Is mechanical deformation of the suboccipital vertebral artery during cervical spine rotation responsible for vertebrobasilar insufficiency?

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PURPOSE: The atlanto-axial region of the vertebral artery (VA) has traditionally been considered at risk for injury during cervical spine rotation, leading to compromised blood flow to the hindbrain and vertebrobasilar insufficiency or ischaemia (VBI). The anatomical relationships of the suboccipital VA (VA3) and related haemodynamic changes associated with cervical spine movements have been neglected, however. The present review aims to provide a new perspective on possible causes of reduced blood flow to the hindbrain, with particular reference to the functional anatomy of VA3 and related biomechanics of cervical spine rotation, to inform evidence-based practice.

METHOD: To support the hypothesis that it is VA3, not the VA in the atlanto-axial region, that is compressed or stretched during cervical spine rotation, current studies of blood flow changes in the VA distal to the region of rotation and possible arterial deformation were retrieved, using AMED, CINAHL, Embase, Pedro and PubMed, and reviewed. RESULTS: Possible sites for VA3 deformation, based on a re-examination of its anatomy and biomechanics, are described. However, no research reports of VA3 blood flow measurements associated with cervical spine rotation have been published to date. Five studies on blood flow changes in the intracranial VA after cervical spine rotation were reviewed. The subjects for four of these reports were young, healthy individuals, and the fifth included older patients and young non-patients. The analysis of these studies demonstrated that more rigorous control of variables is necessary before meaningful conclusions can be made.

CONCLUSION: The paucity of studies of VA3 emphasises the need for research based on informed understanding of the anatomy and biomechanics of this area. This view on mechanical deformation of VA3 associated with cervical spine rotation as a possible cause of compromised blood flow to the hindbrain and VBI provides further argument for avoiding full-range or sustained cervical spine rotation in clinical practice.

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