

Spinal manipulation

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Spinal manipulation is a therapeutic intervention performed on spinal articulations which are synovial joints. These articulations in the spine that are amenable to spinal manipulative therapy include the z-joints, the atlanto-occipital, atlanto-axial, lumbosacral, sacroiliac, costotransverse and costovertebral joints. National guidelines come to different conclusions with respect to spinal manipulation with some not recommending it, and others recommending a short course in those who do not improve with other treatments.^[1]

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Spinal manipulation



A chiropractor performing a spinal manipulation of the thoracic spine on a patient.

Alternative therapy

NCCIH	Manipulative and body-based
Classification	
Risks	Vertebral artery dissection, compression fracture, cauda equina syndrome
Benefits	Placebo
Legality	Legal in adults, treatment of children varies by jurisdiction
MeSH	D020393

History

Spinal manipulation is a therapeutic intervention that has roots in traditional medicine and has been used by various cultures, apparently for thousands of years. Hippocrates, the "father of medicine" used manipulative techniques,^[2] as did the ancient Egyptians and many other cultures.^[3] A modern re-emphasis on manipulative therapy occurred in the late 19th century in North America with the emergence of osteopathic and chiropractic medicine.^[4] Spinal manipulative therapy gained recognition by mainstream medicine during the 1960s.^{[5][6]}

Providers

In North America, it is most commonly performed by chiropractors, osteopathic physicians, occupational therapists, and physical therapists. In Europe, chiropractors, osteopaths and physiotherapists are the majority providers, although the precise figure varies between countries. In 1992, chiropractors were estimated to perform over 90% of all manipulative treatments given for low back pain treatment.^[7] A 2012 survey in the US found that 99% of the first-professional physical therapy programs that responded were teaching some form of thrust joint manipulation.^[8]

Terminology

Manipulation is known by several other names. The British orthopedic surgeon A. S. Blundell Bankart used the term "manipulation" in his text *Manipulative Surgery*.^[9] Chiropractors often refer to manipulation of a spinal joint as an 'adjustment'. Following the labeling system developed by Geoffery Maitland,^[10] manipulation is synonymous with Grade V mobilization. Because of its distinct biomechanics (see section below), the term high velocity low amplitude (HVLA) thrust is often used interchangeably with manipulation.

Biomechanics

Spinal manipulation can be distinguished from other manual therapy interventions such as mobilization by its biomechanics, both kinetics and kinematics.

Kinetics

Until recently, force-time histories measured during spinal manipulation were described as consisting of three distinct phases: the preload (or prethrust) phase, the thrust phase, and the resolution phase.^[11]

Evans and Breen^[12] added a fourth 'orientation' phase to describe the period during which the patient is orientated into the appropriate position in preparation for the prethrust phase.

Kinematics

The kinematics of a complete spinal motion segment, when one of its constituent spinal joints is manipulated, are much more complex than the kinematics that occur during manipulation of an independent peripheral synovial joint.

Suggested mechanisms of action and clinical effects

The effects of spinal manipulation have been shown to include:

- Temporary relief of musculoskeletal pain
- Shortened time to recover from acute back pain
- Temporary increase in passive range of motion (ROM)
- Physiological effects on the central nervous system (specifically the sympathetic nervous system)^{[13][14]}
- Altered sensorimotor integration
- No alteration of the position of the sacroiliac joint^[15]

Common side effects of spinal manipulation are characterized as mild to moderate and may include: local discomfort, headache, tiredness, or radiating discomfort.^[16]

Effectiveness

Back pain

A 2004 Cochrane review found that spinal manipulation (SM) was no more or less effective than other commonly used therapies such as pain medication, physical therapy, exercises, back school or the care given by a general practitioner.^[17] A 2010 systematic review found that most studies suggest SM achieves equal or superior improvement in pain and function when compared with other commonly used interventions for short, intermediate, and long-term follow-up.^[18] In 2007 the American College of Physicians and the American Pain Society jointly recommended that clinicians consider spinal manipulation for patients who do not improve with self care options.^[19] Reviews published in 2008 and 2006 suggested that SM for low back pain was equally effective as other commonly used interventions.^{[20][21]} A 2007 literature synthesis found good evidence supporting SM and mobilization for low back pain.^[22] Of four systematic reviews published between 2000 and 2005, one recommended SM and three stated that there was insufficient evidence to make recommendations.^[23]

