The Immediate Effect of Anterior Pelvic Tilt Taping on Pelvic Inclination

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Abstract. [Purpose] The purpose of this study was to investigate the effect of anterior pelvic tilt taping (APTT) on the anterior inclination of the pelvis when Kinesio tape (KT) was applied to the erector spinae and the internal oblique, which are involved in anterior pelvic tilt. [Subjects] Forty asymptomatic adults (twenty-three males and seventeen females) agreed to participate in this experiment. [Methods] First, the pelvic inclination of both sides was measured with a palpation meter (PALM), as the subjects leaned the anterior aspect of their thighs against a stabilizing table, in an upright standing posture. After applying KT to the erector spinae and the internal oblique, the anterior inclination of the pelvis of both sides was measured again. [Results] The anterior inclination of the pelvis of both sides significantly increased when APTT was applied to the erector spinae and the internal oblique in both males and females. [Conclusion] These results suggest that APTT with KT, applied to the muscles involved in anterior inclination, for the purpose of tilting the posteriorly tilted pelvic anteriorly, may change pelvic inclination.

Key words: Anterior pelvic tilt taping, Kinesio tape, Pelvic inclination

INTRODUCTION

Lumbar lordosis is the compensatory curvature that directly delivers the center of gravity of the head, neck, and trunk to both the legs, distributing the body weight and promoting posture1. There is a close relationship between changes in pelvic tilt and changes in lumbar lordosis measured in the standing position2. Such changes in lordosis alter the location of the nucleus pulposus within vertebral discs, as well as the diameter of the intervertebral foramina3. The most important aspect of anterior pelvic tilt is that it increases lumbar lordosis, which can optimize the alignment of the entire spine3. However, abnormal positions strain ligaments and muscles, and indirectly affect the curvature of the lumbar spine4. In many studies, the relationship between changes in lumbar lordosis and back pain has been investigated5. Some studies have reported that patients with chronic low back pain experience loss of lumbar lordosis6,7 and they demonstrate overly posterior pelvic tilt compared with healthy individuals8. Posterior pelvic tilt reduces lordosis by flexing the lumbar spine, which causes posterior movement of the nucleus pulposus and an increase in the intervertebral foramina diameter1. When lumbar lordosis is decreased, imbalance in the center of gravity of the anterior to the sacrum may be created9. There are many manipulation methods available for pelvic treatment10, but the effects of these manipulations are still controversial. In particular, one study concerning the effect of manipulation on the position between the ilium and the sacrum found that manipulation-mobilization, as evaluated by Roentgen stereophotogrammetric analysis (RSA) in the standing position, failed to alter the position between the ilium and the sacrum11.

The use of KT is gradually increasing in the clinical field, not only for reducing pain but also for normalizing muscular function12. In a study on traumatic patella dislocation, KT showed beneficial effects, including pain reduction, quadriceps strengthening, and increased weight bearing stability13. Many studies have shown that leuko tape, a non-elastic tape, can be used to reduce pain and improve function e.g., there are cases of patients with patellofemoral syndrome showing improved patellar location14,15, and cases in which the humeral heads of shoulder impingement patients were relocated16. However, no researchers have yet studied the repositioning of pelvic inclination using KT. Thus, the purpose of this study was to investigate the immediate effect of anterior pelvic tilt taping (APTT) on the anterior inclination of the pelvis after application of KT to the erector spinae and internal oblique on both sides of asymptomatic adults.
SUBJECTS AND METHODS

The subjects of this study were 23 males [age: 23.8 ± 1.3 years (mean ± SD); height: 175.4 ± 4.9 cm; body weight 69.7 ± 8.1 kg] and 17 females [age: 21.4 ± 1.1 years (mean ± SD); height: 161.1 ± 3.6 cm; body weight 50.3 ± 6.4 kg]. The subjects had no limitations in the ranges of movement of the pelvis or spine, and no orthopedic disabilities (such as deformity, fracture, or arthritis of the pelvis or spine). The subjects read and signed an informed-consent document that was approved by the Human Ethics Committee of the Faculty of Health Sciences at Inje University prior to their participation.

The palpation meter, PALM, (Performance Attainment Associates, St. Paul, MN, USA) consists of an inclinometer and two caliper arms. It is a reliable and cost-effective instrument used to calculate height discrepancies between landmarks. The validity estimates of PALM measurements are excellent, when compared with radiograph measurements[7]. Some studies have used PALM to measure static innominate rotation of the ipsilateral anterior superior iliac spine (ASIS) and posterior superior iliac spine (PSIS)[8,9]. The intra-test reliability of the PALM is 0.90, and the inter-test reliability is 0.85.

