of DPT had more entrepreneurial aptitude (60.86%). Students from BDS showed (30%) and students from MBBS showed (27.69%). Entrepreneurial talent was

more among DPT students and was least among MBBS students but most of the students of MBBS and BDS lie in second level of entrepreneurship i.e., have entrepreneurial potential but need skill improvement. Students from different fields showed variation in their entrepreneurial potential but overall potential was significant.

This finding was supported by a study conducted by Schwarz, et al. (2009) in 35,040 students from different fields of seven universities of Austria showed that there is variation in the entrepreneurial intention level among students of different fields of study but general or specific attitudes towards entrepreneurship were significant¹⁸. Entrepreneurial talent varies among students of different departments.

Students of DPT showed more aptitude as compared to MBBS and BDS and this finding was supported by a study conducted by Babur, Arjumand and Awan (2012) who studied entrepreneurial potential among undergraduate students of DPT of The University of Faisalabad and Riphah International University¹⁹. Research was conducted on 130 students and results were similar to this study. Most students were scored in highest category that meant majority of the students of final year of DPT had high entrepreneurial potential or ability to start their own private clinic.

CONCLUSION

The final year students of DPT (60.86%), MBBS (27.69%) and BDS (30%) showed strong entrepreneurial potential. There was variation in the entrepreneurial aptitude level among students of different departments but overall attitudes towards entrepreneurship were significant. But students of DPT showed more potential as compared to students of MBBS & BDS.

LIMITATIONS

The study is conducted only on the students of final year MBBS, BDS and DPT in The University of Faisalabad and therefore it is not representative of entrepreneurial potential of all students of these professions. The questionnaire used in the study does not analyze the economic, social and educational factors affecting the entrepreneurial potential.

RECOMMENDATIONS

There must be focus on medical students regarding entrepreneurial potential as well as entrepreneurial education of students as hundreds of medical graduates are passing every year from the university.

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Ethical Clearance: The study was approved by the Ethics committee of University of Faisalabad

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Effect of Constraint Induced Movement Therapy v/s Motor Relearning Program for Upper Extremity Function in Sub Acute Hemiparetic Patients-a Randomized Clinical Trial

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ABSTRACT

Background: Motor impairment after stroke is common, following damage to areas of the brain normally involved in the planning and execution of motor commands. Impaired motor control of the upper extremity is one of the most frequent consequences of stroke.

Objectives: To determine the effect of CIMT and MRP on upper limb function and to compare the effect of both in sub-acute hemiparetic patients.

Method: 45 participants were randomly allocated into group A and B. Group A received CIMT technique. The unaffected extremity was restrained for 80 percent of working hours and task oriented training was given for affected extremity for 3 hours daily for 14 days. Group B received the motor relearning program for 14 days. Functions of upper limb were assessed using Nine Hole Peg Test, Motor Activity Log and Fugal Meyer Performance measured at the beginning and after completion of the intervention.

Result: The results of the present study showed statistical significant improvement in MAL ($p=0.001$) and FMS ($p=0.031$) in the CIMT group. The MRP group showed significant improvement in MAL ($p<0.001$).

Conclusion: Both CIMT and MRP are found effective in improving upper extremity function in patients; however CIMT was more effective than MRP.

Keywords: Stroke, Upper extremity function, Constraint induced movement therapy (CIMT), Motor relearning program (MRP)

Abbreviation - CIMT - Constraint induced movement therapy, MRP- Motor relearning program, MAL - Motor Activity Log, FMPM - Fugal Meyer Performance Measure, NHPT- Nine Hole Peg Test, and BMI – Body Mass Index

INTRODUCTION

Stroke, a leading cause of functional impairments, requires institutional care after 3 months with 15% to 30% being permanently disabled.¹ Incidence of stroke in India is 400-800 per 100,000 and the prevalence is 55.6 per 100,000. About 85% of people with stroke have difficulty in upper extremity functioning and 75% of them persists even after 3 to 6 months.²

The major problem in hemiplegics is an impairment in motor function of the upper extremity. As time progresses, the patient regains some motor function, but the dynamic recovery occurs only within 6 months.³ Hemiparetic patients find it difficult to carry out their daily activities such as dressing, bathing, self-care and writing due to upper extremity impairment.⁴ Upper extremity impairments along with increase in tone and muscle weakness limits the

individual to carry out functions related to activities of daily living subsequently.⁵

Although various neurological rehabilitation approaches have been implemented in stroke rehabilitation, Constraint induced movement therapy (CIMT) is one which emphasizes on constraining the unaffected extremity combined with intensive rehabilitation training. This method is effective for improving upper extremity function, 3 to 9 months post stroke.⁶ another therapeutic approach is a Motor- Relearning Program (MRP). MRP treatment is planned based upon the kinematic analysis of the task through which missing component of the task is determined. Initially, training is focused on the practice of the missing component. Later the missing component is incorporated into the task and the whole task is repeated.⁶ Previous study has suggested that MRP is effective in enhancing upper extremity function.⁷ Evidence has also suggested that, the strategies which impose the training related to functional activity is superior compared to others.⁸

Even though these techniques use the functional activities as a training component after stroke and have shown some degree of improvement in functional domain of upper extremity, there is paucity of literature on, which technique optimizes motor performance. Given this gap in the literature, study is needed to elucidate and compare the efficacy of Constraint Induced Movement Therapy (CIMT) & Motor Relearning Program (MRP) on upper extremity function in sub-acute hemiparetic patients.

METHODS

The study was approved by institutional ethical committee. Written informed consent was obtained from all the participants after fulfillment of inclusion and exclusion criteria. **Inclusion criteria** for this study were: participants with Sub-acute stroke (Sub-acute stroke is defined as stroke from first week to six months).⁹ Ischemic brain injury or intra cerebral hemorrhage confirmed by CT scan or MRI, Grade 2 Brunnstrom's voluntary control of the affected upper extremity, Motor Activity Log scores more than 2, Mini Mental Status Examination score > 24. **Exclusion Criteria:** Behaviorally disturbed or other psychiatric problems, Visual disturbances or visual neglect, Orthopaedic or arthritic condition interfering with upper extremity function, severe cardiopulmonary

disease, recurrent stroke or any other neurological deficit that compromises with their ability to comply with the study.

45 Participants from two tertiary care hospitals were randomly allocated in group A and B by using envelop method. Three main valid and reliable outcome measures were used in this study Nine Hole Peg Test¹⁰, Motor activity log¹¹ Fugl Mayer performance measure¹² **Group A** received constraint induced movement therapy (CIMT) The unaffected extremity was constrained and functional training was used for the unaffected extremity.¹³ Unaffected upper extremity was constrained for 80% of working hours by using padded sling.¹⁴ The affected side extremity was treated with a task oriented approach for 3 hours, which consist of the performances of the task related to the functional activities.¹⁵ **Group B** received Motor Relearning Program. MRP focuses on the improving the motor control through the relearning of the functional activities. Correction of those abnormal patterns of movement is done with repeated practice of the task which facilitate the refinement and development of the new motor program.¹⁶ The training emphasis all upper extremity functions involving all the joint and different body positions. MRP group was treated for 30 minutes. Both the group received 14 days intervention.

RESULTS

Statistical analysis – Series of analysis were conducted using SPSS 13 by the statistician who was blinded about the groups. The significance level was set at $p < 0.05$. As the data were normally distributed based on the demographic characteristics paired t-test was utilized to assess the difference between the pre and post treatment session of different outcomes. The pre and post values of all 3 outcomes were compared within and between two groups by using t- test and Paired t- test.

Group Characteristic - The mean age of the participants in Group A was 64.6 ± 11.7 years, and in Group B were 62.3 ± 14.4 years. The mean BMI in group A and group B was 25 ± 3.2 and 24.2 ± 4.4 respectively. There was no statistically significant difference between the mean age and BMI of both the groups. Thus, the demographic data of the two groups were matched.

Table: 1 Demographic Data

Groups	Gender		Age wise distribution				Mean age	Mean Height	Mean Weight	Mean BMI
	Male	Female								
A	12	08	02	02	00	16	64.6±11.7	1.54±0.1	65.2±12.0	25±3.2
B	08	12	02	03	01	14	62.3±14.4	1.59±0.1	62.6±15.5	24.2±4.4
t value							0.54	0.081	0.52	0.60
p value	0.20		0.86				0.59	0.936	0.56	0.54

Group difference on Nine Hole Peg Test - The mean score for NHP in Group A was 488.5±106.5 and for Group B was 460.5±127 seconds during the baseline assessment. Whereas after intervention the NHPT score for two groups reduced to 450.5 ±105. 95 and 429 ± 125.7 for group A and group B respectively. There was no significance difference between pre and post scores in group A and group B. (Table 2)

Group difference in Motor activity log: In pre intervention average score of MAL for Group A & Group B were 1.3± 6.5, 1.4 ±0.58 respectively. Post intervention the average scores for Group A was 1.93±0.6 & for Group B was 2.40 ±0.62. When a comparison was made between the pre and post test

value, result showed significant statistical difference in MAL score in both the group (P<0.001). Even though there was significant improvement in both the groups, with better improvement in group A compared to group B. (Table 2)

Group difference on Fugl- Meyer Performance Scale: Pre intervention score of Fugl- Mayer performance measure of Group A was 82.7 ±10. 6 and of Group B was 89.9± 17.76. Whereas post intervention score for Group A was 90.7 ±11.8, Group B was 97.6 ±19.8. Intra group comparison shows significant improvement in both the groups. Intergroup analysis shows no significant difference between Group A and Group B with 'p' value 0.18. (Table 2)

Table 2 NHPT, MAL, and FMPM Pre and post values.

Groups	NHPT				MAL				FMPM			
	Pre	Post	t	P	Pre	Post	t	P	Pre	Post	t	P
	Mean value	Mean value			Mean value	Mean value			Mean value	Mean value		
A	488.5±106.5	450.5±105.9	1.13	0.78	1.3±6.5	1.93±0.6	3.51	0.001	82.7±10.6	90.7±11.8	2.23	0.031
B	460.5±127.01	429.0±125.7	0.265	0.435	1.40±0.58	2.40±0.62	5.26	0.001	89.9±17.76	97.6±19.8	1.30	0.201
t	0.75	.584			0.574	2.416			1.544	1.344		
p	0.45	.562			0.569	0.02			0.3	0.186		

(MAL - Motor activity log, FMPM- Fuglmeier performance measure, NHPT - Nine hole peg test)

DISCUSSION

Limitation in upper extremity function after stroke makes the stroke survivor, dependent in their day to day activity, hence emphasis was given to train the activities of daily living related to upper extremity and dexterity function of the hand in the present study. A study has shown that, practice of functional task enhances the rate of recovery in the activities related to daily living.¹⁷ Active participation and self-reliance to perform the task help the participants in motor learning.¹⁶ Participants in both the group practice the task repeatedly. Repeated practice of functional

training leads to improvement in performance related to functional activities, that is in line with our study.¹⁸ Feedback is given in terms of number of repetitions per unit of time or time required to perform a set of task. The study has suggested that use of feedback help to form the association between performance and outcome and motivate the participants to practice the task repeatedly.¹⁹

Mean age of participants in Group A was 64.6 years and in Group B was 62.3 years. So, there were no significant age differences between the groups. The study has suggested an inverse relation between

age & outcome of rehabilitation program after stroke.²⁰ So the outcome of this study is not affected by the participant's age. Study participants in this study were ranging from 3 to 6 months from the onset of stroke, which supported by previous excite randomized clinical trial on the effect of Constraint-Induced Movement Therapy on Upper Extremity Function which shows the significant functional improvement in sub-acute phases of stroke.²¹ A study suggests that motor recovery during the first 3 months after stroke is associated with increased motor excitability of the affected cerebral hemisphere.²² The result of the study showed a significant difference in performance of NHPT. There was no statistical significance in inter and intra group comparison, but CIMT group showed more clinical significant improvement compared to MRP group. Evidence suggests that during the acute post-stroke phase, participants with stroke found difficult to perform activities by affected extremity.²³ This is because of a natural and spontaneous reliance on the contralateral, relatively unimpaired limb to perform most tasks of daily living. Once the cortical suppression occurs, after substantial neurological injury subsides improved motor activity is possible. CIMT may not be changing actual movement potential, but may be changing behavior patterns, so that individuals are willing to use their limbs more, thus achieving their real movement capabilities. The present study showed statistical significant improvement for the MAL and the Fugl Mayer performance measure of the upper extremity in the CIMT as compared to the MRP group in which significant improvement was found only in MAL. There was no statistical significant difference seen in both the groups for the NHPT. In the present study the CIMT group was given 3 hours of training, whereas in the MRP group training was given for 30 minutes. In the CIMT group real time objects were used for performing the ADL activity to over come synergy pattern during practice session. The study suggests that the use of real time objects focused the individual's attention to them which enhanced the learning.²⁴ The overall improvement for the CIMT group may be attributed to two reasons, repetitive practice of functional task leads to cortical reorganization, and repeated use of compensatory strategies rather than promoting appropriate movement control during functional use of the impaired limb facilitate the motor and sensory

recovery of the hemiplegic limb. Major limitations of the study were small sample size. Subjects could not be followed up on completion of the treatment.

CONCLUSION

Upper extremity function improved significantly from both CIMT and MRP. The CIMT is more effective as compared to MRP for upper extremity functions.

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Relationship between Body Mass Composition and Primary Dysmenorrhoea

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ABSTRACT

Introduction: A healthy menstrual cycle is a sign of women's sound health. Various variables may influence the length and regularity of menstrual cycle. Studies have revealed that menstrual cycle abnormalities may be associated with psychological stress, lack of physical exercise, alteration in body composition, body weight, and endocrine disturbances. Higher estrogen levels as seen in obese females, hence there is a urgent need to find out the relationship between variations in body mass composition (BMI & body fat%) with menstrual abnormalities like primary dysmenorrhoea.

Aim- To find out relationship between body mass composition and primary dysmenorrhea.

Objective - 1. To check whether there is any association between body mass index and primary dysmenorrhoea. 2. To check whether there is any association between body fat percentage and primary dysmenorrhoea.

Method- The study was conducted over a period of 6 months with 90 samples selected on random basis. The procedure was explained to the participant and a written consent was taken thereafter. The participant was made to stand on the BODY COMPOSITION SCANNING MONITOR, which scanned the physical profile of the participant (height, weight, BMI, body fat percentage & visceral fat). Thereafter, the candidate was asked about her menstrual irregularities and was asked to grade her level of dysmenorrhoea (if present) using the VERBAL DIMENSIONAL DYSMENORRHOEA SCALE. The relationship between body mass composition (i.e- body mass index and body fat %) and primary dysmenorrhea among the female candidates was then found by using the chi square test of association.

Result- Chi square test of association was performed to find out the association between body mass index and primary dysmenorrhea & association between body fat % and primary dysmenorrhoea. The chi square value for association between body mass index and primary dysmenorrhea was 38.63 @ df=4 with a p value=0.00000008 i.e. $p<0.001$ which was highly statistically significant. The chi square value for the association of body fat % and primary dysmenorrhea was chi square value=30.09 @ df=4, the P value was obtained as 0.000004 i.e. ($p<0.001$) which was highly statistically significant.

Conclusion- Thus we conclude that, there exists a significant relationship between body mass composition and primary dysmenorrhea. Also as the study shows that as the value of Body mass index and body fat percentages goes on increasing in females the severity of development of primary dysmenorrhea also increases.

Keywords- Body mass index (BMI), Body fat percentage, Body composition screening monitor.

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INTRODUCTION

A healthy menstrual cycle is a sign of women's sound health. Various variables may influence the length and regularity of menstrual cycle. Problems like primary dysmenorrhea, irregular menstruation

are commonly seen.¹

Dysmenorrhea is defined as cramping pain in the lower abdomen occurring just before or during menstruation that interferes with the activities of daily living.² Primary dysmenorrhea is defined as cramping pain in the lower abdomen occurring just before or during menstruation,² in the absence of other diseases such as endometriosis, pelvic pathology, fibroids or any other pathology along with the abdominal cramps primary dysmenorrhea is characterized by other symptoms like feeling of pressure in the abdomen Pain in the hips, lower back, and inner thighs, nausea, fatigue etc.^{2,3} Primary dysmenorrhea is caused by myometrial activity resulting in uterine ischemia causing pain. This myometrial activity is modulated and augmented by prostaglandin synthesis. Uterine contractions can last many minutes and may produce uterine pressures greater than 60 mm Hg. Multiple other factors may play a role in the perception and the severity of the pain.^{1,2,7}

On the other hand secondary dysmenorrhea is pain that is caused by a disorder in the woman's reproductive organs, such as endometriosis, adenomyosis, uterine fibroids, or infection.³ Pain from secondary dysmenorrhea usually begins earlier in the menstrual cycle and lasts longer than common menstrual cramps. The pain is not typically accompanied by nausea, vomiting, fatigue, or diarrhea.³

Studies have revealed that menstrual cycle irregularities and abnormalities may be associated with psychological stress, physical exercise, alteration in body composition, body weight, and endocrine disturbances.¹ Also in obese individuals there is higher generation of prostaglandins (PG alpha 2), which is responsible for higher occurrence of dysmenorrhea in obese individuals.⁵ Again obese individuals have high fat so higher amount of estrogen circulating in the body, this leads to a phenomenon called "estrogen dominance".⁶ There are many factors that contribute to estrogen dominance including hormone therapy, environmental estrogens (i.e. xenoestrogens), stress, high amount of adipose tissue and glandular dysfunction. Both these factors increase the risk of obese individuals to have dysmenorrhea.⁶

So, there is a urgent need to assess the relationship between variations in body mass composition (BMI & body fat %) with menstrual abnormalities like primary dysmenorrhea

The purpose of this study is to create awareness about the significance of BMI and body fat percentage, evaluate and scrutinize the sensitivity deflections with abnormal BMI & body fat percentage on menstrual cycle pattern and abnormalities like primary dysmenorrhea.

Aim and objective of this study is to find out relationship between body mass composition and primary dysmenorrhea and to check whether any significant association exists between obesity and overweight with menstrual irregularities and primary dysmenorrhea.

MATERIAL & METHOD

It was across-sectional study conducted on 90 female's subjects between age group 16-25 years.

INCLUSION CRITERIA

- Females between the age group 16-25 yrs.
- Nulliparous females.
- Participants willing to participate in the study with the written informed consent taken.

EXCLUSION CRITERIA

- Females with pathological conditions like polycystic ovarian disease.
- Females with uterine or ovarian tumors.
- Females below 16 & above 25 years.
- Females with secondary dysmenorrhea.
- Females with acute or chronic pelvic pathology
- Females taking any psychotherapeutic drugs and oral contraceptives.
- Females refusing to participate in the study.

OUTCOME MEASURES

- Body mass index and body fat percentage.
- Verbal dimensional dysmenorrhea scale

PROCEDURE

The study was conducted over a period of 6 months with 90 samples selected on random basis. The procedure was explained to the participant and a written consent was taken thereafter. The participant

was made to stand on the BODY COMPOSITION SCANNING MONITOR, which scanned the physical profile of the participant (height, weight, BMI, body fat percentage & visceral fat). Thereafter, the candidate was asked about her menstrual irregularities and was asked to grade her level of dysmenorrhoea (if present) using the VERBAL DIMENSIONAL DYSMENORRHOEA SCALE. The relationship between body mass composition (i.e- body mass index and body fat %) and primary dysmenorrheal among the female candidates was then found by using the chi square test of association.



Fig1 showing subjects standing on body mass scanning monitor for assessment of body mass composition (BMI and Body fat %)



Fig2 showing subjects standing on body mass scanning monitor for assessment of body mass composition (BMI and Body fat %)

RESULT

The result of the above study that is the relationship between body mass composition (Body mass index & body fat %) and primary dysmenorrhea was calculated by using the chi square test of association. After conducting the overall study it was seen that the prevalence of menstrual cycle irregularities is seen in 33/90 females i.e. (36.6%) of the females, while regular menstrual cycle pattern is seen in 57/90 females. From among total 90 females, the presence of dysmenorrhea is seen in 76 females i.e. in (84.5%) females while absence of dysmenorrhea is seen in 14 females i.e. in (15.5%) females.

Table 1 shows BMI-out of the total 90 females, 8 females are found with bmi <18.5 i.e.(underweight) 53 females were found with BMI between 18.5-24.9(normal range), 14 females were found with BMI between 25-29.9, 3 females were found with BMI between 30-35.9, 5 females were found with a BMI between 36-39.9 while 7 females are seen with a BMI of 40 and above.

BMI	No of females in each bmi group	percentage of females
<18.5	8	8.88%
18.5-24.9	53	58.88%
25-29.9	14	15.55%
30-35.9	3	3.33%
36-39.9	5	5.55%
>40	7	7.77%

Table -2 shows the Severity of dysmenorrhea in females with primary dysmenorrhea-

Total females with dysmenorrhea	Grade 0 on dysmenorrhea scale	Grade 1 on dysmenorrhea scale	Grade 2 on dysmenorrhea scale	Grade 3 on dysmenorrhea scale
76(84%)	8(11%)	23(30%)	19(25%)	26(34%)

Association of body fat% with Primary dysmenorrhea- For obtaining this association we performed the Chi Square test for which (chi square

value=30.09 @ df=4 the P value was obtained as 0.000004 i.e. ($p < 0.001$) which is highly statistically significant value hence the association between body fat% and primary dysmenorrhea is significant.

Table 3 shows the Association of body fat% with Primary dysmenorrhea –

Body fat%	No of females with dysmenorrhea	Dysmenorrhea severity grade(0+1)	Dysmenorrhea severity grade 2	Dysmenorrhea severity grade 3
<30	50(65.7%)	25(50%)	12(29%)	13(26%)
31-39	21(27.6%)	8(36.66%)	5(22.7%)	8(36.36%)
>40	5(6.57%)	0	1(20%)	4(80%)

Association between BMI and Primary dysmenorrhea –Chi square test was performed to get this result for which (chi square=38.63@ df=4) with a p value=0.00000008 i.e. $p < 0.001$ which is highly statistically significant.

Table 4 showing distribution of bmi with severity of dysmenorrhea-

Bmi	No of females with dysmenorrhea	Gr(0+1)	Gr 2	Gr 3
18.5-24.9	42	24 (57.14%)	12 (28.57%)	6 (14.28%)
25-29.9	13	8 (61.5%)	3 (23.07%)	2 (15.38%)
>30	12	0 (0%)	2 (16.66%)	10 (83.33%)

Hence the association between BMI and Primary dysmenorrhea is significant.

DISCUSSION

The objective of this study was to find out relationship between body mass composition (BMI & Body fat %) and primary dysmenorrhea. For which a randomized selection of 90 females between the age group of 16-25yrs was done and informed consent was taken from all participants. The individual height of the participant was measured using an inch tape ,thereafter the Body composition scanning monitor was used to assess the body mass composition and the physical profile of the participant, out of the total, participants with presence of dysmenorrhea were asked to record the severity of dysmenorrhea on the verbal dimensional dysmenorrhea scale.

After carrying out this study it was seen that menstrual irregularities were seen in higher proportion in females with BMI in higher ranges (36-39.9 & < 40).Also females who have higher total body fat%(35-39 & 40%),have higher percentage of irregular menstrual cycle patterns.

With respect to severity of dysmenorrhea it is seen that as the value of BMI increases the severity of dysmenorrhea increases such that maximum no of

females with BMI (30) are seen with grade 3 on the dysmenorrhea severity scale.

With respect to body fat% it is seen that as the percentage of body fat goes on increasing the severity of dysmenorrhea increases such maximum no females with body fat% of(31-39 & above 40) are seen with grade 3 on dysmenorrhea severity scale.

Researches have proved that higher Body mass index and higher body fat% possess a significant threat to the presence and severity of dysmenorrhea^{6,7,10} According to researcher F Haider (2000),overweight and obesity increase biosynthesis of prostaglandins,(which are primarily responsible for myometrial hyperactivity^{1,2,3}

Increase in myometrial activity causes increased muscular contractions. As the uterus contracts more strongly, it can press against nearby blood vessels, cutting off the supply of oxygen to the muscle tissue of the uterus.^{2,4} Pain results when part of the muscle briefly loses its supply of oxygen. Along with this other hormonal disturbances (estrogen) and imbalances in obese individuals may contribute to severity of dysmenorrhea and menstrual irregularities¹⁴,

¹⁵ Adipose tissue is the chief producer of sex hormones like estrogen apart from ovaries. In obese individuals there is increased amount of fat, which leads to increased production of estrogen circulating throughout the body. When there is too much excess estrogen circulating in the body, this is referred to as a condition called "estrogen dominance."^{10,11} There are many factors that contribute to estrogen dominance including hormone therapy, environmental estrogens (i.e. xenoestrogens), stress and glandular dysfunction.^{9, 10, 11}

Estrogen dominance in obese females is known to cause a whole host of menstrual irregularities, alterations in menstrual cycle pattern, abnormalities like primary dysmenorrhea and secondary dysmenorrhea resulting from pathologies like tumors of reproductive organs.^{9,10,11,12} Reproductive cancers like cancer of the breast, ovaries and cervix since these cancers depend on estrogen to develop and multiply are also common.⁶ Effects of estrogen dominance-increased fluid retention, endometriosis, fibroids, increased risk of developing polycystic ovarian disease, increased risk of dysmenorrhea.¹²

The problems like overweight and obesity thus require careful attention and the importance of regular exercise and nutritional habits (dietary habits) needs to be explained to the individual.^{10, 13} Aerobic conditioning exercises along with regulated dietary habits will help to combat the problems of obesity and excessive body fat percentage, thus preventing the occurrence of menstrual irregularities and abnormalities of primary dysmenorrhea.^{11, 13}

CONCLUSION

Thus we conclude that, there exists a significant relationship between body mass composition and primary dysmenorrhea. Also as the study shows that as the value of Body mass index and body fat percentages goes on increasing in females the severity of development of primary dysmenorrhea also increases.

LIMITATIONS

- Small sample size
- Single study setting (MVP hospital and research centre)

- Only subjective evaluation of the participant done, so the presence or absence of dysmenorrhea will vary subjectively.

- Other dimensions like relationship of body mass composition with menstrual irregularities and other abnormalities are not carried out in the study.

Small study duration

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Conflict of Interest: None

Ethical Adherence: Yes

Disclaimers: None

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To Compare the Effectiveness of McKenzie Exercises v/s General Conditioning Exercises in Low Back Pain

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ABSTRACT

Objectives: Effectiveness of McKenzie exercises versus general conditioning exercises in low back pain.

Method: The study was conducted on 60 adults with low back pain at physiotherapy department at Institute of Physical Medicine & Rehabilitation, Dow University of Health Sciences. Informed consent was taken from each patient. Data was collected through structured questionnaire. The data feeding analysis was done on computer package SPSS Version 16. Sixty patients were randomly selected on convenience base. These patients with low back pain on same medications were divided into two groups in such a way that group A consists of 30 patients who received general conditioning exercises for two weeks. Group B consist of 30 patients with low back pain who received McKenzie exercises for two weeks. Their pain was measured on the basis of visual analog scale on initial assessment and reassessed on same scale after two weeks.

Result: Sixty patients with low back pain were included in this study over a ten months period. There were 70% males and 30% females with a mean age of 35.9±5.6 years. After the completion of the study the result showed that Group B patients who had McKenzie exercises protocol made better progress with the P value of 0.23±0.43, as compared to Group A patients who had general conditioning exercises with the P value of 2.6±1.1.

Conclusion: McKenzie exercises were found to be effective, easy to administer with minimal side effects resulting in reduction in pain intensity in patients suffering from low back pain as compared to patients undergoing general conditioning exercises of back.

Keywords: McKenzie exercises, general conditioning exercises

INTRODUCTION

Low back pain refers to pain felt in lower back accompanied by back stiffness, decreased movement of the lower back, and difficulty in standing straight¹. Low back pain is a common musculoskeletal disorder affecting 80% of people at some point in their lives and the prevalence of low back pain is extremely common.²

United Kingdom population studies have reported a 1-year period prevalence of low back pain of 37%.³ Mechanical low back pain (LBP) remains the second most common symptom in the United States about 85% of the US population experience an episode

of mechanical LBP during their lifetime.⁴ LBP is a common problem in the Australian adult population, over 10% had been significantly disabled by LBP in the past 6 months. In rural North India during June 2001 to June 2002, 23.09% of the population had low back pain.⁵ According to a recent survey by Gallup Pakistan 40% of the Pakistan had low back pain.⁶

The most common cause of low back pain is overuse of the soft tissues. Muscular abnormalities of the body develop due to poor posture. Muscles that are commonly involved in lower back pain are erector spinae group, quadratus lumborum, iliopsoas, gluteus medius, Piriformis, iliotibial band, hamstrings and quadriceps. All of these muscles can become short

and stiff and cause pain into the lower back.⁷

McKenzie concept of low back pain has benefits of self-treatment, constant self-assessment, patient independence and control over their low back pain.⁸ This concept divides low back pain into postural syndrome, derangement and Dysfunctioning syndrome. In postural syndrome pain is felt in the lower back, however, there is no significant damage or trauma to the tissues. Patients with postural syndrome only experience an ache or pain during activities placing sustained stress on normal tissue.² ⁹ The dysfunction syndrome is the condition in which shortening of muscles reduces the loss of mobility and can causes pain at end range of the movements. Derangement syndrome is the condition in which the normal resting position of the articular surfaces of two adjacent vertebrae is disturb. This change will affect the ability of the joint surfaces to move in their normal relative movements.^{8, 10, 11}

According to Ann C. et al. UK, McKenzie approach is one of the most frequently used exercises program for back pain.³

The general conditioning exercises are core stability exercises. It has nine components which includes Flexibility- the ability to achieve an extended range of motion, Local Muscle Endurance - a single muscle's ability to perform sustained work, Strength - the extent to which muscles can exert force by contracting against resistance, Balance - the ability to control the body's position, Co-ordination - the ability to combine the exercise components by which effective movements can achieved, Agility - the ability to perform a series of explosive power movements in rapid succession in opposite directions, Strength Endurance - a muscle's ability to perform a maximum contraction time after time, Power - the ability to exert maximum muscular contraction instantly in an explosive burst of movements. Cardiovascular Endurance - the heart's ability to deliver blood to working muscles and increase the ability to use.¹²

Jesse A Lieberman from University of North Carolina defined general conditioning exercises as the prescription of body movements which correct impairment, improve musculoskeletal function and maintain a state of well-being. It may vary from activities restricted to specific muscles of the

body, to general activities that can improve patient condition.¹³

Michael L. Pollock of American Heart Association defined general conditioning exercise programs are emphasized on dynamic lower-extremity exercise has favorable effects on muscular strength and endurance.¹⁴

Christian Larivière from *American College of Sports Medicine* says, If you want to bring about physiological change to help the development and endurance of back muscles must focus on specific muscles groups by conditioning exercises.¹⁵

As far as author's knowledge is concerned there is no local study conducted on McKenzie exercises in Pakistan.

METHOD

This experimental study was conducted on 60 adults who attended therapy sessions in Physiotherapy department of Institute of Physical Medicine & Rehabilitation, Dow University of Health Sciences. A randomized controlled trial was done with a 2 weeks follow-up conducted from Jan 2011 to June 2011. Informed consent was taken from each patient, the data was collected through structured questionnaire and feeding analysis was done on computer package SPSS Version 16. Patients were randomly selected on convenience bases and were screened and diagnosed prior to therapy. Eligible participants were on same drugs and divided into two equal groups for therapy programme based on the McKenzie method and general conditioning exercises of low back pain for 2 weeks. Their pain was measured on the basis of visual analog scale on initial assessment and reassessed after two weeks post therapy.

RESULT

Over the period six months sixty patients with low back pain were included in the study. There were 73% males and 27% females with a mean age of 35.9± 5.6 years. After the completion of study the result shows that Group B received McKenzie exercises is more effective with the value of 0.23±0.43, as compared to Group A which received general conditioning exercises was least effective with the value of 2.6±1.1

Tables: 1.1 The Comparison of Pre and post Assessment between means and standard deviation of visual analog scale (Table 1).

	Group-A	Group-B
Before	4.2 ±1.02	4.1 ±1
After	2.6 ±1.1	0.23 ±0.43
P-Values	< 0.0001	< 0.0001

*P<0.05 considered as significant using paired t-test

Tables: 1.2: Distribution in Study Groups (Table 2).

Gender	Group-A		Group-B	
	Cases	Percentages	Cases	Percentages
Male	20	66.7	22	73.3
Female	10	33.3	8	26.7

DISCUSSION

The result provides by Bruce F Walker. Australia that McKenzie therapy results in a decrease in short-term (<3 months) pain and disability for low back pain patients compared with other standard treatments since twenty years.¹² However, our findings also suggest that McKenzie exercise therapy reduce patient's self-reported pain more effectively immediately after the end of two weeks on visual analogue scale.

According to the study conducted in India, repetitive lumbar region exercises are recommended by McKenzie have been used in the assessment and management of low back pain.¹⁴

Study conducted in Australia by Dixon ASJ, The addition of the McKenzie method to first-line care which includes rest and medications may be worthwhile in low back pain because they found that participants in the First-line Care Group sought more additional care than the McKenzie Group which threaten the internal validity of the study because the primary interest was in the effects of the McKenzie method in the first 3 weeks.¹⁶

Nachemson from Sweden proves that it's important to reduce biomechanical load on spine

when treating low back pain.¹⁷ Gracy et al conducted a study in Ireland which proves that McKenzie exercises are at best in reducing the biomedical load on spine.¹⁸

Bigos S, et al. conducted a study which showed that General conditioning exercises has numerous benefits for the patients with low back pain these exercise programs consist of flexibility training endurance and resistance which were combined into 1 exercise session.¹⁹

J. Mark Miller and Scott Herbowy proves that McKenzie proposed a classification system for LBP labeled as Mechanical Diagnosis and Treatment (MDT), The McKenzie Method treating low back pain has the greatest support regarding validity and reliability and therefore seems to be the most promising and result oriented treatment in low back pain.²⁰ In 1994 Cherkin DC did a systematic review concluded that there is insufficient evidence to evaluate the effectiveness of the McKenzie Method for patients with LBP. A critical concern is that most trials had not implemented the McKenzie Method appropriately, the common flaw of that study was the trialed participants were given the same intervention regardless of classification which opposing the principles of McKenzie therapy.²¹ However our study showed that McKenzie protocol of exercises according to the classification is more effective and result oriented in the patients who are suffering from low back pain.

