

Efficacy of kinesio tape on neck pain and functional disability in pregnant women: a randomized controlled trial

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DOI: [10.31083/j.ceog.2021.01.2145](https://doi.org/10.31083/j.ceog.2021.01.2145)

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Submitted: May 14, 2020 Revised: September 14, 2020 Accepted: September 23, 2020 Published: February 15, 2021

Neck pain during pregnancy has negative effects on the quality of a woman's life. The goal of this study was to determine the efficacy of kinesio-tape application on neck pain and functional activity during pregnancy. Thirty primigravid women who suffered from mechanical neck pain during the second and third trimester of pregnancy were recruited. They were randomly assigned to two groups: one received general antenatal advice about good posture in addition to kinesio taping for 4 weeks; the other received only general antenatal advice about good posture. Pain was assessed with the Visual Analogue Scale (VAS) and Neck Disability Index scale (NDI) at the start of the study and after 4 weeks of treatment. After 4 weeks, both groups showed improvement, but the group that received advice and kinesiology taping showed significantly less pain (VAS) than did the control group, but no differences in NDI scores. Kinesiology taping and antenatal advice are more effective for treatment of neck pain during pregnancy than is antenatal advice alone.

Keywords

Kinesio taping; Neck pain; Pregnancy

1. Introduction

During pregnancy, almost 20% of pregnant women suffer from muscular neck pain, which increases as pregnancy progresses [1].

Physiological and structural changes during pregnancy may cause various musculoskeletal complaints such as discomfort in the neck and nearby shoulder muscles. This pain may extend into the postnatal period. Eventually, the neck pain may cause headache, decreased range of motion, numbness, and even swelling in the neck [2].

Increased levels of relaxin, estrogen, and progesterone during pregnancy lead to changes in collagen metabolism and increased connective tissue elasticity. Ligaments predisposed to laxity lead to joint instability [3].

During pregnancy, increased breast size may lead to rounded shoulders and over-activity of neck muscles. In addition, increased abdominal size leads to increased lordotic curve, compensated for by increased thoracic kyphosis and increased cervical lordosis. These changes increase the load on cervical ligaments and tendons of the neck and back. As

pregnancy progresses, there is no significant decrease in the range of side-to-side flexion, but there is decrease in forward flexion and axial rotation, and motion of the thoracic segment and the thoracolumbar spine [4]. This, in turn, leads to neck pain that may affect all aspects of daily living [2].

Neck and back pain during pregnancy and the postnatal period are a main cause of functional disability that subsequently burdens the health care system and has substantial socioeconomic effects. However, physical therapy has various methods to treat such intractable conditions without any side effects on the mother or her baby [5, 6].

Management of neck pain during pregnancy commonly involves exercise programs; the exercises differ with regard to duration, training frequency, intensity, and mode of exercise. Isometric exercises and strength training can have good effects on neck pain [7].

KinesioTaping is a commonly used in the management of a number of clinical conditions as well taping is purported to facilitate and inhibit muscle activity [8]. 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 [9].

KT application decreases pain, increases stability and proprioception, and improves function [9], and is used in cases of acute ankle sprain, shoulder pain and trunk dysfunction [10].

The application of Kinesio taping to the skin may stimulate cutaneous mechanoreceptors and assist postural alignment. Kinesio tape is easy to apply and works well to relax muscles, but there is not a lot of information regarding the use of this method during pregnancy [11, 12].

The aim of our study, therefore, was to investigate the effect of KT on neck pain and functional activity in pregnant women. We hypothesized that KT can improve functional movement of neck muscles and decrease pain in pregnant women. We assume this can be accomplished by the tape decreasing mechanical irritation of the soft tissues and improv-

ing circulation of blood and lymphatic fluids, thereby increasing the cervical range of motion.

2. Methods

2.1 Design of the study

The study was designed as a prospective, randomized, single-blind study. The participants were enrolled and assessed for their eligibility to participate in the study. The purpose and procedures of the study were explained and informed consent was obtained from each participant. The study received ethical committee approval from Faculty of Physical Therapy Ethical Committee, Cairo University Number (No: P.T.REC/012/002195). The subjects were randomly assigned to one of two groups (A and B) by an independent researcher who opened sealed envelopes that contained a computer-generated randomization card. No subjects dropped out of the study after randomization.

2.2 Subjects and procedures

Subjects were 30 primigravid women suffering from mechanical neck pain during the second and third trimester of pregnancy. They were referred by orthopedic physicians from Kafrelsheikh University Hospital, Kafrelsheikh, Egypt.

