Technical Note

Arthroscopic Management of a Coracoid Fracture Associated With Acromioclavicular Dislocation: Technical Note

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Abstract: Operative management of a coracoid process fracture is indicated in case of painful nonunion, displacement of more than 1 cm, or multiple disruptions of the superior shoulder suspensory complex. Several techniques have been described with open reduction of the fracture and internal fixation using cortical screws with or without additional fixation of the acromioclavicular joint. This Technical Note aims to introduce an alternative safe, minimally invasive method for arthroscopic fixation of a coracoid fracture with simultaneously reduction of the acromioclavicular joint. The described arthroscopic technique might be helpful for shoulder surgeons who want to fix the coracoid process while avoiding the disadvantages of an open approach.

Fractures of the scapula are rare,[1] and the coracoid process is affected in only 2% to 13% of all scapular fractures.[1,2] A coracoid fracture is classified according to the Ogawa classification as type I if it is proximal to the coracoclavicular ligaments and as type II if it is distal to the ligaments and preserves the scapular-clavicular connection.[3] The coracoid process plays an important role in the configuration of the coracoacromial arch. Disruption of these anatomic structures, proposed as the superior shoulder suspensory complex (SSSC),[3] can lead to functional impairment. Although an isolated fracture with no or minimal displacement may be treated conservatively, multiple disruptions of the SSSC may result in nonunion due to instability of the shoulder girdle.[1-3]

Operative management is indicated in case of painful nonunion, displacement of more than 1 cm, or multiple disruptions of the SSSC.[1,4] The management of a coracoid process fracture with acromioclavicular joint dislocation is described either by fixation of the coracoid process alone[5] or by additional acromioclavicular joint fixation.[6] Various surgical techniques have been proposed for fixation of the coracoid process, most using open reduction and internal cortical screw fixation.[4-6]

To our knowledge, arthroscopic-assisted reduction with internal screw fixation has not yet been described. The following technique permits the arthroscopic anatomic reduction and fixation of the coracoid process, simultaneously providing stability of the acromioclavicular joint.

Technique

Indications, Patient Evaluation, and Imaging

The indications for operative management of a coracoid fracture are displacement of more than 1 cm on radiographic evaluation, multiple disruptions of the SSSC (e.g., in case of acromioclavicular joint dislocation), or a painful nonunion. In such cases, operative fixation of the coracoid fracture has to be considered to avoid resulting shoulder dysfunction.

At clinical evaluation, a coracoid process fracture is typically painful on palpation of the coracoid process. The vertical and horizontal stability of the acromioclavicular joint should also be tested, and a neurologic examination of the upper limb should be performed.

Routine imaging of the coracoid process includes an axillary view, which is the more reliable view to assess a coracoid fracture,[1] and an anteroposterior view. The anteroposterior view could suggest a coracoid process fracture in case of acromioclavicular joint separation

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The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received April 17, 2020; accepted July 30, 2020.

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2212-6287/20719

https://doi.org/10.1016/j.eats.2020.07.019

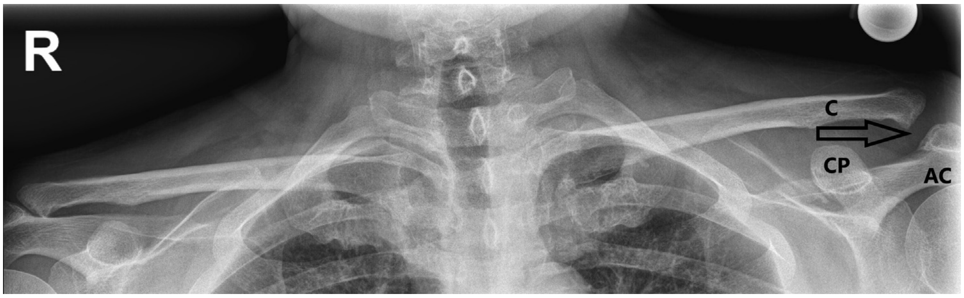

Fig 1. Standardized panoramic anteroposterior radiograph showing a left acromioclavicular joint dislocation (arrow) with the same coracoclavicular distance on both sides, suggesting a coracoid process (CP) fracture. The examination is performed with the patient standing upright with the arms in 0° of abduction and neutrally rotated. (AC, acromion; C, clavicle; R, right.)

