

# Comparison of Soft Cervical Collar Versus Cervical-5 Cross-Taping on Cervical Active Range of Motion in Asymptomatic Subjects

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**Abstract.** [Purpose] The objective of this study was to compare the active cervical range of motion (CROM) of asymptomatic subjects without orthosis with wearing cervical soft collars or with cervical 5cross-taping. [Subjects] Twenty-three asymptomatic subjects (13 males, 10 females) without neck or shoulder pain agreed to participate in this study. [Methods] The active neck movement (flexion, extension, and left and right rotation and lateral flexion) of the subjects was measured using a CROM instrument without orthosis, while wearing a cervical soft collar, and with cervical-5 cross-taping. [Results] All active neck movements with cervical-5 cross-taping were significantly reduced compared to without orthosis. All active neck movements while wearing soft cervical collars were significantly reduced compared to without orthosis and cervical-5 cross-taping. [Conclusion] These preliminary results suggest that cervical-5 cross-taping using Kinesio tape may allow more active neck movement than soft cervical collars and be more supported than without orthosis.

**Key words:** Kinesio taping, Neck movement, Soft cervical collar

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## INTRODUCTION

In clinical practice, cervical collars are used as a treatment for neck disorders<sup>1)</sup>, and 76% of patients with neck pain found pain was reduced by wearing a cervical collar<sup>2)</sup>. Although, whiplash patients are commonly discharged with a soft cervical collar<sup>1)</sup> for symptomatic benefit<sup>3)</sup>, there is no empirical evidence indicating that whiplash patients should wear a soft cervical collar<sup>1)</sup>. In addition, several studies have shown that immobilization or cervical collars are no more effective than active mobilization<sup>4)</sup> in reducing whiplash-related disorders<sup>1,5)</sup>. Despite the widespread use of soft cervical collars for neck pain and disability, the clinical benefits are still controversial<sup>1)</sup>.

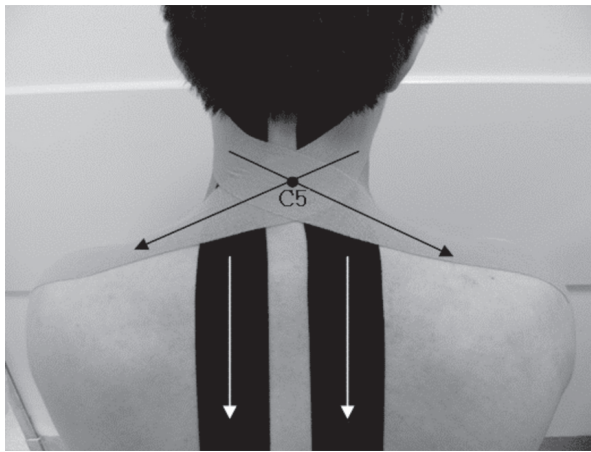
Kinesio tape has an elastic quality and is often used in sports traumatology, orthopedics and neuromuscular rehabilitation to support injured joint structures, and weak muscle function,<sup>6)</sup> and to enhance sensorimotor and proprioceptive feedback<sup>7)</sup>. In addition, Kinesio taping intervention, which is less invasive than other intervention, may allow normal daily functional movements and social participation<sup>6)</sup>. However, studies of the mechanical effects of Kinesio taping intervention for the cervical and shoulder areas have been very few. We are interested in the active cervical range of movement when Kinesio taping is applied to the cervical and shoulder areas and the objective of this preliminary study

was to compare the active cervical range of motion (CROM) in asymptomatic subjects with no orthosis with wearing a cervical soft collar and with cervical-5 cross-taping.

## SUBJECTS AND METHODS

The participants of this study were 13 male [age:  $26.0 \pm 4.0$  years (mean  $\pm$  SD); height:  $174.3 \pm 4.0$  cm; body height  $67.6 \pm 7.1$  kg] and 10 female [age:  $22.4 \pm 4.1$  years (mean  $\pm$  SD); height:  $161.7 \pm 5.7$  cm; body weight  $50.7 \pm 4.8$  kg] asymptomatic subjects without pain in the neck or shoulder. The subjects had no limitations in the movement due to pain or pathology of the neck and shoulder. All subjects understood the purpose of this study and signed an informed-consent document, in accordance with the ethical standards of the Declaration of Helsinki.

The active neck movement (flexion, extension, and left and right rotation and lateral flexion) of the subjects was measured using a Cervical Range of Motion (CROM: Performance Attainment Associates, St. Paul, Minn) instrument with a high reliability for CROM measurement by the same investigator<sup>8-13)</sup>, in an upright sitting posture. The CROM measurement was repeated while subjects wore at random no orthosis, a soft cervical collar (3011M, Kumkwang, Daegu, Korea), or cervical-5 cross-taping at intervals of 30 min, to eliminate the learning effect of active CROM.



**Fig. 1.** Application of cervical-5-cross taping for neck and shoulder muscles, C5; The spinous process of fifth cervical vertebra.

