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Associated Intraarticular Lesions encountered during Arthroscopic Assisted Stabilization of Rockwood Type IV and V Acromioclavicular Joint Injuries

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Abstract: ***Acromioclavicular joint (ACJ) injuries are relatively common, encompassing 3.2% of all shoulder girdle injuries. High grade (Type IV-VI) dislocation of the ACJ requires tear of both the coracoclavicular ligaments and acromioclavicular ligaments plus ACJ capsule and deltotrapezial fascia simultaneously. Surgery is the mainstay of treatment for high grade ACJ disruptions. High grade injuries are stabilized surgically via an open approach, arthroscopically, or a combination of both. The incidence of associated intraarticular lesions encountered during arthroscopic assisted ACJ stabilization has been reported to range from 43% to 53% in recent literature. In our study, more than half (65.9%) of our patients had an associated intraarticular injury. Of these, 74% required additional debridement or reconstructive surgery. We highly recommend the use of arthroscopic assisted ACJ stabilization to accurately diagnose and treat associated intraarticular lesions.***

Keywords: acromioclavicular joint, ACJ injury, Rockwood classification, associated intraarticular lesions, arthroscopic assisted ACJ stabilization

1. Introduction

Acromioclavicular joint (ACJ) injuries are relatively common, encompassing 3.2% of all shoulder girdle injuries [1]. This injury predominantly occurs in the young productive age group [2]. The male to female ratio is reported to be as high as 8.5:1 and more than half of all ACJ injuries occur in individuals between the ages of 20 and 39 years, mainly during sporting activities [3, 4].

The ACJ is a diarthrodial joint between the distal clavicle and acromion. It provides a stable construction between the clavicle and the multidirectionally rotating scapula. It receives passive stabilization in the vertical plane by the coracoclavicular (CC) ligaments (ligament conoideum and trapezium) which act as the primary stabilizers of the ACJ [5, 6]. Horizontal stability is provided by four acromioclavicular (AC) ligaments and the deltotrapezial fascia [6].

Several classification systems have been used to describe the failure of the ACJ based on the amount of displacement and anatomic disruption [1, 7, 8]. Most surgeons adopt the Rockwood classification system that take into consideration the ACJ, CC ligaments, deltoid-trapezius muscles, and the direction of dislocation [2]. Accordingly, there are six types of dislocations described with increasing severity. High grade dislocations (Type IV – VI) requires tear of both the CC and AC ligaments plus the ACJ capsule and deltotrapezial fascia simultaneously [2]. Recently, the addition of Type IIIA and Type IIIB to the Rockwood classification has been suggested by the ISAKOS Upper Extremity Committee [9].
Management of ACJ disruption can be widely divided into non-operative and surgical treatment, with lack of evidence to support ideal treatment options. However, the general consensus is for non-operative treatment of Rockwood type I and type II dislocations while high grade injuries (Type IV-VI) are stabilized surgically [7, 10, 11]. The treatment for type III injuries remains controversial as the current evidence is inadequate to establish statistical differences between surgical and non-operative treatment [12-14]. Thus, the search for the optimum care, treatment and the gold standard surgical technique is still ongoing.

Surgical techniques can be broadly divided into non-anatomic and anatomic procedures with more literature favouring the latter [15-17]. Numerous surgical techniques have been described to facilitate anatomical repair or reconstruction of the CC ligaments and the AC ligaments. Of late, arthroscopic assisted ACJ stabilization has gained popularity due to several advantages. Amongst them include a minimal surgical approach, elimination of the need for a second surgery to remove implants, the use of biomechanically superior implants and finally the prospect of diagnosing and treating other concomitant glenohumeral lesions in ACJ dislocations [17-21].

A high energy force is required to cause ACJ injuries, which may result from direct trauma caused by a fall or a blow to the shoulder with the arm in adduction [8]. Indirect injuries due to a fall on the outstretched hand or elbow may contribute to ACJ separation as well though ACJ disruption results more frequently from a direct blow to the lateral aspect of the acromion than from an indirect force [3, 22]. It is reported that one third of all ACJ injuries have concurrent intraarticular lesions of the glenohumeral joint. This has been attributed to the excessive force involved and similarities in mechanism of injury leading to ACJ dislocation and other intraarticular lesions [23]. Pauly et al. recognized labral lesions, biceps pathologies, chondral lesions and rotator cuff tears as associated intraarticular

