Coracoid Process Fracture With Acromioclavicular Joint Separation in an American Football Player: A Case Report and Literature Review

Matthew DiPaola, MD, and Paul Marchetto, MD

Abstract

Coracoid process fractures are rare and few cases have been reported in the orthopedic literature. In this article, we report the case of an American football player with a coracoid process fracture in the setting of acromioclavicular separation and describe incidence, mechanism of injury, and treatment.

Although rare, coracoid process fracture should be considered in the differential diagnosis for shoulder pain. Treatment varies according to fracture type. Based on our literature review, we recommend that clinicians initially treat nondisplaced coracoid fractures nonoperatively.

Coracoid process fractures are relatively rare and have been estimated to account for 3% to 13% of all scapular fractures, with scapular fractures in turn accounting for only 1% of all fractures.[1] Kaplan and colleagues[2] found that 50% of 336 collegiate American football players had a history of shoulder injury, 41% of which were acromioclavicular (AC) joint injuries. None of these football players had a history of coracoid fracture.

Coracoid fractures and ipsilateral shoulder injuries often occur concurrently. Ogawa and colleagues[1] found that 37 of 67 coracoid fractures were associated with ipsilateral AC dislocations. With the incidence of AC injury as high as it is in the football population, it is incumbent upon the sports medicine physician and general orthopedist to remain cognizant of the potential for concurrent coracoid fracture and shoulder injury. There is evidence that, of the athletes who sustain this injury, football players perhaps are at highest risk.[3-5]

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Case Report

A 15-year-old boy injured his right shoulder while playing in a high school football game. At time of presentation, he reported that he had been carrying the ball and was tackled from the front and side while he was lowering his shoulder. He complained of pain over the AC joint and vague pain over the anterior deltoid. On examination, forward flexion was restricted to 150º, and he was tender to palpation over the AC joint and coracoid process. In addition, he had pain with cross-body adduction of the symptomatic arm. Anteroposterior (AP), lateral, and axillary radiographs of both shoulders were obtained. The AP radiograph showed a nondisplaced fracture of the coracoid and a grade II AC separation (Figures 1, 2). Radiographic examination of the asymptomatic shoulder confirmed that the growth plates in this region were closed. The patient was treated conservatively, with a sling, and he was advised not to participate in sports until fracture healing was confirmed on follow-up.

The patient returned at 8 weeks for follow-up. On examination, both shoulders had full active and passive range of motion, and the patient was nontender to palpation. Follow-up radiographs in 3 planes showed a fully healed coracoid (Figures 3, 4). The patient was cleared for full athletic participation in contact and collision sports.

We have obtained the patient's guardian's informed, written consent to publish the case report.

Discussion

Paramount to diagnosing coracoid fracture are taking a thorough history,

Dr. DiPaola is currently Shoulder and Elbow Fellow at the NYU Hospital for Joint Diseases, New York, New York. He was a resident at Thomas Jefferson University at the time the article was written.

Dr. Marchetto is Associate Professor, Department of Orthopedic Surgery, Thomas Jefferson University Hospital, Rothman Institute, Philadelphia, Pennsylvania.

Address correspondence to: Matthew DiPaola, MD, Hospital for Joint Diseases, 301 E. 17th St, New York, NY 10003 (e-mail, matthew.dipaola@nyumc.org).

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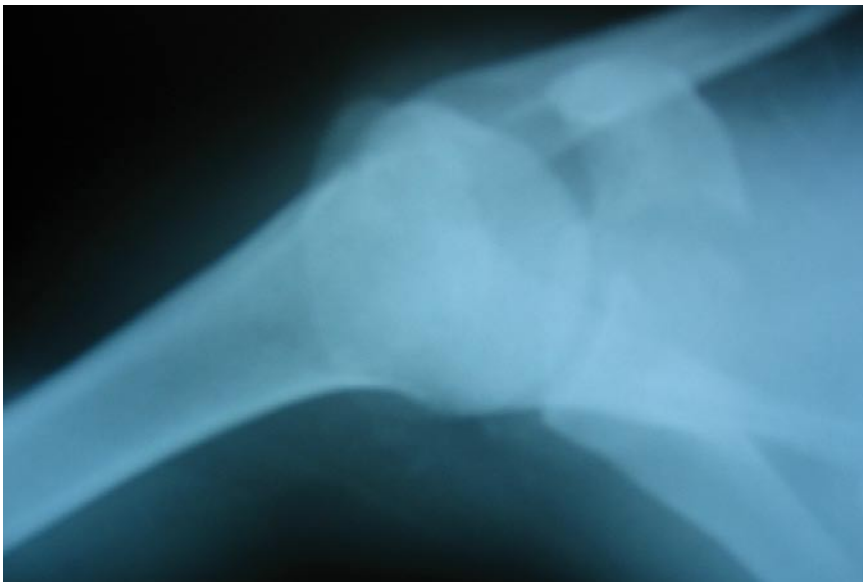

Figure 1. Initial-presentation axillary radiograph shows coracoid process fracture.

