Effect Of Iliotibial Band Stretching Versus Hamstrings And Abdominal Muscle Activation On A Positive Ober’s Test In Subjects With Lumbopelvic Pain: A Randomized Clinical Trial

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ABSTRACT

STUDY DESIGN: Randomized Clinical Trial

OBJECTIVES: To check the effects of ITB stretching versus the effects of hamstring and abdominal activation on pain levels and ipsilateral hip ROM in people with lumbopelvic pain.

BACKGROUND: Previous studies have shown the effectiveness of Hot moist pack and Stretching to reduce pain and improve range of motion. Also abdominal and hamstring stretching has shown reduction in lumbopelvic pain. However, no studies are available that compare the effects of hamstring and abdominal activation on pain levels and ipsilateral hip ROM and stretching in lumbopelvic pain.

METHODS: Thirty individuals with lumbopelvic pain were randomized to intervention group (Group B) and control group (Group A). Patients attended a baseline session, followed by 6 days of intervention, and were reassessed at the end of the intervention. Assessment measures used were hip adduction range of motion using smartphone inclinometer app, Visual Analogue Scale and Modified Oswestry Disability Questionnaire (MODQ).

RESULTS: Both the groups showed significant improvements in hip adduction range of motion, pain and on MODQ. When compared, the intervention group showed better results than control group. The results also showed significant differences within the groups post intervention.

INTRODUCTION

The term lumbopelvic pain refers to pain in the lumbo-scaral area of spine encompassing the distance from 1st lumbar vertebra to the 1st sacral vertebra.¹ Specific postural changes seen in Lower Cross Syndrome include anterior pelvic tilt, increased lumbar lordosis, lateral lumbar shift, lateral leg rotation, and knee hyperextension.² If the lordosis is deep and short, then imbalance is predominantly in the pelvic muscles; if the lordosis is shallow and extends into the thoracic area, then imbalance predominates in the trunk muscles. These imbalances lead to lumbo pelvic pain.³

Low back pain (LBP) is a problem worldwide with a lifetime prevalence reported to be as high as 84% by World Health
Organization (WHO). In India occurrence of low back pain is also alarming, it has been reported to be 23.09%. Ober’s test was developed by orthopedic spine surgeon Frank R. Ober to assess passive hip-adduction in patients with lumbopelvic pain. Ober’s test was used to determine whether the ITB and/or tensor fasciae latae (TFL) needs passive stretching or not as described by Kendall which led to the use of Ober’s test primarily as an assessment of ITB/TFL length.

A fundamental approach used by the Postural Restoration Institute is the use of hamstring activation or hamstring and abdominal activation to influence Ober’s test measurements. PRI’s rationale states that the body is not symmetrical, that is the neurological, respiratory, circulatory, muscular and vision systems are not the same side of the body. And these asymmetries can cause imbalances and dysfunctional movement patterns as a result of overuse of one side of the body compared to the other.

Ober reviewed ITB tightness as a factor in sciatica and low back pain. Stretching of the iliotibial band is frequently recommended in treatment programs for patients with low back pain (LBP). Because the iliotibial band attaches to the ilium, tightness of this muscle is thought to cause anterior innominate rotation and lateral pelvic tilt. Application of heat to muscle is commonly advocated to enhance the efficacy of stretching. Healing provides an added benefit on stretch related gains of ROM in healthy people.

There are case reports which support clinical reasoning that a positive Ober’s test may indicate a lumbopelvic complex that is not in neutral position. No studies have been done to compare the effects of ITB stretching versus Hamstring and abdominal muscle activation in subjects with lumbopelvic pain.

The purpose of this study is to check the immediate effects of ITB stretching versus the immediate effects of hamstring and abdominal activation on pain levels and ipsilateral/bilateral hip ROM in people with lumbopelvic pain.

**METHODS**

**Patients**

The study was approved by the Institutional review board and Patients were recruited from tertiary care hospital at Belgaum. The inclusion criteria was as follows: 1) 18-59yrs2, 2) Positive Ober’s test one side or both sides, 3) Pain in SI, Hip, Lower Back, 4) Pain more than 1 week in the lumbopelvic region. The exclusion criteria was: 1) Lumbopelvic surgery, 2) Lower limb amputation, 3) Foot ulcers, 4) Pregnancy, 5) Radiculopathy, 6) Sensory impairments. Informed consent was obtained from all the participants. Patients were then randomized to the control group (Group A) or the intervention group (Group B) by the envelop method.