Ted Dreisinger proves that McKenzie Method is successful with treating acute low back pain it is also very helpful for those patients with sub-acute and chronic back pain.²²

Evidence-based clinical practice guideline. Philadelphia developed a structure and exact methodology for back pain which recommends that there is good evidence of treating mechanical low back pain by McKenzie method.²³ Robin McKenzie, a physical therapist in New Zealand noted that the spine could provide significant pain relief to the patients with mechanical low back pain and allows them to return to their normal daily activities.²⁴

CONCLUSION

A treatment based on the McKenzie method in

comparison with general conditioning exercises in low back pain produce appreciable additional short-term improvements in pain.

Ethical Clearance: Taken from committee of Institute of the Physical Medicine & Rehabilitation, Dow University of Health Sciences.

Source of Funding: Self

Conflict of Interest: Nil

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A Treatment based Classification Approach to Mechanical Lesion of Shoulder for Conservative Management and Improvement in Clinical Outcomes

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ABSTRACT

Introduction: A treatment based classification approach is where subjects are sub grouped to receive lesion specific interventions and this study presents similar approach for mechanical lesions of shoulder. Research has shown that Treatment Based Classification (TBC) system can enable and aid clinical research by identifying evidence based practice and this classification strategy had proven to be effective in neck and low back regions.

Aim of the Study: To formulate and establish the clinical utility of a treatment based classification for mechanical lesions of shoulder and to aid clinicians by providing a user friendly reasoning algorithm for effective patient management.

Methodology: The construction of TBC comprises of 3 steps (i) formulating Treatment Based Classification algorithm (ii) content validation by expert opinion and (iii) application on patient population. The algorithm enables categorizing the subjects into 7 possible sub groups based on unique markers. This case study included 6 subjects for analysis.

Discussion: By using the proposed Treatment Based Classification system, it was evident that the process of examination became easy and enables lesion specific interventions to the subjects as directed by the significant markers contained in the categorization. All the 6 subjects included in the study were benefited by using TBC approach by receiving matched interventions, had significant improvement in pain, ROM and shoulder function.

Conclusion: The proposed treatment based classification eases the clinical decision making process and effectively categorizes the subjects with mechanical shoulder dysfunction to be able to receive matched interventions resulting in better outcome.

Keywords: Treatment Based Classification, mechanical lesions of shoulder, shoulder pain.

INTRODUCTION

Shoulder pain is a functionally disabling condition and pure mechanical musculoskeletal disorders are common in shoulder region. Out of 30.13% crudely prevalent musculoskeletal pain in south Indian community shoulder pain accounted

for 25.05%¹. The burden of these disorders includes pain, impaired joint, muscle performance and daily function which ultimately affect the quality of life.

Evidence shows that exercise therapy and manipulations are effective in treating shoulder disorders^{3,4,5} and to make effective clinical decisions aiming to achieve favorable outcome it is recommended to categorize subjects into various subgroups.

A treatment based classification (TBC) approach is where subjects receive lesion/impairment specific interventions after being sub grouped and found to

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be very effective comparing to non lesion matched interventions⁶.

The clinical presentation with the shoulder disorders are complex because of its similarity and heterogeneity that makes the diagnosis towards confirming the source for existing problem more challenging and difficult. The current recommendation is to construct a TBC algorithm that makes the diagnosis easy as it includes all aspects of examination, significant clues and markers that can help clinician in accomplishing the above task.

Research has shown that TBC system can improve clinical research by identifying evidence based practice⁴ and classification strategy had proven to be effective in yielding outcomes for lumbar and cervical regions^{4,12}. The goal of this model is to improvise the clinical decision making abilities of the care providers in relation to diagnosis, intervention and prognosis.

One recent study had reported a 98% between-rater percentage agreement with the use of a treatment-based classification (TBC) system for shoulder disorder. This indicates that such categorization could be used generously by different examiners who are considering same patient data, with the quest to assist in validation of outcomes using TBC system. The purpose of this study is to construct and determine the use of treatment based classification system, in the management of patients with mechanical disorders of shoulder.

METHODOLOGY

Prior to the commencement of the study, ethical clearance was obtained from Institutional Ethical Committee (IEC), Sri Ramachandra University, IEC no.CSP/13/DEC/32/218.

Study Design: Case study

Sample size: 6

Inclusion criteria: Subjects with mechanical shoulder dysfunction

Exclusion criteria: Any recent trauma

Any previous surgery to shoulder

Neck pain radiating to upper limb

Intolerable pain

Unwilling for screening

Procedure: This consists of three steps

1. Formulating treatment based classification using evidence
2. Validating the content by obtaining an Expert opinion
3. Using it on patient population

Participants are informed about the nature of the study and after obtaining consent were considered for inclusion. After initial examination are then sub grouped as per the algorithm according to the markers obtained in initial examination.

THE ALGORITHM

There are two main broad categorization in the algorithm based on the pain intensity.

CATEGORY I: VAS >7

CATEGORY II: VAS <7

The category I uniquely focus on pain control after clearing upper quarter disorders confirming shoulder pain. The possible objective evaluation under this category was SPADI and FABQ. If the pain intensity was controlled, there was a possibility of shifting the subjects to next category.

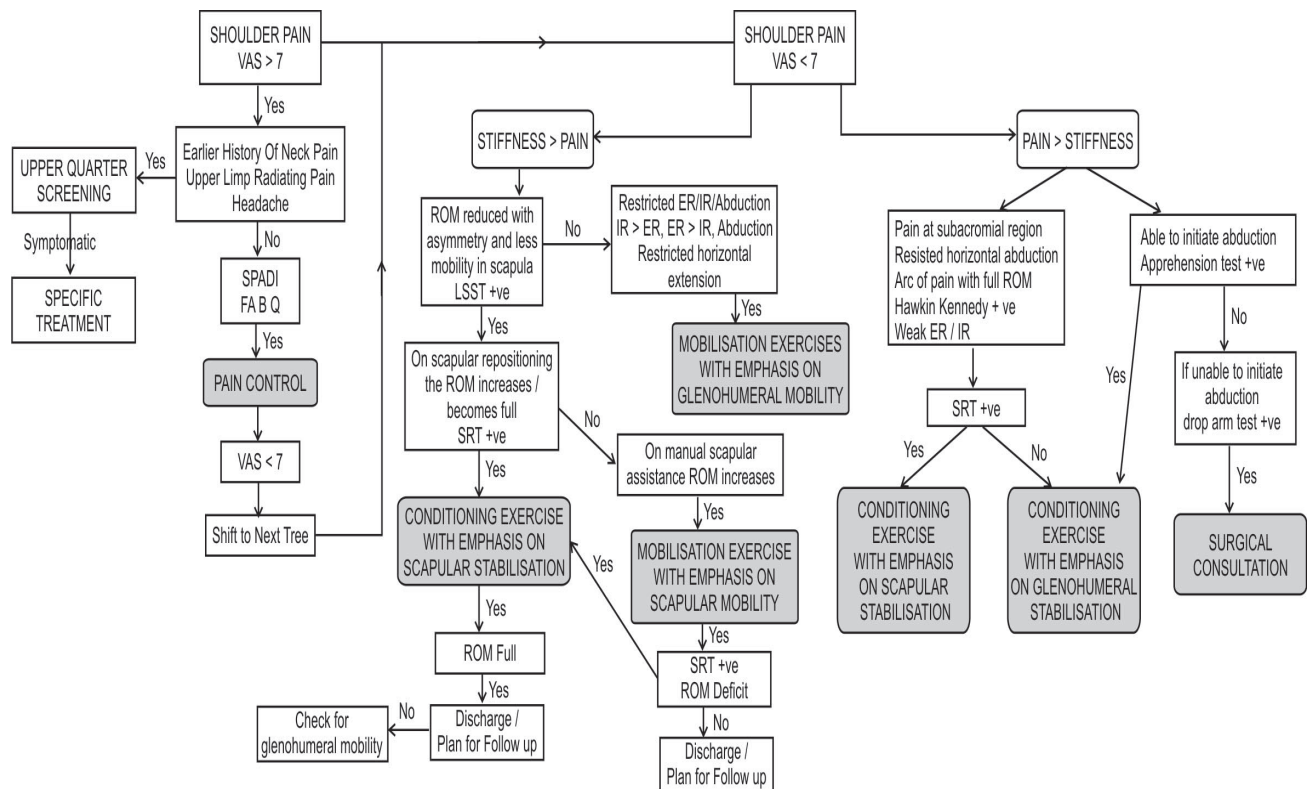
The category II was further categorized into:

STIFFNESS > PAIN CATEGORY

PAIN > STIFFNESS CATEGORY

The sub group stiffness > pain was further divided to isolate scapular dyskinesia and Glenohumeral ROM deficits using Lateral Scapular Slide Test (LSST), Scapular Reposition Test (SRT), Scapular Assistance Test (SAT) values and the pattern of Glenohumeral mobility restriction. The scapular dyskinesia was further processed to identify scapular instability and immobility to direct appropriate treatment and understand the influence of one over the other. The Glenohumeral mobility disorders after confirmation are addressed directly.

The sub group pain > stiffness was further processed to discriminate impingement, instability and rotator cuff/labral tears. After confirmation, are directed for appropriate treatment programs



wiz...Scapular Stability program, Glenohumeral Stability program and surgical consult.

PATIENT CHARACTERISTICS

PATIENT 1: A 29 year old female came with the chief complaint of right shoulder pain difficulty in lifting, moving shoulder for the past 2 weeks. The irritability was severe with pain intensity 8/10 on Visual Analogue Scale (VAS).

As the VAS >7 the patient was sub grouped under PAIN CONTROL. After one week of treatment consisting rest, ultrasound therapy and mild ROM exercises with in painful limits, the pain reduced considerably measuring 5/10 on VAS. Once the pain intensity was reduced the patient was shifted to the next tree in the algorithm.

On the 8th visit, the patient was able to perform good amount of active ROM with arc of pain 60-120 degree on frontal abduction comparing to gross restriction on the first visit. Lateral scapular slide test was positive and there was a difference of 1.9 cm at all angles of shoulder elevation compared with other side. Scapular Repositioning Test and Scapular Assistance Test did not influence the symptom.

There was a painful arc, external rotator strength was weak and painful and Hawkins Kennedy test was symptomatic.

On the basis of above markers the patient was grouped under CONDITIONING EXERCISES and was treated for 2 weeks with emphasis on strengthening of rotator cuff and scapular stabilizers. She had improved ROM which became full with no pain and the SPADI & FABQ scores improved from 45 and 39 to 18.75 & 20 respectively.

PATIENT 2: A 65 years old female came with the chief complaints of difficulty in lifting the right arm and mild pain in right shoulder for past 16 weeks. The pain was gradual onset dull aching and intermittent in character, aggravated by lifting arm relieved by rest, more of night pain with moderate irritability. The pain intensity was 5/10 on VAS and the cumulative SPADI score was 34 on initial assessment.

Active ROM on first visit showed capsular set pattern of limitation and with slight improvement in abduction range (0-47) on PROM.

Based on the above markers the patient was grouped under MOBILISATION EXERCISES WITH

EMPHASIS ON GLENOHUMERAL MOBILITY. After 2 weeks of treatment with mobilisation exercises the AROM increased to 160 & 70 degree of elevation and rotation. She was able to perform grooming activities and with SPADI score of 18.

PATIENT 3: A 65 years old male came to physical therapy department with pain in left shoulder since 2 weeks. He had a history of click sound heard while lifting the arm overhead to take an object. The pain was sudden onset, stabbing intermittent aggravated with overhead activities and relieved by rest. The pain intensity was 4/10 on VAS with moderate irritability. The cumulative SPADI score was 26.9.

On the first visit, there was a painful arc (70 -90) on frontal abduction and was able to complete ROM with pain. Rotations were full with end range pain. The inferior angle of scapula was rotated at resting position and there was 2.3 cm difference noted than other side from midline. The lateral scapular slide test was positive with 2.3 cm at 0, 2.5 cm at 30, 2.6 cm at 60, and 2.4 cm at 120 degrees of humeral elevation. The scapular repositioning test was positive, with reduction of symptoms on passive assistance to scapular motion.

Based on the above markers the patient was grouped under **CONDITIONING EXERCISES WITH EMPHASIS ON SCAPULAR STRENGTHENING.**

After 2 weeks of treatment the patient symptoms were improved with SPADI and VAS scores being 16.4 and 1.

PATIENT 4: A 25 year old male came with chief complaints of pain over left shoulder from past 6 weeks. He had no history of trauma except for playing cricket in the past 2 months. The pain was insidious onset dull aching intermittent character Aggravated with overhead activities of 5 on VAS .

The shoulder ROM was full with pain in end ranges with more pain on internal rotation. The Inferior angle of scapula was tipped and Lateral Scapular Slide Test was positive with 2.1 cm difference during shoulder elevation. Scapular repositioning test was positive with reduction of pain on passive assistance to scapular motion. The External rotator strength was weak and painful and Hawkins Kennedy test was positive.

Patient was grouped under **conditioning EXERCISES WITH SCAPULAR STABILISATION.** After 2 weeks the scapular mobility during elevation improved, external rotator strength was strong and pain free. The LSST value was 0.8cm on comparison with other shoulder on elevation.

PATIENT 5: A 45 year old female came with chief complaints of pain in right shoulder and difficulty in using her upper limb since 9 weeks. She had no history of trauma and known case of Diabetes Mellitus for past 2 years and on medication.

The pain was gradual onset catchy & intermittent in character. Severity was 6/10 on VAS with moderate irritability. On examination there was a gross reduction in AROM within 90 degree with 5 degree difference on passive ROM testing.

Lateral scapular slide test was positive with 1.7 cm difference & on Scapular Assistance Test the Glenohumeral ROM increased beyond 120 degree.

On the basis of above markers, the patient was grouped under **MOBILISATION EXERCISES** with emphasis on scapular mobility. After 2 weeks the ROM passed 160 degree & patient was able to perform functional activities with less pain.

PATIENT 6: A 47 years old male came with chief complaints of difficulty in using his left arm since 3 weeks for overhead activities. The pain was insidious onset pulling intermittent aggravated by elevation. The pain severity was 5/10 on VAS scale with moderate irritability.

In active ROM there was a painful arc with 50 – 80 degree of abduction and the scapular evaluation was normal. There was a painful arc with external rotators weakness and positive Hawkins Kennedy test.

On the basis of above markers, the patient was categorised under **CONDITIONING EXERCISE WITH EMPHASIS ON GLENOHUMERAL STABILITY.** After 2 weeks of therapy there was improvement in range of motion which was full and pain free and patient performed his functional activities with minimal pain.

DISCUSSION

The proposed Treatment Based Classification

(TBC) system for mechanical dysfunctions of shoulder classifies patients based on the initial examination into seven categories enabling matched interventions leading to improved pain, joint and regional function as demonstrated by VAS, ROM and SPADI scores.

The results of the present study are in concordance with the previous studies done on neck and low back region using similar treatment based classification in improving function by providing them with matched interventions^{4,12}.

The current trends in research suggests that to achieve a normal functioning shoulder it is important to have coupled rotator cuff and scapular activation exercises in the rehabilitation. Also evidence suggests that manual therapy along with conditioning exercises improve function in shoulder impingement². There are many specific exercises being proposed by several authors for individual muscles but most of them lack significant evidence to be included in a specific rehabilitation protocol².

The limitations with the current study was no quantitative data obtained for shoulder muscle strength evaluation only qualitative and there are limited evidence/literature available regarding optimal treatment recommendation for the management of mechanical dysfunctions of shoulder.

With the presented 6 case scenarios it was evident that by using the proposed Treatment Based Classification system, the process of examination became easy and enables matched interventions according to significant markers contained in the categorization.

The results seem to support the concept that when patients are treated according to matched interventions the outcomes are better. Also with the current study it can be recommended that this treatment based approach was favorable in improving outcomes and restoring functions among subjects with mechanical shoulder dysfunction

CONCLUSION

The proposed treatment based classification effectively categorizes the patients and was able to direct matched interventions to the subjects with mechanical shoulder dysfunction. And this algorithm

may play a crucial role in increasing the efficacy of the treatment and also improves outcomes.

Future studies can be conducted addressing the following:

- Algorithm validation.
- Among large sample population
- Using objective outcome measures

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Effect of Total Motion Release on Acute Neck Pain: A Pilot Study

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ABSTRACT

Objective: To evaluate the effectiveness of total motion release in acute neck pain.

Study Design: A pre- test and post-test pilot study

Outcome Measure: Visual analog scale (VAS), Neck disability index (NDI) and Range of motion.

Materials & Method: consent form, data collection sheet and goniometer were used. 30 Subjects in age group 18 -45 years clinically diagnosed with Acute neck pain received hot moist pack followed by total motion release approach once daily for a total of 7 sessions for 25 minute per session.

Intervention: total motion release approach along with hot moist heat for seven days

Results: 30 participants completed the 7 day treatment. There was significant statistical reduction of neck pain ($p=.000$) on comparison between pre and post values of Visual Analog Scale (VAS), and a significant statistical reduction of neck disability ($p=.000$) on comparison between pre and post values of Neck Disability Index (NDI). There was also significant increase in cervical range of motion on comparison between pre and post values of range of motion.

Conclusion: Total Motion Release was effective in reducing pain and disability and increasing the cervical range of motion in cases of acute neck pain.

Keywords: Neck pain, total motion release, neck disability, NDI, VAS, goniometer.

INTRODUCTION

Neck pain is not a disease but, a symptom and can be of traumatic or atraumatic origin, and/or associated with systemic disease.¹

Neck pain is common, has a huge impact on individuals and their families, communities, health-care systems, and businesses. There is substantial heterogeneity between neck pain epidemiological studies. The estimated 1 year incidence of neck pain from available studies ranges between 10.4% and 21.3% with a higher incidence noted in office and computer workers. While some studies report that between 33% and 65% of people have recovered from an episode of neck pain at 1 year, most cases run an episodic course over a person's lifetime and, thus, relapses are common.²

The overall prevalence of neck pain in the general population ranges between 0.4% and 86.8%; point prevalence ranges from 0.4% to 41.5%; and 1 year prevalence ranges from 4.8% to 79.5%. Prevalence is high in women, developed countries and urban areas. Onset and course of neck pain is influenced by environmental and personal factors. Most studies indicate a higher incidence of neck pain among women and an increased risk of developing neck pain until the 35–49 year age group.²

Neck pain may be related to soft tissue disorders, sustained use or immobility of the neck, structural abnormalities, joint degeneration or trauma. Soft-tissue-related neck pain can be because of poor posture while sitting or standing, repetitive activity, sports injuries, or the presence of an underlying

condition such as a cervical disc degeneration or cervical disc herniation.¹ Other causes include Injuries, arthritis, a ruptured or herniated disk, meningitis, and fibromyalgia, Atlanto – axial subluxation, cervical spondylosis, temporo mandibular joint disorders and spasmodic torticollis.³

TMR was developed by Tom Delanzo – Baker, a physical therapist. It is an approach of therapy using a series of exercises to balance strength and range of motion.⁴ TMR is a movement oriented technique that looks at movement imbalances.⁵

In TMR the patient will learn simple and easy five tests to check movement imbalances or restrictions of the five major joint regions of the body – the shoulders, spine/rib cage, hips, knees, and ankles—comparing one side to the other. The main goal of TMR is to balance these five joint regions and eliminate the restrictions, because one of these restrictions could be the main culprit (cause) of the pain/problem.⁵ Exercises are then performed to balance the right and left, using a series of repetitions or sustained holds on the “good” side and rechecking the “bad” side to see how it responded.⁴ The conditions in which TMR is found effective are: neck pain, shoulder pain, back pain, hip and pelvic pain.⁵

To the best of our knowledge, there is no study conducted on effect of Total Motion Release (TMR) on acute neck pain in adult population. Hence, the present pilot study is designed to study the effect of Total Motion Release over the range of motion, disability, and pain caused due to acute neck pain.

MATERIALS & METHOD

Population: Participants of age group 18 -45 years having acute neck pain from Dr.Prabhakar kore hospital and Dr. BMK Ayurvedic hospital, Belgaum.

Study design: pilot study

Sampling design and method: non-probability sampling and convenient method

Materials used: consent form, data collection sheet, goniometer

Participants: Over a period of 3 months 30 subjects (males and female) with acute neck pain, from Dr. Prabhakar Kore hospital and Dr BMC

Ayurvedic hospital Belgaum were recruited for the study. Ethical approval and consent was received. All subjects were screened for inclusion and exclusion criteria. The inclusion criteria of the subjects were that they were between age group of 18 -45 years and were willing to participate in the study and had neck pain for less than 7 days. Subjects were excluded if they had previous history of trauma to cervical region, cervical musculoskeletal injuries, and malignancies. Before beginning the therapy all subjects were thoroughly clinically examined. Additional exclusion criteria were visual or auditory handicaps. The 30 subjects were then assigned to the approach of total motion release.

Procedure: Based on a brief history, the subject suffering from neck pain complained about pain and disability which affected the educational profile, range of motion and socioeconomic status. The active range of motion has then been assessed. Treatment included assessment time for 15-20 minutes on the first day followed by 25minutes of therapy per day for seven days. The Participant is asked to sit comfortably on the chair with Therapist sitting in front. To increase the affected side ROM, the participant is asked to do the movement on the unaffected side, the movement has to be done throughout the range. The participant is asked to sustain the range for 15 seconds for three times in three different ranges. Then the participant is asked to do the movement on the affected side for three times holding it for 15 seconds.

OUTCOME MEASURES

Neck Disability Index (NDI): The Neck Disability Index is a modification of the Oswestry Low Back Pain Disability Index.⁶ It is a 10 item questionnaire that asks patients to rate how their neck pain is affecting the daily living. Each section is scored on a 0 to 5 rating scale, in which 0 means “no pain” and 5 means “worst pain” all points can be summed to a total score. The test can be interpreted as a raw score, with a maximum score of 50, or as a percentage.

Visual Analogue Scale: A horizontal visual analogue scale was used. A 10 cm line was drawn on a paper and participants were asked to mark a point on the line that best defined the Present pain level, where zero indicated no pain and 10 indicated severe

pain.⁷

Goniometry: A Goniometer is a device used to measure joint range of motion either active or passive range of motion. It can also measure progress in return of range of motion during recovery.⁸

STATISTICAL ANALYSIS

Difference between the values before treatment and after was considered as main outcome parameters measuring the treatment effect. Data is analysed by statistician, blinded to the group. The statistical tests used were paired and unpaired t-test. Nominal data from subject's demographic data i.e. age, BMI, pre and post values of range of motion were analysed using Paired t-test. Pre and post values of neck disability percentage, visual analogue scale were analysed using paired t test as well Wilcoxon Signed Rank Test. Probability values less than 0.05 were considered statistically significant and probability values less than 0.001 were considered highly significant.

RESULT ANALYSIS

30 subjects completed the study. The results obtained from t-test showed that there were significant differences between pre- and post- treatment values of VAS and between pre- and post- treatment NDI values and ROM. Paired t-test for the pre- and post- comparisons revealed a significant decrease in pain($p=.000$) and disability($p=.000$) and increase in range. In VAS the mean score on pre session as on the first session was 6.98 ± 1.11 which was decreased to a mean of 5 ± 1.35 after 7 sessions of treatment. The difference in mean VAS is 1.98 ± 0.93 p value by paired t test was found to be 11.582 and that by Wilcoxon Signed Ranks Test: $2 = 4.812$ was < 0.001 which is highly significant. A significant decrease in pain was noted after treatment (Table No. 1). In Neck Disability Index,

the mean score on pre session was 39.9 ± 12.06 , which was decreased to a mean of 28.8 ± 9.93 after 7 sessions of treatment. The p using paired t test was found to be 11.128 and then by Wilcoxon Signed Rank Test: $2 = 4.786$ the p value was found to be < 0.001 which was highly significant (Table No. 2). In Flexion range of motion, the mean score on pre session was 45 ± 4.67 , which was increased to a mean of 47.3 ± 2.92 after 7 sessions of treatment. The p value by using paired t test was found to be < 0.001 which is highly significant. In Extension range of motion, the mean score on pre session was 56.3 ± 5.01 , which was increased to a mean of 58 ± 2.94 after sessions of treatment. The p value by using paired t test was found to be < 0.001 which was highly significant. In Right lateral flexion range of motion, the mean score on pre session was 41 ± 4.49 , which was increased to a mean of 43.4 ± 1.95 after 7 sessions of treatment. The p value by using paired t test was found to be < 0.001 which was highly significant. In Left lateral flexion range of motion, the mean score on pre session was 42.5 ± 3.83 , which was increased to a mean of 44.2 ± 1.68 after 7 sessions of treatment. The p value by using paired t test was found to be 0.001 which was significant. In Right rotation range of motion, the mean score on pre session was 70.5 ± 7.70 , which was increased to a mean of 71.9 ± 12.06 after 7 sessions of treatment. The p value by using paired t test was found to be 0.518. In Left rotation range of motion, the mean score on pre session was 74.4 ± 7.25 , which was increased to a mean of 76.6 ± 5.53 after 7 sessions of treatment. The p value by using paired t test was found to be < 0.001 which was highly significant (Table No. 3). Based on the results we can conclude that there was significant increase in range of motion post treatment and decrease in neck disability percentage and pain by visual analog scale.

Range of motion

Table No. 1--Visual Analogue Scale

Pre- treatment	Post-treatment	Difference	Paired-t	p
6.98 ± 1.11	5 ± 1.35	1.98 ± 0.93	11.582	< 0.001

Table No. 2--Neck Disability Index

Pre- treatment	Post-treatment	Difference	Paired-t	p
39.9±12.06	28.8±9.93	11.1±5.47	11.128	<0.001

Table No. 3- Range of Motion

Movements	Pre- treatment	Post-treatment	Difference	Paired-t	p
Flexion	45±4.67	47.3±2.92	2.3±2.81	4.10	<0.001
Extension	56.3±5.01	58±2.94	1.7±2.28	4.419	<0.001
Rt. lateral flexion	41±4.49	43.4±1.95	2.4±3.03	4.272	<0.001
Lt. lateral flexion	42.5±3.83	44.2±1.68	1.7±2.52	3.694	0.001
Rt. Rotation	70.5±7.70	71.9±12.06	1.14±11.43	0.654	0.518
Lt. rotation	74.4±7.25	76.6±5.53	2.2±2.48	4.919	<0.001

DISCUSSION

TMR which works on the principle of Myofascial release is also a systemic approach which starts by finding the “issue of the session” i.e. a movement or position that consistently reproduces pain or shows decrease in range of motion. Then the FAB5 motions involving larger joints of the body are tested and compared left to right, then rank accordingly in order of significance. Exercises are then performed to balance the right and left, using a series of repetitions or sustained holds on the “good” side and rechecking the “bad” side to see how it responded.⁴

Present study showed significant decrease in pain, reduced neck disability scores and increase in cervical range of motion in all the thirty subjects, when compared the results of pre –treatment and post -treatment. The idea of using the unaffected side to treat the affected side may be a little difficult to believe at first. But, current study proves the same concept true! The unaffected side is actually treated to treat the affected side.⁹

Based on a case study since two weeks, a 49 year old female with a history of pain in her right shoulder has been complaining of the difficulty while reaching her hand to the back of her shoulder. Testing the FAB5 exercises showed the most significant differences in performing the balanced activities like sit to stand, arm raise, twists, leg raise, bent knee and toe touch. Two sets of twelve repetitions of the same

activity were performed on the left i.e. the “Good” side, which showed a considerable decrease in pain and increase in range of motion on the right side. The same was performed on the good side until balance was achieved¹⁰. The current study also shows convincing results i.e. reduction in pain and increase in range of motion.

Bill Jones had conducted a study in which a young girl suffering from low back ache could bend forward only reaching the knees with limited extension. A total motion release of three sets was done and patient was made to bend forward again, now she can bend up to the mid shin level and her extension range was also increased further, arm raises were done to eliminate the imbalances of her body. After doing this, she was able to bend and touch her toes and could do full extension.¹¹ Relating, the above study of “back pain” the conducted experiment of “neck pain”, showed similar results i.e. decrease in neck pain and disability and a considerable increase in cervical range.

FINDINGS

The conducted study showed the effectiveness of total motion release in subjects with acute neck pain. Since neck pain is a common problem within our society and being an occupational hazard this study would benefit the population in managing their symptoms.

CONCLUSION

The conducted study concluded that total motion release was effective in alleviating acute neck pain in terms of decreasing pain and disability and increasing range of motion.

Conflict of Interest: None

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Novel Approach to a Rare Presentation Painful Os Intermetatarsaleum & Shockwave Therapy First Experience & Review

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ABSTRACT

Background: Painful Os Intermetatarsaleum is a rare yet disabling cause of dorsal foot pain in sporting fraternity, necessitating a definite awareness about it and its management. Approach to the management of established painful os intermetatarsaleum has been largely conservative. Though shockwave therapy has been promising in the field of sports and orthopaedic medicine, yet there is no scientific underpinnings on its therapeutic use in painful os intermetatarsaleum.

Purpose: To critically review literature to establish effective ways of managing painful os intermetatarsaleum and to report the first experience in the world of use of shockwave therapy as conservative tool in painful os intermetatarsaleum.

Study Design: Critical Systematic Review and Case Report

Methods: Computer-aided searches were conducted using: PubMed, Medline, SAGE, Cochrane, Ovid and Science Direct. An extensive manual search and cross-referencing from review and original articles published between Jan 1963 and December 2013 were performed. The search strategy combined key words expanding the terms 'painful os intermetatarsaleum' for population, 'management' for intervention, and 'pain, return to activity' for outcome. Predefined inclusion and exclusion criteria were applied.

Results: Eleven relevant papers were found, including case reports and case series. Current evidence suggests surgery to be preferred option than conservative approach in management of painful os intermetatarsaleum irrespective of the natural history of the condition. In the current review no paper was found relating to the use of shockwave therapy in painful os intermetatarsaleum.

Conclusion: Based on the current review it can be concluded that the evidence has been anecdotal and that there is need of large scale randomised trial for a better clinical interpretation and guideline laying for the conservative approach, and in that use of shockwave therapy in conservative management of painful os intermetatarsaleum needs to be explored.

Keywords: *Painful Os Intermetatarsaleum, Shock Wave Therapy, Conservative Management, Surgery.*

INTRODUCTION

Os Intermetatarsaleum (OI) or Os Intermetatarsale I, is a rare developmental defect^{1,2} of human foot anatomy that is incidentally reported on radiographs as accessory ossicle³. Knowledge of this rare occurrence is a must, as it might pose a challenge to Diagnostic Medicine, presenting as a cause of dorsal foot pain with plethora of differential diagnosis or rather misdiagnosis like calcified dorsalis pedis artery,

a ligamentous avulsion of the adjacent metatarsal or cuneiform, 'fleck' sign in Lisfranc fracture-dislocation and post-traumatic osteophyte formation^{4,6}.

Conservative line of management is the recommended first line of approach in managing painful OI with surgery reserved for complex cases and cases that don't respond to conservative management⁵. Here we present first experience and report *first time the successful use of novel approach of Shockwave therapy (SWT) in management of painful*

OI and also a review of literature highlighting management of painful OI.

CASE REPORT

29 year old exercise enthusiast came in with complaints of persistent pain in dorsum of his right ankle, for past one year. Patient had a fall and sustained ankle fracture one year back, for which he underwent open reduction and internal fixation. Patient complained of dorsal foot pain, more so while wearing formal shoes and doing exercises involving going on toes and jumping. On examination patient was found to have moderate flatfoot deformity with tenderness between first and second metatarsal area associated with mild weakness of extensor hallucis. Though there was positive tincl like sign, no associated paraesthesia was detected. There was no restriction in passive and active range of motion in metatarsophalangeal joints. Patient is a non-smoker and otherwise healthy athlete with no other significant history and unremarkable systemic examination. Family (Maternal) history of hallux valgus was present. Patient did reported taking analgesics as and when necessary but not on regular basis. The patient does regular moderate to heavy intensity gym based progressive resistance training in a periodized fashion.

Further to the clinical assessment, blood tests and radiologic investigations including Computed Tomography scan (CT) were ordered. Blood reports were within normal limits ruling out rheumatological and infectious causes, while radiograph and CT scan of ankle showed presence of os intermetatarsaleum (Figure) and type two accessory os naviculare. Based on the compatibility between clinical history, physical examination and radiographic findings, the diagnosis of painful OI was made. Because the clinical findings did not support a nerve compression, nerve conduction velocity studies were not performed.

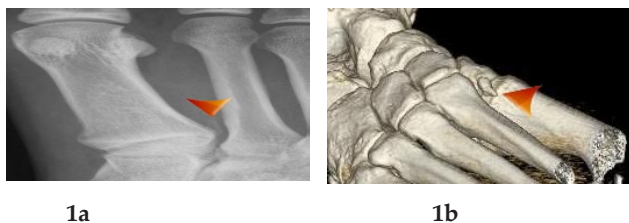


Fig.1. Plain X-Ray (1a) and 3D CT image (1b) of the right ankle showing the presence of OI between first and second metatarsal base, as indicated by the arrow head.

Following the diagnosis, the patient was informed of his ankle condition and that there was few promising treatment options available at that time inclusive of analgesics, modified footwear, activity modification/restriction, local injection, shock wave therapy (SWT), and/or surgery, with surgical excision being the preferred. The patient was not interested in surgery or injection and decided to go with shockwave therapy management.

