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# Short-Term Effects of Kinesio Taping Versus Cervical Thrust Manipulation in Patients With Mechanical Neck Pain: A Randomized Clinical Trial

**STUDY DESIGN:** Randomized clinical trial.

**OBJECTIVE:** To compare the effectiveness of cervical spine thrust manipulation to that of Kinesio Taping applied to the neck in individuals with mechanical neck pain, using self-reported pain and disability and cervical range of motion as measures.

**BACKGROUND:** The effectiveness of cervical manipulation has received considerable attention in the literature. However, because some patients cannot tolerate cervical thrust manipulation, alternative therapeutic options should be investigated.

**METHODS:** Eighty patients (36 women) were randomly assigned to 1 of 2 groups: the manipulation group, which received 2 cervical thrust manipulations, and the tape group, which received Kinesio Taping applied to the neck. Neck pain (11-point numeric pain rating scale), disability (Neck Disability Index), and cervical-range-of-motion data were collected at baseline and 1 week after the intervention by an assessor blinded to the treatment allocation of the patients. Mixed-model analyses of variance were used to examine the effects of the treatment on each outcome variable, with group as the between-subjects variable and time as the within-subjects variable. The primary analysis was the group-by-time interaction.

**RESULTS:** No significant group-by-time interactions were found for pain ($F = 1.892$, $P = .447$) or disability ($F = 0.115$, $P = .736$). The group-by-time interaction was statistically significant for right ($F = 7.317$, $P = .008$) and left ($F = 9.525$, $P = .003$) cervical rotation range of motion, with the patients who received the cervical thrust manipulation having experienced greater improvement in cervical rotation than those treated with Kinesio Tape ($P<.01$). No significant group-by-time interactions were found for cervical spine range of motion for flexion ($F = 0.944$, $P = .334$), extension ($F = 0.122$, $P = .728$), and right ($F = 0.220$, $P = .650$) and left ($F = 0.389$, $P = .535$) lateral flexion.

**CONCLUSION:** Patients with mechanical neck pain who received cervical thrust manipulation or Kinesio Taping exhibited similar reductions in neck pain intensity and disability and similar changes in active cervical range of motion, except for rotation. Changes in neck pain surpassed the minimal clinically important difference, whereas changes in disability did not. Changes in cervical range of motion were small and not clinically meaningful. Because we did not include a control or placebo group in this study, we cannot rule out a placebo effect or natural changes over time as potential reasons for the improvements measured in both groups.

**LEVEL OF EVIDENCE:** Therapy, level 1b.

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**KEY WORDS:** *cervical spine, manual therapy, mobilization*

Mechanical neck pain is a significant societal burden and may include symptoms in the neck and upper extremity. It has been reported that the lifetime and point prevalence of neck pain are almost as high as those of low back pain.[26] A systematic review of the literature has indicated that the 1-year prevalence of neck pain ranges between 16.7% and 75.1% (mean, 37.2%).[14] Additionally, mechanical neck pain results in substantial disability and costs.[5,11,24] Determining the most appropriate intervention for individuals with neck pain remains a priority for researchers. Physical therapy is usually the first management approach for patients with mechanical, idiopathic, insidious neck pain, and manual therapy is often the preferred intervention.[8]

Although a number of randomized controlled trials support the use of manual therapy directed at the cervical spine in patients with neck pain,[6,13,20,27,30] a recent Cochrane review concluded that there is only low-quality evidence to suggest that cervical thrust manipulation may provide

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greater short-term pain relief than no intervention.[19] Additionally, some individuals with mechanical neck pain may not tolerate or be appropriate candidates for the application of cervical manipulation. Therefore, alternative therapeutic strategies should be considered.

