

## IMMEDIATE AND LONG TERM EFFECT OF KINESIOTAPING ON CERVICAL CORE IN FORWARD HEAD POSTURE: ONE WEEK FOLLOW UP STUDY

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### ABSTRACT

**Background:** For maintaining normal posture of cervical spine, deep cervical flexor muscle endurance is essentially required. Therefore, if muscle recruitment is impaired the balance between the stabilizers on the front and the back of the neck will be disrupted. This will cause loss of proper alignment of spinal segments and forward headed posture. It has been studied that Modified sphygmomanometer just like pressure biofeedback can be used as a assessment tool for measuring cervical core endurance. Kinesio –Taping (KT) has been developed as an adjunct to the treatment of musculoskeletal dysfunction and has improved over time to provide therapeutic effects which do not hinder the functionality of body segments. But, rather help in correcting or maintaining the alignment of body segments. There is lot of evidences available on immediate effect of kinesiotape but very few studies done on long term effectiveness.

**Materials and Method:** 50 healthy asymptomatic young individuals within the age group of 18 -30 years having forward head posture were taken using random sampling. Cervical core muscle endurance was assessed by calculating activation score (mm Hg) using modified sphygmomanometer before and immediately after application of kinesiotape and the mean was recorded. On the 3<sup>rd</sup> day the tape was removed and subject was reassessed for cervical muscle endurance and mean was recorded again. Repeated measure analysis was done for next 24 hours, 48 hours, 72 hours and 96 hours. The data recorded was used for statistical anlysis.

**Results:** There was significant statistical difference in the activation score pre and post application of kinesiotape using wilcoxon signed rank test ( $p < 0.05$ ). Thereafter, to analyse the long term effect of kinesiotape after its removal on 3<sup>rd</sup> day (0 hours) onwards till next consecutive 4 days Bonferroni method for repeated measure analysis was used. It was found that there was no significant statistical difference between repeated measure analysis between 0-24 hours, 0-48hours, 24-48hours, 48-72hours, 72-96hours, 48-96hours ( $p > 0.05$ ), but there is a significant reduction between 0-72hours (3<sup>rd</sup> -6<sup>th</sup> day), 0-96 hours (3<sup>rd</sup> -7<sup>th</sup> day), 24-96 hours (4<sup>th</sup> – 7<sup>th</sup> day) ( $p < 0.05$ ).

**Conclusion:** Thus our study to determine the immediate and long term effect of kinesiotaping on cervical core in forward head posture :one week follow up study concluded that there was no significant difference in the activation score (mm Hg) after the removal of kinesio tape post 24 hours, 48 hours and 72 hours but there was a significant reduction seen in activation score after 72 hours for next two consecutive days.

**KEY WORDS:** Activation Score, Long Term Effect, Cervical Core Muscle Endurance, Modified Sphygmomanometer, Kinesiotape.

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## INTRODUCTION

The cervical spine consists of seven cervical vertebrae. The joint in the cervical spine are diarthrodial synovial joints with fibrous capsule. The cranio-cervical junction and the atlantoaxial joints are secured by the external and the internal ligaments. The external ligaments consists of atlanto-occipital, anterior atlanto-occipital and anterior longitudinal ligaments, transverse ligament. The paired alar ligaments, the tectorial membrane are passive structures maintaining stability along with deep neck flexor muscles are identified as Longus Capitus and Longus Colli muscles [1].

The anterior positioning of the cervical spine is termed as forward neck posture. This posture is also called "Scholar's neck", "Wearsie neck" or "Reading neck". Forward Head Posture (FHP) may result in the loss of 30% of vital lung capacity. These breath related effects are primarily due to loss of the cervical lordosis which blocks the action of the hyoid muscle especially the inferior hyoid muscle which is responsible for helping lift the first rib during inhalation. This forward head posture can later lead to symptomatic problems in previously asymptomatic individuals.

For maintaining normal posture of cervical spine, deep cervical flexor muscle endurance is essentially required [2]. Therefore if muscle recruitment is impaired the balance between the stabilizers on the front and the back of the neck will be disrupted. This will cause loss of proper alignment of spinal segments and forward headed posture. Endurance deficiencies of deep cervical muscle can lead to rest pain, increased lordosis and headache [3].

Modified sphygmomanometer can be used to measure cervical core muscular endurance just like pressure biofeedback. Pressure biofeedback (Chittanooga Stabilizer system) is generally used as a measuring cervical core endurance. But it has been found that activation score for cervical core has good inter-rater reliability ICC= 0.709 and excellent intra-rater reliability determined by the ICC=0.820. There is lot of consensus on cervical core strength using pressure biofeedback but very few on modified sphygmomanometer. So there was a need to

assess immediate and long term effect of kinesiotape on cervical core endurance.

The search for new therapeutic approach capable of preventing and treating musculoskeletal dysfunction is progressively increasing in conjugation with current technological innovation. In this context, taping techniques have developed as a complement to the treatment of musculoskeletal dysfunction and has improved over time to provide therapeutic effects which do not hinder the functionality of body segments [4-7].