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pathology in their study of 56 subjects [24]. The prevalence of intraarticular associated injuries in high grade ACJ dislocation was observed to be ranging from 43% to 53% in recent literature [25-27]. In a multi-center observational study of two hundred subjects, Ruiz et al. reported a low prevalence of 14% associated intraarticular lesions in type III to type VI acute ACJ dislocations. Of this, only half the lesions required additional surgical intervention [28]. One reason for poor surgical outcome of ACJ dislocation can be ascribed to these simultaneous injuries that are initially missed during pre-operative evaluation and are not addressed [23]. Thus, arthroscopic assisted identification of associated intraarticular lesions seen with ACJ dislocation allows for concurrent treatment and results in overall improved treatment outcome.

Arthroscopic assisted stabilization of high grade ACJ injuries have long been routinely practiced in our center. The aim of our study was to describe and analyze associated intraarticular lesions of the glenohumeral joint found in patients who underwent surgical treatment of Rockwood type IV and V ACJ disruptions in Kuala Lumpur Hospital, Malaysia.

2. Methods

From January 2010 until January 2015, all patients suffering from high-grade ACJ separation (Rockwood type IV-VI) who underwent arthroscopic assisted treatment at our center were included in our study. Ethical approval was obtained from the National Medical Research Registry (NMMR ID: 46373) and data on these patients were collected retrospectively. Any patients with known pre-existing shoulder pathology prior to the ACJ injury were excluded. The obtained data was analysed descriptively and statistically using SPSS for Windows, Version 23 (SPSS, Chicago, IL, USA). Statistical significance was calculated with the Pearson Chi-Square test and in the case of small numbers, Fisher's exact test was used.

3. Results

A total of 41 patients (40 male; 1 female; mean age 34.5 years; range 18-60 years) were included in this study. The vast majority (n=38, 78.0%) of injuries were obtained via a direct blow to the shoulder during a road traffic accident (n=29, 70.7%) whereas injuries sustained during sports comprised of only four patients (9.8%). Many of our patients sustained the injury over their dominant hand (n=27, 65.9%).

Twenty-five (61.0%) of our patients presented acutely (within 3 weeks from injury) to our center. Thirty-three (80.5%) patients were classified to have a Rockwood type V injury while Rockwood type IV injuries were seen in the other patients. We did not encounter any Rockwood type VI injury during the period of our study.

Associated intraarticular lesions of the glenohumeral joint were found in more than half of our patients (n=27, 65.9%). A total of 51associated intraarticular lesions occurred with an average of 1.9 injuries per patient. These were divided into labral injuries (n=21, 41.2% of 51 total associated intraarticular lesions), long head of biceps tendon injuries (n=11, 21.6%), rotator cuff injuries (n=9, 17.6%), chondral injuries (n=4, 7.8%), and others (n=6, 11.8%) (Table 1). Typical patterns of injury are SLAP (superior labral tear from anterior to posterior) lesions with either rotator cuff tears or biceps tendinosis. Other lesions include tears to the superior or middle glenohumeral ligaments. Of these 27 patients, 74.1% (n=20) of them required additional debridement or repair.

Table 1: Breakdown of associated intraarticular lesions encountered during shoulder arthroscopy for acromioclavicular joint reconstruction surgery

Type of associated intraarticular lesions	Number
Labral injury	21
SLAP 1	10
SLAP 2	4
SLAP 3	2
SLAP 5	1
Anterior partial tear	2
Superior labral	2
Long head of biceps tendon injury	11
Fraying	2
Ruptured	1
Tendinosis	8
Rotator cuff injury	9
Partial supraspinatus tear	7
Partial supraspinatus with subscapularis tear	1
Complete supraspinatus tear with partial subscapularis tear	1
Chondral injury	4
Both humeral head and glenoid involvement	3
Shallow Hill Sachs lesion	1
Others	6

Subgroup analysis showed that patients with Rockwood IV injuries tend to present late (n=7, 87.5%) compared to patients with Rockwood V injuries (n=9, 27.3%) ($p<0.005$). We also found that patients from a younger age group (below 35 years old) more commonly sustain Rockwood type V injuries (n=24, 92.3%) compared to those from an older age group (n=9, 60.0%) ($p<0.05$). No difference concerning etiology, mechanism of injury, and the kind and frequency of concurrent intraarticular lesions was found between the age groups, chronicity, and between different Rockwood types.

