

# Arthroscopic Excision for Painful Acromial Fracture Nonunion After Reverse Total Shoulder Replacement



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**Abstract:** Acromial stress fracture is a well-known complication after reverse shoulder arthroplasty. Although some patients are asymptomatic, others may present with reproducible pain to palpation and signs of impingement. Generally, the initial mode of treatment is conservative; however, surgical intervention is considered in patients with painful nonunion and displaced fragments. Although open reduction techniques are most common, Levy type I fragments may be amenable to excision. This technical note provides a stepwise approach to arthroscopic excision for painful nonunited acromial stress fractures after reverse shoulder arthroplasty.

After reverse shoulder arthroplasty (RSA), acromial stress fractures occur in approximately 4% of cases.<sup>1</sup> Fractures often present at 3 to 12 months postoperatively and are initially treated conservatively.<sup>2</sup> Most of these stress fractures go on to nonunion. Whereas some patients may have a painless nonunion and report acceptable results, others may endure persistent pain and lower satisfaction.<sup>2,3</sup>

The structural integrity of the anterior acromion can be compromised after (e.g., stress fracture; Fig 1) or prior to (e.g., acromioplasty or os acromiale; Fig 2) an RSA. Inferior displacement (Figs 1 E and F and 2 C and D) of the compromised anterior acromion caused by increased tension on the deltoid origin after RSA can

cause painful impingement, instability, and general compromise of the outcome of the RSA.

Operative treatment of the acromion has been described, most commonly involving open reduction and internal fixation of postoperative fractures.<sup>4</sup> However, achieving fixation is difficult in the setting of small fragments and is associated with the risk of complications, as well as the potential need for subsequent hardware removal. Thus, an alternate consideration for small fractures may be excision alone. Excision is a well-described technique for the operative management of acute fractures and painful nonunions in multiple anatomic areas (e.g., radial head, olecranon, ulnar styloid, clavicle, and talus). We have successfully treated painful, inferiorly displaced acromial fragments after RSA using the technique described in this article.

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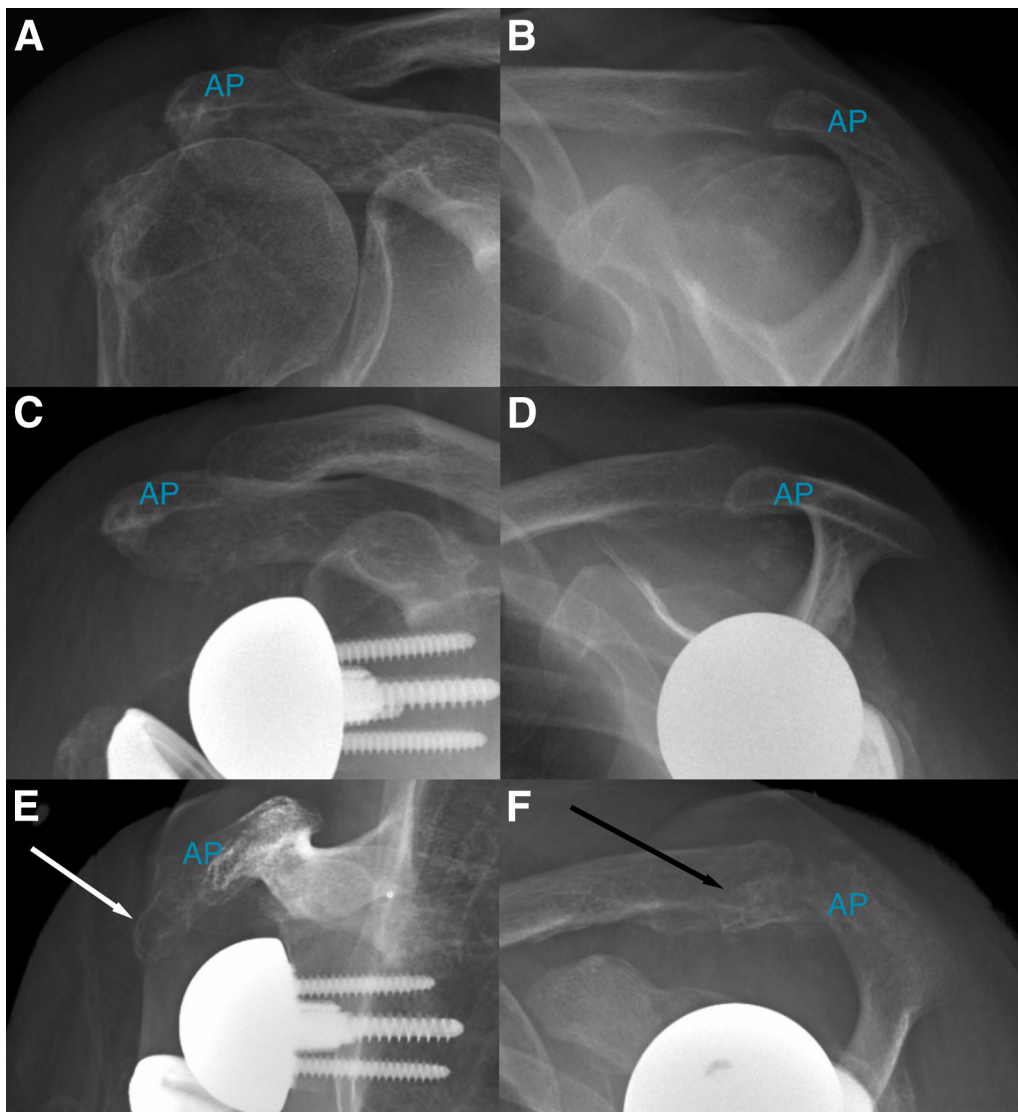
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## Surgical Technique

