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In a 36-Year-Old Woman With Neck Pain, Will Manipulation and Mobilization Be Beneficial for Reducing Her Reports of Neck Pain?

Holly Jonely, David A. Scalzitti

<LEAP> highlights the findings and application of Cochrane reviews and other evidence pertinent to the practice of physical therapy. The Cochrane Library is a respected source of reliable evidence related to health care. Cochrane systematic reviews explore the evidence for and against the effectiveness and appropriateness of interventions—medications, surgery, education, nutrition, exercise—and the evidence for and against the use of diagnostic tests for specific conditions. Cochrane reviews are designed to facilitate the decisions of clinicians, patients, and others in health care by providing a careful review and interpretation of research studies published in the scientific literature.¹ Each article in this PTJ series summarizes a Cochrane review or other scientific evidence on a single topic and presents clinical scenarios based on real patients or programs to illustrate how the results of the review can be used to directly inform clinical decisions. This article focuses on a patient with neck pain. [Can manipulation or mobilization reduce her neck pain?](#)

Neck pain is a common condition, with estimates of the prevalence in the previous 12 months between 30% and 50% and activity limitations from neck pain between 1.7% and 11.5%.² The impact of neck pain on society is large due to high medical costs, time off from work, and associated disability.^{3,4}

Manual therapy techniques, including manipulation and mobilization, are utilized by physical therapists as one option to reduce neck pain.^{5,6} Previous systematic reviews have demonstrated a benefit from manipulation and mobilization in combination with exercise but were inconclusive in regard to the specific effects from manipulation and mobilization.^{7,8} In addition, debates continue in regard to the need for manipulation of the cervical spine, especially due to the potential for serious risks, such as vertebral artery dissection and stroke.^{9,10} A 2002 clinical practice guideline reported the true risk from manipulation is not known and that the greatest reported estimate of risk in the literature for irreversible injury is 1 in 20,000.¹¹ Uncertainty is associated with the reported estimates due to small sample sizes and the quality of the studies reviewed. Di Fabio¹² concluded that the risk may be minimized, but not entirely eliminated, with the use of mobilization instead of manipulation. To date, however, there is no empirical evidence that the risk is influenced by the type of technique.¹³

Gross et al¹⁴ conducted a Cochrane systematic review to update their previous systematic reviews^{7,8} and to

assess the effectiveness of manipulation or mobilization in adults with neck pain. The review included a search of the literature for trials published through July 2009. A secondary purpose of the systematic review was to assess treatment characteristics such as technique and dosage, methodological quality, symptom duration, and subtypes of neck disorder in the effect of treatment. In contrast to their previous systematic reviews, the current review focused on the effectiveness of manipulation and mobilization by excluding studies in which manual therapy was used as part of a multimodal approach. These excluded studies are reviewed elsewhere.^{15,16} In the current systematic review, manipulation was described as a localized force of high velocity and low amplitude directed at specific spinal segments, and mobilization was described as use of low-grade/velocity, small- or large-amplitude passive movement techniques or neuromuscular techniques within the patient's range of motion and within the patient's control. The outcomes of interest were measures of pain, function, patient satisfaction, global perceived effect, quality of life, adverse effects, and costs of treatment. The results of the review by Gross et al¹⁴ are summarized in the Table.

Take-Home Message

Gross et al¹⁴ reviewed 27 trials that included 1,522 adults with neck pain. Among these trials, 2 included people with whiplash-associated disorders, 6 included people with degenerative changes, 2 included people with radicular signs and

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<LEAP> Case #21 Manipulation and Mobilization for Neck Pain

Table.