Patient was treated with applications of low energy, radial SWT by the same physician. The BTL 5000 Shock Wave Therapy Power equipment of BTL Industries Inc. (Columbia, South Carolina, USA) was used. Total of two sessions were given, over a period of seven days (first session on day one and second session on day seven). 500 impulses were applied at a frequency of 4 Hz and pressure of 2 bar. The applicator was placed perpendicularly dorsally over the space between first and second metatarsal space, and used in painting fashion. On the day of shockwave no exercise was done, but for passive mobilisation post shock wave session. Patient was also instructed to stop any pain medications during the entire course of treatment. Patient continued to do his routine fitness exercises.

To chart the progress, ten point Visual Analog Scale (VAS) ⁷ was recorded prior to start of the SWT, 2 weeks after last session of SWT, and two years after last session of SWT. Patient reported VAS of 3 at rest and 6 to 7 with activity at the start of the treatment. The patient showed good recovery with prompt pain relief as measured by VAS at the end of two weeks (score of 0 at rest and 1 with activity), which was maintained even after two years of therapy (0 both at rest and with activity). Physical examination also revealed no tenderness over the dorsum of foot. Further improvement in toe extension was also recorded. On examination at two years the patient is asymptomatic.

METHODOLOGY

Search Strategy

To study the effective ways of managing painful os intermetatarsaleum conservatively, a modified PICO search strategy was employed as preliminary scope search resulted in limited literature.

- **Population** – "Painful os intermetatarsaleum, os intermetatarsaleum, os intermetatarsale"
- **Intervention** – "conservative, surgery, injection, physiotherapy, footwear, shockwave therapy, shockwave"
- **Outcome** – "pain, range of movement, muscle power, return to activity, return to play"

Computer-aided searches were conducted using: PubMed, Medline, SAGE, Cochrane, Ovid and Science Direct. An extensive manual search and cross-referencing from review and original articles published in last fifty years, between January 1963 and December 2013 were performed.

Study Selection

The inclusion criteria involved all kind of studies comprising of case reports and case series. Studies evaluating management of painful os intermetatarsaleum in any form either individually or in combination were included. No language restriction was laid.

Quality Assessment

Though quality assessment is essential for any study to establish evidence and reliability⁸, no study was excluded from the current review on the basis of quality assessment. This may be explained due to the limited availability of literature and also as it has been reported that case reports and case series do offer valid and essential insight in to complex clinical situation and rare benefits or side effects of novel treatments⁸⁻¹⁰. Hence studies were included with a broad study eligibility criteria to maximise the information available.

RESULTS

Search Results: Eleven potentially relevant studies¹¹⁻²¹ were identified. All the studies included were case reports. Eight studies were published in English¹⁴⁻²¹, while three studies were published in German¹¹, Korean¹² and Spanish¹³ language respectively.

Patient Characteristics: In this review, the patients with painful OI were mostly in the third decade, ranging from 14 years to 52 years, with 70% being male and 30% female.

Injury Profile: In the present review about 50% of the injury was reported in sports person^{11, 12, 15, 17-19}. Painful OI was found to be bilateral in 35%^{12-14, 19}, while the pain was unilateral in 65%^{11, 15-18, 20, 21}. The major complain was of dorsal foot pain¹¹⁻²¹ associated with local swelling^{12, 15, 21}, paraesthesia^{15, 17, 20}, tenderness^{13, 15, 16, 21}, discomfort in mobilising in closed footwear^{11, 16, 19, 20}, positive tinell sign, and weakness in toe extension^{15, 17, 20}. Pain was mostly chronic in origin and included both traumatic and non-traumatic etiology. Further Nakasa et al¹⁷ noted the pain increased with activities involving plantar flexion with toe flexed like standing on toes and jumping. Henderson observed OI to have familial preponderance, while other studies reported OI to be associated with hallux valgus^{14, 16, 18} or deep peroneal nerve impingement^{15, 17, 20}.

Treatment Parameters & Outcome Measures:

1. Treatment Modality: In the current review 80% ended up getting treated surgically, while 10% were treated conservatively^{18, 19} and 10% received no treatment^{14, 21}. Of the two patients who received no treatment, one had no symptoms, while the other had vascular compromise.

2. Post Treatment Follow-up: In the current review of the twenty, only nine patients^{16-18, 20, 21} were followed up post treatment over varying time period ranging from 4months to 4 years. Of the 9 patients only one was treated conservatively¹⁸ and was found to be effective even at end of 6month post treatment. While the remaining 8 patients were successfully treated surgically.

3. Outcome Measures:

a. Pain: All the studies recorded prompt relief in pain¹¹⁻²¹ irrespective of the mode of treatment (conservative or surgical)

b. Return to Activity: Only three studies^{11, 17, 21} reported return to activity as criteria. The average return to activity time was found to be 12 weeks (SD of 8 weeks).

DISCUSSION

Os intermetatarsaleum (OI) is a rare accessory ossicle of the foot that is reported commonly as an incidental finding on radiology in the space between the medial cuneiform and bases of first and

second metatarsal bones³. Occurrence of OI has been reported across various anatomical and radiological studies, with varying incidence ranging between 0% to 14%^{1, 22, 23}. OI is frequently asymptomatic⁵. But as seen in the current review there have been various reports of painful OI.

In the current review painful OI was more commonly seen in males between 2nd and 3rd decade, with majority belonging to sports background. Our patient is also an exercise enthusiast in his third decade and presented with features similar to that found in the current review, i.e., chronic unilateral dorsal foot pain associated with tenderness and difficulty mobilizing in closed footwear, with increase in pain and discomfort while doing exercises that required him to go on toes¹¹⁻²¹. Further our patient also gave history of previous trauma^{17, 20, 21}.

Studies, in the current review, have further shown OI to be associated with weakness of toe extension associated with paraesthesia and tingling^{15, 17, 20}. No such finding were seen in our patient. Further studies have shown strong association between presence of OI & hallux valgus^{14, 16, 18}. Though our patient had maternal history of hallux valgus, all the measured angles were in normal range ruling out hallux valgus. This is important from the fact that the presence of an OI may create a rigid metatarsocuneiform articulation that resists successful correction of the 1-2 intermetatarsal angle in hallux valgus^{24, 25}.

Though conservative approach has been advocated as the first line of approach by all authors, 80% were treated surgically^{11-17, 20, 21} in the current review, with an average return to play time of 12 weeks^{11, 17, 21}. Clearly making surgery the preferred option. Guided by our patient's preference, we decided to go with conservative management. Conservative^{18, 19} approach recommended in the literature were shoe wear modifications, prohibition from participating in sporting activities, NSAIDs and local steroid injections.

SWT has been shown to be effective in various musculoskeletal conditions²⁶ resulting in prompt pain relief and functional restorations with results comparable to surgical interventions^{27, 28}. Further in conditions like heterotopic ossification, though no effect has been seen on deposit resorption, SWT has

shown to have significant effect on pain relief and movement restoration²⁹. Hence we opted for SWT and physiotherapy in this patient. NSAID wasn't prescribed, as the patient gave history of no benefit from them. Patient showed prompt relief in pain at the end of the second session of SWT, and no pain two weeks and two years after last session of shockwave therapy. Improvement was also seen with toe extension that was similar to the other foot. This may be explained by the fact that the mild weakness in extension was initially due to pain inhibition, and once pain was relieved the extension was back to normal. The patient was encouraged to continue with his exercise routine, unlike the study by Chavali¹⁸ where the patient was advised to refrain from physical activities. Patient also reported to be back to exercising in full rigor without any discomfort in the toes during his last visit, after two years.

To our knowledge, there has been no report of shockwave therapy usage in OI in world literature, we believe that this is the first experience of use of novel conservative approach in the form of shockwave therapy in a rare presentation of painful OI.

CONCLUSION

Knowledge of OI and their pathology is important to prevent misdiagnosis leading to unnecessary work ups and cost for the hospital, while not ignoring patient's agony. Though non-surgical treatment has been advocated as the first line of approach in literature, we like to draw attention of the research and clinical fraternity to the probable role shockwave may play in OI treatment, and recommend need for larger and quality study to establish and extend the horizon of shockwave therapy indications.

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Consent: Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Conflict of Interest: None

Funding Agency: None

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Are Physiotherapists able to Identify Patients' Psychosocial Problems Related to their Treatment? A Critical Evaluation of Research

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ABSTRACT

The purpose of this review was to provide a critical evaluation of literature related to physiotherapists' ability to identify and diagnoses psychosocial problems related to treatment. As research has increasingly supported to relationship between psychosocial factors and treatment outcomes, physiotherapists have placed increased attention on incorporating intervention strategies that address these factors in treatment. Current psychosocial issues in physiotherapy research were presented, as well as gaps in the literature and directions for future research. Based on the evidence presented in this review, it appears that promising strides have been made to address these psychological and social issues that impact treatment. However, the field of physiotherapy still has many methodological and assessment issues that must be addressed in order to enhance the efficacy of these interventions.

Keywords: *Physiotherapy, Psychosocial, Pain*

INTRODUCTION

Due to the increasing evidence for the support of psychosocial factors in physiotherapy, a question that has arisen within the literature is the extent to which physiotherapists understand and can effectively identify these factors ^[1]. According to Overmeer et al. (2004), debate exists as to the operational definitions and assessment methods of psychosocial risk factors, and the field of physiotherapy is currently divided as to the use of various measurement techniques in clinical settings ^[2]. For example, Overmeer et al. (2004) illustrated that, while physiotherapists appear to understand the significance of psychosocial factors in working with chronic pain, they lack specificity about their assessment and treatment ^[2]. The following section discusses research regarding these assessment factors in more detail.

Current Psychosocial Issues in Physiotherapy Research

Much of current research related to psychosocial factors in physiotherapy is oriented toward addressing the aforementioned assessment issues. Accordingly, research is now largely concerned with determining physiotherapists' ability to identify psychosocial

factors in patients with chronic pain ^[3]. For example, Bishop and Foster (2005) sought to determine whether or not musculoskeletal physiotherapists in the UK were able to recognise situations in which patients with chronic low back pain were more susceptible to chronicity as a result of these psychosocial issues. Drawing on a cross-sectional descriptive design, Bishop and Foster (2005) surveyed more than 400 physiotherapists in the UK regarding their assessment of psychosocial factors. Results from this study demonstrated that physiotherapists largely were proficient in assessing chronicity of both low- and high-risk individuals. Bishop and Foster (2005) concluded that physiotherapists were generally successful in recognising when patients were experiencing psychosocial issues that facilitated chronicity ^[4].

This study illustrates the significance of identifying psychosocial risk factors in working with chronic pain, as well as effectively designing intervention strategies that account for these issues ^[5]. However, the results of Bishop and Foster's (2005) research also reflect a critical need within the study of these psychosocial factors ^[4]. Physiotherapists must be effectively educated regarding these assessment techniques and intervention strategies, and the

field must adopt evidence-based guidelines for incorporating these strategies into the treatment of chronic pain ^[5].

Main and George (2011) conducted a review of existing psychosocial research within the field of physiotherapy. These authors specifically examined literature emphasising the assessment of pain and disability symptoms. Echoing the above sentiments, Main and George (2011) asserted that, while a promising number of empirical studies have emerged examining this topic, assessment remains a critical area of need. One of the problems that has persisted within physiotherapy practice is the lack of development of a generally agreed upon model of care and set of assessment criteria for pertinent psychosocial constructs influencing treatment. Interpreting the impact of these psychosocial factors generally occurs as a result of the manner in which they were implemented within a particular study ^[6]. More information is needed regarding the moderating and mediating effects of these psychosocial risk factors, as well as their potential implications on treatment outcomes ^[7].

Linton and Shaw (2011) also performed a review of the existing psychosocial factors within physiotherapy research. These researchers specifically sought to investigate the role psychological factors play in the experience of pain. In performing an evaluation of scientific evidence of these factors within the literature, Linton and Shaw (2011) attested that pain has a significant impact on human emotion and behaviour. These accompanying psychological factors can subsequently moderate treatment outcomes and modify the experience of pain. Interestingly, Linton and Shaw (2011) concluded that the psychological factors influencing treatment outcomes are not typically accounted for in modern physiotherapy treatment programmes for pain ^[8].

Linton and Shaw's (2011) study clearly indicates the need for a consistent model of care delivery, as well as empirically validated assessment criteria for diagnosing these factors. The potential to integrate psychosocial factors into treatment programmes has the ability to significantly improve treatment outcomes ^[8]. However, an additional issue that has arisen within the field of physiotherapy is the successful integration of psychosocial principles into a more holistic and multimodal model of care. As the field continues to gather more empirical evidence of

the psychosocial constructs in treatment, subsequent research will need to identify the proper application and integration of evidence-based therapeutic techniques. According to Nicholas and George (2011), integrating psychosocial factors into physiotherapy treatment is likely to be primarily effective as a secondary prevention method. Psychosocial factors typically result in response to a debilitating injury, and the physiotherapist can facilitate recovery through identifying and managing these obstacles ^[9].

Main and George (2011) suggest that the successful identification and incorporation of psychosocial factors into physiotherapy will require educational and training adjustments. Transforming the theoretical and conceptual model within any vocation is bound to face a number of challenges and barriers that detract from positive change ^[9]. Within the field of physiotherapy, a significant challenge will include overcoming traditional modes of thinking about assessment and interventions. Additionally, an increased body of research is needed to support the evidence for pain's impact on behaviour and emotion, as well as valid assessment and treatment strategies ^[3]. Fortunately, preliminary evidence appears to demonstrate strong support for a more holistic model of care that includes psychological and social symptoms ^[9].

In addition to increasing research and education surrounding psychosocial factors related to pain, Foster and Delito (2011) suggest a biopsychosocial model of care. Such a model highlights the equally contributing psychological, social and biological factors that result in an effective diagnosis and treatment for pain ^[3]. Few randomised, controlled models have tested this intervention model within physiotherapy treatment, although there is some evidence demonstrating its potential efficacy ^[2].

In summary, an abundance of research has emerged within the physiotherapy literature addressing psychosocial issues in treatment ^[10-12]. While some research has demonstrated that this appears to be a worthwhile area of inquiry, a number of issues have detracted from the successful incorporation of psychosocial factors into care ^[13]. The field currently lacks a consistent and agreed upon conceptual framework for identifying and targeting these factors ^[14]. Additionally, operational definitions of psychosocial constructs and validated assessment criteria are lacking. The following section discusses

the efficacy of existing research on this topic in more detail, emphasising assessment and integration factors.

Efficacy of Psychosocial Research in Physiotherapy

Researchers began to explore specific assessment criteria for psychosocial factors in physiotherapy in the mid- to late-1990s ^[14 - 16]. Although these influential studies called for increased research related to psychosocial assessment and integration, the existence of valid and reliable criteria, as well as, consistent theoretical and conceptual frameworks for integrating these strategies into interventions is still scarce ^[17]. Research in this area is still largely focussed on identifying the impact of various psychosocial factors in treatment outcomes. For example, Lohmann et al. (2011) demonstrated that motivation for recovery tends to have a strong correlation with improved functional status in patients in an acute hospital. However, researchers still lack sufficient means of assessing these criteria or successfully integrating appropriate treatment strategies ^[18].

Demmelmair et al. (2012) highlighted the existing gap between evidence-based guidelines and clinical physiotherapy practice, particularly related to the assessment of pain. Therefore, these researchers designed an educational intervention attempting to improve physiotherapists' training and assessment of prognostic factors related to chronic pain. The results demonstrated that the time each physiotherapist spent assessing psychosocial factors increased, as did the accuracy of their psychosocial diagnoses. Additionally, results showed that the greater amount of attention placed in these psychosocial factors resulted in substantially improved treatment outcomes ^[19]. This study demonstrates promise for educational efforts to improve physiotherapists' assessment skills, as well as the efficacy of this strategy for enhancing treatment outcomes.

Strengths and Weaknesses of Psychosocial Assessment

While Demmelmair et al.'s (2012) research provides promising insight into the assessment and integration of psychosocial factors into physiotherapy treatment, it should be noted that this study generally lacked a strong theoretical basis or conceptual framework. Instead, these researchers handpicked psychosocial factors that they believed to be relevant

for the purpose of the study. These factors included goal setting, psychosocial education, verbal feedback, self-efficacy and cognitive and emotional response to pain ^[19]. Although Demmelmair et al.'s (2012) study offers insight into the role of these psychosocial factors in physiotherapy interventions, its lack of theoretical support prevents the assessment of specific research hypotheses ^[19-20]. Subsequent research needs to be theory driven, as this will promote more consistency within the field and encourage the identification of evidence-based assessment criteria ^[20].

An additional weakness of current psychosocial assessment research is its lack of consistency within the physiotherapy research addressing this topic itself. For example, Demmelmair et al. (2012) utilised a quasi-experimental, single-subject design to assess these psychosocial prognostic factors ^[19]. However, Lee et al. (2013) conducted a randomised, controlled trial of a group of physiotherapy patients to explore the management of psychosocial contributors to low back pain ^[21]. While these varying research designs help build a wide body of contextual evidence for the role of psychosocial factors in physiotherapy treatment, they do not help narrow the gap between evidence and practice ^[19]. To adopt more evidence-based guidelines for assessing and diagnosing psychosocial factors related to pain, meta-analytic studies are needed based on a large set of consistent study designs. This approach would allow researchers to draw broad conclusions about the effectiveness of various treatment effects ^[22].

Despite these weaknesses, an increasing body of research is specifically investigating these assessment criteria. The anecdotal and qualitative evidence appears to strongly support the role of psychosocial factors in the experience and management of pain, and it remains clear that this is a critical area for physiotherapists to address in any treatment programme. As increased empirical support for assessment instruments begins to appear, physiotherapists will likely experience markedly increased identification skills. Furthermore, as increased empirical support of educational and training strategies for assessing and intervening in the existence of these factors begins to build, physiotherapists will be able to make more evidence-based clinical treatment decisions ^[23].

Perhaps the most promising theoretical framework for incorporating these psychosocial factors into

care is the adoption of the biopsychosocial model. Sanders et al. (2013) suggest that physiotherapy is currently in the midst of a “paradigmatic shift, where a biopsychosocial model of care has acquired popularity in response to mounting research evidence indicating better patient outcomes” [24]. This model appears to offer physiotherapists the best chance to account for the multiple contributing factors that influence treatment outcomes, including psychosocial issues. However, research has yet to specifically assess effective integration strategies within clinical settings. Additionally, the field currently lacks research regarding training and educational efforts for incorporating this model into practice. Nevertheless, the biopsychosocial model of treatment is likely to represent the most promising direction for physiotherapy practice, and an increasing body of empirical research will help alleviate the gaps mentioned above.

SUMMARY AND CONCLUSION

The purpose of this paper was to explore the clinical implications of pain, drawing on relevant literature within the field of physiotherapy. Specifically, this paper aimed to address the degree to which physiotherapists are able to identify and assess psychosocial problems related to pain. While the field of physiotherapy has always recognised the impact of psychological and social factors in treatment outcomes, these constructs have only recently begun to emerge within the literature.

Research has demonstrated that patients experience a number of emotional and behavioural symptoms related to pain and disability, and physiotherapy research is currently exploring methods for addressing these issues. Preliminary evidence suggests that, while practitioners widely recognise the significance of these psychosocial factors, they lack proficiency in effectively assessing and treating them. As the field continues to expand its body of research on this topic, these assessment and identification weaknesses are likely to experience improvement.

Additionally, future research needs to adopt a consistent theoretical framework for integrating these factors into intervention efforts. The biopsychosocial model offers a promising direction for future research and practice in this respect. Finally, educational and training interventions need

to be explored in order to successfully narrow the gap between evidence and practice. Once research expands on these evidence-based guidelines, physiotherapists will continue to experience improved efficacy in assessing and treating psychosocial factors related to pain and disability.

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Comparative Study to Determine Potential Injury Risk between Active and Inactive Adults Using the Functional Movement Screen

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ABSTRACT

Background: The Functional Movement Screen is a screening instrument that helps determine the potential of injury risk in an individual by evaluating selective fundamental movement patterns.

Objective: To establish a comparison of potential injury risk in individuals who exercise versus those who do not exercise, using the FMS.

Compare each exercise between inactive and active individuals.

Method: We evaluated two groups of individuals i.e.; Group A (Active Individuals) and Group B (Inactive Individuals). Each group consisted of 75 individuals each. All individuals were between the age of 20-40 years with no recent history (<6 weeks) of injuries. All participants performed all 7 exercises and were scored accordingly.

Result: The Inactive individuals group has a higher potential of injury risk as compared to the active individuals group. FMS can be used by physiotherapist and to identify those with injury risk, prescribe a program and reduce the potential of injury. Out of 150 subjects 105 subjects had a high risk of injuries whereas 45 subjects have no risk of injuries.

Keywords: Functional Movement Screen, Active and Inactive individuals, Risk of Injury.

INTRODUCTION

Functional Movement Screen (FMS) was developed by Lee Burton and Gray Cook. In their book the authors describe two different types of motor programmes, general motor programs and specific motor programs. So if these general or fundamental patterns are faulty, the specific ones will also be faulty^{1,2}. These patterns or compensatory movement patterns can be due to tight, weak muscle or due to coordination issues. The functional movement screen consists of seven tests which help assess fundamental movement patterns which in turn help in determining the potential risk of injuries.

The tests which are used are deep squat, in-line lunge, trunk stability push up, hurdle step, shoulder mobility, active straight leg raises and rotary stability. Out of these tests the deep squat, trunk stability and push up are tests done unilaterally and the In-line lunge, Shoulder Mobility, Active straight leg raises and rotary stability are performed bilaterally. Five of the seven FMS tests are scored separately for the left and right sides, and can therefore be used to locate asymmetries which have been identified as an injury risk factor.

Scoring for the FMS is based on procedure described by Cook, Burton and Hoogenboom². The FMS is scored out of 21 points and an FMS specified cut-off value of 14 or below is suggested to indicate an elevated risk of injury³.

The tests help in determining the potential of injury risk by assessing an individual's muscle

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strength, balance and stability, range of motion, proprioception, flexibility and co-ordination. It also makes an assessment of the individual's posture, form and the body's kinetic chain system.

This study compares the potential of injury risk by comparing each screening test between individuals who exercise regularly versus those who do not exercise.. A Functional Movement Screen is a test used to find weaknesses before they affect sports performance or turn into injuries⁵. This screen identifies limitations that can hinder proper function and decrease strength. Research has shown that FMS can be used in athletes to determine risk of injury before active participation in sports and therefore improve performance⁴.

The scale has a high reliability to determine the risk of injuries as well as help a physical therapist to prescribe apt exercises in order to improve an individual's level of fitness. Patients of all ages and skill levels will benefit by gaining strength and balance enhancing their return to work, play, or daily activity. Using the FMS, helps patients and clients identify where they need help, and also educates them on how to make these areas better⁵.

The purpose of this study was to compare the potential of injury risk in the individuals who exercise regularly versus those who do not exercise at all using the FMS. Secondary aims were to compare each exercise between inactive and active individuals.

The study helps to prove that the FMS can be used for the Indian population in active as well as inactive individuals. This is the first study to compare levels of injury risk in active as well as inactive individuals within the Indian setting. It is a simple and easy method which can be used by a physiotherapist in his/her setup in order to define an individual's fitness levels. It helps a therapist decide the problem areas of the individual and prescribe an individual specific exercise program.

METHOD AND PROCEDURE

Type of study: Comparative

Study subjects: Those who regularly exercise versus those who do not exercise regularly.

Sample size: 150 subjects

Inclusion criteria:

- Both Males and Females

- Individuals between the age group of 20-40 years.

- Individuals who have been regularly exercising in a gymnasium for at least 3 months and at least 5 times a week. (For the Active Individuals group)

- Individuals who do not follow a programmed exercise (Inactive)

Exclusion criteria:

- Individuals who have suffered a recent (<6weeks) musculoskeletal or head injury which was likely to affect their motor performance on the FMS.

- The use of a mobility aid(e.g. walker, stick) or a prophylactic device (e.g. knee brace).

Materials Used:

- The FMS scale
- Data collection protocol
- Hurdle Step
- Mat

Subjects were recruited via advertising by announcements in gymnasiums, direct contact, and word of mouth.

There were two groups of individuals: Group A (active Individuals) & Group B (Inactive Individuals)

Each participant was instructed to wear their usual athletic clothing and footwear for the study. They were asked to fill a short questionnaire regarding their injury history, usual physical activity levels, and demographic information. Followed by this each participant will be given three trials on each of the seven tests.

Each individual was instructed to perform three trials. Each trial was scored on a scale from 0 to 3.

A score of:

0- Indicates that pain was reported during the movement;

1- Indicates failure to complete the movement or loss of balance during the movement;

2- Completion of the movement with compensation; and

3- Performance of the movement without any compensation.

For each item, the highest score from the three trials will be recorded and used to generate an overall composite FMS score with a maximum value of 21. For the tests that were assessed bilaterally, the lowest score was used.

The following tests were carried out:

1. Deep squat- The subject was asked to do a squat to the end limit, stand up and squat again. This will be done thrice.

2. Hurdle step- the subject is asked to step over a hurdle with the back straight and the upper limbs holding a wand behind the head. The wand and the hurdle were to be maintained in parallel.

3. In-line lunge- the subject was asked to stand with feet shoulder width apart. He was then asked to step forwards (heel touching the floor first). The knee was to be maintained at 90 degrees of flexion. The step is completed once the back knee is almost touching the ground. The subject then returns to the starting position of standing.

4. Shoulder mobility- The subject was asked to place both fists on the upper back. One hand over the shoulder and the other hand reaching to touch the first hand from below. The distance between the two fists were then measured was deemed normal if it was one hand length apart.

5. Active straight leg raise- The subject was asked to lie supine and then lift one leg with the knee straight. The measurement is done vertically behind the mid joint line of the knee.

6. Trunk stability push-up- The subject was asked to lie face down on the floor and then do a push up and then down again. The body was required to be maintained in a straight position with the feet together.

7. Rotary stability- In a quadruped position, the subject was asked to raising the same side hand and leg, making them parallel to the floor thrice, for 10 seconds each and checking for stability.

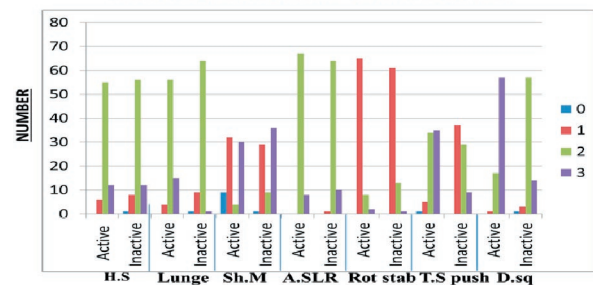
Statistical Analysis:

The study consisted of 150 individuals i.e.; Group A(Active Individuals) and Group B(Inactive Individuals). All individuals were between the age of 20-40 years with no recent history (<6 weeks) of

injuries. All participants performed all 7 exercises and were scored accordingly. The Mann-Whitney test was used to analyze the data collected. The results we found showed that the group A scored a higher mean rank in four out of seven tests i.e.: Hurdle step, In-line lunge, Trunk stability push up and Deep squat. Whereas, the group B scored a higher mean rank in three out of seven tests i.e. Shoulder mobility, Active SLR and Rotary stability.

The analysis shows that the group with the active individuals scored a higher total mean rank than the group with inactive individuals which in turn proves that inactive individuals have a higher injury risk than the group with active individuals.

SCORE DISTRIBUTION TABLE FOR FMS



(H.S-Hurdle step, Lunge- In-line lunge, Sh.M-Shoulder Mobility, A.SLR-Active SLR, Rot Stab-Rotary Stability, T.S push-Trunk stability push up, D.sq-deep squat)

DISCUSSION

There are many sports specific scales and screens used for determining risk of injuries in the pre-season and pre- participation period. The FMS can be used for different sports and also athletes and those who exercise as well as those who do not exercise in order to evaluate and prescribe a program specific to their needs for injury prevention.^{6, 8, 9} Recent studies have also found normative values in physically active students so that their values could be compared to the athletes⁷.

A study performed on the Real-time intersession and interrater reliability of the FMS suggests that it has a high intersession and interrater reliability⁴. This is the first time this screening method is used successfully in the Indian population.

A study has also been performed to determine the normative values of the FMS and it was found that there was no statistically significant difference in scores between females and males, or those who reported a previous injury and those who did not. Inter-rater reliability for the composite FMS score demonstrated excellent reliability. Inter-rater

reliability for individual test components of the FMS demonstrated substantial to excellent agreement.¹⁰

This study was to determine its use in the inactive group and it proves that there is a significant difference between the active and inactive group. It shows that certain tests are performed better by the inactive individuals and thus it can also be used in inactive individuals.

Using pre-defined selection criteria, the results suggest that amongst the seven tests to determine injury risk between individuals who are active versus those who are Inactive; four tests show significant differences between the two groups. These include the In-line lunge, shoulder mobility, trunk stability push up and deep squat.

The statistical analysis suggests that the active group scored higher in the following tests: In-line lunge, Trunk stability push-up and deep squats. Whereas, the Inactive individuals scored higher in the following test: Shoulder mobility, Active SLR and Rotary stability.

According to the Mann-Whitney U test the active group scored a higher mean rank in the following exercises: Hurdle step, In-line Lunge, Trunk stability push up and Deep squat. Whereas, the Inactive group scored a higher mean rank in the following exercises: Shoulder Mobility, Active SLR and Rotary stability. The total mean rank calculated is higher in the active individuals than the inactive individuals. The statistics suggest that there is a significant difference between the active and inactive individuals in the following exercises: In-line lunge, Trunk stability push up and deep squat.

The risk factor analysis suggests that out of the 150 subjects tested there are 105 individuals who have high injury risk whereas 45 individuals have no injury risk. Out of the 105 at risk there are only 42 individuals from the active individuals who are at high injury risk and there are 63 individuals from the inactive individuals who have a high injury risk. The analysis also showed that 33 individuals from the active group and 12 individuals from the inactive individuals group who have no injury risk. This suggests a statistical significance of higher injury risk in the inactive individual's group as compared to those who belong to the active individuals group.

These seven tests/movements challenge an

individual's ability to perform basic movement patterns. These reflect that the active individuals group have better combinations of muscle strength, flexibility, range of motion, coordination, balance, proprioception and dynamic stability. Whereas, those who do not exercise regularly are more prone to injuries and need to improve their posture, form, tone and their body's kinetic chain system. This study also indicates that not all active individuals are prevented from injury risk. It indicates that only the active individuals with a regular exercise regime and the correct form, posture and kinetic chain system have no injury risk, whereas those who exercise less than 5 times a week have a risk of injuries.

The exercises/tests like shoulder mobility, Active SLR and Rotary stability which demands trunk stability in the sagittal and transverse planes during asymmetric movement of the upper and lower extremities have been performed better by the inactive individuals group compared to the same performed by the active individuals group. This suggests that the active individuals who fail to give time to warm up and cool down session's pre and post their workout tend to develop muscle tightness (e.g. Hamstring tightness), soreness as well as poor joint mobility (e.g.: poor shoulder joint mobility). Warming up and cooling down improves an individual's level of performance and accelerate the recovery process needed before and after training or competition. Warm up should be aimed at reducing muscle stiffness as stiffness has been shown to increase the chances of injury. Warm up exercises consist of slow controlled movements through the full range of motion. Cool down consists of static stretches.⁷⁻⁹

The FMS has been used in the past for evaluating the progress in fitness levels. A study was performed to see if yoga could improve fitness levels and then assess the difference between the pre and post scores using the FMS¹¹. FMS has also been used to determine if a 6 week functional training program could improve fitness levels in soldiers and help them to achieve the required fitness levels to get back to work.¹² In the past FMS has been used in order to screen and assess the levels of fitness in female collegiate athletes¹³, as well as in fire fighters to determine the parameters of injury risk¹⁴. These individuals were then trained with the help of core strengthening exercises and functional movement enhancement programs in order to attain the required levels of fitness.

FMS helps physiotherapists to identify those with injury risk, so that this risk might be reduced. As mentioned beforehand the FMS takes into account movement patterns.. Physiotherapists can make use of FMS score to determine progress and to identify exercises that will be most useful in reducing risk in a person. This can therefore be used for pre participation for individuals who are into sports etc. Further studies need to be done to determine changes in the FMS score with different types of training and exercises.

CONCLUSION

The Inactive individuals group has a higher potential of injury risk as compared to the active individuals group. The exercises/ tests state that there is a significant difference between the two groups while performing the following tests: In-line lunge, shoulder mobility, Trunk stability push up and deep squat. The study suggests that the inactive individuals group achieved a higher score in the following exercises/tests: Shoulder mobility, Active SLR and Rotary stability.

The study suggests that the Active individuals group achieved a higher score in the following exercises/ tests: Hurdle step, In-line lunge, Trunk stability push-up and deep squat. FMS can be used by physiotherapist to identify those with injury risk, prescribe a program and reduce the potential of injury.

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Efficacy of Cryotherapy v/s Thermotherapy with PNF Technique in Improving Hemiplegic Gait

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ABSTRACT

Objective: Cold or Ice therapy is mostly used in the management of various acute and chronic conditions. The purpose of this study is to determine the effectiveness of Cryotherapy or Thermotherapy with Hold -Relax technique on hemiplegic patients in improving gait parameters.

Methodology: 80 hemiplegic patients were selected from Neurological ward and outpatient department of Civil Hospital and Rabia Moon Trust. Simple Random Sampling technique was used. After baseline assessment, Individuals were divided into control and experimental groups through general neurological Performa (Annex 1). Each group had 40 patients, in which control group was treated by Thermotherapy with hold Relax Technique while the experimental group was treated by Cryotherapy with hold relax Technique. Both the groups received the treatment for 30 minutes, 5 days a week for 6 weeks; the treatment was free of cost. Then the patients were re-assessed on the 3rd and 6th week of the study through Pedograph gait analysis Pre- test of gait parameters (Annex 2).

