

***EFFECTS OF KINESIOTAPING IN COMBINATION WITH MUSCLE ENERGY
TECHNIQUE AND STATIC STRETCHING OF HIP FLEXORS ON PAIN, ROM,
AND FUNCTIONAL STATUS IN A PATIENT WITH ANTERIOR INNOMINATE
ROTATION DYSFUNCTION- A CASE STUDY.***

ABSTRACT :

Background: The pain in and around the sacroiliac joint is known as sacroiliac joint dysfunction (SIJD), and it is generally brought on by improper biomechanics or a biomechanical problem with or without a history of trauma. Improper movement of the ilium around the sacrum and improper function of SIJ structures such as ligaments, muscles, and capsules cause pain in the SI joint. One kind of sacroiliac joint dysfunction is anterior innominate rotation dysfunction, which happens when the anterior superior iliac spine moves anteriorly and inferiorly in relation to the contralateral landmark. In order to alleviate discomfort, enhance range of motion, and improve functional status in patients with anterior innominate rotation dysfunction, this case study investigates the use of Kinesiotaping in conjunction with Muscle Energy Technique and static stretching of hip flexors.

Study design: A case study

Case description: This case study describes the physical therapy intervention given for 28year- old female with Anterior innominate rotation dysfunction.

Result: The patient attended 2 weeks of physical therapy intervention and 4 weeks of home exercise program. At the end of the 2 weeks there was reduction in pain, improvement in Range of motion and functional status of the patient.

Conclusion: This study concludes that Kinesio taping in combination with muscle energy technique and static stretching of hip flexors is effective in reducing pain and improving ROM and functional status of the patient with Anterior innominate rotation dysfunction.

Keywords: Anterior innominate rotation dysfunction, Kinesio taping, Muscle energy technique, Static stretching

INTRODUCTION

Sacroiliac joint dysfunction (SIJD) refers to pain or discomfort around the sacroiliac joint, which is commonly associated with changes in its normal biomechanics rather than a history of major trauma. Altered movement between the joint surfaces, either excessive movement

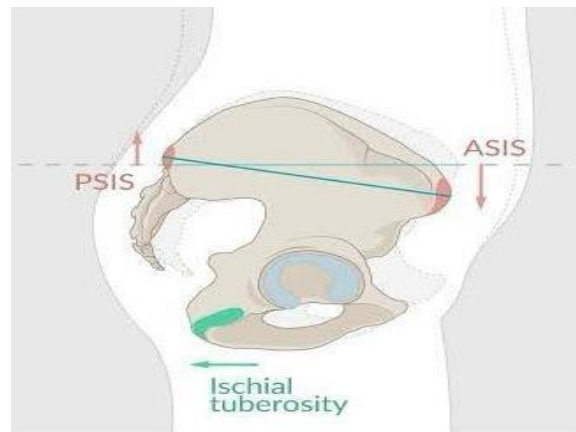
(hypermobility) or restricted movement (hypomobility), may affect the normal function of the joint and contribute to pain in the sacroiliac region.¹ Individuals with mechanical SIJD commonly experience a dull, aching pain around the lower back and sacroiliac region, usually on one side. In most cases, the pain does not extend below the knee, although it may sometimes be felt in the buttock, groin, or back of the thigh. Certain daily activities, including prolonged sitting, bending, lifting, getting up from a chair, and climbing stairs, may increase the intensity of the pain.² The sacroiliac joint forms a connection between the lumbar spine and the pelvis. Although it allows only a small amount of movement, it has an important role in transferring loads between the upper body and lower limbs. Because of this function, any alteration in its normal movement or load distribution may contribute to pain in the lower back and pelvic region.¹ SIJD is considered to be a relatively common contributor to low back pain, with its prevalence reported to range between 13% and 30% among individuals presenting with low back pain.¹ It is also reported more frequently in women than in men. Studies suggest that women may be three to four times more likely to experience SIJD than men, and the condition may affect up to 30% of women presenting with low back pain. Increased body weight is another factor that may contribute to SIJD, as it can influence load distribution and lumbopelvic muscle function, potentially resulting in pain and stiffness.³ A cross-sectional study conducted in 2020 examined the occurrence of SIJD among individuals diagnosed with lumbar disc herniation. The study included 234 participants and found a considerable occurrence of SIJD, with right-sided involvement reported more frequently than left-sided involvement.¹

