

Acute Effects of Kinesio Taping on Women with Diastasis Recti Abdominis

Hilal DENİZÖĞLU KULLİ¹ , Kübra ALPAY² 

¹Division of Physiotherapy and Rehabilitation, İstanbul Atlas University, Faculty of Health Sciences, İstanbul, Turkey

²Division of Physiotherapy and Rehabilitation, Bezmialem Vakif University, Faculty of Health Sciences, İstanbul, Turkey

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ABSTRACT

Objective: The study aimed to evaluate the acute effect of Kinesio taping on abdominal endurance, limits of stability, and postural stability in parity women with diastasis recti abdominis.

Methods: Around 17 parity women who had at least 2 cm inter-recti distance at one or more points of the linea alba related to pregnancy participated in the study. Inter-recti distance was assessed with a caliper. Before and immediately after Kinesio taping application, the static abdominal flexion endurance test, postural stability test, and limits of stability test were performed. Kinesio taping was applied to all participants along with rectus abdominis muscles, obliquely crossing the midline of the linea alba. Repeated measure analysis of variance test was utilized to determine the difference between the static abdominal flexion endurance test, postural stability, and limits of stability scores before and after Kinesio taping.

Results: The static abdominal flexion test and limits of stability test scores showed statistically significant improvements after Kinesio taping application ($F = 16.826$, $P = .001$, $\eta_p^2 = 0.564$ and $F = 9.262$, $P = .012$, $\eta_p^2 = 0.481$, respectively). Postural stability test scores did not present any significant alterations after Kinesio taping application ($P > .05$).

Conclusion: The present study revealed that Kinesio taping improved abdominal endurance and limits of stability immediately after application but did not create any acute effect on postural stability in women with diastasis recti abdominis. We conclude that Kinesio taping may be an effective tool in the therapy of women with diastasis recti abdominis. Further studies are needed to investigate the long-term effects of Kinesio taping on diastasis recti abdominis.


Keywords: Athletic tape, diastasis, muscle, postural balance, physical endurance

Introduction

Diastasis recti abdominis (DRA) is defined as widening of the linea alba via the separation of rectus abdominis muscles.¹ It may cause musculoskeletal dysfunctions and insufficiency in the performance of associated trunk muscles.^{2,3} Diastasis recti abdominis generally occurs due to progressive and prolonged abdominal distension during the second and third trimesters of pregnancy to the growing uterus causing hormonal alterations.^{4,5} The normal width of inter-recti distance (IRD) varies according to the studies and measurement site but DRA is frequently diagnosed in the presence of more than 2 or 2.5 cm IRD at least in 1 point of the linea alba or a midline bulge with loading.^{4,5}

In terms of biomechanical demands, linea alba should have a major role in the stability of the abdominal wall.⁶ Additionally, urinary incontinence and some musculoskeletal problems were attributed to DRA over the years after pregnancy.⁷ The treatment options are surgery techniques and physiotherapy which may consist of exercise, electrical stimulation, taping, or binding.^{1,8} There is no consensus in the effectiveness of treatments in the literature.^{8,9} Furthermore, a limited number of studies have investigated the effect of addictive techniques such as binding and taping.¹⁰⁻¹² Ptaszkowska et al¹¹ revealed that Kinesio taping (KT) application for 48 hours decreased IRD compared to sham taping did, although Depledge et al¹² did not present any difference in IRD immediately after KT application in women with DRA.

Corresponding author: Hilal DENİZÖĞLU KULLİ, e-mail: hilal_denizoglu_7@hotmail.com

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The effect of KT on functional parameters is still unclear in women with DRA. Thus, the aim of our study is to determine the acute effect of KT on abdominal endurance and postural stability in women with DRA.

Methods

Around 17 primi- and multiparous women who have at least 2 cm IRD at one or more points of the linea alba enrolled in the study between April 2022 and June 2022.¹³ The women who were pregnant or in the postnatal period of less than 8 weeks and had a history of any neurological or acute musculoskeletal injuries or acute/chronic physical or mental illness were excluded.

The study was authorized by the Human Research Ethics Committee of Istanbul Atlas University (approval number/date: E-22686390-050.99-19127/ 28 Nisan 2022) and was performed in accordance with the Declaration of Helsinki. All subjects signed written informed consent.

The characteristics and clinical features such as age, height, weight, IRD, having single or multiple births, and time since delivery were collected via an assessment form. The static abdominal flexion endurance, postural stability, and limits of stability tests were tested before and immediately after KT application.

