

Bipolar Acromioclavicular Joint Resection



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Abstract: Acromioclavicular (AC) joint arthropathy remains one of the most common causes of shoulder pain. In the case of AC joint arthropathy resistant to conservative treatment, most authors have recognized distal clavicle resection as the gold-standard treatment. However, some challenges remain to be solved. One is the difficulty in visualization of the superior and posterior part of the distal clavicle from the midlateral portal, causing an incomplete resection of the distal clavicle. This could potentially lead to unresolved pain and therefore surgical failure. We propose a technique for arthroscopic resection of the distal clavicle and the medial portion of the acromion, without any added portal: bipolar AC joint resection. The term “bipolar” is used because both the acromion and the clavicle are resected, without injuring the superior capsule.

Most authors have recognized distal clavicle resection as the gold-standard treatment for acromioclavicular (AC) joint arthropathy resistant to conservative treatment.¹⁻⁸ In the literature, it is well known that arthroscopic treatment of the AC joint is an acceptable alternative to open excision of the distal clavicle, showing several advantages.¹⁻⁵

Commonly, the midlateral portal is used to visualize the AC joint during resection. Nevertheless, it can be difficult to visualize the superior and posterior portion of the clavicle with this portal, and therefore the resection of this part of the clavicle is often incomplete (Fig 1). Many techniques have been described to avoid this problem, including a change in portals or the introduction of different portals.⁵ Commonly, the AC joint is approached after subacromial decompression with a posterior viewing portal and midlateral or anterior portal. Even if it is

possible to work on the AC joint with 1 lateral instrumental portal, we think that only the anterior view allows one to control the complete AC joint resection. Flatow et al.^{1,2} proposed an AC joint direct approach with 2 superior AC joint portals: 1 anterosuperior and 1 anteroinferior portal. However, this method led to AC joint superior ligament damage and therefore instability.

In this work, we propose a technique using the classic midlateral portal for visualization but with resection of the inferior and medial part of the acromion. This allows better visualization of the superior part of the clavicle and therefore its adequate resection.

Surgical Technique

Patient Preparation

The patient is positioned in the beach-chair position. Access to the posterior shoulder is obtained by removing a support used initially for the positioning of the patient, with the appropriate surgical table. General anesthesia and a brachial plexus block are used if there is no contraindication for the patient. After appropriate skin preparation with alcohol solution, traction is obtained, positioning the shoulder in approximately 20° of forward flexion and fixing the extremity to the surgical table. The following anatomic landmarks are palpated: clavicle, AC joint, acromion, coracoid, and coracoacromial ligament. The 3 portals (posterior portal, lateral portal, and a portal through the rotator interval) are then marked with a surgical pen (Video 1).

Subacromial Space Exploration

The arthroscopic diagnostic phase is initiated with the standard posterior viewing portal 2 cm inferior and

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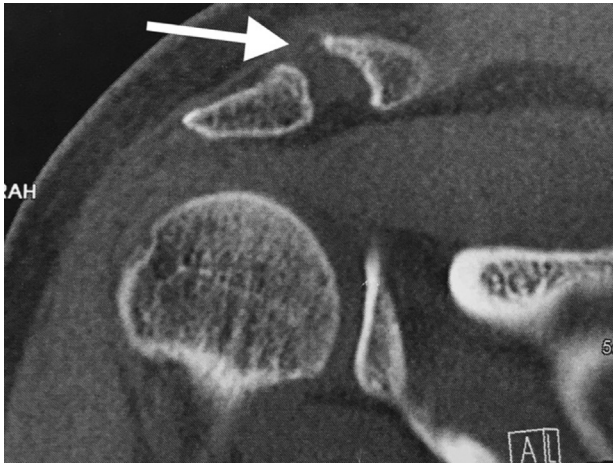


Fig 1. Example of a partial acromioclavicular joint resection leading to persistent pain (computed tomography scan, frontal view, of right acromioclavicular joint). The superior part of the joint has not been evenly resected, as shown by the arrow.

1 cm medial to the posterolateral border of the acromion. The arthroscope is then introduced into the glenohumeral joint, and a standard anterior portal is created with a spinal needle introduced between the tip of the coracoid and the anterior margin of the acromion. The articular surfaces, the long head of the biceps, and the rotator cuff are explored and evaluated from the articular side. The arthroscope is then moved to the subacromial space, and a midlateral portal is realized with a spinal needle. A bursectomy is performed until the inferior surface of the AC joint is exposed.

