

# Arthroscopic “Wallow” Procedure for Resection of Symptomatic Os Acromiale Pseudoarthrosis



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**Abstract:** Os acromiale is a relatively common anatomic variant that can occasionally be associated with shoulder pain. Several surgical options to address a symptomatic os acromiale that has failed nonoperative treatment have been described. Published techniques, however, are often very invasive, technically challenging, and carry the risk of potential complications that can be difficult to manage. The technique presented here describes a relatively simple arthroscopic alternative, coined by the authors as the “Wallow technique” due to the fact that the arthroscopic shaver is used to rotate within and resect the os site, that results in complete resection of the os acromiale pseudoarthrosis and avoids the need for an open approach or the use of implants.

**O**s acromiale has been defined as a failure of fusion between any 2 of the 4 apophyses of the acromion. This most commonly occurs between the meso-acromion and the meta-acromion, resulting in the meso-acromion form of os acromiale. The prevalence of os acromiale is reported to range from 1.1% to 15%.<sup>1</sup> The great majority of cases are asymptomatic and are discovered incidentally on radiographic findings.<sup>2,3</sup>

When evaluating a patient with shoulder pain who is also identified as possessing an os acromiale, it can be difficult to determine whether the os acromiale is the source of symptoms. Patients with a symptomatic os acromiale typically present with anterolateral shoulder pain localized to the area of the acromion. Patients may complain of pain with overhead activities and display rotator cuff weakness, a positive impingement sign, and decreased forward elevation on physical examination.<sup>4</sup> Other findings, however, are more specific, such as

tenderness directly over the superior acromion and palpable motion at the pseudoarthrosis site. If one or both of these more specific findings are present on physical examination, they can be useful in making the correct diagnosis. Anteroposterior, scapular Y, and axillary radiographic views of the shoulder should be routinely obtained and can help to confirm the diagnosis (Fig 1). An os acromiale can be easily overlooked radiographically and is best visualized on the axillary lateral radiograph.

The etiology of symptoms for a symptomatic os acromiale is not definitively understood but has been postulated to be secondary to 2 potential causes. One source for symptoms may be due to a painful inflammatory reaction due to motion at the pseudoarthrosis site. On magnetic resonance images, edema or fluid may be noted at the pseudoarthrosis. The other potential source for pain is theorized to be dynamic sub-acromial impingement caused by the mobile anterior os acromiale flexing during deltoid contraction with shoulder elevation.<sup>3</sup> A lidocaine injection into the acromial pseudoarthrosis can provide important diagnostic information, especially if the patient has immediate improvement in symptoms.

A symptomatic os acromiale initially is managed nonoperatively using nonsteroidal anti-inflammatory medications, physical therapy focusing on optimizing muscular imbalance, avoidance of repetitive trauma, and corticosteroid injections directly into the pseudoarthrosis. Patients who remain symptomatic despite extensive nonoperative treatment modalities can be indicated for surgical intervention. Multiple surgical techniques have been described, including fragment

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**Fig 1.** Anteroposterior, scapular Y, and axillary lateral radiographic views of the left shoulder in a patient with an os acromiale as indicated by arrow. Os acromiale can be best visualized on the axillary view.

excision, open reduction and internal fixation, and open and arthroscopic acromioplasty.<sup>5</sup>

The arthroscopic technique described herein is a novel surgical method that uses standard equipment to arthroscopically resect the pseudoarthrosis site and has been used by the senior author (L.D.F.) for more than 20 years. The major advantages and disadvantages of this technique are summarized in [Table 1](#). [Video 1](#) shows the technique.

