

## Effect of Kinesio Taping in Patients with Mechanical Neck Dysfunction

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### Abstract

**Background:** Mechanical Neck Dysfunction (MND) is a leading cause of impaired mobility. Patients with MND have neck pain and limitations in the function that prevent them from engaging in their usual functional activities.

**Purpose:** This study was conducted to investigate the effect of combined kinesio taping with therapeutic exercises on pain, head posture and functional limitation in patients with MND.

**Subjects:** Thirty patients with MND. Their age ranged from 30-45 years (35.04±3.70). Mean of BMI was (31.98±2.88) Kg/m<sup>2</sup>. They were randomly distributed into two equal groups.

**Methods:** The experimental Group (B) received kinesio taping in addition to therapeutic exercises. The control Group (A) received the same therapeutic exercises only. Pain pressure threshold was measured by electronic digital algometer, head posture was measured by craniocervical angle from lateral cervical view X-ray, and functional activity level was determined by neck disability index before and after 12 sessions.

**Results:** There was a significant difference between the two groups in post treatment measurements; the experimental group had significant decrease of pain, craniocervical angle and the limitation of function than the control group ( $p < 0.05$ ).

**Conclusion:** Combined kinesio taping with therapeutic exercises proved to be beneficial in improving neck pain, head posture and decreasing the limitation of function more than therapeutic exercises only in patients with mechanical neck dysfunction.

**Key Words:** Kinesio taping – Mechanical neck dysfunction – Therapeutic exercises.

### Introduction

**MECHANICAL Neck Dysfunction (MND)** is a type of dysfunctional syndrome affecting the cervical spine, characterized by intermittent pain,

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restriction of end range movement and dysfunction of the cervical muscles especially when the cervical spine is loaded [1]. Mechanical neck dysfunction may result from postural dysfunction, trauma, or it may be of insidious onset [2]. In adults, mechanical dysfunction of the cervical spine can be the primary cause of recurrent neck pain [3].

Mechanical neck dysfunction can result from poor or faulty posture, overuse injuries or trauma. Neck pain affects about two thirds of people in middle age. Neck posture can be affected by sedentary lifestyles such as prolonged sitting in front of computer, watching television, electronic games and office work [4,5].

Kinesio taping is a new therapeutic modality that corrects and treats many musculoskeletal disorders which is based on natural healing process. Kenzo Kase, the creator of Kinesio tape, proposed the following mechanisms for the effects of Kinesio Tape: Altered muscle function by the tapes effects on weakened muscles, improved circulation of blood and lymph by eliminating tissue fluid or bleeding beneath the skin, decreased pain through neurological suppression, repositioning of subluxed joints by relieving abnormal muscle tension, and helping to affect the function of fascia and muscle [5,6].

Kinesio taping can restore muscle function and assist the postural alignment. Because of the change of life style, modern people usually have sedentary behavior. The poor muscular endurance may lead to poor postures. Some studies emphasized the effect of kinesio tape on Forward Head Posture (FHP) alignment and deep cervical flexors [5].

Exercise therapy can improve the performance of the cervical muscles, decreasing neck pain and

improvement of disability and function associated with MND [7].

Limited studies compared between the effect of combined kinesio taping with therapeutic exercises and therapeutic exercises only so the current study was conducted to investigate the effect of combined kinesio taping with therapeutic exercises on pain, head position and neck disability and functional limitation in patients with MND.

### Subjects and Methods

This study was conducted at Physical Therapy department in Central Buraidah Hospital in Kingdom of Saudi Arabia (KSA) from 2014 to 2015 to investigate the effect of combined kinesio taping with therapeutic exercises on pain, head posture and functional limitation in patients with MND. Thirty patients (17 males and 13 females) with MND were selected from physical therapy department in Central Buraidah Hospital. Their age ranged between 30 and 45 years ( $35.04 \pm 3.70$ ). Mean BMI was ( $31.98 \pm 2.88$ ). They were randomly assigned into two equal groups. Subjects in the experimental Group (B) received combined treatment of application of kinesio taping in addition to therapeutic exercises program in the form of strengthening and stretching exercises of the neck muscles. Subjects in the control Group (A) received the same exercise program of the experimental group. The treatment program was applied for both groups 3 times per week for a period of four weeks. Patients were referred from orthopedic physicians with diagnosis of MND that have been confirmed both clinically and radiologically. All patients signed informed consent before participating in this study.

