

ANZMUSC and Chiropractic Australia/COCA

PhD RESEARCH PROJECT TOPIC SUBMISSION

Complete all sections or indicate 'same as above' where applicable.

Project Title	Could the Dorsal Root Ganglia be Associated with Chronic Whiplash symptoms?
Primary Supervisor(s)	Dr Alexandra Webb and Dr Diana Perriman
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Associate Supervisor(s)	Prof Christian Lueck (ANU), Prof Rob Herbert (UNSW), Assoc.Prof Lars Uhrenholt (Aarhus, Denmark)
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Project description: In 200-250 words(or less), please provide a synopsis of the project, highlighting the main features of the project, (including the potential research question, aim and rationale).	<p>This project builds on research conducted over several years aimed at clarifying the precise cause of pain in people with whiplash injury caused by motor vehicle trauma. Using 3-Tesla magnetic resonance (MR) scanning, we recently discovered that, in a small cohort of 30 participants (10 chronic whiplash, 10 acute whiplash and 10 controls), cervical spine dorsal root ganglion (DRG) volume was significantly decreased in the chronic whiplash group. These findings suggest that pain resulting from whiplash injury may arise from damage to the DRGs. This finding is novel but needs further examination with a larger study and more advanced MR techniques, would open up potential new diagnostic and therapeutic possibilities. We will therefore extend our current cohorts by including older participants and an additional group with non-traumatic chronic neck pain. In addition, diffusion tensor imaging (DTI) will be used to assess the architectural configuration and microstructural properties of the cervical DRG and spinal nerves in the participants.</p> <p>The aim of this study is to further investigate the preliminary findings of DRG changes in patients with whiplash compared to non-traumatic neck pain after motor vehicle trauma.</p> <p>Our objectives are:</p> <ol style="list-style-type: none"> 1. To examine whether the findings are consistent in older patients with chronic whiplash. 2. To determine if the DRG are also affected in chronic non-traumatic neck pain. 3. To investigate multiple diffusion metric changes using DTI of cervical DRG and nerve roots, as well as their relationship to clinical data, in patients with whiplash and non-traumatic neck pain compared to controls.
Methodological approach: In 200-250 words (or less) describe the main methodological approach to be	<p>Participants: 18 participants (6 control, 6 acute whiplash, 6 chronic whiplash) aged between 40 and 60 years. 16 participants with chronic non-traumatic neck pain aged 18-60 years.</p> <p>Measurements:</p> <ol style="list-style-type: none"> 1. Previously established 3T MR protocol for the quantification of cervical DRG with volume measurement using Mimics software.

<p>undertaken (quantitative or qualitative). Also detail the proposed type of data collection the student will be required to undertake. If the project uses existing data, clarify how this project will be unique.</p>	<p>2. Feasibility study of Diffusion Tensor Imaging (DTI) and fibre tractography of the cervical DRG and nerves in whiplash, non-traumatic neck pain and control participants. DTI has been widely applied to the central nervous system and less commonly in the spinal nerves and associated ganglia. The results of previous studies of the lumbar and sacral spinal nerves indicate that DTI with tractography (i.e. orientation and pathways of nerve fibres) might provide information and depict abnormalities beyond the resolution of conventional MR techniques.^{1,2}</p> <p>3. Clinical data collection including neck disability index, pain threshold, neck morphometry.</p> <p>Analysis: The effect of group on DRG volume will be assessed using a linear regression model. The DTI parameters and fibre tractography will be used to assess whether there are any unique changes in the microstructure of the DRG and cervical spinal nerves after whiplash in both the acute and chronic participants.</p> <p>Role for the student: The student will undertake analysis of the MR images. There will also be opportunities for the student to be involved in the recruitment and consenting of participants, consenting of participants for MR scans and collection of clinical data.</p> <p>Impact: If DRG volume changes prove to be robust markers of whiplash the findings could have a major impact on whiplash diagnostics and management.</p> <p>References 1. Oikawa Y et al. (2015) Diffusion tensor imaging of lumbar spinal nerve in subjects with degenerative lumbar disorders. <i>Magn Reson Imaging</i>. 33(8):956-61 2. van der Jagt PK et al. (2012) Architectural configuration and microstructural properties of the sacral plexus: a diffusion tensor MRI and fiber tractography study. <i>Neuroimage</i>. 62(3):1792-9</p>
<p>Necessary skills/knowledge</p>	<p>An interest or experience in magnetic resonance imaging. A strong knowledge of anatomy. Clinical experience, especially effective communication with patients and the application of physical examination techniques. Competent in written and spoken English.</p>
<p>Ethics Approval (please tick appropriate answer)</p>	<p>Yes <input type="checkbox"/> Ethics approval has been received for Objective 1 No <input type="checkbox"/> Ethics approval will be sought for Objectives 2 and 3 If No: date of expected submission January 2017.</p>
<p>Main site of Project</p>	<p>Australian National University and The Canberra Hospital</p>
<p>Number of students supervised to completion by supervisor (s)</p>	<p>Alexandra Webb – 1 PhD and 3 Masters Diana Perriman – 1 PhD and 1 Masters</p>
<p>Supervisors Availability [hours pw]</p>	<p>Alexandra Webb and Diana Perriman - 3 hours per week</p>
<p>A/Supervisors Availability [hours pw]</p>	<p>Christian Lueck - 2 hours per month</p>

	Others not yet specified
Research Timeframe:	Commence from January 2017