

BIOMECHANICAL ANALYSIS OF CERVICAL ORTHOSES IN FLEXION AND EXTENSION: A COMPARISON OF CERVICAL COLLARS AND CERVICAL THORACIC ORTHOSES.

Gavin T, Carandang G, Havey R, Flanagan P, Ghanayem A, Patwardhan A.
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The analysis of current cervical collars (Aspen and Miami J collars) and cervical thoracic orthoses (Aspen 2-post and Aspen 4-post) in reducing cervical intervertebral and gross range of motion in flexion and extension was performed using 20 normal volunteer subjects. The gross sagittal motion of the head was measured relative to the horizon with the use of an optoelectronic motion measurement system. Simultaneous measurement of cervical intervertebral motion was performed with the use of a video fluoroscopy (VF) machine. Intervertebral motion was described as (1) the angular motion of each vertebra and (2) the translational motion of the vertebral centroid. We used surface electromyographic (EMG) signal data to compare subject efforts between the two collars and between the two CTOs. Each orthosis significantly reduces gross and intervertebral motion in flexion and extension ($p < 0.05$). No statistically significant differences were found between the Miami J and Aspen collars in reducing gross or intervertebral sagittal motion, except at C5-6. Both CTOs provided significantly more restriction of gross intervertebral flexion and extension motion as compared to the two collars ($p < 0.05$). The Aspen 2-post CTO and 4-post CTO performed similarly in flexion, but the Aspen 4-post CTO provided significantly more restriction of extension motion ($p < 0.05$).

SELECTED QUOTATIONS

Introduction

"It is important that the prescribing physician recognizes the differences between the function of cervical orthoses, so they may make informed decisions as to which orthosis is most appropriate for a specific condition." (Pg. 527)

Gross Head Motion Restriction

"Flexion motion allowed in the Miami J collar was significantly greater than that allowed in the Aspen collar. No significant difference was found between the two collars in extension." (Pg. 531)

Neck (C0 to C7) Motion Restriction

"When measuring angular motion of C0 relative to C7 using VF images, we found no statistically significant differences in angular motion allowed between the Miami J and Aspen collars in either flexion or extension." (Pg. 531)

Intervertebral Angular Motion Restriction

"No significant differences in flexion were allowed at any intervertebral segment between the Aspen or Miami J collars except at C5-6, where the Miami J allowed more motion." (Pg. 532)

"In restricting angular motion in flexion, the CTO's were significantly better than the collars at C3-4, C5-6 and C6-7 segments." (Pg. 532)

Discussion

"The capability of the 4-post CTO to effectively restrict extension motion seems to contradict the current thinking that the halo may be the only effective orthosis for reducing motion in extension." (Pg. 536)

Conclusion

"Our findings suggest that either of the two collars could be used to treat similar cervical pathologies or injuries except those involving the C5-6 segment, where the Aspen collar may provide better motion restriction." (Pg. 537)