Pelvic asymmetry is a common finding associated with sacroiliac joint dysfunction (SIJD). It is frequently observed in individuals involved in activities that require repetitive lifting, twisting, and unilateral loading, such as racket sports, where repeated shear and torsional forces are placed on the pelvis.⁸ Athletes participating in sports such as football, basketball, powerlifting, gymnastics, golf, cross-country skiing, and rowing may be at greater risk of developing low back discomfort related to SIJD.²

Several factors may contribute to the development of SIJD, including sudden or repetitive heavy lifting, muscular or soft-tissue injuries, pelvic fractures, previous lumbar or lumbosacral fusion, pregnancy, spondyloarthropathies, osteoarthritis, scoliosis, leg-length discrepancy, rheumatoid arthritis, inflammatory bowel disease, and other autoimmune disorders.² Other recognized risk factors include previous lumbar fusion, lumbar spinal stenosis, obesity, leg-length asymmetry, prolonged participation in sports, pregnancy, and abnormal gait patterns.²

There are five different types of SIJD: Anterior innominate rotation dysfunction, posterior innominate rotation dysfunction, sacral torsion, down slip and up slip. The condition known as AIRD occurs when the anterior superior iliac spine moves anteriorly and inferiorly relative to the contralateral landmark. In AIRD, innominate bone moves anteriorly on the sacrum which is in counter nutation. When standing, the line of gravity passes posterior to the hip joint, allowing the dorsal parts of the pelvis to support the body weight. When the line of gravity shifts ventrally, the ilium rotates anteriorly, resulting in dysfunction¹⁰. There is inhibition of gluteus maximus which alter its stabilizing effect on pelvis so at some point in weight bearing during ambulation, the pelvis no longer maintains its neutral function. The gluteus maximus must be properly activated to maintain pelvis stability.³ The anterior superior iliac spine may experience anterior- inferior rotation force due to a tight rectus

femoris⁵ AIRD can be unilateral or bilateral, unbalance hip flexors, hip extensors and abdominal muscles results in unilateral AIRD¹



Anteriorinnominaterotation

This dysfunction can be identified through various methods such as inspection, history, palpation, and diagnosed by using motion test.⁹ The following pain provocation tests are used to identify SIJD: Patrick test/ faber test, Gaenslen's test, Thigh thrust test, compression test, distraction test and sacral thrust test. Patrick test differentiates between SIJD and hip pathology.¹⁰ In order to provide a definitive diagnosis of AIRD, the Gillet test/ stork test, standing flexion test, sitting flexion test and supine to sit test are conducted.³

Conservative treatment has been utilized for many years to treat variety of musculoskeletal condition. Treatment option for SIJD include Manual therapy technique such as manipulation, Kinesio taping, muscle energy technique, Mckenzie, Maitland's mobilization and Mulligan's mobilization.⁸

Kinesio taping is a non-invasive technique that has become increasingly popular in recent years for managing musculoskeletal pain and functional limitations. It is believed to support neuromuscular re-education, reduce pain and inflammation, improve blood circulation, prevent further injury, and promote faster recovery.³ Kinesio taping may also enhance the activity of the muscles beneath the skin, improve the strength of weak muscles, and help restore normal muscle function. In addition, the tape stimulates cutaneous mechanoreceptors through contact with the skin. This sensory stimulation may produce a reflex response in the underlying muscles, potentially lowering the threshold required for motor-unit recruitment and thereby improving muscle activation.

Muscle energy technique is a modern treatment for joint dysfunction. This method indirectly treats joint dysfunction by applying an isometric muscle contraction against an external counter- force through the force exerted by the muscle.⁶ This technique has reported in multiple studies to have beneficial results in reducing disability and pain among patient with SIJD.⁴

Static stretching is a passive technique to relax and lengthen the muscle. One of the hip flexors that crosses the pelvis is the iliopsoas. Theoretically, the neuromuscular recruitment

of the gluteus maximus will be decreased by the short hip flexor. As a result, excessive hip flexor activation will block the gluteus maximus and increase reliance on secondary extensors like the hamstring, a phenomenon known as synergistic dominance. In addition to being essential for iliopsoas extensibility, static stretching of hip flexor also indirectly recruits the gluteus maximus.³

According to the previous studies, Kinesio taping, MET and Static stretching of hip flexors has demonstrated benefit in treating the condition AIRD but there is limited evidence on the combined effectiveness. Hence, the purpose of the study was to determine the combined effectiveness of Kinesio taping, MET and static stretching of hip flexors in reducing pain and improving ROM and functional status in patient with AIRD

CASE DESCRIPTION

Patient history/subjective finding

A 28-year-old female patient with a history of chronic pain in anterior aspect of hip since 2 years (2022) started experiencing pain in her hip/ groin region while exercising in the gym especially lower body exercise and also while performing hip mobility exercises which involves hip rotations. Pain was gradual on onset. Pinching and pulling type of pain was present on both the side where right was more than left. Patient self-performed stretching and mobility exercises often in the gym but didn't see any improvement in pain. Patient is now expecting a reduction in pain in the groin and also improvement in her hip movements. So, she visited Physiotherapy Centre for the management of her pain and improvement of her functional status.

