

# Batter's Shoulder: All-Knotless Posterior Labral Repair With Retensionable Anchors for Treatment of Batter's Shoulder



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**Abstract:** Batter's Shoulder is a unique injury that may be associated with recurrent microtrauma followed by acute subluxation of the humeral head on the posterior glenoid edge, leading to posterior labral tears. Early identification of this injury is critical, as it may be treated with conservative nonsurgical treatments prior to labral tear onset. If conservative treatment fails and pain persists, surgical options include arthroscopic fixation to reapproximate the posterior labrum to the glenoid and restore capsular tension. Previous studies have shown the benefit of using knotless suture anchors in arthroscopic shoulder fixation. This technical note demonstrates that Batter's Shoulder is a unique injury associated with posterior labral tears of the shoulder and provides a contemporary method of arthroscopic fixation of a posterior labral tear using retensionable knotless all-suture anchors.

Shoulder instability is defined as the inability to keep the humeral head centered in the glenoid fossa, which is often due to a glenoid labrum tear.<sup>1</sup> Because of the relative infrequency of posterior labrum tears (5-10%), it is less studied than other types of instability.<sup>2,3</sup> In baseball and other bat or club-swinging sports, athletes can develop an acute posterior labral tear from the swinging motion, an injury that has been termed "Batter's Shoulder".<sup>4</sup> There are significant biomechanical forces transferred from batter and bat to a ball when hit, with linear bat velocities approaching 70 mph.<sup>5</sup> However, in cases where the ball is missed during the swing, a large percentage of the kinetic energy is transferred into torsional and shear forces on the posterior glenohumeral joint complex, especially the lead shoulder. These increased forces, which can

reach 500 N, can result in trauma of the soft tissues with subsequent subluxation of the glenohumeral joint, resulting in tears of the posterior shoulder labrum.<sup>4</sup> This differs from the more common form of posterior instability seen in other sports, such as football and swimming, where repetitive glenohumeral loading leads to a more chronic posterior degeneration and labral tearing.<sup>6</sup> Batter's Shoulder injuries should preliminarily be treated nonoperatively for 12 weeks with physical therapy; if nonoperative management fails, surgical interventions should be considered.<sup>7</sup> The unique injury mechanism of a Batter's Shoulder lends itself to a different surgical approach and subsequent physical therapy than other subtypes of posterior labrum tears.

Surgical treatment of Batter's Shoulder can be performed arthroscopically. With advancements in arthroscopic anchors over recent years, management of posterior labral tears has continued to evolve. Contemporary techniques have been described using both knotless and knotted fixation with either hard-body or all-suture anchors. Knotless all-suture anchors have allowed surgeons to avoid knot abrasion of the cartilage surface, while still achieving adequate fixation with comparable long-term outcomes to that of knotted fixation.<sup>8</sup> However, there are nuances to the use of these anchors and their application to posterior labral pathology. The purpose of this technical note is to describe the fixation of the posterior labrum using an

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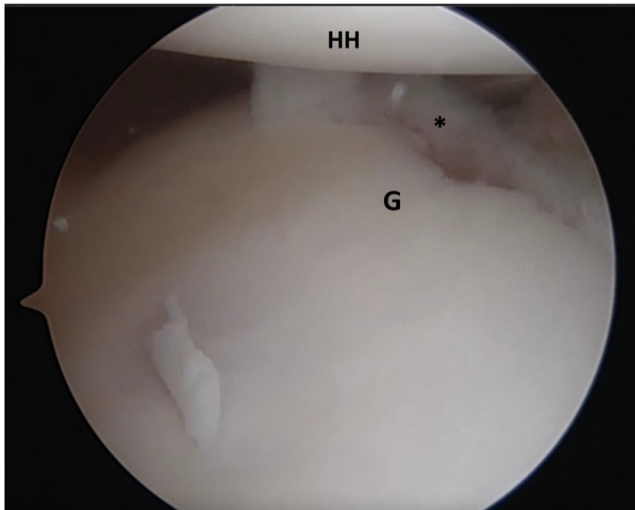
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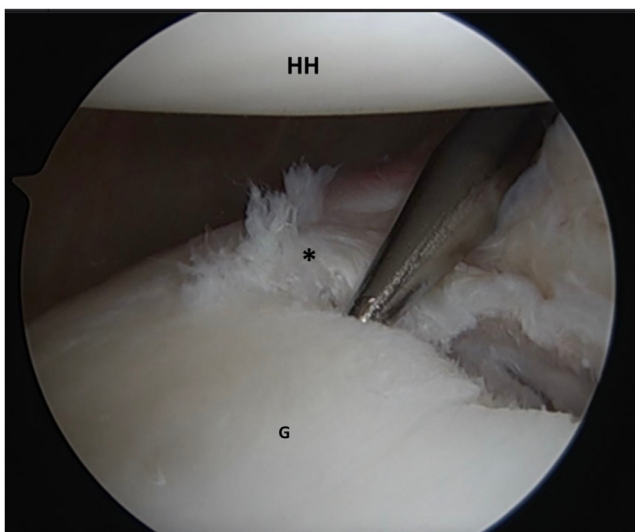
**Fig 1.** Arthroscopic image of Kim lesion between posterior labrum and glenoid cartilage of right shoulder viewed through anterosuperior portal. Patient in lateral decubitus and this is a left shoulder. The asterisk denotes the labrum. G, glenoid cartilage; HH, humeral head.