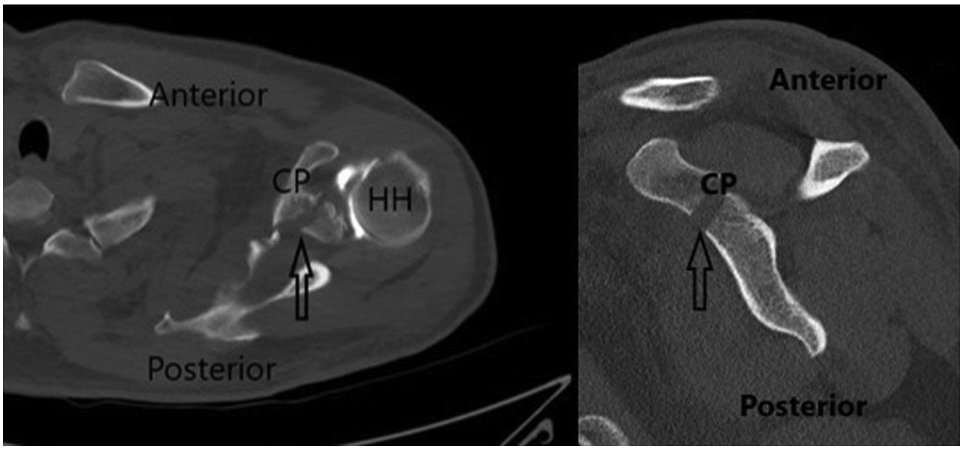

Fig 2. Computed tomography scan of a left shoulder (axial and sagittal views) showing a coracoid process (CP) base fracture with displacement of 8 mm (arrows). The examination is performed with the patient supine and the arm in neutral rotation. (HH, humeral head.)

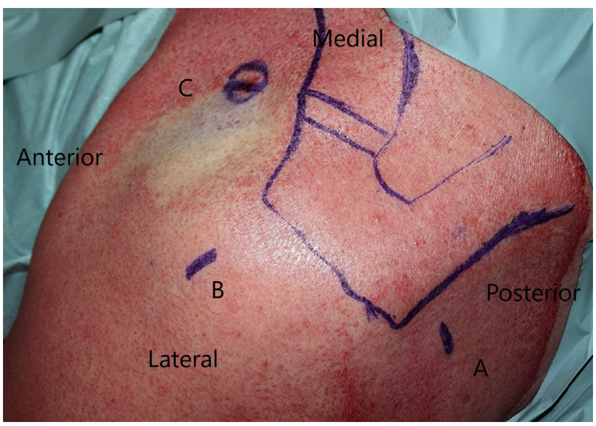

Fig 3. Portal placement in a left shoulder with the patient placed in the supine beach-chair position: standard initial dorsal portal (A), anterolateral portal (B), and anterior portal (C) at the level of the coracoid.

without increased coracoclavicular distance in comparison to the healthy side (Fig 1). A computed tomography scan is performed to confirm the diagnosis (Fig 2).

Patient Positioning and Preparation

After administration of an interscalene nerve block and general anesthesia, the patient is placed in the supine beach-chair position. The shoulder is disinfected and draped in a standard fashion. The arm is placed in a hydraulic arm holder (Trimano Fortis Support Arm; Arthrex, Munich, Germany).