A standard caliper was used to evaluate IRD by the same physiotherapist. While the subjects carried out a crook lying trunk curl up until the inferior angles of the scapulae were off the table, IRD was obtained by caliper at 5 locations; on the umbilicus, 5 cm, and 2 cm above and below the umbilicus.⁵

The static abdominal flexion endurance test was done in the crook lying position with the hands positioned on contralateral shoulders. The time in which the women maintained the position after raising their head and shoulder blades upward until the scapulae cleared the table was recorded as the score of the test.¹⁴

The postural stability was evaluated with Biodex Balance System (Shirley, NY, USA) using the postural stability test (PST) and limits of stability (LOS) tests. In PST, subjects are asked to remain as stable as possible on the device platform. Overall stability index, Anterior/Posterior (AP) stability index, and Medial/lateral (ML) stability index were recorded as the score of PST. Higher scores indicated poor postural stability. In the LOS test, the feet of the subjects have been positioned so that the cursor on the screen can be seen in the center of the 8 directions. We asked to try the subjects to reach the target circles on the screen by changing their center of gravity. The hands of the subjects were placed on their contralateral shoulders during all balance tests. The overall score of the system was used for analysis. Higher scores point out better stability. The subjects performed trials 3 times before endurance and all postural control tests to minimize the learning effect.¹⁵

Kinesiotape (Kinesio Tex Gold, Kinesio, Albuquerque, NM, USA) was applied from the subcostal to pubic area obliquely crossing the midline of the linea alba and along all lengths of the rectus abdominis muscle using the corrective (mechanical) technique with an approximately 75% tension range according to the protocol of Kenzo Kase.¹⁶

Statistical Analysis

The statistical procedure was performed using Statistical Package for Social Sciences (SPSS) software (Version 16.0; SPSS; Chicago, IL, USA). The normality of variables was tested using the Kolmogorov–Smirnov test. Repeated measure analysis of variance test was utilized to determine the difference between the static abdominal flexion endurance test, postural stability, and LOS scores before and after KT. $P < .05$ was accepted as statistically significant.

The sample size estimation was calculated using the GPower program. The power analysis showed that a minimum of 11 participants are needed for the study to have 0.95 power and type I error equal to 0.05 according to the study of Toprak Celenay et al.¹⁷

Results

This study included 17 women as per the inclusion criteria. The age ranges of women were between 25 and 39 years. The demographic and clinical characteristics of the subjects are presented in Table 1.

The static abdominal flexion test and LOS scores were improved after KT application ($F = 16.826$, $P = .001$, $\eta_p^2 = 0.564$ and $F = 9.262$, $P = .012$, $\eta_p^2 = 0.481$). However, postural stability test scores did not change after KT application ($P > .05$) (Table 2).

Discussion

Our study aimed to determine the acute effect of KT on abdominal endurance, postural stability, and LOS in women with DRA. The results of the present study showed that KT application using corrective technique improved abdominal muscle endurance and LOS immediately after KT but did not affect postural stability.

Kinesio taping is a taping method that may be used to improve muscle performance, facilitate or inhibit muscular activity, reduce pain and edema, mechanically correct or support body parts, and reposition joint misalignments.¹⁶ The studies presented suggested that KT may reduce intra-abdominal pressure via supporting abdominal muscles and correcting rectus abdominis muscle alignment thus preventing

Table 1. Demographic and Clinical Characteristics of the Subjects

	Mean \pm Standard Deviation (n = 17)
Age (year)	32.9 \pm 4.6
Height (m)	1.6 \pm 0.1
Weight (kg)	60.6 \pm 11.2
Body mass index (kg/cm ²)	22.6 \pm 4.7
Time since last birth (month)	21.2 \pm 10.6
Birthweight (g)	3910.0 \pm 774.0
Weight gains last pregnancy (kg)	16.3 \pm 4.8
Number of pregnancies (n)	1.35 \pm 0.5
Inter-recti distance (cm)	
5 cm above the umbilicus	3.0 \pm 1.2
2 cm above the umbilicus	3.4 \pm 1.2
Umbilicus	3.7 \pm 1.4
2 cm below the umbilicus	2.4 \pm 0.9
5 cm below the umbilicus	2.0 \pm 1.3

Table 2. The Static Abdominal Flexion Endurance Test, Postural Stability, and Limits of Stability Test Scores Before and After KT

	Before KT	After KT	F	P	Partial Eta Squared
The static abdominal flexion endurance test	66.9 \pm 55.9	97.3 \pm 54.3	16.826	.001*	0.564
Postural Stability Tests					
Overall stability index	1.0 \pm 1.1	0.7 \pm 0.8	2.034	.173	0.113
AP stability index	0.8 \pm 0.9	0.5 \pm 0.6	1.810	.199	0.108
ML stability index	0.4 \pm 0.7	0.4 \pm 0.5	1.577	.228	0.095
Limit of stability test overall score	52.3 \pm 12.9	59.2 \pm 12.9	9.262	.012*	0.481