### Surgical Technique (With Video Illustration)

Following induction of general anesthesia, the patient is placed in the beach chair position. The surgery also may be performed equally as effectively in the lateral decubitus position at the discretion of the surgeon. A standard posterior portal is established, and a 30° arthroscope is inserted. Next, a standard anterosuperior portal centered within the rotator interval is made, and a diagnostic arthroscopy of the glenohumeral joint is completed. Following evaluation of the glenohumeral joint with treatment of any pathologies as appropriate, the subacromial space is entered using the previously established posterior portal. A lateral portal is then established using spinal needle localization. If indicated, a bursectomy is performed to allow for visualization of the rotator cuff and acromion undersurface. The anterior acromion is then palpated with an inferiorly directed force, and motion of the anterior bony fragment can be arthroscopically visualized at the unstable os acromiale ([Fig 2](#)). An accessory anterolateral portal is then typically established several centimeters anterior to the lateral portal and is used for visualization during resection. The arthroscope is then inserted into this accessory anterolateral portal, and the bone-resecting arthroscopic shaver is typically brought into the subacromial space from the lateral portal position ([Fig 3](#)). However, because it is very important that the arthroscopic shaver blade be parallel to the pseudoarthrosis to both ensure complete resection and to avoid excessive resection of bone, the most advantageous portal location to resect the pseudoarthrosis site may vary depending on the anatomic orientation of the pseudoarthrosis. Spinal needle localization of the track of the pseudoarthrosis is helpful in determining the best

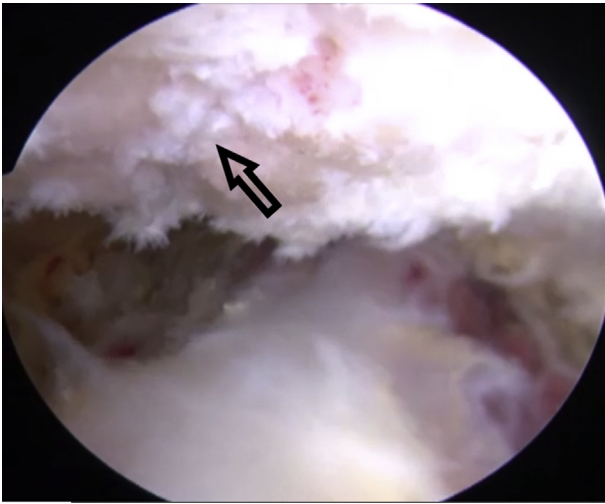
position for lateral portal placement so as to orient the arthroscopic bone resecting blade parallel to the pseudoarthrosis. The os acromiale pseudoarthrosis is then removed using the shaver in a “wallowing” method of rotational progression ([Fig 4](#)). Several passes often are required to remove all the bone that makes contact within the pseudoarthrosis ([Fig 5](#)). Significant care is taken to preserve all soft-tissue attachments around the perimeter of the anterior acromial fragment, including the deltoid fascia, the acromioclavicular joint capsule, and the superior fascia above the acromion to minimize the risk of destabilizing this fragment. Likewise, only the minimum amount of bone that is necessary to ensure that all bony contact between the 2 acromial fragments is resected is removed. The bony gap created at the pseudoarthrosis is almost always approximately 5 mm in diameter (corresponding to the diameter of the arthroscopic shaver blade). Following resection of the pseudoarthrosis, the arthroscope can be moved to the lateral portal to confirm that all the bone at the pseudoarthrosis site has been resected ([Fig 6](#)). In the authors’ experience, palpation of the anterior acromial fragment following pseudoarthrosis resection demonstrates continued stability if these soft-tissue attachments have been preserved. If no concurrent procedures are performed that require activity restrictions, the postoperative protocol consists of physical activity as tolerated and with no formal physical therapy usually prescribed.

### Discussion

The optimal surgical intervention for patients with a persistently symptomatic os acromiale has yet to be

