

## A review of the effects of manipulation and mobilization for neck pain: One more reason to add exercise!

### Transferring Research into Practice

The purpose of *Linkages* is to critically review the best available evidence in the literature regarding soft-tissue injury and to disseminate these reviews to clinical decision-makers in health-care delivery, workplace, policy and compensation settings. For these reviews, we draw on topical, English-language articles about the diagnosis, treatment and prevention of soft-tissue injury.

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NECK PAIN IS A TERM THAT ENCOMPASSES VARIOUS conditions such as acute torticollis, whiplash associated disorders or osteoarthritis of the cervical vertebrae. Although this terminology is not specific, a number of well-designed studies have concluded that the prevalence of neck pain in the general population is high and that neck pain can be a serious condition. Côté et al conducted a general population survey in Saskatchewan in 1995 and found that 54 per cent of 1131 participants had experienced neck pain at some point in the six months prior to the survey and almost 5 per cent were severely disabled by neck pain.<sup>1</sup> In a more recent general population survey in northern Sweden, Guez et al found that 18 per cent of 4392 adults reported chronic neck pain, defined as continuous pain lasting longer than six months in duration. Five per cent of these individuals had a history of neck trauma.<sup>2</sup>

Neck pain is an important source of burden to society. Direct and indirect costs related to neck pain were studied in The Netherlands. Borghouts et al examined several national administrative databases and found that the total cost of neck pain in The Netherlands in 1996 was estimated to be US \$686 million. Direct costs were \$160 million, and paramedical care (physical therapy accounted for 90 per cent of the total paramedical costs) accounted for the largest proportion of direct costs (84 per cent). Disability from neck pain accounted for the largest proportion (50 per cent) of the total costs related to neck pain in 1996 (\$341 million).<sup>3</sup>

There are many therapeutic options for the treatment of neck pain. The Philadelphia Panel Evidence-based Clinical Practice Guidelines

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concluded: “There is scientific evidence to support and recommend the use of proprioceptive and therapeutic exercises for chronic neck pain. There is a lack of evidence at present regarding whether to include or exclude the use of thermotherapy, therapeutic massage, EMG biofeedback, mechanical traction, therapeutic ultrasound, TENS, electrical stimulation, and combined rehabilitation interventions in the daily practice of physical rehabilitation of patients with acute and chronic neck pain.”<sup>4</sup>

Spinal manipulation and spinal mobilization are also therapies commonly employed for neck pain. There are currently about 50,000 chiropractors in active practice in North America. In a recent survey involving 131 chiropractic clinics, more than 70 per cent of patients specified that they were seeking chiropractic care for back and neck problems.<sup>5</sup> Spinal manipulation is not offered exclusively by chiropractors. Several different professionals (osteopaths, naturopaths, massage therapists, physiotherapists and medical doctors) can also take formal training in spinal manipulation or mobilizations.

It is important to evaluate whether spinal manipulation and spinal mobilization are effective treatments for neck pain. Furthermore, this evaluation must identify the possible risks associated with either treatment. The incidence of serious complications from manipulation is estimated to vary from one adverse event in 3,020 manipulations to one in 1,000,000.<sup>6,7</sup>

The recently published Cochrane review by Gross et al includes spinal manipulation and spinal mobilization as the main interventions, delivered by a variety of health-care professionals. It includes 33 randomized controlled trials that examine the effects for a range of diagnoses presenting as neck pain. This systematic review is the subject of this edition of *Linkages*.

## The value of systematic reviews

Every year six million new articles reporting results of biomedical research are published. The sheer volume of new publications makes it virtually impossible for health professionals, consumers and policy-makers to keep up with the literature and make timely, evidence-based decisions on patient care, treatment choice and health policy.

Traditionally, research results have been summarized in non-systematic narrative reviews. However, these are open to bias because the author's subjective opinion of an article's quality may influence the narrative review. Systematic reviews offer a better alternative. They apply scientific strategies in ways that limit bias in the assembly, critical appraisal and synthesis of all relevant studies that address a specific clinical question.

Although systematic reviews are supposed to use methods that minimize bias and error, they are not immune from flaws in methodology that can compromise the validity of results. This is why it is so important to “review the reviews.”

In this edition of *Linkages*, we report on a recently published Cochrane systematic review of manipulation and mobilization for mechanical neck disorders. Four experts provided commentaries on the relevance and applicability of the results. We thank all those who contributed to this issue of *Linkages*.