Result: After 6th week of treatment, Cryotherapy with Hold Relax Technique was the treatment which showed that there was a significant difference between the pre and post values among both groups in different weeks. Cryotherapy with Hold relax techniques also showed significant difference in gait parameters such as stride length, cadence and walking velocity ($p < 0.05$).

Conclusion: Cryotherapy with Hold relax technique was found much effective in improving gait parameters thus improving walking abilities in hemiplegic patients.

Keywords: Cryotherapy, Thermotherapy, Stride Length, Cadence, Walking velocity, Pedograph, Hold Relax technique.

INTRODUCTION

Stroke is a worldwide health problem. It is the most common neurological and leading cause of mortality throughout the globe (**World Health Report 2003**). Stroke is the principal cause of disability in old age¹. Rough statistics showed 20% of these deaths occurred in South Asia². According to **Marc Fisher et al**, the incidence of stroke is about 9.0 million, 0.7% in Africa, 0.9% in America, 02.0% in Europe, 1.8 in South- East Asia. The frequency of stroke differs among countries and it increases along with population age.³

Khealani B et al declared that Pakistan will be the fourth country in terms of Stroke till 2020. Since every fourth person in Pakistan has Hypertension, due to lack of knowledge and poor diagnosis the incidence of stroke is gaining. To determine the exact amount of Stroke incidence in Pakistan is not possible, due to lack of epidemiological data. In the survey report of University based hospital Neurology department shows that about 519 patients were admitted with the case of stroke within 22 months periods.^{1,4}

Baloch G H et al discussed that about 350,000 are survivors of stroke each year, out of which 15%

required assistance in daily living activities, 20% need assistance in walking and 16% require institutional care.⁵ **Khan J et al and Khan H et al** gives result that 26% of stroke were between 15 to 45 years. Since the mean age of stroke varies between 40 to 66, the ratio of male to female is 1.5.^{6,7} Studies have suggested that stroke incidence in Pakistan is close to 250 per 100,000 populations out of which about 60% of patients are unable to get proper rehabilitation due to limited resources, causing poor quality of life along with limited independence in activities at home and at community level.¹

Stroke patients have poor perception, muscle power, motor control, passive movements, tone and balance of the body.⁸ The severity of impairments depends upon the damage occurred to that part of brain. As these impairments cause significant effect on walking.⁹ Hemiplegic patients have a typical asymmetric gait pattern. Because of this, patient have reduced swing and stance phase on the affected side of the lower limb.^{10,11} According to **Lehmann et al** due to asymmetric gait pattern, there is a marked reduction in cadence, step length, stride length and walking velocity.¹⁰ In the report of **Perry J et al** single limb stance is the most important factor for gait stability, but as in hemiplegic patient's single limb stance and standing balance both are the major root for the reduction of weight bearing on the affected side.¹² Due to this gait asymmetry, risk of fall is also increased.⁴³ According to the result of **Olney et al** there is very good recovery regarding daily activities of hemiplegic patients when their asymmetric gait pattern was treated.¹³

Proprioceptive Neuromuscular Facilitation technique is commonly used as active and passive stretching to improve neuromuscular response. It is used most widely as progressive resisted exercise program.¹⁴

Physiotherapy plays a major role in stroke rehabilitation. **Liesbet De Wit** affirm that there are number of interventions used in stroke rehabilitation which provide optimal recovery benefits for stroke patients such as Cryotherapy, Thermotherapy, Stretching exercises, Proprioceptive Neuromuscular facilitation techniques has different approaches for stroke rehabilitation such as Bobath, Brunnstrom, Clayton, Coulter, Fay, Kabat, Knott, Rood, and Voss.¹⁵

But according to **Watanabe.T** it is difficult to use these intervention due to lack of evidence based approach.^{16, 17} **Osternig LR et al** suggested that spasticity in hemiplegic patient can also be treated by giving PNF either with Hold Relax or Contract-relax type which significantly shows improvement in range of motion and gait in hemiplegic patient.¹⁸

Price R et al and **Harlaar J et al** suggested that Cryotherapy is useful in reducing spasticity and increases muscle range in hemiplegic patient.^{18, 19} There are only few studies which show effects of thermotherapy on spasticity but thermotherapy has only short term but according to **JC Chen et al** suggest that the role of Thermotherapy is still unclear in facilitation of sensori-motor recovery in lower limb.^{19, 20}

METHOD

The study consists of 80 hemiplegic patients having difficulty in gait due to which limited stride length, cadence and walking velocity. Simple Random Sampling technique was used. Then the subjects were divided into control and experimental groups through general neurological Performa (Annex 1). Each group had 40 hemiplegic patients, in which control group was treated by Thermotherapy with hold Relax Technique while the experimental group was treated by Cryotherapy with hold relax Technique. Hemiplegic patient graded as recovery stage IV according to BRUNNSTROM Classification, both male and female equally included, Age group limitation 40 to 60 years, without any contractures in lower limb, Ambulatory patient. Whereas hemiplegic patient graded as recovery stage I, II, III and V according to BRUNNSTORM Classification, Age group below 40 or above to 60, Patients with cognitive and perceptual deficits, Patient with musculoskeletal abnormalities, head injuries, surgery of lower limb and fracture of lower limb were excluded. 40 hemiplegic patients in group A were treated with thermotherapy for about 15 minutes of PNF, Hold Relax technique for Planter flexors muscles. Whereas, 40 hemiplegic patients in group B were treated with Cryotherapy for 15 minutes, 3 repetitions of PNF Hold Relax technique for planter flexors. Both the groups were treated 5 days a week for 6 weeks where as Gait Parameters i.e Cadence, stride length and walking velocity were assessed through Pedometer.

method on the pre test, 3rd week and on the 6th week through (Annex 2).

Data was measured on SPSS version 21. Mean and SD was calculated for quantitative parameters. Two-way ANOVA of variance of repeated measure design with groups as between subjects and time period as within subjects was used to compare groups as time period of simple contrast with baseline as the reference were employed for time comparison.

RESULT

Of the 80 patients with mean age of 53 years (SD $\pm$ 3.81) primarily enrolled in the study, 40 patients were in Thermo therapy with hold relax group and 40 were in Cryotherapy with hold relax group completed their assessment at baseline and after 6 weeks.

Table -1: Mean age

GROUP	N	MEAN AGE VALUE
GROUP A	40	54.6
GROUP B	40	52.9

Table -1.1: Frequency and percentage of male and female:

GENDER	GROUP A	GROUP B	TOTAL	PERCENTAGE
MALE	33	33	60	75%
FEMALE	7	7	20	25%
TOTAL	40	40	80	100%

Table -1.1: Table showing the distribution of male and female in the study. Hence male are 75% while female are 25%. Hence there was a significant difference between the proportion of male and female.

Table -2: Pre and post treatment values of gait parameters in male and female in Group A:

PARAMETERS	GROUP A MALE & FEMALE					
WEEKS	Pre-test	Week - 3				Week - 3
	Male	Female	Male	Female	Male	Female
STRIDE LENGTH cm	18.6	18.6	20.01	19.55	21.03	19.23
CADENCE steps\min	24.10	21.08	25.00	21.08	25.23	22.03
WALKING VELOCITY m\min	3.04	1.70	3.20	2.03	4.71	2.05

Table 2.1: Pre and Post treatment values of gait parameters in Male and Female in

PARAMETERS	GROUP B MALE & FEMALE					
WEEKS	Group A	Group B				
	Pre-test	Week - 3	Week - 6	Pre-test	Week - 3	Week - 6
	Male	Female	Male	Female	Male	Female
STRIDE LENGTH cm	11.07	6.05	19.02	7.50	22.03	9.05
CADENCE steps\min	25.2	15.23	25.56	16.71	25.96	18.00
WALKING VELOCITY m\min	3.12	1.052	4.10	2.0	4.71	2.75

Table : 2 and 2.1 : Shows that the group A (Thermo therapy Group) and Group B (Cryotherapy) male

and female had a mean value of gait parameters in pre-test, 3rd and 6th week were significantly different.

Table-2.2: Comparing Pre & Post- Treatment Mean values of Gait Parameters between the groups:

PARAMETERS	GROUP A MALE & FEMALE					
WEEKS	Pre-test	Week - 3				Week - 3
	Male	Female	Male	Female	Male	Female
STRIDE LENGTH cm	37.200	39.52	41.70	37.35	43.05	49.75
CADENCE steps/min	50.37	53.00	55.80	50.52	57.97	65.01
WALKING VELOCITY m/min	9.409	10.47	11.43	9.63	12.61	16.208

Table-2.2 Shows that the group A (Thermotherapy Group) and Group B (Cryotherapy) had a mean value of gait parameters after the 6th week of treatment.

Table -3: Comparison of both groups for stride length

Stride length of both groups at different time period were compared by using RMANOVA

	Within subject p-value	Between Subjects p-value	
Level 1 vs Level 2	0.001	Group A Vs Group B	0.020
Level 3 Vs Level 1	0.001		

Level1: Pre test VS 3rd week values; Level 3 vs. Level 1: 6th week vs. Pre test values.

Table- 3.1: Cadence parameter of both groups at different time period were compared by using rmanova

	Within subject p-value	Between Subjects p-value	
Level 1 vs Level 2	0.001	Group A Vs Group B	0.040
Level 3 Vs Level 1	0.001		

Level1: Pre test VS 3rd week values; Level 3 vs. Level 1: 6th week vs. Pre test values.

Table- 3.2: Comparison of both groups for walking velocity:

Walking Velocity parameter of both groups at different time period were compared by using RMANOVA

	Within subject p-value	Between Subjects p-value	
Level 1 vs Level 2	0.001	Group A Vs Group B	0.020
Level 3 Vs Level 1	0.001		

Level1: Pre test VS 3rd week values; Level 3 vs. Level 1: 6th week vs. Pre test values

DISCUSSION

Although there are various studies on the effect of Cryotherapy, thermotherapy and PNF hold relax

technique on various muscular and neurological conditions. There were studies on improving gait pattern. But this is the first study in Pakistan which shows effectiveness of cryotherapy and thermotherapy with PNF hold relax technique in improving gait parameters of hemiplegics.

The ratio of male is more than female. Both showed significant difference in their gait parameters. The ratio of females is low because of factors of society.

The result concludes that hemiplegic patients which given Cryotherapy with Hold relax Technique had successful improvements in their gait parameters. Statistically, there is a marked difference found among the treatment of Cryotherapy with Hold Relax Technique and thermotherapy with Hold relax Technique. Since, both the groups showed differences in there result from Pre-test to 6th week, but Cryotherapy with Hold Relax technique showed significant results ($p < 0.05$) in improving gait parameters both within groups and between groups.

This study is the first step, which is investigating the effectiveness between thermotherapy and Cryotherapy with Hold Relax technique. Although the study have shown significant result regarding walking abilities by both therapies but Cryotherapy is better in the improvement of tone in muscles, marked reduction of spasticity. **Price R et al** found significant results of Cryotherapy in reduction of spasticity and increased muscle range which helps hemiplegic patient in walking.²¹

A larger percentage of patients showed positive results of Cryotherapy in reduction of spasticity and reduced muscle tone as per thermotherapy results were limited in lower limb, which strongly supports the result of **Preisinger E et al**, stated that there is reduction of increased muscle tone by thermotherapy but when the results were compared with Cryotherapy it showed that thermotherapy effects last for shorter period of time.¹⁹

Many studies have suggested that Cryotherapy is useful in reduction of spasticity, swelling, spasm and acute injuries. **Harlaar J et al** proves that, the effect of cooling muscle can cause reduction in spasticity of the limbs. PNF is a very useful technique which helps to re-establish the accurate functioning of joints and its related structures. The effect of PNF is to increase muscle activities on the spindle and fiber type.²² The result of hold relax technique were very effective in improving gait parameters of hemiplegics, with improved muscle strength when combined either with thermotherapy or Cryotherapy,

which supported by **Funk Dc et al** proves the study of PNF stretching produces great increase in range of motion.²³ The study strongly supports the result regarding PNF stretchings. **Romona F** analyze that Cryotherapy has long term result when combined with PNF stretching in improving walking abilities.²⁴ There was also improvement in weight bearing on the effected side, which strongly supports by **Osternig LR et al** suggest that spasticity in hemiplegic patient can also be treated by giving PNF Stretchings.¹⁸

Since gait deviation in hemiplegic patients is always a complex process that includes both neurological and biochemical factors. But it can be achieved by proper therapy and motivation of patients. Thus, the result of this study indicates the effect of Cryotherapy with hold relax technique in improving gait parameters such as stride length, cadence and walking velocity.

LIMITATION OF THE STUDY

This study was done on the on extensor synergy pattern lower extremity of Hemiplegic patients and so it doesn't support the role in upper extremity.

CONCLUSION

It can be concluded that both groups of age between 40-60 years responded to their respective treatments. Group B which were given Cryotherapy with hold Relax Technique showed marked difference than the Group A which were given Thermotherapy with Hold Relax Technique. Group B showed considerable improvements in gait parameters, due to which it helps in improvement in weight bearing and balance in affected side causing better confidence in ADL activities. Cryotherapy with Hold Relax Technique provided strong facts that it helps to improve gait parameters.

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To Determine the Effect of Plyometric Training for Shoulder Musculature in Athletes - an Evidence based Practice

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ABSTRACT

Shoulder injuries are frequently caused by athletic activities that involve excessive, repetitive, overhead motion like swimming, tennis, pitching, and weightlifting. Injuries can also occur during everyday activities such as washing walls, hanging curtains and gardening. Most problems in the shoulder involve the muscles, ligaments and tendons rather than the bones. Athletes are especially susceptible to shoulder problems. In athletes, shoulder problems can develop slowly through repetitive, intensive training routines. Plyometrics also known as jump training is a training technique designed to increase muscular power and explosiveness. Because plyometric exercises mimic the motions used in sports such as skiing, tennis, football, basketball, volleyball, and boxing, plyometric training often is used to condition professional & amateur adult athletes.

Keywords: Plyometrics, atheletic training.

INTRODUCTION

In the overhead athlete, the shoulder joint complex receives repetitively high stresses which may lead to inflammation of the shoulder joint capsule and the rotator cuff musculature. This type of prolonged inflammatory process can eventually result in decreased muscular efficiency, poor dynamic stability; increased humeral head displacement, eventual functional instability, and progressive tissue failure. Thus, in the overhead athlete, the glenohumeral joint capsule must be loose enough to allow the extreme motions required for successful completion of various sporting activities and, at the same time, exhibit the ability to dynamically stabilize the humeral head via rotator cuff force couples. The throwing athlete usually exhibits excessive external rotation (greater than 145°) to accomplish arm cocking and exhibits a decrease in internal rotation

(75° or less). This adaptive change in motion is due to the repetitive stresses of throwing, which result in acquired laxity anteriorly and a loss of flexibility in the posterior muscles and joint of secondary functional impingement is referred to as the "riding up of the humeral head".¹

Plyometrics are training techniques used by Players in all types of sports to increase strength and explosiveness. Plyometrics consists of a rapid stretching of a muscle (eccentric action) immediately followed by a concentric or shortening action of the same muscle and connective. The stored elastic energy within the muscle is used to produce more force than can be provided by a concentric action alone. Researchers have shown that plyometric training when used with a periodized strength-training program, can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness and overall pro-perception.²

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The purpose of plyometric exercises is to increase the power of subsequent movements by using both the natural and elastic components of muscle and tendon and the stretch reflex.

Plyometric is a type of exercise which utilizes the stretch-shortening cycle of musculotendinous tissue. Eccentric stretching is followed by concentric shortening of the same muscles. Often involves rebound activities. Plyometric training also called stretch shortening drills or stretch strengthening drills or reactive neuromuscular training.³

There are three phases in plyometrics:

1. **Eccentric pre-stretch phase**
2. **Amortization phase**
3. **Concentric shortening phase**

Plyometric training is most frequently completed using body weight rather than a mechanical load to provide the resistance, although weight can be attached to athlete to increase the resistance. Weighted implements, such as medicine balls, can also be used for training upper extremities.⁴

METHODOLOGY

The articles were taken from Saudi Journal of Sports Medicine, International Journal of Movement Education and Social Science, Physical Education and Sport, South African Journal for Research in Sport, Physical Education and Recreation, Journal of Sports Science and Medicine & Journal of Athletic Training. These articles were taken with reference to assess effect of plyometric exercise on shoulder joint muscles.

DISCUSSION

In 2014, Amrinder Singh et al.⁵ conducted a study to find out the effect of 8 weeks 'Ballistic Six' plyometric training on performance of 30 national level medium pace Asian Indian cricket bowlers. Average of 3 bowling velocities was taken using Bushnell (50 Hz) Doppler Radar Gun pre- and post-training program and compared. The study concluded that Ballistic Six plyometric training increases the bowling velocity in medium pace cricket bowlers hence improves their performance.

In 2013, Dr. Subhabrata Kar⁶ conducted a study to find out the effect of 4 weeks short-term plyometric training on strength performance of the athletes. 45 male college students were taken into consideration. These subjects were divided into three groups-one

control group & two experimental groups. All three groups were first of all tested for arm and shoulder explosive strength by putting the shot (16pounds). After that first experimental group was treated with 4 weeks of Medicine ball (4kg) chest throw exercise and 2nd group was treated with 4 weeks of Clap Push ups exercise. Both exercises were performed for 4 weeks, 4 days per week and 30 min. per day with other usual physical activities. Before exercise 15 minutes of warm up was mandatory for the subjects. The study concluded that medicine ball chest throw exercise showed greater impact on arm and shoulder explosive strength performance than Clap push ups exercise.

In 2012, Nikola Stojanovic et al.⁷ conducted a study to find out the effects of plyometric training on the development of the jumping agility in volleyball players. The first phase of the preliminary period lasted for a period of three weeks. During each week, five training sessions were held, lasting from 90 to 120 minutes. The basic aim during this period was to increase the basic abilities for aerobic endurance and strength.

During a micro-cycle of seven days, three training sessions were aimed at developing endurance, while two training sessions involved gym exercise. Following the completion of first phase of the preliminary period, initial measuring was carried out, while final measuring was realized three days following the end of experimental program. The experimental group used a technical-tactical program in its training along with a special plyometric program for development of explosive leg strength, during a period of six weeks in second part of the preliminary period. A total of 15 training sessions were held. The model set for development of explosive leg strength consisted of five exercises, which took up first part of the training session, following a 30-minute warm-up period. At the same time, control group training used a technical tactical program. This study concluded that by using the set of plyometric exercises for the development of explosive leg strength in the case of the experimental group, an increase in jumping agility was noted. In addition, an increase was noted for the control group as well.

In 2012, Shahram Alam et al.⁸ conducted a study to find out the effect of plyometric circuit exercises

on the physical preparation indices of elite handball player. The experimental and control groups were homogenized randomly and before applying experimental interventions for the experimental and control groups, a pre-test was administered and post-test was also conducted at the end of the intervention. The control group participated only in the handball exercises and experimental group performed plyometric circuit exercises and joined the control group in the end. They participated in the exercises for 6 weeks, with 3 sessions per week, each lasting 90 minutes. In the first three weeks, the training program was carried out with a fixed weight and after the third week, adding weight was applied to the number of sets and repetitions. The control group only did handball exercises three sessions per week. This study concluded that plyometric circuit exercises had an effect on the vertical jump of male handball players and had increased the participants' jump.

In 2012, Ognjen Andrejic⁹ conducted a study to evaluate & compare the effects of a plyometric and strength training off-season conditioning program on the fitness performance in young basketball players. Two groups (a strength training group and combined plyometric and strength training group) were selected for this purpose. The combined plyometric (CT group) and strength training group (ST group) performed plyometric exercises, while the strength training group performed free full court basketball. Following that, all of the participants took part in the same strength training program. Changes in all the variables were measured before and after the six-week training program. This study concluded that a combined plyometric and strength training program resulted in significantly greater improvements in motor performance skills.

In 2012, Hamid Arazi et al.¹⁰ conducted a study to compare the effect of land- and aquatic-based plyometric training on jumping ability and agility of young basketball players. Both the Land and Aquatic Plyometric trained three times per week with a 48 hour recovery period between each training session. Each training session lasted for approximately 40 minutes. The plyometric exercises consisted of ankle jumps, speed marching, squat jumps and skipping drills. The participants were encouraged to perform all exercises in an explosive manner by performing

each movement at a maximal effort. Each subject was allowed a 1-minute rest between sets and 3 minutes rest between exercises. This study concluded that aquatic- and land-based plyometric training programs of an eight-week duration had a significant training effect with regard to all the measured jumping ability and agility values from pre- to post-training in a group of young, male basketball players.

In 2006 Michael G. Miller et al.¹¹ conducted a study to find out the effects of a 6-week plyometric training program on agility. Subjects were divided into two groups, a plyometric training and a control group. The plyometric training group performed in a six week plyometric training program and the control group did not perform any plyometric training techniques. All subjects participated in two agility tests: T-test and Illinois Agility Test, and a force plate test for ground reaction times both pre and post testing. This study concluded that the plyometric training group had quicker post-test times compared to the control group for the agility tests. The plyometric training group reduced time on the ground on the post-test compared to the control group.

In 2004 Nicole J. Chimera et al.¹² conducted a study to find out the effects of plyometric training on muscle-activation strategies and performance in female athletes. A pre-test and post-test control group design was used. Experimental subjects performed plyometric exercises 2 times per week for 6 weeks. This study concluded that the increased preparatory adductor activity and abductor-to-adductor coactivation represent pre-programmed motor strategies learned during the plyometric training.

CONCLUSION FROM EVIDENCES

Plyometrics are used to improve speed, agility, strength & reduce the chance of injury. These benefits favour the use of plyometrics in shoulder musculature training in athletes for pre-season as well as for rehabilitation purpose.

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The Effects and Risks of High Intensity Interval Aerobic Exercise in Cardiac Rehabilitation Programme- A Critical Evaluation of Research

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ABSTRACT

This review intends to explore the impact of high interval level of exercise intensity on physical fitness in cardiac rehabilitation. Specifically, this paper aims to determine if a high-intensity interval aerobic exercise is as effective as a moderately intense aerobic exercise programme for producing improvements in fitness level. Although numerous studies have emerged in the past decade revealing the advantages of high-intensity interval aerobic exercise for cardiac rehabilitation, this paper will review this question and will also provide novel information related to its effect and safety issues in patients with cardiovascular disease. Information gained from this review is believed to allow for more individualised and appropriate exercise prescription for cardiac rehabilitation programmes, as well as promote greater consistency and clarity related to the fitness of varying levels of exercise intensity.

Keywords: *Physiotherapy, cardiac rehabilitation, high intensity interval exercise.*

INTRODUCTION

Exercise has always remained an essential component of cardiac rehabilitation, and this practice has become more evidence-based in recent years. One method of cardiac rehabilitation that has gained considerable research attention over the past several decades is aerobic exercise ^[1]. Researchers have discovered that properly prescribed physical activity is effective for producing a range of physiological and psychological adaptations that can prevent the recurrence of subsequent cardiac episodes and costly hospital readmissions. Furthermore, researchers have experimented with varying exercise modalities to determine each one's effect on these predetermined outcomes. Also, there appears to be clear evidence that exercise intensity, rather than duration or frequency, is the most important variable in designing a cardiac rehabilitation exercise programme ^[2].

An increasing body of research has begun to show that exercising at higher interval intensity is more beneficial to patients undergoing cardiac rehabilitation than light- or moderate-intensity exercise ^[3-5]. Unfortunately, a lack of assimilation among researchers and varying heart health

organisations, such as the American Heart Association (2013), and the European Society of Cardiology (2013), has resulted in inconsistent guidelines and a range of misconceptions related to the application of this exercise method ^[6,7]. For example, different organisations have different standards for exercise intensity and the frequency of exercise sessions for rehabilitation. For example, Fletcher et al. (2001) recommends that patients with the coronary artery disease engage in regular aerobic exercise at intensities of 40 to 90% of their peak maximal oxygen consumption ^[8]. However, the American Heart Association (AHA, 2013) maintains that individuals include vigorous exercise (i.e., 80% of one's maximal heart rate or greater) in their programmes at least three times each week ^[6]. These guidelines also vary as to their primary and secondary aerobic exercise limits. Interestingly, exercise recommendations tend to differ based on the location in which the research was conducted. In general, researchers and practitioners from the United States suggest that higher intensities are more effective for fitness and quality of life improvements, whereas research from Ireland and United Kingdom tends to advocate for exercise of more moderate intensities ^[9, 10]. Therefore,

no dose-specific guidelines have been established, and national and organisational guidelines for high- and moderate-intensity exercise vary considerably so that the lack of clinical guidelines on this matter has led to some inconsistency within the field. Therefore, Establishing such guidelines would assist with the identification of potential risk related to patients of varying stages of rehabilitation and activity levels ^[11].

Nevertheless, numerous exercise and heart organisations have established guidelines to protect certain individuals from undergoing certain levels of exercise intensities due to the perception of risk. Interestingly, British researchers Beale et al. (2010) found that cardiac rehabilitation programmes within the UK tend to overestimate the recommended intensity for chronic heart failure patients. According to these researchers, the British Association for Cardiac Rehabilitation (BACR), target heart rates determined from predicted maximum values were generally much higher than utilising other methods, such as the ventilatory threshold which not considered as a logistical and practical measurement of cardiorespiratory performance biomarker ^[12]. Therefore, Debate exists as to whether moderate- or high-intensity interval exercise is more effective for patients of varying levels of risk and rehabilitation. As higher levels of exercise intensities can provide both improvements and increases in cardiovascular risk, physiotherapists have expressed a range of theoretical perspectives as to the appropriate level of exercise for patients with cardiovascular disease ^[13].

The majority of research that has been carried out related to the impacts of exercise on cardiovascular rehabilitation has been conducted at lower intensities ^[14]. The reasons for this are likely related to safety concerns and attempts to reduce the risk of potential harm placed on research participants. However, the increasing body of evidence advocating higher levels of exercise intensity merits further consideration. If such exercise methods are more beneficial for patients of certain levels of risk, physiotherapists have an obligation to prescribe such treatments to their patients ^[15].

EFFECTS OF HIGH-INTENSITY INTERVAL EXERCISE ON CARDIAC REHABILITATION

Due to proposed safety concerns, research

exploring higher levels of exercise intensity for cardiac rehabilitation patients has been lacking. However, recent evidence suggests that such exercise programmes may be more beneficial and less harmful than previously considered ^[16, 5]. More empirical studies have emerged in the past decade highlighting the advantages of higher exercise intensities for both healthy and unhealthy patients alike. Improvements in our understanding of high-intensity interval programme design and the appropriateness of this exercise for some patients has advanced research in this area ^[17]. Canadian researchers Guiraud et al. (2012) conducted a recent review of the impact of high-intensity interval training in cardiac rehabilitation. Specifically, these authors sought to examine the degree to which this exercise intensity level could benefit patients with coronary artery disease, heart failure, and general benefits in people with cardiovascular risk. Drawing on a classic and non-systematic review of the MEDLINE database of clinical trials, these researchers concluded that high intensity interval training was safe and tolerable for patients undergoing cardiac rehabilitation. Furthermore, these authors found that the effects of high-intensity interval training were generally greater than those of moderate exercise programmes (e.g., peak oxygen uptake, ventricular function, endothelial function, quality of life) deemed the former a superior method of rehabilitation. While the research surrounding this topic is still fairly scarce, Guiraud et al.'s (2012) review provides clear evidence as to the increasing trends toward more strenuous exercise for cardiac patients. It should be noted that this was a narrative review, and was subject to the independent evaluations of the authors ^[18].

Finally, recent meta-analyses study conducted by Weston KS, Wisløff U and Coombes JS (2014) shows that high-intensity interval training is superior to moderate-intensity continuous training by double in improving cardiorespiratory fitness and physiological benefits in patients with lifestyle-induced chronic diseases which effect on changing morbidity rate and all-cause mortality ^[5]. However, many issues still needed to be investigated and discussed .For example, greater consistency is needed regarding the definition of terms and research variables. The parameters that characterise exercise intensity are not commonly agreed upon, nor are conceptions

of “light”, “moderate” and “high”. In one study ^[19], moderately intense exercise was considered 70 to 80% of one’s maximal oxygen consumption, whereas this level of intensity was considered high in another ^[20]. A common set of criteria needs to be established in order to perform a proper meta-analytic analysis of the impact of varying exercise intensities on proposed research variables.

RISKS OF HIGH-INTENSITY INTERVAL EXERCISE IN CARDIAC REHABILITATION

While exercising at higher intensities has been demonstrated to offer a number of superior effects for cardiac rehabilitation patients than moderate intensities, the proposed risk of this type of training has led some researchers to utilise caution ^[21]. For example, researchers speculated that high-intensity training might lead to adverse effects, such as heart pooling, and even cardiac arrest ^[22]. Heart pooling is a phenomenon in which the heart fails to pump enough blood to satisfy the needs of working muscles. In response to high-intensity aerobic exercise, researchers speculated that individuals may undergo episodes, such as the loss of respiratory function, increased muscular fatigue, swelling of joints and increased coughing as a result of this lack of blood flow. Ultimately, some researchers suggested that high-intensity training in some individuals could lead to congestive heart failure ^[23]. Also, it may increase risk of subsequent cardiac episodes, such as sudden cardiac death or myocardial infarction ^[24].

While some episodes of cardiac arrest and congestive heart failure have been documented in response to training, there is little evidence to suggest a causal relationship between exercise intensity and adverse health consequences. The cardiorespiratory system appears to maintain a self-limiting mechanism that prevents exercisers from surpassing a predetermined “dangerous” level of physical activity ^[25]. When a particular individual’s exercise intensity becomes too high, it simply cannot surpass its own safety zone and will ultimately secrete the appropriate fatiguing factors needed to slow its heart rate and decrease blood pressure ^[26]. Also, Rognmo et al. (2012) evaluate the question that exercising at vigorous intensities can increase the risk of sudden cardiac death and myocardial infarction in highly susceptible patients so that they studied the exercise

rehabilitation programmes of nearly 5,000 patients and correlated this data with incidences of cardiac arrest or infarction. In these patients combined, moderate-intensity exercise was associated with one fatal cardiac arrest during intervention, whereas high-intensity aerobic exercise was associated with two non-fatal episodes. These results appear to indicate that the risks associated with either type of exercise are relatively low, and there is no evidence to suggest that high-intensity aerobic exercise elicits greater risk than moderate-intensity exercise. Therefore, based on the considerable advantages of high-intensity exercise, Rognmo et al. (2012) suggest that this training modality be considered in patients experiencing cardiovascular disease who have met appropriate risk stratification assessments ^[27]. In addition, other study Sawka et al. (2011) mentioned that the few cases of cardiac arrest that have occurred in response to exercise have likely been related to heat exhaustion or dehydration ^[28]. Therefore, the overwhelming abundance of research available within peer-reviewed journals and meta-analysis suggest that these risks have been overstated and it is safe and well-tolerated ^[5, 24, 27, 29]. However, further research is needed to confirm this finding, and caution should certainly be taken when employing high-intensity exercise.

CONCLUSION

In summary, Current researches tends to favour high intensity interval exercise training in cardiac rehabilitation and the evidence base generally supports this, although the potential risk involved in intensity is not clear. However, Cautions and appropriate screening and communication with the patient’s doctor should be considered when prescribing high intensity interval exercise. And further research is needed related to the potential risk involved in such exercise modalities, and greater assimilation is needed between organisations regarding exercise prescription guidelines. There have been some ethical and logistical constraints when seeing to determine the differing effects between different intensities level, such as the assumed increase exposure to cardiovascular risk elicited by exercising at higher interval intensities.

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Comparison of Effects of Concentric and Eccentric Resistance Exercise on Dyspnea, Pulmonary Function and Health Status in COPD Patients

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ABSTRACT

Purpose: To evaluate the effects of concentric and eccentric resistance exercise on Dyspnea , Pulmonary function and Health status in COPD patients.

Method: Forty male and female COPD patients were randomly assigned into two groups, were trained for the intervention and then the intervention was performed by them. Dyspnea, Pulmonary function and Health Status score were measured pre and post.

Results: Eccentric resistance exercise shows marked improvement in dyspnea, pulmonary function & overall health status of COPD subject.

Conclusion: : Eccentric resistance exercise can be prescribed to COPD patient as it provides safe mode of exercise to COPD patient with less or no exertional dyspnea & it also improves health status and pulmonary function of the patients.

Keywords: COPD, Concentric resistance exercise, Eccentric resistance exercise, Dyspnea, Pulmonary functions and Health status.

Abbreviations: COPD – Chronic obstructive pulmonary disease, FEV1 – Forced expiratory volume in 1 second, FEV6 – Forced expiratory volume in 6 sec, FVC – Forced vital capacity, FEV1/FEV6 – Ratio between Forced expiratory volume in 1 second & Forced expiratory volume in 6 sec, BMI – Body mass index, GOLD – Global initiative for chronic obstructive lung disease

INTRODUCTION

The Global initiative of obstructive lung diseases (GOLD) classified chronic obstructive pulmonary disease as “a disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive & is associated with an abnormal inflammatory response of the lungs to noxious particles or gases”¹.

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The WHO has published data placing the world- wide prevalence of COPD at 0.8%. Other reports place the prevalence of COPD substantially higher, at approximately 4 to 6%.²⁻³ the prevalence of COPD reported in different population based studies from India is highly variable. For epidemiological assessment, the rounded-off median prevalence rates were assessed as 5 percent for male and 2.7 percent for female subjects of over 30 years of age.⁴

The symptoms limiting the exercise performance of the pulmonary patient are exertional dyspnea & fatigue.⁵ Chronic obstructive pulmonary disease is often characterized by over inflation of lung & overexpansion of the thorax. Based on length tension properties of muscle, foreshortening of inspiratory muscles in COPD may substantially reduce their

force generating capacity⁶. Associated symptoms, such as fatigue and dyspnea, cause restrictions on patients' exercise tolerance, consequently having a major impact on their ability to carry out daily activities, frequently resulting in reduced quality of life (Jones, Cully et al 2006)⁷.