**Intervention**

Patients randomized to the intervention group and the control groups were assessed at the beginning of the first session and after six sessions by the physiotherapist. The assessment consisted of a detailed history with the duration of symptoms. Group A received Hot moist pack for 20 minutes at the site of lumbopelvic pain by asking the patient to expose the area and ITB static stretching static stretching, 3times with one minute hold each with the patient positioned in side lying with hips and knees flexed aligning the shoulders with the hips and ankle with the legs stacked on top of each other. The therapist held the patients top leg with the forearm in supination supporting the lower leg and knee (90degrees) while his other hand stabilized his pelvis. Upper leg was passively taken through the motions of the hip flexion, abduction, extension, and adduction. Group B received hot moist pack for 20 minutes and Exercises by the postural research institute. If there was unilateral affection, 90/90 hembridge with balloon and those with bilateral affection, 90/90 Hip lift with balloon was used.

1) **90/90 Hip lift with balloon**

Instructions

i. Lie on back with feet on a wall and hips and hips bent at 90° angle

ii. Place a 4-6” ball between knees

iii. Place right arm above head and a balloon in left hand

iv. Inhale through nose and as exhale through mouth perform a pelvic tilt so that tailbone is raised slightly off the mat. Keep low back flat on the mat. Do not press feet flat in the wall; instead dig down with heels

v. Shift left knee down so that it is below the level of right without moving feet. Should feel left inner thigh engage.

vi. With left knee shifted down, take right foot off the fall should feel the back of the left thigh engage. Maintain this position for the remainder of the exercise.

vii. Now inhale through nose and slowly blow out into the balloon

viii. Pause 3 seconds with tongue on the roof of mouth to prevent airflow out of the balloon.

ix. Without pinching the neck of the balloon and keeping tongue on the roof of the mouth, inhale again through nose.

x. Slowly blow out as stabilize the balloon with hand.

xi. Do not strain neck or cheeks as blow.

xii. After the fourth breath in, pinch the balloon neck and remove it from mouth. Let the air out of the balloon.

xiii. Relax and repeat the sequence 4more times.

2) 90/90 hemibridge with balloon.
   i. Lie on back with feet on a wall and knees and hips bent at 90° angle
   ii. Place a 4-6" ball between knees
   iii. Place right arm above head and a balloon in left hand
   iv. Inhale through nose and as exhale through mouth perform a pelvic tilt so that tailbone is raised slightly off the mat. Keep low back flat on the mat. Do not press feet flat in the wall; instead dig down with heels.
   v. Take right foot off the wall. You should feel the back of left thigh engage. Maintain this position for the remainder of the exercise.
   vi. Now inhale through nose and slowly blow out into the balloon.
   vii. Pause 3 seconds with your tongue on the roof of your to prevent airflow out of the balloon.
   viii. Without pinching the neck of the balloon and keeping tongue on the roof of the mouth, inhale again through nose.
   ix. Slowly blow out as you stabilize the balloon with your hand.
   x. Do not strain your neck or cheeks as you blow.
   xi. After the fourth breath in, pinch the balloon neck and remove it from your mouth. Let the air out of the balloon.
   xii. Relax and repeat the sequence 4 more times.

Outcome Measurement

1) Hip ROM using Smart Phone Inclinometer
   Patient was in sidelying position. The smart phone inclinometer was placed near the knee joint. The dial was turned until the scale read zero; the patient was taken into slight extension and patient was asked to do hip adduction. Readings were taken as the range-of-motion (in degrees) directly from the dial.

2) Pain-Visual Analogue Scale (VAS)
   Visual Analogue Scale consists of a line, usually 100 mm long, with each end of the line labelled with descriptors signifying the extremes of pain intensity (eg, no pain to extreme pain). Participants were asked to place a mark on the line that represents his or her pain intensity level, and the distance was measured from the “no pain” end to the mark which was taken as that person’s VAS pain score.

3) Modified Oswestry Low Back Pain Disability Questionnaire
   The ODI is a disease-specific disability measure is used to establish a level of disability, stage a patient’s acuity status, and monitor change over time. Scoring is done for 10 questions. Each question is scored from 0-5 (minimum to maximum).

STATISTICAL ANALYSIS

Based on available literature and consult with expertise in this field we assume that these exercises have effect on lumbopelvic pain. So from the previous study we take the mean and standard deviation of hip adduction range pre and post exercises and sample size was calculated.