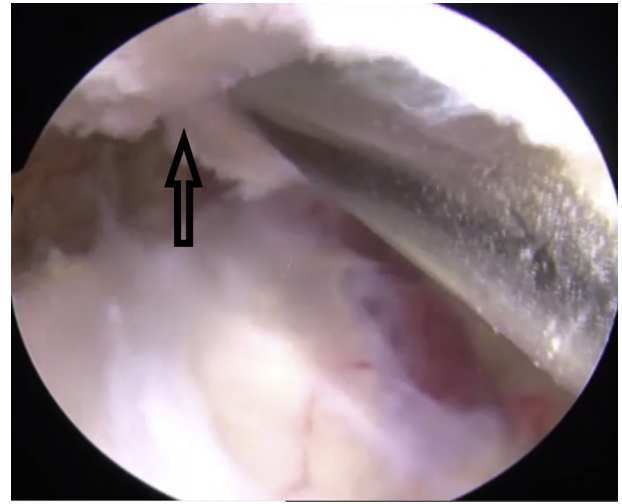
**Table 1.** Advantages and Disadvantages of the Arthroscopic “Wallow” Technique for Symptomatic Os Acromiale

Advantages	
	Efficient and reproducible procedure
	No implants required
	Uses standard arthroscopic portals and instrumentation
	No risk for symptomatic hardware
	No postoperative immobilization or rehabilitation required
Disadvantages	
	If needed, a future fusion may be more difficult after the resection



**Fig 2.** The instability of the os acromion is seen in this left shoulder placed in the beach chair position via application of external pressure to the acromion. Arrow indicates the os acromion junction.

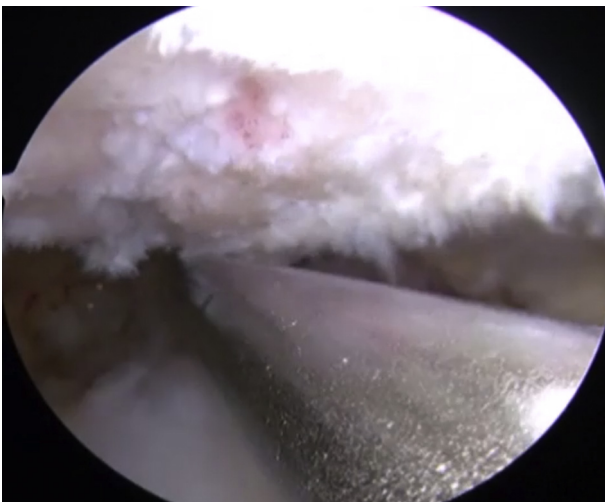
determined. Since an os acromiale rarely requires surgical intervention, the literature consists primarily of case series. Three surgical options previously reported include open or arthroscopic anterior acromion excision, acromioplasty, and open reduction and internal fixation (ORIF). Excision has been performed successfully for smaller fragments. However, results may be poor when larger fragments, such as the commonly encountered meso-acromion, are excised.<sup>6,7</sup> Poor outcomes are thought to be due to loss of the lever arm that the acromion provides for deltoid function. Acromioplasty as a surgical treatment for symptomatic os acromiale has been published using both a standard resection amount but also by intentionally



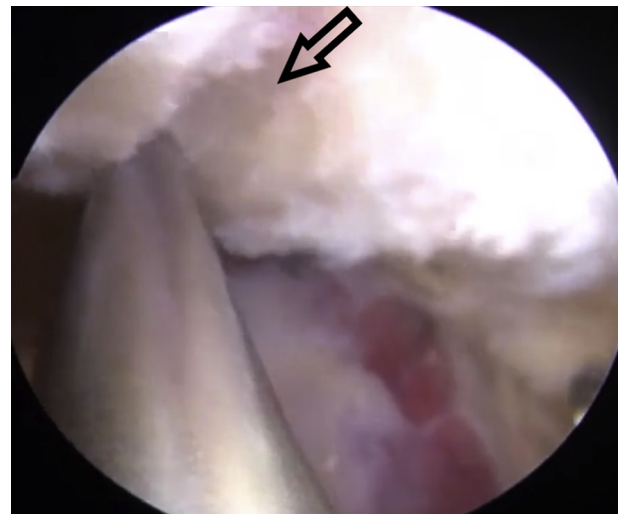
**Fig 4.** For this left shoulder placed in the beach chair position, the bone shaver is manipulated in a wallowing movement pattern to efficiently and conservatively excise the os acromion pseudoarthrosis. Arrow indicates the initial extent of the resected bone channel.