Resistance training therapy with its manifold effects is a part of a modern and multi modular treatment of the COPD. Because of the specific symptoms (e. g. muscle atrophy, dyspnea) and the deconditioning of these patients, resistance training might meet the demands of a COPD⁸. Resistance exercise of sufficient intensity can enhance strength, muscular endurance & maintain fat free mass. Resistance exercise increase bone mass/attenuation of sarcopenia, strength of connective tissue, basal metabolic rate & functional capacity⁹.

Resistance exercise contain both the components i.e. eccentric & concentric but breaking resistance exercise into concentric & eccentric component will have more significant effect as concentric resistance exercise has greater exercise capacity & eccentric exercise eccentric exercises are less physiologically demanding & less metabolically costly so both exercise will prove beneficial in their own way to COPD patient⁹. So the purpose of this study is to evaluate the effect of eccentric & concentric exercise on dyspnea, pulmonary function & health status of COPD patient.

METHOD

Patients: Forty moderate COPD patients including male and female of age group 45 to 65 were included for the study. Coexisting medical problems like Acute Exacerbation of COPD, Acute MI, Respiratory failure patients, Congestive heart failure patients Hypertension, Diabetes, Pneumothorax, Haemoptysis, and Resting dyspnea and Patients with Hemodynamic instability and Uncooperative patients were also excluded from the study.

Intervention: Subjects clinically diagnosed as moderate chronic obstructive pulmonary disease were selected and randomly divided into two experimental groups, as Group A and Group B, consisting each of 20 subjects. A brief explanation about the treatment session was explained to all the subjects of the study.

The treatment duration for both the groups included: Intensity – 10 repetitions for each exercise, Frequency – 3 sets with 2 minutes rest period between each set., Repetition – daily 3 sets, Duration of the study- 6 days a week.

The pre- post test values of FEV1, FEV6 FEV1/FEV6, dyspnea & health status were noted for six days of treatment program. Group A was treated with concentric resistance exercise and Group B with eccentric resistance exercise.

Group A: Biceps curls were performed through dumbbell. Therapist hold dumbbell while in extension in concentric exercise to avoid eccentric work done. Triceps exercises were performed through dumbbell. Therapist hold dumbbell while in flexion in concentric exercise to avoid eccentric work done. Bench press was performed through iron rod with weight on each side. Therapist holds the rod while coming downward in concentric exercise to avoid eccentric work done.

Quadriceps exercise was done by placing weight cuff on ankle. Subject sits on table or couch with legs hanging down. Therapist holds the weight cuff while in flexion in concentric exercise to avoid eccentric work done. Calf exercise was performed by placing weight cuff on ankle. Patient stands on stairs. Moving upward is a concentric exercise. Leg squatting were performed by holding gym rod with weight on each side at the shoulder level. Supervisor holds the rod during standing in concentric exercise to avoid eccentric work done.

Intensity – 10 repetitions for each exercise

Frequency – 3 sets with 2 minutes rest period between each set.

Repetition – daily 3 sets for 6 days a week.

Group B: Biceps curl was performed through dumbbell. Therapist hold dumbbell while in flexion in eccentric exercise to avoid concentric work. Triceps exercise was performed through dumbbell. Therapist hold dumbbell while in extension in eccentric exercise to avoid concentric work. Bench press was performed through iron rod with weight on each side. Therapist holds the rod while going upward in eccentric exercise to avoid concentric work done. Quadriceps exercise was done by placing weight cuff on ankle. Subject sits

on table or couch with legs hanging down. Therapist holds the weight cuff while in extension in eccentric exercise to avoid concentric work done. Calf exercise was done by placing weight cuff on ankle. Patient stands on stairs. Moving downward is an eccentric exercise. Leg squatting was done by holding gym rod with weight on each side at the shoulder level. Therapist holds the rod during sitting in eccentric exercise to avoid concentric work done.

Intensity – 10 repetitions for each exercise.

Frequency – 3 sets with 2 minutes rest period between each set.

Repetition – daily 3 sets for 6 days a week.

DATA ANALYSIS

Data analysis was performed using software package of SPSS13 & SIGMASTATE. Independent t- test was used to analyze the homogeneity of the groups. Paired t- test was used to analyze the changes in outcome variables from baseline to post intervention period within each group. The significance level set for the study was $P < 0.05$ with a confidence level of 95%.

RESULTS AND INTERPRETATION

Forty moderate COPD patients (acc. to GOLD guidelines) were recruited for the study after signing the consent form Sahara Hospital, Lucknow on the basis of inclusion and exclusion criteria. Their age group were between 45 to 65 years for the study.

Table : 1.1 The demographic data of the patients summarized in table 1.1 is noted as : 20 moderate COPD patients in concentric exercise (Group A) and 20 moderate COPD patients in eccentric exercise (Group B). When descriptive demographic data was analyzed between group A and group B following result was obtained in group A & B data.

Variables	N	Group A	Group B	t-value	p-value
		Mean $\pm$ SD	Mean $\pm$ SD		
Age	40	53.40 $\pm$ 6.36	55.30 $\pm$ 6.82.	.910	.785
BMI	40	20.599 $\pm$ 2.66.	21.45 $\pm$ 2.79	.986	.552

Comparison of variables within the group. The paired t- test was used for within group analysis.

Concentric Resistance exercise group (GROUP A)

There was no significant decrease in the BODE's index from pre intervention to post intervention reading i.e. from 8.00 ± 0.99 to 6.00 ± 0.58 . Borg scale significantly decreased from pre intervention to post intervention reading i.e. from 3.4 ± 1.02 to 2.1 ± 1 . Result has shown significant increase in the FEV1 from pre intervention to post intervention reading i.e. from 1.8 ± 0.31 to 1.96 ± 0.32 . There was significant increase in the FEV6 from pre intervention to post intervention reading i.e. from 2.7 ± 0.5266 to 2.86 ± 0.45 . FEV1/FEV6 do not significantly increased from pre intervention to post intervention reading i.e. from 0.673 ± 0.025 to 0.682 ± 0.01 .

Table 1.2 : Showing within group analysis of BODS index, Borg scale and Pulmonary fuctions in Group A (concentric resistance exercise)

Variables	Mean $\pm$ SD		t value (pre vs. post)	p- value (pre vs. post)
	Pre	Post		
BODE's index	8.00 ± 0.99	6.00 ± 0.58	13.38	$P > 0.05$
Borg scale	3.4 ± 1.02	2.1 ± 1.0	6.37	$P < 0.05$
FEV1	1.8 ± 0.31	1.96 ± 0.32	14.03	$P < 0.05$
FEV6	2.7 ± 0.5266	2.86 ± 0.45	10.98	$P < 0.05$
FEV1/FEV6	0.673 ± 0.025	0.682 ± 0.016	6.98	$P > 0.05$

Table shows that there is a significant decrease between pre & post reading of Borg scale but there is no significant decrease in BODE'S index. FEV1 & FEV6 increases significantly but FEV1/FEV6 did not increase significantly in Group A (concentric resistance exercise)

ECCENTRIC RESISTANCE EXERCISE GROUP (GROUP B)

There was significant decrease in the BODE's index from pre intervention to post intervention

reading i.e. from 7.5 ± 0.75 to 4.6 ± 0.50 , Borg scale from pre intervention to post intervention reading i.e. from 3.4 ± 0.96 to 0.975 ± 0.8 . FEV1 significantly increased from pre intervention to post intervention reading i.e. from 1.8 ± 0.38 to 2.107 ± 0.4 , FEV6 from pre intervention to post intervention reading i.e. from 2.74 ± 0.45 to 3.07 ± 0.55 but there is no significant increase in FEV1/FEV6 from pre intervention to post intervention reading i.e. from 0.64 ± 0.025 to 0.68 ± 0.021

Table 1.3 Shows that there is a significant difference between pre & post reading of variables of Group B (Eccentric exercise)

Variables	Mean $\pm$ SD		t value (pre vs. post)	p value(pre vs. post)
	Pre	Post		
BODE's index	7.5 ± 0.75	4.6 ± 0.50	19.22	$P < 0.05$
Borg scale	3.4 ± 0.96	$.975 \pm 0.8$	20.876	$P < 0.05$
FEV1	1.8 ± 0.38	2.107 ± 0.41	15.607	$P < 0.05$
FEV6	2.74 ± 0.45	3.07 ± 0.55	10.2	$P < 0.05$
FEV1/FEV6	0.64 ± 0.025	0.68 ± 0.021	18.462	$P > 0.05$

Comparison of variables between the group:

The independent t-test was used to analyze the mean difference of pre & post reading between concentric & eccentric exercise group. There was a significant difference between concentric & eccentric exercise group with respect to mean difference of pre & post reading of BODE's index i.e. from 2.85 ± 1.046 to 2.41 ± 0.686 , Borg scale i.e. from 2.253 ± 1.032 to 1.325 ± 0.658 , FEV1 i.e. from 0.420 ± 0.0383 to 0.319 ± 0.0913 , FEV6 i.e. from 0.138 ± 0.0622 to 0.328 ± 0.0139 , but there is no significant difference between group A & group B with respect to mean difference of pre & post reading of FEV1/FEV6 i.e. from 0.0091 ± 0.00634 to 0.0359 ± 0.00836 .

Table 1.4: Showing within group analysis of BODS index, Borg scale and Pulmonary fuctions in Group group B (eccentric resistance exercise) and it shows that there is a significant difference in group B (eccentric exercise) than in Group A (Concentric exercise)

Variables	Mean $\pm$ SD		t- value	p value
	Concentric exercise	Eccentric exercise		
BODE's index	2.85 ± 1.046	2.41 ± 0.686	1.966	0.05
Borg scale	2.253 ± 1.032	1.325 ± 0.658	2.831	.003
FEV1	0.31 ± 0.0383	0.420 ± 0.09	8.971	.001
FEV6	0.138 ± 0.0622	0.328 ± 0.0139	5.644	.001
FEV1/FEV6	0.0091 ± 0.00634	0.0359 ± 0.00836	10.487	.501

DISCUSSION

This study is designed to compare the effectiveness of concentric & eccentric resistance exercise on dyspnea & health status of COPD patient.

It is an experimental study, 20 subjects were taken in each group. Group A has been given concentric exercise & group B has given eccentric exercise for 1 week.

Concentric Resistance exercise group(Group A)

The result shows that there is a significant increase in FEV1 & FEV6 & dyspnea in concentric exercise. The result of the present study is in accordance with the study done by Jan Hoff et al in 2007, they did a randomized control trial on 12 patients with COPD (8 males & 4 females) for 8 week of training regime of concentric contraction of quadriceps & found that there is a significant increase in FEV1, FEV6. It is well accepted that the biomechanics of leg press exercise demands an integral involvement and, therefore, training adaptation of the abdominal muscles found that there is a significant improvement in perceived breathlessness due to increase in mechanical efficiency⁹.

The result shows that there is no significant decrease in BODE's index & there is no significant increase in FEV1/FEV6 in concentric exercise.

Eccentric Resistance exercise group(Group B)

There is a significant increase in FEV1, FEV6 in eccentric exercise which is in accordance with the study done by Peter Wright et al who conducted a randomized control trial on 28 patients with moderate to severe COPD (12 male, 16 female). The patients underwent hypertrophic maximal strength training for 12 weeks. Result showed that FEV1 & FEV6 performance (forced expiratory volume in 6 s) showed a significant increase with the strengthening of pectoralis muscle by bench press.

The result shows that there is significant decrease in BODE's index in eccentric exercise. This study is in accordance with M.A Spruit et al in 2002, had conducted a study on 48 patients (age & forced expiratory volume in one second) were randomly assigned to resistance training (RT, n=24) or endurance training (ET, n=24). Result showed that there was significant improvement in exercise performance and health-related quality of life¹⁰.

Rooyackers et al in 2003 conducted a study on 24 patients with severe COPD. Patient perform eccentric cycle exercise training for 10 weeks & concluded that eccentric cycle exercise can be performed at a high intensity without the patient becoming out of breath or needing supplemental oxygen¹¹.

Comparison of concentric and Eccentric exercise group

There is a significant increase in FEV1 & FEV6 & significant decrease in Borg scale also in eccentric exercise. But eccentric exercise shows more significant increase in FEV1, FEV6 & significant more decrease in Borg scale than concentric exercise. This study is in accordance with that of JM Rooyackers who did a randomized control trial on 12 patients with moderate COPD. Eccentric & concentric exercise test were performed in random order at constant workload of 25 & 50% of individual maximum work capacity & found that VE, VO₂ were approximately 30% lower during negative work than during positive work for both work intensities. It is due to decreased work of breathing which contributed to the reduced oxygen cost of negative work.

Knuttgen et al in 1971 did a study on 23 patients with moderate COPD. Eccentric & concentric workload was performed by patient simultaneously & their oxygen uptake was assessed & found a higher ventilatory equivalent for oxygen (VE/VO₂) during eccentric exercise than during concentric exercise at similar workload. There is a role of different mechanoreceptor activity or motor activity during negative workdone. FEV1 is related to VO₂max so it increases as VO₂ decreases.⁹ There is no significant difference in FEV1 & FEV6 in concentric & eccentric exercise

CONCLUSION

The result of the study revealed that there is a significant difference in the FEV1, FEV6 & dyspnea of COPD patients both within & between the groups. But health status of COPD patient as assessed by BODE's index is not significant in concentric group but significant in eccentric group. FEV1/FEV6 proved to be insignificant in both the groups. Eccentric resistance exercise can be prescribed to COPD patient as it provides safe mode of exercise to patient with less or no exertional dyspnea & it also improves health status of patient. Pulmonary function also improves by eccentric resistance exercise.

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Early Cardiac Rehabilitation in a 14 year Old Male with Familial Hypercholesterolemia Post Coronary Artery Bypass Graft Surgery – a Case Report

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ABSTRACT

Familial Hypercholesterolemia is a genetic disorder caused by mutations in the genes encoding the low density lipoprotein (LDL) receptor consequently which results in elevated plasma levels of LDL. We report a case of a fourteen year old male with homozygous familial hypercholesterolemia who underwent coronary artery bypass surgery and later underwent a phase one cardiac rehabilitation program. The program consisted of early post surgical respiratory care with bronchial hygiene therapy and a submaximal exercise stress test done at the end of first phase of cardiac rehabilitation.

Keywords: Exercise, gene, hypercholesterolemia, mutation, rehabilitation.

INTRODUCTION

A large number of genes are believed to act as a causative factor in the process of atherogenesis regulate lipid metabolism, inflammatory and immune responses, endothelial function and coagulation, elevated homocysteine levels, diabetes, insulin resistance.¹ Familial hypercholesterolemia (FH) is a genetic disorder caused by mutations in the gene encoding the low density lipoprotein (LDL) receptor, thereby results in either a deficient gene expression or the expression of defective LDL receptors. This dearth of functioning LDL receptors results in decreased catabolism of LDL and its accumulation in the plasma. The mutations can prevent the synthesis of LDL receptor proteins, or can cause the formation of a defective LDL receptor that is unable to bind or ingest LDL into the hepatic cells.

CASE REPORT

We report a case of a fourteen year old male, diagnosed as homozygous familial hypercholesterolemia (FH) with peripheral arterial disease and later underwent a phase one cardiac rehabilitation program post a coronary artery bypass graft surgery. An institutional ethical committee approval was obtained. An informed consent and an assent were obtained from the parents and the subject respectively prior to preparation of the report.

A fourteen year old male, presented with complaints of chest pain for duration of three years, pain in the knee joints for a period of two years and multiple nodular enlargements over dorsum of hands, fingers, ulnar aspect of wrist joints, elbow joints, knee complexes, buttocks and ankle joints. These were painless and progressed to the great toe, soles of both feet.

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Chest pain was described as retrosternal, associated with dyspnea on exertion and palpitations, which was relieved on rest (NYHA Class III). Later the pain progressed in intensity with symptoms presented at rest. There were no associated symptoms of fever, syncope, orthopnea or paroxysmal nocturnal

dyspnea. Preliminary treatment of statins (3-hydroxy-3-methylglutaryl HMG CoA reductase inhibitors) and low cholesterol diet was initiated. The subject developed recurrent chest pain episodes of similar character as described in the earlier episode. The subject did not experience any symptoms of intermittent claudication during walking.

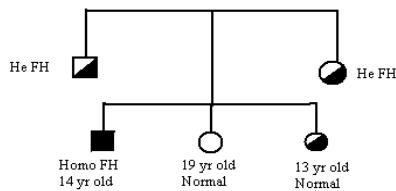


Figure 1. Pedigree Chart of D.B

D.B showed a normal birth and developmental history, born to parents from a non consanguineous marriage with no family history of similar complaints (Fig. 1). He also received the routine vaccination protocol after birth.

Physical examination presented with disseminated tendon xanthomas and non tender, nodular enlargements over the extensor aspect of the proximal interphalangeal joints with ulnar deviation of metacarpophalangeal joints, nodules over the olecranon processes, lateral malleoli, and both Achilles tendons (Fig 2). The shoulder, elbow, wrist and proximal and distal carpophalangeal joint examination exhibited normal range of motion. Ocular examination carried out by the physicians showed corneal arcus juvenalis, minimal opacification of both lenses with conjunctival xerosis (Fig 3). Large nodular enlargements were observed over inter gluteal region due to which the subject experienced difficulty in sitting for prolonged periods.



Figure 2. Tendon and cutaneous xanthomas in the proximal interphalangeal joints and subcutaneous areas of elbow joint



Figure 3. Bilateral corneal arcus juvenalis, with conjunctival xerosis

Examination of the cardiovascular system showed normal first and second heart sounds with a pan systolic murmur in the mitral area on auscultation. An evident left carotid artery bruit was also noted. Peripheral pulses of the dorsalis pedis and posterior tibial arteries were diminished on palpation in both the lower extremities with pedal edema.

The respiratory system examination revealed normal intensity of breath sounds in the bilateral lung fields post auscultation. The skin of peripheral extremities showed no signs of discoloration, loss of hair as are frequently observed in cases of peripheral arterial disease.

D.B weighed 33.2 kilograms, height of 151.5 centimeters and a body mass index (BMI) of 14.5. Serum total cholesterol and triglyceride levels (Table 1) showed more than twice the amount of the normal cholesterol (457 mg/dL). A large increase in LDL cholesterol concentrations were also observed (411 mg/dL) accompanied by a raised total cholesterol/ HDL-C ratio.

Table 1: Serum Cholesterol and Triglyceride profile

Plasma lipids	Plasma lipids (mg/dL)
Total cholesterol	457 mg/dL
Triglycerides	81 mg/dL
HDL-cholesterol	29 mg/dL
LDL-cholesterol	411.8 mg/dL
TC/HDL	15.8

LDL: Low density lipoprotein, HDL: High density lipoprotein, TC: Total cholesterol

Electrocardiogram reports showed a normal sinus rate, rhythm, PR and QT intervals of normal

duration with no axis deviation. Echocardiographic reports showed a normal biventricular systolic function, trivial mitral regurgitation with no wall motion abnormalities and an ejection fraction of seventy percent and fractional shortening of thirty nine percent.

A coronary angiogram revealed 90 percent stenosis of the proximal left anterior descending artery, ostial portion of the right coronary artery. A carotid artery doppler investigation showed intimal thickness due to atherosclerotic changes and diffuse circumferential wall thickness of left common carotid artery with 65 percent luminal stenosis. An Ankle Brachial Index (ABI) measured for peripheral arterial disease was recorded as 0.65 and 0.8 on the left and right sides respectively.

TREATMENT

An on-pump coronary artery bypass grafting surgery was done with three conduits harvested and anastomosed.

Acute post operative care in the intensive care unit included ventilatory support for twenty four hours with inotropic drug support, hemodynamic and ventilatory parameters monitoring, airway management, and monitoring fluid intake and output. Acute physiotherapy management on day one consisted airway clearance techniques during ventilatory support and therapeutic body positioning every two hours. Post extubation, routine sessions of deep breathing exercises, incentive spirometry, and splinted huffing and coughing techniques were administered. Bed side active assisted upper limb range of motion exercises, active heel slides and ankle and toe movements with progression were implemented up to a functional capacity level of 1.5 – 2 METs. D.B made a gradual progression from sit to stand with a graded ambulation program within the intensive care.

Phase one program: A postoperative echocardiographic investigation with an ejection fraction of 71% was recorded. Progressive exercises and ambulation were within a functional capacity level of 2 – 3 METs. Sessions of breathing exercises, active upper limb range of motion exercises and incentive spirometry were continued. D.B underwent a 6 minute walk test on post-operative day six and

a supervised stair climbing session at the end of this phase (5-6 METs). A distance of 390 meters during the 6 minutes was covered; no symptoms of intermittent claudication, fatigue or dyspnea were reported during the test. A modified Borg's rating of perceived exertion score of 4 (0 to 10) with a normal heart rate recovery response were recorded.

Genetic counselling to the family and a medication regime were followed consisting of HMG CoA reductase inhibitors (statins), antiplatelet agents, nitrates, beta blockers, and diuretics.

DISCUSSION

Familial hypercholesterolemia occurs in two forms; heterozygous² (htzFH) and homozygous³ (hmzFH). The heterozygous form has a mutation frequency of ~ 1: 500⁴ where one of the two LDL receptor genes mutates and becomes nonfunctional. The rare homozygous form occurs with a mutation frequency of ~1: 1, 000,000 (1 in one million)⁴ and is characterized by large elevations in plasma LDL (in the order of 15-24 mmol/L). This variant which is monogenic has both copies of the LDL-receptor gene defective with complete absence of LDL receptor genes. Severely elevated LDL-cholesterol levels are noted at birth (~ 3 to 4 times the normal).⁵ Characteristic cholesterol deposits such as tendon xanthomas are seen deep in the tendons of the dorsum of the hand or knuckles, the Achilles tendon, in the cornea (corneal arcus/ arcus cornealis) and eyelids (xanthelasma) often by the age 20. Serum cholesterol levels exceed 600 mg/dL and are as high as 1,200 mg/dL, with the first cardiovascular event occurring in childhood or adolescence. Severe LDL hypercholesterolaemia exceeds >12 mmol/L in the homozygous variant in comparison to other sterol disorders such as phytosterolaemia and cerebrotendinous xanthomatosis (CXT).⁶

Our subject was a rare case of homozygous familial hypercholesterolemia with peripheral arterial disease subjected to early cardiac rehabilitation after coronary artery bypass graft surgery. Phase two rehabilitation with aerobic exercise could not be undertaken as the subject failed to attend consequent sessions of training. Studies related to the role of exercise and its effects on the genetic predisposition of hypercholesterolemia show that exercise training reduces neointimal growth and vascular lesions

stabilize after injury.⁷ However the role of exercise and its effects on the genetic predisposition of an autosomal recessive hypercholesterolemia such as homozygous FH is yet to be established. The homozygotes of familial hypercholesterolemia have demonstrated a genetic defect in the surface LDL binding receptor sites leading to an inability of the “second messenger” to suppress HMG CoA reductase enzyme.⁸

HMG CoA (3-hydroxy-3-methylglutaryl coenzyme A) reductase inhibitors are a common and effective mode of treatment for familial hypercholesterolemia. HMG CoA reductase inhibitors (statins) have been known to exhibit other pleiotropic effects such increasing bioavailability of nitric oxide, anti-inflammatory effects, stabilizing atherosclerotic plaques and improving any kind of endothelial dysfunction.⁹ A 16 to 20 weeks of aerobic exercise training program in familial hypercholesterolemic male pigs increased the anticontractile effect of the peripheral vascular adipose tissue on the left circumflex coronary artery caused by endothelin-1.¹⁰ These effects may additionally improve arterial functioning in patients with homozygous FH along with effects of exercise training. Aerobic exercise training as a prerequisite to sensitization of LDL receptors can be studied in further cases of the homozygous allele of familial hypercholesterolemia.

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Pain, Walking Time, Physical Function and Health-related Quality of Life in Nigerians with Knee Osteoarthritis

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ABSTRACT

Background: This study was aimed at investigating the relationship among pain, walking time, physical function PF and health-related quality of life HRQoL in patients with knee OA.

Method: Ninety-six individuals with knee OA. PF, pain, walking time (at comfortable and fast paces) and HRQoL were assessed using Ibadan Knee Hip Osteoarthritis Outcome Measure, Visual Analogue Scale, stopwatch, and Arthritis Impact Measurement Scale respectively. Data were analyzed using descriptive statistics, Pearson's correlation test and linear multiple regression with alpha level set at 0.05.

Results: The mean age of the participants was 61.27±13.73 years. There were significant correlations between average daily pain (ADP) and PF ($r = -0.21$) and pain intensity and HRQoL ($r = 0.47$); and between pain during walking and each of PF and HRQoL ($r = -0.29$ and 0.37). The correlations between comfortable pace walking time (CPWT) and each of ADP, PF and HRQoL were also significant ($r = 0.33$, -0.87 , 0.31). Regression analysis indicated that a negative relationship existed between PF and each of pain during walking and CPWT ($R^2 = 0.768$) while HRQoL is positively related to ADP, pain during walking and CPWT ($R^2 = 0.318$).

Conclusion: Pain during walking and CPWT were the most significant predictors of physical function and health-related quality of life in patients with knee osteoarthritis.

Keywords: Pain, Walking, Physical function, Health-related quality of life, Knee osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) is the most common degenerative joint disorder and a major public health problem which imposes a significant health and economic implications on the society due to its effects on function and activities of daily living^{1,2}. It affects any joint containing hyaline cartilage and the knees are most commonly affected³. The disease is characterized by pain, reduced function, swelling,

morning stiffness lasting less than 30 minutes, joint enlargement, deformity, grinding, clicking and joint instability which may make the affected individual present with muscle atrophy, weakness, joint effusion, crepitus, bony tenderness and enlargement, altered gait and limitation of motion⁴.

Pain and disability are major problems in patients with knee OA which lead to reduced physical function and consequently pose great challenge in the performance of activities of daily living resulting in a decline in health-related quality of life⁵. Health-related quality of life (HRQoL) is the patients' appraisal of their current levels of functioning and satisfaction when compared to what they perceive to be ideal⁶. The ability to effectively measure HRQoL is central to describing the impact of a disease (such

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as OA), treatment, or other insult including normal ageing on a patient⁷. It is particularly appropriate to measure HRQoL because of the chronic debilitating nature of arthritis which does not cause death, but has substantial effects on health, fitness and physical, emotional and social functioning of the affected patients⁷.

Relationship/associations among pain, PF and HRQoL of Nigerians with knee OA have not been well documented, few studies available for referencing^{5,8} seem to have limitations in terms of instruments⁸ and focus⁵ and sample size⁸. We tried to include walking time in our study because difficulty in walking has been identified as a major activity limitation in patients with knee OA^{9,10}. This study was hence designed to investigate the relationship among pain [measured as average daily pain and pain during walking (pain before and after walking)], walking time (measured as comfortable pace walking time (CPWT) and fast pace walking time (FPWT)), PF and HRQoL.

MATERIALS & METHOD

This study was a descriptive cross-sectional survey evaluating the associations among pain, walking time, PF and HRQoL in patients with knee OA. The study was approved by the Health Research Ethics Committee of the University of Ibadan and University College Hospital (Ref no: UI/EC/13/0013), the permission of the management of the Federal Medical Centre (FMC), Owo, Nigeria, was also sought and obtained before the commencement of the study. The participants were consenting patients with mild to moderate knee OA attending the Physiotherapy Department, FMC, Owo who were diagnosed according to the radiographic assessment of their knee joints by the orthopaedic surgeons and family physicians. They were male and females with knee OA of one or both knees with grade II Kellgren and Lawrence classification¹⁰ and also satisfied the American College of Rheumatology Criteria¹¹. Participants were selected through a purposive sampling technique having met the inclusion criteria of a physician/surgeon diagnosis of knee OA and screened for absence of other comorbid conditions and inability to walk¹¹.

MEASUREMENTS

Participants' age and sex were documented, height, weight and body mass index were assessed using standardized procedures.

Measures of Pain, Walking Time, Physical Function and Health-related Quality of Life

Participants' average daily pain intensity (PI) and pain during walking measured as pain before walking (PBW) (before the 50-foot walk test) and pain after walking (PAW) (immediately after the 50-foot walk test) were evaluated using Visual Analogue Scale¹². Participants' comfortable pace walking time (CPWT) and fast pace walking time (FPWT) (for 50-foot walk test) were measured with stopwatch in line with the protocol described by Silva et al¹¹. To assess physical function, the participants completed the self-reported part of Ibadan Knee/Hip Osteoarthritis Outcome Measure (IKHOAM) while the researcher completed the clinician-reported section of the instrument. The IKHOAM is a scale that assesses PF and treatment outcomes in patients with knee and/or hip OA which was developed to reflect the Nigerian environment and culture¹³ IKHOAM demonstrated high validity, reliability and responsiveness in measuring function in Nigerians with knee/hip OA^{13,14}. The Arthritis Impact Measurement Scale 2 (Short Form) (AIMS2 SF) was used for the assessment of participants' health-related quality of life^{15,16}. The instrument demonstrated good discriminate validity, internal consistency, and test-retest reliability¹⁷.

DATA ANALYSES

The data were analyzed using SPSS 16.0 version software (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics, Pearson correlation test and linear multiple regression analysis were used for analysis. Significance level was set at 0.05.

RESULTS

Fifty-nine (61.5%) of the participants were females while 35 of them (36.5%) presented with bilateral knee OA; their bio data is presented in table 1. Participants' ADP demonstrated a significant negative association with PF ($r = -0.21$; $p = 0.002$) but showed significant positive correlation with each of CPWT, FPWT and HRQoL scores ($r = 0.33, 0.39$ and 0.47 ; $P < 0.001$).

There was also a significant negative correlation between PF and HRQoL scores ($r = -0.40$; $p < 0.001$). Similarly, a strong negative correlation was observed between PF and each of CPWT and FPWT ($r = -0.87, -0.79$; $p < 0.001$). Both PBW and PAW have similar significant linear correlation with CPWT, FPWT, and HRQoL but significant inverse relationship with PF (table 2). Multiple regression analysis presented in table 3 indicated that PBW, PAW and CPWT are the most significant predictor of both PF and HRQoL.

Table 1: Participants' characteristics and their OA profile

Variable	Mean $\pm$ SD	Minimum	Maximum
Age (Years)	61.27 $\pm$ 13.73	38.00	86.00
Height (m)	1.61 $\pm$ 0.49	1.51	1.76
Weight (kg)	77.88 $\pm$ 18.08	47.00	120.00
BMI (kgm ²)	30.38 $\pm$ 8.12	19.07	46.93
PI	5.08 $\pm$ 0.81	2.90	6.5
PBW	3.29 $\pm$ 1.04	1.00	5.00
PAW	3.30 $\pm$ 1.04	1.00	5.00
CPWT (s)	15.74 $\pm$ 2.86	13.00	25.00
FPWT (s)	10.83 $\pm$ 2.44	8.00	17.00
PF (%)	78.21 $\pm$ 13.43	47.37	94.00
HRQoL	10.98 $\pm$ 6.15	1.02	20.34

Table 2: Correlation among participants' variables

Variable	PI	PBW	PAW	CPWT	FPWT	PF	HRQoL
PI	1						
PBW	0.25*	1					
PAW	0.25*	0.99*	1				
CPWT	0.33**	0.22*	0.22*	1			
FPWT	0.39**	0.24*	0.24*	0.89**	1		
PF	- 0.21*	-0.29*	-0.29*	- 0.87**	- 0.79**	1	
HRQoL	0.47**	0.37**	0.37**	0.31**	0.20	- 0.40*	1

*Correlation is significant at 0.05 level (2 tailed)

**Correlation is significant at 0.01 level (2 tailed)

Table 3: Standard multiple regression analysis for physical function and health-related quality of life

Variable	B	Std. Error	Beta	p-value
PF				
CPWT	- 3.83	0.529	- 0.816	< 0.001
FPWT	- 0.552	0.635	- 0.100	0.387
PI	1.738	0.909	0.104	0.061
PBW	-1.580	0.665	- 0.122	0.020
PAW	1.576	0.665	- 0.122	0.020
HRQoL				
CPWT	1.529	0.415	0.710	< 0.001
FPWT	- 1.571	0.499	- 0.623	0.002
PI	3.603	0.714	0.473	< 0.001
PBW	1.602	0.511	0.270	0.002
PAW	1.593	0.511	0.269	0.002

Dependent variables: physical function and health-related quality of life; β : Unstandardized Coefficients; Beta: Standardized Coefficients

$P < 0.05$

For Physical function, $R = 0.876$, $R^2 = 0.768$

For HRQoL, $R = 0.564$, $R^2 = 0.318$

DISCUSSION

The findings of this study showed that ADP showed a significant negative correlation with PF, an individual with minimal pain is likely to cope better with activities of daily living than one with increased pain who may exhibit activity limitation and participation restriction. This shows that pain is a possible predictor of PF in individuals with knee osteoarthritis and likewise PF is a predictor of pain. This is in line with the findings of Aghdam et al¹⁸ and Odole et al⁵ who reported similar relationship in their studies, conversely, regression analysis computed in this study did not indicate pain as a significant predictor of PF, though Pearson Correlation showed a significantly weak negative association between the two variables. It is probable that the participants involved in this study did not objectively report either their ADP or self-reported aspect of IKHOAM. The severity of pain is expected to impact on the PF of patients with OA; however the degree of pain perception varies from one person to the other⁸. Furthermore, Africans are known to trivialize pain and discomfort¹⁹ probably for the fear of being tagged lazy or for religious reasons, a situation in which the individual declares by faith that his/her problems have gone when he/she truly has discomfort. Pain not being a significant predictor of PF as observed in this study may be partly explained in the light of the aforementioned viewpoints.

