

All-Arthroscopic Treatment of Glenoid Rim Fractures



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Abstract: We describe an arthroscopic technique for the management of glenoid rim fractures. It is performed with the patient placed in lateral decubitus position. The fracture is assessed through the anterosuperior portal, and the fragment is mobilized. A special glenoid guide is used from the posterior portal to reduce the fragment and to create 2 tunnels through the glenoid and through the glenoid rim fragment. Two pairs of round buttons are connected with high-strength sutures and are tightened posteriorly. This allows strong fixation of the fractured fragment and avoids all the anterior structures since all the instruments are inserted posteriorly.

Anterior shoulder dislocation is a common injury in the young and athletic population. This injury pattern usually disrupts the capsuloligamentous complex, leading to the well-known Bankart lesion. However, in some cases, this injury provokes a fracture of the antero-inferior glenoid rim, the so-called Bony Bankart lesion. All the aforementioned are the results of violent contact of the humeral head with the anterior rim of the glenoid during the dislocation. This lesion results in glenohumeral instability and may lead to osteoarthritis of the glenohumeral joint in the long term. Glenoid rim fractures are classified into 3 types according to the Bigliani classification (Table 1).¹

Surgical treatment often is considered to manage these injuries, especially when the fracture is displaced or the fragment is large enough. The results of arthroscopic surgery have steadily improved, such that recent studies comparing current arthroscopic techniques with open procedures report similar rates of recurrence. However, there are many authors who prefer open reduction and internal fixation techniques for the treatment of this type of injury.² Many arthroscopic

procedures for the treatment of glenoid rim fractures have been described in recent years, including fixation with screws,³ transglenoid suture fixation,⁴ suture anchor fixation,⁵ and double-row bony Bankart bridge fixation.⁶

The aim of this technical note is to describe an all-arthroscopic approach concerning the surgical management of the type I and II glenoid rim fractures according to the Bigliani classification, when the width of the fragment is more than 1 cm. Two pairs of round buttons, connected with No. 5 high-strength orthopaedic sutures, stabilize the bony fragment to the anterior glenoid rim. This technique allows an anatomic and strong fixation of the glenoid rim fracture in a reproducible manner, avoiding open surgery as well as major neurovascular complications.⁷

Surgical Technique

The patient is placed in lateral decubitus position under general anesthesia. The affected shoulder is placed at 70° of abduction and 15° of forward flexion with 3 kg of traction. A fluid control system is used. The arthroscope is introduced through the posterior portal, standard anterosuperior and anteroinferior portals are created, and 75-mm cannulas are positioned.

A standard diagnostic examination of the glenohumeral joint is performed to record the characteristics of the fracture (Fig 1), the attachments of the capsuloligamentous complex to the bony fragment, and possible concomitant injuries. The fractured fragment is mobilized with an elevator, and its capsular attachments are kept intact. A shaver is used to debride the bony surfaces. A traction suture is passed through capsule and labrum to the inferior and the superior edge of the fracture to manipulate the fragment. With

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Table 1. Glenoid Rim Fractures Are Classified Into Three Types According to the Bigliani Classification

Type I	A Displaced Avulsion Fracture with Capsule Attached
Type II	A medially displaced fragment malunited to the glenoid rim
Type III	Erosion of the glenoid rim
	Less than 25% of the glenoid has been detached from the labrum
	Greater than 25% of the glenoid has been detached from the labrum

the help of an elevator and the traction sutures, the bony fragment is reduced to the proper position.

Keeping the arthroscope in the anterosuperior portal a small release to the anterior capsule performed and a special posterior glenoid guide (Fig 2) is passed through the posterior portal. The hook tip of this guide is passed along the glenoid, anterior to the fragment, and positioned to the center of the bony fragment (Fig 3). The guide should be parallel with the glenoid surface and in contact with it. Therefore, a new accessory portal is created, in cases that the posterior portal is not suitable. When the position is optimal, a bullet is placed through each one of the guide holes and is driven into contact with the posterior glenoid. A 2.8-mm sleeved drill guide is advanced carefully through each one of the bullets, drilling the glenoid from posterior to anterior and then through the bony fragment.

