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The Rapidly Evolving Role of Ultrasound in Acute Spinal Cord Injury Care

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Summary: Intraoperative ultrasound (IU) has been used for several years for localization of spinal cord lesions such as tumors in neurosurgery, but only recently applied to spinal cord injury. In the past decade, with striking technological advances, IU has emerged as a powerful and readily accessible scientific and clinical tool in SCI. Two critical clinical problems are informed by IU. The first is the determination of the adequacy of spinal cord "decompression" from fractures and dislocations. Complete decompression is considered important to provide optimal recovery potential, reduce compressive ischemia, and prevent future complications. Adequate decompression is often difficult to ascertain visually, but IU can readily show residual compression, and safely guide removing it. The second critical issue is to optimize spinal cord blood flow (SCBF) in the peri-injury region, which is most at risk for additional tissue loss through ischemia, akin to a stroke penumbra. Flow is the basis for sufficient oxygen delivery and metabolism. Doppler IU can readily display which vessels have flow, and the response to changes in blood pressure. Intravenous contrast-enhanced IU using "micro-bubbles" can be used to quantify the perfusion deficit, which is an important indicator of injury extent. Micro ultrasound and other monitoring devices/protocols will allow greatly improved physiological monitoring and objective use of BP augmentation. IU is surprisingly simple to use and should be further implemented. Speakers will be able to present these concepts from their physiological basis through their rapidly evolving clinical impact. Funding Sources: NIH, DoD, CDMRP, MCPF, CHNF, Miami Project to Cure Paralysis, NACTN, CDRF Agenda: :00-0:10 The need for non-invasive intraoperative imaging measures of spinal cord physiology and treatment (James Guest). :10-0:30 High-Resolution injury imaging and quantitative spinal cord tissue perfusion imaging (Zin Khaing). :30-40 Strategies to avoid inadequate spinal cord decompression. Inadequate spinal cord decompression can limit recovery- is intraoperative ultrasound a solution? (Brian Kwon) :40-50 Clinical implementation of perfusion contrast imaging to optimize spinal cord injury care (Christoph Hofstetter) :50-60 Discussion

Learning Objective 1 Ultrasound is easy! To understand how ultrasound can provide real-time spinal cord imaging to identify and quantify clinically relevant SCI structural and vascular pathology.

Learning Objective 2 The problem of inadequate spinal cord decompression and solutions based on intraoperative ultrasound.

Learning Objective 3 The use of intraoperative contrast-enhanced blood flow ultrasound to optimize surgical and intensive care after SCI.