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Scapular Fracture Open Reduction Internal Fixation: How to Approach?

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Background

The scapula is a complex bone. It involves the scapular body, scapular spine, acromion, and glenoid. While the majority of it is flat and the site of muscle attachments, it also includes the glenoid and is involved with shoulder joint mechanics. Scapula fractures are uncommon, and their treatment depends on the fracture location, amount of displacement, and other patient and fracture characteristics. This publication aims to briefly present the approach for scapular fracture open reduction internal fixation.

Scapular Body Fractures

Scapular body fractures are the most common scapula fracture and are common in poly-traumatized patients. The majority of these injuries are treated non-operatively, but surgical treatment may be indicated in the setting of significant displacement. Displacement is assessed on anteroposterior (AP) scapular radiographs by measuring the glenopolar angle (GPA) and amount of body medialization/translation. The GPA is the angle between a line connecting the most cranial and caudal points of the glenoid, and a line connecting the most cranial part of the glenoid to the caudal point of the scapular body. The mean GPA is normally between 30°-45°, and an angle below 20° is associated with poor outcomes. Angulation of the scapular body is assessed by the use of scapular Y-view radiographs. Current indications for surgery include: GPA < 22°, angulation > 45°, and medialization > 2 cm (1, 2) (Figure 1). Computed tomography (CT) scans and especially three-dimensional (3-D) reconstruction images are very helpful in assessing the amount of displacement (Figure 1). Scapular body fractures heal quickly, and surgical fixation after 2-3 weeks will be more difficult due to extensive callus formation and the potential need for callus takedown/osteotomy.

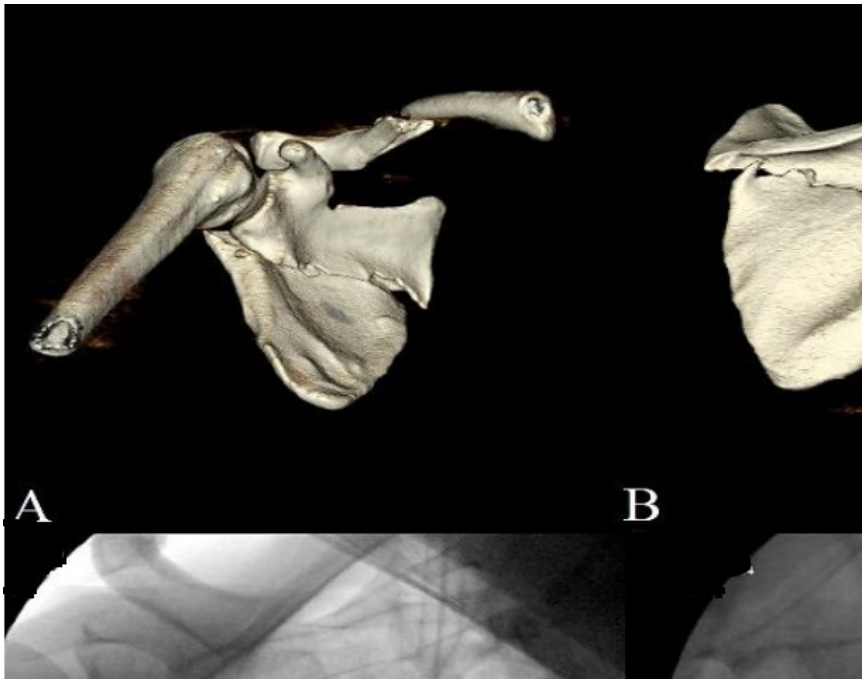

Figure 1. A, B) Three-dimensional (3-D) computed tomography (CT) images of a scapular body fracture with medialization/translation over 2 cm; the fracture line starts at the medial border and exits at the lateral border of the scapula; C, D) surgical fixation is performed by fixing the fractures of the lateral and medial borders

Surgical Approaches: Surgical fixation of scapular body fractures is generally performed via a posterior approach. The patient is positioned in lateral decubitus position and the affected upper extremity is free draped, and the arm is placed over a sterile mayo stand.

The fracture line usually goes through the medial border of the scapula and exits at the lateral border of the scapula (Figure 1). Often both locations are reduced and fixed with plate and screws.

The extensile Judet approach is the workhorse approach, especially for fractures > 14 days old or complex fracture patterns. An "L"-shaped incision is made over the scapular spine and down the medial border of the scapula. The deltoid muscle is elevated off the scapular spine. The infraspinatus and teres minor are elevated on the medial aspect of the scapula and body, giving access to the scapular body underneath (1, 2).

A modified Judet approach utilizes the same incision as the extensile Judet approach; however, after the deltoid is taken down, the interval between the teres minor and infraspinatus muscles is utilized to gain access to the lateral border of the scapula (2).

