

A PROSPECTIVE STUDY TO COMPARE THE EFFECTS OF ULTRASOUND THERAPY AND STABILIZATION EXERCISES AND SACROILIAC GAPPING WITH STABILIZATION EXERCISES FOR SACROILIAC DYSFUNCTION IN POST NATAL WOMEN.

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LIST OF ABBREVIATIONS USED

1.SIJT	:	Sacroiliac joint
2.ROM	:	Range of motion
3.MD	:	Mean difference
4.N	:	Number of subjects
5.NS	:	Not Significant
6.SD	:	Standard deviation
7.SE	:	Standard error
8.VAS	:	Visual Analog Scale
9.SLR	:	Straight Leg Raising

ABSTRACT

BACK GROUND;

Low back pain is a very common among female in middle age as well as older group.. There are so many causes for low back pain including infection, trauma, ligament injury, muscular pain, arthritic pain, neural impingement,discitis,visceral pain, sacroiliac dysfunction, etc. The incidence is more in post partum period which may be the continuation from pregnancy period .The low back pain during and after pregnancy is mainly predisposed by sacroiliac dysfunction. The anatomical, biomechanical, neuro physiological consideration became an evidence for loss of stability of SIJT in the etiology of nonspecific low back pain. 22.5% of patient shows SIJT dysfunction⁸ and also pregnancy and post pregnancy results in instability of SIJT⁵.Pelvic pain during Pregnancy was reported to exist 48-56% of females^{7,8,9,10}

SETTING: Out patient clinic

METHOD: 40 Patients who have diagnosed to have sacroiliac dysfunction after delivery were randomly assigned to two groups. Each group consists of 20 patients. Group I received ultrasound therapy with stabilization exercise and group II received sacroiliac gapping technique with stabilization exercise. Both groups were given treatment for 5 days per week for 4 weeks. Both groups were evaluated with VAS scale for pain Intensity, measurement of lumbar flexion with inch tape and manual muscle power test at the time of initial assessment (time=0) and At the end of 4th week.

RESULTS.

The initial evaluation showed no variation between two groups.

But the post test measures showed very high significance between the variable.

However Sacroiliac dysfunction, Ultrasound therapy, Stabilization exercise, Sacroiliac gapping technique.a comparison between the groups showed a improvement with Group II ,which is statistically significant.

CONCLUSION: This study led to the conclusion that gapping technique with stabilization exercise if effective to reduce pain as well as improve mobility and improve stability of SIJT dysfunction.

KEY WORDS:

Table of Contents

SL. NO	CONTENTS	PAGE NO.
1.	INTRODUCTION	1
2.	BACKGROUND AND OBJECTIVES	6
3.	REVIEW OF LITERATURE	9
4	MATERIALS AND METHODS	25
5.	RESULTS	36
6.	DISCUSSION	42
7	CONCLUSION	46
8	SUMMARY	47
9	BIBLIOGRAPHY	48
10	ANNEXURE	

List of Tables

Sl.No	Tables	Page No.
5.1	Median, Quartiles For MMT of group I and II	36
5.2	The pre and post test comparison of MMT scores of group I and group II	37
5.3	The post test comparison of MMT in Group I and II	37
5.4	ROM of pre and post test between both the groups	38
5.5	The pre and post test mean and SD fro ROM scores fro group I and group II	39
5.6	The Post test comparison of lumbar flexion scores between the groups.	39
5.7	Pre and Post Test Comparison Of Median, QD for VAS	40
5.8	The pre and post test comparison of VAS in group I and group II	41
5.9	The post test comparison of VAS in group I and II	41

List of Figures

Sl.No	Figures	Page No.
4.1	Anterior rotation of innominate on the sacrum.	
4.2	Ultrasound unit	
4.3	Bilateral Leg raising	
4.4	Abdominal exercises	
4.5	Static contraction of Glutei	
4.6	Self correction exercise for gapping	
4.7	Straight leg raising with glutei contraction	
5.1	Pre and post test comparison of MMT scores in both groups.	
5.2	Pre and post test comparison of ROM between the groups	
5.3	Pre and post test comparison of VAS in both groups	40

SACROILIAC JOINT DYSFUNCTION

INTRODUCTION:

Sacroiliac dysfunction has been implicated as a source of low back pain by many clinicians⁵². Sacroiliac dysfunction is very common in pregnancy and post partum period. In postpartum period joint laxity is most prominent in SIJT,^{6, 9,11,28,35} allowing enough repetitive new movements at one or both SIJT to cause pain if combined with activity. Alternatively the new movement would result in becoming stuck, producing a locked joint rather than a moving joint. This may produce pain in the same side as well as in the opposite side by causing strain. Another possibility is that one joint becomes more mobile than its pain. Constraint strain is placed on the less mobile joint. A further more possibility is the widening of pelvis in post partum period produces a rotatory torsional strain on the SIJT. This in turn affect the SIJT stability and Self locking mechanism resulting in post partum SIJT strain. This in turn become a factor for so many related pattern of pain including left posterior pubic bone, left sacral rotation, left sacral side bending fixation, right anterior ileum, left posterior ileum, lumbar flexion movement dysfunction, type I and II right in flare and left in flare.

INCIDENCE:

Sacroiliac dysfunction is very difficult to diagnose as well as to treat because of the wide anatomical area. 22.5% of female showed SIJT dysfunction during and after pregnancy⁸. Pelvic pain during and after pregnancy was reported to exist 48-56 % of Female.^{9, 10,11,53}. The prevalence of 33% using single blocks injection. Using double injection it was shown a prevalence of 18.5%. Various studies SIJT is a source of symptoms in 15% population.

ETIOLOGY:

Sacroiliac dysfunction has long been suspected as a cause of low back pain and lumbo sacral dysfunction. The causes for SIJT dysfunction is so many including trauma, pregnancy, post partum, posture etc. The changes occurring during pregnancy period may be the cause for sacroiliac dysfunction and no clear evidence is available to explain the symptoms. women with the history of back pain is common 49% of women who were pregnant experience the some type of back pain including pain that is experienced above lumbar region and pain over the sacroiliac joints sometimes with the radiation to thighs. How ever the changes during the pregnancy period leads to sacroiliac dysfunction in the post partum also. Sometime the posture adopted at the time of labour may predispose to sacroiliac dysfunction.

PATHO MECHANICS AND PATHO PHYSIOLOGY

The most accepted cause of SIJT dysfunction is hormonal changes occurred during pregnancy. The relaxin hormone release causes muscle and ligament relaxation. It Allows joints to more easily misalign. The increased weight gain during third trimester leads to increased demand and fatigue on spinal and pelvic muscle and stress on spinal and pelvic ligaments. The change in the lumbar and thoracic curves which further increase the above. Totally all the stress leads to sacroiliac and vertebral misalignment. The change

in weight distribution increased the stress, fatigue of the ligaments and muscles. The increase in lumbar and thoracic spinal curves leads to misalignment.

