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Three-Dimensional Analysis of Acromion Morphology Using Reconstructed Ct Model : A Comparison Between Subjects With and Without Rotator Cuff Tear

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Summary:
Morphologic changes at the anterior (>2mm) and lateral (>3mm) acromial edges are associated with the presence of a rotator cuff tear, and tear size was not correlated with change in acromial morphology.

Abstract:
Introduction:
Acromial deformity including spur formation occurs both in the presence and absence of rotator cuff tear (RCT), although many studies have correlated the presence of acromial change with RCT. The purpose of the current study was to determine whether any particular change in acromial morphology was significantly associated with the presence or absence of RCT using reconstructed three-dimensional CT model.

Methods:
The study population comprised the 25 unilateral RCT patients and 17 frozen shoulder patients without RCT that underwent arthroscopic surgery. Acromial shape was evaluated before surgery by using conventional CT. 3D models of both affected and mirror-image of unaffected scapulas generated from DICOM data, and this mirror image was superimposed over the model of the affected scapula surface matching by using the Iterative Closest Point (ICP) algorithm. By using the proximity mapping technique, differences in acromial morphology between unaffected and affected shoulders were investigated in four regions: anterior edge, lateral edge, medial edge, and inferior surface. Cut-off values for each region, determined by Receiver Operating Characteristic (ROC) analysis, were used to define whether acromial shape differed between shoulders with and without RCT. Subsequently; changes in acromial morphology were compared in subjects with and without RCT by using the Pearson chi-squared test (significance, P<0.05). Associations between the size of the tear in the rotator cuff tendon and the change in acromial morphology were evaluated by using Pearson correlation analysis.

Results:
Cut-off values were 2 mm for the anterior edge, 3 mm for the lateral edge, 4 mm for the medial edge, and 4 mm for the inferior surface. Acromial morphology at the anterior and lateral edges differed significantly (P<0.01) between shoulders with and without RCT. Tear size was not correlated with change in acromial morphology (P=0.37–0.73).

Conclusion:
Morphologic change at the anterior (>2 mm) and lateral (>3 mm) edges of the acromion is associated with the presence of a full-thickness RCT in symptomatic patients, suggesting that acromial morphology can be diagnostic for RCT. The size of the tear in the rotator cuff tendon was not correlated with the severity of the change in acromial morphology.