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Glenoid Fractures

Kara J. Bragg; Pavel Volkov; David C. Tapscott; Matthew Varacallo.

Author Information

Authors

Kara J. Bragg¹; Pavel Volkov²; David C. Tapscott³; Matthew Varacallo⁴.

Affiliations

¹ Mayo Clinic

² Michigan State University

³ Southern Illinois University

⁴ Department of Orthopaedic Surgery, University of Kentucky School of Medicine

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Introduction

The glenohumeral joint is a complex joint that lacks innate stability; the humeral head relies heavily on the ligaments of the shoulder and the rotator cuff to maintain stability. The humeral head stabilizes against the glenoid fossa, which is the lateral articular extension of the scapula.[1] [2] The glenoid is a relatively shallow dish that has multiple morphologies. It is located on the lateral scapula and is the socket portion of the shoulder joint that meets to articulate the humeral head.[3] Fractures to the glenoid are often seen in association with various shoulder instability patterns,[4] although isolated fracture can occur less commonly following direct axial loading forces to the glenoid vault or rim.[5]

The glenoid fossa fractures are often associated with other injuries and are the result of blunt trauma or high-velocity sporting injuries where the humeral head forcefully abuts the glenoid fossa.[5] There have been several glenoid fracture classifications based on the mechanism of injury, location of the fracture, and specific fracture pattern following injury. Traumatic glenoid injuries encompass a wide range of clinical severity and complexity. Patient outcomes vary accordingly, with milder forms of injury patterns healing with excellent results and full recovery expected following nonoperative management alone, to complex instability patterns resulting in poor patient outcomes even following optimal comprehensive management.[6]

Etiology

Scapular fractures, including the glenoid fossa, occur secondary to high impact blunt trauma and are often associated with other injuries.[7] The glenoid fossa can be fractured when a high-velocity blunt force causes the humeral head to impact the glenoid cavity. These fractures are typically transverse and occur along the direction of the impact of force.[5] Glenoid avulsions and rim injuries are more common and usually occur in association with an anterior shoulder dislocation and do not require as high an impact in certain scenarios. This condition commonly occurs as a sporting injury and low impact trauma or falls.[5] The latter often occurs in the elderly following a fall with a resulting associated rotator cuff injury.[8][9][10][11] The avulsions and rim fractures occur secondary to high traction on the capsulo-labral-ligament complex secondary to indirect force or my external abduction rotation by force.[5][12][13]

Epidemiology

A scapular fracture is rare and occurs in less than 1% of all fractures and only 3 to 5% of shoulder girdle injuries.[5][14] Most scapular fractures are associated with high impact trauma, and the average age is 35 years and is four more times prevalent in males.[5] Of the scapular fractures, only 10 to 20 percent are glenoid fractures.[6][5] There is a greater variance in the glenoid specific fractures with the age group between 40 and 50 years.[5] The most common types of glenoid fractures are anterior avulsion fractures and rim fractures; which are often associated with sports and occurs in younger males.[5] Intraarticular fractures of the glenoid fossa are only 1% of scapular fractures and are associated with high impact trauma.[14]

Pathophysiology

Many authors have attempted to classify the glenoid fossa fractures. In 1984, Ideberg developed a classification that was based on plain radiology films and consisted of 6 fracture types.[14] These include avulsion and rim fractures. Type II extends from the glenoid fossa through the existing scapula laterally. Type III extends from the fossa to the scapula superiorly. Type IV extends from the fossa to the scapula medially. Type V has various combinations of II-IV. Type VI has severe comminution.[5] Euler developed another classification system based on location in the scapula. Type A involved fractures of the body of the scapula; type B involved fractures of the process, type C involved fractures of the scapular neck, type D included articular fractures and type E was a combination of any of the types.[14] Computed tomography (CT) can diagnose and distinguish glenoid fossa fracture types and has led to a new classification by the Orthopedic Trauma Association (OTA) with three main groups of scapular fractures identified based on anatomical parts.[6] Fracture type F is a fracture of the articular segment that does not involve the glenoid, F1 includes simple glenoid fractures, and F2 shows multi fragmentary glenoid fractures.[6]

History and Physical

Accurate history is essential to help determine the mechanism of injury and risk for glenoid fossa injury vs. glenoid rim and avulsion fractures. The physical exam included an examination of the humerus, clavicle, scapula, and shoulder joint. The provider should assess both active and passive range of motion, strength, and neurovascular status.[15] Patients with a scapular injury will often present with ecchymosis and tenderness to palpation of the shoulder. Patients may also show an impaired range of motion of the shoulder with rotation and abduction as well as clavicular tenderness.[15] Ecchymosis was found to have the highest correlation of clinical findings with a glenoid fracture.[15]

Evaluation

Scapular fractures may be diagnosed using plain X-ray films, and in a true anteroposterior (scapular plane) and the axillary view, you will have the best view of the glenoid fossa.[5] Plain chest films are often used to assess for thoracic injuries, and studies have shown that in many situations, clinicians miss scapular fractures can [16] Other injuries such as rib fractures, clavicular fractures, pulmonary contusions, pneumothorax can obscure their presence and distract clinically from detecting the injury.[16] Computerized tomography (CT) is often needed even with the detection on plain films to determine the nature and extent of the injury, including size and precise involvement of the glenoid fossa.[5][6]