Arthroscopic Portals and Debridement

Overall, we use 3 arthroscopic portals for diagnostic arthroscopy, fracture reposition, and screw fixation (Fig 3). We alternately use 30° and 70° arthroscopes

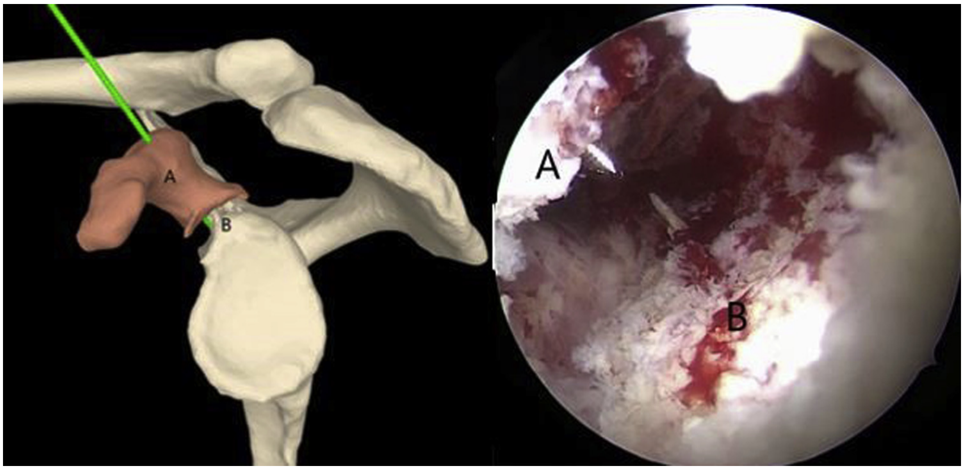

Fig 4. Three-dimensional com puted tomography illustration and arthroscopic view of coracoid fracture after debridement of fracture hematoma. The fracture is mobilized with an arthroscopic probe placed between the coracoid fragment and the coracoid base. Under direct visual control, a 1.6-mm Kirschner wire is positioned through the base of the coracoid fragment (A) to reduce the fracture on the coracoid base (B).

during shoulder arthroscopy. Accurate portal placement is important to access the coracoid fracture.

Portal 1 (Posterior). First, we establish a standard dorsal viewing portal, placed 2 cm medial and 2 cm inferior to the posterolateral corner of the acromion in line with the glenohumeral joint. Thereby, concomitant intra-articular or subacromial pathology can be excluded.

Portal 2 (Anterolateral). The second portal is created with a direct view from portal 1. Thereby, the ideal position of the portal is first ensured with a needle. This portal should allow good access and a view of the lateral coracoid tip to the base and is finally placed about 2 cm lateral to the anterior tip of the acromion. The rotator interval is opened, and obstructing bursa and hematoma are débrided around the coracoid with a shaver (Aggressive Pro Line Shaver Blade; Karl Storz, Tuttlingen, Germany).

Portal 3 (Anterior). The third portal is used for screw fixation and is placed straight anterior, just above the coracoid.

Fracture Reposition and Fixation

After débridement of the surrounding bursa and fracture hematoma, the fracture is mobilized with an arthroscopic probe. Under direct visual control, a 1.6-mm Kirschner wire is positioned through the base of the coracoid process (Fig 4), then used as a joystick for fracture reduction, and finally, further advanced through the fracture side into the scapular body.

By use of a conventional drill guide technique, a 3.2-mm drill hole is placed through the base of the coracoid process, and a 4.5-mm partially threaded cannulated screw is placed under fluoroscopic control along the Kirschner wire, permitting a good reduction of the fracture (Fig 5). For increasing rotational stability of the fracture, a second Kirschner wire is placed through the tip of the coracoid process, passing the subcoracoid space and again entering the glenoid. After 3.2 mm of drilling, another 4.5-mm fully threaded cannulated screw is placed along the Kirschner wire to supplement the first screw (Figs 6 and 7, Video 1). The reduction and fixation of the coracoid process simultaneously reduce the acromioclavicular joint owing to the