There is a change in center of gravity due to weight gain. The average weight gain during a single fetus is 12 kg. As the uterus begins to enlarge and ascend in to the abdominal cavity, the center of gravity is displaced forward and laterally during the 12th week of pregnancy. This change leads to change in lordosis of spine. Although this is a conflicting view in the literature whether there is increase or decrease in lumbar lordosis. But this change in lordosis affects paraspinal musculature. The abdominals become over stretched and weakened as the expanding uterus separates the rectus abdominals. This decreases the lumbopelvic stability. The hormonal changes occur during pregnancy causing imbalance between the ligaments, muscles, joints, in the posterior aspect of pelvis. Hormone causes laxity in collagen tissue with in symphysis pubis and sacroiliac joint in preparation for delivery. Pregnancy hormone Relaxin poly peptide hormone decreases the strength and rigidity of collagen in capsule and ligament As ligamentous relaxation occurs, the stability between the paired sacroiliac joints and pubic symphysis decreased loading to increase joint range between pelvic joints, which decreases lumbar pelvic stability.

SIGNS AND SYMPTOMS.

Symptoms of SIJT problems can vary and may include low back pain, buttock pain, thigh pain, sciatic pain, and pain with prolonged sitting or lifting. This pain may be or may not be an extended one. Many researchers showed that the pain associated with the SIJT is result of the bone on one side of the joint sliding out of the position, there by forcing the muscles and ligaments that keep the bones aligned to over compensate, which in turn causes pain. The longer the misalignment exists the more likely muscles are in spasm and tissue damage to occur. In some cases the pain associated with mal alignment may radiated to lower back or leg. There may be a change in the gait due to pain. The activities are normally decreased due to pain. Decreased stability can result due to laxity of the joint capsule and ligaments, decreased muscle strength and decreased co contraction of stabilizing muscles. This decreased stability can strain the pelvic ligaments which results in pain. Orthopedic assessment is positive for Gillett's test, sitting flexion test, standing flexion test, Active straight leg raising test, Ganeselan's test, Patrick's test and Faber test.

BACKGROUND

Sacroiliac joint pain was considered to be complex one to treat as well as evaluate. The assessment of SIJT will be a tough one due its complex nature. There are so many causes for the pain in the back during and after pregnancy,^{41,42,43} but the accepted one is increasing weight which may alter the gait as well as posture. The stress put over the lower back at third trimester may increases the risk in post partum also. The position adopted during the labor also the reason for SIJT dysfunction. There are so many controversy to treat Low back pain during pregnancy and also it was believed that the pain may be reduced after delivery. But this pain may persist in post partum and results in group of syndromes and referred pain to thigh, buttock, lower back etc. Previously the traditional physiotherapy modalities were used to treat SI joint dysfunction that there was no evidence of improvement from the symptoms. The studied are comparing the effects of physiotherapy verses manipulations to treat SI joint. But the result did not give any evidence of better results among the groups. The non thermal effects of ultrasound tried along with other modalities to treat SI joint dysfunction. The effect of ultrasound alone is unable to predict so in my study I tried with ultrasound with stabilization exercises to compare gaping technique with stabilization exercises.

The gapping technique is a kind of passive accessory movement which increasing the gap in SIJT. When it was given along with stabilization it shows better results. This study was done previously in compare with manipulation therapy but due to short period the results was not significant.

The stabilization exercises are very important to treat SIJT because these are believed to strengthen SIJT muscles^{33,37,39}. The rectus abdominals played an important role in maintaining the SIJT stability. The gapping exercise may reduce the misalignment and related pain due to dysfunction. Chad .E cook, PT author of manual therapy of the sacroiliac joint and pelvis explain the effect of gapping technique which can be used to treat sacroiliac dysfunction. Especially in unilateral Sacroiliac dysfunction in order to encourage posterior glide in unilateral gap.

OBJECTIVES OF THE STUDY

The objective of the study is to investigate, in a randomized, prospective study, the effect of ultrasound therapy with stabilization exercises verses gapping technique with stabilization exercises. Specifically,

1. To determined the effect of ultrasound therapy with stabilization exercises in reducing pain and to improve the joint range (lumbar flexion), and hip adductor muscles power in SIJT dysfunction.
2. To determine the effect of gapping technique with stabilization exercises in reducing pain and to improve the joint range (lumbar flexion), and hip adductor muscles power in SIJT dysfunction.
3. To compare the effectiveness of ultrasound therapy with exercises verses gapping technique with exercise in reducing pain and improving lumbar flexion range, hip adductor muscle power in SIJT dysfunction in SIJT dysfunction.

REVIEW OF LITERATURE

MECHANICAL PROBLEMS DURING PREGNANCY

First, the abdominal cavity is already, relatively speaking, smaller in a superior-inferior direction in view of the sacralization of the last two lumbar vertebra (L4 and L5) and their integration into the sacrum and smaller in an anterior-posterior direction in view of the formation of the lumbar lordosis. Human pregnancy barely has adequate space in the abdominal cavity and this result in compression on all surrounding organs, such as the major abdominal vessels anterior abdominal wall, vertebral and pelvic joints, muscles, ligaments, etc. This is contrary to the quadruped condition in which the pregnancy rests comfortably over the anterior abdominal wall with the necessary space available and with no undue pressure on any organ.

Second, the human fetus grows in a ventral direction and, at or near term, the CG of the human body no longer falls over the base of support formed by the feet. To regain her equilibrium, the pregnant woman at term has to lean backwards, and this results in important orthostatic and orthodynamic consequences. Spinal curvatures are completely disorganized. The lumbar curvature moves dorsally and may or may not be accentuated, the thoracic curvature has to compensate accordingly, and the equilibrium of the body has to be maintained in an unusual (painful) position. Because of the dorsal displacement of the trunk, the rectus

abdominal muscles have to increase their tension and the intra-abdominal pressure is increased, producing elevation of the diaphragm. The cardiopulmonary consequences are numerous.

Third, from the orthodynamic point of view, the situation is even worse. Because of the backward position of the trunk in relation to the pelvic girdle, the glutei lose some of their abductor function and the pregnant patient at term now wobbles, as previously described. The elegant striding walk, the pride of human erect behavior, is all but gone in advanced pregnancy.

Obstetric problems during labor

During labor, the fetal head and body have to find passage at the level of the three pelvic planes through a bony pelvis that has been adapted to and distorted by erect posture and locomotion.