## Questions about Linkages?

You will find this issue of *Linkages* (and an archive of previous issues) on the Institute's web site ([www.iwh.on.ca](http://www.iwh.on.ca)). They can be downloaded at no charge in PDF. For more information about *Linkages*, please contact Andrea Furlan at the Institute for Work & Health, by phone at 416-927-2027 ext 2171, by fax at 416-927-4167, or by e-mail at [afurlan@iwh.on.ca](mailto:afurlan@iwh.on.ca).

## ARTICLE REVIEWED

Gross AR, Hoving JL, Haines TA, Goldsmith CH, Kay T, Aker P, Bronfort G. Cervical Overview Group.

### *Manipulation and mobilization for mechanical neck disorders.*

Cochrane Database Syst Rev. 2004: Issue 1

#### OBJECTIVE

The objective of this systematic review was to assess the effect of manipulation and mobilization, either alone or in combination with other treatments, on pain, function/disability, patient satisfaction and global perceived effect in adults with mechanical neck disorders (MND).

#### TYPES OF STUDIES

Any published or unpublished randomized controlled trial (RCT) or quasi-RCT, either in full text or abstract form was included.

#### TYPES OF PARTICIPANTS

The participants were adults (18 years or older) with the following neck disorders:

- mechanical neck disorders, including whiplash associated disorders (WAD) category I and II, myofascial neck pain and degenerative changes
- neck disorder with headache
- neck disorders with radicular findings, including WAD category III

For the purpose of this review, symptom duration was defined as **acute** (less than 30 days), **subacute** (30 days to 90 days) or **chronic** (greater than 90 days). The follow-up periods were defined as short-term when outcomes were measured up to three months after the end of the intervention; intermediate-term if between three months and one year; and long-term when follow-up was longer than one year.

#### TYPES OF INTERVENTIONS

This review included studies using manipulation or mobilization techniques. **Manipulation** is defined as a localized force of high velocity and low amplitude directed at cervical joint segments. **Mobilization** is defined as low velocity, small or large amplitude passive movement techniques or neuromuscular techniques within the patient's range of cervical motion and control. In the

studies, these techniques were used individually, one after the other or in combination with other treatment agents in what is called multimodal care.

#### TYPES OF OUTCOME MEASURES

The authors of the review extracted outcome data on pain relief, function/disability, patient satisfaction, global perceived effect, adverse events, cost of care and return to work.

#### SEARCH STRATEGY FOR IDENTIFICATION OF STUDIES

A research librarian searched computerized bibliographic databases, without language restrictions, for medical, chiropractic and allied health literature. The following databases were searched from their respective start dates to March 2002: CENTRAL (The Cochrane Library Issue 4, 2002), MEDLINE, EMBASE, Manual Alternative and Natural Therapy (MANTIS), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Index to Chiropractic Literature (ICL). To further identify potential references, the authors screened the reference lists of retrieved articles, communicated with the coordinator of the Cochrane Back Group, had personal communication with identified content experts, and searched their own personal files. Subject headings (MeSH) and keywords included anatomical terms, disorder or syndrome terms, treatment terms and methodological terms consistent with those suggested by the Cochrane Back Review Group.

#### METHODS

Four pairs of independent reviewers, with expertise in medicine, physiotherapy, chiropractic, massage therapy, statistics and clinical epidemiology conducted the reviews, including citation identification, study selection, data abstraction and assessment of methodological quality.

Methodological quality was judged using the following three scales:

- Primarily, the validated Jadad 1996 criteria (ranges from 0 to 5, high quality means score greater than 2);
- the abbreviated Cochrane Back Review Group criteria (van Tulder 1997; van Tulder 2003) (ranges from 0 to 9, high quality means score greater than 4); and

- the Cochrane grading system for quality of allocation concealment (A to D) which evaluates how well the allocation to treatment group was concealed.

If the trials were statistically homogeneous, then a pooled standardized mean difference (SMD) was calculated for continuous outcomes while relative risk (RR) was calculated for dichotomous outcomes.

To reach final conclusions, qualitative analysis was carried out using levels of evidence as outlined by van Tulder and colleagues:

- **Strong evidence** denoted consistent findings in multiple high quality RCTs.
- **Moderate evidence** denoted findings in a single, high quality RCT or consistent findings in multiple low-quality trials.
- **Limited evidence** indicated a single low-quality RCT.
- **Conflicting evidence** denoted inconsistent results in multiple RCT.
- **No evidence** meant no studies were identified.
- **Evidence of adverse effect** was used for trials that showed lasting negative changes.