SPSS version 20 was used. P value of 0.05 was considered statistically significant. Demographic data was calculated using t test. Comparison of the two groups was done using t test, Mann-Whitney U test, Wilcoxin test, paired t test.

RESULTS

Between November 2014 to January 2015, 39 patients were screened and 30 patients met the inclusion criteria. A participant flow diagram (figure 1) details the number and explanation of the participants included.

There were no notable differences (p > 0.05) between the exercise intervention and the control group at baseline. (Table 1). Outcome scores and adjusted mean differences between these groups before intervention and after six sessions are given as follows.

Table 1: Comparison of two groups (Group A and Group B) with respect to age, height, weight, and BMI scores

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A</th>
<th>Group B</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>30.87±9</td>
<td>26.07±5.8</td>
<td>0.0954</td>
</tr>
<tr>
<td>Height</td>
<td>166.13±3.7</td>
<td>165.40±9.5</td>
<td>0.7842</td>
</tr>
<tr>
<td>Weight</td>
<td>67.00±6.1</td>
<td>66.73±7.4</td>
<td>0.9157</td>
</tr>
<tr>
<td>BMI</td>
<td>24.31±2.5</td>
<td>24.63±1.4</td>
<td>0.8005</td>
</tr>
</tbody>
</table>

Table 2: Comparison of two groups (Group A and Group B) with respect to VAS scores in at pre and posttest by Mann-Whitney U test

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre test</th>
<th>Post Test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>7.33±0.8</td>
<td>4.47±1.68</td>
<td>P=0.0007*</td>
</tr>
<tr>
<td>Group B</td>
<td>7.13±1.3</td>
<td>2.27±1.2</td>
<td>P=0.0001*</td>
</tr>
<tr>
<td>Total</td>
<td>7.23±1.07</td>
<td>3.37±1.8</td>
<td></td>
</tr>
<tr>
<td>P value</td>
<td>0.4807</td>
<td>0.0008*</td>
<td>0.0004*</td>
</tr>
</tbody>
</table>

P<0.05
The mean VAS score in Group A pre intervention was 7.33±10.8 and after six sessions it was 4.47±1.68. The p value by Mann-Whitney U test was statistically significant (p=0.0007). The mean VAS score in Group B pre intervention was 7.13±1.3 and after six sessions it was 2.27±1.2. The p value by Mann-Whitney U test was statistically highly significant (p=0.0001). The mean difference between the groups was statistically significant (p= 0.0004). (Table 2)

Table: Comparison of hip adduction range scores in right side at pre and post-test

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre test</th>
<th>Post Test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>21.60±2.85</td>
<td>23.40±2.38</td>
<td>P=0.0007*</td>
</tr>
<tr>
<td>Group B</td>
<td>19.80±3.43</td>
<td>29.27±1.98</td>
<td>P=0.00001*</td>
</tr>
<tr>
<td>Total</td>
<td>20.70±3.23</td>
<td>26.33±3.68</td>
<td></td>
</tr>
</tbody>
</table>

The mean difference between the groups was statistically highly significant (p=0.00001). The mean difference between the groups was statistically highly significant (p=0.0006) (Table 4).

The mean hip adduction range in Group A pre intervention was 21.6±2.8 and after six sessions it was 23.40±2.3. The p value by paired t test was statistically significant (p=0.0007). The mean hip adduction range in Group B pre intervention was 19.80±3.4 and after six sessions it was 29.27±1.98. The p value was statistically significant (p=0.0001). (Table 3)

The findings in our study conclude that exercises with hot moist pack were effective but stretching with hot pack was also effective statistically. Clinically, the effects in terms of pain, range and MODQ scores seen in the intervention group were maintained for a longer time as compared to the short term effects seen in the control group. The effects in the control group were seen immediately after each session but not maintained till the next session.

Both the group showed significant decrease in pain levels measured by VAS. The decrease in pain levels could be attributed to the application of hot moist pack for 15 minutes in both the groups.

The reason for pain reduction by application of hot moist pack maybe mediated by heat sensitive calcium channel as a result of which there is increase in the intracellular calcium which is responsible for generating action potentials that stimulate the sensory nerves. Calcium channels are a part of transient potential receptor vanilloid (TRPV) receptors. TRPV1 and TRPV2 channels are sensitive to noxious heat, while TRPV4 channels are sensitive to normal physiological heat. Once these channels are activated they inhibit the activity of purine pain receptors. These receptors are present in peripheral small nerve endings which could lead to the reduction of pain. If the pain is present in the deeper tissues it could be reduced via the gating mechanism of the spinal cord.

