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Research Paper Review

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Immediate changes in neck pain intensity & widespread pressure pain sensitivity in patients with bilateral chronic mechanical neck pain: A randomized controlled trial of Thoracic Thrust Manipulation vs. Non-Thrust Mobilization

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ABSTRACT

OBJECTIVE: *The purpose of this study was to compare the effects of thoracic thrust manipulation vs thoracic non-thrust mobilization in patients with bilateral chronic mechanical neck pain on pressure pain sensitivity and neck pain intensity.*

METHODS: *Fifty-two patients (58% were female) were randomly assigned to a thoracic spine thrust manipulation group or of thoracic non-thrust mobilization group. Pressure pain thresholds (PPTs) over C5-C6 zygapophyseal joint, second metacarpal, and tibialis anterior muscle and neck pain intensity (11-point Numerical Pain Rate Scale) were collected at baseline and 10 minutes after the intervention by an assessor blinded to group allocation. Mixed-model analyses of variance (ANOVAs) were used to examine the effects of the treatment on each outcome. The primary analysis was the group * time interaction.*

RESULTS: *No significant interactions were found with the mixed-model ANOVAs for any PPT (C5-C6: P>.252; second metacarpal: P>.452; tibialis anterior: P>.273): both groups exhibited similar increases in PPT (all, P<.01), but within-group and between-group effect sizes were small (standardized mean score difference [SMD]<0.22). The ANOVA found that patients receiving thoracic spine thrust manipulation experienced a greater decrease in neck pain (between-group mean difference: 1.4; 95% confidence interval, 0.8-2.1) than did those receiving thoracic spine non-thrust mobilization (P<.001). Within-group effect sizes were large for both groups (SMD>2.1), and between-group effect size was also large (SMD = 1.3) in favor of the manipulative group.*

CONCLUSIONS: *The results of this randomized clinical trial suggest that thoracic thrust manipulation and non-thrust mobilization induce similar changes in widespread PPT in individuals with mechanical neck pain; however, the changes were clinically small. We also found that thoracic thrust manipulation was more effective than thoracic non-thrust mobilization for decreasing intensity of neck pain for patients with bilateral chronic mechanical neck pain.*

BACKGROUND INFORMATION

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Neck pain is a common musculoskeletal complaint with a point prevalence around 15% in males and 23% in females (1). Patients often seek manual therapy for the management of their symptoms. As an alternative to cervical spine manipulation, it has been shown in the literature that individuals with neck pain could also benefit from thoracic spine manipulation (2-3). The neurophysiologic mechanism by which thoracic spine thrust manipulation (TTM) affects individuals with neck pain is not yet well understood. Both segmental and central theories have been proposed as the most likely mechanisms by which a spinal thrust manipulation could act through the stimulation of descending inhibitory mechanisms (i.e., the periaqueductal gray matter) (4-5). It is assumed that spinal manipulation exerts a mechanical hypoalgesic effect, thereby increasing pressure pain thresholds (PPTs). A total of 5 studies have demonstrated that cervical spine manipulation induces this hypoalgesic effect in healthy people (6-8), individuals with mechanical neck pain (9) and those with lateral epicondylalgia (10). Only 2 studies to date have compared the hypoalgesic effect of thoracic thrust- versus non-thrust treatment on neck pain:

1. Cleland et al. (11) found that patients with mechanical neck pain receiving TTM had greater pain reduction at 2-day follow-up than did patients receiving thoracic non-thrust mobilization (TNM); and
2. Suvarnnato et al. (12) did not find a significant difference in pain reduction between individuals with neck pain who received TTM or TNM.

Given the discrepancy in findings and that the physiological effects of TTM remain to be elucidated, the purpose of this randomized clinical trial was to examine the widespread effects of TTM and TNM on pressure pain sensitivity and intensity of neck pain in patients with chronic mechanical neck pain.

PERTINENT RESULTS

- 60 patients screened for eligibility; 52 were included in the trial – 58% female and average age 33 ± 9 years. Twenty-seven (27) patients were randomly allocated to thoracic thrust manipulation (TTM) group, while 25 were allocated to the thoracic non-thrust mobilization (TNM) group. No significant differences were noted between baseline demographic data for the 2 groups.
- To examine the *effects of the intervention on PPT*, comparisons were made within each participant prior to and after the intervention as well as between dominant or non-dominant side. Comparisons of PPT were also made between each intervention group (i.e., TTM or TNM).
- To examine the *effects of the intervention on neck pain*, comparisons were made within each participant before versus after the intervention, as well as between each intervention group.
- There were no statistically significant interactions for PPT at any of the 3 pressure points bilaterally, however, there was a main effect for time with both groups experiencing similar PPT increases after the interventions at all pressure points ($p < 0.01$). Effect sizes (i.e., standard mean score difference, SMD) were small (SMD < 0.22) for changes in PPT.
- Patients receiving TTM experienced a statistically significant decrease ($p < 0.01$) in neck pain compared to those receiving TNM. Within-group effect sizes were large (SMD > 2.1) for both groups, and between-group effect size large (SMD = 1.3) in favour of the manipulative group.

