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ABSTRACT

Purpose of study: To find out the effectiveness of myofascial release in treatment of plantar fasciitis.

Materials and Methods: 30 subjects with the clinical diagnosis of chronic plantar fasciitis were randomly allocated to two study groups. Group A (control) received therapeutic ultrasound (1 MHz, 1 Watt/cm², pulsed mode 1:4,5 minutes), contrast bath for 20 minutes, foot intrinsic muscles strengthening exercises, plantar fascia stretching exercises and group B (experimental) received conventional treatment as group A added with myofascial release for 15 minutes for 10 consecutive days. The outcome was assessed in terms of VAS and Foot Function Index.

Results: In this study we found that there was significant change in pain relief as per the VAS score (p=0.000) and functional ability as per Foot Function Index (p= 0.024).

Conclusion: It is concluded that myofascial release is an effective therapeutic option in the treatment of plantar fasciitis.

Key Words: Plantar fasciitis, myofascial release.

INTRODUCTION

Plantar fasciitis is the most common cause of inferior heel pain. The word — “fasciitis” assumes inflammation is an inherent component of this condition. It is typically precipitated by biomechanical stress.

Plantar fascia is plantar aponeurosis, lies superficial to the muscles of the plantar surface of the foot. Plantar fascia has a thick central part which covers the central muscle of the 1st layer, flexor digitorum brevis and is immediately deep to the superficial fascia of the plantar surface. It acts as a truss, maintaining the medial longitudinal arch of the foot, and assists during the gait cycle and facilitates shock absorption during weight bearing activities. Plantar fasciitis has been reported across a wide sample of the community. In the non athletic population, it is most frequently seen in weight bearing occupations. 65% of non sports demographics are overweight, with unilateral involvement most common in 70% of cases. Second major distribution of plantar fasciitis is in the athletic population, 10% of all running athletes. Basketball, tennis, football, long distance runner and dance have all noted high frequency of plantar fasciitis.

The classic presentation of plantar fascia is pain on the sole of foot at the inferior region of the heel. Patient report the pain to be particularly bad with the first step taken on rising in the morning or after an extended refrain from weight bearing activity. After few steps and through the course of the day, the heel pain diminishes, but returns if intense or prolonged weight bearing activity is undertaken. Initial reports of heel pain may be diffuse or migratory; with time it usually focuses around the area of the medial calcaneal tuberosity. Generally, pain is most significant when weight bearing activities are involved.

Various physiotherapy treatment protocols have been advocated in the past such as rest, taping, orthosis- night splint, Silicon heel cups, stretching and myofascial release. Electrotherapy modalities in the form of ultrasound, phonophoresis, laser, microwave diathermy, iontophoresis, cryotherapy, contrast bath have been given in past. Myofascial release has been one of the physical therapy treatments given in the chronic conditions that causes tightness and restriction in soft tissues.
tissues (e.g.: fibromyalgia and post polio syndrome), asymmetrical muscle weakness due to peripheral neuropathy and in inflexible rib cage due to chronic respiratory disease and also in plantar fasciitis.

Myofascial release is a soft tissue mobilization technique. If the condition is treated in the acute stage, then symptoms will be aggravated. If treated in the chronic stage, the symptoms will alleviate. Myofascial release techniques stem from the foundation that fascia, a connective tissue found throughout the body, reorganizes itself in response to physical stress and thickness along the lines of tension. By myofascial release there is a change in the viscosity of the ground substance to a more fluid state which eliminates the fascia’s excessive pressure on the pain sensitive structure and restores proper alignment. Hence this technique is proposed to act as a catalyst in the resolution of plantar fasciitis.

The present study was undertaken with the intention to find out the effectiveness of myofascial release in plantar fasciitis, in conjunction with conventional treatment and to compare the effectiveness of MFR over conventional treatment.

**METHODOLOGY**

The study was carried out in patients referred to Physiotherapy department of K.L.E.’s Hospital and Research Center, Belgaum, for treatment of plantar fasciitis. It was a randomized controlled trial study. Consent to carry out the study was granted by the Institutional ethical clearance committee. Both male and female (30 subjects) individuals suffering with heel pain and clinically diagnosed plantar fasciitis since 6 weeks referred to physiotherapy department and willing to take treatment for 10 successive days, were enrolled for that study.

**INCLUSION CRITERIA**

Subjects were selected for the study if they fulfilled the following criteria:

a) Clinically diagnosed cases of plantar fasciitis not less than 6 weeks.

b) Those who were willing to precipitate in the study and willing to take treatment for 10 successive days.

c) Heel pain felt maximally over plantar aspect of heel

d) Pain in the heel on the first step in the morning

e) No history of rest pain in heel

**EXCLUSION CRITERIA**

a) Subjects with clinical disorder where therapeutic ultrasound is contraindicated such as infective conditions of foot, tumor, calcaneal fracture, metal implant around ankle.

b) Subjects with clinical disorder where myofascial release is contraindicated as dermatitis.

c) Subjects with impaired circulation to lower extremities

d) Subjects with referred pain due to sciatica and other neurological disorders.

e) Arthritis

f) Corticosteroids injection in heel preceding 3 months

Subjects selected for the study were randomly allocated to 2 groups - group A (Control group) and group B (Experimental group). For this purpose randomization is done by allocating subjects with odd number to control group and even number to experimental group. Then examination for sensory impairment by Semmes-Weinstein monofilaments, foot deformity, type of foot, Achilles tendon tightness, peripheral pulsations, foot wears. This was followed by objective assessment of the involved foot for tenderness, temperature, and swelling, pain on plantar fascia stretch and pain intensity in terms of the Visual Analog Scale (VAS). In addition to this functional assessment based on Foot Function Index was carried out. After this participants were randomly allocated to two groups, group A and group B.

**Group A (control group):** Participants were treated with

a. Ultrasound with the output of 1W/cm² for 5 minutes using a pulsed mode 1: 4 ratio with
frequency of 1MHz for 10 sittings for 10 consecutive days.

b. Contrast bath was given for 20 minutes for 10 days.5

c. Exercises for intrinsic muscles strengthening -

1. Towel curl up
   For towel curl ups participants sat with foot flat on the end of towel placed on a smooth surface small weight is kept at the other end of towel. Keeping the heel on the floor, the towel was pulled towards the body by curling the towel with the toes, for 10 minutes.

2. Active ankle exercises
   For active ankle exercises - dorsiflexion, plantar flexion, inversion and eversion in supine lying 10 times.

3. TA stretching
   Active tendon Achilles stretching in standing by leaning against the wall, holding each stretch for 1 minute and repeating 5 times each session.

4. Plantar fascia stretching with tennis ball.
   Subject sitting on the chair rolling foot on the ball for 5 minutes.6,7

**Group B (experimental group):** Subjects received conventional treatment as group A added with myofascial release by using thumb, plantar cupping and fingers technique for 15 minutes.

All the subjects were advised to use soft heel foot wear, not to stand for long time and not to walk bare foot. Participants were instructed not to do any stretching exercises at home.

Outcome was assessed, at the end of 10th day of intervention, based on Foot Function Index and pain on VAS.

**RESULTS**

The results of this study were analyzed in terms of pain relief by VAS and functional ability by FFI.

**STATISTICAL ANALYSIS:**

Statistical analysis was done by the GraphPad Prism software 4 version and also manually which was done to cross check the outcomes. Statistical measures such as unpaired”t’ test and Mann Whitney U test were used to analyze the data. The results were considered statistical significant with p < 0.05.

Unpaired”t’ test was used to compare the difference of FFI scores on 1st and 10th day. Mann Whitney U test was used to compare the difference of VAS on 1st and 10th day.

**DEMOGRAPHIC AND ANTHROPOMETRIC PROFILE:**

Thirty subjects were studied and out of which fifteen were male and fifteen were female. Experimental group consisted of nine male and six female. Control group consisted of six male and nine female. (Table No. I)

**AGE:**

The average age of subjects in experimental group was 42.46 years ± 10.26 and in control group was 43.73 years ± 9.88. (t = 0.344, p = 0.733, df = 28). (Table II, III)

**HEIGHT:**

The average height of subjects in experimental group was 1.59 mts ± 0.065 and in control group was 1.57 mts ± 0.091. (t = 0.690, p = 0.496, df = 28). (Table II, III)

**BODY WEIGHT:**

The average body weight of subjects in experimental group was 61.6 kgs ± 8.69 and in control group was 65.8 ±11.63. (t = 1.119, p = 0.272, df = 28) (Table II, III)

**BODY MASS INDEX:**

The average BMI of subjects in experimental group was 24.22 kgs/m² ± 2.38 and of subjects in control group was 26.36 kgs/m² ± 3.95. (t = 1.792, p = 0.084, df = 28) (Table II, III)

**VISUAL ANALOGUE SCALE**

The average VAS score for experimental group on 1st day was 8.8 ±0.94 and on 10th day was 1.6 ±0.73
The average VAS score for control group on 1st day was 8 ± 1.13 and on 10th day was 3.67 ± 1.49.

The p value for VAS on 1st day for both groups was 0.074 and on 10th day was 0.000, which showed a statistical significant difference between 1st and 10th day score. (Table IV)

FOOT FUNCTION INDEX

The average FFI for experimental group on day 1st was 69.4 % ± 12.33 and on day 10th was 16.20 % ± 3.89.

The average score for control group on day 1st was 46 % ± 19.39 and on day 10th was 19.80 % ± 4.36.

The p value for FFI of both groups on day 1st was 0.000 and on 10th day 0.024, which showed a statistical significant difference between 1st and 10th day score. (Table V)

Table I: SEX DISTRIBUTION:

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<td>Total</td>
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Table II: DEMOGRAPHIC PROFILE

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<tr>
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<td>61.6 8.69</td>
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<td>Control</td>
<td>43.73 9.88</td>
<td>1.57 0.091</td>
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Table III: t and p values

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Table IV: Pain relief (Mean change in VAS score)

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<th>Day 10th</th>
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<td>8.8±0.94</td>
<td>1.6±0.73</td>
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<tr>
<td>Control</td>
<td>8±1.13</td>
<td>3.67±1.49</td>
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<td>Mann-Whitney U test (p)</td>
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Table V: Foot Function Index (FFI scores)

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<td>Experimental</td>
<td>69.4±12.33</td>
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<td>p</td>
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DISCUSSION

Plantar fasciitis is one of the conditions, which can be treated by a wide variety of physiotherapy methods. It is still difficult to formulate all proof guidelines for the management of plantar fasciitis. Various methods of treatment exist with own claims of success without any attempts of comparing the maximal effective methods. The objective of this study was to find out the effectiveness of myofascial release in treatment of plantar fasciitis.

In the present study, age group participated was between 28 to 62 years. The majority of patients afflicted with plantar fasciitis are 40 to 60 years of age, although the range has been reported to be 8 to 80 years of age. It has been reported that subcalcaneal pain is a common orthopaedic problem that generally occurs in person 30 to 70 years of age. Body mass index of the subjects has been assessed for both groups and mean BMI was found which were 24.22 kgs/m² for experimental group and 26.36 kgs/m² for control group. According to WHO standard ideal BMI is in range of 18.5 - 24.9.

One of the risk factor for plantar fasciitis is sudden gain in body weight or obesity. In this study experimental group subjects were within range and control group subjects were overweight.