Neck pain

For neck pain, manipulation and mobilization produce similar changes, and manual therapy and exercise are more effective than other strategies.^{[24][25]} There is moderate- to high-quality evidence that subjects with chronic neck pain, not due to whiplash and without arm pain and headaches, show clinically important improvements from a course of spinal manipulation or mobilization.^[26] There is not enough evidence to suggest that spinal manipulation is an effective long-term treatment for whiplash although there are short term benefits.^[27]

Non-musculoskeletal

There was some evidence that spinal manipulation improved psychological outcomes compared with

verbal interventions.^[28]

Safety

There is not sufficient data to establish the safety of spinal manipulations.^[29] The rate of adverse events is unknown.^[30] Adverse events are increasingly reported in randomized clinical trials of spinal manipulation but remain under-reported despite recommendations in the 2010 CONSORT guidelines.^{[31][32]} It is frequently associated with mild to moderate temporary adverse effects, and also serious outcomes which can result in permanent disability or death.^[30] Serious outcomes are likely rare.^[33] About half of people reported encountering adverse effects following spinal manipulation.^[33]

Risks of neck manipulation

The degree of serious risks associated with manipulation of the cervical spine is uncertain, with little evidence of risk of harm but also little evidence of safety either.^{[34][35]} There is controversy regarding the degree of risk of vertebral artery dissection, which can lead to stroke and death, from cervical manipulation.^[34] Several deaths have been associated with this technique^[30] and it has been suggested that the relationship is causative,^{[36][37]} but this is disputed by many chiropractors who believe it is unproven.^[36]

Understandably, vascular accidents are responsible for the major criticism of spinal manipulative therapy. However, it has been pointed out that "critics of manipulative therapy emphasize the possibility of serious injury, especially at the brain stem, due to arterial trauma after cervical manipulation. It has required only the very rare reporting of these accidents to malign a therapeutic procedure that, in experienced hands, gives beneficial results with few adverse side effects".^[38] In very rare instances, the manipulative adjustment to the cervical spine of a vulnerable patient becomes the final intrusive act which results in a very serious consequence.^{[39][40][41][42]}

Edzard Ernst has written:

"...there is little evidence to demonstrate that spinal manipulation has any specific therapeutic effects. On the other hand, there is convincing evidence to show that it is associated with frequent, mild adverse effects as well as with serious complications of unknown incidence. Therefore, it seems debatable whether the benefits of spinal manipulation outweigh its risks. Specific risk factors for vascular accidents related to spinal manipulation have not been identified, which means that any patient may be at risk, particularly those below 45 years of age. Definitive, prospective studies that can overcome the limitations of previous investigations are now a matter of urgency. Until they are available, clinicians might tell their patients to adopt a cautious approach and avoid the type of spinal manipulation for which the risk seems greatest: forceful manipulation of the upper spine with a rotational element."^[43]

A 2007 systematic-review concluded: "Spinal manipulation, particularly when performed on the upper spine, is frequently associated with mild to moderate adverse effects. It can also result in serious complications such as vertebral artery dissection followed by stroke. Currently, the incidence of such events is not known. In the interest of patient safety we should reconsider our policy towards the routine use of spinal manipulation."^[30]

Potential for incident under-reporting

Statistics on the reliability of incident reporting for injuries related to manipulation of the cervical spine vary. The RAND study assumed that only 1 in 10 cases would have been reported. However, Edzard Ernst surveyed neurologists in Britain for cases of serious neurological complications occurring within 24 hours of cervical spinal manipulation by various types of practitioners; 35 cases had been seen by the 24 neurologists who responded, but none of the cases had been reported. He concluded that under-reporting was close to 100%, rendering estimates "nonsensical." He therefore suggested that *"clinicians might tell their patients to adopt a cautious approach and avoid the type of spinal manipulation for which the risk seems greatest: forceful manipulation of the upper spine with a rotational element."*^[43] The NHS Centre for Reviews and Dissemination stated that the survey had methodological problems with data collection.^[44] Both NHS and Ernst noted that bias is a problem with the survey method of data collection.