1. Pelvic inlet. The sacral promontory has moved forward, thus restricting the AP diameter of the pelvic inlet. When the fetal head presents the pelvic inlet, it pushes the sacral promontory dorsally, thus producing a backward rotation of the upper sacrum around the SIJ.
2. Midpelvis. The ischial spines have moved inward, thus restricting the transverse (TR) diameter of the midpelvis. When the fetal head presents at the midpelvis, it attempts to widen the TR diameter of this pelvic plane, and thus stretches the SIJ wide open.
3. Pelvic outlet. The bi-ischial diameters and the sub pubic angle are narrower when the pelvis is android (30% of cases; Berman 1955, Warwick & Williams 1973), thus restricting the diameters of the outlet. When the fetal head presents at the outlet, it pushes the sacral apex dorsally and therefore produces a backward rotation of the lower sacrum around the SIJ.

Bony readaptations-misadaptations are not the only anatomic consequences of erect posture. Soft tissue structures are also altered and maladapted. In quadruped posture, all the abdominal viscera, including the pregnant uterus, are supported by the anterior abdominal wall, but in erect posture all these organs pound against the pelvis.

The hormones of pregnancy, specifically relaxin, are produced during gestation and contribute to relaxation of all the body joints, including inter-vertebral and pelvic joints

There is a need to resume erect posture and locomotion immediately or as soon as possible after giving birth, to avoid complications of excessive bed rest such as phlebitis and thromboembolism. This early resumption of erect posture and locomotion may impose some stretching of the pelvic joints before they return to their normal prepregnancy condition because they have been softened by hormones of pregnancy (progesterone and relaxin, among others). The damage may be permanent (leading to backaches, etc.).

To carry her pregnancy to or near term, the human female has had to lean backward in order to keep her equilibrium. This results in disequilibrium of the vertical alignment of the body, with a reorganization of the spinal curvatures. This may be associated with a partial loss of abductor function of the gluteal muscles and wobbling.

The hormone relaxin stretches all the lumbar and pelvic joints, and makes erect locomotion and even erect posture painful and tiring.

The distortion and narrowing of the three planes make labor and delivery painful, prolonged, and traumatic. The soft tissues of the pelvis are temporarily stretched or permanently damaged by the passage of the fetus.

Erect posture and encephalization, therefore, make human parturition particularly difficult

BIOMECHANICS :

The relation between sacroiliac joints and lumbopelvic movement will be explained here.

There have been conflicting studies regarding the mobility of the SI joints. For some time it was generally accepted that there was motion early in life, but progressively less motion as the degenerative changes of the joint took place, and many investigators felt that the joints eventually fused. Clinicians now feel that motion occurs throughout life. Hippocrates First described pregnancy-related motions of the SI joint in the fifth century BC. SI joint is a diarthrosis. SI joint overuse and hyper-mobility leading to lumbar plexus irritation. Many of these early studies were conducted on cadavers, and led to conflicting reports in the literature. In 1920, Halladay was the first to study cadaver, and found asymmetrical SI joint movements. He found that these movements also led to movements in the pubic symphysis, and that back hyperextension leads to displacement of the sacrum with respect to L5. Much of his work was the basis for spinal mechanics, further developed by the osteopathic profession. SI joint arthrodesis that was effective for ischialgia, and in 1934 Cyriax stated that the SI joint subluxation can be measured by comparing leg lengths.

In the modern area, Bowen and Cassidys were the first to demonstrate that the SI joint is patent throughout life, and in 1991 Ostgaard et al. reported that SI joint pain was one of the most common etiologies of low back pain during pregnancy. In a number of studies throughout the 1990s, shows that intraarticular ridges and depressions that are found as we progress through life are actually adaptations to the forces on the SI joint. These adaptations increase the stability of the joint, and imply its underlying mobility.

Actual validation of SI motion has been dearly established in the modern era via clinical evidence and biomechanical studies. These studies note motion in both prolonged and abrupt load patterns. Vleeming et al. Showed that in vitro, loading tests showed SI joint mobility into old age, and that prolonged loading caused creep of ligaments. Buyruk et al. used color Doppler imaging to assess joint stiffness and motion in live subjects in 1995, and the actual innervations of the joint was confirmed

Biomechanical models of function have developed from the first description of load transfer from the spine to the lower extremities crossing through the SI joint, to the description of an integrated model of joint function. These include a left and right oblique axis, a vertical and anteroposterior (AP) axis, a vertical and sagittal axis, and three horizontal axes. It should be noted that none of these axes is rigid. The actual axis used depends on the motion and the summation of forces that move through the joint with a particular action.

In the normal gait cycle, there are combined activities that occur conversely in the right and left innominates, and function in connection with the sacrum and spine. As one steps forward with the right foot, at heel strike the right innominate rotates posterior and the left innominate rotates anterior. During this motion, the anterior surface of the sacrum is rotated to the left and the superior surface is level, while the

spine is straight but rotated to the left. Toward midstance, the right leg is straight and the innominate is rotated anterior. The sacrum is rotated right and side-bent left, while the lumbar spine is side-bent right and rotated left. At left heel strike, the opposite sequence will occur and the cycle is repeated.

Throughout this cycle there is a rotatory motion at the pubic symphysis, which is essential to allow normal motion through the SI joint. Pubic symphysis dysfunction in walking is one of the essential or leading causes of the development of SIJD. In static stance, when one bends forward and the lumbar spine regionally extends, the sacrum regionally flexes, with the base moving forward and the apex moving posterior. During this motion, both innominates go into a motion of external rotation and out-flaring. This combination of motion during forward bending is called nutation of the pelvis. The opposite occurs in extension, which is called counternutation. As the sacrum goes into extension with the base moving posterior and the apex anterior, the innominate components internally rotate and in-flare. This motion is clearly demonstrated and illustrated by Kapandji

As previously noted, throughout later decades of life, the SI joint becomes less mobile due to adaptive changes in both the joint articulation and connective tissues. Some believe that these changes are actually the result of hyper mobility in the joint and the body's own response to this motion Hypomobility in general appears to be common in clinical practice, in both acute low back and SI joint pain syndromes.

SIJD is broken down into iliosacral and SI dysfunctions. Torsions have both a right and left anterior and right and left posterior types. These are diagnosed when rotation is the primary component, although there is an additional side-bending component as well. Unilateral lesions tend to have a primary flexion or extension plus side-bending component, as opposed to a rotatory component. A bilaterally flexed or extended sacrum is also possible, which is often found in certain decompensate postures and during pregnancy.

Gross SI joint instability is rare, but micro instability is a relatively common component seen in patients with recurrent SIJD. This micro instability often leads to chronic pain syndromes and must be treated as part of these complex pain presentations. Instability often occurs as a result of the loss of the functional integrity of any of the systems of the lumbosacral and pelvic region that provide stability. The myofascial or the osteoarticular and ligamentous components may be affected, as with chronic spondylolisthesis. Understanding this concept is critical, because it implies that a thorough evaluation of the lumbosacropelvic function must be carried out in the evaluation for SIJD, regardless of the origin of pain.

