MINIMISING RISK FACTORS FOR CERVICAL SPINE MANIPULATION

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This is to certify that the thesis entitled “Minimising risk factors for cervical spine manipulation” submitted by Lucy Thomas in fulfilment of the requirements for the degree of Doctor of Philosophy is in a form ready for examination.

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DECLARATION

I, **Lucy Thomas**, hereby declare that the work contained within this thesis is my own and has not been submitted to any other university or institution as a part or a whole requirement for any higher degree. I certify that the work embodied in this thesis contains published papers of which I am the lead author. I have included a written statement, endorsed by my supervisor, attesting to my contribution to these joint publications.

In addition, ethical approval from the University of Newcastle Human Research Ethics Committee and Hunter New England Research Ethics Committee was granted for the four studies presented in this thesis. Participants were required to read a participant information statement and informed consent was gained prior to data collection. Ethical approvals for all studies are included in Appendix A.

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ACKNOWLEDGMENTS

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PUBLICATIONS

Parts of the work presented in this thesis have been published or presented in the following forums:

PUBLISHED PAPERS


PUBLISHED ABSTRACTS


CONFERENCES AND OTHER INVITED PRESENTATIONS


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ABSTRACT

The overall aim of the work presented in this thesis was to examine the risk factors for cervical manipulation and make recommendations for clinical practice. Cervical spine manipulation is a manual technique used for the treatment of neck pain and associated headache. The most commonly described serious neurovascular adverse event following cervical manipulation is dissection of one or more of the craniocervical arteries, which comprise the main blood supply to the brain. Current pre-manipulative screening guidelines are limited in their ability to identify patients at risk of adverse events or screen patients for signs of brain ischaemia. The aim of the thesis is to guide practitioners in minimising the risk of neurovascular events associated with cervical manipulation, and this was approached in two ways. Firstly, by identifying risk factors and early presenting clinical features associated with craniocervical arterial dissection and secondly, by identifying neck positions inherent in common manipulative techniques which might have a greater impact on craniocervical arterial blood flow.

The thesis comprises four studies investigating the risk factors for adverse neurovascular events following neck manipulation and the presenting features of arterial dissection. Study one examined the risk factors and clinical features of craniocervical arterial dissection in a retrospective medical records review and found that mechanical trauma, vascular anomaly and less so recent infection were associated with dissection, and that typical cardiovascular risk factors were generally less important. Study two examined the radiological features of craniocervical arterial dissection and their association with risk factors, and found that mechanical...
trauma and vascular anomaly were associated with a higher incidence of cerebral infarction. Study three examined the risk factors and clinical features of dissection in a prospective group of patients. Preliminary findings are reported that mechanical trauma was associated with dissection, and that 70% of patients reported ‘early warning signs’ of brain ischaemia. The final study investigated the effects of various head and neck positions commonly utilised in manual therapy on blood flow in the craniocervical arteries and consequent blood supply to the brain. The study found that selected neck positions did not have any significant effect on blood flow compared with the neutral position, and that combined end-range rotation and distraction positions of the head and neck did not have any greater effect on blood flow than localised segmental rotation positions.

There are specific recommendations which can be made as a result of these findings. Clinicians should screen patients presenting with headache or neck pain for a recent history of trauma or recent infection, and closely examine for transient features of brain ischaemia. If potential ischaemic features are identified, prompt referral for medical assessment should be made. Generally cardiovascular risk factors do not appear to be useful indicators of risk of adverse events following manual therapy of the neck, and probably do not need to be considered contraindications to manual therapy applied to the neck. Neck positions commonly used in manual therapy practice such as end-range head and neck rotation and/or distraction do not appear to be any more hazardous in terms of their effects on craniocervical arterial blood flow than techniques performed in positions in neutral or with more localised segmental rotation. The positions for manipulative techniques commonly used in clinical practice therefore do not appear to be inherently dangerous, although the thrust
component was not evaluated. The findings also do not support the utility of measurement of blood flow in a single vessel such as the vertebral artery during pre-manipulative screening to identify deficits in brain perfusion imposed by some neck positions. Isolated measurement of vertebral artery blood flow is therefore not supported for inclusion into clinical screening guidelines.