

DO CERVICAL COLLARS AND CERVICOTHORACIC ORTHOSES EFFECTIVELY STABILIZE THE INJURED CERVICAL SPINE? A BIOMECHANICAL INVESTIGATION

Paul C. Ivancic, PhD

Biomechanics Research Laboratory, Department of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven, CT
Spine (Phila Pa 1976). 2013 Mar 12.

OBJECTIVE: Our objective was to determine the effectiveness of cervical collars and cervicothoracic orthoses for stabilizing clinically relevant, experimentally produced cervical spine injuries. **SUMMARY OF BACKGROUND DATE:** Most previous in vitro studies of cervical orthoses used a simplified injury model with all ligaments transected at a single spinal level, which differs from real-life neck injuries. Human volunteer studies are limited to measuring only sagittal motions or three-dimensional motions only of the head or one or two spinal levels. **METHODS:** Three-plane flexibility tests were performed to evaluate two cervical collars (Vista collar and Vista Multipost collar) and two cervicothoracic orthoses (Vista TS and Vista TS4) using a skull-neck-thorax model with 8 injured cervical spine specimens. The injuries consisted of flexion-compression at the lower cervical spine and extension-compression at superior spinal levels. Pair-wise repeated measures analysis of variance ($p < 0.05$) and Bonferroni post-hoc tests determined significant differences in average RoMs of the head relative to the base, C7 or T1, among experimental conditions. **RESULTS:** All orthoses significantly reduced unrestricted head/base flexion and extension. The orthoses allowed between 8.4 to 25.8% of unrestricted head/base motion in flexion/extension, 57.8 to 75.5% in axial rotation, and 53.8 to 73.7% in lateral bending. The average percentages of unrestricted motion allowed by the Vista collar, Vista Multipost collar, Vista TS, and Vista TS4 were: 14.0, 9.7, 6.1, and 4.7%, respectively, for middle cervical spine extension and 13.2, 11.8, 3.3, and 0.4%, respectively, for lower cervical spine flexion. **CONCLUSIONS:** Successive increases in immobilization were observed from Vista collar to Vista Multipost collar, Vista TS, and Vista TS4 in extension at the injured middle cervical spine and in flexion at the injured lower cervical spine. Our results may assist clinicians in selecting the most appropriate orthosis based upon patient-specific cervical spine injuries.

SELECTED QUOTATIONS

Results

“...the flexion-compression injuries of the lower cervical spine were best immobilized in the flexion loading mode by Vista TS4, followed by Vista TS, and lastly the Vista MultiPost and Vista Collars. All orthoses significantly reduced average unrestricted head/base RoMs in flexion and extension.” pE770

“Vista TS4 allowed the least percentage of average unrestricted motion in axial rotation of the upper cervical spine, extension of the middle cervical spine, and flexion of the lower cervical spine, followed by Vista TS, Vista MultiPost Collar, and lastly Vista Collar.” pE770

Discussion

“Successive increases in cervical spine motion restriction were observed from Vista Collar to Vista MultiPost Collar, Vista TS, and Vista TS4 in the main injury mode of extension at the middle cervical spine and flexion at the lower cervical spine.” “...who observed that the CTO improved immobilization of the lower cervical spine as compared with the collar alone.” pE773

**Note: The Vista TS referenced in this study is sold as the Vista CTO and the Vista TS4 is sold as the Vista CTO4.*