Analysis of pain relief was done by subjective VAS by statistical mean. Mean and standard deviation of pain in terms of VAS was done and found that the average of VAS score for experimental group on 1st day was 8.8±0.94 and on 10th day was 1.6±0.73. The average VAS score for control group on 1st day was 8±1.13 and on 10th day was 3.67±1.49. The p value for VAS of both groups on 1st day was 0.074 and on 10th day was 0.000, which showed a statistical significant difference between 1st and 10th day score.

Functional assessment was done by using foot function index. Foot Function Index (FFI) was designed to measure the impact of foot pathology on function in terms of pain, disability and activity restriction in a rheumatoid arthritis population. During its validation it was examined for test retest reliability, internal consistency, and criterion validity. It has good test retest reliability (intraclass correlation coefficient ranging from 0.69 to 0.87) and a high degree of internal consistency (Cronbach’s ± ranging from 0.73 to 0.95). The Foot Function Index was originally developed to assess the effect of foot orthoses on foot pathology in people with rheumatoid arthritis, however its developers suggest its use need not be restricted to this group. In fact, few studies have used the FFI in research unrelated to rheumatoid arthritis; although in each study the authors changed the questionnaire in some way without investigating the effect on validity or reliability.

In this study average FFI for experimental group on day 1st was 69.4 % ± 12.33 and on day 10th was 16.20 % ± 3.89. The average score for control group on day 1st was 46 % ± 19.39 and on day 10th was 19.80 % ± 4.36. The p value for FFI of both groups on day 1st was 0.000 and on 10th day was 0.024, which showed a statistical significant difference between 1st and 10th day score. FFI was used because it includes all the activities which are part of our daily normal function. Since majority of subjects who participated in this study were house wives and from other occupations which needs prolong standing for their work for their work.

In this study both groups received therapeutic ultrasound as apart of conventional treatment for plantar fasciitis. According to a study performed by Hana Hronkova in 2000 in which the group which received ultrasound for plantar fasciitis showed significant reduction in pain.

In contrast, study done by Crawford F, et al in 1996 therapeutic ultrasound was given to patients with heel pain and found no evidence to support the effectiveness of therapeutic ultrasound. Therapeutic ultrasound the dosage used in this study was chosen from evidence available. Pulsed ultrasound was used as it's preferred for soft tissue repair as affirmed by Young and 1 MHz was chosen as it is capable of reaching to deeper layer. Pain relief could have occurred due to the non-thermal effects of pulsed ultrasound in the form of stimulation of histamine release from mast cells and factors from macrophages that accelerated the normal resolution of inflammation as suggested by young and Dyson. Although the results are contradictory to a review carried out by Robert and Baker of 35 randomized controlled trials look-
ing at evidence of the biophysical effects of ultrasound out of which only 2 trials were found to be more effective than placebo ultrasound and ten of the 35 trials studied were judged to be robust. Experimental group showed more improvement in functional ability. This can be attributed to myofascial release which experimental group received in addition to conventional treatment. Myofascial release refers to soft tissue manipulation techniques, effective therapeutic option in the treatment of plantar fasciitis.

REFERENCES


CONCLUSION

On the basis of present study, it can be concluded that conservative treatment approach like phys-
PHOTOGRAPHS

PATIENT RECEIVING MYOFASCIAL RELEASE

INTRINSIC MUSCLE STRENGTHENING EXERCISE

PLANTAR FASCIA STRETCHING
CALL FOR SUBSCRIPTIONS

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Increased flexibility is one of the basic concerns addressed in the day to day practice of physical therapy. It is a goal for any patient recovering from a period of immobilization or injury involving the connective tissue. Optimal flexibility is also desirable for participants in most athletic activities.

A shortened muscle may create imbalance at joints and faulty postural alignment that may lead to injury and joint dysfunction. Research with clinical trials has long advocated the use of thermotherapy to increase tissue flexibility in conjunction with a stretching program designed to lengthen tissue. Lengthening the musculotendinous unit and its supporting connective tissue increases the range of motion (ROM) through which a joint can move as well as the muscles ability to respond to stress placed upon it.

Roy & Iryin suggested that more the athlete runs, the greater the likelihood of developing muscle tightness. In addition runners have a tendency to be tight in hamstring and calf muscles. Running frequently hypertrophies the gastrocnemies and hamstring muscles groups with concomitant inflexibility of these muscles all stretching procedures should be preceded by some low intensity active exercise or therapeutic heat to warm up the tissues that are to be stretched. Soft tissues yield more easily to stretch if the muscle is warm.

Warm up and stretching are advocated by clinicians to increase muscle flexibility. All stretching procedures should be preceded by some low intensity active exercise or therapeutic heat to warm up the tissues that are to be stretched. The warm up may include superficial and deep heating modalities or repetitive exercises at low intensity such as jogging.

Kenneth et al state that a combination of static stretch and ultrasound treatments increased the extensibility of triceps surae muscles more than only static stretch treatment.

It has been suggested that heating an area before and during a stretch then cooling the area in the stretched or loaded position will optimize the permanent plastic deformation of the connective tissue structure. Static stretching involves maintaining a constant amount of tension on a muscle.
for a given period of time in order to create a progressive deformation of the tissues and increase their length.

Through static stretching, stimulation of the Golgi tendon organs, located in the myotendinous junction, is achieved, resulting in decreased muscle tone. Additionally a slowly applied stretch helps reduce muscle tone by reducing the degree of myotatic reflex contraction. Both neurophysiologic responses participate in the effectiveness of this technique to elongate a muscle through both elastic and plastic deformation of its non contractile components.

Many of the stretching techniques have been compared with static stretching technique. Sady et al stated that among the method of stretching, static stretching, ballistic stretching and variation of PNF techniques all would increase the flexibility of the muscle. They believed that static stretching to be the most commonly used stretching method.

Taylor et al determined if the application of a superficial heating or cooling modality followed by static stretching, increased the efficacy of the static stretching of the hamstring muscles. The results suggest that adequate hamstring stretching can occur without the use of superficial thermal modality.

Kottke et al applied 10-30 pounds of stretching weight for 20 minutes to elongate the triceps surae. Kenneth et al used 51 pounds of stretching weight for the 1 minute static stretching treatment to elongate Triceps Surae muscle in healthy women.

Knight et al evaluated the effectiveness of superficial heat, deep heat and active exercise warm up prior to stretching compared with stretching alone on the extensibility of plantar flexor muscles. They concluded that the use of ultrasound for 7-minutes prior to stretching might be the most effective for increasing ankle dorsiflexion. Knight et al applied ultrasound on plantar flexors for 7 minutes, prior to static stretching with a frequency of 1 MHz, intensity of 1.5 W/cm². Kenneth et al applied static stretching and ultrasound combined on triceps surae for 7 minutes, 1 MHz, continues mode at 1.5 W/cm².

Warren et al evaluated — high and low loads applied at temperatures of 39, 41, 43 and 45 degrees Celsius to produce residual elongation of connective tissue. It was found that higher therapeutic temperatures at the low loads produced the greatest elongations with the least damage.

METHODS

DESIGN

The research plan used for this study was randomized, counterbalanced 2x2x5 repeated measures design. Measurements were taken prior to and after each treatment session. It was a single blinded study, the subject being unaware of the groups they belong to.

There were 2 independent variables; treatment mode, pretreatment-post treatment measurement and day (5 levels). Treatment mode had 2 levels, including ultrasound and static stretch, and static stretch only.

The dependent variable was ankle active dorsiflexion range of motion and measurement being reflective of plantar flexor flexibility. And additional range of motion measurement was acquired 72 hours after the last treatment session to assess the intermediate term result of the treatment.

SUBJECTS

A sample of 30 healthy college age male volunteers with the mean age of 24.13 years participated in the study. Prior to the recruitment of volunteers, IRB approval was provided by committee at Jamia Hamdard. All the subjects were students of Jamia Hamdard university. The study was conducted at Majediea hospital, Jamia Hamdard, New Delhi. To participate, the subjects needed to have tight triceps surae (inability to achieve 20° of active dorsiflexion). Exclusion criteria included Hypermobility, Subject under medication (muscle relaxants), Skin disease, wounds, neurological problem, any circulatory problem or metal implants in the leg.

All the subjects were informed the purpose and procedure of the study and an informed consent was taken from them prior to participation. Subjects were randomly assigned into Group A (ultrasound and static stretching), and Group B (only...
static stretching), each group includes 15 subjects.

**INSTRUMENTS**

A SONOPLUS 992 Ultrasound unit was used to administer deep heat. The generator operated at a frequency of 1 MHz. The geometric surface was 5.8 cm² and beam non uniformity ratio of the crystal was maximum of 5.0. The effective radiating area of the sound head was 5.0 cm². A standard plastic transparent goniometer was used, the transparency of goniometer helped in noting the marks (lines and dots) drawn over the skin.

A Standardized stop watch (casio1219 DW 290 Japan) was used to note the duration of static stretch.

Weighing machine, couch, pulley, measuring tape, straps, rope and weights were other instruments used.

**PROCEDURES**

The testing occurred over a 1 week period with each subject receiving 1 treatment a day for 5 consecutive days. The subjects were tested at approximately the same time each day. All of the subjects also had the range of motion measured 72 hours after the last treatment to measure the lasting effect of each treatment.

Previously a pilot study was performed to determine how much weight to apply. Using our pilot study data, it was found that 1/3 of the subjects’ body weight to the calf for 10 minutes was comfortable.

A standard tape measure was used to ensure that the subjects were positioned prone on the testing table with their lateral maleolus 9 inch beyond the tables’ edge. All the subjects wore shorts and were secured to the table with waist and knee straps. All the subjects used their right leg (dominant) throughout the study. Prior to data collection, subjects were asked to kick a ball, hop on one leg, and step upon a stool with one leg. The dominant leg was determined to be the leg asked to perform 2 out of 3 of the above tests.

The control treatment consisted of subjects lying prone while receiving ultrasound on plantar flexors for first 7 minutes of 10 minutes of static stretch with 1/3 of body weight. The same ultrasound machine was used throughout the study.

During every treatment session of the stretching, weight was adjusted in 2-kilogram increment until it was 1/3 of subjects’ body weight. If the subjects could not tolerate this much weight, it was decreased until the subject could tolerate it while feeling a firm stretch of the Triceps Surae.

For goniometric measurements, fibular head, lateral maleolus, the base of 5th metatarsal and the 5th metatarsal head were marked with a permanent marker. Stationary arm of the Goniometer was placed along the long axis of fibula by using the marks on the fibular head and the lateral maleolus. Moving arm of the Goniometer was placed parallel to the lateral border of the foot by using the marks on the base and head of the 5th metatarsal. The axis of the Goniometer then fell on the lateral border of foot. The zero position of dorsiflexion was defined as the 90-degree angle between the long axis of the fibula and the lateral border of the foot.
Bony landmarks for goniometric measurements

All the measurements were recorded before and immediately after each treatment session as the subjects achieved maximum active dorsiflexion. To establish reliability of ROM measurements across sessions, we took pre & post treatment ROM thrice & used their mean for analysis.

STATISTICAL ANALYSIS

A 2x2x5 mixed design ANOVA as performed. Independent variables included treatment (2 levels between subjects factor) pretreatment-post treatment (2 levels within subject factor) and day (5 levels within subject factor). The dependent variable was active dorsiflexion ROM. Post hoc analysis were performed using Bonferroni tests to determine which differences between treatments were significant. Using the same test, we compared the level of significance between groups. Paired t-test was also used to find the significance of daily difference between pre and post treatment active dorsiflexion ROM within each group.

