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Stress radiographs for evaluating acromioclavicular joint separations in an active-duty patient population: What have we learned?

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ABSTRACT

Introduction: Acromioclavicular (AC) joint separation is a common entity in athletic patient populations. The surgical treatment of these injuries varies based upon extent of injury, with numerous imaging modalities recommended to differentiate injury severity and treatment options. The use of weighted stress radiographs is controversial in the diagnostic evaluation of AC separation with previous consensus recommending against their use. No study to date has investigated the clinical utilization of diagnostic studies in the evaluation of AC joint separations in a military surgeon population.

Methods: Thirty-eight shoulder or sports medicine sub-specialty certified orthopaedic surgeons on active service in the Army, Air Force, and Navy were surveyed on their evaluation and treatment protocols for AC joint injuries. Specifically analyzed were imaging choice including the use of weighted stress radiographs as well as treatment recommendations based upon Rockwood grade. Responses were recorded in addition to surgeon descriptive data. Responses were analyzed with descriptive statistics.

Results: Thirty-seven of the identified thirty eight surgeons responded to the survey, for a 97% response rate. Of the group, 70% of surgeons were within 10 years of completing fellowship with an estimated average of 15 AC joint separations treated annually. Plain radiographic examination was relied upon by 48% of surgeons for treatment of AC joint separation with 13% using weighted stress radiographs. Overall, 10% of surgeon stated that their treatment plan would vary based upon results from a weighted stress view. 51% of surgeons included magnetic resonance imaging in their diagnostic approach of these injuries. Treatment recommendation varied according to injury severity with 78% preferring nonoperative treatment for acute Grade III injuries with 86% waiting a minimum of 3 months before proceeding with operative treatment. For Grade V injuries, 81% of surgeon preferred operative treatment, with 59% incorporating a soft-tissue graft in their repair or reconstructive procedure.

Discussion: This study identified substantial practice variation amongst military surgeons treating a relatively homogenous population with AC joint separations, reflective of a lack of definitive evidence to guide diagnosis and treatment. Overall, nonoperative management is the preferred initial approach for Type III injuries and operative treatment is the preferred initial approach for Type V injuries. The diagnostic evaluation varied across the surgeon cohort, but 87% elected against the use of weighted stress radiographs for the evaluation of AC joint separations, with only 10% relying upon them to dictate their recommended treatment. Future research identifying optimal diagnosis and treatment of AC joint separations is needed.

1. Introduction

Acromioclavicular (AC) joint separation is a common shoulder girdle injury, accounting for up to 9% of traumatic injuries.[1] The most common mechanism of injury for an AC joint separation is a fall or a direct blow to the joint while the arm is in an adducted position.[2] The primary assessment of AC joint injuries is made via radiographic examination, analyzing the position of the clavicle relative to the acromion. In addition to standard radiographic views, numerous authors recommend the addition of a weighted stress radiographs to aid in treatment recommendations.[3–5] However, in 1999 Yap et al.[6] surveyed 105 members of the American Shoulder and Elbow Society and 85

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(81%) of respondents recommended against the use of weighted stress views thereby questioning the utility and practicality of the radiographs in the acute setting.[6] Of the 105 respondents, 57% did not use weighted radiographs in their practice, and of the 45 respondents (43%) that did use them, most indicated that the results of the stress radiographs did not determine their treatment recommendation.

Due to the inherent turnover of faculty in military medical practice, most Sports Medicine and Shoulder and Elbow fellowship-trained orthopaedic surgeons in the military have been trained since the publication of these results by Yap et al.[6] in 1999.

We hypothesized that there would be a trend away from the use of weighted radiographs in the routine evaluation of AC joint separations. We also hypothesized most surgeons would choose acute surgical intervention for high grade AC separations. We also hypothesized that recent trends in surgical treatment would show that the previous surgical techniques of coracoacromial ligament transfer and rigid coracoclavicular screw fixation would be supplanted with the use of suspensory fixation techniques and the use of anatomic ligament reconstruction.

2. Materials and methods

An online survey was designed and sent to all Sports Medicine and Shoulder and Elbow fellowship trained members of the Society of Military Orthopaedic Surgeons (Appendix 1). This reflects all active-duty orthopaedic surgeons that have completed a Sports Medicine or Shoulder and Elbow fellowship in the United States Army, Navy or Air Force. The survey was constructed and reported in accordance with the published recommendations of the Journal of Medical Internet Research.[7]

The survey was adapted from the previously reported results by Yap et al.[6] It was designed to obtain demographic data including: years in practice and number of cases of AC joint injuries treated per annum. Additionally, information was obtained regarding the specific radiographic studies employed to assess AC joint injuries, including the utilization of weighted stress radiographs and the surgeon-perceived clinical utility provided by these studies. Treatment preferences for grade III and IV injuries and clinical definitions were also assessed.

