HEALTH AND HUMAN SCIENCES

A Pain in the Neck: Assessing the Impact of Cervical Disc Decompression Surgery on Spinal Stiffness in Canines

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Cervical intervertebral disc herniation, or a slipped disc, is a common orthopedic disease in canines. The standard surgical treatment used to relieve the herniation is the ventral slot technique, wherein a small slot is created by drilling into a neighboring vertebral body and the intervertebral space to relieve the pressure. However, the defects created in the disc, vertebral body, and adjacent ligaments typically cause postoperative instability of the spine. Two modifications of the ventral slot method, the inverted cone and slanted slocum slot, have recently been developed. These techniques could potentially offer greater postoperative spinal stability, but their effects on spinal stiffness have not been evaluated. Biomechanical four-point bending tests were performed on the vertebral motion unit (VMU), including the 5th and 6th cervical vertebrae and the intervening intervertebral disc, to measure the impact of each surgical approach on spinal stiffness. A total of six spines were dissected from deceased canines and two samples for each of the three surgical techniques, tested before and following surgery, to compare the effects of each approach on spinal stiffness. We hypothesized that all specimens would show a decrease in stiffness following surgery. As predicted, all three surgical approaches decreased cervical spine stiffness relative to the preoperative measures. No single technique provided a significant

advantage in maintaining cervical stiffness. This study establishes rigorous biomechanical techniques for examining the effect of surgical intervention on VMU stiffness that can be used for measuring stiffness in other planes of motion, such as long-axis twisting and medial-lateral bending.

Research advisor Russell Main says, "As biomedical engineers and basic scientists, we relish the opportunity to apply mechanics-based analyses to clinical problems to assist clinicians in determining the efficacy of a given surgical procedure. Michael tackled this project with great enthusiasm and continues his work examining the impact of cervical spine surgery on spinal biomechanics."

Lehner testing a specimen at the Musculoskeletal Biology and Mechanics Lab in Lynn Hall.

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