



# **Cervical Artery Insufficiency and Manipulative Therapy A Literature Review**

## **Introduction**

This review was commissioned by the Manipulation Association of Chartered Physiotherapists (MACP) in response to demands from the MACP membership. The demands suggested an uncertainty among the members regarding the nature of arterial insufficiency related to the cervical spine (commonly referred to as vertebrobasilar insufficiency (VBI)), the risks of manual therapy with respect to such arterial complications, and the MACP's position on pre-cervical spine treatment screening.

This review attempts to provide an evidence-based information source to further facilitate clinicians understanding of the effect of manual therapy on the cervical spine with regards to cervical blood flow.

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**MACP Clinical Summary**

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## Method

The review process began in 2004 and involved an international body of reviewers considered as experts in this field. A comprehensive literature search was conducted which resulted in 224 relevant articles being reviewed. The review was inclusive of a variety of evidence sources, critical, and non-systematic. The literature fell into four broad categories: blood flow studies, case reports, surveys and reviews, and haemodynamic principles. In addition to this, a review of contemporary medico-legal issues and case law relating to clinical practice and guidelines was undertaken by an expert in this field (JB). The full results and discussion of the literature reviewed will be published in complete format in the near future. This clinical summary provides comment on frequently asked questions by the MACP members based on the findings of the review.

## FAQs:

### What is VBI?

“VBI”, or vertebrobasilar insufficiency relates to the transient or permanent reduction or cessation of blood supply to the hind-brain through the left and right vertebral arteries and the basilar artery (Rivett, 2005). Manual therapists have been concerned about this concept for many decades because of the intimate relationship between the course of the vertebral arteries and the cervical vertebral column. Traditionally, VBI was said to result in transient episodes of hindbrain ischaemia manifesting in a number of cardinal signs, referred to as “Coman’s 5 D’s” (Coman, 1986). Based on this review, three things are apparent:

Complications of manipulative therapy treatment related to vessels other than the vertebrobasilar system (i.e. the internal carotid arteries) are reported.

The clinical presentations of cervical artery insufficiency (a term which is inclusive of all cervical blood flow) are more diverse than the classically quoted cardinal signs. For example, unilateral neck and head pain is a commonly reported symptom preceding arterial dissection, or as a symptom of a compressed/distended vessel (this somatic pain response has been demonstrated in a number of studies), and Arterial insufficiency / complications are not necessarily confined to manipulative thrust techniques. Complications can occur, for example, after non-thrust treatments or exercise.

### **What is the real risk of arterial complications following manual therapy?**

The actual number of reported cases directly related to arterial complications during or after treatment is relatively low.

During this review, 42 case reports were considered which had been published over the last 15 years. This amounts to 2.8 cases per year, worldwide, and profession-wide (i.e. physiotherapists, osteopaths, chiropractors). Many authors use this kind of information to calculate the ratio of incidents per estimated number of treatments, so they can pass judgment on the "size of the risk". These calculations range from 1: 9122 to 1: 5 million (incidents: number of treatments) (e.g. Michaelli, 1993; Haynes, 1994). The review suggests that this is an inaccurate and misleading judgment on the 'size of the risk'. Primarily, there is the argument of under-reporting (i.e. not all cases are reported or published). A recent review (Ernst, 2004) suggested a 100% under-reporting rate, based on his findings of 32 cases within the UK in one year, none of which had been previously reported.

The actual size of the risk is, from the evidence, impossible to calculate. All that can be stated is that there is a risk of arterial complications with cervical spine treatment. Large scale, high quality, prospective trials are needed to develop understanding of the size of the risk associated with manual therapy treatment.

### **Is functional pre-treatment screening useful?**

Recent Australian Physiotherapy Association guidelines (APA, 2001; Magarey et al, 2004) reviewed existing guidance of the screening test and suggested that functional testing should comprise of sustained cervical rotation, as a minimum requirement. The idea of this, and variations of this theme, is that if blood flow can be altered in a controlled way (by carefully and vigilantly rotating the neck), cardinal signs of insufficiency can be observed. If such signs manifest, then certain treatments are contra-indicated. The present review provides little support for the validity or reliability of these tests.