### Indications

Excision should only be considered if it can be accomplished without risk of substantially compromising deltoid function. Thus, only fractures involving the anterior and middle part of the acromion (Levy type I<sup>5</sup> or Crosby type I-II<sup>6</sup>) should be considered for excision (Fig 3). We consider fractures involving the posterior deltoid to be a contraindication to excision (Levy types II and III). Nonsurgical treatment often results in a satisfactory outcome when the anterior acromion is compromised after reverse total shoulder arthroplasty.<sup>1,7</sup> Thus, arthroscopic excision should only be considered if symptoms persist after a minimum of 3 months of conservative management. Pain without



**Fig 1.** Development of acromial fracture after reverse total shoulder arthroplasty in right shoulder. Preoperative Grashey (A) and scapular-Y (B) radiographs show a normal preoperative acromion process (AP) of the scapula. Initial postoperative Grashey (C) and scapular-Y (D) radiographs also show a normal acromion. By 6 months postoperatively, the acromial stress fracture (white and black arrows) had displaced on Grashey (E) and scapular-Y (F) radiographs.

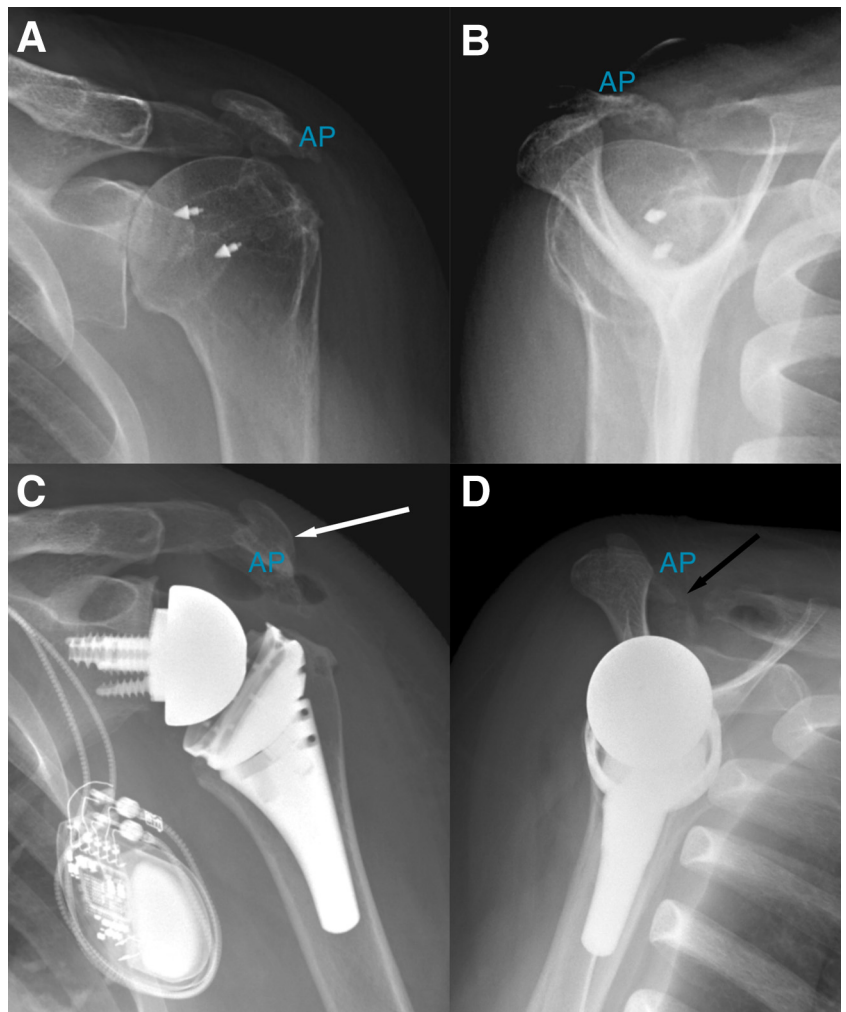
instability should be the primary indication for surgery, particularly if the patient complains of classic “impingement” symptoms with physical examination findings that corroborate that the inferiorly displaced fragment is the primary source of pain (e.g., direct tenderness to palpation of the fragment, pain with active or passive arm elevation near 90°, and positive Neer and Hawkins test results).