Manipulation or Mobilization for Neck Pain: Cochrane Review¹⁴ Results^a

Characteristics of included trials:
The literature search was conducted in July 2009 for randomized or quasi-randomized controlled trials. Twenty-seven trials (32 publications and 1,522 participants analyzed), which included either manipulation or mobilization, or both, were included. Multimodal treatment approaches were not included in this review.
Trials included adult participants with neck pain with and without radicular findings, including whiplash-associated disorder categories I and II, and people with cervicogenic headaches. The review included people with symptom durations classified as acute (<30 days), subacute (30–90 days), and chronic (>90 days). All of the included trials had fewer than 70 participants per intervention arm.
Details of the intervention:
The systematic review included 16 trials of manipulation of the cervical region, 6 trials of manipulation of the thoracic region, and 8 trials of mobilization of the cervical region. Three of these trials investigated both manipulation and mobilization of the cervical spine.
The manipulation studies included investigations of a single treatment session of manipulation, low dose of manipulation (1–4 treatment sessions), and multiple treatment sessions of manipulation (4–20 sessions over 2–11 weeks). Techniques of cervical mobilization included posterior-anterior, unilateral anterior-posterior, rotatory, and transverse.
Comparison interventions included: placebo treatments (eg, sham mobilization, sham ultrasound); adjunct treatment, such as mobilization plus a treatment (eg, ultrasound) versus that same treatment; waiting list or no treatment; another intervention (eg, exercise, medication, acupuncture, heat, electrotherapy, soft tissue techniques); a different manipulation or mobilization technique; or a different dose of manipulation or mobilization.
Outcome assessment:
Outcomes were analyzed according to the duration of the follow-up. The classifications for the duration of follow-up were: immediately posttreatment (within 1 day), short-term (closest to 4 weeks), intermediate-term (closest to 6 months), and long-term (closest to 12 months).
The outcomes of interest were pain, function, patient satisfaction, global perceived effect, quality of life, adverse effects, and costs of treatment. No restrictions were placed on the types of tests used to assess the outcomes. Impairment-level outcomes such as range of motion and strength were reported in some of the trials; however, these outcomes were not included in the systematic review.
All 27 trials included a measure of pain (eg, visual analog scale, numeric rating scale, pain pressure threshold). Eleven trials included a measure of function (eg, Neck Disability Index, Northwick Park neck pain questionnaire, modified von Korff neck disability scale). Three trials measured global perceived effect, 1 trial reported measuring patient satisfaction, and 1 trial included a measure of quality of life (General Health Questionnaire 28). Forest plots were included for individual studies for the outcomes of pain, function, and patient satisfaction. A pooled effect size from multiple studies could be calculated only for the outcome of pain from 3 clinically similar low-dose studies of cervical manipulation.
Only 8 of the 27 trials reported measuring adverse effects, and none of the trials reported data for the cost of treatment. Of the trials that reported adverse effects, 3 reported no adverse effects and 5 reported transient side effects, including radiculopathy, headache, or increased neck pain. This review was unable to address serious adverse effects such as stroke.
Risk of bias:
At least 2 of the review authors checked 12 criteria to assess the risk of bias for each trial. The criteria were: randomization; concealed allocation; blinding of patient, provider, and outcome assessor; acceptable dropout rate; intention-to-treat analysis; free of selective outcome reporting; similar groups at baseline; similar cointerventions; acceptable treatment adherence; and similar timing of outcome assessment. Studies that met 6 or more of these 12 criteria were classified as having a low risk for bias. Nine of the 27 trials had a low risk of bias. The most common risks of bias were lack of blinding of the provider, patient, and outcome assessor and failure to describe or use concealed allocation.
The GRADE approach was used to assess the quality of the body of evidence. This approach considers randomized controlled trials with low risk of bias that provide consistent and precise estimates of the outcomes as high-quality evidence. Six domains of the body of evidence are assessed and may lower the quality rating from high to moderate, low, or very low. An additional 3 domains are assessed and, if present, may raise the quality rating.
Results:
There is moderate-quality evidence from 2 studies that cervical manipulation produces pain relief, functional improvements, and patient satisfaction similar to cervical mobilization for people with acute, subacute, and chronic neck pain.
Low-quality evidence from 3 studies suggests that cervical manipulation may provide short-term pain relief for acute to chronic neck pain (pooled SMD = -0.90, 95% CI = -1.78 to -0.02). No long-term outcomes were available.
Low-quality evidence from one small trial (25 participants) suggests that 9 or 12 sessions of manipulation are superior to 3 sessions for pain relief at immediate posttreatment follow-up and neck-related disability for chronic cervicogenic headache. (SMD _{12 sessions vs 3 sessions} = -0.48, 95% CI = -1.51 to 0.56, and SMD _{9 sessions vs 3 sessions} = -0.90, 95% CI = -1.98 to 0.18).
Very low-quality evidence suggests that there is little or no difference between manipulation and other manual therapy techniques, certain medications, and acupuncture for mostly short-term and on one occasion intermediate-term follow-up for those with subacute and chronic neck pain (6 trials, 494 participants) and superior to TENS for chronic cervicogenic headache (1 trial, 65 participants).
There is very low-to-low quality evidence from 1 trial (133 participants) that manipulation of the thoracic spine may provide some immediate reduction in neck pain (NNT=7) when provided alone or as an adjunct to electrothermal therapy or individualized physical therapy for people with acute neck pain or whiplash. When thoracic manipulation was added to cervical manipulation alone, there was very low-quality evidence suggesting no added benefit for participants with neck pain of undefined duration.
There is low-quality evidence from 2 trials (71 participants) that a mobilization is as effective as acupuncture for pain relief and improved function for subacute and chronic neck pain and that neural dynamic techniques produce clinically important reduction of acute to chronic neck pain. Very low-to low-quality evidence from 3 trials (215 participants) suggests certain mobilization techniques may be superior to others (ie, anterior-posterior mobilization superior to transverse oscillatory and rotational mobilization; ipsilateral posterior-anterior or central posterior-anterior better than 1 of 3 random posterior-anterior mobilizations).
The quality of the evidence suggests additional studies are very likely to have an important impact on the confidence in the estimate of effect and are likely to change the estimate.

