Unilateral Cervical Spine Facet Fractures: Radiographic Predictors of Instability

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INTRODUCTION:

Isolated subaxial cervical spine facet fractures make up less than 5% of symptomatic cervical spine injuries. There is much controversy regarding treatment of these injuries, and management is typically based on the neurological status of the patient and perceived stability of the injury. Since it has been shown that the degree of ligamentous instability can help predict instability and the need for surgery, MRIs are increasingly being used to evaluate these injuries. While there are many studies that evaluate radiographic characteristics of facet fractures on CT, there are few that specify which CT findings predict instability on MRI and vice versa. The purpose of our study is to identify CT characteristics of unilateral cervical spine facet fractures that are predictive of instability on MRI. We hypothesize that there are discrete parameters on CT and MRI that will predict fracture instability and the need for surgery.

METHODS:

This is a retrospective review of 48 patients with unilateral cervical facet fractures during a 7-year period from a level I trauma center. All patients had CT and MRI performed at the time of injury. Measurements of fracture fragments size (absolute height, absolute width, percent height, percent width, percent articular height), anterolisthesis, displacement, and extension were obtained from CT scans. MRIs were thoroughly examined by an independent radiologist and assigned an objective instability score based on injury to the seven ligaments at the injured level. Demographic data and follow up information were recorded.

RESULTS:

Forty-eight patients were identified with unilateral cervical spine facet fractures, 7 of which had unilateral fractures in two consecutive levels. Twenty-two fractures required operation, and 34 required no operation. Only one patient in our study failed nonsurgical management. The average instability score in the operative group was 3.34, versus 1.06 in the conservative treatment group ($p<0.001$). Fracture displacement ($p=0.013$), multi-fragmentary fractures ($p<0.001$), and MRI instability score ($p<0.001$) were correlated with a statistically significant increased likelihood of operative necessity. When comparing CT characteristics to MRI, multi-fragmentary fractures and increased displacement had significant correlation with higher instability on MRI, whereas percent height of fracture fragment on CT had negative correlation with MRI.

DISCUSSION AND CONCLUSION:

To date, this is the largest study looking at isolated subaxial cervical spine fractures including CT and MRI imaging to help determine stability. Previous studies have shown that ligamentous injury on MRI can help predict the need for operative stabilization, and others have looked at the size of fractures, comminution, and displacement on CT scans to do so. In our study, fracture size did not correlate ligamentous injury, but rather displacement and multi-fragmentary fractures on CT scan were found to have highest correlation with instability scores on MRI. This suggests that patients presenting with subaxial cervical facet fractures benefit from analysis with both CT and MRI scans to help determine the need for operative stabilization.