Pain during walking assessed as PBW and PAW demonstrated significant inverse relationship with PF which implies that reduced pain enhances functional ability, although studies on the relationship of pain during gait with physical function in knee OA are rather scarce, Silva et al¹¹ had opined that the assessment of pain during gait is more relevant in knee osteoarthritis than pain in the previous week or ADP. The result is however expected because walking is a crucial activity of daily living and lack

of mobility has been linked with depression and reduced fitness level²⁰ which may impact negatively on the individual's overall quality of life; PBW and PAW as significant predictors of both PF and HRQoL as observed in this study seems to have laid credence to these submissions.

The strong significant negative correlation observed between PF and each of CPWT and FPWT strengthens the evidence that walking time is a good index of performance-based PF²¹. An individual with improved functional capacity is likely to cover a given distance in shorter duration. From the finding of this study, CPWT was a strong significant predictor of PF while FPWT was not. Culturally, elders in Southwestern (Yoruba Speaking) Nigeria are not favourably disposed towards walking fast or running, this study involved elders with mean age of about 61 years; the finding may not be unconnected with such cultural inclination.

The results of Pearson Correlation co-efficient showed significantly moderate pain-HRQoL, CPWT-HRQoL and physical function-HRQoL relationships although FPWT is not significantly associated with HRQoL. This implies that pain, CPWT and physical function are likely predictors of HRQoL perception of the participants in this study. Chacon et al²² have similarly reported a significant correlation between knee pain and quality of life perception measured as AIMS scores. Multiple regression analysis however revealed pain, CPWT and FPWT as significant predictors of HRQoL. It is expected that pain and mobility would significantly impact on HRQoL, however, these associations must be taken with caution because quality of life is a complex issue that is influenced by age, socioeconomic, cultural and other variables²³. These factors could have contributed to pain severity, PF and HRQoL scores at the time of recruitment for the study.

LIMITATIONS

The present study is not without some limitations. The limitations of our study are the relatively small sample size which poses challenge on the external validity of the study, and the potential patient selection bias of studying a convenience, non-random sample, making our results relevant only to patients with knee OA attending tertiary health facilities.

CONCLUSION AND RECOMMENDATION

Our results support existing evidence that pain is significantly associated with PF and HRQoL among Nigerians with knee osteoarthritis. Furthermore, pain during walking and comfortable pace walking time were the most significant predictors of both functional performance and overall health status among patients with knee osteoarthritis. This may imply that interventions and assessment procedures targeted at improving PF and HRQoL of patients with knee osteoarthritis should pay considerable attention to walking for optimal treatment outcome.

Conflict of Interest: None declared by the authors.

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Age-related Musculoskeletal Disorders Associated with Sedentary Lifestyles among the Elderly

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ABSTRACT

Objective: Increasing age has a tendency to enforce sedentary lifestyle on individuals. This study therefore investigated the age-related musculoskeletal disorders associated with sedentary lifestyles among the elderly.

Method: One hundred and eighty two (100 females and 82 males) elderly subjects purposively selected from residential homes for older adults and selected churches in Lagos State participated in the study. Their heights and weights were measured and were assessed for sedentary lifestyles as well as the presence of musculoskeletal disorders using a 38-itemed questionnaire.

Results: The mean age, height, and weight were 70.14 ± 8.62 years, 1.69 ± 0.11 m and 70.12 ± 10.32 kg respectively. The point prevalence of musculoskeletal pain/discomfort among respondents was 51.6% while the 12 months prevalence was 87.4%. The four most common areas of pain were the knee (31.9%), low back (25.3%), ankle (22.0%) and the upper back (20.9%). 6.6% of the respondents could not perform their daily activities in two weeks as a result of pain. 41.8% reported that the severity of pain they felt was moderate pain while 29.7% reported mild pain. About 142 (78.0%) respondents spent 15 minutes to 2 hours watching television on a week day. Many of the respondents had other forms of musculoskeletal discomforts due to sedentary lifestyles. There were significant relationships between sedentary activities and knee pain ($p = 0.01$), Low back pain ($p = 0.02$), Ankle pain ($p = 0.03$) and Upper back pain ($p = 0.03$).

Conclusion: The prevalence of age related musculoskeletal disorders associated with sedentary lifestyle in the elderly is high and are common in the lower limbs and back.

Keywords: Musculoskeletal disorders, sedentary lifestyle, elderly.

INTRODUCTION

The size of the elderly population is increasing rapidly both in number and proportion in most parts of the world and will triple to account for more than 20% of the world's population by year 2050.^{1,2} The aging population would be one of the most important social phenomenon for the next half century.³ The increase in the number of elderly people in the world will exert a big impact on health and social services.⁴

The impact is mostly due to the association between the number of elderly and the number of individuals at risk of chronic diseases, disabilities and injuries.⁵ Due to the developing health care in developing countries, lifespan tend to increase with some elderly people enjoying relatively good health, but also with a good number suffering from diseases related to old age.⁶ Old age has a tendency to enforce sedentary lifestyle on individuals.⁷

Sedentary lifestyle is a medical term used to denote a type of lifestyle with no or irregular physical activity.⁸ Sedentary activities include sitting, reading, watching television, and using computer for much of the day with little or no vigorous physical exercise. A

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sedentary lifestyle can contribute to many preventable causes of death in the elderly.⁷

According to the World Health Organization (WHO), one of the major disabling conditions among the elderly population is musculoskeletal disorders.^{1,9} With old age, quite a number of changes are likely to occur in the body including those of musculoskeletal origin.¹⁰ Generally, muscles decrease in strength, endurance, size and weight with ageing.¹¹ There is reduced mineralization to bone making it fragile and more susceptible to fracture. The strength of the tendons and ligaments and their insertions to bone are also reduced. These changes tend to be exaggerated by inactivity.¹²

Although some works have been done on the evaluation of musculoskeletal disorders in the elderly in Nigeria, the association of these musculoskeletal disorders to sedentary lifestyles has not been extensively explored. This study therefore investigated the age-related musculoskeletal disorders associated with sedentary lifestyles among the elderly.

MATERIALS & METHOD

One hundred and eighty two participants (82 males and 100 females) whose ages ranged from 60 to 80 years old and had sedentary lifestyles participated in this study. They were selected by a sample of convenience from selected homes for the elderly and 3 churches in Lagos State, Nigeria. Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital, Idi-Araba, Lagos. An informed consent was obtained from each participant prior to participation. Their heights and weights were measured using a height meter and a weighing scale respectively. Each of them completed a structured 38-item questionnaire adapted from previous studies that are related to the present study.^{3,13} The copies of the questionnaire were distributed to them by the researchers and the completed copies were immediately collected by hand.

Data analysis

Data collected was analyzed using Statistical Package for Social Sciences (SPSS) version 17.0. Results were illustrated using tables and bar charts. Inferential statistics of chi-square was used to determine association between variables.

RESULTS

The mean age, height, and weight were 70.14 ± 8.62 years, 1.69 ± 0.11 m and 70.12 ± 10.32 kg respectively. Eighty-one (44.5%) respondents were between the age range of 61 and 70 while 21 (11.5%) were between the age range 51 and 60.

The point prevalence of musculoskeletal pain/discomfort among respondents was 51.6% (94 respondents) while the 12 months prevalence was 87.4% (159 respondents). The four most common body parts affected by musculoskeletal pain were the knee [58(31.9%)], low back [46 (25.3%)], ankle [40 (22.0%)] and upper back [38 (20.9%)] (Table 1). Thirteen (7.1%) of the respondents could not perform their daily activities in two days as a result of pain (Table 2). Seventy-six (41.8%) respondents reported that the severity of pain they felt was moderate (Figure 1). Seventy (38.5%) respondents reported ankle stiffness as other musculoskeletal discomforts experienced (Table 3).

One hundred and forty-two (78.0%) respondents spent 15 minutes to 2 hours watching television on a typical week day (Figure 2). One hundred and fifty-six (85.7%) respondents spent more than 3 hours lying down and sleeping during the weekend (Table 4).

There were significant relationships between sedentary activities and knee pain ($p = 0.01$), Low back pain ($p = 0.02$), Ankle pain ($p = 0.03$) and Upper back pain ($p = 0.03$) (Table 5).

There were significant relationships between sedentary activities and Leg weakness ($p = 0.04$), Swelling Legs ($p = 0.05$), Ankle stiffness ($p = 0.03$) and Low back stiffness ($p = 0.05$) (Table 6).

Many of the respondents (68.7%) had treatment prescribed by a doctor, 58 (31.9%) received treatment from physiotherapists and 28 (15.4%) had self-medication.

DISCUSSION

The high prevalence of musculoskeletal pain/discomfort observed in this study among the elderly shows that musculoskeletal disorders are common in the elderly. The prevalence of many musculoskeletal conditions has been reported to increase markedly with age, and many are affected by lifestyle factors, such as obesity and lack of physical activity.^{9,14,15}

Dillon *et al*¹⁶ reported that the prevalence of knee osteoarthritis among adults ≥ 60 years is 37.4% in the United States of America. Estimates from Australia indicate that the incidence of osteoarthritis is highest among women that are aged 65 -74 years while the incidence among men is highest at age 75.⁹ This may be as a result of the physiological changes associated with ageing. The muscular system undergoes a 40% loss of muscle mass and 30% decrease in strength by age 70.^{11,17} There is a 1% loss of bone mass per year after age 35, with up to a 2 to 3% loss after menopause for women. Degeneration of the joints, specifically the spine is common. Connective tissues gradually lose their elasticity, muscle fibers shorten, and joints show decreases in the production of joint lubricating synovial fluid. By age 60, there is up to a 15% reduction in nerve conduction concomitantly with a reduction in neurons and brain mass.¹⁸

It was observed that the most common musculoskeletal pain/ discomforts found in this study were in the lower limbs (ankle stiffness, leg weakness and leg swelling) and low back (low back stiffness). This may be due to the wear and tear the lower limbs and the low back are subjected to over time because they bear much of the weight of the body. These findings are consistent with that of Peat *et al*¹⁹ and Croft *et al*²⁰ Peat *et al*¹⁹ observed that 40% of the elderly had more than one painful joint in the lower extremity. Croft *et al*²⁰ reported that about 26%-33% of the older adults had both hip and knee pain while Dawson *et al*²¹ reported 11%. Bemben *et al*²² reported that the lower body is more affected than the upper body with age-related muscle mass loss.

In some other studies, several musculoskeletal pain sites of both upper and lower limbs as well as the low back in more than half of the elderly people were reported.^{23,24} Baek *et al*²³ observed that more than half of the South Korean elderly population (65 years and above) reported upper extremity pain as well as low back pain and/or lower extremity pain. Similarly, in an Israeli population of elderly people aged 61 and above, more than half reported low back, neck, knee and shoulder pain.²⁴

The finding that 91% of respondents performed sedentary activities both during the week and weekend shows that sedentary behaviour among the elderly is very high. This might have been the reason for the high prevalence of musculoskeletal disorders observed among the elderly as there were significant relationships between several areas of musculoskeletal pain/ discomfort and sedentary behaviours. Vella and Kravitz¹⁸ reported that those who lead a sedentary life are more likely to have an acceleration of sarcopenia than those who lead an active life. Sedentary lifestyle is a known cause of the escalation of musculoskeletal disorders and other medical problems in the aging population.²⁵

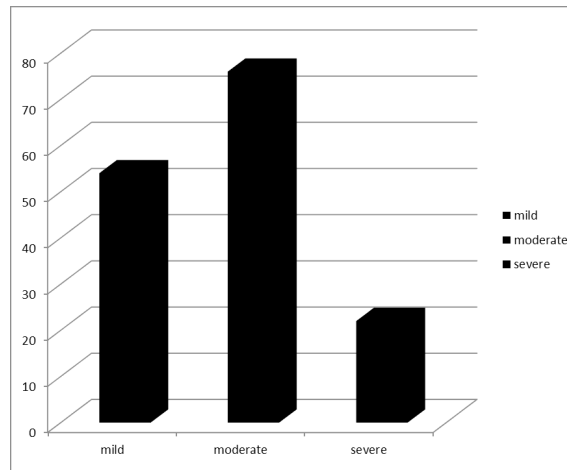
The finding that 68.7% and 31.9% of the respondents were treated by doctors and physiotherapists respectively shows that most of the elderly seek expert care for their musculoskeletal pain or discomfort. This may be because the elderly people in the old people's homes are closely monitored by caregivers and doctors designated to these centers to take proper care of them.

Table 1: Respondents' body parts affected by musculoskeletal pain

Body parts	No of subjects (N)	Percentage (%)	Male		Female	
			(N)	(%)	(N)	(%)
Knee	58	31.9	25	43.1	33	56.9
Low back	46	25.3	19	41.3	27	58.7
Ankle	40	22.0	18	45.0	22	55.0
Upper back	38	20.9	18	47.4	20	52.6
Shoulder	28	15.4	14	50.0	14	50.0
Neck	24	13.2	11	45.8	13	54.2
Elbow	14	7.7	6	42.9	8	57.1
Arm	10	5.5	4	40.0	6	60.0

Table 2: Periods respondents could not perform their daily activities due to pain

Periods	No of subjects (N)	Percentage (%)
2 days	13	7.1
2 weeks	12	6.6

Figure 1: Severity of pain felt by the respondents**Table 3: Other Musculoskeletal discomforts experienced by respondents**

Category	Frequency (N)	Percentage (%)	Male (N)	Male (%)	Female (N)	Female (%)
Neck stiffness	30	16.5	13	43.3	17	56.7
Low back stiffness	51	28.0	22	43.1	29	56.9
Hand weakness	25	13.7	5	20.0	20	80.0
Numb fingers	16	8.8	3	18.8	13	81.3
Tingling fingers	17	9.3	4	23.5	13	76.5
Leg weakness	63	34.6	29	46.0	34	54.0
Swelling legs	54	29.7	21	38.9	33	61.1
Temperature changes in legs	12	6.6	2	16.7	10	83.3
Ankle stiffness	70	38.5	32	45.7	38	54.3
Toe numbness	26	14.3	8	30.8	18	69.2
Tingling toes	27	14.8	6	22.2	21	77.8

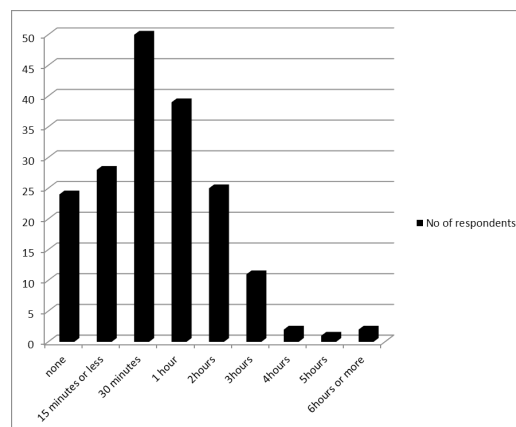
**Figure 2: Sedentary activity (sitting while watching television) performed by respondents on a typical weekday**

Table 4: Sedentary activities performed by the respondents during the weekends

Sedentary activities	< 1 hour		1-3 hours		> 3 hours	
	(N)	(%)	(N)	(%)	(N)	(%)
Watching television	91	50.0	81	44.5	10	5.5
Reading magazine	112	61.5	62	34.1	8	4.4
Listening to music	82	45.1	89	48.9	11	6.0
Talking on the phone	93	51.1	52	28.6	-	-
Sitting in a car/bus	125	68.7	53	29.1	-	-
Lying while sleeping	3	1.6	22	12.1	156	85.7

Table 5: Association between musculoskeletal (MS) pain and sedentary activities (SAs)

MS Pain	SAs (<1 hour)		SAs (1-3 hours)		SAs (>3 hours)		X ²	p-value
	N	%	N	%	N	%		
Knee pain	22	12.1	28	15.4	8	4.4	16.8	0.01*
Low back pain	21	11.5	15	8.2	10	5.5	15.7	0.02*
Ankle pain	27	14.5	8	4.4	5	2.7	14.2	0.03*
Upper back pain	15	8.2	12	6.6	11	6.0	13.6	0.03*
Shoulder pain	23	12.6	2	1.1	3	1.6	10.6	0.56
Neck pain	22	12.1	2	1.1	-	-	7.8	0.62
Elbow pain	8	4.4	3	1.6	3	1.6	5.6	0.72
Arm pain	-	-	10	5.5	-	-	-	-

*= Significant at (p≤0.05)

Table 6: Association between musculoskeletal (MS) discomfort and sedentary activities (SAs)

MS Discomfort	SAs (<1 hour)		SAs (1-3 hours)		SAs (>3 hours)		X ²	p-value
	N	%	N	%	N	%		
Leg weakness	11	6.0	52	28.6	-	-	2.61	0.04*
Swelling legs	49	26.9	5	2.7	-	-	2.15	0.05*
Left ankle stiffness	15	8.2	3	1.6	-	-		
Right ankle stiffness	16	8.8	3	1.6	-	-	2.96	0.03*
Both ankle stiffness	28	15.4	5	2.7	-	-		
Toe numbness	20	11.0	3	1.6	3	1.6	1.35	0.18
Left tingling toe	4	2.2	3	1.6	-	-		
Right tingling toe	6	3.3	1	0.5	2	1.1	1.43	0.15
Both tingling toes	7	41.2	3	1.6	1	0.5		
Low back stiffness	35	19.2	15	8.2	1	0.5	2.12	0.05*

*= Significant at (p≤0.05)

CONCLUSION

The prevalence of age related musculoskeletal disorders associated with sedentary lifestyle in the elderly is high and are common in the lower limbs and back.

RELEVANCE OF THE STUDY

Based on the findings of this study, it is hereby advocated that

- The public should be enlightened on a

regular basis through mass media and seminars by physiotherapists on the dangers of sedentary lifestyles and be encouraged to engage in regular fitness exercises.

- The government should provide safe and accessible public exercise areas.
- Old people's homes should provide adequate facilities for physical activities with physiotherapists leading and supervising them.

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Attitude & Beliefs of Physiotherapists towards Low Back Pain: A Review of Literature

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ABSTRACT

We all know that Low Back Pain (LBP) is one of the most common reason for the visit of patients to a Physiotherapist and treating LBP accounts for almost half of their workload as a clinician. It's a well-known fact that attitude and beliefs of any clinicians towards the patient's pain plays a vital role in deciding its management. A very less is known about Physiotherapist's attitude & belief towards LBP and also if their attitude and beliefs influence their management approach. Articles included relevant literature identified through searches of published studies in 3 electronic databases namely PubMed, PEDro and CINAHL using keywords as "attitude, beliefs, low back pain & physiotherapy". Finally, 28 articles were selected to review the attitude & beliefs of Physiotherapists towards treating Low Back Pain. After reviewing it was observed that, Attitudes & beliefs about its course and management has an important role as they have an impact on the extent and severity of distress and disability. In order to frame provisions of low back pain management for future, it will be good to study more about the differences and similarities in attitudes to the management of LBP between physiotherapists working in different settings & with different conceptual frameworks. The study of Indian physiotherapist's cognitions, therefore, warrants further attention.

Keywords: "attitude, beliefs, low back pain & physiotherapy".

INTRODUCTION

Pain is not well understood by many although it's universal. Most of the time the best hope for a patient suffering from pain continuously is that the pain can be managed properly, thinking the attending Physiotherapists has identified it in the first place. This should be a collaborative venture between the attending physiotherapists & the patient to make sure that the quality of life of patient to be maintained if it is not improved. Studies have shown that practice setting does play a role in treatment approach, the number of sessions for treatment and restricting the activity levels.

Low Back Pain

We all know that Low back pain (LBP) is one of the most common & costly issues and continues to present a significant health problem especially in developing countries like India and Physiotherapists treats most low back pain patients which account for approximately half their workload. In industrialized

countries, after a headache and tiredness, back pain is the most commonly reported complaint and results in a great degree of disability and distress. As per Andersson GB et al (1999)²⁴ in all populations, every individual has a probability of 80% of having pain in low back at some period of their life time and approximate 18% of the total population experiences pain in their low back at any given time. Because of which, a good number of research produced worldwide on the course & management has been increasing for many years. Beliefs and attitudes about course and management of low back pain play an important role: as they have a great impact on the extent and severity of disability and distress. Low back soft tissue injury is a descriptive term which refers to injury to muscle, tendon, ligament, intervertebral disc and other connective tissues located at the low back area of a human body. The main reason of injuries of these soft tissues is stress on them beyond a certain point which can be due to manual handling, repetitive movements or wrong postures. Evidence-based treatment for low back pain other than conventional

PT treatments includes counseling, brief sessions of educational talks, painkillers for a short time and exercises under supervision. Though, risk factors for the development of persistent problems have been identified during many systematic reviews of prospective cohorts, but the accounted variance is quite small. Almost all the guidelines recommend and urge practitioners for an early intervention and also to consider and identify risk factors, but they do not offer specific guidance as to how they can address risk factors during their clinical practice. Hence, the implementation of these guidelines is proved to be difficult and, wherever they were implemented, it had made no significant impact on their practice. Few studies have suggested that instead of focusing only on individual differences in patients, factors related to clinician needs to be investigated. As it has been observed that attitudes and beliefs of practitioner's, at least in few cases, made some contribution in chronic spinal disability development of due to over treating or under treating or not further referring him/her appropriately, and, in time, reinforcing perception of illness by advising to improve spinal and environmental vigilance while having restricted normal activities. In addition, there is evidence about some practitioners having beliefs on movement avoidance conceptualized as fear avoidance. There is also a good amount of evidence where clinicians advise immobility as part of their treatment. In order to summarize, although there are clinical guidelines for the management of low back pain based on evidence, the Physiotherapists advice and his/her choice of treatment are different from the guidelines. These beliefs, in a number of ways, could contribute in the development of spinal disability, which may include over or under treating, not using the effective pain control or strategies for reactivation, reinforcing patient's unhelpful illness perceptions by prescribing greater spinal vigilance and restrictions on normal activities. It has been observed that there may also be a problem with a small number of clinicians providing treatment for LBP patients for an extended period, without showing any clinical progress. *Pincus T et al. (2006)*⁶ reported that around 10% of Musculoskeletal Practitioner's continue to treat patients of sub-acute back pain, though they are not responding as expected and this could be an underestimate, as suggested by few available data. Findings of numerous randomized controlled trials suggest some

convincing evidence related to their approaches in management of low back pain although they support active interventions over no treatment at all. There has been an argument that clinician factors need investigation in order to understand the complexity in the behavior of professional practice in a better way and how to further improve implementation of LBP management guidelines. There is evidence given by *Goubert L et al (2003)*² that some clinicians, as part of their treatment advise immobility. There is evidence provided by *Buchbinder R, (2005)*²⁷ that educational strategies towards changing patient's and health professionals' beliefs about low back pain can reduce pain and disability.

Although there is no official data available for India, we can consider figures available for other countries like United States of America where Americans spend at least \$50 billion each year on low back pain; United Kingdom spends £1.5 billion and Australia spends more than \$1 billion (Australian) in providing treatment for low back pain apart from huge numbers of hours of productivity. Hence, there is a compelling need to address the solutions of this problem through investments and changes in health policy, service delivery and research that will drive the development and implementation of effective prevention and treatment strategies for low back pain. The returns on these investments will be of great help.

Attitude & Belief

The word 'attitude' can be referred to a lasting group of behavior tendencies and feelings directed towards specific groups, individuals, ideas, conditions or an object. The dictionary meaning is "A settled way of thinking or feeling about something". It generally describes a way of doing something in terms of what one thinks is proper. The values are those attitudes for which we feel very strongly about and opinions are those which are of less importance. Whenever we hold an attitude we will have a tendency to behave in a certain way toward that person, object or condition as attitudes will always have a positive and negative element.

The beliefs that we hold may be cultural, professional, religious or moral are an important part of our identity. Although beliefs are based on

our real experiences, we should not forget that what is happening in life now may not be the same as the original experience. Beliefs are considered to be precious as they are the true reflection of who we are & how we live our lives and act professionally. For example a social worker attached to Drug Addiction Treatment Center, the pre-existing beliefs one may have could be related to notions that have developed around him/her for issues like alcohol and other drugs, disabilities and what it's like to be sick and mentally disturbed.

This compartmentalization could affect the way one interact and work with our clients/patients and the reason we do this is our assumptions about what our clients/patients can and can't do for themselves. If we make such assumptions as a health care provider then we are denying our patients their dignity, respect and rights and will be treated as a breach in your duty.

As per *Rainville et al (2000)*²⁶ and *Ostelo et al (2003)*¹¹ clinicians have been shown to have a range of attitudes and beliefs related to pain and these appear to be related to the treatment they give to their patients.

*Bishop A & Foster NE et al (2005)*¹⁶ documented that It is possible that clinicians beliefs and attitudes, at least in some cases, does have contribution towards development of spinal disability because sometimes they over treat or under treat the condition, doesn't refer to the right consultant, and, in time,. They also concluded that most physiotherapists recognize when patients are at high risk of developing chronicity, still many recommend that the patient limit their activity levels or do not work.

*Rainville J et al (1995)*⁴ did a study with more than 200 health care providers as participants, to find out their attitudes and beliefs about functional impairments and chronic back pain using HCPAIRS. Factor analysis was performed to explore the dimensions of attitudes and beliefs which showed four dimensions entitled as "functional expectations," "social expectations," "need for a cure," and "projected cognition". Validity was determined by HC-PAIRS accurately measuring the pain attitudes and beliefs of functional restoration providers, who have a stated philosophy concerning this notion. Most

respondents were neutral or disagreed somewhat with the notion that chronic back pain should limit functional performance, but a wide range of responses were noted indicating that diverse pain attitudes and beliefs are held. The 66 functional restoration providers had a mean HC-PAIRS score of 38 (S.D. = 7), and a range of scores from 26 to 52 was found. As expected, these scores corresponded to disagreement with the notion that chronic low back pain justifies impairments and disability. With these finding, they concluded that clinicians have been shown to hold a range of beliefs and attitudes about pain.

*Foster et al (2003)*¹⁵ argued that the in order to understand the complexity of behavior in terms professional practice behavior & better implementation of Low Back Pain management guidelines in a better way, factors related to clinician needs further investigation and how to improve

*Houben et al. (2004)*⁵ in his study with 156 therapists who completed the Health Care Providers' Pain and Impairment Relationship Scale (HCPAIRS) and questionnaires measuring the perceived harmfulness of physical activities. Furthermore, the therapists gave recommendations for work and physical activity for patients described in vignettes, suggested that practitioner's beliefs and attitudes were most of the time, associated with recommendations physical activity for patients and for work (based on clinical vignettes). Therefore, there is a support that clinician's beliefs and attitudes do influence the behavior and future research will further expand this debate. This study also suggests an influence of therapists' attitudes and beliefs on their actual behavior, which in turn might be an important source of information for the patients.

*Kennedy N. et al (2014)*²³ compared beliefs of students of medicine, physiotherapy and nursing (total of 271) towards low back pain. They concluded that differences exist in the beliefs of three cohorts of students toward LBP. Physiotherapy students had the most positive LBP beliefs while nursing students had the most negative. Medical and physiotherapy students LBP beliefs improved significantly over their four-year degree programs, while nursing students essentially remained the same. A student with previous LBP was found to have significantly poorer levels of fear-avoidant behaviours towards

LBP compared to students with no previous LBP. These findings highlight the need for education for nurses to promote positive beliefs towards LBP.

*Pincus T et al (2006)*⁶ developed and tested a new questionnaire (for practitioners who specialize in musculoskeletal therapy), the Attitudes to Back Pain Scale (ABS) in order to study about practitioner's beliefs and attitudes in treatment of low back pain, and whether this has influence on their clinical decisions making and prescribing intervention.

*Pincus T et al (2007)*⁷ studied the attitudes of three professional group's i.e Chiropractors, Osteopaths and Physiotherapists who play key roles in the treatment of patients with low back pain, using a recently developed and validated questionnaire, the Attitudes to Back Pain Scale for musculoskeletal practitioners (ABS-mp). A cross-sectional questionnaire survey was shared with 300 of each professional group (n=900). After analyzing the responses, they concluded that all three groups endorse a psychosocial approach to treatment and see re-activation as a primary goal. However, physiotherapists and osteopaths tend to endorse attitudes towards limiting the number of treatment sessions offered to LBP patients more than chiropractors, and chiropractors endorse a more biomedical approach than physiotherapists.

However, till date, there is no systematic review available which can said to be critically appraising the scientific evidence establishing the relation between the psychological factors of individual with different clinical settings. Although there are reports of screening for psychosocial risk factors and intervention targeting them, being implemented successfully, any clarification of the evidence will considerably enhance the efficacy in both.

Tools to Measure Attitude & Belief

The concept of attitude – behavior relations is quiet old now, but its use in the management of pain is relatively newer and is getting acknowledged worldwide. The inclusion of assessment of attitudes as part of a multidimensional assessment prior to the commencement of treatment programmes has been an issue of debates at various levels (*Strong et al. 1992*)²². Such information is very important in order to plan the treatment, as a patient's attitudes and beliefs about the pain may have some influence

in compliance to treatment, their ability to cope up with pain, and showing improvement on treatment outcomes (*DeGood et al. 1990*)¹⁹. While it is possible that pain attitudes & beliefs are being observed may be informally by the clinical staff, it will be good if a more formal and sound methods is used (*Schwartz et al. 1985*)²¹.

There are some measures available to assess attitudes and beliefs towards pain and its treatment. As per *Strong J et al. (1992)*²² the first scale (published) to assess factual information about conservative management of pain and to the level, to which they agree with treatment being given to them, was the Pain Information and Beliefs Questionnaire (PIBQ). The 4 factors given to in the PIBQ are: (1) admission of emotionality; (2) perceived relevance of videotape; (3) acknowledgement of personal responsibility in treatment; and (4) discrimination of non-invasive treatment (*Schwartz et al. 1985*)²¹. The second measurement tool available is, Pain and Impairment Relationship Scale (PAIRS) consists of 15 items to be scored on a 7-point Likert scale, which was devised for patients with chronic pain to measure the extent to which they believe that pain interferes with their day to day functional abilities (*Riley et al. 1988*)²⁰. One major limitation of the PAIRS is its consideration of only one attitude – that the link between pain and impairment. The third measure is Survey of Pain Attitudes (SOPA) which consists of 24 true or false items which are further put into five subscales: pain control, medical cure, medication, disability and solicitude (*Jensen et al. 1987*)¹⁸. A revised instrument (SOPA) was also developed (*Jensen & Karoly 1987*)¹⁸, after an early promising result of the same measure, with five subscales of the earlier version and an additional sixth subscale to measure the attitude which may have been influenced due to pain and its link with emotions. As per *Williams and Thorn 1989*¹⁷ another development to assess a patient's beliefs about the pain's stability over time, a mystery of pain, and blaming self was the Pain Beliefs and Perceptions Inventory (PBPI). Provided that the enhanced interest in assessing of attitudes and beliefs in relation to pain, and also the measurement tools availability, it is a question as to which assessment is most appropriate for a researcher or clinician to be included into their assessment procedures.

While till late nineties focus was only on attitude

& belief of patients; it was only in early years of this century when it was argued that clinician factors also needs to be investigated along with individual differences in patients, as suggested by *Foster NE et al. (2003)*¹⁵.

There are scales available to measure attitudes such as; (1) Pain Attitudes and Beliefs Scale for Physiotherapists (PABS.PT) which was developed by *Ostelo RW et al. (2003)*¹¹ to evaluate the role of physical therapists' attitudes and beliefs on the development and maintenance of chronic low back pain. A previous factor analysis of the scale indicated two discrete factors: biomedical (items 1 to 10) and biopsychosocial (items 11 to 19). The items for both factors are scored on a 6-point Likert scale (0="totally disagree" to 5 = "totally agree"). (2) Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS) developed from the Pain and Impairment Relationship Scale (PAIRS), which was originally developed to evaluate the attitudes and beliefs of patients with chronic low back pain by *Rainville J, et al. (1995)*⁴. The total score for the HC-PAIRS ranges from 0 to 90 points, with higher scores representing stronger beliefs in the relationship between chronic pain and disability. The most recent one is (3) Attitude to Back Pain Scale in Musculoskeletal Practitioner (ABS-mp) by *Pincus T et al. (2006)*⁶ which contains two sections, labeled Personal Interaction and Treatment Orientation. Personal interaction further consists of four factors: (i) Limitations on sessions, items about practitioners' policy towards limiting the length of treatment (four items), (ii) Psychological, items measuring practitioners' willingness to engage with psychological issues with their patients (four items), (iii) Connection to healthcare system, items measuring practitioners' perception of the healthcare system and provision of available services (three items) and (iv) Confidence and concern, items measuring practitioner's confidence and concern about treatment and clinical limitations in themselves and others (two items). Treatment orientation consists of two factors: (i) Re-activation, items that concern return to work and to daily activity and increasing mobility (three items) and (ii) Biomedical; items that concern advice to restrict activities and to be vigilant, and the belief that there is an underlying structural cause of back pain (3 items). Few other scales used in the pasts are Back Beliefs Questionnaire (BBQ) and the physical subsection of the Fear-Avoidance Beliefs questionnaire (FABQ-PA).

CONCLUSION & SUGGESTIONS

The relation between attitude & belief, pain and its management is well established and will accept across the world. Considering the cost, both direct (money spends on treatment) and indirect (due to loss of productive hours & disability) it is important to focus not only on individual characteristics of patients presenting with low back pain, but also on factors related to attending Physiotherapists such as their attitude & beliefs and also in different setting they work in. Therefore, it is clear that we need to understand beliefs & attitudes of Physiotherapists about Low Back Pain and its management in a better way. It is likely that the belief of Physiotherapists has an influence on their interaction with a patient and their clinical behaviour; hence make some contributions to the failure or success of the chosen interventions.

