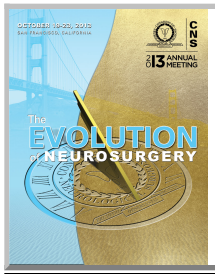


# Diffusion Tensor Imaging as a Predictor of Experimental Spinal Cord Injury Severity and Recovery

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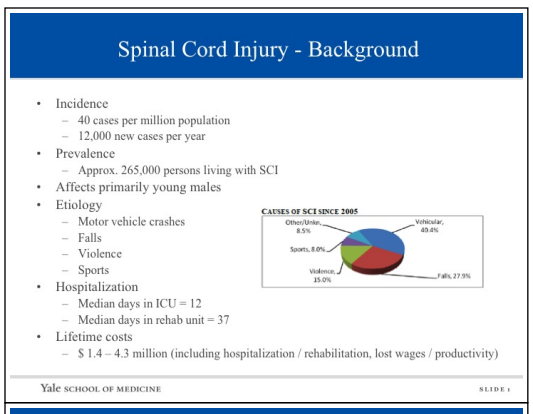
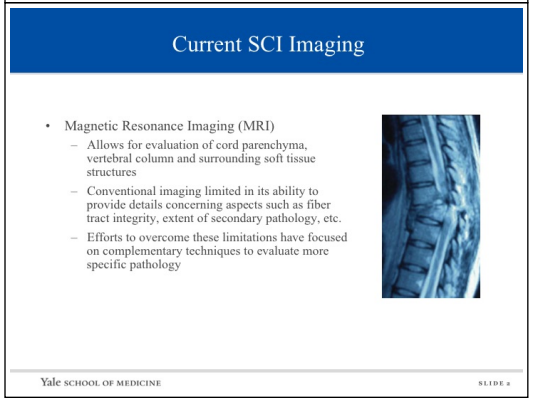
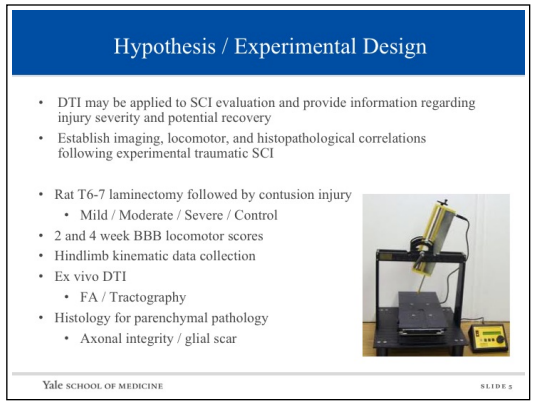
INTRODUCTION: Traumatic spinal cord injury (SCI) remains a significant contributor to patient morbidity with limited functional recovery linked to the extent of axonal damage. The ability to ascribe quantitative measures to axonal pathology using magnetic resonance (MR) is a novel strategy that may further characterize SCI-mediated axonal injury. Furthermore, the establishment of relationships between functional recovery, imaging studies, and in vitro axonal histopathology may provide insights into understanding neuronal recovery and guide post-injury treatment strategies aimed at maximizing regenerative potential.



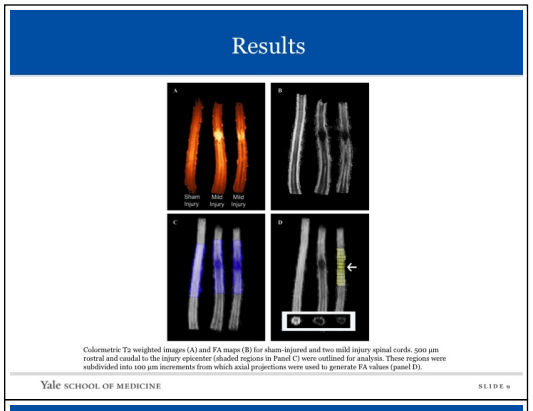



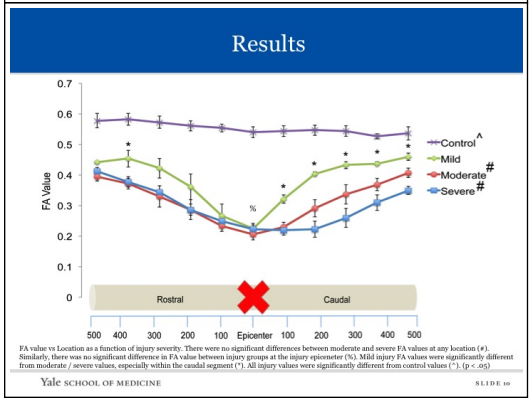

METHODS: To examine these concepts, female Sprauge-Dawley rats underwent laminectomy at T6-7 followed by traumatic spinal cord contusion of differing severities along with sham-injured animals that underwent laminectomy without contusion. Over a 4-week post-injury timeframe, locomotor scores were obtained and hindlimb kinematic functional data was collected. Ex vivo diffusion tensor imaging (DTI) was then performed to generate tractography and determine fractional anisotropy (FA), a numerical measure of relative white matter integrity, at the injury epicenter and at specific intervals rostral and caudal to the injury site. Corresponding immunohistochemistry for markers of axonal integrity and scar formation was also performed. Functional and imaging data were brought together to look for relationships between these parameters.




Please attend the oral presentation on Tuesday 10/22 at 2:45 PM at the Trauma and Critical Care Subsection for a more complete discussion.

RESULTS: All injured animals showed some recovery of locomotor function while hindlimb kinematics revealed graded deficits consistent with injury severity. While standard T2 MR sequences illustrated no difference in syrinx sizes and conventional spinal cord morphology adjacent to contusions despite different injury severities, corresponding FA maps indicated graded white matter pathology within these adjacent regions. Positive correlations between locomotor (BBB score) and imaging (FA values) parameters were also observed within these adjacent regions, most strongly within the caudal segments.




CONCLUSION: These findings suggest that DTI may augment current imaging modalities used to evaluate SCI and contribute to the development of clinically relevant algorithms predictive of traumatic SCI severity and potential recovery.