Another intervention used clinically in the management of patients with neck pain is Kinesio Taping (Kinesio USA, Albuquerque, NM).[22] Kinesio Tape is a thin, pliable adhesive material that can be stretched up to 120% to 140% of its original length, making it more elastic than conventional tape.[23] Although physical therapists regularly use Kinesio Taping in clinical practice, particularly for sport injuries,[36] there is only limited scientific evidence of its effectiveness. A few published case reports have suggested that Kinesio Taping may be beneficial in treating acute patellar dislocations,[29] trunk pain,[35] and myofascial pain.[17] More recently, 2 randomized clinical trials have suggested that Kinesio Taping may be effective for the treatment of shoulder pain[32] and acute whiplash.[18] In patients with shoulder pain, Kinesio Taping immediately improved pain-free active shoulder range of motion but did not change pain or disability.[32] In individuals with acute whiplash, the application of Kinesio Taping slightly improved pain and cervical range of motion (CROM).[18] Nevertheless, changes in these 2 studies were relatively small, which may indicate that the effects of Kinesio Taping are limited. To date, no study has evaluated the effects of Kinesio Taping in patients with mechanical neck pain.

The purpose of this randomized controlled trial was to examine the short-term effects of Kinesio Taping versus cervical spine manipulation on neck pain intensity, self-reported disability, and CROM in patients with mechanical neck pain.

# METHODS

## Participants

Participants were patients with primary complaint of mechanical idiopathic neck pain, referred to physical therapy treatment at a private clinic in Almería, Spain. Mechanical neck pain was defined as generalized neck or shoulder pain provoked by sustained neck postures, neck movement, or palpation of the cervical musculature. Exclusion criteria were as follows: (1) contraindication to neck manipulation (eg, fracture, osteoporosis, positive extension-rotation test, any symptom of vertebrobasilar insufficiency), (2) history of whiplash, (3) history of cervical surgery, (4) diagnosis of cervical radiculopathy or myelopathy, (5) diagnosis of fibromyalgia syndrome, (6) previous spinal manipulation therapy or Kinesio Tape applications, (7) any tape allergy, and (8) being younger than 18 or older than 55 years of age. Informed consent was obtained from each patient before participation in the study, which was performed in accordance with the Helsinki Declaration. The study was approved by the Ethics and Research Committee of the University of Almería.

## Outcome Measures

The primary outcome measure was neck pain intensity, with disability and CROM as secondary outcomes. Patients provided demographic and clinical information and completed a number of self-report measures at baseline, which included a numeric pain rating scale (NPRS) to assess neck pain intensity,[21] the Neck Disability Index (NDI) to measure self-perceived disability,[33] and a body diagram to assess the location and distribution of pain.[34] Once patients completed the self-report measures, they underwent cervical-range-of-motion (CROM) testing. They were also screened for any signs of vertebrobasilar insufficiency, such as nystagmus, gait disturbances, and Horner syndrome.[9] Patients underwent screening for upper-cervical-spine ligamentous instability using the Sharp-Purser test, alar ligament stress test, and transverse ligament test.

The NPRS (range, 0 to 10, with 0 as no pain and 10 as maximum pain) has been shown to be a reliable and valid tool for the assessment of pain.[21] The minimal detectable change (MDC) and minimal clinically important difference (MCID) for the NPRS have been reported as 1.3 and 2.1 points, respectively.[10]

The NDI consists of 10 questions addressing functional activities.[33] There are 6 potential responses for each item, ranging from no disability (0) to total disability (5). The NDI is scored from 0 to 50, with higher scores indicating greater disability. MacDermid et al[25] recently concluded that the MDC and the MCID for the NDI were 5 and 7 points out of 50, respectively.

CROM testing was assessed with the patient sitting comfortably on a chair, with both feet flat on the floor, hips and knees at 90° of flexion, and buttocks positioned against the back of the chair. A CROM goniometer was placed on the top of the head, and patients were asked to move their head as far as possible, without pain, in a standard fashion (flexion, extension, right lateral flexion, left lateral flexion, right rotation, and left rotation). The CROM goniometer has been shown to exhibit intratester reliability between 0.87 and 0.96 in subjects with neck pain.[16] A recent study reported that the standard error of measurement across the 6 cervical movements ranged from 1.6° to 2.8°, whereas the MDC ranged from 3.6° to 6.5°.[1]

All outcomes were collected at baseline and 7 days after the intervention by an assessor blinded to the treatment allocation of the patients. Patients were blinded to their treatment allocation and uninformed of what intervention the other group would receive.