**Inclusive criteria:** Age of patients ranged from 30-45 years. All patients were referred from orthopedic consultants with diagnosis of MND. Their Neck Disability Index (NDI) is above 5 [8].

**Exclusive criteria:** Patients with previous history of neck trauma, head injuries, ankylosing

spondylitis, osteoporosis of cervical spine, cervical disc with radiculopathy and patients with allergy or hypersensitivity manifestation for kinesio-tape as proved by first application on the skin.

**Assessment procedures:**

**Electronic digital algometer:**

An electronic algometer "Force one gauge-model FDI" (Wagner instruments, Greenwich, CT, USA) Device Model: TOSHIBA E5830SD-P2-made in JAPAN as shown in Fig. (1). It was used to Measure Muscular Trigger Points (MTRP) tenderness by determining the Pain Pressure Threshold (PPT) through either a flat palpation technique in which a clinician applies finger or thumb pressure to muscle against underlying bone tissue, or a pincer palpation technique in which a particular muscle is palpated between the clinician's fingers [9]. An electronic Algometer is valid and reliable in measuring MTrP tenderness [10].



Fig. (1): An electronic algometer.

**X-ray:**

Lateral views of cervical spine from C2-C7 were taken pre and post treatment. A superior vertical line from posterior inferior corner of C7 was constructed and measured the perpendicular distance from this line to the posterior superior portion of the vertebral body C2 Figs. (2,3). It was found that a distance of about 15mm (1.5cm) of forward head displacement in relation to the thorax is normal [11].

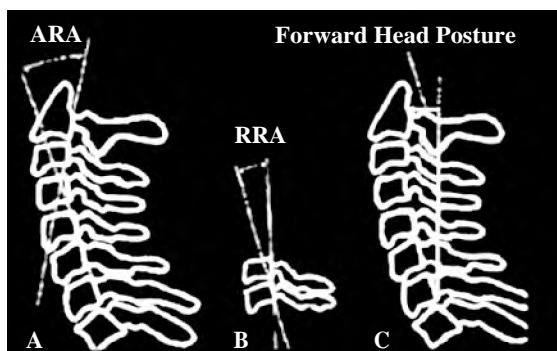


Fig. (2): Lateral cervical X-ray for measurement FHP.

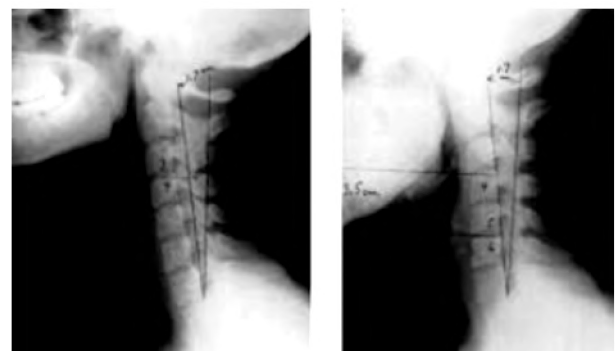


Fig. (3): Lateral cervical X-ray for measurement FHP.

*Neck Disability Index (NDI):*

Measuring self-rated disability due to neck pain was done by NDI which is a standard instrument questionnaire. The scale consists of 20 questions relating to 4 domains (neck function, pain intensity, emotion, cognition and activities of daily living). The NDI has good concurrent validity and high reliability. Arabic edition of NDI was valid and reliable [12,13].

*Outcome measures:*

- 1- *Pain intensity:* Pain intensity was measured by Electronic Digital Algomete by determining the Pain Pressure Threshold (PPT).
- 2- *Craniovertebral (CV) angle:* For Forward Head Posture angle measurement (FHP).
- 3- *Functional neck disability:* Disability related to neck pain was measured by the Neck Disability Index (NDI).

*Treatment procedures:*

*Group A (exercises program only):*

The exercise program consists of stretching exercises followed by strengthening exercises and postural correction exercises which were applied to both groups.