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## RESULTS

Thirty-three trials were selected from 528 initially identified articles. Twenty-four per cent (van Tulder scale) to 42 per cent (Jadad scale) were considered to be high quality trials. Nineteen studies focused on mechanical neck disorder, 12 looked at headache of cervical origin, six studied neck disorder with some radicular signs and symptoms, six looked at whiplash associated disorders and six focused on degenerative changes.

*Table 1* shows the results for all interventions reviewed for outcomes of pain and function. The text below provides more detailed information about these results.

### MANIPULATION ALONE

Four RCTs assessed the effect of a single session of manipulation compared to an ineffective treatment (muscle relaxant, sham mobilization, azapropazone – an anti-inflammatory drug, and muscle energy technique). There was moderate evidence that single sessions did not result in short-term pain relief for acute, subacute or chronic mechanical neck disorders.

Five trials assessed the effect of six to 20 sessions of manipulation, conducted over three to 11 weeks, against wait list control; soft-tissue treatments; high-technology exercise; manipulation with low-technology exercise; tenoxicam with ranitidine; low voltage electrical acupuncture; and physiotherapy. In every case, there were no statistically significant differences. No group showed more benefit than any other in outcomes of pain, function, patient satisfaction or global perceived effect in short-term follow-up assessments for individuals

with chronic mechanical neck disorders.

Three trials found little or no difference in short and intermediate-term pain relief when manipulation was compared to mobilizations for acute, subacute and chronic mechanical neck disorders or subacute/chronic neck disorders with headache or radicular findings.

A further three trials compared one manipulation technique to another. There was limited evidence of no difference in pain relief and functional improvement at short-term follow-up.

### MOBILIZATION ALONE

Four trials compared mobilization against cold pack, cervical collar, transcutaneous electrical nerve stimulation, acupuncture and ultrasound. There was moderate evidence of no difference in outcomes of pain and function from one high quality trial with long-term follow-up for individuals with subacute/chronic mechanical neck disorders including WAD, and three smaller trials with short-term follow-up for acute or subacute/chronic mechanical neck disorders including WAD.

### MANIPULATION PLUS MOBILIZATION

Six trials assessed manipulation in combination with mobilization. When manipulation plus mobilization was compared to a placebo, there was little or no evidence of difference noted in pain and function in one very small but high quality RCT for subacute and chronic mechanical neck disorder. When compared to no treatment, results showed a tendency toward short- and long-term

	PAIN			FUNCTION		
	Short	Inter.	Long	Short	Inter.	Long
<b>MANIPULATION ALONE</b>						
One single session compared to ineffective interventions (acute, subacute or chronic)	◇◇	—	—	—	—	—
Six to 20 sessions compared to various interventions (chronic)	◇◇	—	—	◇◇	—	—
Manipulation compared to mobilization (acute, subacute or chronic)	◇	◇	—	—	—	—
Manipulation compared to mobilization (subacute or chronic with headache or radicular findings)	◇	◇	—	—	—	—
Cervical plus thoracic manipulation compared to cervical manipulation alone (duration not specified)	◇	—	—	◇	—	—
Rotatory manipulation compared to lateral break manipulation (duration not specified)	◇	—	—	◇	—	—
Instrumental manipulation compared to manual manipulation (duration not specified)	◇	—	—	◇	—	—
<b>MOBILIZATION ALONE</b>						
Mobilization compared to cold pack, collar, TENS, acupuncture and ultrasound (acute, subacute or chronic including WAD)	◇◇	—	◇◇	◇◇	—	◇◇
<b>MANIPULATION PLUS MOBILIZATION</b>						
Manipulation and mobilization compared to placebo (subacute and chronic)	◇◇	—	—	◇◇	—	—
Manipulation and mobilization compared to no treatment (chronic with headache)	◇◇	—	◇◇	◇◇	—	◇◇
Manipulation and mobilization compared to manipulation alone (chronic)	◇	—	—	◇	—	—
<b>MANIPULATION AND/OR MOBILIZATION PLUS OTHER TREATMENT MODALITIES</b>						
Manipulation and/or mobilization plus other treatment modalities compared to: no treatment, placebo, exercise, physical modalities, massage, manipulation, mobilization and combinations of any of the above.	◇◇	—	◇◇	◇◇	—	◇◇
<b>MANIPULATION AND/OR MOBILIZATION PLUS EXERCISE</b>						
Manipulation and/or mobilization plus exercise compared to wait list control	▲▲▲	—	▲▲▲	▲▲▲	—	▲▲▲
Manipulation and/or mobilization plus exercise compared to non-exercise-based treatments	▲▲▲	—	▲▲▲	▲▲▲	—	▲▲▲
Manipulation and/or mobilization plus exercise compared to exercise alone	◇◇	—	◇◇	◇◇	—	◇◇