The inclusion criteria were: age between 18 and 35 years; body mass index (BMI) not exceeding 30; housewives. Exclusion criteria: skin disease; allergy; serious cervical injury at time of study; concurrent injuries of back and/or thoracic spine; cervical herniated disc; disc degeneration confirmed by a physician; any history of earlier surgery of the cervical spine.

Intervention group: Group A (n = 15) received cervical kinesiology taping (KT) in addition to general antenatal advice about good posture and cervical care.

Control group: Group B (n = 15) received general antenatal advice only.

2.3 Outcome measures

Pain: All participants in both groups were assessed for pain before and after 4 weeks of treatment using the Visual Analogue Scale (VAS). The VAS is a graphic rating scale consisting of a 10-cm line, with 0 (no pain) at one end and 10 (the worst pain) at the other. It is commonly interpreted as a valid subjective report of pain intensity [13].

General disability: Patients were assessed before participation in the study and after 4 weeks using the Neck Disability Index (NDI), which is a questionnaire used to evaluate the patient's functional status related to neck disability. It comprises 10 items of daily activity (Pain intensity, Personal care, Lifting, Work, Headaches, Concentration, Sleeping, Driving, Reading, Recreation) with 5 different responses on each. Each subject was asked to rate her response to each item as to the limits of to her ability to complete this activity. For each section or activity, the total possible score is 5, where 0 = no ability, and 5 = full ability, minimum score = zero which means unable to perform any activity and maximum score is 60 means no difficulty in any activity, the higher the score the

greater the patient's functional ability [14].

2.4 Procedures

Participants in both groups received general antenatal advice as follows: Avoid reading in bed, avoid carrying heavy objects, use proper breast support, avoid watching TV for long periods, avoid excessive forward neck leaning during sitting, avoid lying on uncomfortable pillows and avoid wearing high heels. In addition, each received routine antenatal vitamin supplementation [5].

Participants in group A (study group) received KT techniques. Using a tape of ≈ 10 cm, a vertical cut was inserted along the middle to create a Y strip, leaving about 2 cm at the end as the origin point. The tape was trimmed to make rounded corners to prevent peeling. The woman leaned her neck forward to produce extreme flexion of the neck. The skin area to be taped was washed and dried to remove any oil and sweat. Next, alcohol was used to clean the skin before application of the tape. The Y-shaped tape was placed over the posterior neck muscles, with the application begin from the insertion and moving toward the origin. The tape was peeled, and the base was placed from dorsal region (T1-T2) to the upper cervical region (C1-C2) below the hairline. For acutely overused muscles the tape was applied with very little or little tension (15-25% of available tension - which can be determined by comparing maximally stretched tape with its original length). For chronically weak muscles or where increased contraction was desired, the tape was applied with light to moderate tension, 25-50%, of available stretch [15]. Tape was left in place for 5 days, then removed for 1 day, then re-taped for 5 days, etc. for 4 weeks. Skin was observed repeatedly for possible allergic reaction.

2.5 Sample-size determination

A power analysis (G Power 3.1.9.2) conducted on a pilot study of 8 participants (4/group), considering NDI as a primary outcome variable, and adding 10% to allow for attrition, suggested a sample size of 15 subjects for each group.

2.6 Statistical analysis

Statistical analysis was conducted using SPSS for windows, version 25 (SPSS, Inc., Chicago, IL). The current test involved two dependent variables, NDI and pain. Prior to final analysis, data were screened for normality assumption using Shapiro-Wilk W Test, and it showed that data was not normally distributed in NDI and VAS post treatment. Descriptive statistics data were expressed as means \pm standard deviations. Non Parametric tests (Wilcoxon Signed Ranks Test and Mann-Whitney Test) were used for inferential analysis of dependent variables, within group and between groups comparison, respectively. Comparison between mean values of age, BMI and gestational age in the two groups (A and B) measured pre-treatment was performed using unpaired *t*-test. Initial alpha level was 0.05 for all tests.

