Authors' objectives
To review previously reported cases of injury attributable to manipulation of the cervical spine (MCS), to identify cases of injury involving treatment by physical therapists, and to describe the risks and benefits of manipulation of the cervical spine.

Searching
The following databases were searched: Index Medicus (1966 to 1997); BIOETHICSLINE (1973 to 1997); Cumulative Index to Nursing and Allied Health (CINAHL from 1982 to 1997); and Current Contents (1994 to 1997). Keywords were chiropractic, cervical vertebrae, neck pain, and physical therapy. Bibliographies of published articles and reviews were scrutinized. Articles not in the English language were included and evaluated on the interpretation from secondary sources or from an English abstract.

Study selection
Study designs of evaluations included in the review
Cases, case reports, surveys, personal communication and reviews involving injuries attributed to MCS were included. Case reports of spontaneous vertebral artery dissection, self-inflicted injuries related to neck motion, injury due to trauma and bony malformations or congenital vascular malformations, and accounts appearing in newspapers or magazines were excluded.

Specific interventions included in the review
Manipulation and mobilisation of the cervical spine were studied. Mobilisation was considered to be any technique that utilised a thrust at the end of the available range of cervical motion and mobilisation was considered to be any non-thrust technique. Types of manipulation included the following: rotation; rotation plus tilt; rotation plus traction; tilt; traction; vertical thrust; and 'other'. Practitioners undertaking manipulations included chiropractors, MDs, osteopaths, naturopaths, physical therapists; and undefined others.

Participants included in the review
Participants ranged in age from 4 months to 87 years (mean age 39.6 years, standard deviation 13 years) and had been treated for head and neck disorders including for neck pain, stiffness and muscle tension headaches.

Outcomes assessed in the review
Injuries attributable to MCS were assessed.

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

Assessment of study quality
The author does not state that they assessed the validity of reviews. Some aspects of validity were mentioned for the case reports of injury.

Data extraction
The following data were extracted and entered into a spreadsheet: patient age and sex; practitioner administering the manipulation (using both raw data and Terrett's correction for practitioners; see Other Publications of Related Interest); type of injury sustained; whether outcomes was death; presence of previous medical complications; type of manipulation; and history of any other manipulative treatment prior to the incident. Attempts were made to remove
Methods of synthesis
How were the studies combined?
A narrative review was undertaken.

How were differences between studies investigated?
The author does not state how differences between the studies were investigated. No statistical test of heterogeneity was conducted.

Results of the review
116 articles were included (N = 177 cases of injury).

Case reports identified were published between 1925 and 1997 and referred to 177 cases of injury. Secondary sources were used to extract data in 17% (30) cases.

Results for the following were presented graphically with no reporting of actual figures: reported injuries; type of practitioner providing manipulation that resulted in injury; and type of manipulation related to injury.

The most frequently reported injuries involved arterial dissection or spasm, lesions of the brain stem and Wallenberg syndrome. Death occurred in 18% of the cases (32 cases).

The majority of injuries were attributed to manipulation by chiropractors.

The specific type of manipulation was not described in 46% (N = 82) cases. When the type was specified manual procedures involving rotational thrust constituted the largest group (23%).

20% (N = 36) cases were described as 'healthy' prior to the injury. Health status prior to injury was not reported for 32% (N = 57) cases.

41% (N = 73) cases had at least one other manipulation prior to the incident with 10% identified as experiencing a first manipulation. The history of previous manipulation was not reported for 24% (N = 43) cases.

12 non-overlapping RCTs evaluated the efficacy of MCS for treatment of patients with neck pain and headache: absolute effect sizes ranged from 0.42 to 0.60 (small to medium effect sizes).

The author mentions evidence of the efficacy of MCS obtained from 5 reviews of randomised controlled trials in which cervical manipulation was compared with placebo control or comparison groups. The author does not review the primary evidence but quotes results from these reviews.

Authors' conclusions
Although the risk of injury associated with manipulation of the cervical spine appears to be small, this type of therapy has the potential to expose patients to vertebral artery damage that can be avoided with the use of mobilization (non-thrust passive movements). The literature does not recommend that the benefits of MCS outweighs the risks.

CRD commentary
The aims and inclusion criteria were stated. The author discusses the following limitations of the evidence: risks of injury due to MCS can only be estimated due to the actual number of manipulations and caseloads of patients receiving MCS being unknown; published cases hard to find; large blocks of data (such as type of manipulation and health history prior to incident) were not reported; incomplete data available from studies published in foreign languages; and the use of ambiguous terminology in describing practitioners.
The list of keywords for the search omitted ‘manipulation of cervical spine’. No details were given of the methods used to select primary studies or extract data. Some aspects of validity for the case reports of injury were mentioned but the validity of reviews was not assessed. It may have proved more helpful to critically appraise the primary studies on efficacy of MCS rather than comment on the results of reviews. Insufficient details were given of the reviews of efficacy to comment on the strength of evidence on efficacy.

Insufficient evidence was presented to support the author's conclusions.

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

**Practice:** The author considers that mobilisation should be used as an alternative to manipulation of the cervical spine and that if MCS is used that clinicians should not apply long-lever techniques that use rotational thrust or short-lever rotational thrust techniques in the cervical spine.

**Research:** The author considers that future research should address the following: the need for prospective reporting systems and the systematic assessment of clinical outcome; the distinction between upper cervical and other cervical manipulations; the sensitivity and specific pre-manipulative screening protocols; identification of risk factors; and the provision of more details in case reports such as response to pre-manipulative testing and to previous manipulation, health status prior to injury, predisposing factors, and specific type of manipulative procedure.

**Bibliographic details**


**PubMedID**

9920191

**Other publications of related interest**


This additional published commentary may also be of interest. Ernst E. The risks of upper spinal manipulation. FACT 1999:4:136-7.

**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Cervical Vertebrae /injuries; Humans; Manipulation, Spinal /adverse effects /methods /statistics & numerical data; Mass Screening; Neck Pain /therapy; Physical Examination; Physical Therapy Modalities; Risk Factors; Vertebro Artery /injuries; Wounds and Injuries /diagnosis /epidemiology /etiology

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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.