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EFFECT OF TRANSVERSE ABDOMINUS AND GLUTEAL MAXIMUS MUSCLE STRENGTHENING EXERCISES ON SACROILIAC JOINT DYSFUNCTION

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ABSTRACT

Sacroiliac joint pain will not arise all of a sudden. This pain takes a large number of years to occur. During this long term the muscles loses their balance. This imbalance also induces another problem. This termed as postural imbalances. These imbalances are together called as SacroiliacJoint(SIJ) Dysfunction. Aim was to study the effect of Strengthening Exercises on SIJ Dysfunction.

Thirty subjects with SIJ Dysfunction were selected based on the selection criteria and randomly divided into two groups. Group-A subjects received Ultrasound therapy. Group-B subjects received Ultrasound therapy and strengthening exercise. Both groups were treated for 4 days a week for 3weeks. The outcome measures were Modified Oswestry Disability Index Score (MODI Score) and Visual Analog Scale (VAS).All the values were tabulated and statistically analyzed by using paired and unpaired t-test. Data analysis revealed significant difference between the two groups in the parameter functional disability.

Ultrasound and Strengthening exercise is effective than Ultrasound therapy alone in the management of subjects with SIJ Dysfunction in reducing Pain and Disability, thereby improving the functional activities.

Keywords: Sacroiliac joint dysfunction, Ultrasound therapy, Strengthening exercises, Modified Oswestry Disability Questionnaire

INTRODUCTION

Sacroiliac pain is a specific form of low back pain reported in approximately 40% patients which can occur separately or in conjunction with low back pain, lumbar disc herniation and lumbar facet syndrome **[1-4]**. This occurs because the low back and pelvis

rely on many common structures to ensure normal stability and function **[5]**. Hence functionally the pelvis cannot be studied in isolation.

Sacroiliac joint pain will not arise all of a sudden. This pain takes a large number of years to occur. During this long term the muscles loses their balance. This imbalance also induces another problem termed as postural imbalances. These imbalances are together called as Sacroiliac Joint (SIJ) Dysfunction **[6, 7]**.

It can be observed that Gluteus Maximus muscle due to its attachment to Sacrum and Iliac bones and Sacrotuberous ligament plays a significant role in stability of Sacroiliac joint and some authors stated that contraction of Transverse Abdominus muscle significantly decreases the laxity of Sacroiliac joint **[8]**. Normally SIJ are protected against dislocation by strong ligamentous system but and prolonged load, ligaments are liable to creep. Therefore in all loading situations extra muscle force is needed to press the Sacrum between the Ilia. This force can be called as force closure **[9]**. The Transverse Abdominus and Gluteal Maxi musmuscle force acting on the ilia is more or less perpendicular to the sagittal plane **[7]**. Therefore these two muscles contributed to the force closure stability of Sacroiliac joint **[5]** so strengthening of these two muscles may help in reduction of SIJ Dysfunction. Strength is a term that refers to the ability of contractile tissue to produce tension and a resultant force based on the demands placed on the muscle **[10, 11]**. Purpose of this study is about to find out the effect of Transverse Abdominus and Gluteal Maximus muscle strengthening exercises for SIJ Dysfunction.

MATERIALS AND METHODS

A total of 30 subjects with and without low back pain (LBP), between the age of 22 and 50 years, participated in this study. Subjects were selected among patients in the orthopaedic and physical therapy clinics. All the subjects signed an informed consent form approved by the scientific review board and Institutional human ethical committee at the Saveetha University before participating in the study.

Selection criteria for subjects with SI joint dysfunction

Subjects with LBP below the level of L5, or with pain over the posterior aspect of SI joint around posterior superior iliac spine and buttock with or without above knee leg pain was included in the study. Subjects were excluded if they had midline or symmetrical pain above the L5 level, had radicular pain with neurological (sensory or motor) deficits **[12]**, had a history of spinal surgery, spinal, pelvic, or lower extremity fracture; hospitalization for trauma or motor vehicle accident; hip or knee dysfunctions;

pregnancy; any systemic disease such as arthritis, tuberculosis, liver,or kidney failure. Subjects with leg length discrepancies, because of its potential effect on hamstring muscle length were also excluded.

