Treatment of whiplash-associated disorders - part II: medical and surgical interventions
Conlin A, Bhogal S, Sequeira K, Teasell R

CRD summary
This review evaluated medical and surgical interventions for whiplash-associated disorder following vehicle collision. It concluded that there was moderate evidence that radiofrequency neurotomy could reduce pain and psychological distress, but conflicting evidence for other surgery, steroid injections and botulinum treatment. Despite some methodological aspects being unclear, most of the conclusions were justified although the evidence for neurotomy came from one small randomised controlled trial.

Authors' objectives
To evaluate medical and surgical interventions for the treatment of acute and chronic whiplash injury and to provide recommendations for clinical practice and future research.

Searching
MEDLINE, CINAHL and the Cochrane CENTRAL Register were searched for studies published in the English language from 1993 to 2003; the search terms were reported. The authors also checked the reference lists of review articles and included studies.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), cohort studies, case-control studies and case series were eligible for inclusion.

Specific interventions included in the review
Studies of a clearly defined treatment protocol to improve whiplash-associated disorder (WAD) compared with another treatment, placebo, sham or no treatment were eligible for inclusion. Dose-escalating studies were excluded. The included medical interventions were local anaesthetic compared with corticosteroids; methylprednisolone infusion; botulinum toxin-A; and C2-C3 joint injections of therapeutic steroids and analgesia. The surgical interventions included radiofrequency neurotomy, cervical discectomy, cervical joint blocks or branch blocks, and carpal tunnel decompression. Noninvasive interventions were reported in a separate paper (see Other Publications of Related Interest); this part of the review focused on medical and surgical interventions.

Participants included in the review
Studies of adults (age over 18 years) with a WAD after a motor vehicle collision were eligible for inclusion. WAD was categorised as acute (injury of less than 3 months' duration) or chronic (injury of more than 3 months' duration).

Outcomes assessed in the review
Any outcome measures were eligible. The outcomes included in the review were pain, physical movement or posture, and function/coping measures. The timing of the follow-up assessments varied between studies, ranging from 2 weeks to 4 years.

How were decisions on the relevance of primary studies made?
The authors did not state how the studies were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
RCTs were assigned a quality score out of 10 based on the PEDro scale, which consisted of the following criteria: random allocation; allocation concealment; baseline comparability of the groups; blinding of the participants, treatment providers and outcome assessors; at least one key outcome measured on more than 85% of the participants; intention-to-treat analysis; reporting of between-group statistical comparisons, point estimates and measures of variability for at least...
one key outcome. The validity of the non-randomised studies was not assessed.

Two reviewers independently assessed study quality, remaining blind to each other's results until all studies had been assessed. Any disagreements were resolved by discussion.

Data extraction
One reviewer extracted the data using a predetermined data extraction form. The outcome measures extracted included pain, physical measures and function/coping measures. Pain was measured using visual analogue scales (VAS), subjective measures and various pain questionnaires. Physical measures comprised cervical range of motion, kinesthetic sensibility and head posture. Function/coping measures included the Self-Efficacy score, Vernon Mior score, sick-leave profile, self-reported activities of daily living and psychological distress. Means and standard deviations were extracted for pain VAS, range of motion and function score. The numbers of patients with complete relief of pain were used to calculate the odds ratios (ORs) and 95% confidence intervals (CIs).

Methods of synthesis
How were the studies combined?
Where appropriate, a pooled OR or pooled weighted mean difference was calculated along with the 95% CI. Only RCTs of patients with similar duration of injury (acute or chronic) were considered for pooling. Fixed-effect models were used if statistical homogeneity was demonstrated (p>0.05). The analyses were based on data reported at the end of the follow-up period. The results from other study designs were described narratively, grouped by type of medical or surgical intervention.

How were differences between studies investigated?
Statistical heterogeneity was assessed using chi-squared tests and the I-squared statistic. Clinical and methodological differences between the studies were described.