Figure 2. Initial-presentation scapular Y radiograph shows coracoid process fracture.

performing a physical examination with a focus on mechanism of injury, and maintaining a high index of suspicion. Standard plain radiography, consisting of 3 shoulder views, may not be revealing, and further studies, such as radiograph at 45° to 60° cephalad tilt, computed tomography, and magnetic resonance imaging, may be necessary. The literature offers some guidance with respect to treatment and classification of this injury.

The largest series of coracoid fractures, which originated outside the United States, consisted of 67 cases[1] and 12 cases.[6] Most commonly, these injuries occur by means of direct trauma, motor vehicle accidents, or falls.[1,6,7]

According to our literature search, the largest US series consisted of only 4 cases, 2 involving football players.[8] Only 6 cases of coracoid fractures have been reported in American football players.[8-12] Mechanism of injury was either direct trauma to the shoulder or a fall. Two patients were treated surgically. One coracoid fracture was found unexpectedly at surgery in a patient with negative radiographs.[12] Another was found in an unusual case in which there was a full tear of the coracoclavicular (CC) ligament.[11] Five patients (2 treated surgically, 3 treated conservatively) had minimal cosmetic deformity with full painless range of motion at a minimum 6-week follow-up.[8,10-12] One patient (treated conservatively) had an unknown posttreatment course.[9]

Mechanism of Injury. At least 3 mechanisms of injury have been proposed for coracoid fractures. (1) The first is direct trauma to the anterior lateral chest, such as occurred in a trapshooter.[13] (2) The second is thought to be from a continuum of similar forces which generates the AC dislocation.[11] Typically, this dislocation occurs with a direct blow to or fall on the AC joint. The direct force displaces the acromion caudad while the coracoid is pulled with the clavicle by the CC ligament cephalad. If the force is sufficient, the coracoid may be avulsed or fractured from its base. (3) The last is when a resisted flexion of the arm and elbow leads to a forceful pull of the muscles that insert into the coracoid—the pectoralis minor and the coracobrachialis.[11,14] As with the second mechanism, there is an avulsing force, but through different structures. Asbury and Tennent[5] reported on the unusual case of a cricket player who sustained an avulsion fracture of the coracoid through throwing (no direct trauma). It is unknown which of these mechanisms is more critical in the development of the injury. Some studies have implicated a combination of mechanisms to explain a particular injury pattern.[11]

"[For] diagnosing coracoid fracture....further studies, such as radiograph at 45°to 60°cephalad tilt, computed tomography, and magnetic resonance imaging, may be necessary."

Classification by Radiographic Appearance. Other authors have attempted to classify coracoid fractures according to their radiographic appearance. After retrospectively analyzing 12 cases, Eyres and colleagues[6] proposed a 5-grade system: (I) avulsion of the tip of the

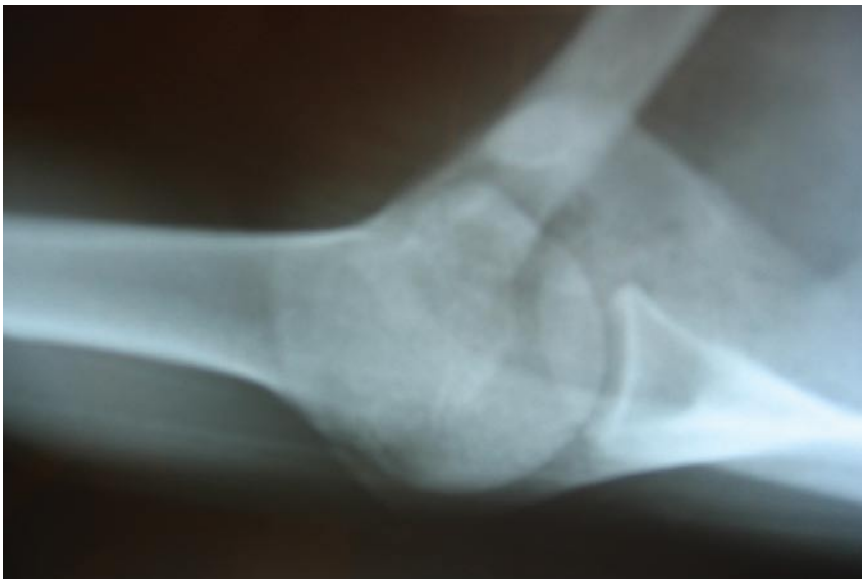

Figure 3. Follow-up axillary radiograph shows healed coracoid process fracture.

