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Case report

BILATERAL OS ACROMIALE IN A DIVISION I BASKETBALL PLAYER

Christina D. Davlin ✉ and Dave Fluker

Department of Sport Studies, Xavier University, Cincinnati, OH, USA

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ABSTRACT

An unfused acromial epiphysis, called os acromiale, can become unstable and mobile when the deltoid contracts. This may cause pain and lead to impingement syndrome and rotator cuff tearing. After sustaining a direct blow to the right shoulder, a male division I basketball player was diagnosed with impingement syndrome and an os acromiale. Following failed conservative treatment, the athlete underwent arthroscopic subacromial decompression & debridement of the loose os acromiale in the right shoulder. One year later, following a fall on the left shoulder, the athlete was diagnosed with os acromiale, impingement syndrome and a superior labrum anterior-posterior (SLAP) lesion. Arthroscopic repair of the unstable type II SLAP lesion, together, with arthroscopic subacromial decompression, and resection of the os acromiale was performed on the left shoulder. Both surgeries were successful and the athlete was able to return to competition subsequent to completing a progressive shoulder rehabilitation program. Symptomatic os acromiale is rarely seen in young athletes. However, proper diagnosis and management is necessary for a successful recovery. Os acromiale should be considered as a part of the differential diagnosis in any athlete with rotator cuff impingement symptoms.

KEY WORDS: Injury, shoulder, athlete, rehabilitation, diagnosis

INTRODUCTION

Impingement syndrome is caused by the compression of the structures that lie between the humeral head and the acromion process. These structures include the rotator cuff tendons, long head of biceps brachii tendon, subacromial bursa, and glenohumeral joint capsule. Impingement syndrome can be caused by acute trauma or chronic overuse. However, the most common cause of impingement is from an anatomical variation in the contour of the coracoacromial arch that leads to mechanical wear (Neer, 1972; Neer, 1983). Bigliani and Morrison (1986) identified three types of acromion shapes and described them in terms of the grade of the anterior slope: type I is flat, type II is curved, and type III is hooked. Type III hooked acromion is commonly seen in patients with impingement syndrome (Bigliani et al., 1991; Kim et al., 1997), and is associated with a 70% incidence of rotator cuff tears (Bigliani and Morrison, 1986).

An unfused acromial epiphysis, called os acromiale, can also decrease the volume of the subacromial space and lead to impingement syndromes in some athletes (Bigliani et al., 1991; Norris et al., 1983; Swain et al., 1996). When the deltoid muscle contracts, it can cause inferior displacement of an unfused acromion fragment, thus impinging the rotator cuff (Warner et al., 1998; Wright et al., 2000). Furthermore, abnormal motion of the unstable segment at the fibrous union site may cause pain and rotator cuff tearing (Ryu et al., 1999).

Os acromiale is the result of the outer ossification centers of the acromion remaining unfused to the more proximal portion of the acromion. The separate ossification centers that emerge at the acromion epiphysis should fuse to the base of the acromion between the ages of 18 and 25

(Biglianai et al., 1991; Liberson, 1937). Presence of an os acromiale is relatively rare. In an anatomical study of 1198 human skeletons, Sammarco (2000) found 128 cases of os acromiale present in 96 skeletons (8%). In 33% of the skeletons with this anomaly, evidence of os acromiale was found bilaterally. However, the incidence of bilateral os acromiale has been found to be as high as 62% (Liberson, 1937).

CASE STUDY

Right Shoulder

A 19-year-old African-American, division I collegiate men's basketball player sustained a direct blow to the right shoulder during a game in the beginning of the season. The athlete had a long history of minor shoulder pain when performing overhead activities. Initial evaluation showed mild inflammation, point tenderness over the subacromial bursa, and limited active, passive, and resistive range of motion. The athlete was still functional and was able to complete the game. Following the game, the athlete was diagnosed with bursitis and impingement syndrome. He was treated with ice, electro galvanic stimulation (EGS), and anti-inflammatory medication. Two days later, the athlete was self splinting the right shoulder. There was swelling over the anterolateral aspect of the shoulder and fullness was felt over the subacromial bursa anterolaterally. The distal acromion was point tender along the dorsal aspect. Motion was painful in all ranges. X-rays revealed a type III hooked acromion with an os acromiale (Figure 1). The athlete was diagnosed with traumatic bursitis, impingement syndrome, and a possible symptomatic os acromiale.

