

# Arthroscopic Management Strategies for Glenohumeral Articular Cartilage Lesions and Defects



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**Abstract:** Glenoid articular cartilage lesions are a source of shoulder pain and can occur in the setting of glenohumeral instability and degenerative shoulder disease. Glenolabral articular disruption lesions have been reported to be associated with worse outcomes after arthroscopic repair of labral tears. There are relatively few published studies evaluating outcomes after surgical treatment of glenoid articular lesions; however, it is generally accepted that management should consist of restoring the glenoid articular surface, minimizing exposed articular defect, and re-establishing capsulolabral integrity to achieve stability. We present arthroscopic strategies to manage these glenoid articular defects through debridement, abrasion, microfracture, capsulolabral advancement and labral interposition.

Glenoid articular cartilage defects are known sources of shoulder pain. In 1993, Naviaser first described the glenolabral articular disruption (GLAD) lesion as a traumatic injury resulting in an anterior inferior labral tear and articular cartilage loss and that caused anterior shoulder pain.<sup>1</sup> Naviaser reported these injuries were not associated with instability due to maintained integrity of the deep fibers of the anterior inferior glenohumeral ligament (aIGHL); however, subsequent authors have reported GLAD lesions can be associated with shoulder dislocations and multidirectional instability.<sup>2-5</sup> These lesions also have been reported as possible causes of failure after arthroscopic Bankart repair.<sup>6</sup>

Degenerative focal glenoid lesions also can occur and have poor healing potential.<sup>7</sup> These lesions also may be associated with degenerative labral tears. A paucity of

literature exists describing treatment options and outcomes for full-thickness glenoid articular lesions, although general tenets include debriding the defect and either stimulating fibrocartilage formation through microfracture or covering the defect with soft tissue advancement or graft. These same strategies are applied to GLAD lesions with concurrent instability, with the addition that the integrity of the aIGHL also must be restored to achieve stability.

The described techniques are the preferred methods by the senior author (L.D.F.) when addressing glenohumeral articular cartilage defects in the setting of instability or degenerative glenoid lesions.

## Surgical Technique (With Video Illustration)

### GLAD Lesions and Instability

An examination under anesthesia is performed on both shoulders to compare range of motion and stability. The senior author's preference when addressing instability is to position the patient in the lateral decubitus position, but these techniques also can be performed in the beach-chair position. Once positioned, the operative arm is sterilely prepped and draped and placed in 10 lbs of suspension traction. A standard posterior portal is established, and a 30° arthroscope is used to perform a diagnostic arthroscopy. An antero-inferior working portal is created under spinal needle localization and a cannula (Twist-In Cannula, 8.25 mm I.D. × 9 cm, Arthrex, Naples, FL) is placed to allow for suture passage and retrieval.

In the setting of a Bankart lesion with full-thickness cartilage loss from the anterior surface of the glenoid