Coracoacromial Ligament Release

The coracoacromial ligament is resected off the anterior aspect of the acromion if there is no risk of anterosuperior humeral head migration. Care is taken to perform electrocauterization of the acromial branch of the thoracoacromial artery.

Bipolar Resection

After the evaluation of the AC joint from the posterior and midlateral portals, the previous anterior portal is used to introduce the instrument as a working portal while the midlateral portal is still used for visualization with the arthroscope. The AC joint is debrided of all soft tissue by both electrocautery (VAPR; Mitek, Raynham, MA) and a shaver or burr (Stryker, Kalamazoo, MI). Most authors recommend a 5- to 10-mm bone resection.⁹ Working from inferiorly to superiorly, the surgeon uses an arthroscopic burr from the anterior portal to remove possible osteophytes and, afterward, to resect the medial aspect of the acromion until the posterior and superior aspect of the clavicle is clearly visualized from the midlateral portal (Fig 2). At this point, 5 to 8 mm of the most distal aspect of the clavicle is resected without disrupting the superior ligaments of the AC joint (Fig 3). To determine the amount of distal clavicle to resect, we use the width of the arthroscopic burr as a landmark. At the end of the resection, the area of the AC joint should be rectangular. The conservation of the superior AC joint ligament and therefore its stability are tested with an arthroscopic hook at the end of the procedure.

Final Control

The arthroscope is inserted directly into the AC joint through the anterior portal to check the complete resection of the distal clavicle and to allow proper electrocauterization (Fig 4).

Postoperative Rehabilitation

A shoulder sling without abduction is used and positioned immediately after surgery. Considering only bipolar AC joint resection, immobilization is usually maintained for 3 days, depending on the patient's pain. The patient is usually dismissed later on the same day as surgery. Shoulder active and passive mobilization, as well as daily life activities, is allowed as tolerated

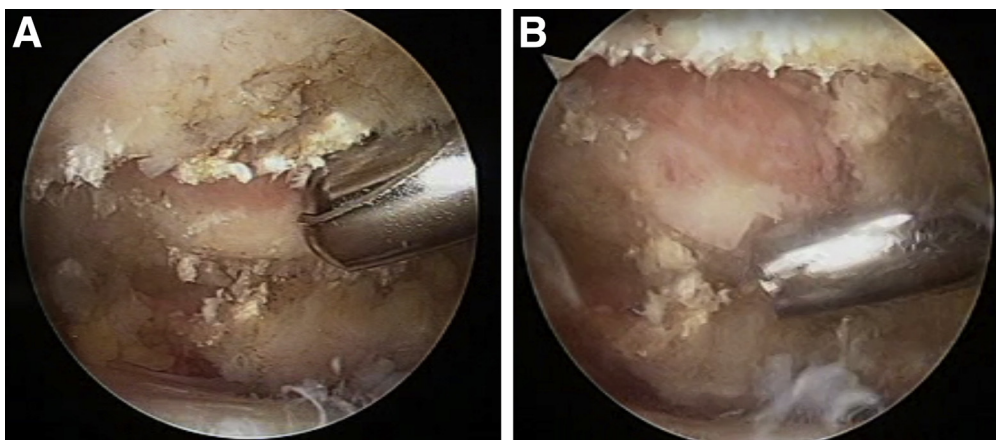
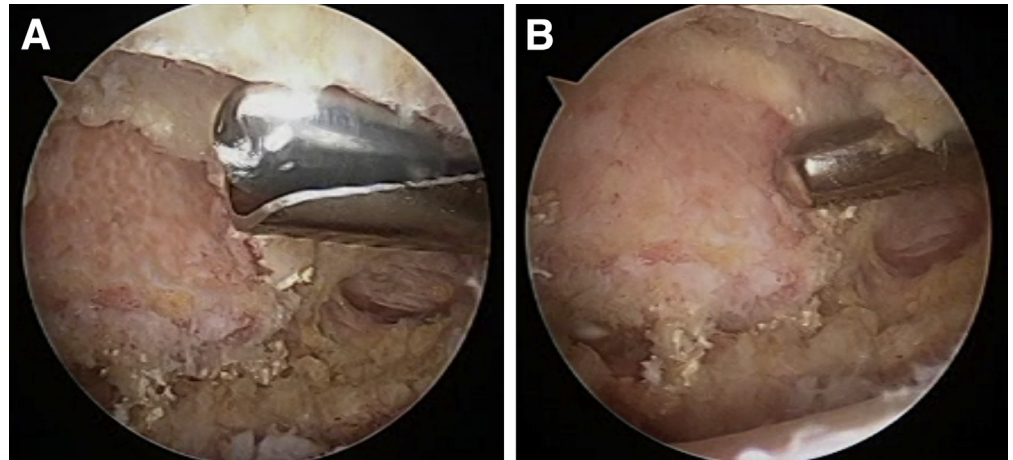