Results of the review
Eleven studies met the inclusion criteria. There were 4 studies of medical interventions (3 RCTs, n=107; one case series, n=18) and 7 studies of surgical interventions (2 RCTs, n=41; 4 case series, n=113; one cohort study, n=38).

Medical interventions.
The mean quality score of the RCTs was 7 (range: 6 to 8).

One trial found no significant differences between botulinum treatment and saline control in head, neck and shoulder pain (p=0.85), total range of motion (p=0.11) or Vernon Mior function score (p=0.20). One trial found significant differences between methylprednisolone and placebo for disabling symptoms (p=0.04), total number of sick days (p=0.01) and the sick-leave profile (p=0.003). The third trial found no significant difference in time to a return to 50% of the pre-operative pain level between local anaesthetic and corticosteroids (median time 3.5 versus 3 days, p=0.42).

One case series showed improvements in headache frequency, use of medication, symptom response and employment status after therapeutic steroids and analgesia, but the statistical significance was not reported.

Surgical interventions.
The 2 RCTs were rated as high quality with scores of 7 and 8, respectively.

Both trials assessed radiofrequency neurotomy compared with a placebo procedure. One trial found a significant difference between groups in the time to a return to 50% of the pre-operative pain level (median times of 263 days for treatment versus 8 days for control, p=0.04). The other trial reported improvements in the relief of pain and psychological distress for the surgical treatment, but did not report the results of between-group analyses. The pooled analysis of both trials found that neurotomy was associated with a significant increase in the complete relief of pain (OR 6.74, 95% CI: 1.57, 28.97, p=0.01; I-squared 0%).
Four case series reported reduced pain after surgery. One controlled cohort study of carpal tunnel decompression found that neck and shoulder pain resolved in 95% of the surgical and 7% of the control patients.

**Authors’ conclusions**

Moderate evidence existed in support of radiofrequency neurotomy for the treatment of WAD. The evidence for steroid injections, botulinum treatments, carpal tunnel decompression and cervical discectomy was conflicting or unclear. Further research is needed to clarify the use of radiofrequency neurotomy and pulsed electromagnetic field treatment.

**CRD commentary**

This review had fairly broad inclusion criteria that were not limited by treatment or outcome measures. The search strategy was fairly limited as it only considered English language articles and made minimal attempts to find unpublished literature. It did, however, include the checking of reference lists, which added a number of extra studies not found by the database searches. Most study designs apart from case reports were eligible, and separate criteria were applied to RCTs to identify those suitable for meta-analysis. Two reviewers independently assessed the quality of the RCTs with a relevant quality scale. It was unclear whether the study selection and data extraction were also repeated by a second reviewer, which might have increased the risk of errors in these processes.

The presentation of results as a narrative, with one meta-analysis where there were sufficient data from RCTs, was appropriate given the different study designs. However, in their discussion the authors stated that the same patients were used in both surgical trials so, essentially, there was only evidence from one RCT; this casts doubt on the authors’ decision to pool these data. Although some methodological aspects of this review were unclear, most of the conclusions were appropriate although those about radiofrequency neurotomy seemed strong given that they seemed to be based on only one small RCT.

**Implications of the review for practice and research**

Practice: The authors stated that recommendations for clinical practice for medically based or surgical interventions cannot be made from the evidence in this review.

Research: The authors stated that large, well-designed RCTs are needed to substantiate the positive findings seen with intra-articular injections, radiofrequency neurotomy and pulsed magnetic field treatment. Further research in patients with acute or chronic injuries is also needed to assess the use of specific interventions in patient subgroups.

**Bibliographic details**


**PubMedID**

15782245

**Other publications of related interest**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Humans; Physical Therapy Modalities; Whiplash Injuries /complications /surgery /therapy
AccessionNumber
12005000022

Date bibliographic record published
31/07/2007

Date abstract record published
31/07/2007

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.