A minimally invasive approach can also be utilized in acute and simple fracture patterns. An incision is made over the lateral border of the scapula, and the interval between infraspinatus and teres minor is used to access the lateral border of the scapula. A separate incision is made over the medial border of the scapula for fixation of the fracture at this site (2).

Intra-Articular/Glenoid Fractures

Scapular fractures can also be intra-articular and involve the shoulder joint and glenoid. These fractures have a lower threshold for surgical management to avoid malalignment of the articular surface and post-traumatic arthritis. Surgical indications include intra-articular fractures with > 2 mm step-off, or small anterior or posterior glenoid rim fractures with subsequent joint instability.

Surgical Approach: The surgical approach for an anterior intra-articular glenoid fractures is via an anterior approach with the use of the deltopectoral interval. The subscapularis is peeled off the capsule, and shoulder arthrotomy is performed medially along the joint line, leaving a cuff of tissue for repair at the end of the case. Once the arthrotomy is performed, the fracture is identified. Humeral head retractors can be utilized to retract the humerus out of the way and obtain further exposure to the glenoid. Fixation is performed with the use of screws alone, or plate and screws, depending on the fracture size and morphology. Direct visualization of the joint can ensure that screws are not placed intra-articularly. In the setting of a posterior glenoid rim fracture, a posterior-based approach is required.

Acromial Fractures

Acromial fractures are increasing, especially in the setting of reverse total shoulder arthroplasty (rTSA). These fractures are difficult to diagnose, and the use of CT scans can be helpful (especially for the diagnosis of acromial stress fractures). In the setting of rTSA, acromial stress fractures are on the rise, and a high index of suspicion is needed for diagnosis. Acromial fractures are also a difficult condition to treat, due to poor function with non-operative treatment, as well as the high rate of failure and non-union with surgical fixation. There is minimal research in this area, including surgical indications and optimal fixation strategies.

While these fractures were routinely treated non-operatively in the past, nonunion is common and can lead to poor functional outcomes due to its effect on deltoid function. This is a significant issue in patients with an rTSA prosthesis in place and can lead to pain and limited function in the affected shoulder. Our indications for surgical fixation of acromial fractures include any fracture in the setting of reverse shoulder arthroplasty (including stress fractures), as well as displaced acromion fractures in healthy and active individuals.

Surgical Approach: Surgical fixation is via a posterior approach. The patient is positioned in lateral decubitus position, and the affected upper extremity is free draped and placed over a sterile mayo stand. The incision is made over the scapular spine, extending laterally to the acromion. The fracture is identified and fixation is performed with mini fragment 2.7 or 2.4 locking plates. Due to the high rate of fixation failure and nonunion, we utilize dual plate fixation, sometimes with a hook to wrap around the lateral end of the acromion and prevent displacement of the distal fragment (Figure 2).

Conclusion

While the majority of scapula fractures can be treated non-operatively in a sling, severely displaced scapular body fractures, intra-articular glenoid fractures, and acromial fractures may benefit from surgical fixation. The approach depends on the fracture location, and stable fixation should be utilized to allow for early motion post-operatively.

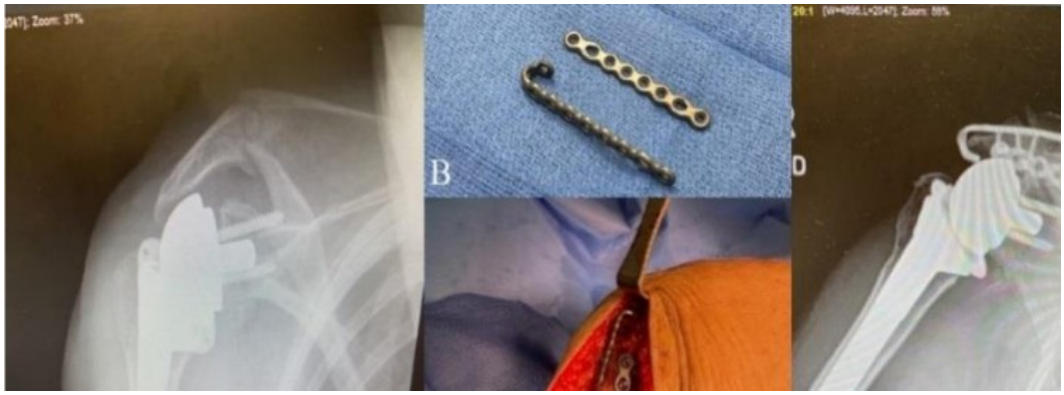

Figure 2. Acromial fracture in the setting of reverse total shoulder arthroplasty (rTSA); A) a 78-year-old patient with an acromial stress fracture which was initially missed due to normal radiographs presents with fracture displacement which is now visible on radiographs; B) intraoperative image of dual plate fixation; C) plates contoured with a hook to wrap around the acromion; D, E) postoperative radiographs

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgements

None.

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