Many blood flow studies have demonstrated a change (reduction) in blood flow in the contralateral vertebral artery during rotation (e.g. Refshauge, 1994; Rossitti and Volkmann, 1995; Licht et al., 1998a; Li et al., 1999; Rivett and Reid, 1998; Rivett et al., 1998, 1999; Mitchell, 2003; Arnold et al., 2004; Mitchell et al., 2004). Others studies however have found no change in blood flow (e.g. Weingart and Bischoff, 1992; Theil et al., 1994; Haynes and Milne, 2001; Zaina et al., 2003). Some authors have used the results of studies demonstrating a reduction in blood flow to support the validity of screening tests i.e. one tests to assess blood flow changes, these studies demonstrate that rotation changes blood flow, therefore the test is valid. The tests may be valid in that they may alter

blood flow, but there is little consistent evidence relating these changes to changes in symptoms. e.g. a patient could have significant reduction in blood flow, but no symptoms and vice versa. This makes the specificity and sensitivity of these tests poor and variable, and this has been mathematically demonstrated in probability calculations (Kerry and Rushton, 2003; Gross et al, 2005; Ritcher and Reinking, 2005). On the basis of the inconsistency of the evidence, a recent paper has raised the issue of whether manual therapists should stop using functional pre-screening tests (Thiel and Rix, 2005). The opinion that the use of functional pre-screening testing cannot be supported has been highlighted again in the evidence reviewed for this present project.

There is no evidence to support the construct validity of functional pre-screening testing in terms of its ability to identify patients who are more likely to have spontaneous dissection events.

### **Can we identify “at risk” patients?**

It is likely that the history-taking may assist in establishing which patients are or are not at risk from cervical artery dysfunction, and therefore at an increased risk from cervical manual therapy. The latest APA guidelines emphasize this point (Magarey et al, 2004). Atherosclerotic risk factors and repeated or significant trauma to the neck (Mitchell, 2002) are two areas of history taking which may help with the decision-making process. Although there are no systematic studies available which have focused singularly on such risk factors, there is a strong theoretical basis which has been developed, based on the haemodynamic literature base.

Upper cervical instability has also been associated with cervical arterial dysfunction (e.g. Volle and Montazem, 2001; Tominaga et al, 2002; Maekawa et al, 2003; Yamazaki et al 2004; Garg et al, 2005). Further study will assess whether screening for upper cervical instability has a place in VBI assessment. The validity of such testing is also an area under question (Cattrysse et al, 1997).

### **What is the relative risk of manipulating the upper cervical spine versus the low cervical spine?**

There are no studies which focus directly on this question. Theoretically, the upper cervical spine carries a greater risk because of the tortuous course of the vertebral artery between

C2 and the occiput. Most blood flow studies have concentrated on this anatomical area and so most information is available is regarding this part of the vessel. Some flow studies have insonated the vessel in the lower part of the vertebral column (Refshauge, 1994; Rivett et al., 1999; Haynes and Milne, 2001; Zaina et al., 2003; Arnold et al., 2004) and used this measure as a reference. However, it may be argued that vertebral artery blood flow related to the upper cervical spine would be a more accurate measure of flow change (Zaina et al., 2003; Mitchell et al., 2004). It is believed that vertebral atherosclerotic plaques are more prevalent around the upper sections, although they do exist in other areas, e.g. around C6 where the vessel enters the vertebral column. Carotid artery plaques are most prevalent around the bifurcation of the internal / external vessels, this is usually around the mid/low cervical spine. Atherosclerotic lesions are thought to be overall more common in the anterior (carotid) system than the posterior (vertebral) system. It is not possible to provide a definitive answer to this question based on the literature. Theoretically, although it is likely that upper cervical treatment carries the greater risk, the low/mid cervical spine cannot be considered as being completely safe in manipulative therapy.