CASE ASSESSMENT

The height of the patient was 157 cm and the weight was 72 kg. The body mass index (BMI) of the patient is 29 (heavily built).

ON OBSERVATION:

ANTERIOR VIEW: It was noted that the patient had slight cubital valgus, a slight anterior drop of the right pelvis, genu valgum that was more in the left knee as compared to the right knee, and pronated feet were observed.

POSTERIOR VIEW: Genu valgum and calcaneovalgus were noted on both sides.

LATERAL VIEW: It was noted that the patient had increased lumbar lordosis, anterior pelvic tilt, and hyperextended knee joints.

ON EXAMINATION

Pain was assessed using NPRS, which is shown in Table No. 2; ROM for hip flexion, extension, abduction, adduction, internal rotation, and external rotation, are shown in Table No. 1; and MMT for hip flexors, extensors, abductors, adductors, internal rotators, and external rotators are shown in Table No. 3. Also, muscle length testing for the iliopsoas and rectus femoris was done by using the Thomas test and Kendell test, which is shown in the

picture below. The Ely test was also done, which confirmed rectus femoris tightness. Four of the tests that were initially performed—the distraction test, compression test, sacral thrust test, FABER/Patrick's test, thigh thrust test, and Gaenslen's test—came back positive, indicating SI joint dysfunction. The Gillet/Stork test, standing flexion test, sitting flexion test, and Supine to Sit test were then performed in order to make a conclusive diagnosis of AIRD.

Table1-ROM examination of hip joint (pre-assessment)

Hip joint	Right	Left
Flexion	0-105 ⁰	0-110 ⁰
Extension	0-7 ⁰	0-10 ⁰
Abduction	0-35 ⁰	0-37 ⁰
Adduction	0-27 ⁰	0-28 ⁰
Int. rotation	0-30 ⁰	0-30 ⁰
Ext. rotation	0-35 ⁰	0-35 ⁰

Table2-NPRS

NPRS	At rest	On Activity
	3/10	9/10

Table3-MMT

Hip muscles	Right	Left
Flexors	4+	4+
Extensors	3+	4
Abductors	3+	4
Adductors	4+	4+
Int. rotators	3+	4
Ext. rotators	3+	4

DSIJQ score: 24/100 (higher the score greater is the disability)

Muscle length testing

- **Thomas Test**
Reduced iliopsoas muscle length (Rt < Lt)
- **Kendall test**
Reduced rectus femoris length (Lt < Rt)

EVALUATION/ DIAGNOSIS

The diagnosis concludes Rt. Anterior Innominate Rotation Dysfunction.

METHODOLOGY

- Total study duration: 1.5 months
- Number of subjects: 1
- Study design: case study
- Subject source: Aditya College of Physiotherapy
- Duration of treatment: 2 weeks
- Material used: posture grid, goniometer, Kinesio tape, scissor, treatment couch

PROCEDURE

This case study took place at Aditya College of Physiotherapy. The study was explained to the subject and consent was obtained before starting the intervention. The duration of the treatment was 2 weeks. During this period, participants received Kinesio taping in addition to MET and static stretching of hip flexors. She attended 3 sessions of Kinesio taping, MET, and static stretching of hip flexors per week for 2 weeks. She was also instructed to follow a four-week home exercise regimen that included lumbopelvic stabilization exercises, beginning on the day of treatment. Post intervention, assessment for pain, ROM of the hip joint, and functional status was done after 2 weeks. After a month, a follow-up on functional status was conducted using Denver sacroiliac joint questionnaire (DSIJQ).

INTERVENTION

The goals were set before the treatment.

GOALS:

- To reduce pain.
- To improve the flexibility of tight muscles.
- Improve the performance while doing hip joint exercises (in the gym).