### Surgical Procedure

Our preferred position for shoulder arthroscopy is the lateral decubitus position; however, beach-chair positioning provides an equivalent approach. It is important

that the shoulder be examined for instability before and after fragment excision. Fluoroscopy should be available for the operation; however, it is typically unnecessary because the acromial fragment is excised under direct visualization.

The initial portal can be posterior or lateral, but starting with a lateral portal (Fig 4A) can be technically easier and safer to avoid iatrogenic prosthetic damage (Video 1). A posterior portal is then created, and an initial debridement is performed with a 5.0-mm shaver (CrossBlade Dual Edge Cutter; Stryker) and electrocautery (SERFAS 90-S Accelerator; Stryker) to define the bony landmarks in the subacromial space (Fig 4B).

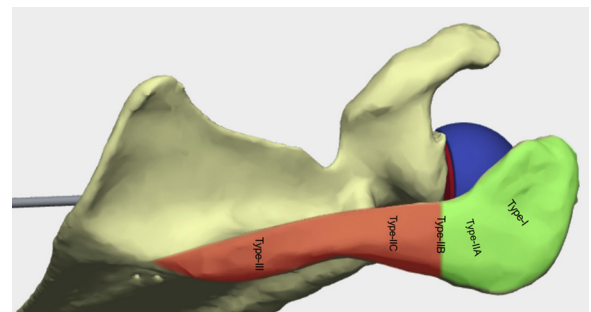


**Fig 2.** Development of displacement of previously compromised and fragmented anterior acromion process (AP) after reverse total shoulder arthroplasty in left shoulder. Grashey (A) and scapular-Y (B) radiographs show that prior to the reverse total shoulder arthroplasty, an arthroscopic rotator cuff repair had been performed with an aggressive distal clavicle excision and acromioplasty that resulted in the development of an acromial fracture. Postoperative Grashey (C) and scapular-Y (D) radiographs also show inferior displacement of the acromial fragment (white and black arrows).

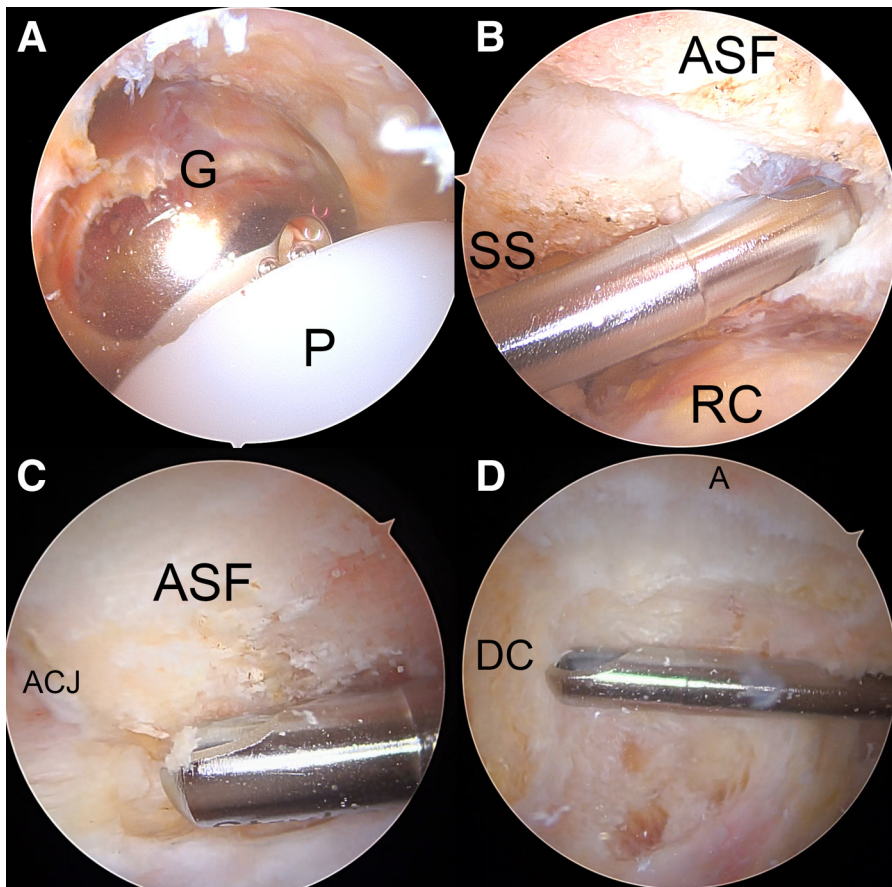
Next, the posterior portal is used for viewing and further defining the fragment (Fig 4C). The lateral portal is used to complete the debridement in the sub-acromial space and finish identification of the edges of the fragment (Fig 4C).

