

Dorsal Plate Fixation of Scapular Fracture

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Scapular fractures are uncommon injuries. When they occur, they are usually treated non-surgically. However, certain indications remain for operative intervention for the treatment of these injuries. In this article, we review some operative indications as well as the surgical technique. We present a case to demonstrate the indications and surgical technique of treatment. As with most surgical approaches, technique is critical to minimize morbidity and maximize functional outcome. Using these techniques, operative management of scapular fractures can be successful. (*J Hand Surg Am.* 2017; ■(■):1.e1-e5. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Glenoid fracture, plate fixation, posterior approach, scapular fracture, suprascapular nerve.



SCAPULAR FRACTURES ARE UNCOMMON, with an incidence of 0.5% to 1.0% of all fractures.^{1,2} High-energy trauma is the usual mechanism that leads to such fractures. Mortality in patients with scapular fractures is reported to range from 10% to 15% because they frequently have other concomitant injuries involving the pulmonary system, cervical spine, or cranial region.^{3–5} Most scapular fractures do not require operative treatment to achieve a satisfactory outcome.^{6,7} Scapular fractures frequently heal well without surgery because the scapula is encased by multiple muscles providing a rich vascular supply to the bone. However, Nordqvist and Petersson⁸ reported that the outcome of nonsurgical treatment showed reduced shoulder function from factors such as arthrosis, rotator cuff dysfunction, scapulothoracic dyskinesis, and impingement pain. Furthermore, it was reported that operative treatment

for scapular fractures demonstrated superior functional recovery and improved outcomes.⁹

More than 90% of scapular fractures involve the body and neck.^{10,11} Therefore, the posterior or dorsal surgical approach is more commonly used for this fracture pattern. We describe our strategy for treating scapular fractures to restore shoulder function.

INDICATIONS

Patients with scapular fractures occasionally experience polytrauma. The operative criteria are controversial. However, current treatment standards recommend at least one of the following for surgical intervention:

1. Intra-articular stepoff of the glenoid surface greater than 4 mm on computed tomography (CT) imaging
2. Fracture line crossing the scapular body, spine, and neck
3. Angular deformity greater than 40° on the scapular-Y view
4. Displacement or shortening greater than 20 mm on CT or anteroposterior radiograph
5. Glenopolar angle smaller than 10° on CT imaging
6. Floating shoulder (concomitant fracture of clavicle, acromion, or coronoid process with displacement greater than 10 mm or acromioclavicular dislocation)

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CONTRADICTIONS

Patients with polytrauma and unstable vital signs should have surgery postponed until they are medically stable:

1. Large bone or soft tissue defect in the shoulder girdle
2. Markedly comminuted fracture of the scapula
3. Concomitant traumatic brain injury or cervical spinal cord injury above C5

SURGICAL ANATOMY

For optimal surgery, it is essential to have thorough knowledge of scapula anatomy. The scapula is divided into 3 major parts when viewed posteriorly: the spine with acromial process, glenoid, and body. The base of the scapula forms by membranous ossification. It is a thinner bone than are the other bones that form by cartilaginous ossification. However, the lateral and medial borders of the scapular body have a markedly thicker bone in which drilling and screw fixation are possible. There are several muscles originating from or inserting onto the scapula, covering the scapula entirely in muscle. These are the supraspinatus and infraspinatus muscles innervated by the suprascapular nerve, the deltoid and teres minor muscles innervated by the axillary nerve, and the subscapularis muscle innervated by the subscapular nerve.¹²

The scapula has a complex vascular network that contains the circumflex scapular artery along with the scapular and subscapular arteries located next to the suprascapular nerve. The suprascapular nerve wraps around the lateral base of the scapular spine, defined as the spinoglenoid notch from superior to inferior. After exiting the notch, the nerve divides into 3 branches and courses just underneath the infraspinatus muscle where the nerve ends. The potential location of the nerve spreads inferiorly and medially like a fan, with a radius of 40 mm around the scapular notch where it is reported to be the 4-7-8 triangle in the cadaver study by Wijdicks et al.¹³

Almost all scapular fractures involve the body and the neck. Because of this, there are 3 common radiographic classification systems for scapula fractures: AO/Orthopaedic Trauma Association,¹⁴ Goss,² and Ada and Miller.¹¹ Armitage et al¹⁵ focused on fracture patterns and traced various patterns of actual fractures of the scapular body and neck treated operatively using a CT mapping technique. Accordingly, 3 main patterns were codified as inferior glenoid neck, spinoglenoid notch, and glenoid articular surface, respectively. They demonstrated that 68% of

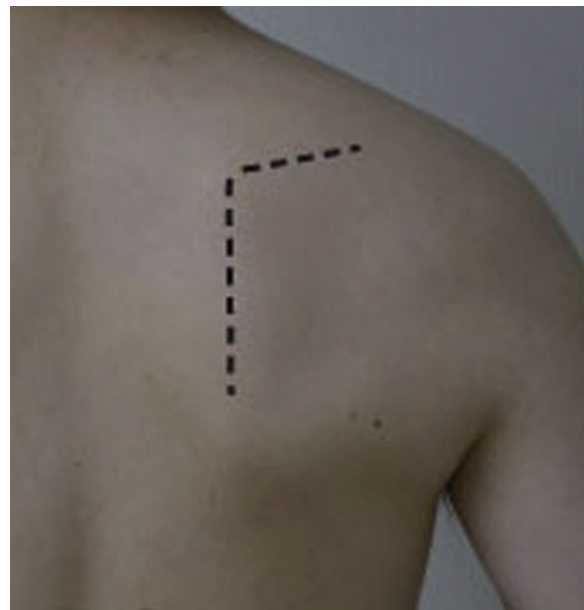


FIGURE 1: Illustration of incision line.

fractures involved an inferior aspect of the glenoid neck, and 71% of fractures traversed the scapular body inferior to the medial extent of the scapular spine. Furthermore, 17% of fractures had an articular fragment and 22% were cracked beyond the spinoglenoid notch.

SURGICAL TECHNIQUE

Surgery is performed under general anesthesia. The patient is positioned laterally with a slight lean anteriorly. This position allows easy manipulation of the arm during surgery. It is important to make sure that there is enough space to move an image intensifier in and out.

A modified Judet approach is recommended to expose the scapular fracture, place hardware adequately, and minimize morbidity and maximize function.¹⁶ The incision line is placed as an L shape ascending from the inferior angle of the scapula to the base of the lateral scapular spine through the medial edge of the scapular spine along the medial border of the scapula body and the ridge of the scapular spine (Fig. 1). A fasciocutaneous flap is raised laterally along the incision line. Consequently, the posterior part of the deltoid muscle is exposed. It is incised sharply from the scapular spine and then bluntly dissected from the infraspinatus muscle moving laterally until reaching the lateral border of the scapula. The infraspinatus muscle is detached from its origin and raised toward the lateral side off the scapular surface. This is done to avoid suprascapular

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