



MASTERCLASS

Manual therapy and cervical artery dysfunction: Identification of potential risk factors in clinical encounters



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Received 25 May 2015; revised 17 December 2015; accepted 12 January 2016

KEYWORDS

Manipulation;
Mobilisation;
Dissection;
Vertebral artery;
Internal carotid artery;
Osteopathic medicine

Abstract Cervical artery dysfunction is a reported potential risk associated with manual therapy applied to the cervical and cervicothoracic spine. While a variety of physical examination tests have been advocated to screen patients who may be at risk of adverse events during or after manipulation, their clinical utility is limited. This paper provides an overview of the literature and current thinking with regard to risk assessment and clinical action related to the application of manual and exercise therapy for the cervical and upper thoracic spine.

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Introduction

For many years it has been proposed that a causal link exists between cervical spine manual therapy, particularly high-velocity ‘thrust’ manipulation,

damage to the cervical arteries, and adverse neurovascular events. However, the literature investigating this link, although extensive, is inconclusive as it establishes an association rather than a clear undisputed causal relationship.^{1–4} Nevertheless, it is important for practitioners to be aware of the potential risks associated with presentations of neck and head pain and manual therapy for the cervical and cervicothoracic area in order to inform patients and assist with clinical decision making. The inconclusive nature of the literature regarding the relationship between cervical spine manipulation and adverse neurovascular events is constrained by lower quality designs including case studies and retrospective audits of purported adverse events.

Whilst cervical artery dissections are the most clearly described and reported adverse event in the literature with respect to adverse events and pathology of the cervical arterial system, this review uses the term cervical artery dysfunction. This term better describes the range of disorders affecting the cervical arterial system, and includes pathology affecting the cranio-cervical structures, and local conditions such as dissection and insufficiency.⁵ The purpose of this commentary is to highlight the contemporary literature in this area and discuss the risk factors that may assist practitioners in identifying patients at risk of an adverse event or, more importantly, those currently experiencing a cervical artery dissection (CeAD) at the time of presentation.

Epidemiology

Cervical arterial dysfunction can involve the internal carotid and/or vertebral arteries. Although there has been an emphasis on the vertebrobasilar system in the manipulative therapy literature, it is important to consider not just the vertebrobasilar system, but the whole cervical arterial system. Consideration should also be given to the pathologies and factors that affect the system, forming part of the clinical and diagnostic reasoning process.¹ The exact pathogenesis of non-traumatic CeAD remains unclear⁶ – it is possible that stroke or death following cervical spine manual therapy may be associated with pre-existing vascular pathologies.^{1,7} Kerry and Taylor⁸ have advanced an argument that our collective focus on this issue should not be limited to high-velocity low amplitude (HVLA) thrust manipulation applied to the neck, as “*The common denominator in the activities [non high-velocity thrust movements] indi-*

cated is cervical movement, thus the phenomenon might not be one of HVT [high velocity thrust], but of movement more generally” (p. 11). This is a position also supported by other authors.^{9,10} In recent years, the role played by the styloid process as one mechanism to explain the relationship between carotid artery dysfunctions and cervical spine movement has emerged. Both increased styloid process length,^{11–13} and proximity to the internal carotid artery,^{10,13} may be risk factors for CeAD when combined with cervical movements or trauma. Further, the hyoid bone has also been described as a potential mechanical compressor of the internal carotid artery.¹⁴

Data from the United States suggests the average annual incidence for CeAD is 2.6 persons per 100,000 population (95%CI 0.9 to 4.2),^{15,16} and it is noteworthy that dissections have been reported to occur in all age groups. Recent work by Metso et al.,¹⁷ distinguishes between internal carotid artery dissection (ICAD) and vertebral artery dissection (VAD). These authors report that ICAD is more likely to occur in younger age-groups (34–54 years) and VAD in older age groups (≥ 55 years), but regardless of the artery involved, the peak incidence occurs between 34 and 54 years of age.¹⁷ In a review of case series published between 1994 and 2003, Haneline and Lewokvich¹⁸ report the majority of CeAD are spontaneous (61%), 30% associated with trivial trauma, and approximately 9% associated with cervical spine manipulation. Based on a review of hospital medical records in the Canadian provinces of Ontario and Saskatchewan, Boyle et al.¹⁹ estimated that the incidence of stroke (or like event) was 0.855 and 0.750 per 100,000 person-years, however, there was no increase in the incidence associated with the number of manipulations performed. Manipulation applied to the cervical spine has been suggested as a risk factor, although as Kerry and Taylor⁸ suggest, the risk may be related to cervical spine movement rather than the manipulation *per se*. Further, there is limited agreement in the literature regarding the strength of the association between cervical spine manipulation and VAD (Table 1), with point estimates ranging from *small* (OR = 2.41; 95%CI 0.98–5.95) to *large* (OR = 11.9; 95%CI 4.28–33.2). The wide 95%CI for these point estimates suggests a degree of imprecision in the calculations, and the *true* point estimate could reasonably be anywhere between the CI values. Interestingly, Cassidy et al.²⁰ also reported *small* estimate (OR = 2.90; 95%CI 1.64–5.13) for patients having attended a primary care physician in the week preceding a stroke, similar to that reported

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