over-resecting the acromion, leaving only a superior cortical shell, the periosteum, and fascia intact. Favorable results with acromioplasty are attributed to the reduction in the dynamic impingement that occurs between the undersurface of the mobile acromion fragment and the rotator cuff and bursa.<sup>8,9</sup> ORIF can be performed with tension band or cannulated screw fixation, and high rates of union have been reported. However, ORIF can be a technically challenging procedure that also carries the risk of both nonunion and the potential need for subsequent hardware removal.<sup>8</sup>

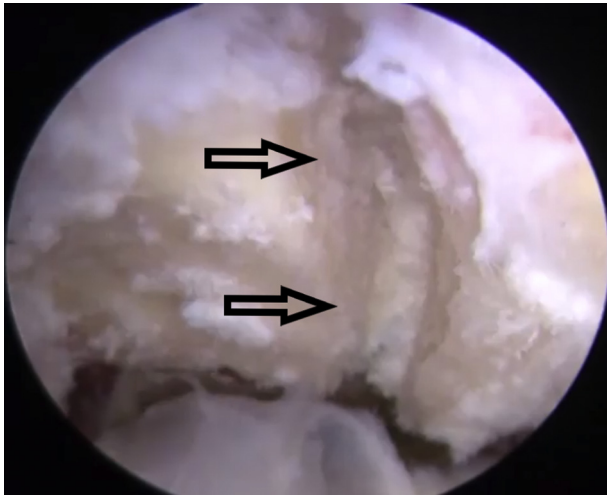
The Wallow procedure represents an alternative for the surgical management of symptomatic



**Fig 3.** For this left shoulder placed in the beach chair position, a bone shaver is shown in an appropriate position in relation to the os acromion, after introduction through a lateral portal.



**Fig 5.** For this left shoulder placed in the beach chair position, shown (as indicated by the arrow) is the near completed os acromion channel.



**Fig 6.** For this left shoulder placed in the beach chair position, the completed os acromion resection channel is indicated by the 2 arrows.

meso-acromion fragments that is yet undescribed in the literature to the authors' knowledge. After the bony contact between acromial fragments at the os acromiale has been resected, patients typically experience significant improvement in preoperative symptoms. The os acromiale can be painful due to an inflammatory process resulting from fragment motion at the pseudoarthrosis, and resection of this pseudoarthrosis is a quick and relatively simple method of eliminating the source of these symptoms. This technique also significantly reduces the amount of bone that is resected compared with the acromioplasty technique. In addition, a standard cutting block acromioplasty does not usually result in complete resection of a meso-acromion pseudoarthrosis in the authors' experience, thus leaving a residual, and potentially painful, pseudoarthrosis

**Table 2.** Technique Pearls and Pitfalls for the Arthroscopic Wallow Technique

Pearls	
Obtain adequate visualization and perform bursectomy before resection	
Use bone resection arthroscopic shaver in wallowing type progression	
Ensure all bone contact between fragments has been resected	
Pitfalls	
If dorsal soft-tissue structures are inadvertently resected, the anterior acromion fragment may be destabilized, potentially causing pain or loss of effective lever arm function	

articulation. This Wallow procedure is analogous to performing a distal clavicle resection for symptomatic acromioclavicular joint pathology since resection of bone can be performed using standard arthroscopic instrumentation and portal placement for both procedures. The technique is effective and reproducible and may have lower risk for complications compared with more complex procedures. In addition, there is no risk for nonunion or for residual, symptomatic hardware that could necessitate further surgical intervention. Also, no limitations or restrictions are imposed on patients postoperatively. A potential disadvantage of the Wallow procedure may be that fusion could be more difficult after a prior resection should revision surgery be required.

The arthroscopic Wallow procedure is the preferred surgical technique of the senior author to address symptomatic meso-acromion pseudoarthrosis that has failed conservative treatment, and he has performed approximately 10 such procedures over the last 20 years. Results have been uniformly satisfactory, and no cases have undergone surgical revision. Table 2 describes pearls and pitfalls of the procedure.

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