## Allocation

Following the baseline examination, patients were randomly assigned to receive Kinesio Taping (tape group) or a manipulation intervention directed at the cervical spine (manipulation group). Concealed allocation was performed using a computer-generated randomized table of numbers created prior to the start of data collection by a researcher who was not involved in either recruitment

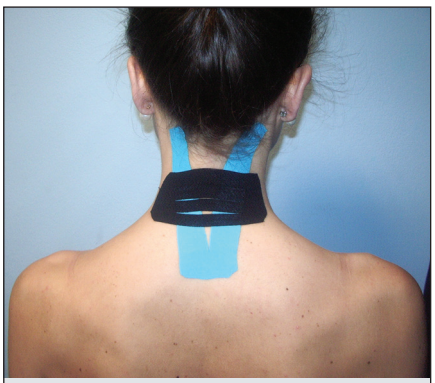

**FIGURE 1.** Kinesio Taping application.

**FIGURE 2.** Midcervical spine manipulation.

**FIGURE 3.** Cervicothoracic junction manipulation.

or treatment of the patients. Individually, sequentially numbered index cards containing the randomly assigned intervention group were folded and placed in sealed, opaque envelopes. A second therapist, blinded to baseline examination findings, opened the envelope and proceeded with the treatment according to the group assignment. All patients received the intervention on the day of the initial examination.

## Kinesio Taping Application

The tape (Kinesio Tex; Kinesio USA, Albuquerque, NM) used in this study was waterproof, porous, and adhesive, and had a width of 5 cm and a thickness of 0.5 mm. Patients in this group received the following Kinesio Taping application[22,23] while seated (**FIGURE 1**). The first layer of tape consisted of a blue Y-strip placed over the posterior cervical extensor muscles, from the insertion to the origin, with paper-off tension, which the manufacturer applies to the tape against its paper backing at approximately 15% to 25% stretch.[22,23] Each tail of the first strip (blue Y-strip, 2-tailed) was applied with the patient's neck in a position of cervical contralateral sidebending and rotation. The tape was first placed from the dorsal region (T1-T2) to the upper-cervical region (C1-C2). The overlying strip (black) was a space-tape (opening) placed perpendicular to the Y-strip, over the midcervical region (C3-C6), with the patient's cervical spine in flexion to apply tension to the posterior structures. This application has been used in a previous study.[18] Patients wore the Kinesio Tape during the duration of the study (1 week), and it was removed just before outcome assessment.

## Manipulation Interventions

The manipulation group received 2 thrust manipulation interventions directed at the midcervical spine and cervicothoracic junction. For the midcervical spine thrust manipulation, the patient was in supine, with the cervical spine in a neutral position. The index finger of the clinician applied a contact over the posterior-lateral aspect of the zygapophyseal joint of C3. The therapist cradled the patient's head with the other hand. Gentle ipsilateral cervical sideflexion and contralateral rotation were introduced until slight tension was perceived in the tissues at the contact point (**FIGURE 2**). A high-velocity, low-amplitude thrust manipulation was directed upward and medially in the direction of the subject's contralateral eye.[28] The cervicothoracic junction thrust manipulation was applied bilaterally. For a left C7-T1 manipulation, the contact was on the right side of the C7-T1 junction. The patient was prone, with the head and neck rotated to the left. The therapist stood on the left side of the patient, facing in the cephalic direction. The therapist's right hand made contact with the thumb on the right side of the spinous process of T1. The therapist's left hand supported the head of the patient. The head and neck were gently flexed laterally to the right, until slight tension was perceived in the tissues. A high-velocity, low-amplitude thrust was applied toward the patient's left side (**FIGURE 3**). These 2 manipulation procedures were selected because they are commonly used in clinical practice in patients with neck pain.

## Adverse Events

Patients were asked to report any adverse event that they experienced during the treatment period. In this study, an adverse event was defined as sequelae of medium to long-term duration, manifesting in a symptom that was serious, distressing, and unacceptable to the patient and required further treatment.[7]

## Sample-Size Determination

The sample-size and power calculations were performed using the Spanish software EPIDAT Version 3.1 (Xunta de Galicia, Santiago de Compostela, Spain). The calculations were based on detecting a mean difference of 2.1 points (MCID) on an 11-point NPRS,[10] assuming a standard deviation of 2.5, a 2-tailed test, an alpha level of .05, and a desired power of 90%. The estimated desired sample size was 30 patients per group. To accommodate the expected dropouts before the study's completion, a total of 40 participants were included in each group.