The athlete was treated conservatively for the next 4 months. He was able to play throughout the season despite the pain in the right shoulder. At the conclusion of the basketball season, arthroscopic decompression was performed. The athlete underwent videoarthroscopic subacromial bursectomy, resection of the coracoacromial ligament, abrasion & debridement of the loose os acromiale, and abrasion of the acromion. The athlete was placed in a Vel Peau immobilizer. Postoperatively, the athlete began a progressive shoulder rehabilitation protocol (Table 1). The athlete continued to improve despite frequently missing therapy appointments. Four weeks after surgery the athlete could fully flex the right shoulder without pain. He demonstrated good strength and range of motion. The athlete returned after summer break in August completely asymptomatic. He was lifting weights and playing daily with no problems.

Left Shoulder

Interestingly, during a follow-up visit with the team physician for the right shoulder, the athlete complained of intermittent symptoms of pain in the left shoulder. X-rays revealed a type III acromion with os acromiale (Figure 2). He had mild laxity but no apprehension and reasonably good rotator cuff strength. The doctor was unable to elicit any pain over the acromioclavicular joint. The athlete was diagnosed with impingement syndrome and treated conservatively with ice and nonsteroidal antiinflammitory drugs (NSAIDs). At this time, the athlete also began maintenance exercises for strengthening the rotator cuff and scapular stabilizing muscles.

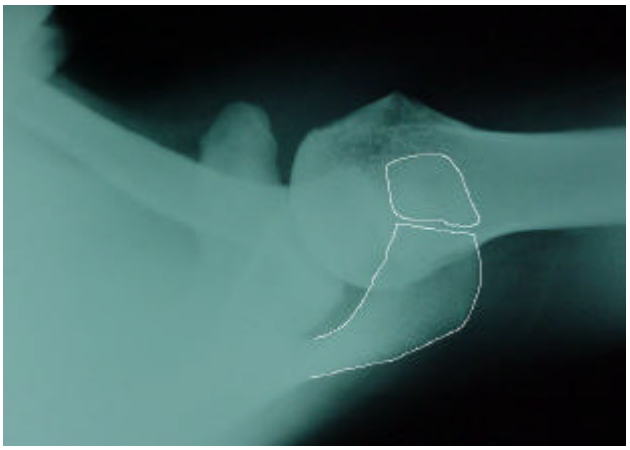

Figure 1. Axillary view of the Right Shoulder. Acromion and os acromial are outlined.

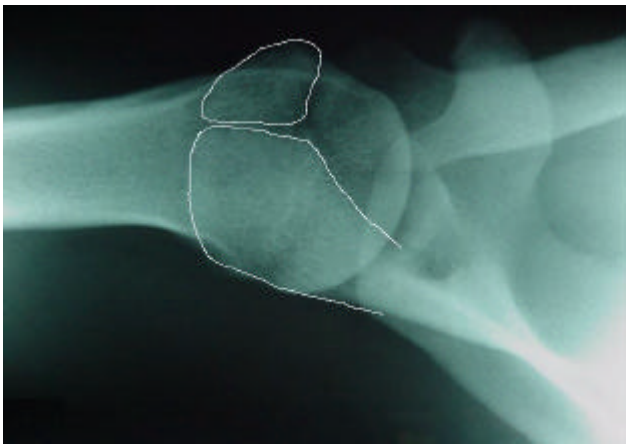

Figure 2. Axillary view of the Left Shoulder. Acromion and os acromiale are outlined.