3. Results

Table 1. Demographic features of both groups (A and B).

| | Group A (n = 15) | Group B (n = 15) | t value | P |
|--------------------------|------------------|------------------|---------|------------|
| Age (yrs.) | 26.07 (3.73) | 27.67 (4.15) | 0.278 | 0.783 (NS) |
| BMI (kg/m ²) | 32.06 (2.28) | 31.8 (2.27) | 0.415 | 0.681 (NS) |
| Gest. Age (weeks) | 29.53 (1.73) | 29.2 (1.52) | 0.561 | 0.579 (NS) |

Table 2. NDI and Pain (VAS) descriptive statistics (Mean [SD]) and within-group comparison in Groups A and B.

| | Group A (n = 15) | | | | Group B (n = 15) | | | |
|------|------------------|---------------|-------|--------|------------------|---------------|-------|--------|
| | Pre | Post | t | P | Pre | Post | t | P |
| NDI | 33 (10.82) | 17.67 (10.67) | 7.043 | 0.000* | 27.47 (12.88) | 22.67 (11.89) | 4.75 | 0.000* |
| Pain | 6.87 (1.3) | 2.93 (0.96) | 9.932 | 0.000* | 7.47 (0.99) | 5.93 (1.16) | 4.561 | 0.000* |

*Significant at $P < 0.05$.

3.1 Demographic data

There were no statistically significant differences ($P > 0.05$) between groups in regard to age, BMI, or gestational age (Table 1).

There were no statistically significant differences between groups before treatment for either NDI ($P = 0.213$) or Pain ($P = 0.167$) (Table 2). Within-group comparison with pretreatment values showed significant improvement in NDI and Pain variables in both groups after treatment ($P < 0.0001$) (Table 2). After treatment, the two groups did not differ significantly on the NDI score ($P = 0.236$), but there was a statistically significant difference in VAS ($P < 0.0001$) in that the KT group reported significantly less pain (Table 3).

Table 3. Between Groups comparison (Group A vs Group B) pre and post treatment.

| | Pre | | Post | |
|------|---------|-------|---------|--------|
| | t-value | P | t-value | P |
| NDI | 1.274 | 0.213 | -1.212 | 0.236 |
| Pain | -1.42 | 0.167 | -7.701 | 0.000* |

*Significant at $P < 0.05$.

4. Discussion

Neck pain during pregnancy is most common in the third trimester. As pregnancy progresses, the growing size of the fetus shifts the center of gravity forward which increases the load on the spine and muscles of back, which in combination with changes in hormones leads to thoracic kyphosis, rounded shoulders, neck lordosis, and neck pain [16–18].

Within-group comparisons showed significant improvement in both NDI and Pain variables in both groups after treatment. But the principal outcome of current study verified that using KT in conjunction with antenatal advice led to more success in the treatment of neck pain during pregnancy than did antenatal advice alone.

These results were consistent with those of Hwang-Bo and Lee [19] who assessed the effect of KT in the management of mechanical low-back pain. They suggested decreases in pain, as assessed by VAS, could be explained as the effect

of KT on Ruffini corpuscles, which respond to stretching of the skin.

In addition, our results are consonant with those of Mohamed *et al.* [20], who reported that KT muscle support, in conjunction with postural-correction training, should be considered in the management of back pain in postnatal women.

Kaplan *et al.* also found that five days of KT in conjunction with paracetamol showed better results in pregnant women with low-back pain than did treatment with paracetamol alone [21].

There are two mechanisms that might account for the efficacy of KT. (1) That KT increases blood circulation in the treated area [22], and (2) that KT stimulates mechanoreceptors at the taped area, thereby increasing range of motion which, in turn, improves function [23, 24]. Some point out that taping affects the excitability of the central nervous system and improves motor control [25]. That is consistent with others [26], who investigated associations between low-level clinical neck pain/discomfort, and range of motion; with the application of KT, the cervico-thoracic spine movement improved and neck, back, and pelvic-girdle pain decreased [26–29]. KT can relax and support over-used muscles, normalize muscle tone, increase lymphatic and vascular flow, decrease pain, and contribute to corrections of posture [30].

On the other hand, some studies have reported contradictory results. Thelen *et al.* [31] stated that KT used in cases of shoulder pain, produced no significant improvement in pain intensity. Morrissey [32] concluded that when KT is applied to weak muscles, it decreases the length of the muscle at rest. And finally, Kavlak *et al.* [33] concluded that KT in addition to classical physical therapy for neck pain yielded no additional significant improvement of pain sensation and disability.

5. Limitation

The results of our study may be limited by cultural and psychological status of participants in addition to small sample size and subjective method of assessment for pain as VAS.

6. Conclusions

In our study, using a combination of kinesiology tape and antenatal advice for 4 weeks was a more effective management technique for neck pain during pregnancy than was antenatal advice alone.

Author contributions

Eman ELhosary and Marwa Mohamed designed the research study, Mahmoud Ewida wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Acknowledgment

Authors would like to thank all patients who participated in the study, and physicians in Kafrelsheikh University Outpatient Clinic of Orthopedics and Obstetrics.

Conflict of interest

The authors declare that there is no conflict of interest associated with this manuscript.

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