The intervention in this study involved the application of Kinesio tape, MET, and static stretching of the hip flexors and a series of home exercise programs, which included lumbopelvic stabilization exercises. The intervention was carried out for 2 weeks, where Kinesio taping, MET and static stretching were done 3 times a week. Additionally, a 1-month home exercise program was taught to the patient.

APPLICATION OF KINESIO TAPE:

The first stripe of tape was placed over the external oblique muscle, starting in the inguinal area and ending on the spinous process of the thoracic vertebrae 12 by applying roughly 50% of tension. The second tape stripe that started at the ASIS was pulled over the PSIS by applying roughly 75% of the available tension. In order to prevent discomfort while applying the tape, the patient was side-lying, and her pelvis was kept in the posterior pelvic tilt posture. While the patient was in a hook-lying position, the third stripe of tape was pulled over the rectus abdominis with roughly 50% of the tension, starting close to the pubic symphysis and ending on the xiphoid process and fifth to sixth costal cartilage.⁸ The tape application direction is indicated by the arrow in the figures. The Kinesio taping was done three times a week for a duration of 2 weeks



Figure 7: Application of Kinesio taping.

- Application of kinesiology tape for the EO muscle
- Application of kinesiology tape from the ASIS to the PSIS
- Application of kinesiology tape for both RA muscles

Table4:Exerciseprotocolforthepatient

Exercises	Descriptions	Dosages
MET	The patient lying on her back. The therapist stood beside the patient's side to be treated at the waist level. The patient's leg and hip were flexed and brought over the edge of the couch. The gluteus maximus was squeezed in order to bring the anterior innominate back. The patient's knees should be on the therapist's shoulder, and the patient should be encouraged to extend (20% of muscle contraction) as the therapist resists, holding the contraction for 10 seconds before releasing it and flexing further. This process is carried out 3 times. The therapist increased its flexion, causing posterior iliac rotation, until the restriction barrier was observed by looking at the movement of the pelvis after the resistance barrier was overcome.	• (10 sec hold×5 rep) • 2 sets per session • 3 sessions per week
Static stretching	The patient was asked to lie in a prone position. The therapist was standing close to the patient's side that was affected. To stabilize the pelvis, the therapist put one hand on the buttock. Then, using the other hand, carefully bend and lift the thigh for a low-intensity stretch that lasted for 30-second. This was done 5 times with a 15 seconds break in between.	• (30 sec hold×5 rep) • 3 sessions per week



Fig8:MET for gluteus maximus and correcting AIRD in a supine lying position



Fig9: Static stretching for hip flexors in a prone lying position

RESULTS

A 28-year-old female patient with Rt. anterior innominate rotation dysfunction was treated with Kinesio taping, MET, and static stretching of hip flexors. Additionally, a home exercise program that included lumbopelvic stabilization exercises was taught during the course of the treatment. Before starting the intervention, the patient was thoroughly assessed for pain, ROM of the hip joint, MMT of hip muscles, and functional status. NPRS was used for evaluating pain, MMT and goniometry were used for assessing muscle strength and ROM, respectively. Also, Denver sacroiliac joint questionnaire was used for assessing the functional status of the patient.

During pre-assessment, NPRS scores were 3/10 (at rest) and 9/10 (on activity). Hip ROM was reduced, where right hip extension was significantly impacted and MMT of hip muscles showed a decrease in muscle strength. After the pre-assessment, the patient was provided with Kinesio taping, MET, and static stretching of hip flexors 3 times a week for 2 weeks and a home exercise program for 4 weeks. After completion of 2 weeks of treatment, the patient was reassessed. Hence, post-assessment shows an NPRS score of 1/10 (at rest) and 4/10 (on activity), ROM of the hip joint was improved as shown in table 5, and muscle strength was also improved, which is shown in table 7. Improvement in functional status was also noted as measured using Denver sacroiliac joint questionnaire (DSIJQ). Additionally, follow-up on functional status using DSIJQ was conducted after 4 weeks, which also showed significant improvement in the functional status of the patient.

Hence, all the pre-test and post-test examinations show the improvement at the end of 2 weeks of treatment sessions.