- A- Isometric exercises for neck extensors (recti capitis posterior, semispinalis capitis, splenius capitis, longissimus capitis and upper trapezius), Flexor (STCM, longissimus capitis, splenius capitis and cervicis and iliocostalis cervicis) and Side-Bending muscles (STCM, longissimus capitis, splenius c apitis and cervicis and iliocostalis cervicis) patient hold 6sec. after maximum contraction against maximum manual resistance given by the therapist then relax 6 sec repeated 5 times.
- B- Stretching exercises for (levator scapula, upper fibers of trapezius and sternocleidomastoid muscles) passive stretch with hold for 30sec. and relax 30sec. repeated 3 times.
- C- *Posture correction exercise program:*
  - Cervical retraction exercise by chin in which the head is aligned more directly over the thorax for 30 seconds with each successive repetition.
  - Upper cervical nodding exercise by nodding the head up and down about 1/2 inch.
  - Each exercise was performed as 3 sets of 10 repetitions each for 3 times/week for 6 weeks. The patients were instructed to continue the posture correction exercises as a home program to influence the self-correction kinesthetic awareness.

*Group B Kinesio tape:*

The tape (Kinesio Tex) used in this study was water proof, adhesive, had a width of 5cm, thickness of 0.5mm made in Japan. It was made from gentle porous cotton fiber strip. It was able to get stretched up to 140% of its original length. Blue and piege were the used tape colors. The tape was worn on the skin and replaced every 4 days [1,14]. The tape was measured and cut according to patient's required treatment area. Two strips (I and Y) of the tape were used; Y strip started from thoracic vertebrae 3-5 to occiput of the skull (hair line), and I strip was put at middle of the neck horizontally. The patient was asked to put his head in neutral position then the base of Y strip was applied over the spinous process of T3-5 then patient was asked to flex his head then the remaining of Y strip were applied para-spinal up to the hair line with no tension on the ends of the tape. Patient was asked to return his head to neutral position then the middle paper packing of I strip was torn and tension was applied on the middle, adhesive of the tape at middle of the neck horizontally then the tension was released at the ends [14]. The total period of treatment was 6 weeks.

*Statistical analysis:*

Descriptive statistics (mean and standard deviation) were computed for all data. The paired *t*-test was used to measure within group differences in pain, FHP angle and NDI pre and post treatment. Independent *t*-test was used to measure changes of pain and FHP angle post treatment between Group (A) and (B). The statistical analyses were performed the aid of the Statistical Package of Social Sciences (SPSS) version 20. All statistically significant differences is determined with confidence interval of 95% and thus at  $p < 0.05$ .

**Results**

*Group (A):*

Fifteen patients (6 male and 9 female) were included in this group. The mean age was (35.07±3.76) years, the mean weight was (84.93±4.84) kilograms, the mean height was (162.66±6.22) centimeters and mean BMI (31.82±3.17) Kg/m<sup>2</sup> as shown in (Table 1).

*Group (B):*

Fifteen patients (8 male and 7 female) were included in this group. The mean age was (35.00±3.64) years, the mean weight was (85.07±4.00) kilograms, and the mean height was (168.06±6.15) centimeters and mean BMI (32.13±2.58) Kg/m<sup>2</sup> as shown in (Table 1).

There was no statistically significant difference between the two groups in their ages, weights, and heights.

There was no significant difference in pre treatment assessment between groups in PPT, FHP and NDI.

*Within group difference:*

There was significant difference between pre treatment assessment and post treatment assessment of all dependant variables in Groups (A,B) as shown in (Tables 2,3).

*Between groups difference:*

There was significant difference between post treatment means of Group (A) and post treatment means of Group (B) ( $p$ -value<0.05) in favor of Group (B) as shown in (Table 4).

Table (1): Mean and standard deviation of the age, height and weight of Groups (A,B).

Items	Group (A)		Group (B)		Comparison		
	Mean	±SD	Mean	±SD	t-value	p-value	S
Age (year)	35.07	±3.76	35.00	±3.64	0.19	0.82	NS
Weight (kg)	84.93	±4.84	85.07	±4.00	0.08	0.91	NS
Height (cm)	162.66	±6.22	163.80	±6.15	0.48	0.61	NS
BMI	31.82	±3.17	32.13	±2.58	0.44	0.56	NS

\*S.D.: Standard Deviation. S : Significance.  
 p : Probability. N.S.: Non significant.

Table (2): Difference within Group (A) pre and post treatment.

Variables	Mean ± SD Group (A)	t	p-value
Pain Pressure Threshold (PPT)	Pre 2.48±0.16 Post 3.22±0.19	11.16	0.0001
Forward Head Posture (FHP)	Pre 1.82±0.14 Post 1.78±0.12	2.44	0.02
Neck Disability Index (NDI)	Pre 27.8±3.74 post 20.13±3.48	13.74	0.0001

\*S.D.: Standard Deviation. S : Significance.  
 p : Probability. N.S.: Non significant.