Table 1. Progressive Shoulder Rehabilitation Program

	Phase I Weeks 1-2	**Phase II Weeks 3-4**	**Phase III Week 4 - Return**
Goals	Increase ROM	Increase ROM Increase Strength	Increase ROM Increase Strength
Modalities	VMS* over supraspinatus & deltoid tendons (10 seconds on - 20 seconds off) Ice post activity	VMS* over supraspinatus & deltoid tendons with forward flexion up to 90 Ice post activity	VMS* over supraspinatus & deltoid tendons with forward flexion up to 90 (add weight) Ice post activity
Range of Motion Exercises	Rehabilitation Wand Lying Supine • flexion • internal/external rotation • horizontal adduction/abduction Codman's Exercises	continued from phase I	continued from phase II
Strengthening Exercises	Isometric Exercises • extension • adduction • internal/external rotation	Theraband Tubing (yellow) • internal/external rotation • forward flexion Sidelying (no weight) • internal/external rotation Standing (no weight) • forward flexion	Theraband (red or blue) • internal/external rotation • forward flexion/extension • rowing Impulse • internal/external rotation • forward flexion/extension Prone (no weight) • horizontal abduction • rows Standing (light weight) • forward flexion

* VMS; Variable Muscle Stimulator (Vectra by Chatanoga)

Seven weeks later the athlete sustained a direct fall onto the lateral side of the left shoulder during practice. He had significant pain and was unable to raise the left arm without pronounced pain. The athlete was not able to complete practice. Upon further examination, point tenderness was felt in the anteromedial deltoid area. Range of motion was painful and limited. There was 1+ inferior laxity with trace anterior translation and trace to 1+ posterior translation of the left shoulder. Supraspinatus strength testing revealed pain and weakness. The apprehension, empty can, and drop arm tests were positive. X-rays were negative. The athlete was diagnosed with an acute rotator cuff strain involving the supraspinatus muscle with a possible glenoid labrum tear. The athlete was placed in a sling for a few days and was initially treated with ice, EGS, and anti-inflammatory medication. The athlete was further treated with the use of modalities together with aggressive rotator cuff and scapular rehabilitation exercises. Unfortunately, the athlete did not fully comply with the rehabilitation program and developed rotator cuff tendinitis which remained unresolved for the remainder of the season.

Four months after the initial injury, an MRI revealed a large posterior-superior labrum tear. He was further diagnosed with left shoulder rotator cuff tendinitis, impingement, and a hypermobile os acromiale. At the end of the season, one year after having surgery on his right shoulder, the athlete underwent arthroscopic repair of the unstable type II SLAP lesion, together, with arthroscopic subacromial decompression, partial coracoacromial ligament release and resection of the os acromiale. The os acromiale fragment was 3 mm and was removed leaving a smooth border with no prominent bony spurs. Surgical repair was successful with no complications.

Once again, adherence to the rehabilitation program was a problem with the athlete frequently missing therapy. This lead to weak rotator cuff musculature, tendinitis, and eventually to subacromial bursitis near the end of the following season. These factors contributed to a decreased skill level. At the conclusion of the season, the athlete refused further treatment and left the team.

DISCUSSION

Abnormal acromion architecture is rarely seen in young athletes (Payne et al., 1997). In this population, muscular imbalance and instability are more often cited as the contributing factors to impingement syndrome (Jobe and King, 1989). Nevertheless, proper identification of a sloped acromion or an unfused epiphysis is important due to its association with chronic shoulder pain and impingement syndrome (Neer, 1983; Bigliani et al., 1991). Type II and III acromion, and os acromiale can best be identified through use of radiographs. The anteroposterior (AP) views of the shoulder can show the distance between the inferior acromial surface and the superior humeral head. The axillary view allows the viewing of an abnormal acromial ossification center or of an acromial fracture (Cloud, 1997). Several authors have stressed the importance of distinguishing an os acromiale from a fractured acromion process (Liberson, 1937; Dennis et al., 1986; Miles, 1994). This view is also meaningful, because it allows observation of the specific nonfusion sites of the os acromiale (Uri et al., 1997). The coracoacromial arch can be viewed using a posteroanterior (PA) axial oblique view, also known as a modified Y-outlet or acromial view. This allows visualization of the curve of the acromion along with any acromial spurs on the anterior or inferior surface (Cloud, 1997). Magnetic resonance imaging can also be used to identify os acromiale along with rotator cuff damage (Park et al., 1994).