RESULTS

A total of 30 subjects participated in the study. Each group included 15 subjects. Mean age, height and weight of the subjects was 24.46±2.5, 1.67±6.9, 60.0±6.30 respectively for group A; and 23.73±2.4, 1.62±7.8 and 56.6±6 respectively for group B.

Active dorsiflexion was recorded daily as pre & post treatment for 5 consecutive days and 72-hours after 5th days post treatment.

Mean±SD increase in active dorsiflexion ROM after 5-days were 9.14±1° for group A, and 7.46±1.1° for group B. First day post measurement was compared between group A & group B (p = 0.004). 2nd day post measurement was compared between group A & group B (p = 0.001). 3rd day post measurement was compared between group A & group B (p = 0.007). 4th post measurement was compared between group A & group B (p = 0.013). 5th day post treatment was compared between group A & B group (p = 0.004).On 8th day, group A vs. group B (p = 0.00).

Paired t-test was also used to find the significance of daily difference between pre and post treatment active dorsiflexion ROM within each group. It was found highly significant within each group (p=0.00) on all 5 days. The follow up measurement (72-hours later) was compared to the last measurement taken i.e. after the 5th day treatment session. It was found that ROM lost in group A was 2.4° (p = 0.00), and group B had lost 4.13° (p = 0.00). However when the 8th day measurement was compared with 1st day pretreatment ROM, it was highly significant in both the 2-groups (p = 0.00).

Table 1: Dorsiflexion ROM (Mean). Day By Treatment Interaction Cell –Means“ Represent Average of Pretreatment & Post treatment Measurement each Day

<table>
<thead>
<tr>
<th>Grp</th>
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<th>Day-3</th>
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Table 2: Daily gains in Ankle dorsiflexion ROM following treatment Average of 5-days (mean)

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Pretreatment</td>
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Daily gains in ankle dorsiflexion ROM following treatment for Group A (mean ± SD)

Daily gains in ankle dorsiflexion ROM following treatment for Group B (mean ± SD)

Daily gains in Ankle dorsiflexion ROM following treatment Average of 5-days (mean ± SD)

Comparison of the average of pre/posttreatment measurements each day between groups

DISCUSSION

Stretching with or without ultrasound significantly increased ROM after each treatment, however the cumulative effect of ultrasound and stretch over 5-days was significantly greater than only stretch over the same period of time.

The within-day gains in ROM while stretching with ultrasound or without ultrasound were fairly similar each day. But the overall effect of ultrasound and static stretch group increase ROM more than only stretch group over the 5-day period. Apparently the stretch group lost some ROM each 24-hour period before the next treatment; whereas the ultrasound and static stretch group maintained the ROM it gained or did not lose much ROM during this time. We suspect this could be probably due to the plastic elongation that occurred during the time, the tissue was heated while it was being stretched.

The results of this study support the premise that when soft tissue is heated and stretched, increased ROM (i.e. flexibility) is possible. Wessling et al in a study of triceps surae muscle group showed a significant increase in ankle dorsiflexion with the use of ultrasound combined with static stretch compared with SS alone.

Our study also supports Steven et al who concluded that pulsed SWD application before prolonged long duration static stretch was more effective then stretching alone in increasing flexibility. Knight et al also concluded that the use of ultrasound for 7-minutes prior to stretching obtained greater increases in ankle dorsiflexion than only stretching.
Other studies of the efficacy of ultrasound failed to identify any significant changes in extensibility. They used 3-MHz frequency ultrasound and this has a considerably lower penetration depth than 1-MHz frequency of ultrasound. Consequently the volume of tissue affected is likely to be less than if 1-MHz frequency of ultrasound or SWD were used.

Deep vigorous heating in combination with stretching requires a temperature increase of more than 4 degrees Celsius over core temperature at a depth of 3-5 cm without damaging superficial tissue. Deep heating is thought to lessen nerve sensitivity, increase blood flow, increase tissue metabolism, and decrease muscle spindle activity to stretch, cause muscle relaxation and increase tissue flexibility. It is assumed that when used in conjunction with stretching, the benefits of deep vigorous heating allow greater tissue flexibility than stretching alone.

There are several similarities in the methods used by draper et al, Peres et al, Wessling et al and our study. Peres et al48 study and our study resembles the way that the subjects received 1/3 of their body weight with long duration passive stretch, with constant tension being maintained with a weight pulley system. Peres et al12 defined the short duration stretching, long duration stretching and prolonged stretching as

- **Short duration stretching:** lasts less than one minute.
- **Long duration stretching:** lasts longer than one minute.
- **Prolonged stretching:** extends throughout several days.

So the term prolonged stretching should be used only in combination with short or long duration, such as prolonged long duration stretching.

We believe that a low load, long duration stretch in place of a high load, brief stretch is required to take advantage of the responses of connective tissue under tensile deformation while being heated. Warren et al reported that the greatest residual increases in rat tail tendon ROM occurred after a low load, long duration static stretch was applied while the tissue was vigorously heated. Previous studies by draper et al (20-sec static stretch); Wessling et al (1-min static stretch) and Draper et al (30-sec static stretch) did not use a low load, long duration static stretch. However, Lentell et al, who used a low load, long duration stretch, reported that combining superficial heat and low load, long duration stretching resulted in significantly greater increases in ROM than low load, long duration stretching without preheating14.

Draper et al16 also took 5-treatments to produce significant differences in flexibility between stretch only and shortwave diathermy plus stretch. Peres et al took 11 treatments longer than ours to produce significant differences in flexibility between shortwave diathermy and stretch, and only stretch. This difference could be attributed to variation within subjects. Peres et al used healthy subjects and did not measure whether or not dorsiflexion ROM was limited prior to the start of the study. In our study, we only accepted subjects with limited dorsiflexion (less than 20°). We feel that our method of prescreening subjects for tight plantar flexors lends itself well to treating clinical condition for which patients present with limited plantar flexor flexibility.

Wessling et al5 and Knight et al10 in their studies applied 7-minutes of ultrasound on triceps surae including Achilles tendon to increase extensibility. We followed the same trend of applying ultrasound for 7-minutes on whole triceps surae and Achilles tendon. Typically, the area should be divided into zones, which are approximately 1.5 times the area of the ultrasound head, and each zone should be treated for 1-2 minutes (Oakley, 1978). Further studies need to be performed to determine the accurate application of ultrasound on whole triceps surae including tendon.

The ultrasound is set in relation to soft tissue thickness. If soft tissue thickness is greater than 8 cm, as in triceps surae, 1.5 W/cm² is used47. In our study we used an intensity of 1.5 W/cm². Lehmann et al17 showed that continuous ultrasound treatment of 5-10 minutes. The ultrasound treatment in our study was of 7-minutes duration and continuous.

Flexibility measurements in draper et al and Wessling et al studies were taken with a goniometer, however Peres et al utilized an electronic...
goniometer, whereas we took measurements with a standard plastic goniometer.

**LIMITATIONS**

A potential limitation is that we assumed that ultrasound produces greater heating at depth than superficial heating, but we did not actually monitor deep-tissue temperature. Whether our assumption is true could have been determined by temperature measurements by using thermistors, but the measurements obtained would be unreliable because the metal thermistor and its wires would produce excessive heating to adjacent tissue with ultrasound. Had the thermistor been removed and reinserted to avoid this consequence, discomfort and tissue damage would have resulted, potentially compromising ROM measurements.

Secondly, whether an ultrasound and low load, long duration stretching regimen would produce lasting increased flexibility in the Triceps Surae. We did measure ROM 72-hours after the last treatment. Subjects in the ultrasound and static stretch group gained 9.14° of active dorsiflexion from the 5-treatments, but 72 hours later lost 2.4° Subjects in the static stretch group gained 7.4° of active dorsiflexion but after 72 hours they lost 4.1°. Because subjects in both the 2-groups lost some ROM during 72-hours of non stretching, we did not know how many days it would take for both the groups to return to their baseline if they did not continue plantar flexor stretching. In retrospect we should have had subjects report back to our lab so that we could remeasure Triceps Surae flexibility on a weekly basis for several weeks.

It was not double blinded; meaning the investigator measuring ROM also applied the ultrasound or stretching. In future studies, we suggest that one investigator apply the Ultrasound or stretching and when the treatment is over, another investigator come into the room and measure ROM and thus be blinded to who is in which group.

Inability to control the activity level of the subjects. Although we did not allow subjects who were regularly participating in flexibility strength training program involving the calf to join our study, we were unable to control the daily activity level of those who participated. Increasing level of activity, beginning new activities or varying the time of day of activity may have affected the temperature and stiffness of the subjects’ calf at the time of treatment.

Clinicians most often use prolonged long duration stretching with patients with ROM less due to injury, surgery or another pathologic condition. This study was performed on young male, healthy college students; these results cannot be applied to female, older or injured subjects without further research.

**CONCLUSION**

The results of our study support the primary hypothesis that ultrasound and prolonged long duration stretching increase triceps Surae Muscle extensibility more than identical stretching alone. After 5-days of continuous ultrasound and prolonged long duration stretching applied to calf, ankle ROM increased more than with prolonged long duration stretching alone. Continuous ultrasound during stretching is a safe and effective protocol for increasing tissue extensibility. However, a weight and pulley system may not be a practical way to stretch the triceps Surae in the athletic room setting. Both the groups in the study produced increases in the extensibility of plantar flexors, resulting in increases in ROM. The group receiving ultrasound during stretching obtained greatest increases in the dorsiflexion ROM over a 5-day period.

This study will allow clinicians more options in effectively increasing the extensibility of plantar flexor muscles. In addition, the results of this study will permit the clinicians the choice of cost effective treatment alternative in an era of more stringent reimbursement.

**REFERENCES**


10. Claudia A Knight, Carrie R Rutledge Susan J Hall. Effect of superficial heat, deep heat & active exercise warm up on the extensibility of plantar flexors. Physical Therapy 2001; 81: (6) 1206-1214


12. Steven E. Peres, David O. Draper: Pulsed SWD & prolonged long duration stretching increase doriflexion ROM more than identical stretching without diathermy: J of athletic training, Jan 2002; 37:43-50


The concept of spinal segmental stabilization in one of the least explored intervention in the management of back pain. The purpose of the study was to examine usefulness of stabilization exercises for athletes with chronic disc prolapse.

Twelve subjects who were sport persons (age: 20-40 yrs) with MRI findings of disc protrusion and were randomly assigned to three groups viz. Group I (n=4) stabilization exercise regimen, Group II (n=4) conventional extension exercise regimen and Group III (n=4) control. The two experimental groups participated in four weeks of treatment program, five times a week. Outcome was based on self reported pain (visual analogue scale), disability (Ronald and Morris disability questionnaire) and custom made barobag testing of transversus abdominis measured immediately before and after intervention program. Outcome measures of self-reported pain and disability were reduced for both experimental groups. Furthermore, motor control deficit was reduced in stabilization exercise group after intervention period.

A “Specific Stabilization Exercise” approach appears effective in athletes with chronic disc prolapse.

**KEYWORDS:**
Disc prolapse, conventional exercises, stabilization exercises.

**INTRODUCTION**
Athletes are at greater risk of sustaining a lower lumbar spine injury as they perform demanding tasks and sometimes they damage their intervertebral disc because of excessive weight bearing.