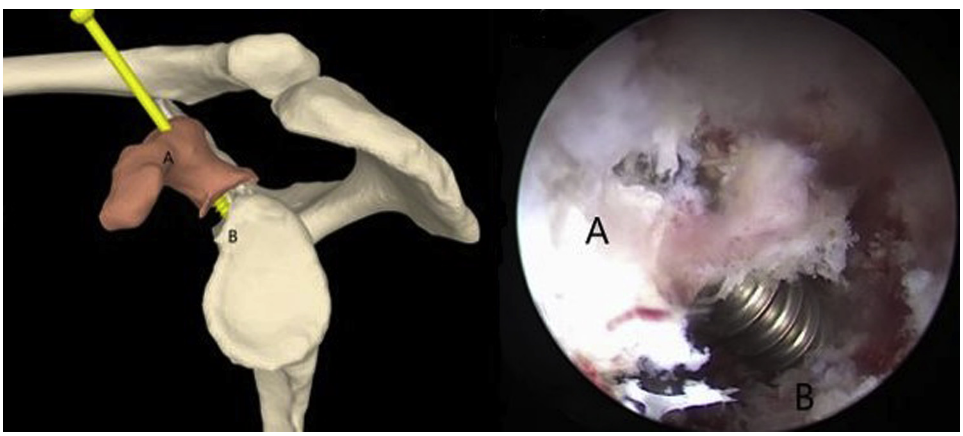

Fig 5. A 4.5-mm partially threaded cannulated screw is placed along the Kirschner wire through the coracoid fragment (A), permitting good reduction of the fracture at the base of the coracoid (B).

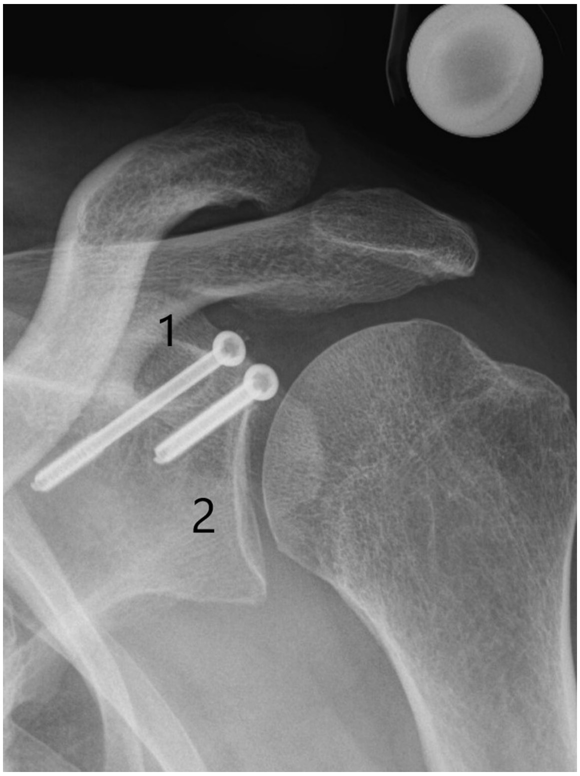

Fig 6. Postoperative standardized anteroposterior view of a left shoulder showing the correct position of the two 4.5-mm screws. The first screw (1) is placed through the base of the coracoid process, and the second screw (2), used for rotational stability of the fracture, is placed through the tip of the coracoid process, passing the subcoracoid space and again entering the glenoid. The anteroposterior view is obtained with the patient in an upright position with the arm in a neutral position by his or her side.