Fig 2. (A) An arthroscopic burr is used to resect the acromioclavicular joint inferior capsule (arthroscopic lateral view of a right shoulder). (B) The burr is used to resect the medial part of the acromion (arthroscopic lateral view of a right shoulder). The resection is carried out until the distal clavicle is visualized.

Fig 3. (A) The resection of the inferior and medial part of the acromion is extended until it is possible to see the entire lateral aspect of the clavicle (arthroscopic lateral view of a right shoulder). (B) The resection is carried out until the distal clavicle is totally resected (arthroscopic lateral view of a right shoulder).



immediately after surgery. Home exercises were prescribed, as well as physiotherapy assisted rehabilitation. When passive range of motion is complete, active range of motion is recovered, followed by muscular reinforcement. Carrying heavy loads and resuming work activities are usually allowed between the second and third months.

Discussion

One of the most common causes of shoulder pain is AC joint arthropathy, frequently associated with subacromial impingement and rotator cuff tendinopathy or lesions. Distal clavicle resection is now seen as the gold-standard treatment for AC joint arthropathy resistant to conservative treatment.¹⁻⁵

The arthroscopic results of AC joint arthropathy are good. Snyder et al.¹⁰ reported good or excellent results in 94% of cases with 2 years' follow-up without post-operative complications. Fischer et al.¹¹ reported a study concerning weightlifters with 18 months' follow-up and only 1 month of rest before returning to their

sporting activities. Levine et al.¹² and Kay et al.¹³ also reported excellent results with arthroscopic distal clavicle resection from a bursal approach.

In the literature, most authors have shown that arthroscopic treatment of the AC joint is a valid and preferred alternative to open excision of the distal clavicle. The arthroscopic procedure has several advantages, including preservation of the AC joint anterior and superior ligaments, a shortened recovery time with less pain, preservation of the deltoid from the trapezius, and exploration of the glenohumeral joint and subacromial space, as well as cosmetic advantages.¹⁻⁵

The most common complications reported in the literature for AC joint arthroscopic resection are bony remnants, heterotopic ossification or calcification, and superior and horizontal instability of the clavicle. Bony remnants are classically found on the posterior side of the AC joint, leading to pain. This is why we advise a final control of the AC joint resection from the anterior portal. Because AC joint arthropathy is frequently

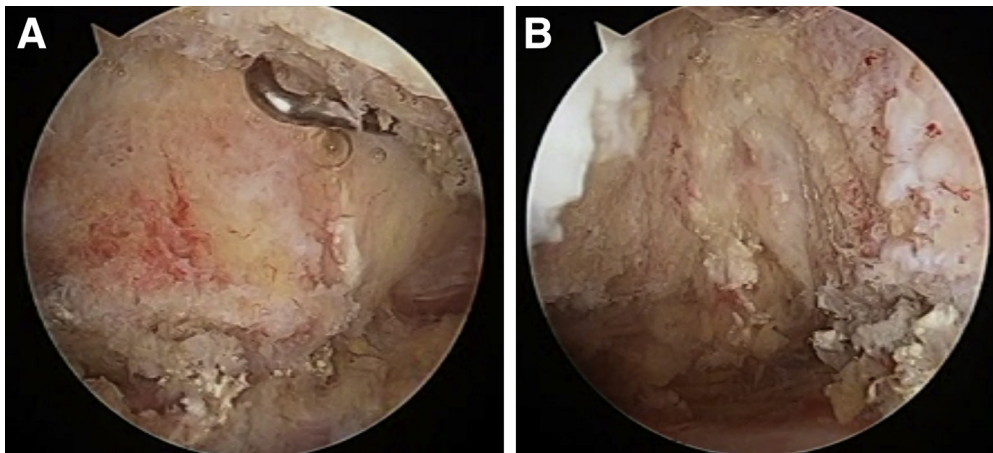


Fig 4. (A) An arthroscopic hook is used to check the posterior and superior margin of the clavicle after complete resection (arthroscopic lateral view of a right shoulder). (B) A final check from the anterior portal is realized (arthroscopic anterior view of a right shoulder). The bipolar resection is checked from inside the acromioclavicular joint.