### **Is 'Manual Therapy' as risky as manipulative treatment used by other groups (e.g. chiropractors)?**

Most case reports and surveys involve chiropractor care and refer to manipulative thrust techniques of various forms. This fact, together with the fact that chiropractors arguably carry out a far greater number of manipulations than physiotherapists, leads many authors to conclude that chiropractic treatment carries the greatest risk. Although there is some logic in this conclusion, it does not support the fact that 'less forceful', physiotherapy treatment is safer. Blood flow studies demonstrate significant flow changes during gentle passive positioning and not fast, manipulative procedures of the cervical spine.

One mechanism of hindbrain ischemic events is a dissection of an atherosclerotic thrombus. Although it is logical that a quicker movement (manipulative thrust) is more likely to dissect a thrombus, it is also feasible, based on the results of flow studies, that gentler, repeated movements offer a potential dissection-inducing force. Due to the progressive nature of atherosclerotic pathology, ischaemic events (e.g. embolisation following thrombus formation and thrombus dissection) may occur some time after treatment. This latency concept will affect the true incidence rate in all manual therapy groups.

Based on the findings of this review, it is apparent that chiropractic treatment carries more risk, but there is disproportionate evidence related to chiropractors. Non-manipulative, manual therapy treatment and other forms of 'hands off' physiotherapy have not been subject to the same degree of study and so no judgment can be made regarding this risk.

### **What is the medico-legal situation regarding treatment and the role of guidelines?**

In English law, the mere fact that a procedure is unsuccessful or goes wrong does not necessarily mean that the duty of care a health care professional owes to the patient has been breached. The Court informs itself regarding whether or not there has been a failure to provide the required standard of care by hearing expert testimony from the profession concerned. If it can be shown that what the defendant did was in accord with a practice currently accepted as proper within their profession, at the time of the incident, it is unlikely the professional will be held to have acted negligently even if there is another currently accepted but contrary practice (*Bolam v Friern Hospital Management Committee* [1957]). Expert opinions may, however, be scrutinised under cross-examination and the Court may disregard a practice, despite it being currently accepted, if it considers it to be unreasonable, irresponsible or logically indefensible. In particular it needs to be satisfied that in forming his/her view, witnesses 'have directed their minds to the question of comparative risks and benefits' (*Bolitho v City and Hackney HA* [1997]). If the defendant cannot show he/she has followed an accepted practice, it falls to him/her to justify what he/she did. The more serious the harm suffered, the more robust that defence will have to be.

Despite a primary aim of guidelines being “to ensure that all the right things and none of the wrong things are done when a patient presents with a particular clinical problem” (Tuffnell, 2002; p22), a guideline has no particular status or automatic effect in English law, and if reliance is to be placed on it, its existence and content must be brought to the Court’s notice as part of the expert testimony mentioned above (Foster 2002 p116). Nor does the mere existence of a guideline guarantee that the quoted aim has been met since a lack of consistency in the quality of evidential bases and methodology can render its authority and clinical trustworthiness suspect (Hurwitz, 2004). The worth of a particular guideline remains a matter for individual clinical judgment as does the decision to follow or depart from it in practice.

### **Key Messages**

- ❖ The term “VBI” may be misleading as complications in the carotid (anterior) system also exist.
- ❖ Traditional cardinal signs and symptoms of “VBI” following manual therapy are not supported by the literature reviewed.
- ❖ The real risk of arterial complications following manual therapy is unknown and impossible to estimate, based on existing data.
- ❖ The results of blood flow studies are contradictory and inconclusive. Commonly used functional screening tests are not supported by the data available from these studies, nor from case reports.
- ❖ Consideration of atherosclerotic risk factors, and possibly upper cervical instability, may assist in identifying “at risk” patients.
- ❖ Consideration of haemodynamics around the cervical region may develop clinicians understanding of risks and mechanisms of vascular events.

- ❖ Because of a lack of evidence, judgment cannot be made on the risk of physiotherapy-specific treatment. Non-manipulative techniques have been associated with neurovascular complications.
- ❖ Adherence to guidelines might not necessarily be a defence, and expert opinion can be over-ruled in law.

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