all-suture knotless repair in the setting of the Batter's Shoulder injury.

## Surgical Technique

### Patient Positioning

The senior author's preference is the lateral decubitus due to the ease of setup, however, the procedure can be done in the beach chair position based on surgeon comfort. For the described technique, the patient is positioned in the lateral decubitus position on a standard operating room table. All bony prominences are padded, and an axillary roll is placed. The arm is sterilely draped,



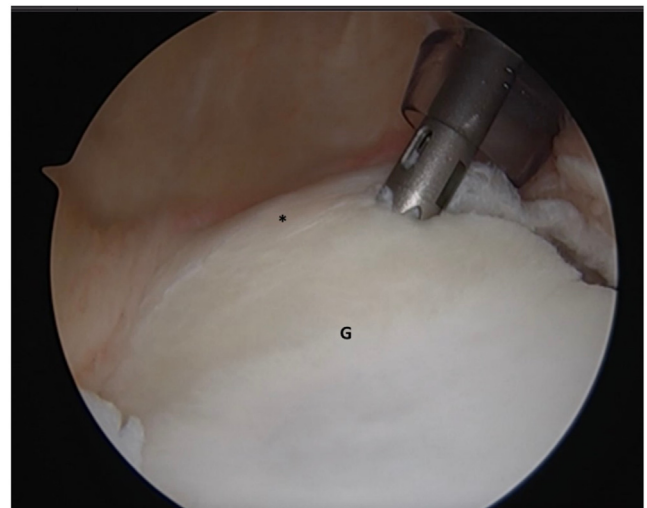
**Fig 2.** Arthroscopic image of mobilization of right posterior labrum from the 6 o'clock to the 11 o'clock position with curette viewed through anterosuperior portal. Asterisk denotes labrum. G, glenoid cartilage; HH, humeral head.

and then placed in a stockinette. The hand is wrapped in Coban and placed in a traction device (Arthrex Shoulder Suspension System) with 10 lbs. of traction to facilitate access to the glenohumeral joint. An arm holder is placed around the arm for stability.

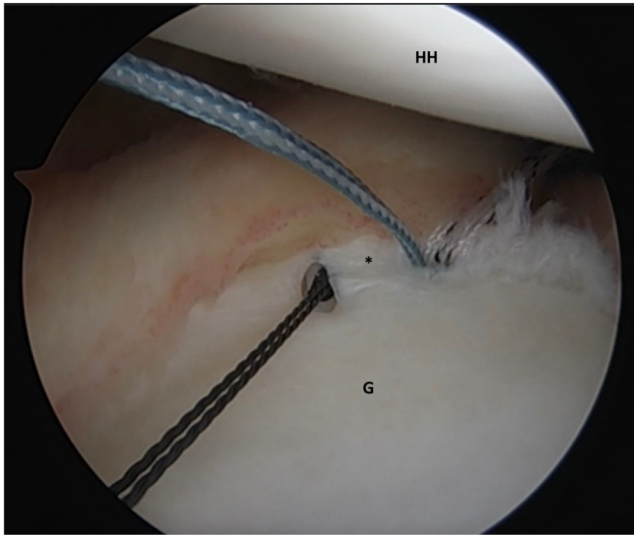
### Arthroscopic Technique

A diagnostic arthroscopy is performed using a standard posterior viewing portal ([Video 1](#)). A low anterior working portal is then established to facilitate introduction of an arthroscopic probe. In some cases, a Kim lesion (i.e., superficial tear between the posterior glenoid labrum and articular cartilage without labral detachment) between the posterior labrum and the glenoid cartilage is identified ([Fig 1](#)). To thoroughly inspect the posterior labrum, an anterosuperior portal is established. A liberator is then used to mobilize the posterior labrum from the 6 o'clock position to the 11 o'clock position, followed by a shaver and a curette to create a bleeding margin ([Fig 2](#)).