CLINICAL APPLICATION & CONCLUSIONS

The findings of the current study indicated that there was no difference in PPT between individuals with chronic mechanical neck pain receiving either thoracic spine manipulation or mobilization. However, individuals who received thoracic thrust manipulation experienced significantly greater reductions in neck pain compared to non-thrust mobilization. The effect sizes for between-groups differences were large, suggesting a clinical effect of thoracic spine manipulation.

The evidence suggests that patients with chronic mechanical neck pain experience improvements with both thoracic spine manipulation and mobilization, albeit manipulation did result in a greater reduction in pain in this study. Thoracic spine manipulation has been shown to be a safe and effective alternative to cervical spine manipulation in reducing chronic mechanical neck pain. In practice, clinicians can offer this viable treatment alternative dependent upon patient preferences.

STUDY METHODS

Participants

Sixty consecutive patients referred by their primary care physician to physical therapy were screened for eligibility.

Inclusion criteria:

- Age between 18 – 60 years
- Bilateral, chronic (at least 6 months duration) idiopathic mechanical neck pain

Exclusion criteria:

- Whiplash injury
- Previous spine surgery
- Diagnosis of fibromyalgia, cervical radiculopathy or myelopathy
- Having undergone any physical therapy intervention in the previous year
- Pregnancy

Outcome Measures

Outcomes were measured before and 10 minutes after each intervention by an assessor blinded to group allocation. *The primary outcome was pain pressure threshold (PPT),* defined as the amount of pressure applied for the pressure sensation to first change to pain (13):

- PPT was measured using electronic algometer consisting of a 1cm2 rubber tip plunger mounted on a force transducer. Participants pressed a switch when the sensation changed from pressure to pain. The average of 3 trials was calculated and used in analysis. A 30 second rest period was allotted between each measurement.
- Pressure points were assessed bilaterally over the C5-C6 zygapophyseal joint, second metacarpal and tibialis anterior muscle (a previous study showed that patients with mechanical neck pain exhibited pressure hypersensitivity in these areas [14]).

The secondary outcome was neck pain intensity, measured on an 11-point Numeric Pain Rating Scale (0: no pain, 10: maximum pain) (15).

Interventions

Middle Thoracic Spine Thrust Manipulation (TTM):

Patient supine with upper extremities crossed over the chest and hands placed on opposite shoulders. The manipulating hand of the clinician stabilized the inferior thoracic vertebra at the segment targeted, while the therapists other hand cradled the patient's head introducing a gentle flexion of the upper and mid-thoracic spine. The clinicians's body directed a high-velocity, end-range, anterior-posterior thrust toward the T3-T6 segmental region. If no audible cavitation was heard on the first attempt, the clinician repositioned the patient and performed the manipulation again. A maximum of 2 attempts were made.

Middle Thoracic Spine Non-Thrust Mobilization (TNM):

Grade III-IV central posterior-anterior non-thrust mobilization directed toward the T3-T6 segmental region for approximately 2 minutes total at 20-second treatment 'bouts'.

STUDY STRENGTHS / WEAKNESSES

Limitations

- No control group, therefore no cause-effect relationship can be inferred.
- Only short-term follow-up therefore cannot translate to long-term follow-up effects.
- Differences in findings between primary and secondary outcomes may be due to the two measures assessing two different aspects of pain (i.e., PPT physiological pain experience versus neck pain self-reported experience).
- There was no measurement of function, therefore, cannot comment on differences in this aspect.
- Possible attention/performance bias as the amount of time spent with the participant in each intervention group may not be equal.
- Possible selection bias, since patients referred to study by family physician for physical therapy.
- Positioning of patient and direction of thrust/force through the spine was different in the intervention groups. The researchers could consider prone prone manipulation and mobilization in future.
- Only one therapist provided the intervention, which limits generalizability.

Strengths

- The authors randomly allocated the patients to the intervention groups.
- The assessor that collected outcome measures was blinded to group allocation.
- The authors tried to minimize attention effect by allotting a similar amount of time to complete both the TTM and TNM (approximately 2 minutes each).

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