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The Influence of Footwear on the Prevalence of Flat Foot

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ABSTRACT

Objective: This study investigated the prevalence of flat foot in children wearing closed toe shoes. Design and setting: children of age group ranging from 6 to 13 years were recruited from rural and urban areas. Static foot prints were taken and plantar arch index was calculated. **Method:** 100 children were recruited from rural and urban areas. Children using closed toe shoes and the ones not using any kind of footwear were randomly selected and static foot print were obtained on chart paper using ink.

Results: readings were interpreted using chi square test. $\chi^2 19.13$ with degree of freedom being 1 and p value less than 0.05 which is highly significant suggesting that shoe wearing is detrimental to the development of a normal longitudinal arch. **Conclusion** - From the present study it is concluded that there is a higher incidence of flat foot in children using closed toe shoes suggesting that shoe wearing predisposes to flat foot. Findings suggest that shoe wearing is detrimental to the development of normal longitudinal arch.

Keywords: PAI: plantar arch index. Flat foot.

INTRODUCTION

Flat feet is normal and common in infants, partly due to “baby fat” which masks the developing arch and partly because the arch has not yet fully developed¹. The human arch develops in infancy and early childhood as a part of normal muscle, tendon, ligaments and bone grow (during first 6 to 8 years)². Human foot is the region most affected by anatomical variations in the human body and one of the most important characteristics presenting the highest level of variability is the medial longitudinal arch and the arch index provides a quantitative measurement of plantar arch which can be compared to other measurements. Causes of flat feet are shoes that do not fit well, obesity and metabolic disorders that may cause the arch muscles to weaken. In older adults, decreased exercise and increased weight can cause

mechanical disturbances in the foot. Purpose of the study was to observe the arches of foot of children using closed toe shoes and children not using any kind of footwear.

MATERIALS & METHOD

This cross sectional study was conducted on 100 children (boys and girls) between the age of 6 to 13 years from rural and urban school were selected after giving a written consent.

INCLUSION CRITERIA

- Children In the age group of 6 years to 13 years (boys and girls).
- Children wearing closed toe shoes.
- Children not using any kind of foot ware.
- Children with BMI within 24.

EXCLUSION CRITERIA

- Children beyond the age of 14 year
- CTEV (Congenital Talipes Equino Varus).
- Polio.
- Cerebral Palsy.
- Trauma, fractures of lower limb and pelvis.

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- Children with a BMI over 24.

Static foot print of both feet was obtained on a chart paper using ink. Plantar arch index was used. PLANTAR ARCH INDEX- This index establishes a relationship between central and posterior regions of the foot print. A line is drawn tangent to the medial fore foot edge to the mid heel region. The mean of this line is calculated. From this point, a perpendicular is drawn, crossing the foot print (mid-foot region, the arch width,-A)⁸.

$$\text{Plantar Arch Index} = A/B$$

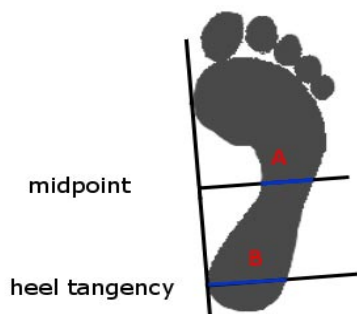


Fig1: Plantar Arch Index.

The same is repeated for the heel tangency point (mid heel width -B). PAI is obtained by dividing the value of arch width (A) by the value of mid heel width (B) PAI= A/B. The range of normal was defined as being within 2SD from the mean.



**Fig 2: Foot print of a 8 years old child using a closed toe shoe. Observed PAI Value= 1.9
Normal Range=0.4 To 1.0**



**Fig 3: Foot print of a 8 years old child not using footwear.
Observed PAI Value= 0.6
Normal Range= 0.4 to 1.0**

RESULT

For the ease of data comparison the sample were grouped on the basis of the footwear used. Chi square test was applied. The values are as follows:

- $\chi^2 = 19.13$
- Degree of freedom=1
- P value < 0.05

Table : 1

	Closed toe shoes	Barefoot	Total
Flat foot	17	0	17
Normal arch foot	35	48	83
Total	52	48	100

As the p value is less than 0.05 it is statistically significant.

DISCUSSION

In the study it was found that there is a higher incidence of flat foot in children using closed toe shoes suggesting that shoe wearing predisposes to flat foot. It seems that closed toe shoes inhibit the development of the arch of the foot due to lack of intrinsic muscle activity that is required for the development of the arch, leading to weakness of the intrinsic muscles⁴.

Think about it this way: when someone has a cast on their leg and they finally take it off, there is

obvious atrophy compared to the opposite leg. The reason for this is because it isn't being used while in the cast. If you have your foot in a shoe all day every day, whether it's a house slipper, running shoe or your work shoes, you are never allowing those muscles and tendons to work properly or strengthen themselves. Bones adapt to the loads placed under them. In response to increased loads (or forces), bones become stronger and thicker. Conversely, if the loading on a bone decreases, the bone will become weaker and thinner (Wolff's Law)³.

When running using a shoe the individual tends to land on their heels, essentially using the padding built into the shoes. Landing in this manner sends a massive jolt of force (called an impact transient force spike) through the ankles, knees, hips, and into the spine⁵. Whereas when running barefoot, one tends to land on their forefoot or midfoot, with the landing point nearer to the body's center of mass (not out in front of the body, like shod runners) thus not creating the impact transient force spike through their joints. Running barefoot has been shown to use about 5% less energy than shod running (Divert et al., 2005; Squadrone and Gallozzi, 2009). It may cost less energy to forefoot strike because of more use of natural springs and calf muscles to store and release energy. Counter to popular belief that the arches are there to absorb shock, they are in fact designed to store energy and return that energy to the gait cycle on the next step. Wearing shoes prevent the arches from performing their function⁷.

There is increased use of the natural shock-absorbing, spring-like mechanism of the muscles, ligaments and tendons within and around the foot, the ankle, the knee, and the hip. Feet have lots of sensory nerves and there is high proprioceptive input when barefoot. Sensory stimulation associated with barefoot activity may produce a protective increase in muscle tone that is capable of elevating the arch⁵. It strengthens the muscles in your foot, especially in the arch. A healthy foot is a strong foot, one that pronates less and is less liable to develop a collapsed arch⁶.

CONCLUSION

From the present study it is concluded that there is a higher incidence of flat foot in children

using closed toe shoes suggesting that shoe wearing predisposes to flat foot. Findings suggest that shoe wearing is detrimental to the development of normal longitudinal arch.

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Effects of “Trunk Dissociation Retrainer” in Improving Trunk Performance and Functional Activities in Hemiplegia

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ABSTRACT

This study aims to find the effectiveness of “trunk dissociation retrainer” for improving trunk performance and functional activities in hemiplegia. **Methodology-** A total of 156 hemiplegic subjects of both gender, who were aged between 40 to 75 of years, who scored 6 or more in trunk impairment scale were randomly assigned to three groups by random number method with 52 in each group. “Trunk dissociation retrainer” group (TDR) received training using the new tool “Trunk Dissociation Retrainer” and conventional exercises, the MTD group received manual trunk dissociation training (MTD) and conventional exercises, the control group (CNT) received only the conventional exercises. Duration of intervention was 60 minutes per day, three days a week, for four weeks. Trunk impairment scale (TIS) and functional independence measure scale (FIMS) were used to measure the outcome using a blinded evaluator. **Results** – The results of the study showed that there was a significant improvement in trunk performance and functional activities in TDR group compared to the other two. There was significant improvement in MTD group than the control group in TIS scores but there were no such differences for FIMS. **Conclusion** – This study concludes that trunk dissociation retrainer can be a better tool for training trunk dissociation. Training in Trunk dissociation retrainer results in a significant improvement of trunk performance and functional status, in subjects with hemiplegia.

Keywords – Trunk dissociation retrainer, hemiplegia, trunk impairment.

INTRODUCTION

Most literature concerning rehabilitation after hemiplegia focuses on the motor recovery of upper and lower extremity¹. The consequences of stroke have a wide spectrum. Out of that, a majority of the survivors from stroke have a combination of sensory, motor, cognitive and emotional impairments leading to restrictions in their capacity to perform basic activities of daily living². Most of the activities of daily living are performed either in sitting or

standing. Sitting and standing involves not only the ability to maintain a static posture, but also the ability to move around and reach for a variety of objects located both within and beyond arm's length³. For such functions to occur smoothly, both trunk and limbs have to move in specific pattern, compensating each other. Of all possible sensorimotor consequences of stroke, impaired postural control and sensory motor deficit probably has the greatest impact on ADL independence and quality of gait^{4,5}. Postural control includes both static posture and dynamic postural responses like trunk-limb coordination, anticipatory trunk muscle recruitment before limb movement, reciprocal inhibition, trunk dissociation⁶⁻⁸. As specificity of exercise plays a vital role in the prognosis of the stroke patients⁹, adaptation of body or posture which precedes movement which allows for

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smooth, economical movement should be selected for training¹⁰. These postural set are position or posture of symmetry or alignment of key-points from which a normal person evolves a movement or sequences of selective movements. To our knowledge there is no equipment for training trunk dissociation so effectively like manual training. "Trunk Dissociation Retrainer" is equipment designed for training the trunk movements following hemiplegia. In this study an earnest effort has been taken to find out the effectiveness of "Trunk Dissociation Retrainer" in improving trunk performance and functional activities in hemiplegic subjects.

SUBJECTS AND METHOD

This Randomized Single Blind Controlled Clinical Trial was performed in two study setup. Simple Random sampling by random number sampling method was used. The duration of intervention for the subjects in each group was 4 weeks. Sample size for the study was calculated based on the prevalence rate of stroke in urban population in India which was 424/100000 population (JeyarajDuraiPandian, et al, 2013)

The exact number of subjects required accordingly was 49 per group. The sample is further increased by 5% to account for contingencies such as non-response, non-completion etc, which made it 52 subjects per group and 156 overall sample size.

The subjects were included in to the study if they fulfil the following criterias. Subjects with history of hemiplegia resulted due to stroke, both male and female, with age between 40 to 75 years were selected. Further, the subjects were recruited only after they scored minimum 6 in static sitting balance rating using Trunk impairment scale. Both right and left hemiplegia due to ischemic stroke were included in the study. The subjects were excluded if they had impaired comprehension, perceptual deficits that may interfere with the study, previous history of stroke, double hemiplegia, Coexisting neurological and orthopaedic disorders. All subjects were provided with informed consent. The study was approved by the institutional ethical committee, Saveetha University on 15th December 2013.

The subjects in TDR Group received conventional stroke rehabilitation programme and additional TDR

training programme^{14,15}. Two different movements were trained. The first set was done towards the affected as well as the unaffected side, parallel to the frontal plane. When the upper end of the upright rod moved to affected side the lower limb moves to the opposite side simulating in normal postural adjustment pattern. The second set was done moving to front and back parallel to the sagittal plane. When the upper end of the upright rod moved anteriorly the lower limb moves posteriorly. The subjects trained in TDR for 30 minutes for 5 sets of 10 repetitions to each side, including rest. The subjects also received conventional exercises in the form of range of motion exercises for the affected extremities and strengthening exercises for muscles which were out of synergy (Bobath B, et al, 1978), Static and dynamic balance training (Rose D, et al, 2010) in sitting and if the subject is able to stand without support, standing balance was also trained, positioning activities, electrical stimulation (Chae J, et al, 2008) trunk activities like reaching to anterior aspect and lateral direction clasping the hands from a seated posture. Total duration of exercises for TDR group was 60 minutes including rest, once in a day, 3 days in a week for 4 weeks.

The subjects in MTD group received conventional exercises as mentioned in the TRD group for 30 minutes and received manual trunk dissociation training for 30 minutes. The intervention was provided by two physiotherapists one guiding the upper trunk and the other directing the lower trunk and limb in contralateral direction to the movement of the former. Total duration of exercises was 60 minutes, once in a day, 3 days in a week for 4 weeks. The subjects in control group received conventional exercises as mentioned in the TRD group for 60 minutes, once a day, 3 days in a week for 4 weeks without any emphasise on specifically training trunk dissociation movements. All the intervention was provided by three Physiotherapists who were postgraduate in physiotherapy having more than 5 years of clinical experience in stroke rehabilitation, which includes the researcher. Intervention was provided by three physiotherapists including the researcher in both the clinical set up. All the three therapists who gave intervention were postgraduate physiotherapist having more than 5 years of clinical experience in neuro rehabilitation.

The Trunk impairment scale (TIS) and Functional independence measure scale (FIM) were evaluated by a post graduate physiotherapist who were blinded to group allotment.

RESULTS

The homogeneity of variances of the data at baseline and significant differences of post intervention data for the three groups were analysed using analysis of variance (ANOVA). The distribution of gender and hemiplegic side in the three groups were analysed using Chi-Square test. Post HOC analysis with Tukey HSD multiple comparisons were done if there was significant difference between groups. Significant changes within group were analysed with Paired t Test. An overall significance level was maintained at $p < 0.05$.

Table 1. One way ANOVA for the age differences

	Sum of Squares	df	Mean Squares	F	Sig
Between group	122.498	2	61.249	2.321	0.102
Within group	3852.441	146	26.387		
Total	3974.940	148			

The table 1 shows that between group analyses of subject's age using one way ANOVA. It showed that there was no significant difference among the

three groups with p value equal to 0.102. There were 88 right hemiplegics and 61 left hemiplegic subjects. Chi Square test was used to analyse if there was a significant difference among the groups, which showed that there was no significant difference among the groups with p value equal to 0.979 as shown in the table 2. There were 106 Male and 43 female hemiplegic subjects overall. Chi Square test was used to analyse the data, which showed that there was no significant difference among the groups with p value equal to 0.756 as shown in the table 3.

Table 2 – Chi – Square test for between group analyses of side involved

	Value	Df	Asymp.sig (2-sided)
Pearson Chi-square	0.042 ^a	2	0.979
Likelihood ration	0.042	2	0.979
Linear-by-linear Association	0.041	1	0.839
N of Valid Cases	149		

Table 3- Chi-Square analysis for gender difference

	Value	Df	Asymp.sig (2-sided)
Pearson Chi-square	0.561 ^a	2	0.756
Likelihood ration	0.557	2	0.757
Linear-by-linear Association	0.048	1	0.826
N of Valid Cases	149		

Table-4: One way ANOVA for baseline comparison

OUTCOME MEASURES	GROUP DIFFERENCES	SUM OF SQUARES	Df	MEAN SQUARE	F	Sig P=0.05
TIS	Between Groups	1.323	2	0.661	.774	0.463
	Within Groups	124.704	146			
	Total	126.027	148			
FIMS	Between Groups	51.557	2	25.778	1.562	0.213
	Within Groups	2409.987	146			
	Total	2461.544	148			

The base line analysis of the pre-test values of all the five outcome measure, using the ANOVA showed that there was no significant difference among the groups at baseline (table 4). This shows that the groups were homogenous at baseline. The

pre and post mean and standard deviation for both the outcome measures of all the three groups are shown in table 5. The analysis shows that there was significant difference among the pre and post datas of the three groups for both the outcome measures.

Table 5. Within group analysis of pre and post test values.

Groups		Pre	post	T	Df	Sig.(2-tailed)
	Scales					
TDR	TIS	14.30 ±1.015	19.32±1.362	-34.801	49	0.001
	FIMS	81.16±5.312	102.26±4.085	-55.16	49	0.001
MTD	TIS	14.53±.844	17.80±1.307	-18.721	48	0.001
	FIMS	79.82±3.462	87.51±4.359	-24.065	48	0.001
Control	TIS	14.40±.904	17.18±1.155	-22.154	50	0.001
	FIMS	80.04±3.037	86.88±4.104	-18.905	50	0.001

The between group analysis of the post test values of all the three group showed that there was a significant difference between the three groups as shown in table 6. Post hoc analysis with Tukey - HSD multiple comparisons were done to find if there was any significant difference between groups. The analysis of post-test values of TIS showed significant difference between TDR group and MTDR with p

<0.001 and TDR and Control group with p <0.001. There was significant difference between MTDR and the control group with P <0.046. The analysis of post-test values of FIMS showed significant difference between TDR group and MTDR with p <0.001 and TDR and Control group with p <0.001. There was no significant difference between MTDR and the control group with P =0.734. The datas are illustrated in the table 7.

Table 6 – Between group Analysis of the post-test values using ANOVA

OUTCOME MEASURES	GROUP DIFFERENCES	SUM OF SQUARES	Df	MEAN SQUARE	F	Sig P=0.05
TIS	Between Groups	121.271	2	0. 60.635	. 37.162	0.001
	Within Groups	238.219	146	0. 1.632		
	Total	359.490	148			
FIMS	Between Groups	7552.667	2	3776.334	215.778	0.001
	Within Groups	2555.145	146	17.501		
	Total	10107.812	148			

Table 7 – Post HOC analysis (Tukey -HSD multiple comparisons)- post-test values for TIS and FIMS.

Dependent variables	(I) Group	(J)Group	Mean Differences	Std. Error	Sig
TIS - POST TEST VALUES	TDR	MTD	1.524	0.257	0.001
		CONTROL	140	0.255	0.001
	MTD	TDR	-1.524	0.257	0.001
		CONTROL	0.616	0.257	0.046
	CONTROL	TDR	140	0.255	0.001
		MTD	-0.616	0.257	0.046
FIMS - POST TEST VALUES	TDR	MTD	14.75	0.841	0.001
		CONTROL	15.38	0.837	0.001
	MTD	TDR	-14.75	0.841	0.001
		CONTROL	0.63	0.841	0.734
	CONTROL	TDR	-15.38	0.837	0.001
		MTD	-0.63	0.841	0.734

DISCUSSION

Trunk dissociation is the act of upper and lower half of the bodies compensating equally with each other, there by bringing the line of gravity as close to the body as possible and also keeping the centre of gravity as low as possible. In normal subjects the trunk muscles activity began much prior to activity in the limb muscles and demonstrated a distal to proximal order of activation^{11,12}. Even in a maintaining a static posture there is a significant activation of trunk, hip, knee, ankle joints¹³.

Out of 156 subjects selected for the study only 149 completed the post-test analysis. There were 7 drop outs out of which 3 subjects got discharged against medical advice and three subjects were volunteered to leave the study on personal grounds. The 7 subjects were considered as drop out and were not considered for statistical analysis. To make sure the quality of treatment and uniformity of treatment, before the study commencement, the researcher discussed with the other two physiotherapists regarding the idea behind the equipment, the ways of handling it, safety precautions, verbal instructions to be provided during the training, treatment duration and protocol. Apart from that, periodic discussions were held once in a month.

This study has taken into consideration five most important aspect of post hemiplegic rehabilitation. These five most important determinants of stroke prognosis namely, the trunk performance, balance,

functional performances, reaching ability and gait velocity were measured using a valid scales. The groups were similar at the time of recruitment. This was made sure by one way ANOVA for age, which showed that there was no significant difference between groups with a p value equal to 0.102. Chi-square analysis was used for sex and side differences which showed that there was no significant difference between group with a p value equal to 0.979 and 0.756 sides and sex respectively.

From the results of the study it is evident that there is a significant difference in the within group analysis of all the three groups for both the outcome measures, which may be attributed to the 4 weeks of intervention. The results of TDR training had shown better improvement than the other two groups for all the five outcome measures, with statistical significance. When comparing the results of MTD and control group, there was a significant improvement in trunk performance with p value < 0.046. But, there was no significant difference between the control group and MTD group for FIMS with the p value to 0.734. This shows that there was no added advantage in training a subjects with manual trunk dissociation compared to giving only conventional physiotherapy exercises as far as functional recovery is concerned. This shows that TDR can be an effective replacement for existing manual trunk dissociation training. In the previous studies done by the researcher it is proved that TDR is an effective tool in improving Gait and balance^{14,15}.

CONCLUSION

This study concludes that “Trunk dissociation retrainer” (TDR) is an effective tool in improving gait, balance, reaching, trunk performance and functional activities in hemiplegia. Hence TDR can be used as an effective replacement tool for manual trunk dissociation training for hemiplegic subjects.

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Literature Review on Dizziness based on PEDRO Scale – a Review Study

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ABSTRACT

Objective of the study: To review the exercise programme used in the treatment of dizziness based on the PEDRO scale. **Background of the study:** The Pedro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht. The list is based on “expert consensus” not, for the most part, on empirical data. Two additional items not on the Delphi list (Pedro scale items 8 and 10) have been included in the Pedro scale. As more empirical data comes to hand it may become possible to “weight” scale items so that the Pedro score reflects the importance of individual scale items. **Methodology:** The study was approved by the ethics in research committee of Dr.D.Y.Patil Vidyapeeth, Pune with ref no .DYPV/EC/361/15, and the study was registered in clinical trial registry of India with no :CTRI/2015/10/006308. A literature search was conducted in electronic databases MEDLINE, SCIELO, EMBASE Cochrane library; Potentially relevant studies were identified by the following search strategy “Pedro scale, proprioception, vestibular, visual exercises, vestibular rehabilitation, cawthorne exercises, brandt daroff exercises, dizziness handicap inventory, balance outcome measure. **Conclusion:** All 3 articles demonstrate that the dizziness is not significantly improved with any specific exercise and the 3 articles recommended, adding different exercise regimen will be beneficial in the treatment of dizziness, and we consider that it is sufficient amount of evidence to develop the of multi component exercise program on patients with dizziness.

Keywords: Pedro Scale, Dizziness, BPPV, Vestibular Rehabilitation, Literature review.

OBJECTIVE OF THE STUDY

To review the exercise programme used in the treatment of dizziness based on the PEDRO scale

BACKGROUND OF THE STUDY

The Pedro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht (Verhagen AP et al (1998). The list is based on “expert consensus” not, for the most part, on empirical data. Two additional items not on the

Delphi list (Pedro scale items 8 and 10) have been included in the Pedro scale. As more empirical data comes to hand it may become possible to “weight” scale items so that the PEDro score reflects the importance of individual scale items [9].

The purpose of the PEDro scale is to help the users of the PEDro database rapidly identify which of the known or suspected randomised clinical trials (ie RCTs or CCTs) archived on the PEDro database are likely to be internally valid (criteria 2-9), and could have sufficient statistical information to make their results interpretable (criteria 10-11). An additional criterion (criterion 1) that relates to the external validity (or “generalizability” or “applicability” of the trial) has been retained so that the Delphi list is complete, but this criterion will not be used to calculate the Pedro score reported on the Pedro web site [9].

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METHODOLOGY

The study was approved by the ethics in research committee of Dr.D.Y.Patil Vidyapeeth ,Pune with ref no. DYPV/EC/361/15 ,and the study was register clinical trail registry of india with no :CTRI/2015/10/006308 A literature search was conducted in electronic databases MEDLINE, SCIELO, EMBASE Cochrane library; potentially relevant studies were identified by the following search strategy “Pedro scale, proprioception, vestibular, visual exercises, vestibular rehabilitation, cawthorne exercises, brandt

daroffexercises,dizzinesshandicapinventory,balance outcome measure Total 68 studies were retrieved from the initial search strategy. After title and abstract screening 13 studies identified as potentially eligible. However after full text screening 10 studies were excluded from this study due to following reasons, article was not scoring 8 points based on the pedro scale usage of surgical interventions, usage of drugs and usage of other outcome measures .And thus the 03 studies were included in the study and were eligible for the inclusion in this review and had their content critically analysed

Table 1 : Items Assessed Based on PEDRO Scale

Sl.No	Items Based on PEDRO Scale	Article :01	Article :02	Article :03
1	Random Allocation	1	1	1
2	Allocation Concealed	1	1	1
3	Groups similar at base line	1	1	1
4	Blind subjects	1	1	1
5	Blind therapists	1	0	1
6	Blind Assessors	1	1	1
7	Adequate follow up	0	0	0
8	Intention to treat	1	1	1
9	Between Group	1	1	1
10	Point estimates and variability	1	1	1
	Total Score	9/10	8/10	9/10

Article: 1 Hall CD, Husel-Giling L, Tusa RJ, Herdman SJ Efficacy of gaze stability exercises in older adults with dizziness .J Neurol Phys Ther. 2010 Jun;34(2):64-9. doi: 10.1097/NPT.0b013e3181dde6d8^[4]

Article 2: Szturm T,Ireland DJ, Lessing-Turner M.Comparison of different exercise programs in the rehabilitation of patients with chronic peripheral vestibular dysfunction .J Vest Res.1994;4(6):461-479 ^[7]

Article 3: Patricia A. Winkler, Barbara Esses , Platform Tilt Perturbation as an Intervention for People With Chronic Vestibular Dysfunction. JNPT 2011;35: 105–115 ^[5]

We chose the above articles for following reasons.

First, the article matched every section of our clinical PICO. Second, the authors attempted to include a control group, which allowed us to contribute findings to the intervention. Third, the outcome measure of decrease in dizziness and improving the balance was quantified by a dizziness handicap inventory and dynamic gait index and balance beg scale, increasing the validity of the study. Finally, this study included the vestibular rehabilitation, which is an aspect of multi component exercise program we wanted to investigate.We chose article two for three main reasons. This article also matched each section of our clinical PICO. We determined that this article had the highest Pedro score and an excellent attempt at blinding when applicable.

Article : 1 Hall CD, Husel-Giling L, Tusa RJ, Herdman SJ Efficacy of gaze stability exercises in older adults with dizziness. J Neurol Phys Ther. 2010 Jun;34(2):64-9. doi: 10.1097/NPT.0b013e3181dde6d8^[4]

Clinical Bottom Line:

The purpose of this study was to determine whether the addition of gaze stability exercises to balance rehabilitation would lead to greater improvements of symptoms and postural stability in older adults with normal vestibular function who reported dizziness

Participants who were referred to outpatient physical therapy for dizziness were randomly assigned to the gaze stabilization (GS) group (n = 20) or control (CON) group (n = 19).

There were no baseline differences ($P > .05$) between the GS and CON groups in age, sex, affect, physical activity level, or any outcome measures. Both groups improved significantly in all outcome measures with the exception of perceived disequilibrium. However, there was a significant interaction for fall risk as measured by Dynamic Gait Index ($P = .026$) such that the GS group demonstrated a significantly greater reduction in fall risk compared with the CON group (90% of the GS group demonstrated a clinically significant improvement in fall risk versus 50% of the CON group). This study provides evidence that in older adults with symptoms of dizziness and no documented vestibular deficits, the addition of vestibular-specific gaze stability exercises to standard balance rehabilitation results in greater reduction in fall risk ^[4].

HALL ET AL ^[4]

Population : Subjects 55 years and above were included in this study and the subjects who are having dizziness and fall of risk **Comparison:** The experimental group performed the gaze stabilisation exercises and control group was performed the placebo eye exercises

Outcome: Both groups improved significantly in all outcome measures with the exception of perceived disequilibrium. However, there was a significant interaction for fall risk as measured by Dynamic Gait Index ($P = .026$) such that the GS group demonstrated a significantly greater reduction in

fall risk compared with the CON group (90% of the GS group demonstrated a clinically significant improvement in fall risk versus 50% of the CON group). **Blinding:** Throughout the study, subjects, therapists, and assessors were not blinded. It is not a significant threat that the therapists or the subjects were not blinded. **Control:** This control group was appropriate for this study, allowing us to assume that differences between groups can be attributed to the interventions. **Randomisation:** The assignment of subjects into three groups was randomized. The randomization was concealed by envelopes and the authors state that it successfully resulted in similar baseline data between the groups

Outcome measures: The outcome measure relevant to our Clinical PICO is reduction in dizziness and improving the gait both in experimental and controlled group's. **Evidence:** The using of DHI and Dynamic gait index score pre and post score were the clinically evident

Applicability of Study Results: The financial costs, the therapist's time and the patient's time are all comparable. Both groups received similar amounts of intervention and neither group reported adverse events due to treatment. The expense and time to become an expert in vestibular rehabilitation may create a barrier to performing the protocol in clinics. The number and duration of physical therapy sessions would be covered by insurance and is a feasible amount for patients ^[4].

Article 2: Szturm T, Ireland DJ, Lessing-Turner M. Comparison of different exercise programs in the rehabilitation of patients with chronic peripheral vestibular dysfunction. J Vest Res. 1994;4(6):461-479 ^[7]

Szturm et al ^[7]

CLINICAL BOTTOM LINE:

The purpose of the study was to define the effects of two different exercise programmes on the balance performance and adaptive characteristics of the vestibulo-ocular reflex. Twenty three subjects who met the criteria volunteer to participate 1) clinical diagnosis of peripheral vestibular dysfunction without any other neurological dysfunction 2) Persistent symptoms of imbalance, disorientation, or dizziness at least 1 year 3) Not taking any medications

for symptoms related to vestibular dysfunctions 4). Subjects were randomly assigned to either a Rehab group $n=11$ or Home group $n=12$. The rehab group attended 45 minutes treatment session three times per week for 12 weeks during which they received a individualized programme of balance retraining using center of foot pressure, biofeedback, and eye head exercises under various somatosensory and visual conditions. Subjects in the home group were instructed to perform Cawthorne-Cooksey exercises at home 3 to 4 times daily. Telephone contact was made each subject on regular basis and a compliance log was kept for each subject. Balance performance was assessed during the posturography and the VOR response to chair rotation at 60 degree per second and 120 degree per second. The results demonstrated a significant improvement of balance performance in rehab group but not the subjects performing the cawthorne Cooksey exercises [7].

Population: Subjects 55 years and above were included in this study and the subjects who are having dizziness and fall of risk. **Comparison:** The experimental group vestibular exercises group and control group was cawthorne Cooksey exercises. **Outcome:** The results demonstrated a significant improvement of balance performance in rehab group but not the subjects performing the cawthorne Cooksey exercises. **Blinding:** Throughout the study, subjects, therapists, and assessors were not blinded. It is not a significant threat that the therapists or the subjects were not blinded. **Control:** This control group was appropriate for this study, allowing us to assume that differences between groups can be attributed to the interventions. **Randomisation:** The assignment of subjects into two groups was randomized. Subjects were randomly assigned to either a Rehab group $n=11$ or Home group $n=12$. The rehab group attended 45 minutes treatment session three times per week for 12 weeks or home group was received cawthorne Cooksey exercises. **Outcome measures:** The outcome measure relevant to our Clinical PICO is reduction in dizziness and improving the balance in experimental group but not in the control group. **Evidence :** The using of DHI, Posturography, VOR response to chair rotation 60 degree and 120 degree score pre and post score were the clinically evident. **Applicability of Study Results:** The financial costs, the therapist's time and the patient's time are all

comparable. Both groups' different amounts of intervention and neither group reported adverse events due to treatment. The outcome measures used in this study was expensive and need an experts to operate it, so the study will not performed any normal clinical setting. expense and time to become an expert in vestibular rehabilitation may create a barrier to performing the protocol in clinics [7].

Article 3 : Patricia A. Winkler, Barbara Esses, Platform Tilt Perturbation as an Intervention for People With Chronic Vestibular Dysfunction. JNPT 2011;35: 105–115 [5].

Patricia et al [5]

CLINICAL BOTTOM LINE

Training to improve responses to perturbations may be beneficial for individuals with unilateral vestibular dysfunction. We evaluated the effects of an incrementally increasing surface tilt perturbation intervention for individuals with chronic vestibular pathology on gait, activities of daily living, and dizziness. Participants ($n = 29$) were randomly assigned to 1 of 3 groups. The first group received random surface tilt perturbations of increasing angles and speed, half of the trials with vision-occluding goggles, 3 times weekly for 3 weeks (P group). The second group received tilt perturbation intervention (as above) plus a home program of vestibular rehabilitation exercises (P+EX group). The third group performed only the vestibular rehabilitation exercises (EX group). Outcome measures included temporospatial gait measures, Dynamic Gait Index (DGI), Dizziness Handicap Inventory (DHI), Patient Specific Functional Scale (PSFS), and a Perceived Outcomes Scale (POS). The P and P+EX groups showed greater improvement on the PSFS and the POS compared to the EX group [5].

POPULATION

Subjects 18 to 75 years old and above were included in this study and the subjects who are having dizziness, and loss of balance. **Comparison:** In this study total 3 groups 1st group was received the The first experimental group received platform tilt interventions only (P group). The second experimental group received the same platform tilt perturbation interventions plus a vestibular rehabilitation home

exercise program (P+EX group). The third group received only a vestibular rehabilitation home exercise program intervention (EX group).

Outcome: Both groups improved significantly in all outcome measures with the exception of perceived disequilibrium. However, there was a significant interaction for fall risk as measured by Dynamic Gait Index ($P = .026$) such that the GS group demonstrated a significantly greater reduction in fall risk compared with the CON group (90% of the GS group demonstrated a clinically significant improvement in fall risk versus 50% of the CON group). **Blinding:** Throughout the study, subjects, therapists, and assessors were not blinded. It is not a significant threat that the therapists or the subjects were not blinded. **Control:** The control group was appropriate for this study, allowing us to assume that differences between groups can be attributed to the interventions. **Randomisation:** The assignment of subjects into three groups was randomized. The randomization was concealed by envelopes and the authors state that it successfully resulted in similar baseline data between the groups. **Outcome measures:** The outcome measure relevant to our Clinical PICO is reduction in dizziness and improving the balance and gait parameters. **Evidence:** The using of International Classification of Function, Dynamic Gait Index, Temporo-spatial Gait Measures, Dizziness Handicap Inventory, Proprio 5000™ Platform tilt perturbation instrument. **Applicability of Study Results:** The financial costs, the therapist's time and the patient's time are all comparable. Three groups received different amounts of intervention and neither group reported adverse events due to treatment. Expenses were high because as they were using the Proprio 5000™ [5]

CONCLUSION

All 3 articles demonstrate that the dizziness is not significantly improved with any specific exercise and the 3 articles recommended, adding different exercise regimen will be beneficial in the treatment of dizziness, and we consider that it is sufficient amount of evidence to develop the multi component exercise program on patients with dizziness.