Table (3): Difference within Group (B) pre and post treatment.

Variables	Mean ± SD Group (B)	t	p-value
Pain Pressure Threshold (PPT)	Pre 2.42±0.15 Post 4.1±0.21	11.16	0.0001
Forward Head Posture (FHP)	Pre 1.82±0.14 Post 1.56±0.12	2.44	0.02
Neck Disability Index (NDI)	Pre 28.06±4.47 Post 11.66±2.94	13.74	0.0001

\*S.D.: Standard Deviation. S : Significance.  
 p : Probability. N.S.: Non significant.

Table (4): Difference between Groups (A,B) post treatment.

Variables	Mean ± SD Group (A) post ttt	Mean ± SD Group (B) post ttt	p value
Pain Pressure Threshold (PPT)	3.22±0.19	4.1±0.21	0.0001
Forward Head Posture (FHP)	1.78±0.12	1.56±0.07	0.001
Neck Disability Index (NDI)	20.13±3.48	11.66±2.94	0.0001

\*S.D.: Standard Deviation. S : Significance.  
 p : Probability. N.S.: Non Significant.

**Discussion**

There is limited research studying the effect of kinesio taping in patients with MND, the purpose of the current study was to investigate the effect of combined kinesio taping with therapeutic exercises on pain, head posture and functional limitation in patients with MND.

*Regarding the effects of kinesio taping on MND:*

KT facilitates immediate increase in muscle strength by producing a concentric pull on the fascia, which may then stimulate increased muscle contraction. Also, KT improves muscle alignment, which may contribute to marginal increases in muscle strength [15].

The findings of this study may be attributed to the effect of kinesio taping on proprioception as kinesio taping has an effect on cutaneous mechanoreceptors through stretching skin. This sense of stretching is thought to elaborate signal information for joint movement and joint position [16]. Studies confirmed the role of cutaneous mechanoreceptors in detecting joint movement and position resulting from skin stretching at extremes of motion, much like joint mechanoreceptors [1,17].

According to the results of the current study, the kinesio taping group revealed that there was a significant improvement in neck pain, head posture and decreasing the limitation of function.

The results of the current study were in agreement with Saavedra et al., [18]. Who compared the effectiveness of cervical spine thrust manipulation and Kinesio taping applied to the neck on self-reported pain, disability and cervical range of motion in individuals with MND. The results of that study revealed that cervical thrust manipulation and Kinesio taping exhibited similar reductions in neck pain intensity, disability and similar changes in active cervical range of motion except for rotation.

The findings of this study were in agreement with the findings of Dawood et al., [5] participants were assigned randomly into three groups; Group

(A) received Kinesio taping every 4 days for 8 sessions with exercises program, Group (B) received cervical traction posture pump with exercises program 3 days/week for 12 sessions, and control Group (C) received exercises program only in form of stretching, postural and isometric exercises for neck and shoulder joint 3 days/week for 12 sessions. The results revealed that the combined therapy of kinesio taping or cervical traction posture pump with exercise program are effective in improving the absolute rotatory angle, pain intensity and functional neck disability in MND more than exercise alone.

The findings of this study were in agreement with the findings of Mahgoub et al., [1] who had 45 patients with MND participated in that study, their age ranged from 20-45 years. They were assigned randomly and equally into three groups; Control Group (A) received exercises program, Group (B) received phonophoresis with exercise program and Group (C) received kinesio taping replaced every 4 days with 2 days off with exercise program. All groups received treatment 3 times weekly for 12 sessions. The results revealed that significant improvement in the kinesio taping more than phonophoresis on pain intensity, cervical ROM and neck function disability in MND.

The studies found that subjects with head, neck, and shoulder discomfort are more likely to have a smaller craniovertebral angle that indicates a decrease of FHP than that of asymptomatic subjects [19-21].

*Regarding the effects of therapeutic exercises on MND:*

Exercises therapy aimed to improve the performance of the cervical muscles, decrease pain and improvement of functional disability associated with MND [7], in addition to increase cervical ROM and head excursion [22].