The cervical-5 cross-taping was performed using and the Kinesio tape (Kinesio Tex, KT-X-050, Tokyo, Japan) which was stretched to 130–140% of its original length and applied by an Kinesio taping expert. For the cervical-5 cross-taping application, I-type strips were applied from the third cervical vertebra to the seventh thoracic vertebra (the posterior cervical muscles) while subjects sat in a relaxed posture with the neck in 20° flexion and then from the mastoid process to the opposite acromion, crossing the spinous process of the fifth cervical vertebra, with 20° rotation to the other side of the head (Fig. 1).

Statistical analysis was performed using the SPSS statistical package (version 14.0, SPSS, Chicago, IL, USA). One-way ANOVA with repeated measurement was used to analyze the differences of limitation in neck movement in the three states; no orthosis, soft collar and cervical-5 cross-taping. Multiple comparisons were determined by Bonferoni's correction. The statistical significance level was chosen as  $p < 0.05$ .

## RESULTS

Active neck movement (flexion, extension, and left and right rotation and lateral flexion) in the three conditions is shown in Table 1. The active neck movement while wear-

ing a soft cervical collar was not only significantly reduced compared to no orthosis ( $p < 0.05$ ), but also compared to cervical-5 cross-taping ( $p < 0.05$ ) (Table 1). The active neck movement with cervical-5 cross-taping was significantly reduced compared to no orthosis ( $p < 0.01$ ) but was significantly increased compared to soft the cervical collar ( $p < 0.05$ ), except for right lateral flexion ( $p > 0.05$ ) (Table 1). The mean residue of active neck movement with cervical-5 cross-taping was 74.3%, and that of wearing a soft cervical collar was 62.5% (Table 1).

## DISCUSSION

In this study, active neck movement while wearing a soft cervical collar was not only significantly reduced compared to no orthosis, but also by cervical-5 cross-taping. In a clinical setting, soft cervical collars have been often used to provide symptom relief from pain and immobilization<sup>1–3</sup>. However, there is no evidence that longer periods of intervention with the soft cervical collar, have any benefit. Some studies have suggested that there are adverse long term effects of wearing a cervical soft collar for whiplash injuries on activity and mobilization<sup>14</sup>.

Active neck movement with cervical-5 cross-taping was significantly reduced compared to no orthosis, but, was significantly increased compared to wearing of a soft cervical collar, except for right lateral flexion. The elastic quality (e.g., 130%–140% of original length)<sup>15</sup> of the Kinesio tape used for the cervical-5 cross-taping allows functional activities unlike conventional tapes<sup>6</sup>. In addition, Kinesio taping intervention may improve the circulation of blood and lymph<sup>15</sup>, support the joint during daily activities<sup>16</sup> and relieve pain<sup>15</sup>. Therefore, cervical-5 cross-taping using Kinesio tape may protect secondary damage to muscles and joints of cervical and shoulder areas arising from long-term use of cervical collars or pain-avoidance mechanisms<sup>17</sup>, although this study did not test these hypotheses. Based on the result of this preliminary study, the cervical-5 cross-taping allowed active neck movement compared to soft cervical collars and was the nearest to normal neck movement though less so than no orthosis. In turn, the use of cervical-5 cross-taping for whiplash patients with neck pain and disability may be useful when active mobilization is requationuired or for use over longer periods of time, because the support it gives to the neck and shoulder areas allows movements of daily living<sup>6</sup>. The limitations of this study were that the sample

**Table 1.** Comparison of the six cervical ranges of motion (degrees) in the three conditions (N=23)

Neck movement	Mean $\pm$ SD (% of CROM with no orthosis)		
	No orthosis	Soft cervical collar	Cervical-5 cross-taping
Flexion (°)	55.7 $\pm$ 8.9	25.3 $\pm$ 9.9* (45%)	42.2 $\pm$ 10.3 <sup>†‡</sup> (76%)
Extension (°)	71.5 $\pm$ 11.1	49.3 $\pm$ 10.0* (69%)	62.1 $\pm$ 13.5 <sup>†‡</sup> (87%)
Right rotation (°)	63.2 $\pm$ 8.2	35.9 $\pm$ 9.2* (57%)	42.3 $\pm$ 9.9 <sup>†‡</sup> (67%)
Left rotation (°)	62.3 $\pm$ 8.9	34.4 $\pm$ 10.3* (55%)	42.9 $\pm$ 10.2 <sup>†‡</sup> (68%)
Right lateral flexion (°)	38.2 $\pm$ 9.1	28.7 $\pm$ 8.9* (75%)	31.7 $\pm$ 8.1 <sup>†</sup> (83%)
Left lateral flexion (°)	41.2 $\pm$ 9.5	30.7 $\pm$ 7.0* (75%)	33.9 $\pm$ 8.9 <sup>†‡</sup> (82%)

\*significant difference between baseline and soft cervical collar ( $p < 0.05$ ); <sup>†</sup>significant difference between baseline and cervical-5 cross-taping ( $p < 0.05$ ); <sup>‡</sup>significant difference between soft cervical collar and cervical-5 cross-taping ( $p < 0.05$ ); CROM, cervical range of motion.

size was small and contained no neck and shoulder disorder patients. Further, longer, randomized follow-up studies including whiplash patients with neck and shoulder disorders are needed to assess the therapeutic efficacy of cervical-5 cross-taping.

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