When the drill bits are withdrawn, the metal sleeves are left in place to secure the reduction. Two guidewires are passed through the metal sleeves from posterior to



Fig 2. The glenoid guide. Glenoid guide with special bullets used to make the bony tunnels from posterior to anterior at level of glenoid rim and two 2.8-mm sleeves (specific instruments created by Smith & Nephew). (HT, hook tip; SDG, sleeved glenoid drill.)

anterior and through the fracture and retrieved from the anteroinferior cannula. Each guidewire is loaded with an anterior Endobutton (Smith & Nephew, Watford, UK) that holds a high strength orthopaedic suture. This is a No. 5 suture made from ultra-high-molecular-weight polyethylene. The sutures are retrieved through the tunnels from posterior and the buttons come in contact with the bony fragment (Fig 4). Then, 2 posterior buttons are attached to the sutures and are tensioned with a special device (tensioner). The tension

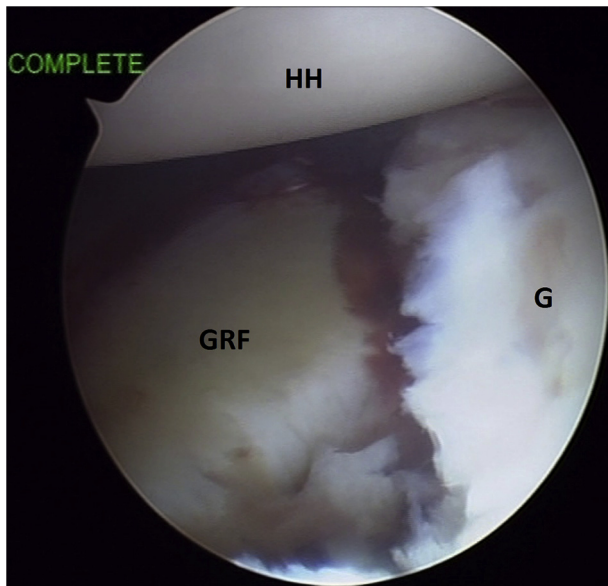


Fig 1. Arthroscopic picture of the glenoid rim fracture (right shoulder with the patient placed in the lateral decubitus position). Keeping the arthroscope in the anterosuperior portal, a standard diagnostic examination of the glenohumeral joint is performed to record the characteristics of the fracture. (G, glenoid; GRF, glenoid rim fragment; HH, humeral head.)

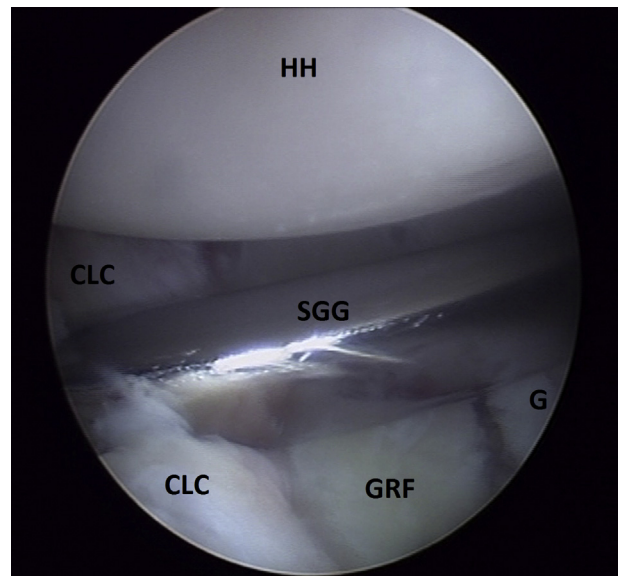


Fig 3. Arthroscopic picture of the fragment reduction using the glenoid guide (right shoulder, as viewed from anterosuperior portal). The special glenoid guide is passed through the posterior portal, along the glenoid and positioned to the center of the bony fragment. The guide should be parallel and in contact with the glenoid surface and is used to achieve fragment reduction. (CLC, capsulolabral complex; G, glenoid; GRF, glenoid rim fragment; HH, humeral head; SGG, special glenoid guide.)