**Table 1: Results of pain and functional outcomes for each intervention or combinations of interventions**

(▲) Limited, (▲▲) moderate or (▲▲▲) strong evidence that the index intervention is more effective than the control; (◇) Limited, (◇◇) moderate or (◇◇◇) strong evidence that there is little or no difference between the interventions; (▼) Limited, (▼▼) moderate or (▼▼▼) strong evidence that the index intervention is less effective than the control; (—): no trial for that comparison was found in this systematic review; (?): contradictory findings.

benefit for chronic neck disorder with headache across the three outcomes: pain relief, functional improvement and global perceived effect, but these differences were not statistically significant. There was limited evidence that mobilization plus manipulation gave results similar to manipulation alone for chronic mechanical neck disorders.

#### **MANIPULATION AND/OR MOBILIZATION PLUS OTHER TREATMENT MODALITIES**

Six trials compared manipulation and/or mobilization in combination with various treatment modalities that included: analgesics, massage, traction, superficial heat or cold, ultrasound, short wave diathermy, pulsed galvanic current, ultraviolet light, neck school, posture and exercise education, proprioceptive neuromuscular facilitation or neck collar. The various comparison groups included:

- exercise for chronic mechanical neck disorder;
- various combinations of manipulation for chronic mechanical neck disorder;
- placebo tablets for neck disorder with radicular findings of unclear symptoms duration;
- a combination of massage, manual traction, electrical stimulation, analgesics and education for chronic neck disorder with radicular findings;
- combined exercise/traction/massage for neck disorder with radicular findings of unclear symptom duration;
- no treatment controls for chronic neck disorder with radicular findings and degenerative changes;
- intermittent collar use for acute WAD;
- direct galvanic current, ultrasound, and ultraviolet light for acute, subacute and chronic neck disorder with headache;
- massage for acute, subacute and chronic neck disorder with headache;
- mobilization or manipulation plus heat or electric muscle stimulation for subacute and chronic mechanical neck disorder with or without radicular findings or headache.

In summary, there is moderate evidence showing no difference in benefit for pain relief, improvement in function, and global perceived effect for various disorder sub-types and for various symptom durations. These findings were from

both low and higher quality trials with both short- and long-term follow-up periods.

#### **MOBILIZATION AND/OR MANIPULATION PLUS EXERCISE**

Fifteen trials compared manipulation and/or mobilization plus exercise to “waiting list,” exercise alone, manipulation or mobilization alone and other non-exercise-based treatments for subacute or chronic neck pain with or without headache or radicular findings. When manipulation or mobilization plus exercise was compared to a waiting list control, there was strong evidence of maintained long-term benefit favouring multimodal care for: pain relief, improved function and global perceived effect. These results were also noted when compared against non-exercise-based treatments. When manipulation or mobilization plus exercise were compared against exercise alone, there was moderate evidence of little or no difference between groups for pain relief or function because both groups showed similar improvements.

#### **ADVERSE EVENTS OF MANIPULATIONS AND MOBILIZATIONS**

Side effects were reported in 31 per cent of the trials. They were benign, transient and included: headache, radicular pain, thoracic pain, increased neck pain, distal paraesthesia, dizziness and ear symptoms. The rate of serious adverse events could not be determined in this review.

#### **COST OF CARE AND RETURN-TO-WORK OUTCOMES**

Three studies showed reduced direct costs for mobilization (alone or in combination with other treatment modalities) compared to analgesics, anti-inflammatory drugs, physical modalities, neck collars, continued care provided by general practitioners or chiropractic treatment which included: spinal manipulation, mobilization, traction and soft-tissue treatment.

Three studies showed faster return to work for mobilization (alone or in combination with other treatment modalities) compared to analgesics, anti-inflammatory drugs, neck collars, continued care by a general practitioner, TENS or ultrasound. A fourth study showed no significant differences in the number of disability days experienced by those who received manipulation

(alone, with heat or with electrical muscular stimulation) compared to those who received mobilization (alone, with heat or with electrical muscular stimulation). A fifth study showed no difference in sick leave and numbers of day off work between chiropractic treatment (which included: spinal manipulation, mobilization, traction, soft tissue treatment and individual

training) compared to physiotherapy treatment (which included: mobilization, traction, exercise, TENS, ultrasound or cold).

