EFFECTIVENESS OF CERVICOTHORACIC ORTHOSES FOR IMMOBILIZING AN UNSTABLE CERVICOTHORACIC JUNCTION INJURY

INTRODUCTION
One of the primary goals of a cervicothoracic orthosis (CTO) is to provide stabilization and unloading to the spine in the presence of unstable fractures in both pre- and post-operative situations. In healthy volunteers with stable spines, CTO’s have proven to be very effective in minimizing global and segmental motion in the cervical spine. However, it is currently unknown whether CTO’s will have the same effectiveness in immobilizing an unstable spine segment. The purpose of this study was to evaluate two modern CTO devices compared to a cervical collar to evaluate their ability to stabilize a complete segmental injury at the cervicothoracic junction.

METHODS
Four lightly embalmed whole body cadavers were utilized for this study. A global instability was created at the C7-T1 level by resecting the anterior and posterior ligaments, intervertebral disc, and facet joint. An electromagnetic motion analysis system (Liberty, Polhemus Inc. Colchester, VT) was used to capture segmental motion. Sensors affixed to the vertebral bodies of C7 and T1 using custom made mounting brackets. Four different conditions were evaluated: Aspen CTO, MiamiJ CTO, Aspen Vista cervical collar and no collar. The amount of motion allowed by each condition was then evaluated during a passive range of motion maneuver. A force sensor was utilized to standardize the amount of force applied during each range of motion maneuver. The motion generated during the application of each orthosis was also measured.

RESULTS
Each of the orthoses provided significant reduction of flexion/extension motion compared to wearing no collar, however there were no statistical differences between any of the orthoses. The Aspen CTO provided a restriction of flexion/extension motion of 82%, the MiamiJ CTO 85% and the Aspen cervical collar 58% compared to wearing no orthotic device. For axial rotation motion, the reduction was 66%, 71% and 57% for the Aspen CTO, MiamiJ CTO and Aspen cervical collar, respectively. For lateral bending motion, the reduction was 46%, 56% and 29% for the Aspen CTO, MiamiJ CTO and Aspen cervical collar, respectively. During orthoses application, the Aspen CTO has significantly less lateral bending motion than Aspen cervical collar, with no other significant differences.
CONCLUSION
Even in the presence of a catastrophic unstable cervicothoracic junction injury, CTO’s can effectively reduce intervertebral motion. Although the motion is not eliminated, it is reduced to be approximately within the physiologic range. Although, there were no statistically significant differences between the CTO devices and the collar for the range of motion evaluation, in all cases the collar allowed more motion than either CTO.

REFERENCES