Treatment / Management

Controversy exists over management of the glenoid fracture. Treatment depends on the instability, the degree of displacement, fracture gap, and fragment size.[6] Many fractures are

small and minimally displaced and can receive conservative therapy.[5] Previously, the thinking was that fractures of the glenoid fossa routinely required surgical treatment.[17] Surgical treatment now is less favorable, and only about 10% indicate a need for surgery with anterior fractures being among those that might require surgery.[5] Avulsion fractures of less than 5 mm that are stable require conservative with immobilization. However, unstable fractures may require operative stabilization.[5] Similarly, rim fractures with a displacement of less than 5 mm and size less than 21% anterior or less than 33% posterior may also receive treatment with immobilization.[5] When the fossa cavity is involved, and the humeral head does not center in the fossa, operative management may be needed.[5] Arthroscopic surgery has made considerable advances in treating anterior glenoid rim fractures with a reduction in complications and reoperation rates.[18] Surgeons often use the arthroscopic approach in combination with percutaneous screw fixation. This method has replaced the posterior Judet approach for anterior rim fractures.[6] The open surgical approach is still necessary for some fractures. The posterior approach is the choice for posterior and inferior glenoid fractures, which account for about 80% of the open fixation surgeries. Surgeons reserve the anterior or deltopectoral approach for superior fossa fractures.[5]

Differential Diagnosis

Differential diagnosis includes clavicular fracture, rib fracture, scapular body fracture, scapular process fracture, dislocation, shoulder separation, and rotator cuff injury.[19]

Prognosis

The outcome is considered to be good in both conservative and operative management. However, there are comorbidities and concurrent injuries that can affect outcomes.[5] There is little research on the outcome and long term function of these patients, and there is evidence that some do not regain full recovery.[7] Some studies have shown that those treated non operatively have had persistent pain and mobility issues.[7] The studies have also indicated that substance abuse such as tobacco and alcohol directly impacted and decreased healing in patients who sustained a scapular fracture.[7]

Complications

Anterior glenoid rim fractures can lead to recurrent dislocations, mal-union, persistent pain, and early onset of osteoarthritis.[6] If untreated, displaced glenoid fractures can lead to chronic pain and disability, including early onset of glenohumeral osteoarthritis as well as shoulder instability with chronic dislocations.[6] Other comorbidities, concomitant injuries, tobacco, alcohol often contribute to less favorable outcomes.[5][7]

Postoperative and Rehabilitation Care

For many with rigidly fixed fractures or minimally displaced fractures, passive range of motion (ROM) exercises to start a few days after surgery. Close radiographic follow up is indicated over several weeks to ensure there is no displacement and to ensure the fracture is healing appropriately. Arthroscopic approach with rigid fixation has the least restriction in ROM, while the anterior and posterior approaches have more restriction in the abduction and rotation, and a brace is often used to limit terminal/provocative ROM which stresses the joint in various instability planes.[5] Full return to function can take up to a full year.

Deterrence and Patient Education

Patients should receive education regarding the potential for chronic, recurrent instability following traumatic shoulder dislocations with associated glenoid bone loss. In general, younger patients involved in high-level competitive sports (e.g., football) are at the highest risk of recurrent shoulder dislocations. Furthermore, glenoid bone loss in the setting of shoulder instability reduces the chance of a good outcome and return to sport, even following the appropriate surgical management and postoperative rehabilitation. Managing patient and family expectations is paramount in all of these clinical scenarios.

Pearls and Other Issues

The provider should consider other injuries when an injury to the scapula presents on imaging. This scenario is typically a high impact trauma and is often associated with other injuries to the clavicle, chest, humerus, brachial plexus, c-spine, and head.[5] Studies have shown that a high Injury Severity Score (ISS) should trigger suspicion for scapular fracture in patients involved in trauma.[20]

Enhancing Healthcare Team Outcomes

The diagnosis and treatments of glenoid fractures are continuously evolving with enhanced imaging, new fracture classifications, and advanced operative techniques. Additionally, this is an uncommon fracture which makes treatment and management more complicated given the limited population and studies. Two strong points surfaced in the literature. One, the mechanism of injury should be a strong consideration of the need for imaging. Evidence shows that other thoracic injuries and a high ISS score should lead to a higher suspicion of scapular fractures and the treatment team should have a low threshold for CT imaging if an injury is suspected. Second, the degree of instability seems to have the most substantial and consistent impact on the need for surgery, but shared decision making with the patient regarding risks and outcomes merits discussion. New advanced techniques can minimize surgical risks. Conservative treatment has been shown to be effective in non displaced fractures. Comorbidities must be considered including age, level of function, and social history can also impact outcomes and should be viable options when discussing therapy options with the patient.

The diagnosis, management, and treatment of glenoid fractures and other glenohumeral joint injuries require an interprofessional team approach, including physicians, specialists, specialty-trained nurses, and pharmacists, all collaborating across disciplines to achieve optimal patient results. [Level V] The nursing staff usually coordinates follow-up care and reports back to the clinicians regarding the progress of physical therapy and whether pain is appropriately controlled. The pharmacist may assist in pain management, sometimes recommended progressive weaning from narcotics to alternative therapies as tolerated. A team approach to the education of the patient involving nurses and clinicians will produce the best long-term results. [Level V]

Questions

To access free multiple choice questions on this topic, [click here](#).



Figure

Anatomy of shoulder joint showing glenoid fossa.
<https://www.earthslab.com/wp-content/uploads/2018/02/Glenoid-Cavity.jpg>

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