The optimal treatment for symptomatic os acromial remains controversial. Typically treatment for os acromiale begins with the conventional conservative treatment for impingement syndrome (Swain et al., 1996). Rest, ice, and NSAIDs can reduce inflammation in the shoulder and decrease the symptoms. If symptoms persist, ultrasound or electrical stimulation may be employed to decrease the swelling in the subacromial space (Swain et al., 1996). Steroid injections may also alleviate the symptoms (Jerosch et al., 1991). Jerosch et al. (1991) found that an injection of cortisone decreased a patient's pain and increased her range of motion. If conservative management has failed over a period of 6 weeks to 6 months, surgical intervention may be warranted (Swain et al., 1996; Matsui, 2000).

The surgical literature has not yet clearly established the most effective treatment for athletes with symptomatic os acromiale. Recently, modified subacromial decompression has shown success in patients with impingement syndromes secondary to an unstable os acromiale. The goal is to create a flat acromion by burring the inferior acromion surface to leave only a thin cortical shell that is incapable of impinging the rotator cuff with shoulder motion (Wright et al., 2000). Along with subacromial decompression, the unfused acromial fragment must also be addressed (Ryu, 1999). Hutchinson and Veenstra (1993) performed arthroscopic subacromial decompression on three patients with impingement secondary to os acromiale without either removing or fusing the unstable segment. Although all three of the patient's symptoms were initially alleviated, one year later they were again symptomatic (Hutchinson and Veenstra, 1993).

Several authors recommend arthroscopic removal of small fragments (less than 4 mm) because it does not disrupt the attachment of the deltoid muscle or alter it's function (Swain et al., 1996; Ryu et al., 1999; Bigliani et al., 1983; Mudge et al., 1984). The deltoid muscle originates on the acromion process, consequently, removal of large fragments can result in abduction weakness (Swain et al., 1996). It has been suggested that despite the difficulty, large unstable fragments should be fused to prevent displacement (Norris et al., 1983). However, fusion or internal fixation prevents the use of subacromial decompression of the shoulder, which may be needed for a successful recovery (Edelson et al., 1993).

Because os acromiale may cause chronic shoulder pain and lead to subacromial pathology, it should be part of the differential diagnosis in any patient with rotator cuff impingement symptoms (Sterling et al., 1995). Yet, identification of this anomaly does not ensure that it is the source of the symptoms (Burkhart, 1992). Burkhart (1992) reported a case of a 29-year-old tennis player with os acromiale, who played professionally for 7 years without shoulder pain. Furthermore, several authors have described patients with os acromiale that were asymptomatic until a single traumatic episode that lead to either impingement syndrome or a rotator cuff tear (Swain et al., 1996; Hutchinson and Veenstra, 1993; Mudge et al., 1984). Therefore, a thorough evaluation should be completed before attributing the cause of the symptoms to an os acromiale and determining the course of the treatment.

CONCLUSION

This case presented a division I basketball player with bilateral os acromiale and impingement syndrome. Following failed conservative treatment both shoulders were surgically repaired. The surgical intervention combined with the subsequent progressive rehabilitation programs allowed the athlete to return to high level athletic performance. Unfortunately, the athlete's lack of motivation and compliance with continued therapy during the basketball season following the last surgery resulted in more chronic shoulder problems.

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AUTHORS BIOGRAPHY:

Christina D. DAVLIN

Employment

Ass. Prof., Department of Sports Studies, Xavier University

Degrees

Ph.D., ATC/L

Research interest

Athletic injuries in college athletes, motor behavior of athletes, spatial orientation of gymnasts

Email: davlin@xu.edu

Dave FLUKER

Employment

Ass. Athletic Trainer, Xavier Univ.

Degrees

Med, ATC/L

Research interest

Athletic injuries and rehabilitation in the collegiate population.

Email: fluker@xu.edu

✉ **Ass. Prof. Christina Davlin**

Department of Sport Studies, Xavier University, 3800 Victory Ave., Cincinnati, OH, 45207, USA