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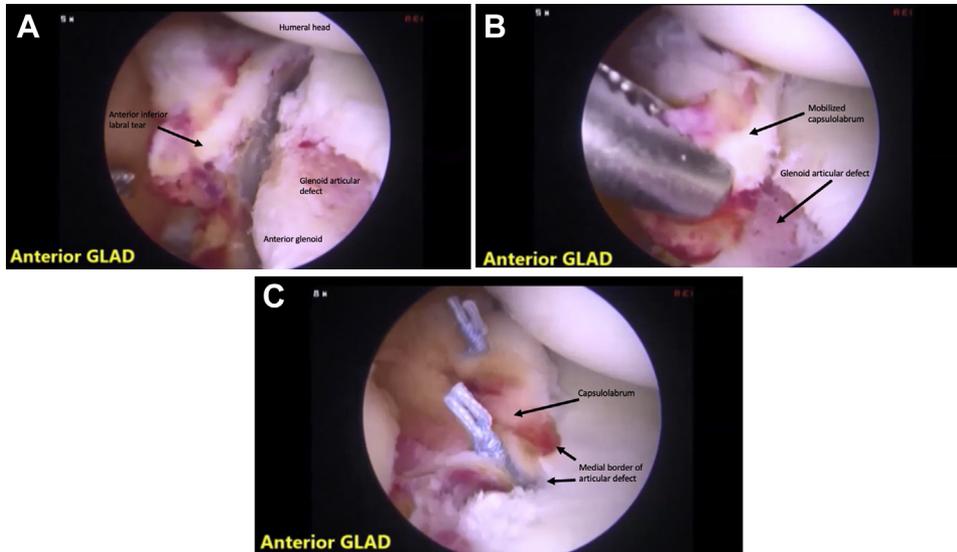
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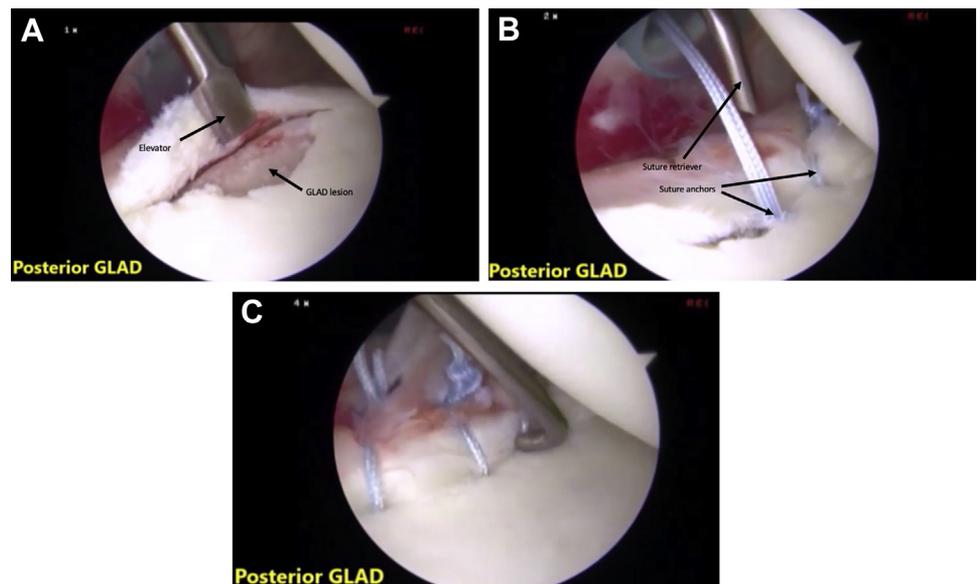


**Fig 1.** (A) The glenohumeral joint of the right shoulder in the lateral decubitus position is viewed from an anterosuperior portal and demonstrates an antero-inferior labral tear with associated GLAD lesion. (B) After elevation of the labral tear, a grasper is used to translate the labrum onto the GLAD lesion to assess mobility. (C) Two anchors are placed in the medial aspect of the GLAD lesion to advance the capsulolabral tissue onto the GLAD lesion. (GLAD, glenolabral articular disruption.)