Procedure for Diagnosing SIJ Dysfunction

At present, there are no widely accepted guidelines for diagnosing SIJ dysfunctions. Current evidence suggests that none of the SIJ provocation tests is valid enough to be solely used for diagnosing SIJ dysfunctions. Therefore, using a cluster of various tests has been suggested for diagnosing SIJ disorders. In this study, four SIJ special tests with good sensitivity, specificity, inter- and intra-ratter reliability was used for screening subjects with SIJ dysfunction. Subjects who tested positive on three out of the four pain provocation tests were considered as having SIJ dysfunction. Laslett et al reported highest sensitivity (93.8%) and specificity (78.1%) for SI joint pain provocation tests when a combination of at least three tests was used.

Testing Procedures

Pelviccompression Test

This test has very good reported for diagnosing SI joint dysfunction. The subject was placed in side lying position with hips and knees flexed to about a right angle. A downward manual pressure is applied vertically to the Ilium, toward the opposite side **[9]**. The test was considered positive if it induced pain in the SI joint.

March Test

This test has excellent reported for diagnosing SI joint dysfunction. The subjects were in standing position, the therapist thumbs placed over the bilateral dimples and index fingers placed over the bilateral ASIS. Ask to subject do march, if abnormal dimple movement the test is positive it induced pain in the SI joint.

Gillette Test

This test has good reported for diagnosing SI joint dysfunction. The subjects were in standing position, the therapist thumbs placed over the bilateral dimples and index fingers placed over the bilateral ASIS. Ask to subject do forward bending, if abnormal sacrum movement the test is positive it induced pain in the SI joint

Procedure

The experimental group received a combination of strengthening exercises and ultrasound therapy. The control group received only ultrasound therapy. Dependent variables measured in this study were the Modified Oswestry Disability Index Score (MODI Score) and Visual Analog Scale (VAS).The VAS consists of a 10-cm line with the two endpoints labeled with verbal descriptors. The patient is required to place a mark on the 10 cm line at

a point that corresponds to the level of pain intensity him or her presently feels. VAS consists of a 10 cm line with descriptors at each end. At the left end there was the number zero with the descriptor "no pain at all", and at the right end there was the number ten with the descriptor "most severe pain". Each subject placed an x dong a 10 cm line to describe the amount of pain he/she was presently experiencing.

The modified Oswestry Index will be used to measure disability and consists of 10 questions **[13]**. Each question is scored from 0 to 5, with high scores indicating greater disability. The scores are then converted to a percentage out of 100. Outcome measures were taken for both the groups before and after intervention.

The experimental group supervised received standard Transverse Abdominus muscle and Gluteus Maxims strengthening exercises and ultrasound therapy for SIJ Dysfunction. The strengthening exercises 10 reps (1 set)/ 3 sets per day as 4 days weekly total 3 weeks. Crook lying with arms beside body perform alternate diagonal limb raise with abdominal tuck in manoeuvre for Transverse Abdominus muscle and prone lying with knee flex to 90^0 extend hip, emphasizing the action of the Gluteus Maxims muscle. Ultrasound therapy was applied with the patients in prone position and placed on Sacro iliac region, each session was given for 10minutes with 1MHz of frequency.

The control group received treatment by the physical therapist that consisted of Ultrasound therapy for 10 minutes at an intensity of 1watt/$cm^2$with pulsed mode to the area of Sacroiliac region. Patients in the treatment group also performed the same exercises at home; the treating physical therapist instructed each patient in the performance of the exercises and provided a detailed handout containing instructions and photographs of the exercises. After completing 3 weeks treatment sessions, patients were instructed to continue the home exercises. The control group was instructed to continue their normal daily activities.