4. Discussion

Several observational studies discussing associated intraarticular lesions in ACJ separations have been reported, ranging from 40 patients to 376 patients[23-27, 29]. In our study, a cohort of 41 patients with high grade ACJ separation is presented. As shown in previous reports, males of the young productive age group more commonly suffer from high grade ACJ separations than females [4, 30]. Similarly, we only had one female patient in our cohort (male: female ratio 40:1). Most of our patients (n=26, 63.4%) also belong to the young age group (below 35 years of age).

We found that regardless of age, our patients most oftenly sustained their injuries during a road traffic accident (n=29, 70.7%). This contrasts with other reports in which ACJ

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injuries were more commonly sustained during a sporting activity [26, 30, 31]. We only had four patients (9.8%) who suffered an ACJ dislocation during sports. Even with the increasing incidence of road traffic accidents, no study has yet relate it as a cause of ACJ injury [32-35].

Amongst the high grade ACJ injuries, Rockwood type V injuries are the most frequently reported and Rockwood type VI injuries are very rare [26]. We encountered no Rockwood type VI injury during our study. 80.5% (n=33) of our patients suffered from Rockwood type V injuries. This number is higher in the younger age group (n=24, 92.3%) compared to the older age group (n=9, 60.0%) ($p<0.05$). Curiously, our data shows that patients with Rockwood V injuries tend to present early (n=24, 72.7%) compared to those with Rockwood IV injuries (n=1, 12.5%). This may be due to the obvious cosmetic effect that Rockwood V injuries produce, compelling patients to seek medical treatment earlier.

It has been reported that the use of arthroscopy during ACJ stabilization surgery has allowed for the diagnosis of associated glenohumeralintraarticular lesions in up to 53% (range 15% – 53%) of cases [23-27, 29]. The percentage of concurrent intraarticular lesions in our series was higher at 65.9% (n=27). A total of 51associated intraarticular lesions were found with an average of 1.9 injuries per patient. We postulate that road traffic accidents are generally high energy injuries compared to sporting injuries, explaining why our patients are at a higher risk of developing concurrent intraarticular pathologies.

Majority of associated intraarticular lesions we found were labral tears (n=21, 41.2% of 51 total associated intraarticular lesions). We less commonly encountered long head of biceps tendon injuries, rotator cuff injuries, and chondral injuries compared to other reports [26]. Of the 27 patients that had a concurrent pathology, 20 (74.1%) of them (or 48.8% of all patients) required an additional debridement or repair for the concurrent pathology found. This is a very high figure compared to other studies published. Market et al. in a study of 163 patients reported that only 8.6% of all patients required additional reconstructive surgery [26]. Similarly, Pauly et al. in their series of 125 patients reported that 9% of all patients required some type of surgical reconstruction [24]. Arrigoni et al. reported a slightly higher figure with 29.5% out of 98 patients requiring additional surgery [27]. In our study, age group, mechanism of injury, injury chronicity, and injury classification did not have a significant effect on the types of associated intraarticular lesions encountered, and whether the patient required an additional surgical procedure or not.

Considering the fact that associated intraarticular lesions are common and many of the lesions require additional surgery, treating surgeons must maintain a high level of suspicion that an individual patient with ACJ injury has a concurrent intraarticular lesion. Arthroscopically assisted ACJ stabilization of high grade ACJ injuries furnish the surgeon with a mean to diagnose and treat these concurrent lesions accordingly. For surgeons who are using an open approach for ACJ stabilization, preoperative MRI should be considered to evaluate patients who may require an additional arthroscopic procedure. Arthroscopically assisted and open surgical treatment of high grade ACJ injuries were found to have similar outcomes after a minimum of two years follow-up [20]. Thus, it is the surgeon's responsibility to actively look for and treat associated intraarticular lesions in high grade ACJ injuries, regardless of what surgical method of ACJ stabilization the surgeon opts to use.

5. Conclusion

Our study showed a high incidence (65.9%) of associated intraarticular lesions seen in high grade ACJ dislocations, of which 74.1% of them required additional surgical treatment and could be missed by an open ACJ repair alone. These associated lesions can be diagnosed and treated concurrently during arthroscopic assisted ACJ stabilization surgery in order to avoid future surgery, additional rehabilitation time, and inferior outcomes.

6. Declaration

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