Therapists have known for a long time that performing knee rehabilitation without first training the vastus medialis oblique (VMO) which is a local stability muscle can lead to patellofemoral problems and the same concept is being used on patients with low back pain. This concept of re-training the local stability system in people with low back pain has made its way into the physical therapy setting within the last four to five years and is not altogether a new concept. The concept is to create stiffness in the spine before load is placed on the spine, thus controlling mid range or neutral zone. Control of this mid range helps to reduce shear force and compression during movement and spinal loading. When working properly, the local intrinsic musculature fibers before the actual motion of an extremity or of the trunk occurs. Thus pre-contraction of the intrinsic musculature can become delayed or inhibited in the presence of pain or pathology. This delay, or inhibition of the stability system, decreases a patient’s ability to control a joint neutral position during movement or under load. (1)

A prolapsed disc was defined as one that protruded beyond the vertebral body margin but contained within an intact annulus. (2) The experiment on cadaveric motion segments showed that compressive damage to the vertebral body endplate alters the distribution of matrix compressive stress in the adjacent intervertebral disc. The annulus is decompressed, and stress peaks appear in the annulus. Subsequent cyclic loading made these changes worse, and there was some evidence to suggest that the annulus was collapsing gradually into the decompressed nucleus. (3)

Adolescent disc herniation is uncommon and is often caused by trauma. The natural history of disc herniation in adolescents is not known. Clini-
Specific back exercises that focus on deep stabilizing muscles have proven to reverse motor control deficits that occur after back injury or degenerative change. The most significant finding thus far is that people who do not retrain their deep stabilizing muscles are 12.4 times more likely to have recurrence of back pain within three years.

The typical back exercise programs, like gym-based rehabilitation program, pool therapy, and pilates are too advanced for low back pain patients prior to retraining the tonic holding capacity and isolated co-contraction of multifidus (MF) and transversus abdominis (TrA). With many programs, the stabilizing muscle activity tends to be trained in a phasic pattern, which does not lead to improvement in tonic holding capacity of the deep muscles.

The co-contraction of the TrA and the MF muscles occurred prior to any movement of the limbs. This suggests that these muscles anticipate dynamic forces, which may act on the lumbar spine and stabilize the area prior to any movement. They also showed that the timing of co-ordination of these muscles was very significant, and that back injury patients were unable to recruit their TrA and MF muscles early enough to stabilize the spine prior to movement. Furthermore, the MF muscle showed poor recruitment in back injury patients, again showing how the recruitment of these deep trunk muscles is very important.

The static holding component between the concentric and eccentric phase is critical in inducing muscles hypertrophy during first 10 weeks. The dynamic static training mode has been recommended in order to recruit as many motor units as possible. The result indicated that the physiological adaptations of the MF muscle to pure dynamic and combined static dynamic muscle activity are different, to such an extent that a systematic difference in CSA (Cross Sectional Area) could be found.

The abdominal-hallowing exercise does not produce as much RA (Rectus abdominis) and EO (external oblique) muscle activity as the pelvic tilt. Furthermore, the abdominal-hallowing exercise can be performed, without increased activation of the RA and EO muscles in the standard and legs-supported position. These findings should be considered when selecting rehabilitation exercises for neuromuscular retraining of the abdominal muscles.

The aim of this study was to investigate whether specific stabilization exercises or conventional back extension exercises are effective in athletes with chronic intervertebral disc prolapse. Our experimental hypothesis was that training programs consisting of specific stabilization exercises or conventional back extension exercises would be effective in reducing patient self-reported pain, disability and improving activity of deep stabilizing muscles (Transversus Abdominis and Multifidus) as these muscles undergo atrophy after injury.

MATERIALS AND METHODS

STUDY DESIGN

The present study was different subject experimental design. Sample consisted of twelve sports person (M=6, F=2) with intervertebral disc prolapse in the age group of 20-40 years. Subjects i.e. 3 footballers, 2 basket ballers, 3 weight lifters, 1 judo player and 3 wrestlers were randomly assigned into three groups. Group I (n=4) specific stabilization exercise group, Group II (n=4) conventional back extension exercise group and Group III (n=4) control.

SUBJECTS

Patients were recruited from the Punjab Armed Police headquarters, Jalandhar (Punjab). Patients took part in the study after informed consent had been obtained using inclusion criteria that all subjects were sports person (both males and females) with no cardiovascular disorder. Patients were eligible for the study if they had a history of recurrent episodes of back pain with at least one primary complaint of leg pain. All patients included in the trial had a prior clinical examination by their physician, including magnetic resonance imaging scan. Patients with previous spi-
nal surgery, radiological diagnosis of spondylosis/spondylolisthesis, lumbar scoliosis and cauda equina compression were excluded.

**PROCEDURE**

Pain perception was measured using the Visual Analogue Scale (VAS), a responsive pain scale that yields reliable and valid data. (11) Disability was measured using the Ronald-Morris Disability Questionnaire (RMDQ), a 24-item scale (0= “no disability”, 24= “highest disability”) with clinically acceptable reliability and validity. (12)

Motor control deficit was measured by custom-made barobag and its validity, reliability and efficacy in comparison to the standard stabilizer was proved. The indigenous Barobag, being more cost effective and easy to construct, can be used clinically as an alternative to the stabilizer. (13)

**BAROBAG**

(Self Devised Bio-feedback pressure Cuff Unit) was assembled by connecting a blood bag (JML, Haryana, India) of 450 ml capacity to the pressure dial (measuring 0-300mmHg) and the inflation gauge from the Aneroid Sphygmomanometer (desk model, CE0483). Few modifications were made in the blood bag by resecting the two needle pipes in the middle and tying multiple knots to prevent air leakage. Further, sufficient opening was made into the two closed corners to take out the sterile solution (CPDA). Then two tubes of adequate length were cut out of TUR Irrigating Arthroscopy tube. To one end of the tube, one valve was inserted whose other end was further inserted into the blood bag opening, while at the other end an inflation gauge was inserted. Then similarly at one end of the second tube a valve was inserted which was further inserted into bag’s other opening while the other end of the tube was joined to the pressure dial. These connections were fixed with the help of fixing material. It was made sure that air was not leaking through these connections.

Five tests were performed with barobag.

- Transversus abdominis activation test (TrAAT) □ The abdominal drawing in test.
- Progressive leg loading test level 1 task 1 (PLLT-I) □ Single leg slide (leg slide with heel support to full extension and return) with contra lateral leg support.
- Progressive leg loading test level 1 task 2 (PLLT-II) □ Unsupported single leg slide (the heel held approximately 5cm from the exercise surface) with contralateral leg support.
- Progressive leg loading test level 2 task 3 (PLLT-III) □ Single leg slide (leg slide with heel support to full extension and return) with contralateral leg unsupported.
- Progressive leg loading test level 2 task 4 (PLLT-IV) □ Unsupported single leg slide (the heel is held approximately 5cm from the exercise surface) with contralateral leg unsupported.

Both experimental groups followed two different exercise regimens separately. Experimental group (Group I) performed specific stabilization exercises. Experimental group (Group II) performed conventional back extension exercises and control group (Group III) was not given any treatment.

Both the intervention periods were for 4 weeks at a frequency of 5 times/week for 30-45 min. Each exercise consists of 3 sets and 10 repetitions (10 sec hold) in each set. Progression was made when a patient was able to perform three sets of 10 to 15 repetitions of an exercise with ease.
<table>
<thead>
<tr>
<th>WEEK</th>
<th>EXPERIMENTAL GROUP I</th>
<th>EXPERIMENTAL GROUP II</th>
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</table>
| I    | Đ Transversus abdominis contraction in crook lying position (Drawing in)  
        . 4 point kneeling and trying to hollow the lower abdominal  
        . Prone with single arm/ leg lifts. | . Prone with single arm/ leg lifts.  
        . Prone with alternate arm and leg lifts.  
        . Alternate supine arm and leg twist. |
| II   | Đ Transversus abdominis contraction in sitting and standing  
        . Heel slides with transversus abdominis contraction.  
        . Single leg hip rotation/ abduction keeping spine in neutral position | Đ Prone on elbows  
        Prone with double-arm/ leg lifts  
        Đ Hip lifts from side lying position |
| III  | Đ Abdominal hollowing with legs supported and hips and knees at 90°  
        . Bridging with spine neutral position  
        . Quadruped exercise, tighten the trunk musculature and hold the spine in neutral position  
        Extend one arm/leg | Đ Prone on hands  
        . Quadruped position and extend one arm/leg  
        Đ Bridging exercise  
        Đ Advanced hip lifts in side lying position |
| IV   | Đ Abdominal hallowing with legs unsupported and hips and knees at 90°  
        Quadruped exercise with spine in neutral position and extend alternate arm and leg  
        Đ Single leg bridging with spine in neutral position. | Đ Single leg bridging  
        Đ Quadruped position and extend alternate arm and leg  
        . Prone with both double arm and double leg lifts. |

**STATISTICS**

To assess changes within each group after the intervention period and between groups, the raw data were used and analyzed with the student "t"-test and One Way Analysis of Variance (ANOVA). For statistical analysis, the software SPSS 14.0 was used. The level of significance was set at p≤0.05 for all comparisons.

**RESULTS**

Table 1 shows the comparison within three groups before and after four weeks of treatment using One Way Analysis of Variance. Further analysis was done using Scheffe’s multiple range test.

In case of VAS, significant differences were obtained between Group I-III (F=28.45) and Group II–III (F=32.66). Significant differences were also obtained between Group I–III (F=29.55) and Group II–III (F=13.13) in case of disability. But no significant result between Group I-II in reducing pain and disability. Thus both the experimental groups helped in reducing pain and disability after four weeks of treatment.

For transversus abdominis activation test statistically significant results were obtained between
Group I–III (F=70.52) and Group I–II (F=54.61) and no significance between Group II–III. For progressive leg loading test task 1, Group I–III (F=15.25) showed statistical significance and no statistical significance between Group II–III and Group I–II. In case of progressive leg loading test task 2, statistical significance were obtained between Group I–III (F=16.31) and Group I–II (F=19.95). Progressive leg loading test task 3 and task 4 showed statistically significant results between group I–III (F=10.44 and 8.93) respectively. Thus group I (stabilization exercises) was better in reducing motor control deficit.

DISCUSSION

Some exercise programs (often called – General Exercise Programs”) are designed to enhance trunk performance through the training of long trunk muscles (erector spinae and rectus abdominis), whose primary function is to generate movement. However, current research has shown that in most cases of chronic low back pain, certain muscles of the back (multifidus and transversus abdominis) that stabilize the spine are reflexively inhibited after injury. (14,15) These stability muscles do not simultaneously recover even if patients are pain-free with a return to normal activity levels. Enhancement of function of such muscles may improve trunk muscle strength, endurance and flexibility. Therefore, research examining the effects of exercise programs (often called – stabilization programs”) that aim to improve trunk stability and strength by training such muscles is worthwhile.