## Statistical Analysis

Data were analyzed with SPSS Version 18.0 (SPSS Inc, Chicago, IL), using an intention-to-treat analysis. When post-

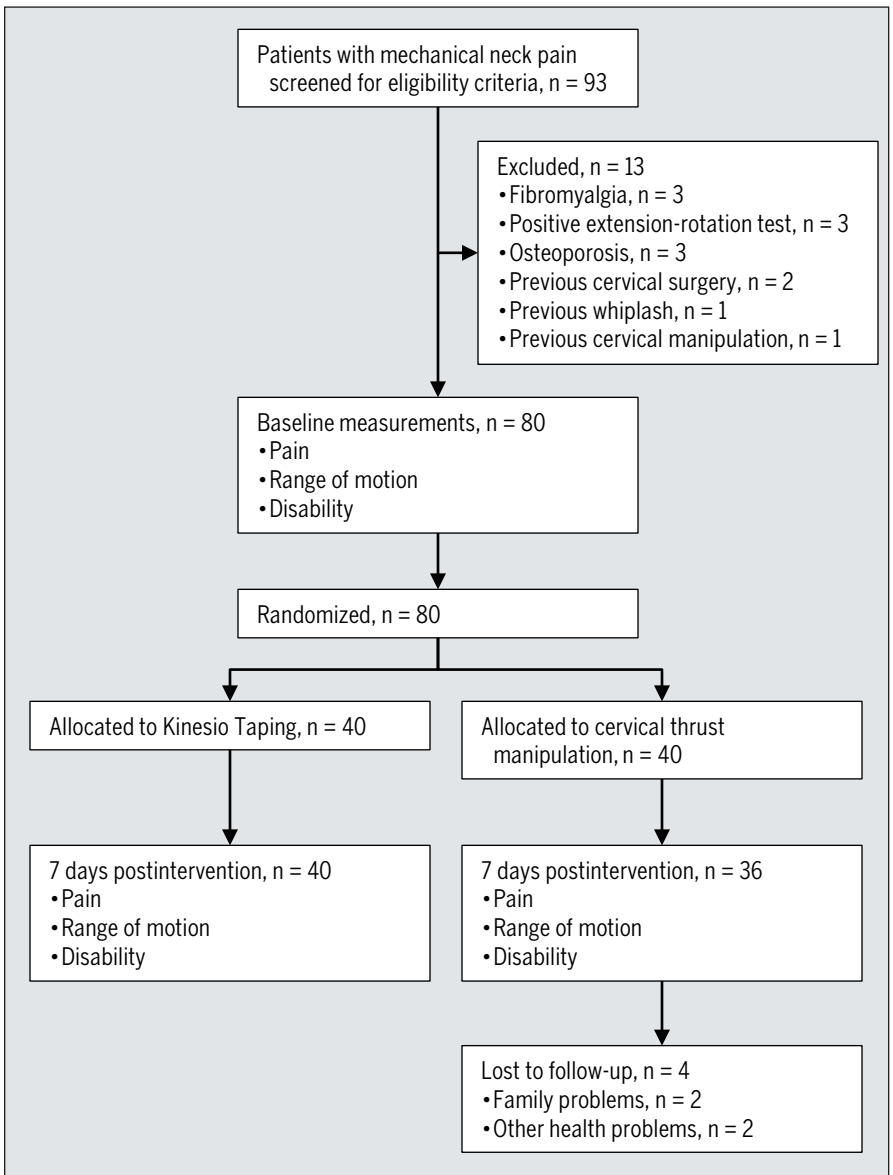


**FIGURE 4.** Flow diagram of patients throughout the course of the study.



intervention data were missing, baseline scores were used, reflecting a conservative approach to handling missing data. Potential differences in baseline demographic and clinical variables between groups were examined using independent Student *t* tests for continuous data and $\chi^2$ tests of independence for categorical data. Separate 2-by-2 mixed-model analyses of variance were used to examine the effects of treatment on pain, self-reported disability, and CROM (flexion, extension, rotation, and lateral flexion) as the dependent variables, with group (tape or manipulation) as the between-subjects variable and time (baseline and 1-week follow-up) as the within-subjects variable. The hypothesis of interest was the group-by-time interaction at an a priori alpha level of .05.

