



IMMEDIATE EFFECT OF KINESIO TAPING ON ABDOMINAL MUSCLES VERSUS HAMSTRINGS ON PELVIC TILT IN HEALTHY YOUNG FEMALES.

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Abstract

Background

Anterior pelvic tilt is an angle of inclination in which anterior superior iliac spine (ASIS) is inferior to the posterior superior iliac spine(PSIS) in relation to the horizontal plane.

Aim

The aim of the study was to compare the immediate effect of kinesio taping on abdominal muscles versus hamstrings muscles on pelvic tilt in healthy young female.

METHODS

The randomized clinical trial was performed in Nashik, India, during the time period from December 2020 to June 2021. 60 females aged between 18 to 30 years with anterior pelvic tilt more than 15°. Females were randomized into two groups (each 30). Abdominal muscle taping was performed for group A and group B went hamstring muscle taping. Anterior pelvic tilt was measured before taping, immediately after taping and after 24 hours. Repeated measure ANOVA was used to compare within group and Unpaired T-test was used to compare between two groups.

RESULTS

No significant results were detected between the Anterior pelvic tilt angle before and immediately after taping in both the groups ($p > 0.05$). However a significant reduction in anterior pelvic tilt was observed in both the groups 24 hours after taping ($p < 0.05$).

CONCLUSION

Taping on abdominal muscles and hamstring muscles was equally effective in reducing Anterior pelvic tilt angle after 24 hours

Key Words Anterior pelvic tilt, pelvic angle, Palpationmeter, Kinesiotaping.

INTRODUCTION

The pelvis acts as a connecting link between the spine and the lower extremities. Movement of the pelvis causes motion at the hip joint and lumbar spine articulations. Contraction of the hip musculature causes pelvic motion through reverse action; however, to prevent excessive pelvic motion when moving the femur at the hip joint, the pelvis must be stabilized by the trunk musculature⁽¹⁾. One of the most common deformity of spinal column is excessive lumbar lordosis⁽²⁾.

Lumbar lordosis is the compensatory curvature that delivers the centre of gravity of the head, neck and trunk to both the legs, distributing the body weight and promoting posture⁽³⁾. Abnormal positions strain ligaments and muscles, and indirectly affect the curvature of lumbar spine⁽⁴⁾.

In anterior pelvic tilt, the anterior superior iliac spine of the pelvis (ASIS) moves anteriorly and inferiorly and thus closer to anterior aspect of femur as the pelvis rotates forward around the transverse axis of hip joint. This shall result in increased lumbar spine extension and hip flexion.

In posterior pelvic tilt, the posterior superior iliac spine (PSIS) of the pelvis moves posteriorly and inferiorly, thus closer to the posterior aspect of the femur as the pelvis rotates backward around the axis of the hip joint. This shall result in increased lumbar spine flexion and hip extension.

The most important aspect of anterior pelvic tilt is that it increases lumbar lordosis, which can optimize the alignment of the entire spine⁽⁵⁾. However, the ligaments and muscles get strained because of abnormal positions, and that indirectly affects the curvature of the lumbar spine. Posterior pelvic tilt reduces lordosis by flexing the lumbar spine⁽⁵⁾. The normal range of lordosis angle is 0-30 degree. Kinesio taping is a well-recognised method widely used to improve musculoskeletal disorders, neuromuscular rehabilitation and sport. Kinesio taping, which uses elastic adhesive tape with an elasticity rate similar to that of skin, is being used by physical therapists during rehabilitation programs to treat musculoskeletal pain and functional abnormalities⁽⁶⁾.

Taping a joint increases mechanical joint stability directly but also may increase proprioceptive signals which are thought to be important in the regulation of the tone of muscles which helps to ensure stability. The kinesio taping technique helps in reducing acute and chronic muscle spasm, oedema, and pain. Taping could be used for pain relief, lumbar muscle function normalization⁽⁷⁾.

PURPOSE OF STUDY: The purpose of the study was to assess whether a 1-day application of posterior pelvic tilt taping [PPTT] using two different techniques of kinesiology tape would decrease anterior pelvic tilt and which technique is more effective in immediately reducing Anterior Pelvic Tilt.

MATERIALS AND METHODS: A randomized clinical trial was performed in Nashik, India, during the time period from December 2020 to June 2021 and was conducted on females with Anterior pelvic tilt angle more than 15°. 60 participants were selected through random sampling.