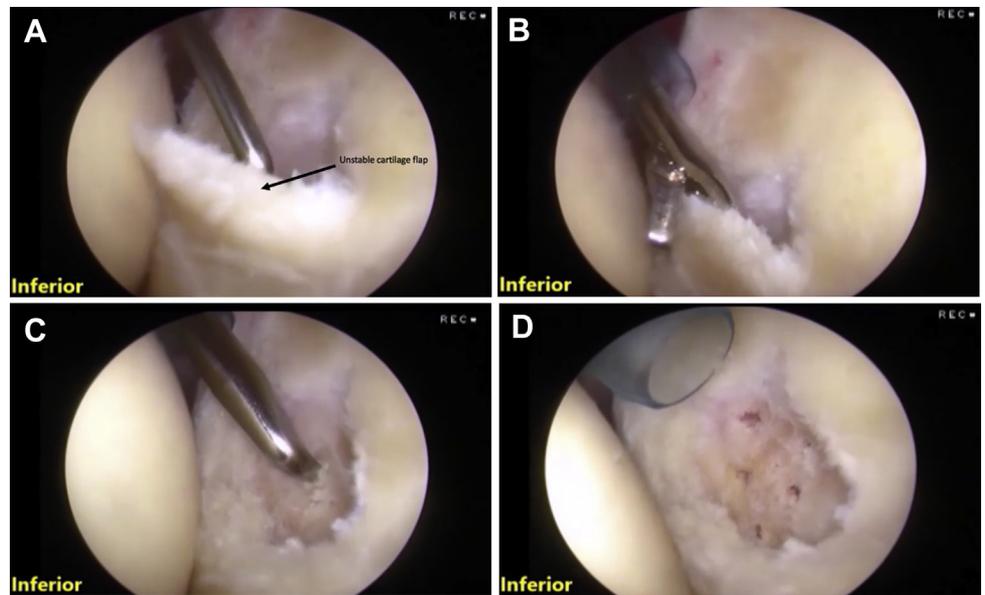
(Fig 1A, Video 1), an accessory anterosuperior viewing portal is established. An elevator is used to mobilize the labrum and capsule to allow for advancement of the labrum onto the GLAD lesion. Often the posterior portal allows for a better angle to perform anterior labral elevation. Conversely, an anterior portal can be used when elevating the posterior labrum. Next, a shaver is used to decorticate the articular defect as well as the glenoid neck to stimulate a suitable environment for healing. A grasper is used to determine the degree of labral translation after mobilization, which guides the optimum placement of anchors (Fig 1B). Using the

anteroinferior portal, anchors (SutureTak  $\beta$ -TCP with two #2 FiberWire, 2.4 mm  $\times$  12 mm; Arthrex) are placed in the medial aspect of the glenoid lesion to allow for advancement of the capsulolabral tissue onto the glenoid. Multiple anchors can be used depending on the size of the defect. These anchors are placed at the most medial point of translation of the labrum to allow for maximum coverage of the defect. Sutures are passed using a 60° retrograde suture retriever (IDEAL suture grasper, Depuy Mitek, Raynham, MA) and tied, thus advancing the tissue onto the GLAD lesion to cover the defect (Fig 1C). In larger lesions, the labrum may not be

**Fig 2.** (A) A posterior GLAD lesion is seen viewing the glenohumeral joint of a left shoulder from the anterosuperior portal in the lateral decubitus position. An elevator is shown mobilizing the labrum. (B) Anchors are placed in the medial aspect of the GLAD lesion to advance the labrum. A 60° retrograde suture retriever (IDEAL suture grasper; DePuy Mitek, Raynham, MA) is used to pass suture through the labrum via a posterior portal. (C) A probe confirms stability of labrum after advancement onto GLAD lesion. (GLAD, glenolabral articular disruption.)