Participation in sports appears to be a risk factor for the development of disc degeneration. Every sport places unique demands on the lumbar spine and, in turn, the intervertebral disc. The elite athletes have a greater prevalence and greater degree of lumbar disc degeneration than the normal population. (16) The magnitude of the loads on the L4–5 motion segment during football blocking exceed those determined during fatigue studies to cause pathologic changes in both the lumbar disc and the pars interarticularis. The mechanics of repetitive blocking may be responsible for the increased incidence of lumbar spine injury incurred by football linemen. (17) In another study, forces in the L4–L5 motion segment in competitive weight lifters was measured and the average compressive loads were more than 17,000N. (18) In a similar study when a person performed half-squat exercises with weights approximately 1.6 times body weight, compressive loads across the L3-L4 motion segment were six to ten times body weight. These investigators found that increasing lumbar flexion was the most influential factor affecting compressive loads. (19)

With the barobag, the subjects to detect lumbar spinal segmental stabilization deficit in deep local muscles of low back performed abdominal drawing in test and four tasks of progressive leg loading tests. (13) The criteria of considering this test of proper transversus abdominis activation as a reduction in mean pressure 6-10 mm of Hg and had used the EMG and real time ultrasound evidence to come to this conclusion. (9) The transversus abdominis activation elicited by drawing in the abdominal wall is associated, with the activation of lumbar multifidus at segmental level. They evaluated the specific and specialized relationship between these two muscles. (5) The co-contraction of multifidus and transversus abdominis simulate the action of activating a deep muscles corset, which provide mechanical support to the lumbar spinal segments and lumbopelvic region. (20)

The specific stabilization exercises were better in improving motor control deficit and thus prevented recurrent episodes of back pain. (6,21-22) Specific stabilization exercise approach was more effective than other commonly prescribed conservation treatment programs in patients with chronically symptomatic spondylolysis and spondylolisthesis. (22) In similar study the multifidus muscle recovery was more rapid and more complete in patients with first episode low back pain after receiving specific, localized, exercise therapy. (8) One more study suggested that the lumbar stabilizing exercises improved lumbar function in patients with low back injury and hence their activities of daily living. (23)

Evidence on the role of stabilization modalities in chronic low back pain with respect to symptom recurrence led to controversial conclusions. In particular, some studies supported the use of stabilization exercise program over general exercise programs for improving the cross-sectional area of the multifidus, (8,21) whereas other studies
found the opposite results that an eight week of general exercise program reduced pain in a short term to a great extent that did a stabilization enhanced exercise approach in patients with recurrent non specific low back pain. Most rehabilitation specialists prescribe therapeutic exercises for low back pain that aims to use larger, superficial musculature in an attempt to stabilize the spine. These exercises have recently evolved into functional capacity training. Although this may be appropriate in later stages of rehabilitation especially for athletes and those who perform heavy labor.

In the present study the specific stabilization exercises and conventional back extension exercises were effective in reducing pain and disability. Motor control deficit, a major cause of recurrent episodes of back pain was improved only by specific stabilization exercises. Thus the main aim of rehabilitation programs should improve patient function and quality of life, not just treat pain. They must teach patients how to control their lumbar dysfunction so that pain does not dictate their life-style.

CONCLUSION

It is concluded that both the specific stabilization exercises and conventional back extension exercises are effective in reducing pain and disability. Motor control deficit, a major cause of back pain is significantly reduced by specific stabilization exercises and no significant improvement was seen in conventional exercise group in reducing motor control deficit. In line with evidence from other studies on patients with nonspecific recurrent low back pain, it could be suggested that a specific exercise program may be beneficial for successful management of athletes with chronic intervertebral disc prolapse.

REFERENCES

21. Maher CG. Effects of motor control exercise versus placebo in


TABLES

Table-1: Comparison of scores between group I, group II and group III using One Way Analysis of Variance

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Table 2: Comparison of VAS, RMDQ, TrAAT, PLLT-I, PLLT-II, PLLT-III and PLLT-IV before and after four weeks of treatment in group I.

<table>
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<tr>
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<th>IV WEEK</th>
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<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
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<tr>
<td>VAS</td>
<td>8 ± 0.81</td>
<td>4 ± 0.81</td>
<td>6.92**</td>
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<tr>
<td>RMDQ</td>
<td>14.5±1.73</td>
<td>6.75±1.5</td>
<td>6.2**</td>
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<tr>
<td>TrAAT</td>
<td>8.6±0.95</td>
<td>4±0.83</td>
<td>8.13***</td>
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<tr>
<td>PLLT-I</td>
<td>7.9±2.73</td>
<td>4±1.13</td>
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<tr>
<td>PLLT-II</td>
<td>9.5±1.80</td>
<td>3.4±0.86</td>
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<tr>
<td>PLLT-III</td>
<td>8.1±1.73</td>
<td>2.8±1.46</td>
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<td>PLLT-IV</td>
<td>7.3±1.0</td>
<td>4.2±0.4</td>
<td>5.39*</td>
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</table>

* £ 0.05        ** £ 0.01        *** £0.001
Table 3: Comparison of VAS, RMDQ, TrAAT, PLLT-I, PLLT-II, PLLT-III and PLLT-IV before and after four weeks of treatment in group II.

<table>
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<tr>
<td>VAS</td>
<td>8.25±0.95</td>
<td>3.75±1.25</td>
<td>15.58**</td>
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<tr>
<td>RMDQ</td>
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<td>9.0±2.0</td>
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<td>TrAAT</td>
<td>9.0±1.23</td>
<td>8.4±0.96</td>
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<td>PLLT-I</td>
<td>4.9±4.34</td>
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<td>0.81</td>
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<td>PLLT-II</td>
<td>8.7±1.06</td>
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<td>PLLT-III</td>
<td>7.15±3.48</td>
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<td>7.9±2.55</td>
<td>8.2±1.15</td>
<td>0.24</td>
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* £ 0.05  ** £ 0.01  *** £0.001

Table 4: Comparison of VAS, RMDQ, TrAAT, PLLT-I, PLLT-II, PLLT-III and PLLT-IV before and after four weeks of treatment in group III.

<table>
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<td>PLLT-III</td>
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<td>7.4±4.4</td>
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**Fig. 1** Distribution of mean values of VAS and RMDQ Scores before and after four weeks of training in Group I, Group II and Group III.

**Fig. 2** Distribution of mean values of TrAAT Scores before and after four weeks of training in Group I, Group II and Group III.
Fig. 3 Distribution of mean values of PLLT-I and PLLT-II Scores before and after four weeks of training in Group I, Group II and Group III.

Fig. 4 Distribution of mean values of PLLT-III and PLLT-IV Scores before and after four weeks of training in Group I, Group II and Group III.
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The Sensitivity and Specificity of Ankle-Brachial Index (ABI) in Diagnosing Peripheral Arterial Disease in Patients with Risk Factors

*Daphne Pereira, **Maiya Arun, ***Kamath Ganesh

*Assistant Professor, **Associate Professor & Head, Dept. of Physiotherapy and Associate Dean, Manipal College of Allied Health Sciences, Manipal, ***Professor & Head, Department of CVTS, KMC Manipal, Karnataka, India 576104

Key words: Ankle Brachial Index, Peripheral Arterial Disease

Introduction: Peripheral arterial disease (PAD) can be considered the —step-child” of cardiopulmonary care.¹ despite the significance of systemic vascular resistance and venous return to the function of the cardiopulmonary system, little emphasis has been placed on preventing or treating vascular problems. PAD was a neglected area in medicine until the work of Buergher in 1920s.¹, ²

Although —peripheral” in its purest sense refers to any vessel distal to the coronary arteries, unless otherwise specified.² Among the many diseases that can affect the peripheral vasculature, atherosclerosis is the most common evident in patients above 40 years. In young patients Thromboangitis obliterans (TAO) is the commonest cause for PAD. Intermittent claudication is the classical symptom of PAD.¹, ², ⁷, ⁸, ¹¹

Claudication is derived from a Latin word for limp (claudicatio) which means discomfort or disability associated with exercise.² It is caused by ischemic muscular pain due to an imbalance of nutrient blood supply and demand, which is usually due to an atherosclerotic obstruction. During walking, the leg muscles require more oxygen. This increased demand cannot be met through the stenosis upstream, thus the muscles are starved of oxygen and ischemic pain is felt (typically in the calf region). The symptom is reversible on cessation of muscular work, as soon as the lower demand at rest can be again met by the limited supply. In other words, the patient walks painlessly for a certain distance and subsequently stops as pain sets in, after some time he/she starts this cycle again.², ⁸

Intermittent claudication is a clinical symptom of an early stage of the condition. In its severe form there may be pain in the limb at rest, as well as the potential for ischemic ulceration and ultimately the need for amputation. Its incidence is particularly high in the smoking male population. PAD in the lower extremities is diagnosed on the basis of the patient’s medical history and physical examination in addition to tests such as Doppler (pulsation) and treadmill. Treatment options include medication, regulated exercises, education about risk factors (e.g. diet, smoking) and vascular surgery.², ⁷, ⁸, ⁹

PAD produces exercise-induced muscle aching or cramping (intermittent claudication) secondary to ischemia in calf, thigh or buttocks depending on the site of atherosclerotic block in the superficial femoral artery, popliteal artery, anterior and posterior tibial artery and dorsalis pedis artery.², ⁸

Patients with intermittent claudication often have moderate to severe impairment of walking ability which leads to functional disability limiting patients from performing personal, social or regular activities of daily living that involve walking short distances. These effects may have a detrimental influence on the perceived quality of life and psychology of these patients.⁸ Normally in Indian clinical set up patients are consulting physician once they experience severe pain, or functional disability. As the peripheral arterial disease is also one of the most common problems in diabetic patients, smokers and hypertension, it is essential to screen these patients for peripheral arterial disease in the early stages. However, there is very limited literature regarding early screening for peripheral arterial disease in patients with history of smoking, diabetes, and hypertension in Indian population. The sensitivity and specificity of ankle–brachial index in di-
agnosing peripheral arterial disease is also not well documented. Therefore, the purpose of the study is to find out the sensitivity and specificity of ankle-brachial index (ABI) in diagnosing peripheral arterial disease in patients with risk factors.

**Purpose:** The purpose of the study is to find out the sensitivity and specificity of ankle-brachial index (ABI) in diagnosing peripheral arterial disease in patients with risk factors.

**METHODOLOGY**

Patients of both gender in the age group of 25-50 years with a history of intermittent claudication for a minimum period of 06 months and presence of risk factors like diabetes, hypertension, obesity and sedentary life-style were taken up for the study. Patients with rest pain on intra venous medication with a low ankle-brachial index (ABI) of <0.25 and unstable angina were excluded from the study.

Informed consent was taken from the patients and detailed evaluation was done as per the protocol. The patient was given clear instructions in the language understandable and explained about his/her role in the program. The patient was then made to lie supine for five minutes in an effort to stabilize the vital parameters and get a baseline measurement.

Pressure measurements were done using the Doppler probe with inflatable cuffs. A pressure cuff was placed around the calf of the affected lower extremity and the posterior tibial artery was located with the Doppler, an audible sound was heard. The cuff was then slowly inflated until cessation of the audible signal occurred. The cuff was then slowly released until the signal was heard again and the pressure reading was recorded. The same procedure was repeated at the upper extremity with the cuff placed on the arm over the brachial artery, and the Doppler placed at the radial artery. The lower extremity pressure was divided by the upper extremity pressure and the ratio or index was calculated. Thus the Ankle Brachial Index (ABI) at rest was determined.

The patient was then asked to walk at his/her own self-selected speed in a 20 meters long hospital corridor. The patient was given prior instructions and told to stop if there was any claudication pain or cramping in the calf muscles. The distance covered, the time taken and the symptom for which the exercise stopped was noted. Post walking the pulse and blood pressure was taken in the same manner as that at rest and the values were recorded. The data was analyzed by Baye’s theorem.

