MRI Analysis of Soft Tissue Disruption following Flexion Distraction Injuries of the Subaxial Cervical Spine

INTRODUCTION: A prospective study evaluating the type and degree of soft tissue disruption with flexion distraction injuries of the subaxial spine utilizing Magnetic Resonance Imaging. Prior published reports of unilateral and bilateral cervical facet dislocations have analyzed the mechanisms and the biomechanics of this injury subtype. No prospective MRI analysis of associated soft tissue disruption has been documented.

METHODS: MRI evaluations of the cervical spine were obtained on all patients with flexion distraction stage II (unilateral facet dislocation-UFD) and III (bilateral facet dislocation- BFD) injury between September 1994-May 1998. The MRI studies were evaluated by two blinded radiologists who made a consensus on the grade of the attenuation of the soft tissue structure (1-intact, 2-indeterminant, 3-disrupted). The data was then pooled and statistical analysis was performed to determine significance. Binomial testing was performed on each group (UFD & BFD) individually due to the lack of a control group, a two-sided 95% confidence interval was then constructed around the percentages of patients with disruptions. A two-sided Fisher's exact test was then used for comparison between the two groups and finally a multivariate analysis was performed.

RESULTS: 48 patients satisfied the inclusion criteria (25 with UFD and 23 with BFD). In the UFD group disruption to the posterior longitudinal ligament (PLL) was not statistically significant. Damage to all other soft tissue structures was significant (posterior musculature, interspinous ligaments, supraspinous ligaments, facet capsule, ligamentum flavum, annulus fibrosus along with the presence of an intervertebral disc herniation and the anterior longitudinal ligament- ALL). In the BFD group all structures were significantly disrupted using the 95% confidence interval. In comparison between UFD & BFD it was found that disruption to the ALL, PLL and one of the facet capsules were statistically significant (all occurring more frequently in the BFD group). The multivariate analysis between the two groups showed that disruption to the anterior longitudinal ligament was significantly associated with a BFD.

CONCLUSION: Unilateral and bilateral facet dislocations of the subaxial spine are associated with damage to numerous soft tissue structures that provide stability to the lower cervical spine. Damage to the posterior longitudinal ligament was not consistently seen to occur in unilateral facet dislocations. Bilateral facet dislocations were significantly associated with disruption of the PLL, ALL and a facet capsule when compared to bilateral facet dislocations.