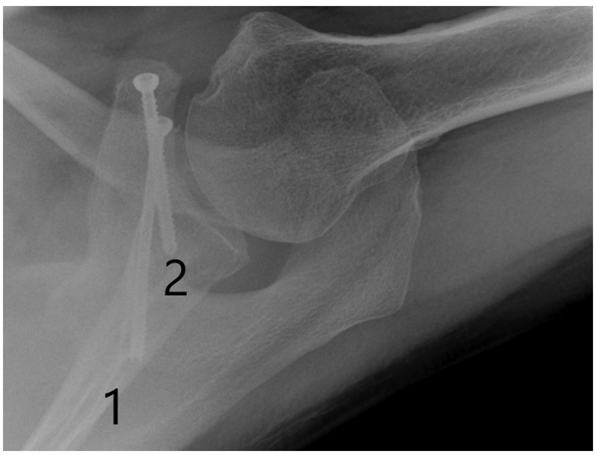

Fig 7. Postoperative standardized axial view of a left shoulder showing the correct position of the two 4.5-mm screws. The first screw (1) is placed through the base of the coracoid process, and the second screw (2), used for rotational stability of the fracture, is placed through the tip of the coracoid process, passing the subcoracoid space and again entering the glenoid. The axial view is obtained with the patient seated next to the image receptor, with the arm abducted.

Table 1. Pearls and Pitfalls

Pearls
A hydraulic arm holder should be used to support the arm during the surgical procedure.
For better visualization around the coracoid process, 30° and 70° arthroscopes are alternatively used.
Diagnostic arthroscopy is performed with a standard posterior portal.
The anterolateral portal is placed after the ideal position at the anterior tip of the acromion has been ensured with a needle under visualization.
The anterior portal is placed straight above the coracoid process.
The coracoid fracture is temporarily fixed with a 1.6-mm Kirschner wire through its base and definitively fixed with a 4.5-mm cannulated screw.
To avoid rotational instability, a second 4.5-mm cannulated screw is placed through the tip of the coracoid process.
Pitfalls
Inaccurate portal placement makes access to the coracoid process difficult.
Medial or superior misplacement of a Kirschner wire or screw might potentially harm the suprascapular nerve.

intact coracoclavicular ligaments, so further stabilization of the acromioclavicular joint is not needed. Pearls and pitfalls of our technique are presented in Table 1, and advantages and disadvantages are listed in Table 2.

Postoperative Care

The shoulder is placed in a sling for comfort only. The patient is allowed to proceed with passive exercises under the guidance of a physiotherapist with restricted flexion to 60° for 6 weeks. The patient is not allowed to bend the elbow against resistance for a period of 6 weeks. After 6 weeks, rehabilitation focuses on gradually re-establishing normal range of motion, and the patient begins a strengthening program. The patient is allowed to return to unrestricted activities at 3 months postoperatively.

Discussion

Several operative techniques have been described for the reduction and fixation of a coracoid fracture, whereas the best treatment for coracoid process fractures is still controversial. In this Technical Note, we describe the arthroscopic screw fixation technique for the coracoid process for the first time. Arthroscopic treatment to

Table 2. Advantages and Disadvantages

Advantages
Good visualization of the coracoid process can be achieved without extensive soft-tissue dissection.
Diagnostic arthroscopy performed before fracture fixation can detect concomitant pathology.
Rehabilitation is faster than with open procedures, allowing faster use of crutches if needed in patients with polytrauma.
Disadvantages
The procedure is technically demanding; advanced arthroscopic skills are necessary.

achieve reduction and internal fixation permits very good visualization of the fracture for reduction and fixation, whereas visualization of the coracoid process remains difficult even in open procedures. The arthroscopic approach is an effective and minimally invasive technique, allowing for rapid rehabilitation while avoiding the deep dissection of the deltopectoral interval and extensive soft-tissue dissection necessary in open procedures to expose the coracoid process. Thereby, the risk of damage to the suprascapular nerve is not higher than when using an open approach. It might even be lower if the nerve would be dissected and visualized. Furthermore, the arthroscopic approach permits, if necessary, the arthroscopically assisted management of associated injuries such as rotator cuff tears, subacromial pathology, acromioclavicular joint injury, or glenohumeral joint injury. Finally, in patients with polytrauma, providing a stable shoulder girdle with surgical fixation of the coracoid fracture and stabilization of the acromioclavicular joint could be needed to permit faster use of crutches.

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