In this study, female participants aged between 18 to 30 years with BMI less than 30kg/m² were included in the study. The participants were excluded if they have limitations in the ranges of movement of the pelvis or spine, orthopaedic disabilities (such as deformity, fracture, or arthritis of the pelvis or spine), history of known neuromuscular, rheumatoid, or other diseases that affecting the musculoskeletal system, use of medication, orthotic devices for treatment of hyperlordosis, allergy to kinesio tape and skin diseases. After filling the consent form the participants were enrolled in the study and the forms were approved by the ethical committee. Anterior pelvic tilt angle was measured with the help of PALMeter (Palpation meter) before taping, immediately after taping and 24 hours later.

A Palpation meter (PALM, Performance Attainment Associates, St. Paul, MN, USA), which consists of an inclinometer and two caliper arms, were employed to measure the inclination of the pelvic. The inclinometer has semicircular arc with one degree gradations that ranges from 0° to 30° on either side. During the measurement, the participants wore non-restrictive clothing, removed their shoes, and spread their feet (approximately 10~12 cm)⁽⁸⁾. They were given instructions to stand as erect as possible without bending the ankles, knees, hips or spine and were told to look at a fixed point ahead of them. The investigator palpated the prominence of the ipsilateral ASIS and PSIS and marked them with a pen⁽⁸⁾. The pelvic tilt was measured by placing the caliper tips of the PALM in contact with the ASIS and PSIS (Lee et al., 2011). To minimize possible error, the change in pelvic inclination between ASIS and PSIS was measured with PALM by the same individual. The PALM is a cost effective, valid and reliable clinical measurement instrument. The intra-test reliability of the PALM is 0.90, and the inter-test reliability is 0.85⁽⁸⁾. An anterior pelvic tilt (APT) angle is shown as a positive (+) value, and a posterior pelvic tilt (PPT) angle is shown as a negative (-) value.

According to the study, the normal anterior pelvic angle is 11±4°. After measuring the anterior pelvic tilt angle, the participants were randomly assigned into two groups (A and B). Abdominal muscle taping was applied for group A and Hamstring muscle taping was done for group B. The tape used in this study was adhesive with a width of 5 cm and thickness of 0.5 mm.

Group A- In abdominal group taping, the rectus abdominis and external oblique muscles taping was performed. For taping of the rectus abdominis muscle the tape was applied while the participants were in a crook-lying position with flexed knees and flat feet. Then, two I-strips of Kinesio tape were applied from origin to insertion of the muscle with a longitudinal elasticity of 30%⁽⁹⁾. For the external oblique muscles, one I-strip was placed from origin to insertion of the muscle with a longitudinal elasticity of 30% in a side-lying position on both sides⁽⁹⁾.

Group B- In hamstring group taping, the semimembranosus and biceps femoris muscles taping was performed. For taping of the semimembranosus muscle, the tape was applied in a standing position from origin to insertion of the muscles with a longitudinal elasticity of 30%⁽⁹⁾. For taping the biceps femoris muscle, the patient was asked to bend forward until the hip is flexed and to extend their knees maximally. Then, two I-stripes were placed over the left and right biceps femoris muscles from the origin to insertion with a longitudinal elasticity of 30%⁽⁹⁾. Before taping, immediately after taping and 24 hours later, anterior pelvic tilt was evaluated.