Biomechanics between the spine and pelvis

This functional description comes from extensive study of the SI joint over the past 10 to 15 years, and is the most studied and supported model for SIJD. It integrates structure (form and anatomy), function (forces and motor control), and the mind (emotions and awareness) on human performance. Integral to the biomechanics of SI joint stability is the concept of a self-locking mechanism. The SI joint is the only joint in the body that has a flat joint surface that lies almost parallel to the plane of maximal load. It's ability to self-lock occurs through two types of closure, form and force. Form closure describes how specifically shaped, closely fit contacts provide inherent stability independent of external load. Force closure describes how external compression forces add additional stability. It had long been thought that only the ligaments in this region provided that additional support. It is the fascia and muscles within the region that provide significant self-bracing or self-locking to the SI joint and its ligaments through their cross-like anatomic configuration.

Ventrally, this is formed by the external abdominal obliques, linea Alba, internal abdominal obliques, and transverse abdominals, whereas dorsally the latissimus dorsi, thoracolumbar fascia, gluteus maximus, and iliotibial tract contribute significantly. Additionally, there appears to be an arthrokinetic reflex mechanism by which the nervous system actively controls this added support system. These supports are critical in asymmetric loading, when the SI joint is most prone to subluxation. The important concept to gain from this understanding of integrated function with regard to treatment and prevention of low back pain is that SIJD is a neuromyofascialmusculoligamentous" injury.

Coupled motion of contralateral latissimus dorsi and gluteus maximus and posterior layer of the thoracolumbar fascia as a mechanism of load transfer from the ipsilateral latissimus dorsi and the contralateral gluteus maximus. This load transfer is critical during rotation of the trunk, helping to stabilize the lower lumbar spine and pelvis. This was demonstrated through cadaveric and electromyographic (EMG) studies. The stretched tissue of the posterior thoracolumbar fascia assists the muscles by generating an extensor influence, and by storing elastic energy during lifting to improve muscular efficiency.

In healthy individuals, a normal lumbopelvic rhythm exists, during which the first 65° of forward bending is via the lumbar spine, followed by the next 30° via the hip joints. Increased hamstring tension prevents the pelvis from tilting forward, which diminishes the forward-bent position of the spine, which results in reducing the spinal load [36]. Normalization of the lumbopelvic rhythm is an essential component to treatment of low back pain and SIJD.

The model of suboptimal posture, though incomplete, has shown to be effective when used as a model to guide treatment. Posture can be defined as the size, shape, and attitude of the musculoskeletal system with respect to gravitational force. Subtle departure from ideal posture has been implicated as an important biomechanical factor in athletes with regard to injury because it results in increased mechanical stress throughout the body. Posture must always be evaluated as part of the biomechanical evaluation. The size, shape, and attitude of three cardinal bases of support should always be included: standing surface, the feet, and the base of the sacrum.

Effects of ultrasound therapy :

It has been shown to increase tissue temperature which in turn leads to increase blood flow and increase repair. The damaged ligament will often respond to ultrasound therapy. Cortisol level present in spinal nerve root and lumbar sacral plexus increased by ultrasound which in turn results in decrease SIJT pain. Electrotherapy modalities are useful to treat SIJT pain. ultrasound is used in pain relief treatment in post partum care. ultrasound gave to positive effect with regards to pain. This was randomized double blind trial using pulse ultrasound and placebo but in the significant results effect was not found. Biologically thermal effect of ultra sound heal the soft tissue. He did this study in sports injury patients.

Effects of gapping:

A study in effect of spinal manipulation in subjects with chronic LBA explained the effect of gapping manipulation procedure.. In that in compare with other manipulation no significant improvement with the gapping technique but the duration of treatment increased to get the results and also when hands are placed on a subject to give the illusion of therapeutic effect, it become possible that therapeutic benefit may result.

Effects of stabilizing exercises :

Stability of the sacroiliac joint is enforced by the thoracolumbar fascia and its attachments to lumbar and pelvic muscles (“i.e., the quadratus lumborum, erector spinae, gluteus maximus, gluteus minimus, piriformis, iliacus, latissimus dorsi, as well as transverses abdominis and internal oblique muscles”), which combine with anterior and posterior sacroiliac joint ligaments. The sarcrotuberous ligament further influences stability due to its anatomical attachments with gluteus maximus and piriformis muscles, as well as the thoracolumbar fascia .Lastly, the shape of the articular surfaces in between the sacroiliac joints also reinforces stability.

Aphysical therapy treatment program evaluating specific stabilizing exercises to decrease posterior pelvic pain after pregnancy and improve functional status and qualify of life. Eighty-one women were evaluated using a randomized, single-blinded, clinically controlled study, with a stratified group design based upon location of the patient’s pain. The inclusion criteria specified that the pain began during pregnancy or three weeks afterwards. Individualized treatment programs were developed consisting of posture and body mechanic training and specific strengthening of transversus abdominis with coactivation of lumbar multifidus, gluteus maximus, latissimus dorsi, oblique abdominal muscles, erector spinae, quadratus lumborum and hip adductors and abductors. Specifically the patients were taught to isolate the transversus abdominis and then progress to contract the other muscles. The exercises were performed thirty to sixty minutes, three days a week, for eighteen to twenty weeks. This study demonstrated that subjects who performed the stabilization exercises, compared to patients receiving patient education with encouragement to perform ordinary physical activity, had significantly decreased pain ($P<0.001$), and higher health related quality of life in the areas of physical functioning, physical role and bodily pain. This is one of the few randomized controlled trials performed on this population. A high level of evidence can be obtained from this study do to its randomization, single blinding and excellent follow up.

Two years later a follow up study on the same eight-one subjects from the previous study by use of questionnaire. Seventy-five of the women’s responses were analyzed. The above significant differences were maintained two years after delivery. The strength of these result may be attributed to the functional approach used with the specific stabilizing muscles. Using the SF-36, an outcome measurement assessing general health status, the control group continued to demonstrate lower scores of physical health as compared on the intervention group. The control group did show improvement of pain and decreased disability, however the findings were not significant when compared to the treatment group. The authors attributed this findings as a possible result of time and natural healing.

