# Arthroscopic Anatomic Glenoid Reconstruction in the Unstable Shoulder: Technique, Pearls, and Pitfalls

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*Location of the study: Halifax, Nova Scotia, Canada*

**Background:** Anterior shoulder instability with glenoid bone loss is a complex condition. Bankart repairs have higher failure rate in this population and the Latarjet procedure is associated with a high complication rate (15%-30%). A recent technique, the arthroscopic anatomic glenoid reconstruction, safely uses distal tibial allograft to augment the glenoid.

**Indications:** Glenoid or bipolar bone loss in the setting of shoulder instability.

**Technique Description:** A diagnostic shoulder arthroscopy is performed to assess bone loss and capsulolabral tissue. After the preparation of the anterior glenoid, a bone block harvested from a distal tibial allograft is prepared. This technique uses the Halifax portal, a safe, far medial portal to insert the graft, and compress it onto the anterior glenoid using screws. A Bankart repair is then performed, to reduce the capsulolabral complex onto the glenoid.

**Results:** Results at 2 years show a 92% to 100% union of the graft, no recurrence of instability, and improved patient-reported outcome scores. Graft remodeling is regularly observed on postoperative imaging. This procedure may be faster to learn and to perform compared to an arthroscopic Latarjet.

**Discussion/Conclusion:** Arthroscopic anatomic glenoid reconstruction is a safe, minimally invasive procedure to address shoulder instability. It has low complication rate and is associated with improved patient-reported outcomes.

**Patient Consent Disclosure Statement:** The author(s) attest that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form of approval from the patient(s) with this submission for publication.

**Keywords:** AAGR; distal tibial allograft; shoulder instability; Bankart repair; Latarjet procedure

## VIDEO TRANSCRIPT

My name is Maude Joannette-Bourguignon, and this video is about arthroscopic anatomic glenoid reconstruction in the unstable shoulder: Technique, Pearls, and Pitfalls.

Here are the disclosures.

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Arthroscopic anatomic glenoid reconstruction is a safe, reliable all arthroscopic technique to address bone loss in shoulder instability. Short-term studies show good patient-reported outcome measures (PROM), low rate of complications, and recurrence of instability. This procedure has a faster learning curve than the arthroscopic Latarjet procedure. This video will go over: indications, surgery planning, surgical technique, pearls and pitfalls, complications, and outcomes.

This is a 32-year-old female patient with a 14-year-old history of left shoulder instability. She is right-handed, ex-Rugby player, and works as a paramedic.

On physical examination, the patient had complete and symmetrical range of motion of the shoulders, normal rotator cuff strength, no pain on rotator cuff testing, no scapular winging, and positive apprehension and relocation of the left shoulder.

Anterior-posterior (AP)/lateral and axillary views of the shoulder are obtained. They are used to assess anatomy, and here you can see the loss of contour of glenoid that indicates bone loss as well as Hill-Sachs lesion.

A computed tomography (CT) scan and 3-dimensional (3D) reconstruction of the shoulder is obtained. 3D

reconstruction allows good understanding of the bipolar bone loss. In this case, there is about 25% glenoid bone loss and a large Hill-Sachs lesion, measuring 22 mm.

A 3D-printed model is useful for panning portal placement. On the left, Halifax portal, which is parallel to glenoid for graft insertion, and on the right, anterior superior viewing portal for visualization of the anterior glenoid. A magnetic resonance (MR) arthrogram can be obtained to assess capsule and labrum quality and associated pathologies.

Indications for surgery include glenoid or combined bone loss in the setting of shoulder instability, primary episode of shoulder instability in high-risk patient (such as young men playing contact and overhead sports), failure or recurrence of instability after a Bankart or a Latarjet procedure.

Contraindications include active untreated infection, shoulder contractures, and severe osteoarthritis.

Arthroscopic anatomic glenoid reconstruction is performed in the lateral decubitus. Cefazolin and tranexamic acid are administered intravenously. The patient is placed in lateral position at 30° from vertical, held by a beanbag. A post is placed to support the beanbag over the scapular spine of the patient. The arm is prepped and draped in the usual aseptic fashion. The left arm is placed in a pneumatic arm holder (Spider 2; Smith & Nephew, Memphis, TN) and is abducted 60°. The standard skin landmarks, including the acromioclavicular joint, clavicle, acromion, and coracoids, are drawn on the patient. A standard posterior portal is established first, and a diagnostic arthroscopy is performed.

The integrity of the articular cartilage, the biceps anchor, the labrum, and the rotator cuff tendons are assessed. In this patient, the humeral head is anteriorly subluxed. There is a large Hill-Sachs lesion. The patient has AP labral labral tears and the posterior labrum were also addressed during this surgery.

An anteroinferior portal is established to verify that the anterior inferior glenoid can be reached and that the portal is not too close to the anterosuperior viewing portal. The rotator interval is opened using the shaver and the cautery. Conjoint tendon and coracoacromial ligament can be visualized after rotator interval debridement. An anterosuperior portal is then created and becomes the main viewing portal for the remaining of the surgery. A probe is inserted from the posterior portal to measure glenoid width (20 mm in this case), and the distance from cuff insertion to intact cartilage represents the Hill-Sachs lesion.