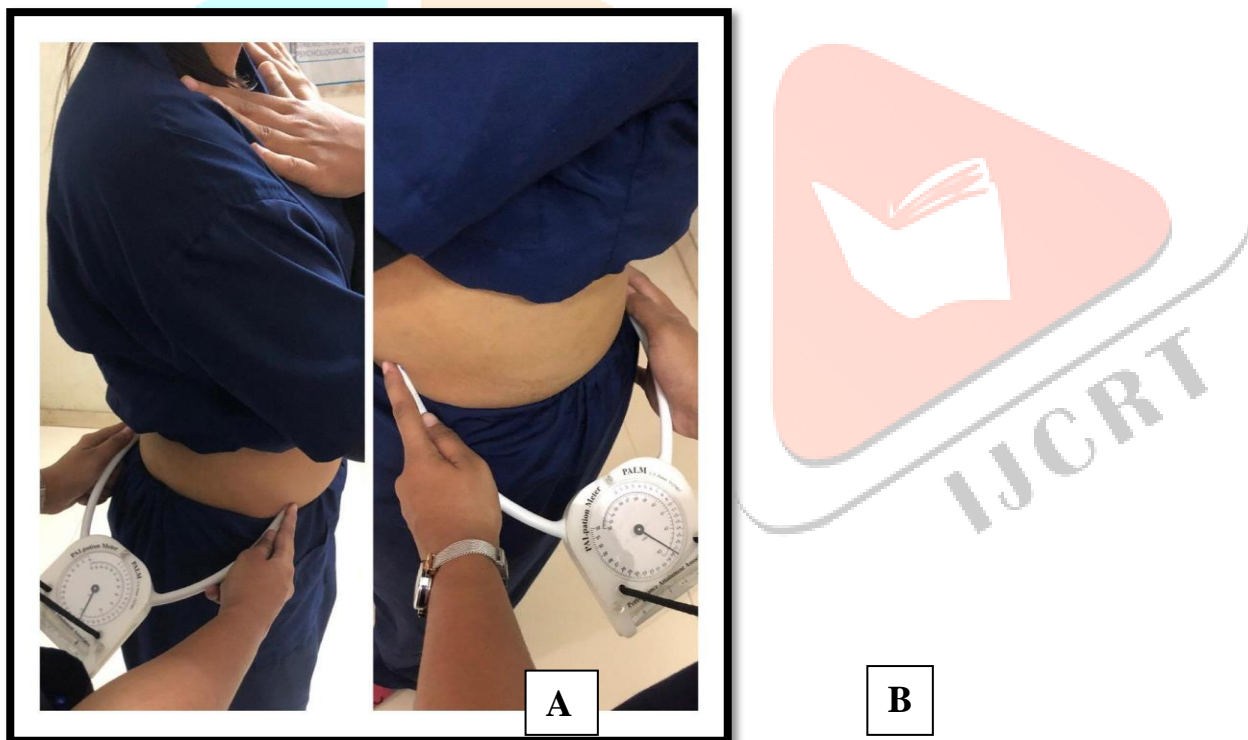


FIGURE 1 : MEASUREMENT OF PELVIC INCLINATION A: RIGHT SIDE B: LEFT SIDE

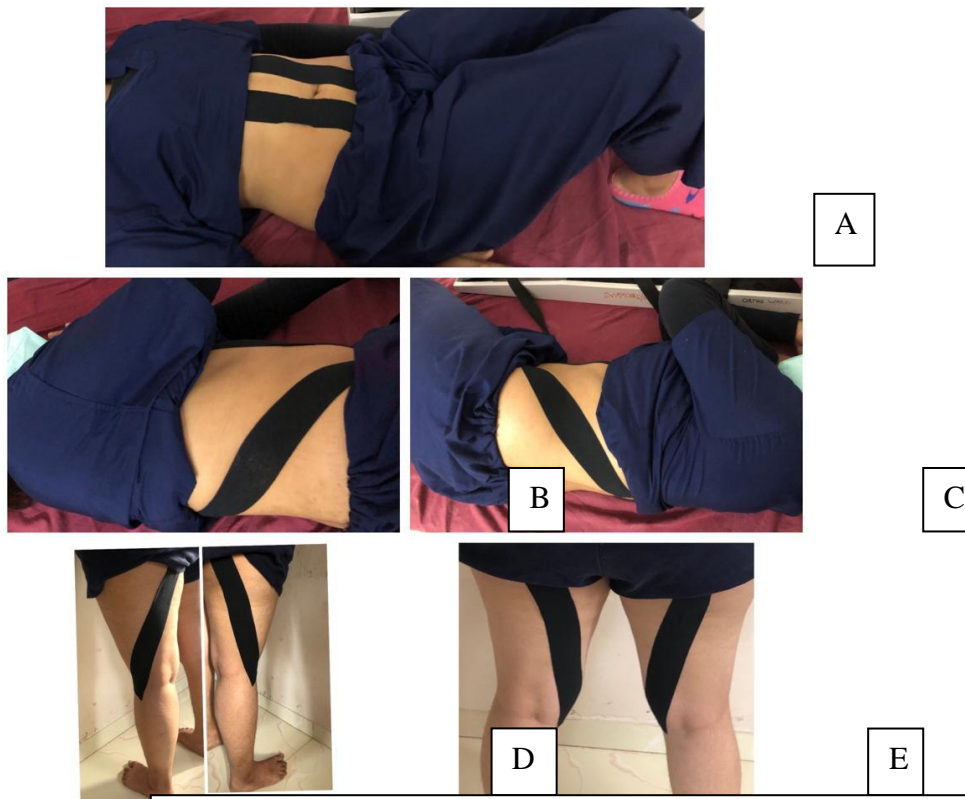


FIGURE 2: Application of taping on various muscles, [A] RECTUS ABDOMINIS MUSCLE, [B] RIGHT EXTERNAL OBLIQUE MUSCLE, [C] LEFT EXTERNAL OBLIQUE MUSCLE, [D] BICEPS FEMORIS MUSCLE BILATERAL, [E] SEMIMEMBRANOSUS MUSCLE BILATERAL.