2.1. Data analysis

Statistical analysis was performed using SPSS statistical package version 24 (SPSS Inc, Chicago, IL). For each question, the number and percentage of respondents selecting each of the given choices was documented. Responses were analyzed using descriptive statistics. A chi-square test was used to compare results between groups, subdivided according to years in practice (< 10 years and $10+$ years) as well as treated cases per annum (< 10 cases and $10+$ cases). Logistic regression analysis was used to evaluate the influence of years in training and cases treated on responses to dichotomous responses. Statistical significance was predetermined as $p < 0.05$.

3. Results

Of the 38 surgeons that were queried, 37 responded for a 97% response rate. The surgeons represented a fairly equal distribution in regard to their years of experience, with the majority of the group (70%) within 10 years of fellowship completion (Fig. 1). Over two-thirds of those questioned treated more than 10 patients with AC joint injuries per year. Surgeons were questioned on the imaging studies they routinely ordered to evaluate AC joint injuries. Almost all surgeons obtained routine shoulder radiographs and 86% obtained a bilateral clavicle upright radiograph. Half of the surgeons also utilized magnetic resonance imaging (MRI). There were a minority of surgeons (14%) who utilized cross-arm adduction radiographs and the same percentage (14%) who obtained weighted bilateral clavicle radiographs (Fig. 2). Surgeons were also questioned regarding their criteria to differentiate grade III and grade V AC joint separation, with 73% choosing the coracoclavicular measurement of greater than 100% displacement to indicate a grade V injury.

Non-operative treatment consisting of sling immobilization with or without physical therapy was the initial treatment of choice in 92% of surgeons for acute, grade III injuries in active-duty patients. Surgeons were also queried regarding timing of surgical treatment for persistently symptomatic grade III injuries with multiple potential time points between injury and two weeks to six months. There was some discordance with 62% choosing three months post-injury. (Fig. 3) When questioned on initial treatment for active-duty patients with a Grade V injury, only 19% chose a non-operative plan. For those who chose operative treatment, they were further questioned on the use of a graft reconstruction. Operative repair and reconstruction with a graft was chosen by 59% of surgeons, while 22% chose operative repair without a graft (Fig. 4). Surgeons were asked if weighted AC joint x-rays would ever change their operative plan or change their decision on whether or not to operate. The majority of surgeons (81%) reported that these images would never change their plan.

Despite the large number of these sports medicine and shoulder fellowship-trained surgeons stating that they do not utilize weighted AC joint x-rays and furthermore that these x-rays would never change their operative plan, 73% of those surveyed reported that their hospitals do routinely obtain these images, ordered by other providers.

4. Discussion

This study identified substantial practice variation amongst military surgeons treating a relatively homogenous population with AC joint separations. This was found specifically in the choice of imaging modalities to make a diagnosis, in the timing of treatment of active-duty patients with chronic grade III separations who remained symptomatic and the initial treatment of acute grade V separations in active-duty patients. This is reflective of a lack of definitive evidence to guide diagnosis and treatment. Acute treatment of grade III AC joint separations continues to remain a controversial subject. Some historical articles evaluating operative versus nonoperative treatment are difficult to use for guidance as they did not identify the grade of injury that was treated and did not use modern surgical techniques.[8,9] Other studies that did solely evaluate patients with grade III injuries did not find a difference between operative and nonoperative treatment.[10] There are multiple open and arthroscopic-assisted methods for fixation now available for higher grade separations or chronic grade III separations that produce good clinical results that are lasting.[11–14] Overall, conservative treatment is recommended for lower grade (I, II) separations, early operative treatment is recommended for higher grade (IV–VI) separations and no definitive management of grade III injuries is universally agreed upon.[15]

The efficacy of weighted AC joint radiographs has been evaluated previously. Bossart et al. evaluated radiographs of patients presenting to the emergency department with an acute AC joint injury.[16] Patients with a grade III injury had their weighted and non-weighted radiographs separated and read by a radiologist who was blinded as to whether or not they were weighted. They found that only 4% of injuries had a greater coracoclavicular distance measured on the weighted radiograph which “unmasked” a grade III separation. The authors concluded that there was not efficacy in obtaining weighted radiographs and recommended that the use of these images be abandoned. Yap et al.[6] conducted a survey of 105 members of the American Shoulder & Elbow Society (ASES) in the United States and Canada.[6] They questioned members on hypothetical cases of grade III AC separations and found that 81% of surgeons did not recommend obtaining weighted images in the emergency department. Interestingly, they found that 43% of their respondents used weighted views although only 9% utilized these to determine surgical intervention. Overall, they