A 5.0-mm bone cut is typically sufficient to remove the softer bone of the fragmented anterior acromion (Fig 4D). An arthroscopic burr used in reverse mode can also be helpful for bone removal for preservation of the soft tissues around the fragment. Arthroscopic curettes can also be used with care. The middle deltoid origin and part of the anterior deltoid origin are at risk of compromise during and after surgery using this technique. However, the internal deltoid fascia, the continuity of the deltotrapezial fascia superiorly, the coracoacromial ligament, and the acromioclavicular ligaments and joint capsule are robust<sup>8</sup> and can maintain prosthetic stability and postoperative deltoid function if they are preserved. Preoperative (Fig 5 A and B) and postoperative (Fig 5 C and D) films are taken for

comparison. The patient is placed in a sling for 4 to 6 weeks after surgery with gradual resumption of active overhead motion and strengthening to protect these



**Fig 3.** Levy classification of acromial fracture after reverse total shoulder arthroplasty showing the area of the anterior acromion (type I) that can be considered for arthroscopic excision. Reproduced with permission from Levy et al.<sup>5</sup>



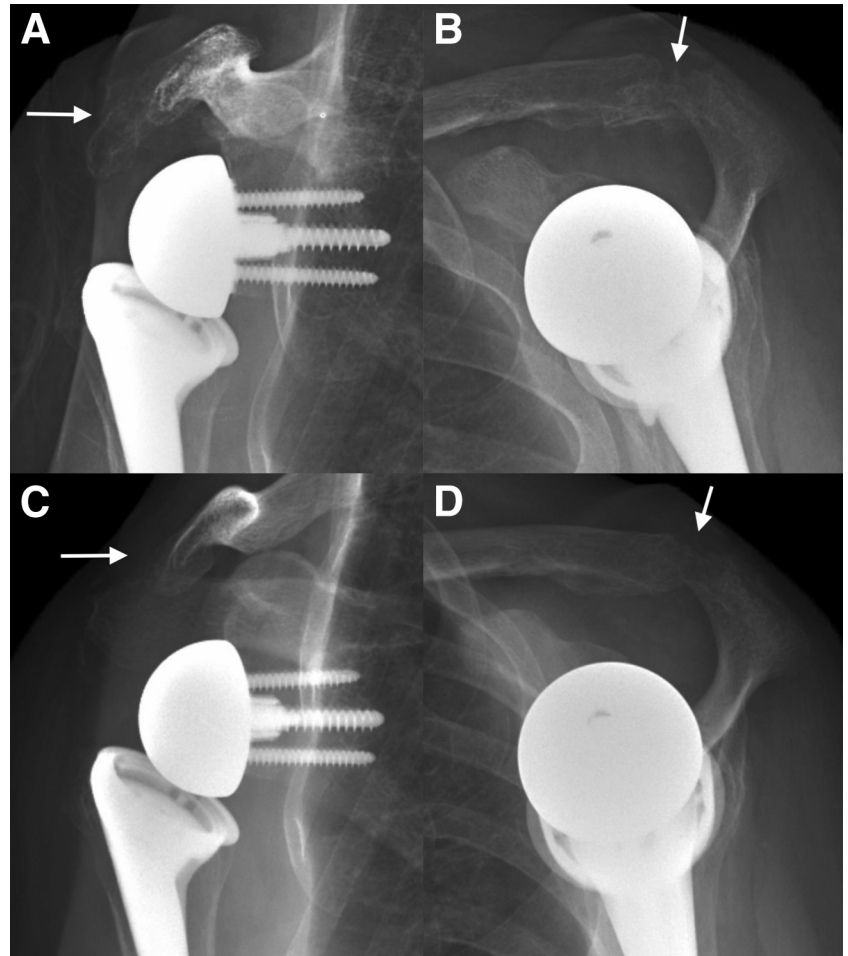
**Fig 4.** Arthroscopic photographs of right shoulder shown in Figure 1 and Video 1. (A) Initial lateral view with 30° arthroscope showing glenosphere (G) and polyethylene insert (P) of reverse total shoulder replacement. (B) View through lateral portal with 30° arthroscope after identification of acromial stress fracture (ASF) fragment, rotator cuff (RC), and scapular spine (SS). (C) View through posterior portal with 30° arthroscope showing acromioclavicular joint (ACJ) and ASF with 5.0-mm shaver. (D) View through posterior portal with 70° arthroscope showing soft tissues surrounding excised fragment. The intact acromion (A) and distal clavicle (DC) are shown.