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pelvic tilt angle before, immediately and after 24 hrs of performing kinesiotaping on abdominal muscles and hamstring muscle. ANOVA with repeated measures with a Greenhouse-Geisser was used to see within a group. Pairwise comparison were done using Bonferroni's
group A and

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was considered as the
the value of anterior
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FIGURE 2: Application of taping on various muscles, [A] RECTUS ABDOMINIS MUSCLE, [B] RIGHT EXTERNAL OBLIQUE MUSCLE, [C] LEFT EXTERNAL OBLIQUE MUSCLE, [D] BICEPS FEMORIS MUSCLE BILATERAL, [E] SEMIMEMBRANOSUS MUSCLE BILATERAL.

Table 1: Comparison of anterior pelvic tilt before, immediately after, and 24 h after taping of group A right and left side.

TIME INTERVAL	ABDOMINAL TAPING GROUP RIGHT SIDE	ABDOMINAL TAPING GROUP LEFT SIDE	P VALUE	RESULT
BEFORE	16.27 ±1.40	16.07 ±1.63	<0.0001	Significant
IMMEDIATELY AFTER TAPING	16.24 ±1.41	16.05 ±1.64		
24 HRS AFTER TAPING	15.58 ±1.34	15.27 ±1.64		

Table 2: Comparison of anterior pelvic tilt before, immediately after, and 24 h after taping of group B right side and left side. [Repeated measure ANOVA]

TIME INTERVAL	HAMSTRING TAPING GROUP RIGHT SIDE	HAMSTRING TAPING GROUP LEFT SIDE	P VALUE	RESULT
BEFORE	16.43 ±2.02	16.17 ±1.72	<0.0001	Significant
IMMEDIATELY AFTER TAPING	16.40 ±2.03	16.15 ±1.7		
24 HRS AFTER TAPING	15.62 ±1.79	15.33 ±1.69		

Table 3: Comparison of anterior pelvic tilt angle before, immediately, and 24 h after taping between the two groups right side. [Unpaired t test]

ANTERIOR PELVIC TILT ANGLE	Mean± SD		P value	RESULT
	Abdominal taping group	Hamstring taping group		
Before taping for Right side	16.27 ±1.4	16.43 ±2.02	0.712	Not significant
immediately after taping for Right side	16.24 ±1.41	16.4 ±2.03	0.719	Not significant
24 hrs after taping for Right side	15.58 ±1.34	15.62 ±1.79	0.922	Not significant

Table 4: Comparison of anterior pelvic tilt angle before, immediately, and 24 h after taping between the two groups left side. [Unpaired t test]

ANTERIOR PELVIC TILT ANGLE	Mean± SD		P value	RESULT
	Abdominal taping group	Hamstring taping group		
Before taping for Left side	16.07 ±1.63	16.17 ±1.72	0.818	Not significant
immediately after taping for Left side	16.05 ±1.64	16.15 ±1.7	0.817	Not significant
24 hrs after taping for Left side	15.27 ±1.64	15.33 ±1.69	0.878	Not significant

RESULT: Sixty females with age group 18 to 30 years with anterior pelvic tilt angle more than 15° were enrolled in this study. No significant difference were seen in this study with respect to age and body mass index. This study showed that while comparing anterior pelvic tilt angle before, immediately after and 24hrs after taping in both group A and group B on both right and left side showed statistically significant difference with p value <0.0001. We can report that when using an ANOVA with repeated measures with Greenhouse-Geisser correction, the mean value was statistically significant with p value<0.0005 for within subject effect in both groups on both side. In pairwise comparison there was significance level for differences between the individual time points. We can see that there was a significant difference in mean between pre taping and 24 hrs after taping ($p = <0.05$), and between post-taping and after 24 hrs ($p < 0.05$), but no significant differences between pre and post taping ($p = >0.05$) in both the groups on both sides. After comparing results between two groups on both the sides by using Unpaired T-test for anterior pelvic tilt angle before, immediately after and 24 hrs later on abdominal and hamstring group, implies that there is no significant difference between the two groups with p value >0.05. Posterior Pelvic Tilt taping on abdominal muscles and hamstrings muscles was equally effective in reducing the Anterior Pelvic Tilt angle in healthy young females.