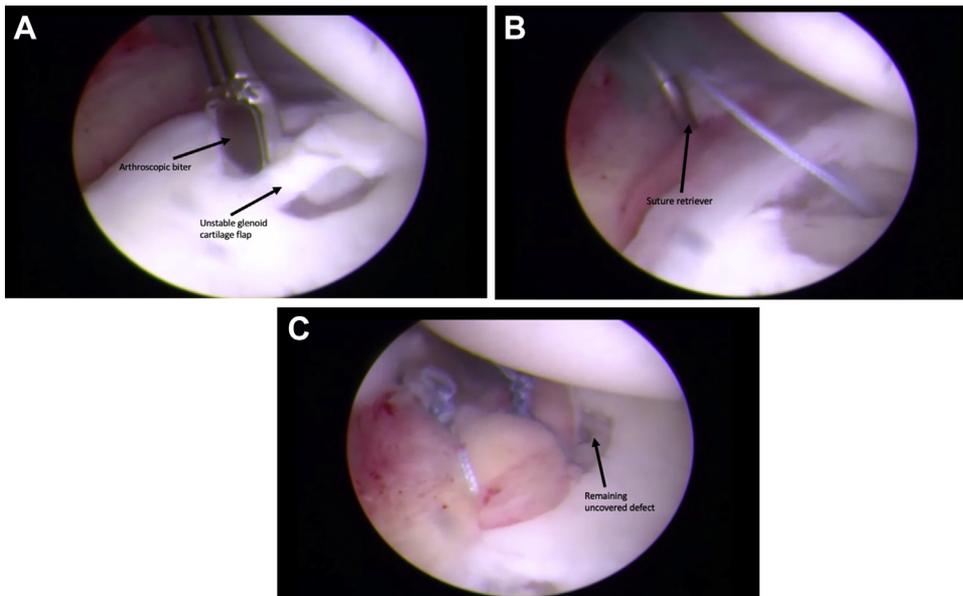
**Fig 3.** (A) A left shoulder in the beach-chair position is viewed from the posterior portal and demonstrates a degenerative articular cartilage defect with an unstable cartilage flap. (B) The cartilage flap is removed using an arthroscopic biter. (C) Microfracture is performed using a chondral pick via the anterior-inferior portal. (D) Multiple microfractures are performed to stimulate fibrocartilage production.



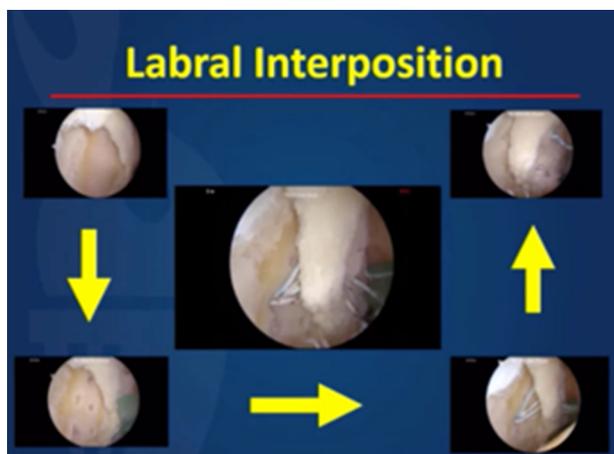
able to cover the entire defect, in which case the exposed portion of the defect is microfractured to stimulate fibrocartilage formation. A similar technique can be performed using the posterior portal as the working portal in the setting of instability with a posterior GLAD lesion (Fig 2 A-C). In this scenario, the cannula is placed in the posterior portal.

### Degenerative Glenoid Articular Lesions

In the setting of degenerative glenoid articular defects, unstable cartilage flaps are not reconstructable and are removed using a shaver or an arthroscopic biter (Fig 3 A and B). Once stable margins are achieved, the shaver is used to expose subchondral bone and abrade the cortex. Microfracture is performed using a standard



**Fig 4.** (A) A posterior GLAD lesion is seen viewing the glenohumeral joint of a left shoulder from the anterosuperior portal in the lateral decubitus position. An arthroscopic biter is used to remove the unstable cartilage flap. (B) After mobilization of the labrum, it was determined the labrum would not advance completely to the medial aspect of the lesion; therefore, the anchor is placed at the position to which the labrum will mobilize medially. A 60° retrograde suture retriever (IDEAL suture grasper, DePuy Mitek, Raynham, MA) is seen piercing the capsule to allow for adequate capsulolabral shift. (C) The lesion is shown to be largely covered by capsulolabral tissue except a small area inferomedial. (GLAD, glenolabral articular disruption.)



