

<sup>3</sup>Department of Neurosurgery, Wayne State University, Detroit - United States

**Introduction:** Regional neurovascular structures must be avoided during invasive spine hardware placement. During C1 lateral mass screw placement, the C2 nerve root is put in harm's way. Therefore, the current anatomical study was performed to identify techniques that might avoid such neural injury. **Materials and Methods:** On 10 cadaveric sides, dissection was carried down to the craniocervical junction. The C2 nerve root was identified and its distal branches traced out into the surrounding posterior cervical musculature. Once dissected, the nerve was displaced inferiorly away from the lateral mass of C1. **Results:** On all sides, the C2 nerve root could be easily detethered from surrounding tissues. On all sides, this allowed lateral mass screw placement without compression of the nerve. **Conclusions:** Based on our cadaveric study, the C2 nerve root can be detethered enough at the level of the posterior lateral mass of C1 to avoid its injury during screw placement into this area.

## A126: Development of a New Assessment Tool for Cervical Myelopathy using a Virtual Reality Hand Tracking Sensor

M. Abdulhadi Alagha<sup>1</sup>, Mahmoud Amir Alagha<sup>2</sup>, Eleanor Dunstan<sup>3</sup>, Olaf Sperwer<sup>4</sup>, Kate A. Timmins<sup>5</sup>, Bronek M. Boszczyk<sup>3</sup>

<sup>1</sup>Academic Orthopaedics, Trauma and Sports Medicine, The University of Nottingham, Queen's Medical Centre, Nottingham - United Kingdom

<sup>2</sup>Medical, Veterinary and Life Sciences College, University of Glasgow, Dental Hospital, Glasgow - United Kingdom

<sup>3</sup>Centre for Spinal Studies and Surgery, Queen's Medical Centre, Nottingham - United Kingdom

<sup>4</sup>Institut für Informatik und Psychologie, Rheinische Friedrich-Wilhelms-Universität Bonn, Bonn - Germany

<sup>5</sup>School of Sport & Exercise Science, University of Lincoln, Lincoln - United Kingdom

**Introduction:** Myelopathy hand is a characteristic feature of cervical myelopathy. Since there are only a few scales to quantify the severity of cervical compressive myelopathy, there is a need to introduce a universal objective platform in outpatient settings. Virtual-Reality offers promise as a means of producing quantitative data regarding the function of the neural system in the hand. The Leap Motion Controller (LMC) is a small, USB Virtual-Reality motion tracking device that could be used for this purpose. The aim of this study was to assess the reliability and validity of the LMC in the 15-second hand grip-and-release (G-R) test, as compared against human inspection of an external digital camera recording. Moreover, to set a baseline measurement of the number of hand flexion-extension cycles and analyse the degree of motion in young healthy individuals, besides examining gender and dominant hand differences.

**Materials and Methods:** Fifty healthy participants were asked to fully grip-and-release their dominant hand as rapidly as possible for three tests, each separated by a 10-minute rest, while wearing a non-metal wrist splint. The first two tests lasted for 15 seconds, and a digital camera was used to film the antero-lateral side of the hand on the first test. The third test lasted for a maximum of three minutes or until subjects fatigued. Three assessors counted the frequency of G-R cycles, of the recorded videos, independently and in a blinded fashion. One assessor counted the frequency of grip-and-release cycles as well as the number of motions (*magnitude of motion*) from the data output of the LMC. The average mean frequency of the three video observers was compared with that measured by LMC using the Bland-Altman method. Test-retest reliability was examined by comparing the two 15-second tests. **Results:** The mean number of G-R cycles recorded in each 15-second test was:  $47.8 \pm 6.4$  (test 1, video observer);  $47.7 \pm 6.5$  (test 1, LMC); and  $50.2 \pm 6.5$  (test 2, LMC). Bland Altman indicated a bias of 0.15 cycles (95%CI = 0.10-0.20), with upper and lower limits of agreement  $-1.16$  and  $1.46$  cycles, respectively. The ICC showed high inter-rater agreement (ICC = 0.998, 95%CI = 0.997-0.999,  $P < .01$ ). The coefficient of repeatability for the number of cycles was  $\pm 5.393$ , with a mean bias of 3.63. Over 3 minutes, the frequency of cycles (per 10-second interval) decreased, as did the magnitude of motion. However, the decline in frequency preceded that of motion's magnitude. Participants reached fatigue from 59.38 seconds; 43 participants were able to complete the 3-minute test. There were no statistically significant differences according to gender or dominant hand at most time intervals ( $P > .05$ ). **Conclusions:** LMC appears to be valid and reliable in the 15-second grip-and-release test. This serves as a first step toward the development of a universal objective platform for the assessment of cervical myelopathy. Further assessment is warranted to gauge benchmark values in a wider range of healthy individuals and in cervical myelopathy patients. Assessing the LMC as a diagnostic tool in the clinical setting is also necessary.

### Keywords

Cervical Myelopathy, Virtual Reality, Grip and release test, Reliability, Validity

## A127: A Proinflammatory and Degenerative Intervertebral Disc Organ Culture Model to Investigate Novel Anti-inflammatory Treatment Approaches for Degenerative Disc Disease

Gernot Lang<sup>1</sup>, Yishan Liu<sup>1</sup>, Zhiyu Zhou<sup>1</sup>, David Kubosch<sup>2</sup>, Norbert Suedkamp<sup>2</sup>, Mauro Alini<sup>1</sup>, Sibylle Grad<sup>1</sup>, Zhen Li<sup>1</sup>

<sup>1</sup>AO Research Institute Davos, Davos - Switzerland

<sup>2</sup>Department of Orthopedics and Trauma Surgery, University Hospital Freiburg, Freiburg - Germany