Mens, Snijders, and Stam (2000) found contrasting results to the above study. These authors examined graded exercises of the diagonal trunk muscles, where subjects were able to increase repetitions as

tolerated. This was a randomized clinical trial with forty-four women that also examined persistent pelvic pain that began during pregnancy or three weeks afterwards. In contrast to the study performed by Stuge et al. (2004) these women were instructed in the exercises by videotape. The subjects were randomly assigned to three groups, where one group performed exercises to target diagonal trunk muscles (external and internal obliques, latissimus dorsi, gluteus maximus, and multifidus), the other group strengthened longitudinal trunk muscles (rectus abdominis, erector spinae and quadratus lumborum) and a control group to perform activities of daily living and not exercise. The videotape also included patient education regarding pain, prognosis and therapeutic possibilities, as well as how to use a pelvic belt. The patients were instructed to perform the exercises three days a week, where two series of exercises were performed (isometric and partly nonisometric), with a five-minute rest period in between. Lastly, they were to perform light exercises to improve muscular awareness and recruitment three times a day. After the eight-week intervention, no significant differences were found between the three groups, in pain, fatigue, perceived general health and mobility of the pelvic joints. It is possible that this study did not find similar results to Stuge, et al. (2004) secondary to the decreased intervention period as well as lack of individualized treatment, where patients performed the exercises at home with instructions by videotape and without the supervision of a physical therapist.

Noren, Ostgaard, Nielsen, Ostgaard (1997) analyzed the effect of a differentiated, individualized treatment program on sick leave during pregnancy for women with lumbar back and/or posterior pelvic pain. A total of one hundred thirty five women participated in this prospective, consecutive, controlled cohort study, where the intervention group had fifty-four women and the control group had eighty-one women from another antenatal clinic, where no intervention for pain was provided. In the treatment group, each woman attended five treatments and participated in an individualized treatment program designed for their pain type and intensity. For example, women who had lumbar spine pain performed lumbar spine strengthening exercises, where as women with posterior pelvic pain were instructed to not overload the pelvis and provided with sacroiliac belt. All patients received education regarding anatomy, body posture, vocational ergonomics, pelvic bottom training and relaxation training. Pain intensity in the treatment group significantly decreased ($p < 0.05$), as well as reduction in sick leave ($p < 0.001$). The validity of this study however is low secondary to the lack of randomization at one clinic, as well as the lack of similarities between the control and treatment group. An additional weakness of this study was the lack of information regarding the type of strengthening exercise as well as frequency and performance of exercises. Lastly, there was limited amount of treatments, as compared to the above studies.

MATERIALS AND METHOD

Source of data collection:

The data for the study was collected from postpartum women diagnosed with SIJT dysfunction referred to out patient department of sugam hospital

Subjects:

40 patients diagnosed with sacroiliac joint dysfunction were used in this study. to be eligible for the following criteria were formulated.

Inclusion:

1. The subjects had to have experienced pain in lower back area after delivery for more than 2 months.
2. On initial assessment should exhibit pain on posterior compression of Right and left innominate in supine position.
3. Pain during Bilateral straight leg rising up to 70° in supine position.
4. Pain during flexion, abduction and external rotational position of affected side hip joint against pressure applied over knee joint.
5. Pain during single active leg raising after 70° which will compare with bilateral straight leg raising.

Exclusion:

1. Patient with degenerative arthritis.
2. Patient with disc problems, sciatica, sprain
3. Patient with hip pathology like perthes, septic arthritis,
4. Patient with pelvic floor infections, perineal pain, episiotomy, osteitis pubis.
5. Patient with intra uterine device
6. Patients using steroids for pain relief
7. patient with cardiovascular, neuromuscular lesions

The age of subjects 20-30 years. Out of 40 females were treated with control study and 20 were with experimental study.

The average duration of treatment is 4 weeks.

Informed consent :

Prior to the participation in the study subjects were explained about the nature of study and treatment, measurement and experimental procedures used in this study. Those who agreed voluntarily were made to sign in informed consent form.

Sampling method:

When the subjects who fulfilled the criteria for selection in the study were referred to physiotherapy and they assigned to two groups (group I & group II).This procedure is followed to assign the subsequent subjects.

Design:

The subjects were randomly assigned to two groups. The group I was assigned to only Ultra sound therapy and stabilization exercises. (N=20) The group II was assigned to sacroiliac gapping technique and stabilization exercises.(N=20).

Tools used for the study.

1. Visual analogue scale.
2. Lumbosacral mobility scale
3. Ultrasound unit with accessories
4. Treatment couch
5. Recording sheets
6. Stationary materials.

Procedure

Subjects were clinically evaluated for Sacroiliac joint dysfunction after delivery and checked for inclusion and exclusion criteria before being selected for the study. At the time of admission to the study following baseline data were collected.

1. Intensity of pain by VAS
2. Functional range of lumbo sacral mobility
3. Hip adductor muscle power

Training:

A 4 week rehabilitation protocol was designed with patients under going treatment for five days per week. During this period patients were not allowed to strain their back including sexual activities. No medications were used as part of their treatment. Tapping and Belts were not advised. Every patient followed the protocol during four weeks.

In ultrasound therapy with exercise group I,

Ultra sound was given for 8 minutes with pulsed ultrasound /1Mhz/0.5 w/cm² for five days per four weeks . During ultrasound therapy, stabilization exercises were given.. Fourth week the subjects are evaluated for the outcome..

II group had given sacroiliac gapping technique which includes the following.

1. Patient is in supine lying .knee of the affected side flexed, the toes were hooked under the lateral aspect of the straight knee. The therapist passively takes the flexed knee across the body while holding the

shoulder of the affected side against the plinth. Thus tension is applied to the affected sacroiliac joint and any slack is “taken up”: at the end of the range a single gentle thrust is given. The subject asked to try this without thrust as a home programme.

2. Patient in sitting or standing position with the hip and knee of the affected side flexed and foot up on a chair or bench, the patient asked to rocks forward to knee and back.
3. Patient in supine lying with hips at 90° and lower legs supported horizontally by a solid surface, the woman presses with her affected side thigh against firm surface, holds, and releases.

This gapping technique was given five days a week for four weeks .the gapping maintained for 15 seconds followed by a thrust by therapist.

Along with stabilization exercises were given.

Stabilization exercises

With lumbar spine in neutral position, tighten stomach and sides without moving spine. Use fingers to feel stomach and sides tighten. Keep breathing. Hold for 20 seconds. Practice when sitting, standing and lying.

1. Lie on back, knees bent. Place fingers on pelvis, with lumbar spine in neutral brace abdominals. Raise one foot up and down 2-3 inches, repeat with other foot. Do not let the pelvis move. Continue for 2 minutes. The exercise can be progressed as follows.

- Bent knee raises, left foot up (lower leg parallel to the ground) and hold, right foot up and hold, left foot down, right foot down, reverse.
- Heel taps. Lift each foot up about 1 inch and slowly tap each heel down one at a time.

2. Lie on back, knees bent and feet flat on the ground. Maintain neutral with abdominal brace. Raise buttocks and trunk slowly up. Lower and touch down lightly without losing neutral. Repeat 10 times. This exercise can be progressed as follows.