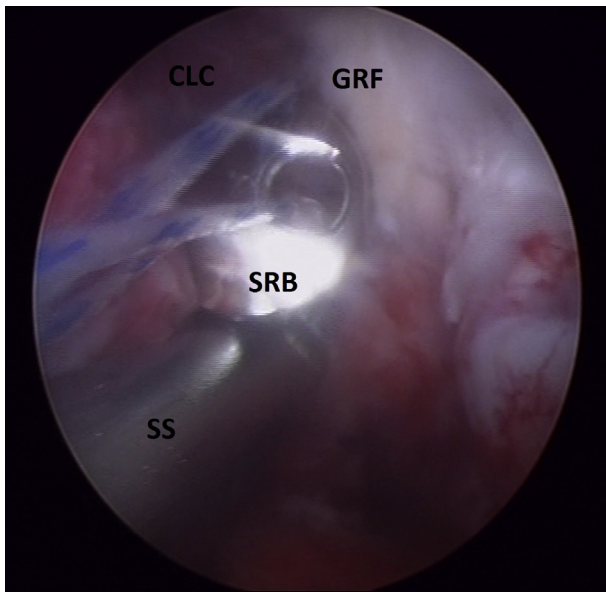


Fig 4. Arthroscopic picture of the fracture fixation using round buttons (right shoulder, as viewed from anterosuperior portal). The special button came in contact with the anterior side of bony fragment as the sutures are retrieved through the tunnels from posterior side of glenoid. (CLC, capsulolabral complex; GRF, glenoid rim fracture; SRB, special round buttons; SS, switching stick.)

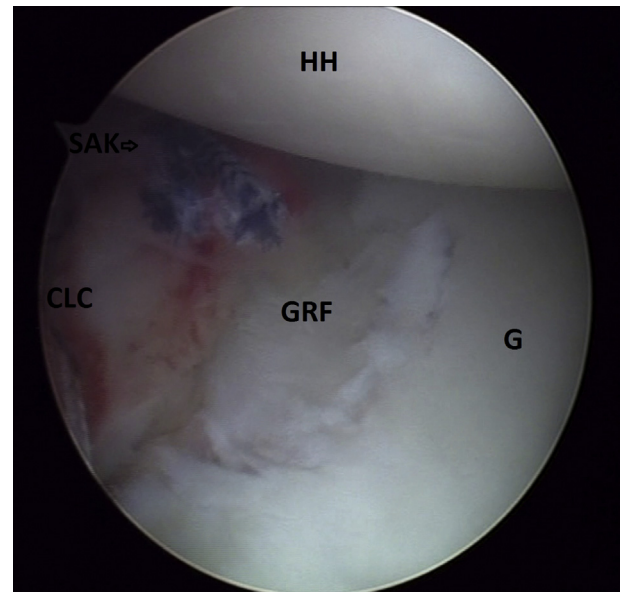


Fig 5. Arthroscopic picture of the glenoid rim fracture fixation (right shoulder as viewed from anterosuperior portal). The main goal of surgical treatment of a glenoid rim fracture is to restore the anatomy of the normal joint surface, to achieve a strong fixation and bone healing. (CLC, capsulolabral complex; G, glenoid; GRF, glenoid rim fragment; HH, humeral head; SAK, suture anchor knots.)

that is applied to the sutures is of 150 N. Eventually, the buttons are secured to the posterior wall of the glenoid with the doubled-suture Nice knot.⁸ Finally, the anterior capsule is repaired to the bony fragment with an all-suture anchor (Table 2).