Table 1. Surgical Pearls and Pitfalls

Pearls	Pitfalls
The medial portion of the acromion should be resected until the superior part of the clavicle is visualized from the midlateral portal.	If the soft tissues are not carefully removed before bone resection, visualization will be worse, and this will increase the difficulty of the procedure.
The superior and posterior portion of the distal clavicle should be resected carefully because this is the area that is most frequently poorly visualized.	Failure to resect the superior and posterior portion of the distal clavicle is common and can cause persisting pain after surgery.
The superior and posterior AC joint ligaments should be preserved while the bone is being resected.	Interruption of the posterior and superior AC joint ligaments can cause instability, as well as pain, and therefore failure of the procedure.
Careful electrocauterization of the acromial branch of the thoracoacromial artery, while resecting the coracoacromial ligament, allows good visualization during surgery.	Failure to remove all inferior osteophytes can lead to persisting pain.

AC, acromioclavicular.

associated with rotator cuff tendinopathy, one of the most frequent failed outcomes of rotator cuff surgery is a persistently painful AC joint.¹⁻⁵ Finally, some authors consider SLAP lesions to be frequently associated with AC joint post-traumatic arthropathy, especially in young patients. This is why we advise checking the glenohumeral joint from the posterior portal.

A major role in this last complication is played by the integrity of the AC joint capsular insertion. The amount of bony resection is therefore crucial for the clavicle's stability. In the literature, the length of clavicle to be resected has varied, ranging from 4 to 15 mm; the optimal amount of resection is therefore still controversial.^{5,6} Some authors have shown that more postoperative pain was associated with bony resection of greater than 10 mm of the AC joint.^{5,6} A cadaveric study showed that 2 to 3 mm of the medial acromion and 3 to 4 mm of the distal clavicle can be resected without removing the AC capsular insertions and that medial resections of greater than 15 mm will begin to take down the trapezoid ligament.⁶ This study also showed that arthroscopic bone resection should be

Table 2. Advantages and Risks

Advantages	
The bipolar resection does not require any added arthroscopic portals or any special instrumentation.	
The resection of the medial acromion allows a good view of the superior and posterior part of the clavicle, allowing its complete resection.	
Risks	
The additional acromial bone resection could lead to additional bleeding that requires careful electrocauterization.	

directed into the AC joint at approximately 50° in the axial plane and 12° in the coronal plane for safe symmetrical resection. Other authors did not confirm the correlation between resection length and functional results.^{7,8}

The portals used for the arthroscopic procedure are still under debate. The direct approach described by Levine et al.¹² requires the insertion of an arthroscope into the posterior and anterior aspect of the AC joint.¹⁻⁵ Recently, Kruse et al.⁵ have described an arthroscopic distal clavicle resection using the "vis-à-vis" portal, allowing direct visualization of the AC joint with a limited resection of the medial acromion or the use of a different angled or sized arthroscope (Tables 1 and 2). They also reported some potential risks with an anterior portal, such as damaging the cephalic vein.⁵ Other authors have proposed an arthroscopic "en bloc" resection of the distal clavicle, trying to reduce the chances of heterotopic ossification or calcification and obtain an even resection of the distal clavicle as compared with piecemeal resection performed in previous arthroscopic procedures.¹⁻⁵

In our technique, we use 3 classic arthroscopic portals. Posterior and midlateral portals are used to check the glenohumeral joint and then to prepare the subacromial space. Without any added risk, the classic anterior portal allows us to control the quantity and quality (integrity of the superior AC joint ligament) of the bone resection.

To our knowledge, this study is the first to describe an arthroscopic bipolar AC joint resection. The removal of the medial portion of the acromion allows an adequate view of the superior and posterior distal clavicle, without adding another arthroscopic portal and without using an arthroscope with a specific angle.

In the literature, very low morbidity was reported with the removal of the medial acromion, although further studies and a longer follow-up are needed to confirm these data.⁵ We believe that the arthroscopic bipolar AC joint resection is a safe, reproducible, and efficient procedure that allows a complete AC joint resection, without any added portals or specific instruments used for standard shoulder arthroscopy.

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