Table5:ROMofhipjoint

Jointrange	Pre-treatment		Post(after2 weeks)	
Hipjoint	Rt.	Lt.	Rt.	Lt.
Flexion	0-105°	0-110°	0-115°	0-120°
Extension	0-7°	0-10°	0-13°	0-15°
Abduction	0-35°	0-37°	0-38°	0-40°
Adduction	0-27°	0-28°	0-30°	0-30°
Int. rotation	0-30°	0-30°	0-35°	0-35°
Ext. rotation	0-35°	0-35°	0-40°	0-40°

Table6:NPRS

NPRS	Pre-treatment	Post(after2 weeks)
Atrest	3/10	1/10
On activity	9/10	4/10

Table7:ManualMuscleTesting(MMT)

HipMuscles	Pre-treatment		Post(after2 weeks)	
	Rt.	Lt.	Rt.	Lt.
Flexors	4+	4+	5	5
Extensors	3+	4	4+	4+
Abductors	3+	4	4+	4+
Adductors	4+	4+	5	5
Int. rotators	3+	4	4+	4+
Ext. rotators	3+	4	4+	4+

Table8:DenverSacroiliacJointQuestionnaire(DSIJQ)

DSIJQ	Pretreatment	Post(after2 weeks)	After4 weeks
Score	24/100	12/100	2/100

DISCUSSION

This case study aimed to assess the effects of Kinesio taping, MET, and static stretching of hip flexors in reducing pain and improving the ROM and functional status of a patient with AIRD. Prognostic studies on the efficacy of combining all of these methods for AIRD are currently lacking. Thus, this case study examines the application of these techniques, outlining the intervention strategies used and their impact on her condition.

The duration of the present study was 2 weeks, and 3 sessions of Kinesio taping, MET, and static stretching of hip flexors were given. The pre- and post-assessments were done before and after interventions, respectively. The post-assessment data showed a reduction in pain and improvement in ROM and functional status of the patient.

During initial assessments, it was noted that the patient had AIRD along with tight hip flexors and weak hip extensors. Theoretically, the hip flexor's short length will decrease the gluteus maximus neuromuscular recruitment; hence, the gluteus maximus will therefore be inhibited by excessive hip flexor activity (Farwa Asad et al., 2021). Also, according to Shafeekhalaf et al. (2023), individuals with sacroiliac joint dysfunction display abnormal gluteus maximus recruitment when doing weight-bearing activities. The compressive strength across the SI joint is increased by the gluteus maximus activation.

Ashraf Vaseghnia et al. (2019) conducted a study on the therapeutic effects of MET on sacroiliac dysfunction. In this study he concluded that MET can be used to reduce pain and correct sacroiliac joint disorders by considering the kind of dysfunction and the direction of the corrective technique. This study also correlates with the current study where MET was given to the patient to activate the gluteus maximus, which helps to counter the anterior rotation by producing a posterior force on the innominate.

According to **Shafeekhalaf et al.** (2023), MET + KT can be used to not only alleviate pain but also correct anterior innominate rotation dysfunction. With reference to this study, our study used Kinesio tape in order to reduce pain perception, facilitate the rectus abdominis and external oblique muscles, and provide mechanical support to the Sacroiliac joint by restricting anterior tilt of the innominate. Likewise, MET was used to strengthen the weak gluteus maximus to re-establish muscle balance around the pelvis to promote pelvic realignment

A study conducted by **Aditya Vaidya et al.** (2019) concluded that both MET and Mulligan mobilization are effective in treating AIRD, but when compared with each other, MET was more effective than Mulligan mobilization. The current study also uses MET to facilitate weak gluteus maximus to restore muscle balance around the pelvis and also counters the anterior rotation by providing a posterior force on the innominate. In this case, MET assists through pelvic realignment and stabilization.

Post-isometric relaxation of the gluteus maximus and static stretchings showed improvement in pain and functional status in patients with anterior innominate rotation dysfunction, **Farwa Asad et al.** (2021). With reference to this study, our study used static stretching of hip flexors to relieve the anterior rotational force on the pelvis and allow the ilium to return to a more neutral position. Also stretching of hip flexors helps to reduce gluteus maximus inhibition allowing better gluteus maximus recruitment which helps posteriorly rotate the ilium. Moreover, the lumbopelvic stabilization exercises

had provided the additional effects to the treatment outcome in reducing pain and disability and increasing the strength in the patient with SI joint dysfunction, **Faryal Zaidi et al. (2020)**.

Some limitations were also noted in this study, which include small sample size and shorter follow-up period. Additionally, the intervention period was brief, making it impossible to assess long-term effects. Future research should employ larger sample sizes, longer study durations, and further follow-up periods in order to validate the case study's findings.

CONCLUSION

This case study concludes that Kinesio taping in combination with Muscle energy technique and static stretching of hip flexors is beneficial in reducing pain and improving range of motion and functional status in patients with Anterior innominate rotation dysfunction.

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