Kinesio taping (KT) has been theorized to be an effective treatment to restore muscle function and assist the postural alignment [8].

It mimics the qualities of human skin. It is roughly of same thickness of epidermis and can be stretched to 30% to 40% of its resting length longitudinally. Kase et al. have proposed several benefits depending an amount of stretched tape: (1) to provide a positional stimulus through skin. (2) to create more space by lifting fascia and soft tissue above area of pain/inflammation. There are evidences available on immediate effect of kinesiotape on muscle strength in athletes and quadriceps strength but very few studies done on cervical core endurance and its long term effectiveness. Again, the studies done analysed the long term effect only upto 48 hours with tape present and after its removal. So there is a need to observe the immediate and long term effect of kinesiotape on cervical core post 1 week after its removal.

**Objectives:** To determine the immediate effect of activation score (mm Hg) pre and post kinesiotaping of cervical core in forward head posture & to observe the long term effect on activation score after the removal of kinesiotape in forward head posture during one week.

## MATERIALS AND METHODS

50 healthy young asymptomatic individuals with forward head posture (FHP) were selected using random sampling for one week experimental study. Inclusion criteria - Normal healthy individuals between 18-25 yrs of age. Exclusion criteria - History of injury or trauma to cervical spine, History of neck pain, congenital cervical anomalies, Cervical spondylosis, Individuals undergoing medical or physiotherapy treatment

for neck pain, Psychologically unstable patient, Neurological deficits. The study was approved by the Institutional Ethical Review Board. All the subjects were informed about the aim, the method of the study and protection of their rights. Informed written consent was taken from all subjects who participated in the study.

**Methodology:**

Subjects were selected on the basis of Inclusion and Exclusion criteria. A proper consent from the participating subjects was taken by filling the consent form. Subjects selected were assessed for endurance of deep cervical flexor muscle by modified sphygmomanometer before the application of the kinesio tape.

Testing Position: Supine lying with head neutrally positioned by placing a folded towel under the head. Place a blood pressure cuff under the upper cervical spine and inflate to 20mmHg as baseline pressure. Instruct the patient to nod and increase the pressure on the blood pressure cuff to 22mmHg and hold the pressure steady for 10 seconds. If the subject is successful to hold with minimal superficial muscle activity, subject is asked to do 10 repetition of 10 second hold and proceed for further 2mmHg rise in pressure.

Further, increasing pressure to 2mmHg total of 10mmHg increase. Final pressure is the one at which patient can hold steady for 10 seconds for 10 times. This pressure rise is noted down as activation score in mm Hg. Activation score was calculated before application of kinesiotape and immediately after application of tape.

Next, The forward head posture was corrected by bringing the cervical spine to neutral position and the kinesiotape was applied vertically. Kinesiotape was applied vertically from C7 to T3 spinous process [9].

On the 3<sup>rd</sup> day, the kinesiotape was removed and the patient were reassessed for cervical core and the activation score was recorded every 24 hourly considering 3<sup>rd</sup> day as 0 hours then

**Table 3:** Result of interaction between 0h, 24h, 48h, 72h 7 96h repeated measure analysis.

consecutively 24h, 48h, 72h, 96h for the next 4 days. The data recorded was used for statistical analysis.

**Statistical Analysis:** Pre and post kinesiotaping Cervical core activation score was recorded. Since the data was not normally distributed, Non-Parametric tests were applied. Data was analysed for pre and post kinesiotaping by Wilcoxon signed rank test.

On the 3<sup>rd</sup> day the tape was removed and the subjects were reassessed for next 0 hrs, 24hours, 48 hours, 72 hours, and 96 hours. Data was recorded for next 4 consecutive days. Repeated measure analysis was calculated using Bonferroni method to assess the long term effectiveness of kinesiotape on cervical core activation score after its removal.

**RESULT**

The result of wilcoxon signed rank test showed that there is a significant difference between pre and post application of kinesiotaping. (p < 0.05). And, the result of Bonferroni correction method showed that there was significant reduction in the effect of kinesiotape after its removal by 72h and 96 h. but no change in the effect of kinesiotape after its removal was seen during 24h and 48h. The effect was consistently maintained till 48 h.

**Table 1:** Comparison of Activation score pre and post kinesiotaping.

Activation score	Mean (mm hg)	p value	Significance
pre	5.4	0.007335*	Significant
post	6		

\*p < 0.05 (significant)

**Table 2:** Mean ± SD values of activation score of kinesiotaping after its removal for 0 hours, 24 hours, 48 hours, 72 hours, 96 hours.