## RESULTS

Ninety-three consecutive patients were screened for eligibility criteria. Eighty patients (mean ± SD age, 45 ± 10 years; 46.5% female) satisfied the eligibility criteria, agreed to participate, and were randomized to the Kinesio Tape (n = 40) or manipulation (n = 40) group. The reasons for ineligibility are found in **FIGURE 4**, which provides a flow diagram of patient recruitment and retention. Baseline features between the groups were similar for all variables (**TABLE 1**).

The 2-by-2 mixed-model analysis of variance did not indicate a statistically significant group-by-time interaction for neck pain (F = 1.892, *P* = .447) or NDI (F = 0.115, *P* = .736), with both groups experiencing similar decreases in pain and disability over the 1-week study period. **TABLE 2** shows baseline, postintervention, within-group, and between-group differences and their associated 95% confidence intervals for pain and self-reported disability data.

The group-by-time interaction for the 2-by-2 mixed-model analysis of variance was statistically significant for right (F = 7.317, *P* = .008) and left (F = 9.525, *P* = .003) rotation. The patients who received the thrust manipulation experienced a greater increase in cervical rotation range of motion than those receiving the Kinesio Tape application (*P*<.01). There was no significant interaction for CROM for flexion (F = 0.944, *P* = .334), extension (F = 0.122, *P* = .728), and right (F = 0.220, *P* = .650) and left (F = 0.389, *P* = .535) lateral flexion. **TABLE 2** summarizes baseline, postintervention, within-groups, and between-groups differences with associated 95% confidence intervals for CROM.

In this study, 5 patients reported minor adverse events (defined as short-term, mild-in-nature, nonserious, transient, reversible consequences of the treatment), with 3 in the manipulation group (7.5%) who experienced a minor increase in neck pain or fatigue after the cervical spine manipulation and 2 in the Kinesio Tape group (5%) who reported cutaneous irritation related to the tape application. These minor posttreatment symptoms resolved within 24 hours.

## DISCUSSION

The results of the current study suggest that the application of Kinesio Tape and cervical spine thrust manipulation had similar effects for reducing pain and disability. Additionally, patients in both groups experienced similar improvements in cervical flexion, extension, and lateral flexion in both directions. However, individuals who received the cervical thrust manipulation exhibited a greater increase in cervical rotation range of motion than those treated with Kinesio Tape. Nevertheless, changes in CROM were extremely small and of questionable clinical significance.

The decrease in neck pain for both groups was statistically significant and surpassed the previously reported 2.1-point MCID.[10] Previous studies have reported that cervical spine thrust manipulation is effective for reducing pain in individuals with mechanical neck pain,[6,13,20,27,30] but this is the first study to suggest that Kinesio Taping applied for a 1-week period had a similar effect. The current results are similar to those previously reported for patients with acute whiplash,[18] although the reduction in neck pain was greater in the current study. Thelen et al[32] also found that Kinesio Taping improved pain-free shoulder range of motion in patients with shoulder pain but had no effect on spontaneous pain or function. This study also demonstrated that both cervical spine thrust manipulation and Kinesio Taping similarly reduced self-reported disability, as measured with the NDI over the 7-day duration of the study. However, changes observed were lower than the reported MCID of 7 points for the NDI.[25] It is possible that consecutive applications of Kinesio Taping or cervical manipulation would result in greater changes.

This study also showed that patients receiving either intervention exhibited small increases in CROM. This is in agreement with previous studies showing an improvement in mobility after Kinesio Taping[17,18,29,32,35] or cervical spine thrust manipulation.[6,13,20,27,30] Changes in cervical rotation range of motion were statistically greater in the manipulation group, but these differences were small. Additionally, improvements in CROM did not surpass the MDC for this measurement, which ranges between 3.6° and 6.5°.[1] It is possible that greater changes in CROM could be observed from multiple applications of each intervention over a longer period.