tissues after fragment excision. [Table 1](#) lists pearls and pitfalls of the surgical procedure.

### Discussion

Acromial stress fractures occur in approximately 3% to 5% of cases after RSA.<sup>9,10</sup> Although the incidence is relatively low, this complication can lead to deltoid compromise, resulting in biomechanical dysfunction and lower postoperative function.<sup>3</sup> Therefore, early recognition and management are key to avoid deterioration in functional outcomes. Initially, patients are treated conservatively. Although conservative care relies on surgeon preference, a common regimen includes use of an abduction pillow and sling for 6 weeks, followed by progressive range of motion.<sup>2</sup> It is common, however, for these fractures to go on to nonunion. In one report, Boltuch et al.<sup>7</sup> documented a 61% nonunion rate in 44 acromial fractures after RSA. Although some patients may have nonunions that become asymptomatic, others may continue to report burdensome continual pain and impingement, at which point surgery is considered.

After failed conservative treatment, surgery may provide pain relief and improved shoulder function. A wide variety of techniques have been reported—from tension band wiring to locking plate fixation to dual plating.<sup>2</sup> However, there are several drawbacks to fixation. First, the inferior deltoid pull predisposes to failure. Second, fixation may require subsequent hardware removal. Third, in Levy type I fractures, the fragments are small, limiting the ability to achieve reliable fixation. Finally, an arthroscopic approach allows the surgeon to concomitantly address adhesions or subcoracoid impingement if present. For these cases, we propose that arthroscopic excision allows the removal of these fragments under direct visualization. This approach is minimally invasive, avoids the potential for hardware removal, and can be performed without compromising deltoid function. Notably, previous authors have shown that RSA can lead to acceptable outcomes if the anterior and/or middle deltoid is compromised.<sup>11</sup> Thus, there appears to be some clinical foundation for the consideration of excision alone in select patients.



**Fig 5.** Preoperative and postoperative comparative radiographs of right shoulder shown in Figures 1 and 4 and Video 1. Complete fragment excision (white arrows) is demonstrated by comparing Grashey (A vs C) and scapular-Y (B vs D) radiographs.

One weakness of the described technique is the lack of clinical data. Although our experience suggests pain relief and increased patient satisfaction, no formal studies have been conducted. In addition, this approach

is limited to fragments involving only the anterior or middle deltoid. Despite these limitations, this technique provides a less invasive approach to excise painful nonunited fracture fragments compromising deltoid function.

**Table 1.** Pearls and Pitfalls of Arthroscopic Excision for Acromial Nonunion After Reverse Total Shoulder Replacement

Assess prosthetic stability before and after excision.
Note that fluoroscopy should be available but is typically unnecessary because the fragment is excised under direct arthroscopic visualization.
Establish a lateral viewing portal and perform diagnostic arthroscopy.
Establish a posterior working portal and perform initial debridement with a shaver.
Obtain biopsy specimens as indicated.
Clearly define the acromial fragment to be excised by removing soft tissue from the “undersurface” and edges using electrocautery.
Preserve as much of the soft tissue around the fragment as possible.
Use an arthroscopic shaver, burr in reverse mode, and arthroscopic curettes to completely remove the acromial fragment.
Preserve the internal deltoid fascia, the continuity of the deltotrapezial fascia, the acromioclavicular joint ligaments, and the coracoacromial ligament as much as possible during all phases of excision.

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