The reduced pain levels were better in the experimental group as compared to that of the control group. This reduction may be due to the added benefit of the exercise which relieves stress on muscle, joints and ligaments associated with pain such as sciatica, sacro iliac joint pain and thoracic outlet syndrome as well as sciatica, sacro iliac joint pain and thoracic outlet syndrome as a result of which there is increase in the intracellular calcium which is responsible for generating action potentials that stimulate the sensory nerves. Calcium channels are a part of transient potential receptor vanilloid (TRPV) receptors. TRPV1 and TRPV2 channels are sensitive to noxious heat, while TRPV4 channels are sensitive to normal physiological heat. Once these channels are activated they inhibit the activity of purine pain receptors. These receptors are present in peripheral small nerve endings which could lead to the reduction of pain. If the pain is present in the deeper tissues it could be reduced via the gating mechanism of the spinal cord.

The hip adduction range of motion measured by smartphone inclinometer app showed significant changes in both the groups. But the hip adduction ROM was statistically highly significant in intervention group. This change could be attributed to the correct alignment of the pelvis to a neutral position, this leaves the femoral head free to adduct without abutting the cotyloid rim of the acetabulum. This was possible because of the exercises that is 90/90 hip lift with balloon...
Table 5: Comparisons of right and left sides at pretest and posttest in group A and group B by t test

<table>
<thead>
<tr>
<th>Groups</th>
<th>Time</th>
<th>Right side</th>
<th>Left side</th>
<th>t-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std.Dev.</td>
<td>Mean</td>
<td>Std.Dev.</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>Pretest</td>
<td>21.60</td>
<td>2.85</td>
<td>21.73</td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td>23.40</td>
<td>2.38</td>
<td>24.07</td>
<td>2.28</td>
</tr>
<tr>
<td>Group B</td>
<td>Pretest</td>
<td>19.80</td>
<td>3.43</td>
<td>19.87</td>
<td>3.11</td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td>29.27</td>
<td>1.98</td>
<td>29.47</td>
<td>2.47</td>
</tr>
</tbody>
</table>

P<0.05

Flow Chart

ENROLLMENT

Assessed for eligibility n=39

Excluded n=9
Radiating pain n=6, Hip arthroplasty n=1, Laminectomy done n=2

Randomized n=30

Allocated to intervention group N=15

Allocated to Control Group N=15

Lost to follow up n=0

Lost to follow up n=0

Analyzed n=15

Analyzed n=15

which activates hamstrings bilaterally or 90/90 hemibridge with balloon which activates hamstrings unilaterally. When the pelvis is rotated forward in the transverse plane with anterior tilting in the sagittal plane, there will be posterior rotation of the pelvis because of the pull of the hamstring on the same side on the ischial tuberosity during unilateral hamstring activation ie placing one foot on the wall. This helps to decrease lumbar lordosis and increase ipsilateral anterior rib internal rotation and this increases intra abdominal pressure. (IAP) 21 There will also be an increase in the IAP along with rib depression, increased lumbar flexion and a posterior tilt will be

achieved with blowing up a balloon which will cause abdominal activation. Application of heat to muscle is commonly advocated to enhance the efficacy of stretching. Heating provides an added benefit on stretch related gains of ROM in healthy people. A study done by Bleakley CM, Costello TJ in 2013 to examine the effect of thermal agents on the range of movement (ROM) and mechanical properties in soft tissue concluded that Heat is an effective adjunct to developmental and therapeutic stretching techniques and should be the treatment of choice for enhancing ROM in a clinical or sporting setting. Hence the hip adduction ROM increased with ITB stretching and hot moist pack in the control group. There was a significant change in the MODQ in the both the groups. In the intervention group MODQ showed more significant because of the exercises and HMP which led to greater reduction in pain, increase in hip adduction as compared to that of control group. Hence the above protocol prescribed to patients with lumbopelvic pain

**LIMITATIONS**

One limitation is that long terms effects were not assessed as there was no follow up.

**CONCLUSION**

In this study the experimental group which had exercises which include abdominal and hamstrings activation with HMP showed greater reduction in pain, increase in hip adduction as compared to that of control group. Hence the above protocol prescribed to patients with lumbopelvic pain.

**Conflict of Interest:** None

**References**