Activation Score	Mean (mm hg) ± SD
0 Hours	6.92 ± 1.96
24 Hours	6.72 ± 1.66
48 Hours	6.38 ± 0.90
72 Hours	5.92 ± 0.72
96 Hours	5.78 ± 0.54

Time	0h	24h	48h	72h
24h	1			
48h	0.949	1		
72h	0.020*	0.134	1	
96h	0.004*	0.037*	0.629	1

\*p < 0.05

## DISCUSSION

50 asymptomatic individuals of age group 18 to 30 years with forward head posture were selected. Activation score (mm Hg) of Cervical core was assessed with the help of modified sphygmomanometer before and immediately after application of kinesiotope. On the 3<sup>rd</sup> day the tape was removed and the individual was reassessed again for activation score of cervical core muscle and the mean was calculated. This was repeated for next 4 consecutive days 24 hourly. The data collected was analysed using wilcoxon signed rank test and bonferroni test.

Table 1 shows significant increase in the pre and post activation score immediately after the application of kinesiotope. Since we had done kinesiotope from C7 – T3 vertebrae for forward head posture. The aim behind it was to align the posture in corrected way to activate neck core muscles efficiently. The kinesiotope done at this spinal level had created temporary neck retraction effect encouraging individuals unfamiliar with neck retraction posture by giving a tactile feedback [10].

Gillerd W et al, suggested that through skin stretching, kinesiotope increases mechanoreceptor stimulation and sensory feedback of taped region, facilitate muscle contraction, and ultimately promote muscle strength and endurance. Kase et al have also proposed several benefits depending on amount of stretched tape: to provide a positional stimulus through skin.

Again, Won-gyu Yoo et al in the year 2013 in his study proposed that the forward head angle significantly decreased during computer work performed with neck retraction taping compared to without taping. He suggested that kinesiotope was stretched more in forward head posture (FHP), and the increased tension may have provided a mechanical effect inhibiting FHP. Researchers have indicated that prolonged and low load stretch are more effective than short term stretch. Kinesiotope maintains the proper alignment and in this way it applies prolonged stretch on tight structures surrounding shoulder and neck. Also kinesiotope places short and overactive muscle in lengthened position and shift length-tension curve to right causing

decrease in overlapping actin-myosin in cross-bridge cycle eventually leading to low muscle force production. Thus reducing the overactivity of shortened muscles and correcting FHP. Thus, giving us a significant difference pre and post kinesiotope in activation score of cervical score endurance [11].

Table 2 shows the mean  $\pm$  Standard deviation of activation score of kinesiotope after its removal for 0 hours, 24 hours, 48 hours, 72 hours, 96 hours. Table 3 shows interaction between 0h, 24h, 48h, 72h & 96h repeated measure analysis. The result showed that there was no significant difference in repeated measure analysis between 0-24h, 0-48h, 24-48h, 48-72 h, 72-96 h, and 48-96 h ( $p > 0.05$ ). But there was a significant difference between 0-72h, 0-96h, 24-96h ( $p < 0.05$ ). The above result indicated that after removal of kinesiotope post 3<sup>rd</sup> day of its application, there was no significant change observed in its effect till 48 h. But, the effect started diminishing after 72h and 96h. The probable reason for the result in reduction in effect of kinesiotope by 72 hours and 96 hours can be because of lesser application time which was only 3 days.

Similar study done by Anna Slupik et al, in his study on effect of kinesiotope on bioelectric activity of vastus medialis muscle studied that bioelectric activity of muscles in the study group increased after 24 hours of kinesiotope and that the effect was maintained for another 48 hours following removal of tape. After which he found decrease in muscle tone on 4<sup>th</sup> day because of shorter duration of its application or improvement in muscle function [12]. There might have been preservation of a high peak torque which was produced on application of tape, persistent reflex action and change produced in muscle tone for 48 hours after tape removal [13].

In our study, we have analysed the repeated measure analysis of effect of kinesiotope over a period of 1 week. In our study, we found significant reduction on the effect of kinesiotope after 48 hours for next two consecutive days. This could be due to inhibitory effect of kinesiotope on positive reflex amplitude of cervical musculature that lasted only till the tape was present at its place, but as the tape was removed this

reflex might have started decreasing causing regression in the effect of the cervical core muscle endurance on 72 hours and 96 hours.

Mikoko A.Nakajima et al, in his study on the effect of kinesiotape on vertical jump and dynamic postural control, suggested that tactile input has been shown to alter motor control by changing the excitability of central nervous system. Moreover, he added that the tension provided by application of tape may have increased the neural feedback of participants during ankle movement resulting in decreased effect of kinesiotape [14]. In our study, three days of kinesiotaping might have increased the neural feedback and might have altered the excitability of stretched cervical muscles thus causing decrease in the effectiveness of kinesiotape.

Our study analyses the effect of kinesiotaping after its removal to determine its long term effect. It has been analysed that there was significant increase in pre and post application of kinesiotape on activation score of cervical core muscle endurance. It has a long term effect after its removal only upto 48hours after which there is significant reduction in the effect of kinesiotape during next two consecutive days.

## CONCLUSION

Thus our study to determine the immediate and long term effect of kinesiotaping on cervical core in forward head posture :one week follow up study concluded that there was no significant difference in the activation score after the removal of kinesio tape post 24 hours, 48 hours and 72 hours but there was a significant reduction seen in activation score after 72 hours for next two consecutive days after removal of kinesiotape.

**Conflicts of interest: None**

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