**Fig 5.** Labral interposition is demonstrated in a step-wise fashion. A GLAD lesion involving approximately 50% of the glenoid articular surface is shown in a right shoulder in the beach-chair position viewing from a posterior portal. The area is microfractured and the labrum is extensively mobilized. Anchors are placed within the lesion to allow for interposition of the labrum between the glenoid and humeral head. (GLAD, glenolabral articular disruption.).

angled chondral pick and mallet to stimulate fibrocartilage production (Fig 3C and D). This is typically reserved for smaller, contained lesions with minimal labral involvement. For anterior defects, the lesion is accessed using the anteroinferior portal. For degenerative lesions extending into the labrum, the unstable cartilage flaps are removed and the capsulolabrum is elevated and advanced onto the GLAD lesion to cover the defect (Fig 4A and B). Any remaining uncovered subchondral bone after labral advancement is microfractured (Fig 4C).

For larger degenerative glenoid articular lesions, a labral interposition technique can be used. The chondral flaps are debrided and microfracture is performed. Extensive mobilization of the labrum and capsule is performed using an elevator. Again, anchors are placed at the medial edge of the articular defect and the capsulolabral tissue is translated onto the defect, covering the defect, and functioning as an interposition between exposed glenoid and the humeral head (Fig 5).

### Postoperative Rehabilitation

Postoperatively, patients are placed in a shoulder immobilizer. Patients who underwent labral repair or labral interposition remain in a sling for 4 to 6 weeks. During this time, they perform gentle passive range of motion exercises including pendulums, shoulder shrugs, and elbow exercises. Formal physical therapy is begun 4 weeks postoperatively and includes passive and active-assist range of motion exercises and gentle strengthening until 3 months postoperatively, at which time they begin full strengthening and range of motion exercises. For patients who undergo microfracture only, they remain in a sling for 4 weeks, during which time they perform gentle range of motion exercises. They begin strengthening and more aggressive range of motion exercises at 4 weeks postoperatively.

### Discussion

Glenoid articular cartilage lesions can occur with glenohumeral instability or degenerative glenohumeral changes and are an additional source of shoulder pain. Management should consist of restoring the glenoid articular surface and geometry, minimizing the exposed articular defect, and re-establishing stability through tensioning of the labrum and aIGHL.<sup>8</sup> This described approach to glenoid articular lesions provides reproducible and efficient strategies for lesion management.

In the setting of a GLAD lesion with glenohumeral instability, it is important to adequately mobilize the labrum to allow sufficient labral translation to cover the GLAD lesion (Table 1). A helpful approach is using the elevator through the opposite portal technique (for example, mobilizing a posterior labral tear via the anterior portal). Once translation is assessed, it is crucial the anchors be placed in the medial aspect of the defect at the level to which the labrum will translate. This will allow the capsulolabral tissue to optimally cover the exposed defect while simultaneously tensioning the aIGHL to achieve glenohumeral stability. However, if anchors are placed too medial, the labrum will not advance to the anchors, thus weakening the construct

**Table 1.** Pearls and Pitfalls of Arthroscopic GLAD Lesion Management

Pearls	Pitfalls
Place anchors on the medial aspect of the articular defect to advance capsulolabral tissue onto GLAD lesion reduces exposed subchondral bone.	Inadequate elevation of capsulolabral tissue will limit excursion of tissue onto the GLAD lesion.
Determine medial excursion of the labrum before anchor placement to ensure appropriate placement of anchors.	Placement of anchors more medial than achievable labrum tissue advancement will result in a weakened construct.
In degenerative GLAD lesions, unstable cartilage flaps must be removed to a stable border prior to advancement of labrum and/or chondral picking.	

GLAD, glenolabral articular disruption.