Using the spectrum, a traction suture is passed through the labral and capsular tissue at 3 o'clock position. An episiotomy of the labrum is performed between the biceps anchor and the traction suture. The undersurface of the coracoid is exposed.

The labrum and capsule are elevated from the glenoid down to the 6 o'clock position, using the cautery and the liberator knife. The anterior inferior surface of the glenoid is flattened using a burr to expose bleeding bone and match the shape of the graft. Traction can be applied onto the 3 o'clock suture to better expose the glenoid.

It is then marked at 3 o'clock position, and this mark should be lined up with the center of the graft at the time of graft fixation.

A fresh-frozen, nonradiated distal tibia allograft (DTA) is used for this arthroscopic reconstruction. The graft is measured and cut according to the amount measured glenoid bone loss. Usually, it is harvested from the anterolateral surface of the distal tibia. Two Kirschner wires (K-wires) are inserted through a guide in the graft, parallel to the cartilage. They are over-drilled and tapped. Two top-hat washers are then screwed into the tapped holes, and the DTA is loaded onto a double-barrel cannula. It is then irrigated with normal saline solution.

A 1-cm anterior to posterior, 2-cm superior to inferior, and 1.5-cm medial to lateral bone graft is obtained.

To establish the Halifax portal, a switching stick is inserted in the posterior portal. It needs to be parallel to the glenoid. The assistant holds the arm to bring the humeral head backwards. The switching stick is then passed over the subscapularis tendon, lateral to the conjoint tendon, and toward the anterior axilla. A skin incision of about 4 cm is performed over the switching stick.

Two half-pipes cannulas are inserted over the switching stick into the joint. The switching stick is replaced by a dilator, and soft tissues are bluntly dissected until the surgeon's finger can be inserted through the Halifax portal and reach the glenoid without soft-tissue bridge.

The subscapularis is retracted inferiorly using a switching stick from the posterior portal. The arm is internally rotated to reduce subscapularis tension. Two half-pipes cannulas are inserted in the Halifax portal, and the graft is advanced toward the anterior inferior glenoid. The switching stick is used to help positioning the graft and make sure that it stays level to the glenoid cartilage.

Two K-wires are used to drill through the double-barrel cannula. The final position of the graft can be adjusted by alternating insertion and removal of each K-wire until the graft is in the correct position. A calibrated drill bit is used to drill through the graft and native glenoid. Two 36-mm-long 4.0-mm cannulated cortical screws (288226 Sterile Latarjet Screw; 34 mm, DePuy Mitek) are inserted over K-wires. The graft is compressed to the native glenoid by advancing the screws until they are flush to the top hats.

The graft is leveled with the glenoid and compressed, and the glenoid now measures 28 mm.

The capsulolabral tissue is reduced over the graft using a switching stick or pulling gently on the traction suture. A first suture-loaded anchor is inserted at the 6 o'clock position. While the assistant pulls on the traction suture, the surgeon passes the spectrum through the capsulolabral tissue, and the anchor suture is tied. This step is repeated with a 3 o'clock anchor. This second anchor may be difficult to position due to the graft screws. The drill may need to be redirected.

Finally, the traction suture is inserted in a knotless anchor just anterior to the biceps anchor. It has been shifted from the 3 o'clock position. The humeral head is balanced onto the glenoid. The Bankart repair covers the graft completely and the graft is compressed to the glenoid, without any area of gapping. The wounds are closed using staples, and local anesthetic is injected around the portal sites.

The patient is placed in a neutral brace and encouraged to move the elbow and wrist regularly. Passive range of motion can be initiated by the physiotherapist. Active range of motion starts at week 4. A strengthening program and scapular training are started at week 6. Patients can return to sports according to a thorough evaluation of their function and strength by the physiotherapist, usually around 4 to 6 months after surgery.

Postoperative x-rays from this case show good graft positioning and hardware positioning. There is always a risk of infection and neurological injuries. By making sure that the Halifax portal is lateral to the coracoid and the conjoint tendon, neurovascular structures are avoided. Wong et al[9] 18 found a 100% graft-union rate and promising short-term clinical outcomes at the 2-year time point. Postoperative imaging has shown that the graft remodels, and in rare cases, the hardware may become prominent or irritating after remodeling of the graft. Provencher et al performed DTAs in 31 males, with an average follow-up of 47 months. The patient reported outcome scores (WOSI, ASES, and SANE) improved after surgery. The union rate was 92%. Twenty-four of the 31 patients had evidence of graft resorption. There was no recurrence of instability.

The 30° tilt gives a good access to the anterior shoulder. To improve viewing and access to the anterior and inferior working space, a lateral jack and an assistant to pull the humerus posteriorly and lateral are essential. Since the Halifax portal is medial and close to the axillary fold, it is important to carefully drape medially to the nipple and inferiorly to the axilla. Opening the rotator interval is a crucial step, to ensure proper visualization of critical structures including the CA ligament and conjoin tendon and to facilitate insertion of the graft. The traction suture is key for viewing, exposing the anterior glenoid, and shifting the capsule superiorly from 3 o'clock to the 12 o'clock position. To maximize bone contact, the anterior glenoid surface must be flat and a small bevel can be added to the graft on the glenoid side.

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