The current study suggests that Kinesio Taping was as effective as cervical thrust manipulation for decreasing neck pain and disability in individuals presenting with mechanical neck pain. One possible mechanism by which Kinesio Taping induced these changes may be related to the neural feedback provided to the patients, which can facilitate their ability to move the cervical spine with a reduced mechanical irritation on the soft tissues. In addition, the tape might have created tension in soft tissue structures that provide afferent stimuli, facilitating a pain-inhibitory mechanism and thereby reducing the pain levels of the patients.[22,23]

Historically, the mechanisms of spinal thrust manipulation have been primarily assumed to be biomechanical in nature, but recently it has been purported that the mechanisms may be neurophysiological.[2-4] It has been demonstrated that spinal thrust manipulation results in decrease in inflammatory cytokine[31] and increase in endorphins.[12] Further, it has also been demonstrated that cervical thrust manipulation increases pressure pain thresholds to a greater magnitude compared to a sham intervention or no intervention.[15] It is also possible that spinal thrust manipulation results in a decrease in thermal pain sensitivity.[3] The exact mechanism through which spinal thrust manipulation exerts its effects remains to be elucidated.

There are a number of limitations in the current study that should be recognized. First, we did not include a control or placebo group, which limits the interpretation of our data. Although both interventions seemed to be equally effective, we cannot rule out that all improvements were due to a placebo effect, natural changes over time, or bias from the assessor, who knew that both groups received some form of treatment. Future studies should include a control or placebo group to address this limitation. Second, we used a sample of convenience from 1 clinic, which may not be repre-

**TABLE 1** Baseline Demographics for Both Groups*

| | Manipulation Group | Kinesio Tape Group | *P* Value |
|---|---|---|---|
| Gender (male/female), n | 19/17 | 21/19 | .906 |
| Age, y | 44 ± 10 | 46 ± 9 | .312 |
| Duration of symptoms, mo | 75 ± 18 | 82 ± 19 | .479 |
| Neck pain† | 5.0 ± 1.9 | 5.2 ± 1.4 | .456 |
| Neck Disability Index‡ | 22.5 ± 4.3 | 21.4 ± 2.3 | .151 |
| Cervical range of motion, deg | | | |
| Flexion | 56.0 ± 10.7 | 55.8 ± 7.8 | .955 |
| Extension | 56.9 ± 12.9 | 53.1 ± 19.9 | .333 |
| Right lateral flexion | 39.0 ± 8.6 | 39.0 ± 8.4 | .978 |
| Left lateral flexion | 39.6 ± 7.5 | 38.9 ± 6.4 | .653 |
| Right rotation | 70.6 ± 12.3 | 71.3 ± 12.6 | .809 |
| Left rotation | 71.1 ± 13.7 | 76.0 ± 12.7 | .108 |

*Values are mean ± SD except for gender.*
†Measured with an 11-point numeric pain rating scale (0, no pain; 10, worst pain imaginable).*
‡Scores range from 0 to 50, with higher scores indicating greater disability.*