- Leg raises. Hold up bridge position – slowly raise and lower one foot at a time (straighten knee without moving thigh)
- Leg raise with 2 kgs ankle weights.

4. Lie face down, arms above head. Look straight down with head lifted off the floor. Reach arms out. Tighten abdominals and buttocks to prevent low back extension (sway back). Pinch shoulder blades until arms rise up ½ inch. Hold 20 seconds. Lower arms. Reach feet out until knees just come off the ground. Hold 20 seconds. Alternate arms, then legs.

Progression : Hold arms and legs up at the same time. Hold for 20 seconds

1. Abdominal strengthening exercises
2. Pelvic tilt
3. Back muscle strengthening exercises
4. Double leg stretch to keep the low back muscles to relax.

5. Stretching exercises for abdominals and back muscles

Evaluation

Before starting the rehabilitation program and after 4 weeks of treatment, all patients are evaluated on several outcome measurements.

Subjective assessment

Pain :

Pain was recorded on a 10cm visual analog scale where 0 is indicated no pain and 10 cm is indicated extreme pain. VAS was chosen over other pain rating system because of its simplicity of use and its universal approval.

Objective assessment

Mobility :

Patient stands erect with normal posture, Identify level of postero-superior iliac spine Mark midline at 5 cm below iliac spine .Mark midline at 10 cm above iliac spine patient bends at waist to full forward flexion. Measure distance between 2 lines (started 15 cm apart) Normal: distance between 2 lines increases 20 cm Abnormal: distance does not increase 20 cm Suggests decreased Lumbar spine range of motion. Ask the patient to bend forward without flexing the knee joints

Muscle strength assessment:

Muscle power assessment

In sacroiliac dysfunction the hip adductors showed weakness due to pain. The adductors were tested in side lying position in which the affected side is down over the plinth where as normal side limb placed over this. Hip adductor muscle power is graded with oxford technique from 0 to 5

Statistical analysis

The data collected by visual analog scale and manual muscle testing were analyzed using non parametric tests as the data is ordinal scale in nature. The intra group pre and post test data were analyzed using wilcoxon signed rank test and the inter group pre and post test data were compared using Mannwhitney test.

The data collected by lumbar flexion range were analyzed

Using parametric tests as the data is interval in nature. The intra group pre and post test data were analyzed using pre and post test data were compared using un related t-test. The statistical significance or the p value for all the analyzed data was fixed at 0.05.

GAPPING TECHNIQUE

Fig 4.1-Anterior rotation of innominate on the sacrum.

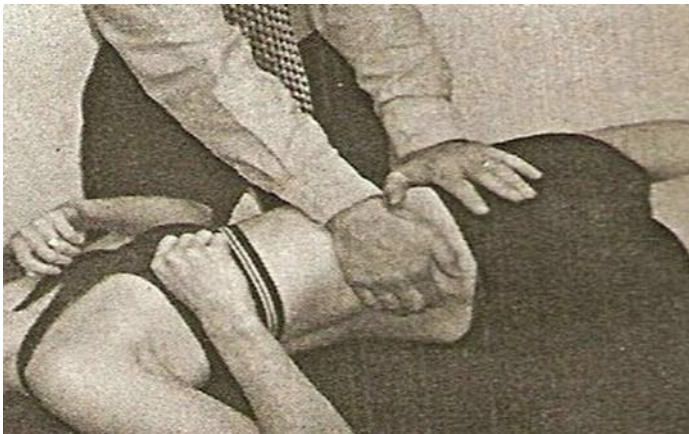


Fig 4.2 : Ultrasound unit



Fig 4.3 : Bilateral Leg raising



Fig. 4.4 : Abdominal exercises



Fig 4.5: Static contraction of Glutei



Fig 4.6 : Self correction exercise for gapping



Fig 4.7 : Straight leg raising with glutei contraction



RESULTS

At initial evaluation (time =0), statistical analysis did not show any significant differences ($p>0.05$) for any of the variable between the ultrasound and stabilization exercises and sacroiliac gapping with stabilization exercises group.

Table 5.1 and fig 5.1 shows the pre and post test Median and QD for manual muscle testing scores for both groups. The median of pre and post –test scores for group I were 3 and 4 and group II were 3,5 and 4 respectively.

Table 5.1 The pre and post test median and QD of manual muscle test scores for both groups.

TABLE-5.1: Median, Quartiles for MMT Group I and II

	GROUP-I		GROUP-II	
MMT	MEDIAN	QD	MEDIAN	QD
PRE	3	0.375	3.5	0.5
POST	4	0.5	4	0.5

Fig 5.1 : Pre and post test comparison of MMT scores in both groups.

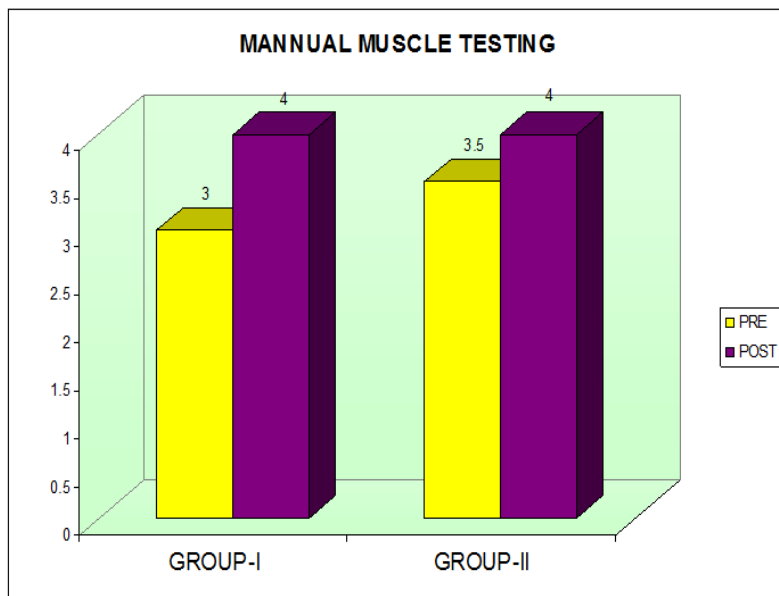


Table 5.2 : The pre and post test comparison of MMT scores of group I and group II

MMT	Z-VALUE	P-VALUE	RESULT
I	3.57	0.000	P<-.05 HS
II	3.5	0.000	P<-.05 HS

Fig 5.1 and table 5.2 shows that both group I and group II demonstrated significant increase in the muscle power of the hip adductor obtain by the MMT score after 4 weeks of training (p=0.000 for both groups)

Table 5.3 : The post test comparison of MMT in Group I and II

Group I and II

Group I & II	U-VALUE	P-VALUE	RESULT
MMT	184	0.641	P>0.05 NS

The comparison of improvement between group I and group II as analyzed from MMT score is presented in table 5.3 which shows group I performed slightly better than group II but is not statistically significant.