**RESULTS ANALYSIS**

Out of a total number of 54 patients that were assessed 14 patients were clinically diagnosed to have PAD based on a low ABI, peripheral pulse, claudication distance and trophic changes. The demographic features of the 14 patients were as follows: Males 12, Females 02 in the age group (30-60 years). Diabetics 06, Hypertensive 08, Sedentary 10, Smoking habit 12

As is evident from the above mentioned data, PAD is very common in the male population having a smoking history. The presence of associated risk factors like diabetes, hypertension, sedentary lifestyle and smoking history is strongly related to the early development of PAD.

The sensitivity and specificity for ABI in diagnosing PAD was found to be 92.85% and 100% respectively (Table I). Other tests like Doppler, peripheral pulses and claudication distances are considered useful tools that give an objective measurement about the patient’s functional status and can be used as adjuncts to ABI in the clinical evaluation of PAD.

**DISCUSSION**

Peripheral arterial disease (PAD) of the lower extremities is a common manifestation of atherosclerosis. It produces exercise induced muscle aching or cramping (intermittent claudication) secondary to ischemia in the calf, thigh or buttocks due to an imbalance of nutrient blood supply and demand. During walking, the leg muscles require more oxygen. This increased demand cannot be met through the stenosis upstream, thus the muscles are starved of oxygen and ischemic pain is felt. The symptom is reversible on cessation of muscular work, as soon as the demand at rest can be met. In other words, the patient walks painlessly for a certain distance and subsequently stops as pain sets in after some
time the cycle starts over again. This symptom usually occurs only during walking but with more severe forms of disease there may be pain in the limb at rest. PAD is diagnosed on the basis of the patients’ medical history, physical examination and non invasive clinical tests such as ABI, Doppler and claudication distance.  

In this study we evaluated 54 patients with a history of diabetes hypertension, pain in the lower extremities, smoking habit and a sedentary lifestyle. Out of the 54 patients assessed 14 patients were clinically diagnosed to have PAD based on a detailed history, physical examination and a low Ankle Brachial Index (ABI), peripheral pulse, Doppler and claudication distance. In this study ABI was considered the Gold Standard in the clinical evaluation of PAD. Other tests like Doppler, peripheral pulse and claudication distance were compared with the ABI.

Doppler ultrasound is considered the most useful diagnostic tool for the assessment of the vascular system. The unit is compact and easy to operate. These units operate according to the Doppler principle in which a 5, 8 or 10 MHz frequency is transmitted into the desired vessel. The signal is then reflected off moving red blood cells back towards the Doppler probe at a different frequency, which is know as the frequency shift. This event is converted into a sound that is heard by the examiner.

The most common test performed with the Doppler ultrasound is the ankle brachial index (ABI). This procedure provides valuable information regarding the arterial system. Pressure measurements were done using the Doppler probe as a stethoscope with inflatable cuffs. This test is most useful in following the progress of the disease with and without therapy and is the most sensitive index of change.

Early detection of PAD is very helpful in preventing late complications like ulceration, gangrene and amputation. It also helps correct risk factors like diabetes, hypertension, sedentary life style, and smoking habit. Thus the incidence of ischemic cardiac disease, stroke, and renal diseases can be reduced.

In our study we also found that the incidence of leg pain and reduced Ankle-Brachial index were varied with the risk factors. The incidence of reduced of ankle-brachial index is higher in male gender as compared to female gender (Figure1). The reduction in ankle-brachial index was higher in diabetes with hypertension, as compared to diabetes and hypertension alone and with smokers and sedentary life styles. The % distribution is mentioned in the (figure 2). We have only identified that risk is more in diabetes with hypertension as compared to other risk factors, however, the mechanism for claudication need to be studied separately.

**PAD in Diabetes:** Involvement of the arteries below the knee is characteristic of diabetic vascular diseases. They are of two types; Macroangiopathy (atherosclerosis of large vessels) and Microangiopathy (small vessel disease).

There is a presence of Mokenberg’s calcific medial sclerosis in the peripheral vessels such as the posterior tibial, dorsalis pedis and digital arteries. Arterial narrowing leads to claudication pain, cramps, absent pulses, blanching of the foot on raising > 45º and delayed venous filling or cyanosis when the foot is dependant. Radiography may reveal calcification of the involved arteries.

**PAD in tobacco smoking:** There is a high degree of association between cigarette smoking (>20 cigarettes) and the development of PAD. It is generally accepted that, nicotine has a vasoconstrictor effect and the higher carboxyhemoglobin saturations suggest the possibility of a toxic effect of carbon monoxide on the arterial wall. There is a controversy in considering tobacco smoking as a primary etiological agent because when the total number of heavy smokers in the general population is considered, the actual numbers who develop PAD is small. Even in heavy smokers the disease does not appear until they have used tobacco for a number of years. Hence tobacco smoking is a strong contributory factor if not a primary etiologic factor.

**PAD and physical inactivity:** Data suggest that a sedentary life style leads to obesity with the development of atherosclerosis. Obesity may be associated with hyperlipidemia and diabetes both of which are concerned with the acceleration of the atherosclerotic process. Atherosclerosis is due
to the deposition of cholesterol in the intimal lining of the arterial wall which is transported principally as low density lipoprotein.²

**LIMITATION OF THE STUDY**

This study did not use invasive techniques like arteriogram to confirm the diagnosis of PAD in patients who had clinical symptoms of arterial disease. Arteriography is considered an essential tool for precise localization and extent of the atherosclerotic plaque and is essential prior to bypass graft surgery of the affected extremity.

**CONCLUSION**

Clinical evaluation of patients with leg pain is an important and useful tool in the early detection of PAD in patients with risk factors. ABI is a Gold Standard in the clinical evaluation of patients with PAD. Early screening of PAD patients clinically will be useful for further diagnosis and management to prevent morbid complications.

**REFERENCES**

11. J. Willem Brandsma, Bertus G. Robeer, Sylvia van den Heuvel, Bart Smit, Cees HA Wittens, Rob AB Oostendorp. The Effect of Exercises on Walking Distance of Patients with Intermittent Claudication: A Study of Randomized Clinical Trials. March 1998;Physical Therapy, Vol. 78,Number 3

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**Table I: The obtained data was represented in a 2 x 2 contingency table and analyzed by Baye’s Theorem.**

<table>
<thead>
<tr>
<th>Ankle Brachial Index (ABI)</th>
<th>Peripheral Arterial Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>True positives</td>
<td>13 (a)</td>
</tr>
<tr>
<td>False positive</td>
<td>0 (b)</td>
</tr>
<tr>
<td>False negative</td>
<td>01 (c)</td>
</tr>
<tr>
<td>True negative</td>
<td>40 (d)</td>
</tr>
</tbody>
</table>

---

**Figure 1: Gender distribution**

**Figure 2: Risk factor distribution**
ANNOUNCEMENT

“Certificate Course in Hand Splinting” at OT School, Manipal

For the first time in India a Certificate Course in Hand Splinting has been launched by the Department of Occupational Therapy, MCOAHS, Manipal. It is the first time in the country an exclusive short term program on a specialized professional topic for Occupational Therapist has been launched. It is for one month duration and full time. Participants will be given certificate and transcript. The course is completely based on hands on training; exposure will be given both on metal and plastic splints. The course is market driven and training is geared towards starting independent unit. The participants will also get an opportunity to apply various clinical reasoning and analytical skills in designing and fabrication of splint directly on patients. Interested candidate can request for information brochure and further details from Dr. Shovan Saha, Chief Resource Person on shovansaha@yahoo.com or Dr. Saras Babu, Program Coordinator on babuot@gmail.com, drbabumot@gmail.com

Dr. Shovan Saha
Associate Professor & Head
Department of Occupational Therapy
Manipal College of Allied Health Sciences
Manipal University, Manipal, Udupi, Karnataka.
Pin- 576104
Call for Papers

Indian Journal of Physiotherapy and Occupational Therapy has commenced publication since 2006. IJPOT will be published four times in a year.

Purpose & Scope: IJPOT is a multidisciplinary refereed journal devoted to disseminating rigorous research on all aspects of the physiotherapy and occupational therapy to enhance learning. The journal seeks to be a catalyst for multidisciplinary dialogue amongst researchers and practitioners worldwide in the fields of learning and cognition, education, and technology, with a view to improving practice and achieving real-world impact in technology enhanced learning.

The journal encourages research from theoretical perspectives, research reports of evidence based practice as well as praxis research work that focuses on the interface between theory and practice and how each can support the other. In addition, the journal strongly encourages reports of research carried out within or involving countries in the Asia-Pacific region.

Invitation to submit papers: A general invitation is extended to authors to submit journal papers for publication in IJPOT.

The following guidelines should be noted:-

1. Please send two hard copies complete in all respects along with one copy in CD. The article can also be sent through e-mail as attachment with two hard copies.

2. The article should be accompanied by a declaration from all authors that it is an original work and has not been sent to any other journal for publication.

3. References should be in Vancouver style.

4. As a policy matter, journal encourages articles regarding new concepts and new information.

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Editor: Dr. Archna Sharma
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E-mail: editor.ijpot@gmail.com
Effect of Turf surfaces on the incidence of low back pain in field hockey

*Kumar Bharti, **Paul Maman, ***Sandhu Jaspal S.*

* MSPT Student, **Lecturer, ***Dean and Head Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, Punjab

ABSTRACT

Participation and sports and recreational activities have increased in recent times and Hockey is one such sport gaining immense popularity between the young players. The advent of synthetic surface has significantly changed the sport by increasing the speed of the game, causing increased injury potential. The present study was undertaken to compare the effect of the turf surfaces on the incidence of low back pain in Field hockey Players. State, National and International level players (N=201) with the age bar of 14 to 28 years from five cities of Punjab. A questionnaire containing history of back pain, personal characteristics, turf information (no. of training hours and type of surface played) was completed. Back pain was more prevalent on Astroturf surface (39.13%) as compared to grass surface (28.57%). Males were more afflicted than females. The study provides an insight to coaches, Sports medicine personnel about the relationship between turf surfaces and injury potential in order to formulate well-designed training programs and making them free from injury.

Keywords-Grass and Astroturf, Field hockey, Epidemiology

INTRODUCTION

Field hockey is a game with an inbuilt symmetry; rules of which allow the stick to be played right handed with only one side of the stick to be played (6). The introduction of synthetic surfaces has significantly changed the sport of field hockey; the turf of which differs from soccer and football in a way that it does not try to reproduce a grass feel being made of shorter fibers allowing the improvement of speed.

The international field hockey Federation (FIH) has developed performance standards for hockey pitches based on ball rebound, ball run, and deviation, impact, response, surface friction, dimensions, slope, smoothness, color, gloss, watering, porosity and surface health (9). Further artificial turf can be a better solution when the environment is particularly hostile to natural grass and requires minimal maintenance, however it is much harder than the natural grass which contains 75-80% water by weight, keeping field at moisture level that helps to maintain players' ability to perform better.

Previous studies have reported a rising incidence of back ailments on Astroturf surface in many sports (1, 5). Further injuries may be incurred on artificial turf than another surface because of its stiffness and the increased frictional force at the shoe and surface interface (2).

Numerous researches have been done in the past regarding the comparison of grass and Astroturf in context of gross injury patterns mainly in the western world however very less studies have been done in past specifically on incidence of low back pain on grass and Astroturf surface in field hockey, another aspect which cannot be overlooked was the environmental factors which varies through out the world and hence keeping these aspects in mind the study was designed considering the Indian scenario, climatic conditions, social and economic factors to examine the incidence of back ailments of various turfs in field hockey in one of the most popular state for sports(Punjab) with a sample size of 201 hockey players.