A 2001 study in the journal *Stroke* found that vertebrobasilar accidents (VBAs) were five times more likely in those aged less than 45 years who had visited a chiropractor in the preceding week, compared to controls who had not visited a chiropractor. No significant associations were found for those over 45 years. The authors concluded: *"While our analysis is consistent with a positive association in young adults... The rarity of VBAs makes this association difficult to study despite high volumes of chiropractic treatment."*^[45] The NHS notes that this study collected data objectively by using administrative data, involving less recall bias than survey studies, but the data were collected retrospectively and probably contained inaccuracies.^[44]

Mis-attribution problems

Studies of stroke and manipulation do not always clearly identify what professional has performed the manipulation. In some cases this has led to confusion and improper placement of blame. In a 1995 study, chiropractic researcher Allan Terrett, DC, pointed to this problem:

"The words chiropractic and chiropractor have been incorrectly used in numerous publications dealing with SMT injury by medical authors, respected medical journals and medical organizations. In many cases, this is not accidental; the authors had access to original reports that identified the practitioner involved as a nonchiropractor. The true incidence of such reporting cannot be determined. Such reporting adversely affects the reader's opinion of chiropractic and chiropractors."^[46]

This error was taken into account in a 1999 review^[47] of the scientific literature on the risks and benefits of manipulation of the cervical spine (MCS). Special care was taken, whenever possible, to correctly identify all the professions involved, as well as the type of manipulation responsible for any injuries and/or deaths. It analyzed 177 cases that were reported in 116 articles published between 1925 and 1997, and summarized:

"The most frequently reported injuries involved arterial dissection or spasm, and lesions of the brain stem. Death occurred in 32 (18%) of the cases. Physical therapists were involved in less than 2% of the cases, and no deaths have been attributed to MCS provided by physical therapists. Although the risk of injury associated with MCS 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)."^[47]

In Figure 1 in the review, the types of injuries attributed to manipulation of the cervical spine are shown,^[48] and Figure 2 shows the type of practitioner involved in the resulting injury.^[49] For the purpose of comparison, the type of practitioner was adjusted according to the findings by Terrett.^[46]

The review concluded:

"The literature does not demonstrate that the benefits of MCS outweigh the risks. Several recommendations for future studies and for the practice of MCS are discussed."^[47]

Emergency medicine


In emergency medicine joint manipulation can also refer to the process of bringing fragments of fractured bone or dislocated joints into normal anatomical alignment (otherwise known as 'reducing' the fracture or dislocation). These procedures have no relation to the HVLA thrust procedure.

See also

- Osteopathic Manipulative Medicine
- Joint manipulation
- Joint mobilization
- Spinal adjustment

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External links

- American Academy of Orthopedic Manual Physical Therapy (AAOMPT) (<http://www.aaompt.org/>)
- Canadian Academy of Manipulative Therapy (CAMT) (<http://www.manipulativetherapy.org/>)
- Canadian Orthopractic Manual Therapy Association (COMTA) (<http://orthopractic.org/>)
- International Federation of Orthopaedic Manipulative Therapists (IFOMT) (<http://www.ifomt.org/>)
- Journal of Manual and Manipulative Therapy (JMMT) (<http://jmmtonline.com/>)
- Prevention of the vertebrobasilar accidents following cervical thrust manipulations (http://www.sofmmoo.com/english_section/2_neck_pain/Cervical%20Manip.%20Recommandation%20SOFMMOO.htm): recommendations of the French Society of Orthopaedic and Osteopathic Manual Medicine (SOFMMOO).
- European Association of Advanced Manual and Manipulative Therapy (<http://www.manual-med.com>)

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