LUMBAR FLEXION RANGE SCORES.

Table 5.4 shows the mean, SD and SE for lumbar spine range of motion scores. The mean pre and post test ROM score for group I were 57.55 and 94.85 and for group II were 50.95 and 92.7 respectively.

\	GROUP-I			GROUP-II		
	MEAN	SD	SE	MEAN	SD	SE
PRE	57.55	14.35	3.2	50.95	11.03	2.46
POST	94.85	7.17	1.6	92.7	8.11	1.81

Table 5.4 : ROM of pre and post test between both the groups

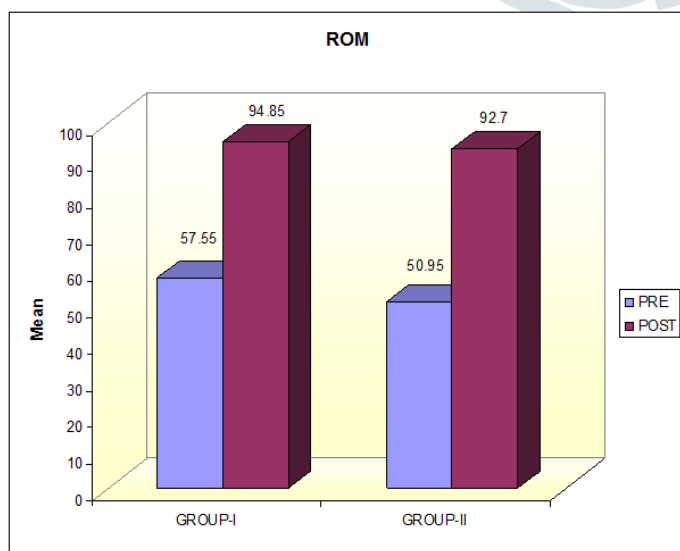


Figure 5.2 : Pre and post test comparison of ROM between the groups

Table 5.5 : The pre and post test mean difference and SD for ROM scores fro group I and group II

PRE-POST COMPARISON OF ROM

PRE-POST	MD	T-VALUE	P-VALUE	RESULT
I	37.3	13.95	0.000	P<-.05 HS
II	41.74	16.62	0.000	P<-.05 HS

Table 5.5 and figure 5.2 shows that both group I and group II demonstrated lumbar ROM scores which is highly significant. ($p < 0.05$)

Table 5.6 : The Post test comparison of lumbar flexion scores between the groups.

Group I & II	T-VALUE	P-VALUE	RESULT
ROM	1.21	0.233	P>.05 NS

Table 5.6 : The Post test comparison of lumbar flexion scores between the groups.

Table 5.6 shows p value is more than 0.05. There is no significant differences in treatment effect of group I and group II since MD of group I =37 and MD of group II is 41. Group II shows slight improvement than Group I

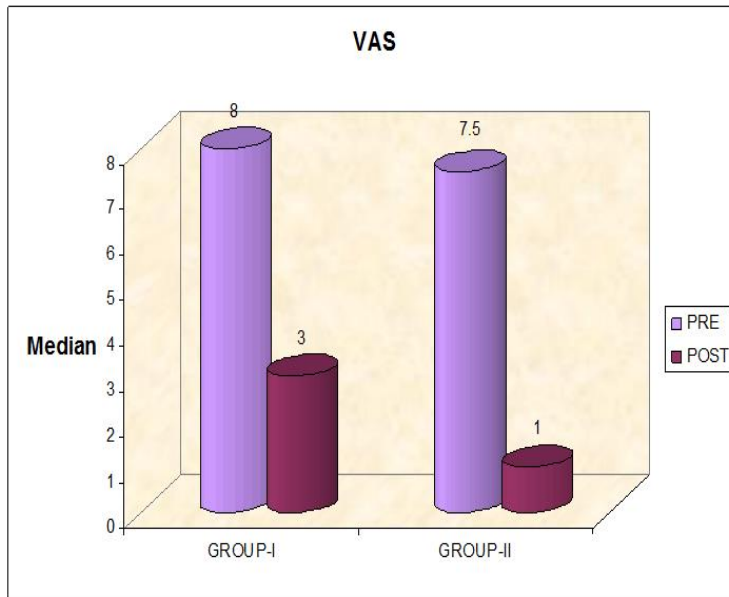
SUBJECTIVE ASSESSMENT**VISUAL ANALOG SCALE FOR PAIN.**

The pre and post test MEDIAN and QD for visual analog scale for pain for both group I and Group II are presented in Table 5.7.. the median of pre and post test scores for group I was 8 and 3 and group II was 7.5 and 1 respectively.

TABLE 5.7: Pre and Post Test Comparison Of Median, QD for VAS

VAS	GROUP-I		GROUP-II	
	MEDIAN	QD	MEDIAN	QD
PRE	8	0.5	7.5	1
POST	3	0.5	1	0.5

5.3 : Pre and post test comparison of VAS in both groups



The pre and post test comparison of VAS in both groups shows highly significant improvement ($p < 0.05$) which is presented in table 5.8 and fig 5.3

Table 5.8: The pre and post test comparison of VAS in group I and group II

AS	Z-VALUE	P-VALUE	RESULT
I	3.95	0.000	$P < .05$ HS
II	3.96	0.000	$P < .05$ HS

The comparison of improvement between groups shows no significant statistically ($p = .745$). But group II shows very slight improvement. The results are presented in table 5.9

Table 5.9 : The post test comparison of VAS in group I and II

Group I & II	U-VALUE	P-VALUE	RESULT
VAS	188	0.745	$P > .05$ NS

DISCUSSION

US with exercises and gapping technique have been used as rehabilitation protocol for SIJT dysfunction, but the number of studies comparing the effect of both these are few. The results of this study revealed that both group demonstrated a significant improvement in symptoms and functional activities as measured by the VAS for pain, r lumbar flexion ROM , and MMT for Adductor muscle strength. The gapping technique group showed slight advantage over U.S group in the outcome measure (ROM, VAS) though it is not statistically significant.

Both group revealed a significant reduction in pain better. This is consistent with previous studies carried out by Noren et al 1997,.

Since pain was already chronic in the beginning of the study, it is likely that no significant natural improvement would have been occurred during the period of this study. Therefore it is probable that the significant reduction in pain observed in this study is as a result of gapping manual therapy . The effect of US therapy in pain relief is unsupported but South worth .T, showed ultrasound may be given to promote healing which has been found to effective in 95% of pain relief with STJT53.