DISCUSSION: The primary objective was to compare the effect of Posterior Pelvic Tilt Taping [PPTT] on anterior inclination of pelvis by applying Kinesiotaping to Abdomen muscles [Rectus abdominis and external oblique] versus Hamstring [Biceps femoris and Semimembranosus] muscle. In this study, pelvic taping was applied on young females and readings were taken by using the Palpation meter [PALM] before taping, immediately after taping and post 24 hours and were compared. From data analysis of this study, it was found that posterior pelvic tilt taping for both right and left side on abdominal and hamstrings muscles had significant effect in reducing the Anterior pelvic tilt angle with more marked changes observed after 24 hours taping. The result also showed that there was no significant difference in two groups before and immediately after taping. In a study were kinesiotape

was applied to reduce hyperlordosis, they found similar results they concluded that this might be due to the fact that tactile inputs generated by kinesio taping might not have been strong enough for short term stimulation. Few studies shows that kinesio taping is more effective 24-72 hours after its placement⁽¹⁰⁾.

In this study there was significant reduction in anterior pelvic tilt angle in both groups on both the sides after 24 hrs of taping. This is because taping the skin would stimulate cutaneous mechanoreceptors and therefore enhance the delivery of sensory inputs from the periphery to central nervous system⁽¹⁰⁾. Mechanoreceptors are stimulated by external stimuli like touch, pressure, stretching, etc.. Mechanoreceptors detect cues through mechanotransducer ion channels⁽¹¹⁾. Mechanical disruption of receptors, ions flow in and out of the cell causing electrical depolarization and generation of action potential. This action potential propagates towards the CNS⁽¹¹⁾. Application of kinesio tape can continuously pull the fascia concentrically, length-tension relationship of the muscle could be optimized and shorten the distance between the muscle origin and insertion and this could have apposite effect on joint alignment⁽¹²⁾. Stimulation of mechanoreceptors activates nerve impulses, the strength of the muscle increases and consequently the anterior pelvic tilt decreases⁽¹³⁾. Slow adapting Type 2 mechanoreceptors located deep in the dermis gets activated and promotes muscle spindle reflex contraction and excitability of motor units⁽¹⁴⁾. Moreover kinesio tape may affect muscle and myofascial function by increasing lymph circulation at the site of application. Kinesio taping may improve the excitability of muscle beneath the skin when applied^(15,16). Suggesting that kinesio taping may play important role in reducing Anterior pelvic tilt by promoting the functions of abdominal and hamstring muscles. Overall kinesio taping is a useful method for improving sensory inputs and the incorrect movement patterns can be controlled.

The result of the current study showed that Anterior Pelvic Tilt angle was reduced in both group A [Abdominal muscles taping] and group B [Hamstrings muscle taping] equally. Four muscle groups are responsible for maintaining the pelvis in neutral alignment; the erector spinae, hip flexors, hamstrings and abdominals. When muscle imbalance occurs the pelvis tilts anteriorly or posteriorly⁽¹⁷⁾. Anterior pelvic tilt is most common than posterior pelvic tilt. This is thought to be result from a combination of weakened and lengthened abdominal or hamstring muscle or tight hip flexors or erector spinae muscle⁽¹⁷⁾. Anterior pelvic tilt is thought to be as a result of lengthened and weakened hamstring muscle group and therefore it decreases the biomechanical efficiency and functional capacity at the hip and knee joint. Due to the orientation of hamstring muscles on the ischial tuberosity of the pelvis, the tension in the hamstring muscles may have an influence on the movement of the pelvis. Therefore, application of tape on the hamstring muscle reduces anterior pelvic tilt.

Weakness of anterior abdominal muscles tilt the pelvis forward. Abdominal muscles are incapable of exerting the upward pull on pelvis that is needed to help maintain a good alignment of the pelvis. As the pelvis tilts forward the low back is drawn into position of lordosis⁽¹⁷⁾. The application of kinesio tape on abdominal muscles reduce anterior pelvic tilt as the rectus abdominis muscle originates from the symphysis and is inserted on xiphoid process of sternum and the lateral fibers of the external oblique muscle flex the spinal column and hence reduce the pelvic tilt. In this study, taping posterior pelvic tilt muscles showed significant reduction in anterior pelvic tilt and resulting in increase in muscle

strength. In this study, we confirmed that posterior pelvic tilt taping has a significant effect on pelvic inclination and muscle strength.

Few limitations of this research should be taken into consideration such as study only included female subjects so we cannot generalise our result to men, short duration of taping, lordosis angle was not taken into consideration and smaller sample size. We suggest that further research could be done in study that can include both male and female subjects, taping duration can be increased, lordosis angle can be considered in further study and study duration can be increased.

CONCLUSION: The study concluded that kinesio taping on abdominal muscles versus hamstrings reduced anterior pelvic tilt angle in females after 24 hrs. The reduction were equally significant 24 hours after taping on both the groups A and group B.

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