MATERIAL AND METHODS

All data were collected using a cross sectional design during the month of May-Sep.2006.The

Corresponding Author : Kumar Bharti, MSPT Student, Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar Ph no. +91-9815465162; Email: kumar.bharti@rediffmail.com

athletic trainers of all the teams were contacted from five cities of Punjab and asked to participate. All of the teams and players contacted agreed to participate. The sample consisted of 201 hockey players (both males and females). Each player signed a consent form before filling out questionnaire. The study consisted of 14 International, 140 National and 47 state level players. A structured questionnaire was designed consisting of back pain history, personal characteristics and turf characteristics (type of surface played, number of hours played per day) and a thorough clinical evaluation of back. Respondents were asked whether the injury affected their performance or caused them to miss games or practices.

The descriptive statistics included calculation of mean values and percentages of injury rates-number of injured players/total number of player’s ∼100 and unpaired T-test was applied for calculating the mean training hours.

RESULTS

Injuries on Astroturf turf surface 39.13 % (N=54) were higher than injuries on grass surface 28.57 % (N=18), (Fig.1 and 2)

On both Astroturf and grass surface males had higher number of injuries than females (fig3 and 4)

Mean training hours of asymptomatic group was higher than symptomatic group but was however statistically insignificant. (table1)

DISCUSSION

The epidemiological study showed that hockey players had greatest number of injuries to back on Astroturf surface as compared to grass surface and so it followed the trend of other injury patterns in Field hockey particularly soft tissue injuries, sprains and strains which were more common on Astroturf surface and joint injuries on grass, due to the semi crouched position assumed by the hockey players which impose a greater spinal load causing back pain (3).

It was also suggested that risks for injury would be higher on a new surface (Astroturf surface) due to different types of playing styles, the difference was noted between a poor standard grass pitch (Long grass, uneven surface and a good standard grass pitch (short grass, even surface) before the introduction of synthetic pitch. As a flat smooth surface of well rolled, short grass immediately raises the standard of the play and gives the players a surge of confidence (11). One of the possible reasons behind the rising incidence of injuries on Astroturf surface was the increased frictional force at the shoe or surface interface (9). Stiffness of a surface affects the impact of forces and can result in overload to tissues such as bone, cartilage, muscle, tendon and ligament. Although friction is necessary for rapid starting, stopping, cutting and pivoting inherent in sports; however increased frictional force may contribute to increased incidence of injuries among the athletes who play on artificial turf (4).

The present study showed that males were more susceptible to back ailments on both artificial and natural surface than females. The possible reason of which could be that boys compete at a higher level of competition in sports and had greater risk of injury (8).

Thus the study emphasizes on the fact that Astroturf surface has its own potential hazards making players more prone to injuries as compared to grass surfaces. The natural cushioning effect gives immediately visible and functional results from the mature turf grass sod (7) along with better physical environment for players where temperature and humidity effect are superior to the artificial surfaces and thereby causing fewer abrasions, safer recreational surfaces in hockey.

One of the major limitations of the study was that it relied heavily on the athlete’s abilities to accurately recall the injuries and clinical details may not be reliable and there is tendency for the adverse events to be recalled as more recent than they actually occurred (10) along with a smaller sample size of 201 hockey players. Another limitation of the study was that only surface effects were considered while it is the combination of both the shoe and the surface that it is implicated for increased injury potential implicating the need for further research.
CONCLUSION

The study is done with a perspective to edify players, coaches and sports medicine personnel to know the effects of turf surfaces both pros and cons in order to formulate well designed training program to make the players free from injury.

Table 1: Mean Training Hours of Hockey Players

<table>
<thead>
<tr>
<th>Sport</th>
<th>Symptomatic</th>
<th>Asymptomatic</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>S.E.</td>
</tr>
<tr>
<td>Hockey</td>
<td>147.06</td>
<td>28.07</td>
<td>3.19</td>
</tr>
</tbody>
</table>

*Insignificant, p>0.05
REFERENCES

Role of early cardiac rehabilitation on the patients with stable angina

Soma Mazumdar
Adesh College of Physiotherapy, Muktsar, Punjab

Background: - Carefully-tailored exercise program in the form of Cardiac rehabilitation has always found positive effects on the patient with cardiac Muscular diseases.

Objective of the Study: - This study was investigated on 30 male patients rehabilitation on stable angina.

Method: Aerobic exercises in the form of upper limb and lower limb exercises were advised on the first day which was to be continued for 45 days with a frequency of 4 days a week. Progression was given after every 15 days by using Karvonen’s formula [THR=RHR + X\% (HR_{\text{max}} - RHR)].

Results: Exercise tolerance and cardio pulmonary fitness were measured after 15 days by Borg’s scale of RPE and Crompton’s Test. Tread Mill test was also tested. ANOVA, Correlation of Coefficient, T-test and Simple regression equation were applied to compare and correlate the value of the variables by suing SPSS version 7.5.

Conclusion: Early cardiac rehabilitation on stable angina proved better cardiopulmonary fitness on the patients who were given 21%-25%-30% of progression.

Key words: Cardiac Rehabilitation, Stable angina, Karvonen’s formula, exercise tolerance, cardiopulmonary fitness, Borg’s Scale, Rate of perceived exertion, Crompton’s test, Tread Mill Test.

INTRODUCTION:

Cardiac rehabilitation refers to co-ordinated, multifaceted interventions designed to optimize a cardiac patients physical, psychological and Social functioning in addition to stabilizing, slowing or even reversing the progression of the underlying atherosclerotic process there by reducing morbidity and mortality.

The world health organization (WHO) has defined cardiac rehabilitation as the sum of activity required to ensure cardiac patient the best possible physical, mental and social conditions. So that they may by their own efforts, regain as normal as possible a place in the community and lead an active life (Kirdar JA et al, 1996). In cardiac rehabilitation, a wider choice of intensities is left to the patients for aerobic exercise without giving up the potential to reduce cardiac risk factors (Metesdof and Schmitz, 2005). Paquet M et al, 2005 states that cardiac rehabilitation program needs to shift their focus of attention from promoting healthier behaviour to responding to participants perceived needs along side risk factor reduction. The American heart association and American college pf Sports Medicine proposes physical activity using dynamic exercises for the prevention of cardiovascular diseases as the secondary prevention. Shiutt A et al (2005) states that exercises induces improvement of the cardiovascular risk factors; e.g; dyslipidaemia, insulin resistance and inflammation, normalization of endothelial function and retardation of atherosclerosis. Because of the strong evidences of benefit of exercise in cardiovascular prevention and rehabilitation; this should be included in the complex therapy in cardiac patients.

An attempt was given to start the cardiac rehabilitation program from the first day to the patients with stable angina.

METHOD:

SUBJECTS:

A total of thirty males from North India of age range 40-60 years (Mean age 53.2 ± 6.1) were recruited fro this study. They were selected and diagnosed by the consulting physician as patients stable angina with at least one common associated disease i.e. diabetes. A common medication i.e. beta lockers were maintained among the pa-
tients; which had blunted their heart rates.

**CARDIAC REHABILITATION PROCEDURE:**

A set of aerobic exercises were prescribed for six weeks to all the patients for 30 minutes of duration and with frequency of 4 times a week. The exercise regime consisted of upper limb, lower limb and trunk exercises. With a calculated intensity, these exercises were started from the first day onwards.

**DETERMINATION OF INTENSITY:**

The patients were divided into two groups of 15 each as group I and group II. The patients were advised to exercise with the target heart rate for six weeks. Progressions were made after every 2 weeks. The resting heart rate was measured and the target heart rate was calculated with the help of Karvonen’s formula; i.e.

\[ THR = RHR + X \% \times (HR_{\text{max}} - RHR) \]

Where \( HR_{\text{max}} = 220 \cdot \text{age} \)

\( X = \text{advised intensity \%} \)

\( RHR = \text{resting heart rate} \)

\( THR = \text{target heart rate} \)

Both the groups were advised on the first day, at the aid of 2nd week and at the end of the 4th week. Group I was advised with 10% on the first day, 15% at the end of second week and 20% at the end of 4th week. Group II was advised 21% on the first day, 25% at the end of 2nd week and 30% at the end of 4th week. The heart rate was monitored by Sports tester.

**MEASUREMENT OF CARDIO PULMONARY FITNESS TEST:**

The cardiopulmonary fitness was measured of each patient by the help of Crompton’s test, RPE by Borg’s scale and TMT. The Crompton’s test and the RPE was measured on the first day, end of second week, end of fourth week and end of sixth week.

**PROCEDURES OF CROMPTON’S TEST:**

The patient was made to lie down supine for at least 3 minutes. Then the pulse rate of the right radial artery was measured. Later on the patients were asked to stand up and the pulse rate was measured again immediately. The difference between the two pulse rates gave the value for cardiovascular fitness. Crompton’s test was repeated after every two weeks till the end of sixth week.

**PROCEDURE FOR BORG’S SCALE**

The rate of perceived exertion was asked verbally to the patients according to the tolerance of the exercise and was rated according to the Borg’s scale on the first day. This was repeated after every 2 weeks till the end of six week.

The scale goes:

1. no exertion at all
2. extremely light
3. Very light
4. Light
5. Some what hard
6. Hard (heavy)
7. Very hard
8. Extremely hard
9. Maximal exertion

**TMT reporting:** The summary of TMT for leads II, V₄ & V₅ showing the ST depression in mm was measured. Bruce sub maximal protocol was used for the first 3 stages with inclination.

**STATISTICAL ANALYSIS:**

Data was analyzed with help of Med Cal Software SPSS 7.5 version on Win XP. Mean, Standard deviation and other useful values were analyzed for the data which showed the effects of cardiac rehabilitation on cardiovascular fitness. Further which the analysis proved the effects of cardiovascular rehabilitation between the two groups.