^a GRADE=Grading of Recommendations Assessment, Development, and Evaluation; SMD=standardized mean difference, CI=confidence interval, NNT=number needed to treat.

symptoms, and 6 included people with cervicogenic headaches. In these trials, manipulation or mobilization was compared with no treatment, with sham treatments, with other treatments, or with each other. Gross et al concluded that cervical manipulation and mobilization reduces pain and improves function and satisfaction for people with neck pain in the short-term and intermediate-term (4 weeks to 6 months follow-up) and that manipulation and mobilization produce similar effects (see Table for details). No conclusion regarding an effect beyond 6 months was made, as long-term data were not available. They further concluded that manipulation of the thoracic spine reduces pain and improves function for people with neck pain in the short-term. Because the quality of the evidence for the majority of the studies reviewed was low and very low, it was concluded that further research is very likely to have an impact on the confidence of the estimate of treatment effect and is likely to change the estimate. In regard to their secondary purpose, there may be some evidence for effectiveness of specific mobilization techniques versus other mobilization techniques. The adverse effects reported in these trials were primarily benign and transient; however, the occurrence of serious adverse effects, such as stroke, could not be estimated by this systematic review.

The studies varied in terms of number of sessions of manipulation or mobilization provided and specific techniques used. The results should be interpreted keeping in mind the heterogeneity in the interventions delivered, the outcome measures utilized, and the relatively small sample sizes. The ideal dosage for manipulation or mobilization for the treatment of cervical pain cannot be determined from the studies included in this systematic review.

Case #21: Applying Evidence to a Patient With Neck Pain

Can spinal manipulation/mobilization help this patient?

“Ms Smith” is a 36-year-old female pastor and mother of 2 children aged 2 years and 9 months. She reports a history of neck pain greater than 6 months, which became worse after the delivery of her second child. She associates the increase in pain secondary to holding and carrying a 13.6-kg (30-lb) toddler and to breastfeeding. Ms Smith reports that symptoms will dissipate within minutes after stopping activity; however, she is never pain-free. She reports that her symptoms are improved temporarily with changing the position of her computer monitor, cervical active range of motion, self-cervical manipulation, yoga, and using a heating pad. Ms Smith reports her sleep is disrupted secondary to pain and is unable to sleep on her stomach.

Symptoms are located over the base of the skull and the region of the bilateral upper trapezius muscles. Pain is described as a dull ache, with a feeling of constant tension, intermittent throbbing, and sharp pain with end-range cervical movements. Pain at rest was 2/10 on a numeric rating scale, and maximum neck pain was 7/10. Her Neck Disability Index (NDI) score was 28% out of 100%, where 100% indicates total disability.¹⁷ Her goals were to improve pain-free cervical mobility so that she can perform all activities pain-free and without restrictions.