The operated shoulder is protected using a sling for 6 weeks. The patient is allowed to remove the sling to perform gentle exercises and for activities of daily living as long as the motion of the shoulder is pain-free and restricted to the front part of the body (90° of forward flexion, internal rotation to the belly, and no more than 10° of external rotation). Active assisted exercises are started during the fourth postoperative week with the range of motion increased gradually. Overhead activities are allowed 3 months postoperatively and sporting activities after 6 months, increasing gradually (Video 1).

Discussion

The main goal of surgical treatment of a glenoid rim fracture is to restore the anatomy of the normal joint surface (Fig 5), to achieve a strong fixation and bone healing to prevent recurrent shoulder instability. Currently, there is no gold standard for the treatment of large glenoid rim fractures. Numerous surgical techniques have been described in the literature concerning their management. The evolution of shoulder arthroscopy gave birth to new surgical options for the treatment of these lesions.

Arthroscopic fixation of fractures of the glenoid rim gained wider acceptance, succeeding in most cases anatomic reduction and healing of the glenoid fracture, with excellent clinical results.⁹ The benefits of using arthroscopic procedures for surgical stabilization of the shoulder are beneficial, including less soft-tissue

Table 2. Pearls and Pitfalls of the All-Arthroscopic Glenoid Rim Fracture Treatment

Pearls	Pitfalls
Use the traction sutures to manipulate the fragment.	Inadequate soft-tissue release to bone fragment disturbs the fragment reduction.
Use the special glenoid guide to achieve provisional reduction.	Create the bone drills very close to fragment edges can result to further fragmentation of bone fragment.
The special glenoid guide must be parallel to glenoid surface.	Improper tensioning of the buttons can obstruct the normal healing process
Leave the cannulated drills through bone fragment to retain reduction until anterior buttons are secured.	Positioning of the fragment not flush with the glenoid.

Table 3. Advantages and Disadvantages of the All-Arthroscopic Glenoid Rim Fracture Treatment

Advantages	Disadvantages
All the benefits of an arthroscopic procedure.	Can performed only in acute cases and fragments bigger than 1 cm.
Safe procedure avoiding neurovascular structures working through standard arthroscopic portals.	Essential to use special equipment such as a special glenoid guide and cannulated drills.
No use of potentially harmful hardware such as screws.	Advanced arthroscopic skills are required.
In cases of failure or recurrence, a less-difficult revision surgery.	

dissection, better visualization of the joint pathology, improved accessibility, and easier rehabilitation.

A great advantage of the aforementioned described technique is the safety of the procedure, using standard arthroscopic portals and avoiding the major neurovascular structures at the anterior part of the shoulder, since all the guides are inserted posteriorly. The initial idea for this technique has been given by the method described by Taverna et al.,⁷ concerning the management of anterior inferior glenohumeral instability by arthroscopic bone grafting procedure. Another great advantage is the avoidance of metal screws near the joint, as only small round buttons and sutures are used to achieve fracture reduction and fixation. So, in case of possible failure and recurrence, there is no need for hardware removal, which makes the revision surgery less difficult (Table 3).

The aforementioned procedure is safe, having the general risks of an arthroscopic procedure (considering anesthesia, positioning, etc.). Additional care should be taken to avoid breakage of the fractured fragment when the drill bits are inserted or during the reduction and the compression with buttons.

Limitations of the procedure are the following. The size of the fragment must be larger than 1 cm and is essential not to be comminuted. The time between the injury and the intervention is essential. This method is applied in acute cases and is not indicated in chronic cases and malunions.

In conclusion, this study describes a technique that uses special instrumentation for the reduction of the bony fragment and 2 pairs of round buttons and high-strength (ultra-high-molecular-weight polyethylene)

sutures for the fixation of the glenoid rim fracture. This is a very safe, all-arthroscopic technique with very strong fixation and stabilization of the fracture.

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