The subjects wore non-restrictive clothing and removed their shoes during the measurement. They spread their feet (about 10–12 cm) and stood in a relaxed posture[20]. They stood in an upright position, leaning the anterior aspect of the thighs against a stabilizing table[20]. The investigator stood in an upright position, leaning the anterior aspect of their shoes during the measurement. They spread their feet (about 10–12 cm) and stood in a relaxed posture[20]. They stood in an upright position, leaning the anterior aspect of

| Table 1. Comparison of the anterior pelvic tilt angle before and after APTT (n=40) |
|-----------------|-----------------|
| Inclination      | Mean ± SD (°)   |
| R. ASIS-PSIS Tilt Angle (M) | 8.17 ± 2.43 | 9.58 ± 2.43* |
| L. ASIS-PSIS Tilt Angle (M) | 7.62 ± 1.86 | 9.63 ± 1.70* |
| R. ASIS-PSIS Tilt Angle (F) | 7.72 ± 2.08 | 10.32 ± 2.80* |
| L. ASIS-PSIS Tilt Angle (F) | 8.06 ± 2.46 | 10.28 ± 2.70* |

R: Right, L: Left, ASIS: anterior superior iliac spine, PSIS: posterior superior iliac spine, M: Male, F: Female, APTT: Anterior Pelvic Tilt Taping, *: p<0.01.

RESULTS

The anterior pelvic tilt of the male participants was significantly increased after APTT application (p<0.01). The left pelvic inclination of the males was 7.62 ± 1.86° before APTT application and 9.63 ± 1.70° after. The right pelvic inclination also increased from 8.17 ± 2.43° before to 9.58 ± 2.43° after taping (Table 1). The anterior pelvic tilt of the female participants also significantly increased after APTT application (p<0.01). The left pelvic inclination of the females was 8.06 ± 2.46° before APTT application and 10.28 ± 2.70° after. The right pelvic inclination also increased from 7.72 ± 2.08° before to 10.32 ± 2.80° after (Table 1).

DISCUSSION

This study was conducted to investigate the immediate effect of APTT on the anterior inclination of the pelvis by applying KT to the erector spinae and internal oblique. For both male and female participants, APTT increased the anterior inclination of the pelvis on both sides.

In a study where pelvic taping was applied to a female collegiate tennis player whose ilium showed excessive anterior tilt, leuko tape (a non-elastic tape) was applied in the direction from ASIS to PSIS to limit anterior pelvic tilt, and the stability of the sacroiliac joint increased[22]. The erector spinae and internal oblique, to which KT was applied in this study, are the muscles that support and stabilize the sacroiliac joint[13]. Since the erector spinae is attached to the sacrum and the pelvis, it may increase lumbar lordosis by causing an anterior tilt of the pelvis[1]. In addition, the internal oblique upper anterior fiber tilts the pelvis forward when the thorax is fixed[23]. It has been reported that cutaneous stimulation induces reflex contractions of the muscles underlying the skin and that this cutaneous stimulation can reduce the threshold value of the recruitment of motor units of those muscles[24]. In other words, KT application may stimulate cutaneous mechanoreceptors[25], strengthen weakened muscles, and normalize muscle functions[26]. Moreover, KT may affect the muscle and myofascia functions by increasing lymph circulation at the point of application[26,27]. KT may also improve the excitability of the muscles beneath the skin where it is applied[27], suggesting that KT may play a role in
the anterior tilt of the pelvis by promoting the functions of the erector spinae and the internal oblique. Furthermore, it has been verified that the mechanical benefits of patellar taping achieved with leuko tape (a non-elastic tape) are also evident when KT (a elastic tape) is applied to the muscles surrounding the pelvis. Taking advantage of these benefits, APTT may increase the lumbar lordosis angle of persons who have a flat-back posture. Clinically, it has been suggested that maintenance of normal lumbar lordosis is related to the prevention of spinal disorders. Maintaining the natural lordotic posture was the fundamental principle that McKenzie used to treat herniated disc patients. An increase in lumbar extension reduces the pressure within the disc, and can also reduce contact pressure between the displaced nuclear material and neutral elements in some cases.

Our data do not explain the effect of APTT on the change of the anterior pelvic tilt angle when KT is applied continuously, since the data obtained in this study represent only the immediate effects of taping. Future studies are needed to investigate the change in anterior pelvic tilt angle after a long period of APTT. Additionally, the effect of APTT on the anterior pelvic tilt in patients with a posterior pelvic tilt also needs to be studied.

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REFERENCES