Coupled three-dimensional passive intervertebral motion testing¹⁸ was performed for the cervical spine using the seated cervical segmental side-bending test. Evidence of hypomobility and pain was observed bilaterally at C2–3. The upper thoracic spine also exhibited evidence of hypomobility during T1–4 extension

and rotation. The seated cervical segmental side-bending test has demonstrated kappa values of .21 to .58 for joint hypomobility and .29 to .65 for pain provocation when people with cervicogenic headaches were assessed by different examiners.¹⁸ During the flexion-rotation test, Ms Smith exhibited 20 degrees of right passive cervical rotation and 30 degrees of left passive cervical rotation.¹⁹ The flexion-rotation test is used to assess joint mobility limitations at the level of C1–2, and normal range of motion has been reported as 44 to 45 degrees in each direction; less than 32 to 33 degrees represents a positive test.¹⁹ In people with cervicogenic headaches and C1–2 dysfunction, this test demonstrated high reliability between experienced examiners (intraclass correlation coefficient [ICC]=.93, kappa=.85).²⁰ The flexion-rotation test has demonstrated sensitivity of 0.90 and specificity of 0.88 for experienced examiners to accurately distinguish patients from asymptomatic controls.²⁰

Ms Smith also exhibited limited movement during the cervical rotation lateral flexion test bilaterally, indicating restricted movement of the first rib.²¹ This test has exhibited excellent agreement between examiners (kappa=1.00) and high concurrent validity when the results of the test were compared with radiographs.²¹ Endurance of the deep neck flexor muscles was evaluated using the test described by Harris et al.²² Studies have demonstrated that people with cervical spine pain have a delay in muscle activation and decreased strength of the deep neck flexors.^{23–25} In a hook-lying position, Ms Smith was able to maintain the chin-tuck position for only 6 seconds. Domenech et al²⁶ reported normative data associated with this test as a mean hold time of 39.1 (SD=20.0) seconds in men and 29.3 (SD=13.7) seconds in women.

How do we apply the results of the Cochrane Review to Ms Smith?

Ms Smith's physical therapist questioned whether she would be a good candidate for spinal manipulation and mobilization for treatment of her mechanical neck pain. Using the PICO (Patient, Intervention, Comparison, Outcome) format, she asked the question: In a 36-year-old woman with neck pain, will manipulation or mobilization (as compared with no manual therapy) be beneficial for reducing her reports of neck pain? Based on the systematic review by Gross et al,¹⁴ relevant information was provided that would assist her physical therapist in answering this question. The systematic review included patients with similar demographics (older than 18 years of age, neck pain without radicular findings, duration of myofascial pain or chronic pain greater than 90 days). Three of the clinical trials examined assessed the inclusion of both spinal manipulation and mobilization as a proposed intervention. Cervical spine mobilization techniques included central posterior-anterior, ipsilateral posterior-anterior, anterior-posterior, rotatory, and transverse mobilizations, and thoracic spine manipulation techniques included translatoric, pistol grip, and T4 dorsal manipulation and seated thoracic spine distraction manipulation to reduce pain and improve function. One to 20 sessions were provided over 2 to 11 weeks.

Evidence in support of any one mobilization or manipulation technique examined in this Cochrane Review was considered very low to low; however, central posterior-anterior and ipsilateral posterior-anterior techniques were found to be superior to random central posterior-anterior techniques. Thoracic manipulation used as a unimodal or multimodal approach exhibited reduced pain and improved function in patients with

neck pain; however, the quality of the evidence was very low to low. Therefore, based on the evidence provided in addition to observed segmental joint provocation and limitations found during the seated cervical side-bending test, the flexion-rotation test, and the cervical rotation lateral flexion test, the following mobilization and manipulation techniques were included: (1) grade II central posterior-anterior mobilizations at C2; (2) grade IV ipsilateral posterior-anterior mobilizations at C2 and C3 articular pillars performed bilaterally; (3) grade IV ipsilateral posterior-anterior mobilization at C2 in 30 degrees of ipsilateral rotation performed bilaterally; (4) grade IV first rib ventral-caudal mobilization; and (5) grade V thoracic spine distraction manipulation²⁷ performed in a sitting position. The use of spinal mobilization or manipulation may be considered by some therapists as a precaution in women who are pregnant or postpartum. However, there are only a few reported cases of adverse events during pregnancy and even fewer reported postpartum.²⁸