RESULTS

The collected data were tabulated & analyzed using descriptive & inferential statistics. To all parameters mean & standard deviation (SD) were used. Paired t-test was used to analyze significant changes between pre-test & post-test measurements. Independent t-test was used to analyze significant changes between two groups.

The post-test mean (SD) value of VAS in Group-A is 2.33 cms (0.82) and post-test mean (SD) value of VAS in Group-B is 1.14 cms (0.86), this shows that Group-A is greater than Group-B with the P value (0.0001).

The post-test mean (SD) value of MODI score in Group-Ais 6.31% (2.75) and post-test mean value of MODI score in Group-B is 1.67%(1.80), this shows that Group-A is greater than Group-B with the P value (0.0001)

From the Data Analysis of post test, Visual Analog Scale and Modified Oswestry Disability Index revealed that there is high statically significant difference seen between group A and group B.

DISCUSSION

In this study strengthening exercise of the Transvers Abdominis and gluteus maximus reduces SIJ dysfunction, after 3 weeks of exercise. The amount of pain experienced was reduced faster in the experimental group than in the control group. This preliminary study supports that reduced Transverse Abdominus and Gluteal Maximus muscle strength is a common finding. No subjects reported pain during the test procedures, supporting that the presence of pain did not directly bias the results of the study. These findings are consistent with a number of other studies that have also reported reduced back muscle strength in other more heterogenous LBP populations **[6, 9]**.

During training progressions, however, the thoracic extensors, scapular muscles, and cervical extensors became more active. As the center of gravity moved more cephalad, muscles closer to the new fulcrum might be expected to contribute more. Dul *et al.*, **[8]** theorized that larger muscles take a proportionately greater share of an increasing load, so the training activities probably addressed those trunk muscles most stressed during the testing sessions the Multifidus and the Lumbar erector spinae muscles.

McGill, **[1]**, reported that performing strengthening exercise there will not be much muscle damage this may be the probable reason in the present study for the pain to get reduced. There by increasing the functional outcome. They indicated that Gluteus Maximus muscle, due to its attachments to sacrum, iliac bones, and sacro tuberous ligament, plays a significant role in stability of the SIJ. The stabilizing forces applied to the SI joint, therefore, could be compromised with Gluteal muscle weakness.

Our findings suggested a significantly higher proportion of individuals with Gluteal muscle weakness, among subjects with SI dysfunction compared to those without SI involvement. Among subjects with LBP, those with SIJ dysfunction showed significantly weaker Gluteal muscle strength compared with those without SI involvement **[6]**. Our data did not show any significant difference in hamstring muscle

length between subjects with and without SIJ dysfunction.

With SIJ dysfunction and Gluteal muscle weakness. They indicated that Gluteus Maximus muscle crosses the SIJ and has attachments to the sacrum, and sacro tuberous and long dorsal sacral ligaments. Muscular tension applied by the Gluteus Maximus to the SIJ and to the sacro tuberous and long dorsal ligaments, contributes to the force closure stability of the SIJ. The proportion of subjects with Gluteal weakness was significantly higher in those with SIJ dysfunction compared to those without SIJ involvement. Transversely oriented muscles that must act to compress the sacrum between the ilia and maintain stability of the SIJ **[12]**.

Exercise techniques that promote independent contraction of the transversely oriented abdominal muscles (inco contraction with Multifidus) have been demonstrated to have beneficial effects in relieving pain and disability in patients with chronic LBP and lowering recurrence rates after an acute pain episode the Transversus Abdominis was effective in decreasing SIJ laxity.LBP exercise treatments to focus on enhancing the stabilization role of the transverses abdominis **[1]**.

CONCLUSION

This study concludes that Strengthening exercise and Ultra sound therapy is more effective than Ultra sound therapy alone on patients with SIJ dysfunction in increasing Gluteal Maximus and Transverse Abdominis Muscle strength, reducing Pain and Disability.

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