Figure 4. Follow-up scapular Y radiograph shows healed coracoid process fracture.

coracoid; (II, III) fracture of the body of the coracoid; (IV) fracture at the base of the coracoid; and (V) fracture at the base with glenoid involvement. Another notation was made for clavicular involvement. After analyzing 67 cases, Ogawa and colleagues[1] created a simpler system based on the position of the fracture relative to the CC ligament: posterior (I) and anterior (II) to the attachment of the CC ligament. These authors have used these systems to roughly guide therapy, though associated injuries have historically played a significant role in determining treatment plans.

Treatment. No randomized controlled trials have evaluated treatments of coracoid fractures. Eyres and colleagues[6] recommended conservative treatment for all nondisplaced fractures and for displaced grade I–III fractures and recommended surgical stabilization for grade IV–V fractures and for fractures combined with dissociation of the clavicle and scapula. Ogawa and colleagues[1] reported treating "relatively stable" type II fractures nonoperatively, except those associated with other shoulder injuries. However, Ogawa and colleagues operated on a majority of type I fractures (31/53) with mostly excellent results. Incidentally, these fractures were most often associated with other, concurrent shoulder injuries. In light of new evidence regarding successful conservative treatment for "floating shoulder" injuries, it is unclear whether the same operative course would now be recommended for these patients.[15] More study is needed.

Our literature review indicates that surgeons have taken multiple approaches in the surgical treatment of coracoid fractures. For fractures with associated AC pathology, some have opted to address only the AC joint,[8,9,16,17] and others have found that surgical reduction of the coracoid reduced the AC indirectly.[12] Ogawa and colleagues[1] favored a single malleolar screw for fixation of the coracoid with concurrent wiring of a fractured clavicle or AC dislocation. They recommended treating concurrent AC dislocation and stable coracoid fracture as one treats simple AC dislocations.

Conservative therapies have historically involved applying an AC immobilizer, a sling, or a Velpeau bandage.[8,10]

Conclusions

Coracoid fractures are uncommon. They occur in the context of trauma, as in motor vehicle accidents. However, a significant percentage of these injuries occur in the nontrauma population—in athletes, football players in particular. Coracoid fracture should be part of the differential diagnosis for football players being evaluated for shoulder pain. Mechanism of injury should be elicited from these patients during history taking and the physical examination. Treatment should be dictated by presence of concurrent injury, fracture location, and degree of displacement.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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Commentary

Acromioclavicular (AC) joint separation is a common injury that most typically occurs because of disruption of the suspensory ligaments between the coracoid and clavicle as well as disruption of the acromioclavicular joint capsule. Articles such as this one by DiPaola and colleagues help remind the practicing orthopedic surgeon that every injury is unique and that even straightforward-appearing injuries can hide significant pathology. Thorough evaluation of every patient, especially in the trauma setting, is necessary to avoid the pitfall of missing injuries such as this.

The authors use a fairly straightforward case with successful outcome by closed management to highlight the importance of heightened clinical suspicion and thorough evaluation. Their clear review of the literature and recommendations regarding the evaluation and treatment of these patients are helpful, allowing the orthopedic surgeon to deal with this problem appropriately. Clinical presentation in AC joint separations associated with coracoid fractures may be very similar to those occurring because of ligament disruption alone. The severity of trauma should be taken into account. If radiographic evaluation raises suspicion but is nondiagnostic, the surgeon should consider a Velpeau axillary view or computed tomography (CT) scan for better delineation of the coracoid. CT scan will also help guide treatment and should clearly differentiate displaced from nondisplaced injuries.

This case presentation by DiPaola and colleagues reinforces the fact that nonoperative management can be successful in the treatment of this injury. The surgeon should have a clear understanding of the coracoid anatomy, especially the close relationship of the suprascapular nerve, if open reduction and internal fixation is planned. Reports such as this reinforce the adage that there may be a snake under every rock, and it is helpful for surgeons to keep in mind these rare presentations of somewhat common injuries so that a more thorough evaluation is undertaken with each and every patient.

Xavier A. Duralde, MD
Atlanta, GA

This paper will be judged for the Resident Writer's Award.