**TABLE 2** Baseline, 7 Days Posttreatment, and Change Scores for Neck Pain, Disability, and Cervical Range of Motion

| Group | Baseline* | 7 d Posttreatment* | Within-Groups Change Scores† | Between-Groups Change Scores† |
|---|---|---|---|---|
| Pain (0-10 points) | | | | 0.2 (0.0, 0.5) |
| Kinesio Tape | 5.2 ± 1.4 | 2.7 ± 1.2 | −2.5 (−2.9, −2.0) | |
| Manipulation | 5.0 ± 1.9 | 2.7 ± 1.6 | −2.3 (−3.0, −1.1) | |
| Neck Disability Index (0-50 points) | | | | 0.3 (−1.3, 1.9) |
| Kinesio Tape | 21.4 ± 2.3 | 15.4 ± 1.8 | −6.0 (−6.8, −5.2) | |
| Manipulation | 22.5 ± 4.3 | 16.8 ± 3.9 | −5.7 (−7.2, −4.1) | |
| Cervical flexion, deg | | | | 2.0 (−2.1, 6.0) |
| Kinesio Tape | 55.8 ± 7.8 | 58.6 ± 9.5 | 2.8 (0.1, 5.5) | |
| Manipulation | 56.0 ± 10.7 | 56.8 ± 7.6 | 0.8 (−4.0, 2.4) | |
| Cervical extension, deg | | | | 1.4 (−6.8, 9.7) |
| Kinesio Tape | 53.1 ± 19.9 | 57.0 ± 15.2 | 3.9 (2.6, 10.3) | |
| Manipulation | 56.9 ± 12.9 | 62.2 ± 9.9 | 5.3 (2.0, 8.6) | |
| Cervical right lateral flexion, deg | | | | 1.4 (−6.7, 9.8) |
| Kinesio Tape | 39.0 ± 8.4 | 43.9 ± 7.6 | 4.9 (2.2, 7.6) | |
| Manipulation | 39.0 ± 8.6 | 45.3 ± 7.7 | 6.3 (4.1, 8.5) | |
| Cervical left lateral flexion, deg | | | | 0.9 (−2.1, 4.0) |
| Kinesio Tape | 38.9 ± 6.4 | 42.8 ± 6.6 | 3.9 (1.9, 4.7) | |
| Manipulation | 39.6 ± 7.5 | 42.6 ± 7.2 | 3.0 (0.4, 5.4) | |
| Cervical right rotation, deg | | | | 6.8 (1.8, 11.7)‡ |
| Kinesio Tape | 71.3 ± 12.6 | 72.0 ± 12.5 | 0.7 (−3.1, 4.6) | |
| Manipulation | 70.6 ± 12.3 | 78.1 ± 9.8 | 7.5 (4.3, 10.7) | |
| Cervical left rotation, deg | | | | 7.0 (2.5, 11,5)‡ |
| Kinesio Tape | 76.0 ± 12.7 | 76.8 ± 10.4 | 0.7 (−2.4, 3.9) | |
| Manipulation | 71.1 ± 13.7 | 78.8 ± 9.6 | 7.7 (4.3, 11.1) | |

**Values are mean ± SD.*
*†Values are mean (95% confidence interval).*
*‡Significant group-by-time interaction (analysis of variance, P<.01).*

sentative of the entire population of individuals with mechanical neck pain. In addition, we excluded patients older than 55 years for safety reasons, because older individuals can exhibit more contraindications to cervical thrust manipulation. This was considered important because, although vertebrobasilar insufficiency screening guidelines exist, there is no evidence substantiating the accuracy of historical information and physical examination to identify individuals at risk. In this study, minor adverse events that resolved within 24 hours were observed in 3 of 40 patients. Third, we investigated the short-term effects (7 days) of cervical thrust manipulation and Kinesio Taping application. Therefore, we cannot infer that the benefits would be maintained long term. In addition, therapists usually use a multimodal approach to the management of patients with mechanical neck pain and do not solely use cervical spine thrust manipulation or Kinesio Taping as an isolated intervention. We suggest that future studies investigate whether the inclusion of either procedure may enhance outcomes when added to interventions already proven effective, such as active exercise.

## CONCLUSION

Patients with mechanical neck pain receiving a cervical thrust manipulation or an application of Kinesio Taping exhibited similar reduction in neck pain and disability and similar changes in active CROM over a 7-day period. Changes in neck pain surpassed the MCID, whereas changes in disability were slightly less than the MCID. Finally, changes in CROM were small and not clinically meaningful because they did not surpass the MCD. The absence of a control group precludes attributing the measured changes to either intervention, as the changes could have been due to placebo, repeated testing, or the natural history of the condition. ◉

### KEY POINTS

**FINDINGS:** The application of Kinesio Tape or cervical spine thrust manipulation leads to similar reduction in pain and disability and increases in CROM in patients with mechanical neck pain. Changes in CROM were small and not clinically meaningful, and changes in disability did not surpass the MCID.

**IMPLICATIONS:** This study suggests that 1 session of cervical thrust manipulation and the application of Kinesio Tape for 1 week had a similar small but positive effect on patients with mechanical neck pain.

**CAUTION:** Because we did not include a control group, we cannot exclude the possibility that changes for both interventions were due to placebo effects or the natural history of the condition. Further, generalizability of the results should be considered with caution, as all patients were treated by the same therapist.

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