In summary, there is moderate evidence of an economic advantage in using multimodal care—defined as mobilization or manipulation plus exercise—for mechanical neck disorders.

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## CONCLUSIONS

Multimodal care that includes mobilization and/or manipulation plus exercise is beneficial for pain relief, functional improvement and global perceived effect for individuals with subacute/chronic mechanical neck disorder with or without headache. The evidence did not favour manipulation and/or mobilization given alone or in combination with various other types of treatment for pain, function, and global perceived effect. It was not possible to determine which technique or dosage was more beneficial, or if certain subgroups benefited more from one form of care than another. There was insufficient evidence available to draw conclusions for those with neck disorders with radicular findings.

## What does this mean?

Exercises should be used in conjunction with manipulation or mobilization for patients with subacute or chronic mechanical neck disorders (with or without headaches). These recommendations do not apply to acute neck pain or to neck disorder with radicular symptoms, as no studies were found to support these cases. Future research needs to be conducted to determine what kind of exercise is most beneficial.

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## COMMENTS

The review by Gross et al suggests that manipulation and mobilization alone are not better than other treatments for mechanical neck disorders. However, either intervention may be helpful to treat chronic neck pain when combined with exercise. A question must be answered for clinicians to accept these results. Are the conclusions based on solid scientific evidence?

As illustrated by Gross et al, the overall quality of randomized controlled trials on manipulation or mobilization for neck pain is poor. Only 24 per cent of included studies were graded as high quality. Some of the common methodological flaws include failure to describe or use appropriate concealment of treatment allocation and lack of blinding of assessors. These flaws are known to bias study results and their inclusion in systematic reviews can lead to an overoptimistic view of the effectiveness of a treatment. This is not the case for the trials of manipulation and mobilization as most of these trials (weak or strong) did not support the effectiveness of these interventions. Therefore, it is unlikely that the

inclusion of weak studies biased the results of this review. Moreover, the results are supported by another recently published systematic review of manipulation and mobilization for neck pain. Bronfort et al came to the same conclusions using a different methodology.<sup>†</sup> To their credit, Bronfort et al tested whether their results were due to the inclusion of weaker trials. This analysis showed no significant changes in the results.

In summary, I believe that the results presented by Gross et al offer a valid measure of the current evidence on the effectiveness on manipulation and mobilization for neck pain.

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† Bronfort G, Hass M, Evans RL, Bouter LM. Efficacy of spinal manipulation and mobilization for low back pain and neck pain: a systematic review and best evidence synthesis. *Spine* 2004; 4:335-356.

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## COMMENTS

*Playing the Devil's Advocate*: the unthinkable supported by the best available evidence.

This is a lengthy and detailed systematic review based on appropriate and thorough study selection, data collection, analysis and synthesis. Although this review focuses on whether manipulation and mobilization are useful alone or in combination with other treatments (i.e. multimodal care), exercise stands out as the only important modality of treatment for patients with subacute or chronic mechanical neck disorders. As a matter of fact, one particular sentence in this review says it all: "When manipulation or mobilization plus exercise were compared against exercise alone, there was moderate evidence of little or no difference between groups for pain relief or function because both groups showed similar improvements." In simple terms, this review shows that it does not matter what kind of passive treatments one offers, it is what the patient does that really matters. Should we then go even further and suggest that (based on the best evidence in the literature) the role of all practitioners who offer hands-on treatments, is to make sure the patient is guided through well-designed exercise regimes (and that passive treatments should be short lived and serve only as a prelude to the introduction of exercise)?

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For a physiotherapist who has been practicing for over 25 years, this review is a welcome addition to the body of evidence concerning treatment of mechanical neck disorders. Manual therapy and manipulation have been integral to the treatment of patients with mechanical neck problems; however in my opinion, physiotherapists never use these techniques to the exclusion of education, exercise and instruction on independence when caring for their clients.

Physiotherapists have always recognized the importance of a multi-modal treatment approach with many pathologies. This evidence encourages us to continue with our clinical theories and treatment approaches. The lack of studies concerning the risks associated with manipulation and mobilization for specific classifications of patient pathologies clearly must be addressed in the future. The report definitely emphasizes this need.

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