In agreement with the results of the present study, Ylinen et al., [23] who evaluated the effect of isometric exercises on chronic neck pain in women. The exercises were applied 3 sessions/week for 6 weeks. They found that there was a significant difference in muscle strength and neck pain before and after treatment.

The results of this study in agreement with Lars et al., [24] who stated that strength training had high clinical relevance and led to marked prolonged relief in neck muscle pain.

The result of the present study supported by Harrison et al., [21] which achieved improvement

in cervical curvature after 12 weeks of application of postural correction exercises program.

Similarly, Ylinen et al., [24] compared between stretching exercise and manual therapy on non-specific neck pain and disability. Measurements were done after 4 weeks and 12 weeks, and there were significant improvements in both groups in neck pain and disability with no difference between both groups. They concluded that stretching exercises can be recommended in the first instance as an appropriate therapy intervention to relieve pain, at least for the short-term treatment.

In contrast to the result of the present study, Morningstar, [20] evaluated postural correction program on FHP. After 6 weeks with 3 sessions/week, X-rays were used to evaluate anterior rotator angle. The results revealed that there was a reduction of FHP and restoration of lordotic curve. This could be attributed to the different lengths in application of the exercises program. The short term of postural exercises in the current study could reflect on soft tissue dysfunction only, while longer period might be required to achieve similar change on the osseous components which lead to restoration of the normal cervical curve.

*Limitation of the study:* The small sample size per each group which may affect the generalization of results in clinical practice.

*Acknowledgement:*

The authors would like to thank all staff members of Physical Therapy Department in Central Buridah Hospital in Qassim for their assistance in this study.

*Conclusion:*

Combined kinesio taping with therapeutic exercises proved to be beneficial and had a superior effect in improving neck pain, head posture and decreasing the limitation of function more than therapeutic exercises only in patients with mechanical neck dysfunction.

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## الملخص العربي

خلفية البحث: يعد اضطراب الرقبة الميكانيكي سبب مؤدى الى اعاقه حركة الرقبة. يعاني مرضى اضطراب الرقبة الميكانيكي من الام الرقبة واضطراب وظيفى بالرقبة يمنعه من ممارسة الانشطة المعتادة.

الهدف: دراسة تأثير اللاصقة الحركية مع التمرينات العلاجية على شدة الألم بالضغط، ومقدار انحناء الرأس إلى الأمام ومؤشر العجز الوظيفى للرقبة فى المرضى الذين يعانون من اضطراب الرقبة الميكانيكى.

الاشخاص: ثلاثون مريضاً يعانون من اضطراب الرقبة الميكانيكى تتراوح اعمارهم بين ٣٠-٤٥ عاماً بمتوسط (35.04±3.70) ومتوسط كتلة الجسم لهم (31.98±2.88) كجم/م<sup>٢</sup> تم توزيعهم عشوائياً إلى مجموعتين متساويتين.

الطريقة: شملت المجموعة الضابطة، المجموعة (أ)، ١٥ شخصاً تم علاجهم ببرنامج التمرينات العلاجية لمدة ٦ أسابيع وشملت المجموعة (ب) وهى المجموعة التجريبية ١٥ شخصاً تلقوا برنامج العلاج باللاصقة الحركية (كينسو) بالاضافة الى نفس برنامج التمرينات العلاجية لمدة ٦ أسابيع أيضاً. وتمت القياسات الأولية (شدة الألم بالضغط، ومقدار انحناء الرأس إلى الأمام ومؤشر العجز الوظيفى للرقبة) قبل العلاج، وبعد الانتهاء من برنامج العلاج.

النتائج: لقد وجد فرق ملحوظ ذو دلالة إحصائية بين كلا المجموعتين فى قياسات ما بعد العلاج تشير الى قلة معدل الألم، ومقدار انحناء الرأس إلى الأمام ومؤشر العجز الوظيفى للرقبة فى المجموعة التجريبية أكثر من المجموعة الضابطة وتم تعيين دلالة إحصائية أقل من ٠.٠٥ لجميع الاختبارات.

الخلاصة: أثبت البحث أن تأثير اللاصقة الحركية مع التمرينات العلاجية مفيد فى تحسن الام الرقبة وتقليل مقدار انحناء الرأس إلى الأمام ومؤشر العجز الوظيفى للرقبة ويعتبر أفضل من العلاج بالتمرينات العلاجية منفردة فى المرضى الذين يعانون من اضطراب الرقبة الميكانيكى.