**Table 2.** Advantages and Disadvantages of Arthroscopic GLAD Lesion Management

Advantages	Disadvantages
In the setting of instability and GLAD lesion, advancing the capsulolabral tissue onto the GLAD lesion covers exposed subchondral bone while also restoring aIGHL stability.	Chondral picking of large glenoid chondral defects produces fibrocartilage, which is not biologically or mechanically equivalent to hyaline cartilage.
Labral interposition provides autologous biologic tissue to decrease exposed subchondral bone and restore functional erosive anteversion of glenoid in anterior cartilage defects.	Some glenoid chondral lesions may be too large to allow advancement of capsulolabral tissue to cover entire defect.
	Overadvancement of capsulolabral tissue may tighten shoulder capsule and worsen range of motion in a degenerative shoulder.

aIGHL, anterior band of the inferior glen humeral ligament; GLAD, glenolabral articular disruption.

and potentially leading to increased suture and humeral head abrasion.

Neviaser<sup>1</sup> managed GLAD lesions with arthroscopic labral debridement and chondroplasty of the articular defect. In a case report, Agarwal et al.<sup>9</sup> described managing a GLAD lesion with simultaneous repair of the labral flap and labral tear. The described technique involved the use of standard glenoid rim anchors with suture passed through the fibrous rim of the displaced cartilage flap, thus reducing the flap in the construct.<sup>9</sup> Pogorzelski et al.<sup>6</sup> reported on 72 patients who underwent arthroscopic Bankart repair (ABR), 7 of whom had GLAD lesions. The authors found GLAD lesions significantly increased the risk of failure after ABR. They managed GLAD lesions with debridement of unstable cartilage flaps to stable margins followed by microfracture and advancement of the labrum into the defect. In comparison, Davey et al.<sup>10</sup> reported on 66 patients who underwent ABR (22 patients with GLAD lesions matched to 44 controls without GLAD lesions) and found patients with GLAD lesions had no significant difference in clinic outcomes or revision rates compared to the control group at midterm follow-up (68 months). They report similar management to our described technique of advancing the labrum onto the GLAD lesion during simultaneous repair of Bankart lesions and GLAD defects. A possible advantage of labral advancement onto the glenoid and labral interposition for significant cartilage defects is helping restore the anterior glenoid structural anatomy and functional retroversion (Table 2), which may be altered due to significant loss of anterior glenoid cartilage.

Various operative strategies have been reported for degenerative glenoid articular cartilage defects, including debridement, microfracture, osteochondral autograft or allograft, and autologous chondrocyte implantation.<sup>11-17</sup> Millet et al.<sup>12</sup> reported on 25 shoulders that underwent microfracture for articular cartilage injuries. They found significant improvement in 81% of shoulder (25/31) with greatest improvement in smaller lesions and worse outcomes in bipolar lesions. Microfracture has been shown to yield optimum outcomes when applied to contained defects. It is important to

remove any unstable chondral flaps to achieve stable contained borders prior to microfracture. A disadvantage of this technique is the production of fibrocartilage rather than hyaline cartilage.<sup>15</sup> Fibrocartilage has less biologically favorable properties than hyaline cartilage in joint surface mechanics.

For degenerative full-thickness chondral defects that occur in conjunction with degenerative labral tears, we have demonstrated a technique of mobilizing the labrum and capsule to advance tissue into the lesion. By placing this interpositional soft tissue, the chondral defect is covered with local tissue and thus avoids additional steps and morbidity required for osteochondral autografts and autologous chondrocyte implantation. Local labral interposition also has the advantage of being an autologous graft, thus avoiding potential complications inherent to allogenic grafts. A possible complication of this technique is the potential for loss of range of motion to occur if the advancement of the capsulolabral tissue overtightens the shoulder capsule. This effect may be exaggerated in a degenerative shoulder with pre-existing range of motion deficits.

In conclusion, glenoid articular lesions can occur in conjunction with glenohumeral instability or secondary to degenerative glenohumeral changes and are associated with pain and progression. Management of these glenoid defects should consist of restoring capsulolabral integrity in the setting of instability, debriding loose cartilage flaps, promoting fibrocartilage formation through microfracture, and covering the defect with advancement of the capsule and labrum onto the defect to minimize exposed subchondral bone. The described arthroscopic management techniques offer helpful strategies to approaching these challenging lesions.

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