**RESULTS:**

The data after the statistical analysis showed the observations mentioned in the tables.
### AGE:

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>95% CI</th>
</tr>
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<tr>
<td>I</td>
<td>40-50</td>
<td>47.00</td>
<td>4.47</td>
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</tr>
<tr>
<td>I</td>
<td>51-60</td>
<td>57.70</td>
<td>2.00</td>
<td>1.24</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>45.83</td>
<td>3.92</td>
<td>3.14</td>
</tr>
<tr>
<td>II</td>
<td>51-60</td>
<td>56.56</td>
<td>3.21</td>
<td>2.09</td>
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</tbody>
</table>

### Resting Heart Rate:

<table>
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<th>Range</th>
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<th>SD</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>40-50</td>
<td>66.60</td>
<td>2.70</td>
<td>2.37</td>
</tr>
<tr>
<td>I</td>
<td>51-60</td>
<td>68.70</td>
<td>5.56</td>
<td>3.45</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>63.83</td>
<td>6.46</td>
<td>5.17</td>
</tr>
<tr>
<td>II</td>
<td>51-60</td>
<td>67.78</td>
<td>8.21</td>
<td>5.37</td>
</tr>
</tbody>
</table>

### TARGET HEART RATE:

<table>
<thead>
<tr>
<th>Group</th>
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<th>Mean</th>
<th>SD</th>
<th>95% CI</th>
</tr>
</thead>
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<td>78.73</td>
<td>3.74</td>
<td>3.28</td>
</tr>
<tr>
<td>I</td>
<td>51-60</td>
<td>79.57</td>
<td>6.09</td>
<td>3.77</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>91.39</td>
<td>6.96</td>
<td>5.57</td>
</tr>
<tr>
<td>II</td>
<td>51-60</td>
<td>95.52</td>
<td>6.50</td>
<td>4.25</td>
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### CROMPTON’S TEST:

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<th>SD</th>
<th>95% CI</th>
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<td>40-50</td>
<td>7.20</td>
<td>1.10</td>
<td>0.96</td>
</tr>
<tr>
<td>I</td>
<td>51-60</td>
<td>7.30</td>
<td>2.26</td>
<td>1.40</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>6.17</td>
<td>0.75</td>
<td>0.60</td>
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<td>II</td>
<td>51-60</td>
<td>5.44</td>
<td>0.88</td>
<td>0.58</td>
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### BORG'S SCALE:

<table>
<thead>
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<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
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<td>12.40</td>
<td>2.07</td>
<td>1.82</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>11.50</td>
<td>1.96</td>
<td>1.21</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>12.67</td>
<td>0.52</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>12.89</td>
<td>0.62</td>
<td>0.39</td>
</tr>
</tbody>
</table>

### TMT REPORTING:

#### Before Cardiac Rehabilitation

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
<th>Leads</th>
<th>Mean ± SD</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>40-50</td>
<td>II</td>
<td>-1.33 ± 0.62</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₄</td>
<td>-0.70 ± 0.00</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₅</td>
<td>-1.30 ± 0.56</td>
<td>0.49</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>II</td>
<td>-1.02 ± 0.73</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₄</td>
<td>-1.03 ± 0.00</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₅</td>
<td>-1.15 ± 0.82</td>
<td>0.49</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>II</td>
<td>-0.93 ± 0.70</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₄</td>
<td>-0.17 ± 0.46</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₅</td>
<td>-1.35 ± 0.47</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>II</td>
<td>-1.05 ± 0.49</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₄</td>
<td>-0.37 ± 0.57</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V₅</td>
<td>-0.97 ± 0.60</td>
<td>0.40</td>
</tr>
</tbody>
</table>
After Cardiac Rehabilitation

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
<th>Leads</th>
<th>Mean ± SD</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>40-50</td>
<td>II</td>
<td>-0.97 ± 0.62</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_4</td>
<td>-0.37 ± 0.64</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_5</td>
<td>-0.85 ± 0.76</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>II</td>
<td>-0.66 ± 0.53</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_4</td>
<td>-0.69 ± 0.68</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_5</td>
<td>-0.82 ± 0.75</td>
<td>0.47</td>
</tr>
<tr>
<td>II</td>
<td>40-50</td>
<td>II</td>
<td>-0.47 ± 0.72</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_4</td>
<td>-0.85 ± 0.44</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_5</td>
<td>-0.99 ± 0.42</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>II</td>
<td>-0.71 ± 0.39</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_4</td>
<td>-0.17 ± 0.63</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_5</td>
<td>-0.58 ± 0.61</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Paired T-test was drawn between before and after the cardiac rehabilitation for leads II, V_4 and V_5 for both the groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Leads</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Before II/After II</td>
<td>-6.532</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Before V_4/After V_4</td>
<td>-8.568</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Before V_5/After V_5</td>
<td>-5.941</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>II</td>
<td>Before II/After II</td>
<td>-7.448</td>
<td>p&lt;0.0001</td>
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<tr>
<td></td>
<td>Before V_4/After V_4</td>
<td>-2.817</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Before V_5/After V_5</td>
<td>-8.969</td>
<td>p&lt;0.0001</td>
</tr>
</tbody>
</table>

Unpaired t-test was drawn between the 2 groups for the parameter as RHR, THR, CT & BS. Unpaired t-test was also drawn between the 2 groups for the ST-level depression in mm for leads II, V_4, V_5.
The observations above mentioned explained that most of patients of stable angina were of the age 51-60 years which is more probable age than 40-50 years. The resting heart rate of the age group 51-60 years had raised which explained their incompatible cardiovascular fitness. As the target heart rate was given more to the group-II, the results showed that the Cromptions test showed lesser readings in Group II than Group-I. This explained the cardiovascular fitness was more in Group-II than Group-I. Within Group-II also, the age limit of 51-60 years showed better results than the age limit 40-50 years. The results of Borgs Scale explained that age 51-60 years of Group-I found greater exercise tolerance than that Group II. The TMT reporting showed marked changes of after cardiac rehabilitation than before cardiac rehabilitation. The Group-I and showed more ST depression in lead Group-II and V5 in age 40-50 years than 51-60 years. The ST depression which reached -1.4 mm had come back to -1 mm after rehabilitation for both the Groups.

The summary of TMT showed Group-II with lesser ST depression than Group-I as in fig-3 & fig-4 in comparison to fig-1 and fig-2

The TMT reporting after cardiac rehabilitation showed the maximum of -1 mm of St depression, which had been showing of maximum of -1.4 mm of St depression before cardiac rehabilitation. As leads II, V4 and V5 showed the summary of the electrical potentials during the treadmill test, lead II was showing the maximum myocardial ischemia during the exercise tolerance.
To provide physical activity recommendation for people with cardiovascular disease, an expert working group of the National Heart Foundation of Australia in late 2004 reviewed the evidences since the US surgeons General Report of Physical activity and health in 1996. Briffa TG et al, (2006), Suggests that physical activity of 30 minutes with moderate intensity and less intense and even shorter bouts of activity, low level resistance activity initially under supervision of a professional may suffice for those with advanced cardiovascular disease. The scientific community should offer standard of care for management of DM with CAD & should design new strategies to promote prevention in these high risk patients (Camerini A. et al 2003). The need to define characteristic and peculiar problems of DM with IHD encouraged the Board of Italian Group of Cardiac Rehabilitation and Prevention (GICR) to set up a working group.

Endurance training increase basal active tone in coronary arteries and enhance myogenic tone in coronary arterioles. Paradoxically, exercise training has also been shown to augment nitric oxide production and nitric oxide mediated relaxation in coronary arterioles (Heaps CL. et al, 2006), Dafoe W, Huston P, (1997) confirms that cardiac rehabilitation can reduce mortality and morbidity for patients with many types cardiac disease cost affectively yet is generally unutilized. Rehabilitation is helpful not only for patients who have had a myocardial infection but also for those with stable angina or congestive heart failure or an intervention with the heart. The beneficial effects of rehabilitation include improved exercise tolerance, fewer cardiac symptoms, improved lipid level, decreased cigarette smoking, improvement of psychosocial well being and increased likelihood to return to work.

CONCLUSION:

The study provides and indication for starting cardiac rehabilitation from the first day in the patients of stable angina. Though the age range of 51-60 years have higher RHR as they can’t cope up with the Cardiac rehabilitation, continuous endurance training to the heart muscle for six weeks improves the cardiovascular fitness.

The obvious changes in the TMT prove that exercising for six weeks definitely effects on the ST levels.

The exercise tolerance, the cardiovascular fitness and the ST-level status proved that the Group-II had better improvement than the Group I.

REFERENCES:

3. Dafoe W, Huston P: Curreint trends in Cardiac rehabilitation; C MAJ, 1997; 156 (4) : 527-32
Abstracts of articles published in Ergoscience 2007 & Physioscience published by Theime (Germany) under exchange programme with IJPOT

ergoscience 2007; 2: 90-99

All Beginnings Are Difficult - Possibilities of Occupational Therapy Services with Preterm Infants in Neonatology in Germany

C. Zillhardt1, L. Honold1
1 Hogeschool Zuyd, NL-Heerlen

ABSTRACT

Introduction: In neonatology the preterm infants’ quality of life and the stimulation of their development are increasingly discussed. This article based on a bachelor thesis investigated the possibilities of occupational therapy services for preterm infants in neonatology in Germany.

Method: Five occupational therapists working in neonatology were interviewed and the results were evaluated with qualitative analysis.

Results: The portrayed results are subdivided into necessary expertise (skills, tasks, knowledge/assets, challenge), occupational therapy process (assessment, goal setting, treatment) and interacting factors respectively institutional conditions of the occupational therapy work in neonatology.

Conclusions: The special needs and environment of preterm infants require optimal coordination of therapy with a variety of treatment modalities. The occupational therapist needs a variety of expertise for the miscellaneous scope of duties such as encouraging the infant’s perception and development or instructing parents and nursing staff. This is an exciting challenge for occupational therapy.

Key words: neonatology - preterm infants - expertise - occupational therapy process - influencing factors
Non-invasive Cortical Stimulation as Adjuvant Therapy
Intervention to Promote Functional Recovery after Stroke

K.-F Heise¹, C. Gerloff², F. C. Hummel³
¹ Klinik und Poliklinik für Neurologie, Universitätsklinikum Hamburg-Eppendorf

ABSTRACT

Background: Over 60% of the stroke patients show persistent functional impairments that considerably limit their occupational and social life. The development of effective therapeutic strategies for neurorehabilitation aims at increasing functional recovery and subsequently promoting quality of life in the long run. Recent studies in healthy subjects have provided increasing evidence for non-invasive cortical stimulation to enhance cognitive function.

Objective: This article gives an overview of the concept of non-invasive cortical stimulation and outlines the methods and their application with regard to their relevance in stroke rehabilitation.

Method: A systematic literature review was performed.

Results: First results of studies with stroke patients suggest that combining a specific motor training with non-invasive cortical stimulation might transiently improve functional outcome.

Conclusions: Non-invasive cortical stimulation appears to offer a promising option to enhance functional recovery. It might provide an adjuvant intervention in neurorehabilitation in the near future. For translation of this innovative strategy into routine clinical practice it is necessary to get better insight into the underlying mechanisms and to evaluate this therapeutic strategy with controlled multicentre trials.
Effectiveness of Manual Therapy in Comparison to a Multimodal Physiotherapeutic Programme in Female Patients with Craniomandibular Disorders

Pilot study

M. Knust\textsuperscript{1}, H. J. M von Piekartz\textsuperscript{1}, C. Zalpour\textsuperscript{1}
\textsuperscript{1} Fachhochschule Osnabrück, University of Applied Sciences

ABSTRACT

**Background:** TMD is the most common form of facial pain with many different symptoms. Since more than 10 % of the population above 18 years are severely restricted in their daily activities due to TMD effective treatment modalities play a vital role.

**Objective:** This pilot study compared the effectiveness of Manual therapy with a multimodal physiotherapy programme in the treatment of female patients with temporomandibular disorders (TMD).

**Methods:** 16 female test persons with TMD diagnosed by a dentist were randomized into 2 groups (Manual therapy: n = 7, therapeutic exercises: n = 9). The measuring parameters of the pilot study were pain, subjective sensation, jaw opening, deviation, muscle pain and clicking. There were 5 treatments per test person, on the sixth day of the treatment the final examination as well as an introduction to the therapy of the other treatment group took place. The data were analysed by means of descriptive and inductive statistics.

**Results:** Manual therapy had no statistically significant better results. Both therapies showed a statistically significant improvement of subjective sensation, jaw opening and muscle pain. However, a detailed analysis of the findings detected that pain only statistically significantly improved in manual therapy and deviation only within therapeutic exercises. In neither treatment group clicking was completely reduced.

**Conclusions:** Manual therapy and the multimodal physiotherapeutic programme produced a different kind of effectiveness and were both indicated for the treatment of TMD. The pilot study serves as preparatory work for a large-scale study and provides important expertise which should be taken into consideration in future projects.