A CADAVERIC STUDY EXAMINING ACROMIOCLAVICULAR JOINT CONGRUITY FOLLOWING DIFFERENT METHODS OF SURGICAL REPAIR

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Introduction: The question of surgically treating certain types of acromioclavicular (AC) joint injuries is a difficult one for many reasons. One of the major concerns that plays a part in this controversy is whether surgically repairing the AC joint restores normal joint congruity [1-7]. Without normal AC joint congruity, there is increased patient morbidity; previous studies have shown that the incidence of arthritis in the AC joint increases 10-20% following repair [1,5,7]. The purpose of this study was twofold: to determine whether restoration of normal AC joint congruity is possible using coracoclavicular (CC) loop repair, and to compare the effectiveness of three variations of this technique in restoring AC joint congruity.

Hypothesis: Coracoclavicular loop repair, regardless of hole placement, does not restore AC joint congruity.

Methods: Fourteen frozen cadaveric shoulders were included in this study. The complete shoulder was placed into an apparatus specifically designed for the project (Fig. 1). The shoulder was clamped at the sternoclavicular joint with the clavicle still attached to the manubrium; the manubrium was held specifically by the clamp to allow for movement at the sternoclavicular joint. The scapula was bolted to the apparatus through the scapular body. The AC joint was not held to allow for free movement. A five pound weight was applied directly over the midline of the clavicle, and the coracoclavicular and acromioclavicular ligaments were then severed and anterior displacement was examined. The weight was then removed, and the AC joint was repaired using loop fixation through the clavicle and around the coracoid with #5 Ethibond suture. This repair was done using three different drilling procedures through the clavicle: Posterior superior to anterior inferior, anterior middle to posterior middle, and anterior superior to anterior inferior (Fig 2). Joint congruity after each of these procedures was then compared by measuring the amount of anterior displacement of the clavicle. For comparison purposes, two shoulders were also repaired using the synthesis technique of screw fixation in which a screw was driven through the clavicle into the coracoid. Statistical analysis was performed using a Kruskal-Wallis One Way ANOVA on Ranks to determine if differences between the groups were present, and the Student-Newman-Keuls method was used for a pairwise comparison of the groups.

Results: None of the procedures using the coracoclavicular loop repair technique restored perfect joint congruity (Fig 3). Posterior superior to anterior inferior (Ps/Ai) showed a mean displacement of 10.9mm, anterior middle to posterior middle (Am/Pm) showed a mean displacement of 6.3mm, and anterior superior to anterior inferior (As/Ai) showed a mean displacement of 2.9mm. The ANOVA on ranks showed significant differences in the median values among all three treatment groups (p<0.001), and in pairwise comparison all possible pairs showed statistically significant differences (p<0.05). In the two shoulders where screw fixation was also performed, joint congruity was near perfect with small displacements of 1-2mm.

Discussion: It was found that none of the procedures using the CC loop repair technique restored perfect joint congruity; all had some degree of anterior displacement. Although normal joint congruity could not be achieved, some of the techniques showed less displacement than others, with the anterior superior to anterior inferior technique showing the least displacement. With screw fixation normal, joint congruity was very closely achieved; however, screw loosening and pull-out are common complications of this procedure which compromise congruity and may necessitate further surgeries, and requires at least one additional surgery for screw removal [4,5,7]. The conclusions of this study indicate that in CC loop repair, as the drill hole moves anterior on the clavicle without compromising fixation, normal joint congruity is closely approached. However, in every CC loop repair regardless of hole placement, AC joint congruity was not achieved.

References:

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