As both training protocol used in this study area mainly to correct the dysfunction which in turn resulted in improvement of hip adductor muscle power as measurement demonstrated. A significant increase in strength results in both groups. These results are consistent with previous finding in the literature by Rost CC43,

The increase in adductor muscle strength probably results in the □ in pain this is proved by Men's et al.

Men's et al reported that weakness of hip adduction strength secondary to pain was indicative of pelvic instability and was useful in implicating post partum SIJT syndromes.³⁵

These stabilization exercises found additional improvement to increase muscle strength which was proved by Richardson et al 1999. This included training global muscle as well as local muscle. This program produces significant improvement in muscle strength as well as SIJT stability. Walker 1992, Veierod, Lacrum, Vollerland (2004) conducted a follow up study of 81 pt who were examined during pregnancy period. In the post [partum period, 75% of subjects who were advised to do stabilization exercises did not showed any disability where as control group showed disability and pain. This finding supports the effect of stabilization exercises.

Punjabi (1992) showed that spinal stability is maintained by muscles as multifidus, transverse abdominals, diaphragm and pelvic floor muscle.. This was proved by Hides et al 1996, Hodges 1996 lumbar Rom measurement in this study reveal significant in improvement both groups. Even though both groups used. The same exs programs, the group treated with gapping technique showed slight improvement than group I.

Green man showed that manual therapy which may correct the dysfunction will reduce the symptoms and improve lumbar mobility. But there is no literature to support the effects of US in SCJT dysfunction in order to increase the lumbar range. As results we conclude that, both the techniques should have place in treatment of SLJT dysfunction. Especially gapping technique which may correct the dysfunction to a certain amount may be followed by ultrasound therapy in order to heal the soft tissue which are more useful in improve the stability of SIJT

Limitations for the Study

- The duration was short only 4 weeks and the results apply to short term only, which might differ in long run.
- No long term follow up was done to ascertain the differences in long term gains in both protocols.
- Sample size taken for the study is small and bigger sample size might led to some differences.
- Sampling was done in small geographical area which might not representing the whole population.
- Sampling was done manually and this may introduce human error which might affect the reliability of the study.
- Subjects were not matched with age weight, height and also with no of pregnancies.
- No control group was used as it is unethical to withhold treatment. no blinding was done which might introduce bias in the measurement.

Suggestions

- A long term study should be carried out to make the results, are reliable.
- Follow-ups at regular interval over a long period of time should be carried out to find the efficacy of the treatment.
- A large sample size should be taken to improve the consistency of results.
- Sampling from a large geographical area will lead to better representation and consistent findings.
- Better and scientific sampling method when possible should be used to validate the results.
- It needs more research in this study with large number of subjects is necessary to find out the relative merits of ultrasound therapy with stabilization and gapping with stabilization on sacroiliac joint dysfunction.

CONCLUSION

This study showed that there was a significant reduction of pain, increase in adductor muscle power and lumbar spine ROM in both groups after four weeks of training in SIJT dysfunction.

When pre-post test improvement was compared between the two groups the group with gapping and stabilization exercise showed a slight advantage over the group with ultrasound therapy with stabilization exercises.

As results we conclude that, both the techniques should have place in treatment of SLJT dysfunction. Especially gapping technique which may correct the dysfunction to a certain amount may be followed by ultrasound therapy in order to heal the soft tissue which are more useful in improve the stability of SIJT

SUMMARY

SIJT dysfunction is a common musculoskeletal problem and is main cause of non specific low back pain, In female this SIJT pain is due to pregnancy and related changes which persist in the post natal period .It is a common problem in out patient clinic the treatment does not convinced clinicians, traditionally ultrasound therapy and exercises were given, but nowadays gapping technique which may be with manual assistance or self correction will be more effective.

This study was carried out to compare the effects of ultrasound therapy with stabilizing exercises and gapping technique with stabilizing exercises in the SIJT dysfunction, 40 subjects (N=40) between the ages of 20-30 diagnosed to have SIJT dysfunction ranging from 1 month to 10 month duration were selected for this study. They were randomly select6ed to 2 groups each consists of 20 .group I tried with Ultrasound therapy and exercises. and group II tried with gapping and exercises. They were treated 5days per week for four weeks with ultrasound therapy and exercises where evaluated for MMT, VAS, and ROM.

The statistical data was dine using paired tuberculosis-test and Wilcoxon test within the groups and unpaired tuberculosis-test and Mann Whitney test between the groups.

The results showed that both groups improved significantly post test ($P < 0.05$) in all the measured variables, but the comparison between the groups showed no statistical significance. ($P > 0.05$)

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MASTER CHART

GROUP I (ULTRASOUND THERAPY AND STABILISING EXERCISES)

Serial no	Age	Duration	Pretest MMT	Post test MMT	Pretest VAS	Post test VAS	Pretest ROM	Post test ROM
1	24	3	3	3	7	2	65	90
2	23	4	3	4	7	3	76	100
3	25	1	4	4	9	3	55	98
4	25	3	3	3	8	2	48	100
5	26	4	3	4	8	4	45	95
6	25	4	3	3	7	2	30	70
7	27	4	3	3	8	3	65	90
8	26	3	4	5	6	1	72	100
9	25	3	3	5	8	4	72	100
10	26	3	4	5	8	3	50	96
11	25	4	3	4	7	5	60	89

12	27	2	3	5	9	3	80	98
13	24	3	3	4	7	3	45	90
14	25	3	4	5	8	2	62	98
15	26	5	3	5	8	2	45	99
16	27	3	3	4	7	2	30	89
17	25	4	3	5	9	1	56	100
18	24	3	3	4	6	1	65	100
19	23	2	4	5	8	4	55	98
20	23	3	3	4	7	3	75	97

MASTER CHART

GROUP II (GAPPING TECHNIQUE WITH STABILISATION EXERCISE)

Serial no	Age	Duration	Pretest MMT	Pretest MMT	Pretest vas	Pretest MMT	Pretest ROM	Post test Rom
1	25	2	3	4	8	2	36	100
2	26	6	3	3	9	4	57	90
3	25	2	4	4	7	1	45	99
4	22	3	3	5	7	2	38	97
5	24	1	4	5	6	1	45	100
6	25	4	3	4	8	1	30	72
7	26	2	4	5	9	4	55	95
8	24	5	3	5	7	2	62	90
9	29	3	4	4	9	3	70	100
10	26	2	4	5	7	1	55	98
11	24	4	3	4	6	1	46	80
12	23	3	3	5	8	1	55	99
13	25	5	4	4	9	2	64	98
14	25	1	3	4	7	1	60	100
15	26	2	4	4	7	1	55	100
16	23	4	3	4	9	1	30	90
17	26	5	4	5	7	0	50	89
18	25	4	3	4	8	2	60	90
19	25	6	4	5	6	1	50	80
20	26	5	4	4	9	2	56	87