Segmental joint mobility, as well as general cervical mobility and symptom provocation, was reassessed at the beginning and end of each treatment session, and areas of continued impairment were addressed with the use of continued mobilization and manipulation. Despite the proposed single-mode approach assessed by this Cochrane Review, a multimodal approach was taken by the physical therapist to address Ms Smith's impairments and activity limitations. Results of the current review also provide only moderate- to very low-quality evidence in support of a single-mode approach. Previous versions of this systematic review and other reviews that have assessed other physical therapy interventions suggest a benefit of a multimodal approach.^{7,8,15,16} Therefore, based on

observed impairments, the plan of care also included education on posture, ergonomics, self-mobilization, and progressive strengthening and endurance training²⁹ of the deep neck flexors.

How well do the outcomes of the intervention provided to Ms Smith match those suggested by the systematic review?

Ms Smith completed 8 physical therapy sessions over an 8-week period. She reported having had no adverse effects from treatment. At discharge, her NDI score was reduced to 4%. This change of 24% exceeds reported values of the minimal clinically important difference for the NDI (from 7% to 18% for people with neck pain).^{30,31} Her rating of pain on a numeric rating scale decreased to 0/10 at rest and was 1/10 at its most during periods of work at the computer greater than 4 to 6 hours. No limitations in mobility were present upon reassessment of the cervical spine, thoracic spine, and first rib, and her deep neck flexor endurance test score was 40 seconds. The findings of decreased pain and improved function are consistent with the results of the evidence identified by the systematic review.

Can you apply the results of the systematic review to your own patients?

The findings of this systematic review applied to patients 18 years of age or older with various types of mechanical neck pain, including insidious onset, myofascial pain syndrome, whiplash-associated disorders (categories I and II), neck pain associated with degenerative changes, neck pain with and without radicular signs and symptoms, and cervicogenic headaches in people who received cervical or thoracic spine mobilization or manipulation interventions, or both. Symptoms were classified as acute (less than 30

days), subacute (30–90 days), and chronic (greater than 90 days).

When considering the treatment of a patient with acute or chronic neck pain of various origins, the systematic review reports very low- to low-quality evidence in support of any one type or mode of application of cervical or thoracic mobilization or manipulation as either a single or multimodal treatment approach. Very low- to low-quality evidence suggests that posterior-anterior, ipsilateral posterior-anterior, and anterior-posterior cervical mobilizations may decrease pain and improve function. There is also very low- to low-quality evidence recommending the inclusion of thoracic manipulations (prone translatoric, T4 supine dorsal, pistol grip, and seated thoracic spine distraction manipulations), either as a unimodal technique or as an adjunct to electrotherapy or an individualized plan of care. Optimal clinical parameters for any given spinal mobilization or manipulation technique per session could not be specifically ascertained based on the systematic review.

Clinicians should be aware of randomized trials that have been published since this systematic review and may improve the quality and conclusions in future systematic reviews of manipulation and mobilization for neck pain.^{32–37} These 6 studies appear to provide additional support in favor of manipulation for people with neck pain. The results, however, are not yet clear in regard to recommendations for specific techniques because among the 4 studies that compared different techniques, 2 studies demonstrated a difference between techniques^{34,37} and 2 studies showed similar effectiveness between techniques.^{35,36}

What can be advised based on the results of this systematic review?

Patients who receive physical therapy intervention with similar signs and symptoms described in this article may benefit from spinal manipulation or mobilization, or both, for the management of neck pain, with observed immediate and short-term changes. The addition of thoracic manipulation also may improve outcomes; however, long-term data associated with any given intervention are still unavailable.

A multimodal approach including manipulation or mobilization as well as exercise also has been proposed; however, specific techniques and dosage are still unclear.^{7,8,38} The evidence from these systematic reviews and the current review supports the use of manipulation or mobilization as either a unimodal or multimodal approach for the management of neck pain. A previous LEAP article reviewed the benefit of exercise for people with chronic neck pain.³⁹ The quality of the evidence from the current systematic review led Gross et al¹⁴ to conclude that additional research is likely to have an impact on the confidence of the magnitude of the effect of manipulation or mobilization on neck pain. Although limited, physical therapists may incorporate the current evidence along with their clinical expertise in the techniques and the patient's expectations from treatment and desired outcomes in determining whether to use manipulation or mobilization for management of neck pain.

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