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Long Term Effectiveness of Ischaemic Compression Technique in Combination with Muscle Energy Technique on Managing Upper Trapezius Myofascial Trigger Point Pain: An Experimental Study

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ABSTRACT

Objective: To establish the best possible long term effective choice of treatment program for deactivating MTrP's by using the combination of ischaemic compression technique with muscle energy technique.

Design: Pretest-Posttest control group design

Patients: Ninety (only male) with Myofascial Trigger Points Pain. Subjects were randomly placed into three groups: Experimental group A (n=30), Experimental group B (n=30) and a Control group C (n=30).

Intervention: The experimental group A received ischaemic compression technique in combination with muscle energy technique and experimental group B received ischaemic compression technique alone whereas control group received conventional treatment only.

Main Outcome Measures: Pain pressure threshold was assessed with the pressure threshold meter. Pain and functional status of the patients were measured by a visual analogue scale and neck disability index scores respectively.

Results: Within group analysis revealed significant improvement in pain pressure threshold, functional status and reduction in pain intensity in all groups. Between group analysis revealed significant difference between group A, group B and group C. Further, bonferroni's post hoc analysis revealed significant difference between group A and B, group A and C and group B and C for all variables even after one week of follow up after the termination of intervention.

Conclusion: The combination of ischaemic compression technique in combination with muscle energy technique has been shown to produce greater improvement in pain pressure threshold on pressure threshold meter, functional status on neck disability index scores and reduction in pain intensity on visual analogue scale even after one week of the termination of intervention. This establishes the long term effectiveness of combination of these two manual techniques on managing upper trapezius myofascial trigger point pain.

Keywords: Myofascial trigger point's pain, Upper trapezius muscle pain, Pain pressure threshold, Pressure threshold meter, ischaemic compression technique, muscle energy technique.

INTRODUCTION

Musculoskeletal disorders are the main cause of disability in the working-age population and are among the leading causes of disability in other age

groups.⁽¹⁾ Myofascial pain syndrome is a common painful muscle disorder caused by myofascial trigger points characterized by painful spot on compression, produces referred pain, referred tenderness, motor dysfunction, and autonomic phenomena.^(3,4)

Trigger points are classified as active or latent, depending on their clinical characteristics.⁽⁵⁾ An active trigger point causes pain at rest. It is tender to palpation with a referred pain pattern that is similar to the patient's pain complaint.⁽⁶⁾ The pain is often described as spreading or radiating.⁽⁷⁾ It differentiates a trigger point from a tender point, which is associated with pain at the site of palpation only.⁽⁸⁾

Occupational or recreational activities that produce repetitive stressor micro tear on a specific muscle or muscle group commonly cause chronic stress in muscle fibers, leading to trigger points. Predisposing activities include holding a telephone receiver between the ear and shoulder to free arms; prolonged bending over a table; sitting in chairs with poor back support, improper height of arm rests or none at all; and moving boxes using improper body mechanics.⁽¹¹⁾ Often, postural muscles like upper trapezius, pelvic girdle muscles, quadratus lumborum etc. are affected.⁽¹²⁾

Among many treatment approaches, Ischaemic compression technique involves applying sustained pressure to the trigger points with sufficient force and for long enough to slow down the blood supply and force the tension out of the muscle.

Muscle Energy Technique is a manual technique developed by osteopaths useful in lengthening of shortened or contracture muscle, strengthening of muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood, and increase the range of motion of a restricted joint. It emphasizes on the relaxation of the contractile component of the muscles.⁽²⁾

Simon and Travell⁽⁹⁾ suggested that a therapeutic approach which effectively deactivates tender points should beneficially influence the other trigger points also. Moreover, Leon Chaitow⁽⁹⁾ suggested that clinical evidence also support this supposition, especially when the positional release method is combined with other approaches such as ischaemic compression, MET, etc. which have good track record in trigger point deactivation. Therefore, Amir et al (2010) and other research associates have worked on long term combined effectiveness of two manual techniques on managing MTrP's pain.

In addition, ischaemic compression technique

used as alone or in combination with strain counter strain have been proven to be effective at short-term as well as long term in the management of myofascial trigger points⁽¹³⁾. However no research till date has been attempted to reveal the combined effectiveness of ischaemic compression technique with muscle energy technique for the complete resolution of MTrP's pain. Therefore the study has been designed to establish the best possible long term effective choice of treatment program for managing MTrP's pain by using the combination of ischaemic compression technique with muscle energy technique.

METHOD

Total 90 male subjects those met the inclusion criteria and found to have clinically active palpable myofascial trigger point pain (MTrPs) in unilateral upper trapezius muscles were recruited from the different hospitals in Arunachal Pradesh. Inclusion criteria was limited to male only having age 19-38 years, maximum 3-5 active MTrPs which when palpated replicated their chief complaints in the upper trapezius muscle (unilateral), subjects didn't receive any treatment for their trigger points before one month prior to the study. Patients were excluded when they had diagnosed case of fibromyalgia syndrome according to American college of Rheumatology (Wolf et al 1990), presented active MTrPs in bilateral Upper trapezius muscles, history of whiplash injury, history of cervical spine surgery, diagnosis of cervical radiculopathy or myelopathy determined by the primary health care physician, had undergone myofascial pain therapy within the past one month before the study, exhibited inadequate co-operation. Sample of convenience was used for the selection of the subject.

STUDY DESIGN

Pretest – Posttest control group design was used in the study. There were three groups each containing 30 subjects.

MEASURING TOOLS

A Thermoregulatory hydrocolator machine was used in this study. Thermostat knob was fixed at 75°C to achieve the therapeutic range of warmth for hot packs. Standardized hot pack was used in this study. Hot pack temperature was maintained at the

75°C, wrapped with 2 towels to keep the temperature for comfortable warmth and applied for 20 minutes over the shoulder as to cover the upper trapezius muscle in supine lying position. Pressure threshold meter, standardized tape measure, treatment plinth and washable marker were used. Outcome measures were pain pressure threshold, visual analogue scale and Neck Disability Index Scores. Manual techniques applied were ischaemic compression technique and muscle energy technique.

PROCEDURE

Prior to participation each subject were required to read and sign an informed consent form. The entire subject who had met the inclusion and exclusion criteria was assigned randomly via chit method to any of the three groups. Pressure Pain Threshold and Visual Analogue Scale scores were taken pre-intervention and after 2 min. of post-intervention at day 1, day 3 and day 5 and one week of follow up after the termination of intervention. Neck Disability Index score assessment were taken but limited to pre intervention at day 1, post intervention at day 5 and one week of follow up (day 12) after the termination of intervention.

MEASUREMENTS

The pressure threshold meter ("WAGNER FORCE DIAL FDK 20" was used in this study, It was used to assess the pain pressure sensitivity of myofascial trigger point pain as suggested by Fischer.¹⁷ The trigger point with lowest pressure pain threshold value was designated the primary trigger point. Subjects were advised that they would feel some pressure over the trigger points and that they should indicate when the sensation changed from one of pressure to one of pain by saying 'there' / 'yes'. Three consecutive measurements were obtained by the same assessor and the mean was considered in further analysis. At least 1 minute elapsed between the 2 consecutive measurements, as suggested by Fischer.⁽¹⁶⁾ After the pre-treatment data of the PPT, a second application of 2.5 kg/cm² of pressure were applied by the physiotherapist. Subjects were told to rate their pain on the VAS, assessing local pain evoked by the application of that amount of pressure. A functional questionnaire "Neck Disability Index" was provided to the subjects to assess their functional

limitations due to myofascial trigger point's pain. The subjects were instructed to take the closest choice to the one which indicated the true subjective assessment of the subject disability for that particular item. The scores for each item were added and final score was calculated for analysis. After pre-treatment measurements, subjects were divided randomly into three groups, using a "Chit Method":

INTERVENTION

All the three groups received the treatment on three alternate days for one week followed by follow up of one week after the termination of treatment. Experimental group A received Hot Packs at 75°C for 20 minutes and Active Stretching exercises (Slow, 5 repetition per session, 10 seconds hold and 10 seconds relaxation between two repetition) followed by Ischaemic compression technique (90 seconds hold) muscle energy technique (5 seconds hold, 3 seconds relax by exhalation while reaching up to new barrier). Experimental group B received all the exercises of group A except ischaemic compression technique only. Control group C received all the exercises of group A except ischaemic compression and muscle energy technique.

ISCHAEMIC COMPRESSION TECHNIQUE

For the ischemic compression technique, the patient was in supine position with the cervical spine in opposite lateral flexion to the treating part so that the upper trapezius muscle fibers was kept in a lengthen position⁽¹⁶⁾. The Physiotherapist applied gradually increasing pressure to the MTrP's until the subject perceived first noticeable pain. At that moment, the pressure was maintained until the discomfort and/or pain eased by around 50%, perceived by the own patient, at which time pressure was increased until discomfort appeared again. This process was maintained for 90 seconds.

MUSCLE ENERGY TECHNIQUE

For the Muscle energy technique the patient will lie supine with cervical spine in opposite lateral flexion to the treating part so that the upper trapezius muscle fibers will be in a lengthen position.¹³ The moderate isometric contraction (approximately 75% Of maximal) of upper trapezius muscles was elicited for a period of 5 Seconds followed by 3 Seconds of

relaxation while reaching to the new barrier. The technique was repeated four times in each session. For Active Stretching, subject was seated on a full back supported chair without arm rest and perform the maneuver under the supervision of the therapist.

DATA ANALYSIS

Statistical analysis was done using SPSS 17.0 Software. Repeated measure ANOVA was used for within group analysis and one way ANOVA was used for between group analysis for all the variables. The outcomes measures were PPT, VAS and NDI scores.

RESULTS

Results of statistical analysis of outcome measures are described below.

Table 1: Between group post hoc Bonferroni analysis for PPT

	PPT 0 'p'	PPT 1 'p'	PPT 3 'p'	PPT 5 'p'	PPT 12 'p'
Group A Vs Group B	1.000	0.103	.000	.000	.000
Group B Vs Group C	1.000	.297	.005	.000	.000
Group A Vs Group C	1.000	.001	.000	.000	.000

Table 2: Between group post hoc Bonferroni analysis for VAS

	VAS 0 'p'	VAS 1 'p'	VAS 3 'p'	VAS 5 'p'	VAS 12 'p'
Group A Vs Group B	1.000	.048	.000	.023	.000
Group B Vs Group C	1.000	.736	.001	.000	.000
Group A Vs Group C	1.000	.002	.000	.000	.000

Table 3: Between group post hoc Bonferroni analysis for NDI

Variables	NDI 0 'p'	NDI 5 'p'	NDI 12 'p'
Group A Vs Group B	1.000	0.005	.001
Group B Vs Group C	1.000	.006	.004
Group A Vs Group C	1.000	.000	.000

Within group: All the three group showed the significant improvement for all variables at day 1 postintervention and final day 5 postintervention when compared with their respective baseline. Only group C showed insignificant improvement after one week of follow up when compared with their baseline value.

Between group analysis revealed significant difference between group A, group B and group C. Further post hoc analysis revealed significant difference between group A and B, group A and C and group B and C for all variables even after one week of follow up after the termination of intervention. Further details are given in following tables:

DISCUSSION

The study was designed to find out the efficacy of ischaemic compression technique in combination with muscle energy technique on managing upper trapezius myofascial trigger point's pain. The inter group comparison of the study reveal that MTrP's pain sensitivity was significantly reduced when ischaemic compression technique was combined with muscle energy technique than ischaemic compression technique alone.

The results of this study can be discussed with the previous studies done by Hong et al., 1993; Hanten et al 2000;

Freyer and Hodgson, 2005; (Jones, 1981; Chaitow, 2001). The results obtained by these authors are similar to those obtained in this present study for ischaemic compression technique and muscle energy techniques in the management of myofascial trigger point pain.

Hong et al. (1993) concluded that the best results in decreasing pain from MTrP's were obtained with deep soft tissue compression techniques when compared to conventional massage.

In another study by Hanten et al. (2000), the effectiveness of a home program involving ischemic compression followed by sustained stretching over active MTrPs was examined. The results of their study clearly revealed that the combination of these techniques was more effective in reducing tenderness from MTrPs.

Fryer and Hodgson (2005) have concluded that the ischemic compression technique was better than sham myofascial technique in reducing tenderness on latent MTrPs in the upper trapezius muscle.

The above studies explained that ischemic compression technique may bring analgesia and increase pressure pain threshold by following mechanism.

Pain relief from pressure treatment may result from reactive hyperemia in the MTrP's region, or a spinal reflex mechanism for the relief of muscle spasm.⁽¹⁹⁾

Local pressure may equalize the length of

sarcomeres in the involved MTrP's and consequently decrease pain.⁽¹⁷⁾

Deep pressure could offer effective stretching and mobilization of the taut bands.⁽¹⁴⁾

Fryer and Hodgson (2005), who recently demonstrated that, decreased local MTrP's tenderness was due to a change in tissue sensitivity rather than any unintentional release of pressure by the practitioner.⁽¹⁰⁾

The ischemic compression technique can also be explained by the concept of the "barrier release" proposed by Lewit (1991) in which the therapist gradually applies pressure to the MTrP's until a definitive increase in resistance is perceived, i.e. the barrier, which is usually perceived as not being painful by the subject.⁽¹⁹⁾

Hence it can be concluded that ischemic compression techniques might be helpful in reducing pain, increasing pain pressure threshold and in turn improving functional status in subjects with myofascial trigger points.

The mechanism relief of pain and increased pain pressure threshold by muscle energy technique is also thought to achieve its benefits by means of lengthening of muscle fibers which would help to dictate the length to the affected soft tissues⁽¹⁰⁾. Lewit and Simons demonstrated that "muscle lengthening" utilizing post-isometric relaxation appears to be effective in reducing trigger point sensitivity and pain intensity, without the use of vapocoolant spray⁽²⁰⁾. Finally, there is emerging evidence supporting the activation of agonist-antagonist inhibitory pathways with the application of manual interventions (Ferna'ndez-de-las-Pen~as et al., 2007; Skyba et al., 2003). Hence, different mechanisms would probably act at the same time.

The improvement in the control group is attributed to the effects caused by stretching and hot packs. Stretching of the affected muscle is believed to be an integral part of trigger point therapy. Lewit and Simons demonstrated that "muscle lengthening" utilizing post-isometric relaxation appears to be effective in reducing trigger point sensitivity and pain intensity, without the use of vapocoolant spray⁽²⁰⁾. Jaeger and Reeves (1986),

who reported the effectiveness of spray and stretch in decreasing pain intensity and increasing pressure pain threshold, indicated that vapocoolant spray could not produce anesthesia in the subcutaneous tissues or muscle because of the depth of the tissue. They suggested, therefore, that it is the stretch that resulted in the decrease in trigger point sensitivity, not the spray. Their study supports the idea that muscle lengthening is the process that provides pain relief ⁽¹⁸⁾. Travell and Simons also argued that the mechanism of relief in spray and stretch is the stretch. They hypothesized that decreasing MTrPs pain utilizing spray and stretch is due to the elongation of the muscle to its full normal length. ⁽¹²⁾ Moist heat tend to relax the underlying muscles and to diminish the tension on the TrPs, thereby reducing referred pain and local tenderness to pressure ⁽¹²⁾. The patient's passive or active stretch exercises at home are more effective performed during or immediately after the application of moist heat ⁽¹²⁾.

Since, the group A received all the techniques such as ischaemic compression and muscle energy technique, so the higher gain in pain relief and increase pain pressure threshold may be attributed to the above mechanism explained and supported by different previous studies. ^(12, 13, 14, 17, 18, 20)

The result of the study showed that application of ischaemic compression technique along with muscle energy technique is the most beneficial, result oriented method in managing upper trapezius myofascial trigger point pain, though the muscle energy technique and Active stretching exercises have also found to be effective.

CONCLUSION

Therefore this study is concluded by rejecting the "Null Hypothesis" that Ischaemic compression technique in combination with muscle energy technique is as effective as ischaemic compression technique alone in managing upper trapezius myofascial trigger point pain and accepting the "Experimental Hypothesis" that ischaemic compression technique in combination with muscle energy technique is more effective than ischaemic compression technique alone in deactivating upper trapezius myofascial trigger point pain. Its long term effects established this combination technique

as a complete choice of treatment to deactivate the MTrP's pain. Clinical relevance to the practice is that it is highly effective in deactivating the MTrPs within a very short span of period, cost effective as well as non-invasive therapy, requires minimum time to get relieve without causing much pain.

This study was limited to subjects of a confined area, only male subjects as it was cultural unsuitable to expose the treatment area for women, lack of definitive amount of muscle contraction, stretch and pressure that is required to apply to deactivate the MTrP's.

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Role of Kinesio Taping in Trunk Stability in Patient with Chronic Low Back Pain

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Abstract

Objectives: The purpose of this study was to investigate the role of Kinesio Taping in patient with chronic low back pain.

Design: Pretest-posttest Experimental – control group design.

Methods: 90 subjects were randomly assigned into two groups. Experimental group received trunk stabilization exercise along with the kinesio taping whereas control group received trunk stabilization exercise without kinesio taping. Transverse abdominis activation capacity, Pain and functional disability were measured at 0 week, 2nd week, 4th week, 6th week and 8th week.

Results: Trunk stabilization exercise along with Kinesio Taping significantly improves the transverse abdominis activation capacity, reduces pain and functional disability.

Conclusion: from the result we may conclude that trunk stabilization exercise along with the Kinesio Taping is more effective than trunk stabilization exercise without Kinesio Taping in rehabilitation of patient with chronic low back pain.

Keywords: Trunk stabilization exercise, Kinesio Taping, transverse abdominis activation capacity, Pain.

INTRODUCTION

Low back pain (LBP) is a common problem affecting both genders and most ages, for which about one in four adults seeks care in a six-month period⁽¹⁾. LBP is closely related to functional disability of the trunk muscles, such as the back extensor and abdominal muscles ^(2,3,4). The deep abdominals, in particular the transversus abdominis (TA) are primarily involved in the maintenance of intra abdominal pressure, while imparting tension to the lumbar vertebrae through the thoracolumbar fascia. It is considered that the role of the deep abdominal muscle contraction in co contraction with the lumbar multifidus (LM) is to provide the stiffening effect on the lumbar spine through its attachment to the thoracolumbar fascia, in conjunction with the increased in the intra abdominal pressure⁽⁶⁾.

The trunk muscles are vital to the maintenance of the spinal stability ^(5, 6). The spinal column is

unable to carry normal physiological loads without the support of trunk muscles⁽⁷⁾. Such functions of the trunk muscles such as strength, endurance, and coordination provide this stability.

There are various treatment techniques available in treating low back pain. One interesting and relatively new method for treating musculoskeletal conditions is the application of Kinesio Taping (KT) ^(8, 9, 10). KT was conceived to be therapeutic and, according to its creators, yields the following results: 1) it corrects muscle function by strengthening weak muscles; 2) it improves blood and lymph circulation by eliminating tissue fluid or bleeding beneath the skin through muscle movement; 3) it reduces pain through neurological suppression; 4) it corrects misaligned joints by retrieving muscle spasm.

When applied to the patient's trunk, KT increases active lumbar flexion. We hypothesized that the application of KT on the lumbar paraspinal muscles

of CLBP patients interferes with muscle function, thereby influencing back pain.

Lumbar stabilization exercises are currently popular interventions for patients with chronic low back pain. Stabilization exercises have typically been prescribed for patients with 'spinal instability.'

Substantial number of researches had proved the effectiveness of kinesio taping and trunk stabilization training in management of low back pain separately.

So, far no previous study had been done on specific topic, thus it inspired me to look deeper in to various aspect of the utility of combination of kinesio taping and stabilization exercises in reducing pain and functional disability and improving transverse abdominis activation capacity in patient with chronic low back pain.

I focus my study to evaluate the effectiveness of Kinesio Taping as add on therapy, thereby to standard stabilization training in increasing the stability of trunk muscles in chronic low back pain.

METHOD

90 subjects were randomly assigned into two groups. Experimental group received trunk stabilization exercise along with the Kinesio Taping whereas control group received trunk stabilization exercise without Kinesio Taping. The criteria for inclusion were Gender –Male, age 30- 40 years, Subject to low back pain as a primary complaint, due to mechanical cause, Low Back Pain of more than 3 months. Subjects were excluded if they are diagnosed as having a tumor, infection, or inflammatory disease affecting the spine, have spinal or lower limb surgery, have spinal fractures or structural deformities such as spondylolisthesis, have contradictions to exercise therapy) e.g.: uncontrolled hypertension, previous myocardial infarction, cerebro vascular disease, peripheral vascular disease, respiratory disorder), have sign of nerve root compression, defined as decreased tendon reflexes, sensory loss and motor deficits, Severe osteoporosis, Lumbar canal stenosis, acute disc herniation, and Lack of motivation.

Study design:

A different subject pretest-posttest experimental

group design was selected for testing the hypothesis. Data were collected pre intervention at 0 week, and post intervention on 2nd, 4th, 6th and 8th week. The outcome measure selected for this study was transverse abdominis activation capacity, functional disability and pain.

PROCEDURE

The Subjects were screened first according to inclusion and exclusion criteria. All the subjects who met the inclusion criteria were included in the study. Prior to participation all subjects were given consent form. On the basis of the inclusion criteria mentioned above the subjects were randomly allocated to group A and group B, and their baseline measurement were carried out for pain by VAS, transverse abdominis activation capacity by pressure biofeedback and functional disability by modified oswestry disability questionnaire.

Group A: Experimental group (trunk stabilization exercises with Kinesio Taping)

Group B: Control group (trunk stabilization exercises without Kinesio Taping)

INTERVENTION

Interventions were conducted over 8 weeks, twice a week, each session lasting 40 minutes. Sessions was supervised by the investigator, and participants were instructed to report any adverse event, whether it was related to the exercises or not. Participants were instructed not to participate in any other physical program during the study and not to exercise while at home.

Warm up exercise component:

Aerobic work: exercise bicycle for 5 minutes at moderate pace.

Stretching exercises:

Back stretches:

Leg stretches: hip flexor, hamstring, calf, adductor stretch.

Kinesio Taping:

Three 20 cm x 5 cm stripes of Kinsio tape were applied over the lumbar spinal tract between the

spinous process of the T12 and L5 vertebrae. One stripe was placed over the midline, along a line corresponding to the spinous processes. Two stripes were placed on the right and left erector spinae muscles, 4 cm from the first stripe. Subjects were asked to bend forward during the taping procedure; no tension was used other than that required to cover the back in the bending position. The KT was changed every week.

For Group A: After the application of Kinesio Tape the exercise performed in stage 1 as given below:

1. Subjects lifted the gym ball up and held it between their legs with both knees flexed in supine position.
2. Subjects lifted the pelvis up to the bridged position and held it, while supporting themselves with both legs on the gym ball and with the knees extended in supine position.
3. Subjects placed both the hand on the gym ball and their knees flexed on the floor, maintaining four-point kneeling position.
4. Subjects control sitting posture on the gym ball.
5. Subjects did a curl-up on the gym ball in half sitting position.
6. Subjects lifted the body up to the push up position and held it, while supporting themselves with both legs on the gym ball and hands on the floor in prone position.

Stage 2 of the exercise program involved increasing the complexity of the exercise by progressing and exercises targeting coordination of trunk and limb movement, maintenance of optimal trunk stability, and improvement of posture and movement patterns.

7. Subjects lifted the gym ball up and held it between their legs with knee extended in supine position.

8. Subjects lifted the pelvis up to the bridged position and held it, while supporting their head on the gym ball and with their feet on the floor, with both knees flexed in supine position.

9. Subjects in four-point kneeling position with

one arm and leg in extension.

10. Subjects control sitting posture on the gym ball while rhythmically extending alternate legs.

11. Subjects did a curl-up on the gym ball in half sitting position while one leg extended.

12. Subjects lifted the body up to the push up position and held it, while supporting themselves with their hand on the gym ball and their toes on the floor in prone position.

For each exercise subjects perform 10 repetitions in that 10 second holds and 5 second rest in between the repetition.

Patient was given 1 to 2 minute rest in between each type of exercise.

Group B: - The same exercise was performed without Kinesio Taping.

DATA ANALYSIS

Statistical analysis was performed by using SPSS 16 version software. Repeated measure ANOVA (multivariate test) was done to find differences within group A and B for all variables i.e. VAS, transverse abdominis activation capacity and functional disability. Post hoc Bonferroni analysis was done to find pair wise differences. Independent (2 tailed) T test was done to compare difference for all variables.

The alpha (probability) level has been taken as 0.05

RESULT

Transverse Abdominis Activation Capacity:

Within Group analysis

Transverse Abdominis Activation Capacity was significantly improved at the end of the second week in both the groups, ($p=0.00$) which was maintained till end of treatment ($p=0.00$) in both the groups \

Between Group analysis

Transverse abdominis activation capacity was significantly improved in Group A as compared to Group B at end of 2nd week ($p=0.53$), 4th week ($p=0.07$), 6th week ($p=0.01$) and the end of 8th week ($p=0.00$)

Pain:**Within group analysis**

VAS score was significantly decreased at the end of the second week in both the groups, ($p=0.00$) which was maintained till end of treatment ($p=0.00$) in both the groups.

Between group analysis

Pain was significantly reduce in Group A as compared to Group B at end of 2nd week ($p=0.467$), 4th week ($p=0.354$), 6th week ($p=0.244$) and the end of 8th week ($p=0.00$)

Functional Disability:**Within group analysis**

Modified oswestry disability score was significantly decreased at the end of the second week in both the groups, ($p=0.00$) which was maintained till end of treatment ($p=0.00$) in both the groups.

Between group analysis

Modified oswestry disability score was significantly reduce in Group A as compared to Group B at end of 2nd week ($p=0.85$), 4th week ($p=0.18$), 6th week ($p=0.00$) and the end of 8th week ($p=0.00$).

Tab1: Between groups comparison of VAS

Variables	Group A	Group B	Mean difference	t value	p value
V0	5.62±0.96	5.57±0.72	0.044	.248	0.805
V2	4.53±0.94	4.40±0.78	0.133	.730	0.467
V4	3.02±1.09	3.20±0.66	0.177	.931	0.354
V6	1.44±1.05	1.66±0.707	0.222	1.17	0.244
V8	.488±0.69	1.06±0.68	0.577	3.96	0.000

Tab:2 Between groups comparison of transverse abdominis activation capacity

Variables	Group A	Group B	Mean difference	t value	p value
TAC0	17.69±2.32	17.59±2.49	0.09	0.19	0.85
TAC2	23.03±2.58	22.68±2.69	0.34	0.62	0.53
TAC4	28.21±1.68	27.41±2.48	0.80	1.78	0.07
TAC6	32.78±2.01	31.09±2.64	1.68	3.39	0.01
TAC8	35.09±1.31	33.60±2.20	1.49	3.90	0.00

Tab:3 Between group comparison of modified oswestry score

Variables	Group A	Group B	Mean difference	t value	p value
MODQ0	32.00±5.02	32.04±4.73	0.04	0.04	0.96
MODQ2	24.66±7.21	24.40±6.09	0.26	0.18	0.85
MODQ4	17.55±6.76	19.33±5.65	1.77	1.35	0.18
MODQ6	7.28±5.27	12.93±4.42	5.64	5.4	0.00
MODQ8	2.66±3.04	6.80±3.44	4.13	6.02	0.00

DISCUSSION

The result of study demonstrated that a combination of Kinesio Taping and trunk stabilization exercise brought greater gains in all outcome

measures, including transverse abdominis activation capacity, pain intensity and modified oswestry score.

Transeverse Abdominis Activation capacity

The analysis showed that the eight weeks of

intervention showed significant improvement in transeverse abdominis activation capacity in both the groups. The improvement was showed in both groups at the end of 2nd week after intervention, which was maintained till the end of 8th week. The experimental group shows more improvement than control group which was statistically significant.

Within Group, Improvement in transverse abdominis activation capacity

According to Kines and Holluszy et al (1994), the effect of exercise induces adaptation in skeletal muscle. Evidence suggested that there is increased in capillary density in all type of muscle fibres^(14,15) and increased oxidative capacity of muscle fibres⁽¹⁵⁾. The benefit of increased capillary density included red blood cells transit time, decrease diffusion distance and improved blood distribution in the muscles. Increase capillary density and enhanced oxygen unloading result in increased VO₂ diffusion. Further studies done by Laughlin et al (1999), Svedenhag (2008) states that exercise leads to increase in cardiovascular responses, they showed increased in VO₂ max by 7%.⁽¹³⁾ Hill and Lupton suggested that VO₂ max was higher in endurance trained people.⁽¹⁶⁾ Mole, Holloszy et al revealed that muscle mitochondria undergoes major adaptive changes in response to exercise and they increased respiratory control, hypermia, oxidative phosphorylation and more ATP production,⁽¹⁵⁾ so that the supply of energy is for longer duration which could lead to enhancement of transeverse abdominis activation capacity.

Kines et al revealed that exercise leads to increase in fat utilization and transport capacity in exercise muscle and supply adequate oxygen and nutrient to working muscle. Increase in fat oxidation improves the transeverse abdominis activation capacity as study done by Coggan and Williams (1995). Grieves et al (2000) showed that exercises leads to increase in major glucose transporter (GLUT-4) and lipoprotein lipase (LPL) in skeletal muscles, these GLUT-4 and LPL act as source of energy fuel.^(17,18) This can leads to increase in blood flow and help in the reduction of lactate level. This can leads to reduction in muscle fatigue and hence improve transeverse abdominis activation capacity and muscle work.

Between Group, improvement of Transverse Abdominis Activation Capacity

The data showed that eight weeks of training period brought significant improvement of transeverse abdominis activation capacity in experimental group was greater than those of control group at the end of training period. Some studies have suggested that keratinocytes may represents the non-neuronal primary transducers of mechanical stimuli,^(19,20) probably through signal transduction cascade mechanisms such as intracellular Ca²⁺ fluxes to evoke a response in adjacent C-fibers. One appealing hypothesis is that the cutaneous stretch stimulation provided by KT may interfere with the transmission of mechanical and painful stimuli. Moreover, KT may provide afferent stimuli, thereby facilitating pain inhibitory mechanisms (Gate control theory) and pain reduction. Lumbar muscle activities, however significantly associated with pain related fear in persons with chronic low back pain⁽¹³⁾. However one study revealed that application of KT reduces the pain related fear in person with chronic low back pain; thereby improve the function of lumbar muscles. Sensory stimulation provided by KT may also represent a dynamic stabilization system of lumbar joints in a flexed position, which may help to reflexogenically inhibit muscle activity^(14,15).

Ogura 1998; Murray 2005), have suggested that KT increases blood circulation in the taped area, and this physiological change may affect the muscle and myofascial functions after the application of kinesio tape.

An additional theory is that KT stimulates cutaneous mechanoreceptors at the taped area, and this stimulation may affect the ROM (Garcia 2001;). Cutaneous mechanoreceptors activate nerve impulses when mechanical loads create deformation. The activation of cutaneous mechanoreceptors by an adequate stimulus causes local depolarizations that trigger nerve impulses along the afferent fiber traveling toward the central nervous system.

Murray and Husk have demonstrated that with the help of proprioceptive cues, subjects could control the recruitment as well as the frequency of discharge of motor units.¹⁰ in terms of the present study, one might hypothesize that the proprioceptive and

sensory cues from the kinesio tape enabled Group A to consciously and precisely control the exercise at submaximal threshold level. Therefore increase firing rate of small motor units, or the frequency of discharge of the active motor neurons. Therefore, one could hypothesize from this work that because more fibres were firing and possibly faster rate, Group A produced greater gains in transverse abdominis activation capacity.

Reduction in Pain intensity and functional disability

The data revealed that 8th weeks intervention brought significant reduction in pain and functional disability in both the groups. The reduction in pain was showed in both the group at the end of 2nd week which was maintained till the end of the 8th week. The experimental group shows more improvement than control group which was statistically significant. The reduction in disability was showed in both the group at the end of 2nd week which was maintained till the end of the 8th week. The experimental group shows more improvement than control group which was statistically significant.

Kinesio taping method theory suggests that muscles are not only responsible for movements of the body, but also help manage the circulation of the venous and lymphatic systems. The main goal for the use of kinesio tape is to decrease pain and increase tissue healing associated with the musculoskeletal injuries and illnesses. Theoretically, kinesio tape may provide therapeutic benefits in one of many ways: increasing interstitial fluids between skin and underlying connective tissues, allowing increase in circulation for both venous and lymphatic fluid, decreasing pain with positional stimulus to the skin, muscle, or fascial structures, and by enhancing joint stability. One specific theory states that kinesio tape increases metabolic activity because fibroblasts are recruited to the injured area, which results in collagen synthesis and increases the healing process. The tape itself aids in promoting normal muscular movement and aids in the realignment of collagen synthesis during the repair and remodeling phases of the healing process.

A possible explanation for this improvement may be due to Kinesio Taping can make the patient feel

more in control of the experienced pain, since there appears to be a way to influence and thus reduce pain levels. Thus, Kinesio Tape promotes active participation and motivates the patient, which is arguably the most critical element for reduction in pain and disability. This significant improvement in both the groups may be attributed to improvement in transverse abdominis activation capacity and thereby by spinal instability which leads to reduction in pain and disability.

The findings are consistent with previous investigators who have reported that Kinesio Taping could be a useful alternative for musculoskeletal pain.

Thus these results show the effectiveness of Kinesio Taping in the reduction of pain and improvement of function, possibly provided by its positive effect on transverse abdominis activation capacity. Our results are consistent with other results in the literature, indicating that Kinesio Taping is very effective in improving transverse abdominis activation capacity.

CONCLUSION

From the result we can concluded that the addition of Kinesio Taping to trunk stabilization exercise programme has shown greater gains in transverse abdominis activation capacity, reduction of pain intensity and functional disability. Future research is needed to look for long term follow-ups.

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