* $P < .05$ is statistical significance.
KT, Kinesio taping.

any possible further separation according to overload activities.^{11,18,19} It is assumed that the effects of KT alter depending on the application technique. The studies used different techniques such as muscle facilitation techniques on rectus abdominis muscle and correction techniques by crossing linea alba.^{11,12,18} In our study, KT was applied along with the rectus abdominis muscle, obliquely crossing the midline of the line alba with approximately 75% tension. We hypothesized that supporting linea alba and abdominal wall, facilitating tissue regeneration, and providing feedback to contraction of transversus abdominis muscle may get easier via KT application in line with the previous studies.^{12,20,21} A recent study showed that KT decreased IRD immediately after KT but did not change the electromyography activity of rectus abdominis muscles, although transversus abdominis muscle activity was not measured.¹² Contrary, Depledge et al¹¹ could not show any differences in IRD after KT. Another study presented that using 12-week KT did not provide any improvement in IRD but when it was concomitantly performed with the exercise program, IRD decreased in women with DRA.¹⁸ Additionally, Tuttle et al¹⁸ speculated that KT may be useful to provide proprioceptive feedback to contract the transversus abdominis muscle during activities that increased intra-abdominal pressure. Furthermore, they claimed that using restrictive binders may be more effective than taping alone to reduce IRD. The studies mentioned above only investigate IRD and did not evaluate any functional aspects of DRA which our study focused on.

The abdominal musculature is anchored to the linea alba which is widening and thinning in DRA.¹ According to this anatomical connection, the relationship between abdominal muscle strength or endurance and DRA has been frequently investigated, but there has not been a consensus yet.^{14,22} Keshwani et al¹⁰ showed that combination program consisting of exercise and binder improved abdominal muscle endurance after a 12-week program. They claimed that while facilitation of collagen formation at the linea alba via the exercise therapy creates a stronger attached area for the abdominal muscles, the binder may provide protection to just produce collagen, thus, better abdominal endurance was obtained in the combination of exercise and binding.¹⁰ The collagen formation needs time but abdominal muscle endurance was significantly higher after KT application in our study. Furthermore, in line with our results, Toprak Celenay et al¹⁷ also revealed that KT augments abdominal flexion muscle endurance in a short term among healthy subjects. We speculated that KT may provide external support to the linea alba which would result in an increase in abdominal endurance. However, studies presented showed that external supports such as binders did not change abdominal muscle endurance.^{10,18} Thus, the improvement of abdominal endurance may also be related to the mechanoreceptor stimulation and positional stimulus of KT which result in the facilitation of motor units and the increment of muscle activities and endurance.^{11,16,23}

Abdominal muscles and optimal intra-abdominal pressure have an important role in postural control.²⁴ Although there was no study investigating the postural control of women with DRA, it is expected that they have poor balance performance.⁴ In our study, postural stability and LOS were assessed before and after the KT. While no difference was determined for postural stability which evaluates static postural control, LOS was enhanced after KT. Limits of stability may examine functional stability limits, motor systems to demand balance, and anticipatory postural control which are associated with the direction-specific patterns of inhibition or activation of postural muscles in healthy adults.²⁵ All the abdominal muscles have some roles in arranging the trunk and spine for perturbation during LOS performance.²⁶ Based on these findings and our results, KT may have improved LOS via changing muscle activity, facilitating proprioceptive inputs, and supporting linea alba as these effects are mentioned in studies about KT in the literature.^{11,18,27}

Based on a study, approximately 40% of physiotherapists utilize taping as a therapeutic modality for women with DRA, but there are a limited number of studies about the effect of KT on DRA and its symptoms.²⁸ One of the strengths of our study is that, to our best knowledge, this is the first study to investigate the effect of KT on abdominal endurance and postural control in women with DRA. Secondly, the postural control assessments were performed using a sensitive, technology-based device. Although there are some limitations in our study such as the lack of a sham or control group which may eliminate the learning or fatigue effect on test scores, the absence of long period, and the tape-removed condition effects of KT, our study may provide evidence about the impact of KT on abdominal endurance and static and dynamic postural control.

The present study concluded that KT improved abdominal endurance and LOS immediately after application in women with DRA. However, KT application did not change postural stability parameters in women with DRA. The results of our study suggest that KT may be used as an effective tool in the therapy of women with DRA. Further studies are needed to investigate the long-term effects of KT on DRA.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Istanbul Atlas University (date: April 28, 2022, number: E-22686390-050.99-19127).

Informed Consent: Written informed consent was obtained from all subjects who participated in this study.

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