Corrective Osteotomy for Ipsilateral Distal Clavicular and Coracoid Malunions

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Abstract

Malunion after double disruption injuries of the superior shoulder suspensory complex accompanied by shoulder pain and dysfunction has been reported infrequently. A 37-year-old man had a double disruption injury (fractures of the distal clavicle and the base of the coracoid process). Conservative treatment resulted in malunion. Twelve months after the injury, pain continued in the coracoclavicular interval, and there was only 125° forward shoulder elevation. Radiographs showed 50° inferior angulation of the distal clavicle and elongated base of the coracoid process. Corrective osteotomy was required; however, the concomitant malunion of the coracoid prevented correction of the deformity with osteotomy of the distal clavicle alone. Therefore, osteotomy of the coracoid was performed. Twelve months postoperatively, successful bone union resulted in loss of pain. Forward elevation had recovered to 160°. Distal clavicular fractures with concomitant coracoid fractures are often significantly displaced, which disrupts physiologic coupling of clavicular and scapular motion and limits forward elevation. In the case of such malunions, excessive movement at the clavicle-scapula junction during mobilization causes pain in the coracoclavicular interval. Correction of this deformity requires osteotomy of both the clavicular and coracoid malunions. [Orthopedics. 2015; 38(8):e742-e745.]
The superior shoulder suspensory complex, which is composed of 2 struts of the clavicle and the lateral scapular body that support a ring consisting of the glenoid process, coracoid process, distal clavicle, and acromial process, maintains a normal, stable relationship between the upper extremity and the axial skeleton. When this complex sustains double disruptions in which its connection breaks in 2 places, its structure becomes unstable. These conditions are associated with a high rate of non-union or malunion. Various combinations of injuries can cause double disruptions, including fractures of the distal clavicle and coracoid. To the author’s knowledge, there have been no previous reports of malunion accompanied by dysfunction caused by this combination of injuries. This report describes a case of concomitant distal clavicle and coracoid fractures and successful surgical management of the resulting malunion with double disruption.

**Case Report**

A 37-year-old right-hand–dominant man who worked as a computer programmer had left-sided ipsilateral fractures of the distal clavicle and base of the coracoid process as well as left rib fractures after a fall down stairs. He had no other health problems. He was treated conservatively by a local physician, and fracture union occurred. Despite intensive physiotherapy, he had pain and limited forward shoulder elevation. He was referred to the author’s institution 12 months after the injury because of lack of improvement.

On admission, motion induced pain in the coracoclavicular interval. The angle of active and passive forward elevation was limited to 125° for the left arm. However, there were no remarkable limits in external rotation of 70° and internal rotation to T8 compared with the contralateral right shoulder, which showed forward elevation of 170°, external rotation of 80°, and internal rotation to T7. Radiography showed 50° of inferior angulation of the distal third of the clavicle in relation to the middle third and elongation of the coracoid at its base (Figure 1). Computed tomography scan confirmed fracture union, and no coracoclavicular ligament tear was seen on magnetic resonance imaging scan (Figure 2), suggesting that the pain and limited forward shoulder elevation resulted from malunion with double disruption of the superior shoulder suspensory complex. Corrective osteotomy was performed.

A saber-cut incision was performed, and the clavicular malunion was exposed. Osteotomy of the distal clavicle was performed upward along the convex malunion, perpendicular to the distal clavicle, with a micro-bone saw. The sharp upper end of the proximal fragment was impacted into the distal fragment to correct the upward convex deformity. However, the proximal fragment impinged on the elongated coracoid with malunion, so the correction was incomplete. The deltoid muscle was then detached from the anterior clavicular border, exposing the anterior coracoid base with blunt dissection between the conjoint tendon and the pectoralis minor. The posterior cora-
coid base was exposed with a trapezius-splitting approach in which the trapezius is divided and the supraspinatus muscle is moved posteriorly en bloc. The entire coracoid base was exposed by connecting the anterior and posterior coracoid subperiosteally to protect the neurovascular bundle, particularly the supraspinal nerve. An additional shortening osteotomy was performed at the base of the coracoid process with a curved chisel, partially resecting the osteotomy section with a rongeur from the posterior side of the coracoid. This maneuver completely corrected the distal clavicle malposition. The clavicular osteotomy site was fixed with a clavicular hook plate, which was necessary in this case because the distal clavicular fragment was too short to maintain the corrected position without the transacromial fixation provided by the hook. The coracoid osteotomy site was then fixed by inserting a cannulated cancellous screw from the coracoid to the neck of the scapula (Figure 3). The patient was placed in an arm sling for the first 3 weeks, with active range of motion of only the elbow, wrist, and hand allowed. Then passive and active range of motion exercises were begun, with forward elevation limited to 90° and external and internal rotation to tolerance, and continued until the plate and screws were removed.

Bone union occurred, and the plate and screws were removed 6 months after surgery, followed by full range of motion exercises focusing on forward elevation. At the latest follow-up, 12 months after corrective osteotomy and 6 months after plate and screw removal, the patient had no pain. The forward elevation angle had recovered to 160° without postoperative changes in external rotation of 70° and internal rotation to T8 (Figure 4).

**DISCUSSION**

Previous reports discussed shoulder malunions accompanied by pain and dysfunction that resulted in double disruptions, called a “floating shoulder.”

The limited forward shoulder elevation in these reports resulted from a markedly deformed scapular neck. However, patients with markedly short malunions in isolated clavicle shaft fractures can have scapular malposition. Shoulder elevation is limited by anterior tilt malpositioning resulting from a decreased posterior tilt angle of the scapula during arm elevation.

Floating shoulder malunions are believed to cause dysfunction because of the combination of clavicular and scapular deformities.

Isolated fractures of the distal clavicle or coracoid without coracoclavicular and acromioclavicular ligament injury do not result in major fracture displacement. In the current case, the distal clavicular fracture caused loss of stability because of the coracoclavicular ligament injury from the coracoid fracture, with marked angular displacement. Inman et al. noted that excursion of the scapulothoracic joint during maximum shoulder elevation was 30° at the sternoclavicular joint, with 40° of posterior axial rotation of the clavicle. That is, the motions of the sternoclavicular joint and the clavicle are transmitted from the distal clavicle to the scapula through the coracoclavicular ligament and acromioclavicular joint, functioning similarly to a crankshaft. Shoulder elevation occurs when the glenoid is rotated upward with the scapula.

In the current case, the anatomic relationship between the clavicle and the scapula was disturbed by malunions of the distal clavicle and coracoid. Therefore, scapular movement was limited and the forward shoulder elevation angle decreased. Intensive physiotherapy to expand forward shoulder elevation required excessive movement at the clavicle-scapula junction, causing pain in the coracoclavicular interval.

This example is very rare and would not be expected to be seen commonly, but it shows that deformities resulting from fresh double disruption injuries must be corrected precisely in young, active patients. The remarkable malunions that develop can cause serious shoulder mobility disorders. It is difficult, if not impossible, to correct malunion with double disruption by performing an osteotomy at only 1 site. Adequate correction requires osteotomy at all sites of malunion.
REFERENCES