An additional 7 o'clock portal is then established percutaneously for labral fixation. A drill guide is positioned on the glenoid face, and the site of anchor placement is predrilled using a 1.6-mm drill followed by knotless anchor (FiberTak, Arthrex) placement at the 6 o'clock position ([Fig 3](#)). A suture lasso device (SutureLasso, Arthrex) is then inserted into the 7 o'clock portal, and a pinch tuck capsulorrhaphy technique is used to improve posterior shoulder stability. In the specific case of Batter's Shoulder, care must be taken to avoid overconstraint. Therefore, the first bite passes through less capsule than is usually pursued with a posterior labrum repair, and the second bite passes through the inferior labrum ([Fig 4](#)). The goal is to imbricate less capsule while still achieving circumferential labral fixation with each suture. The suture is

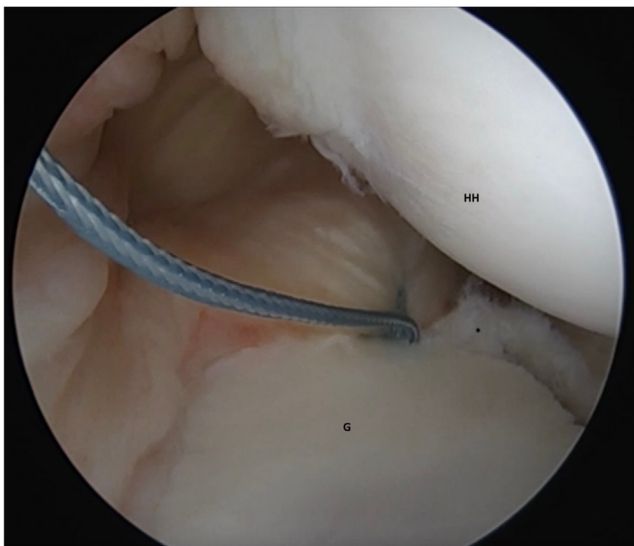


**Fig 3.** Arthroscopic image of drilling for Fibertak (Arthrex) knotless anchor at the 6 o'clock position through the 7 o'clock portal viewed through the anterosuperior portal.

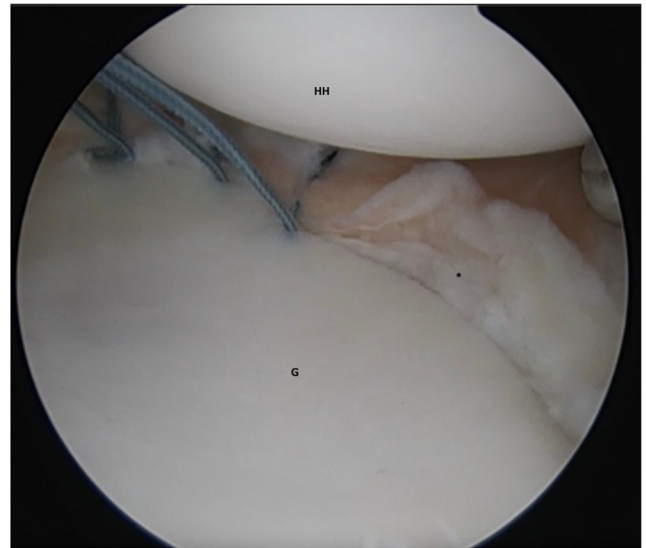


**Fig 4.** Arthroscopic image of suture lasso device after pinch tuck technique through capsule (C) and inferior labrum (asterisk) viewed through the anterosuperior portal. G, Glenoid cartilage, HH: Humeral Head

preliminarily tensioned and tied, and then placed out of the anterior portal for later retensioning (Fig 5). In cases of a labral tear with displacement, rather than a tear “in situ,” an assistant should hold the labral tissue in a reduced position with an arthroscopic grasper during knotless tensioning to ensure anatomic labral reduction. The drill is then reinserted into the 7 o’clock portal, and another knotless anchor is placed at the 7 o’clock position. The suture lasso device is reinserted, and a pinch tuck configuration is used, again passing through less of the capsule and more of the posterior

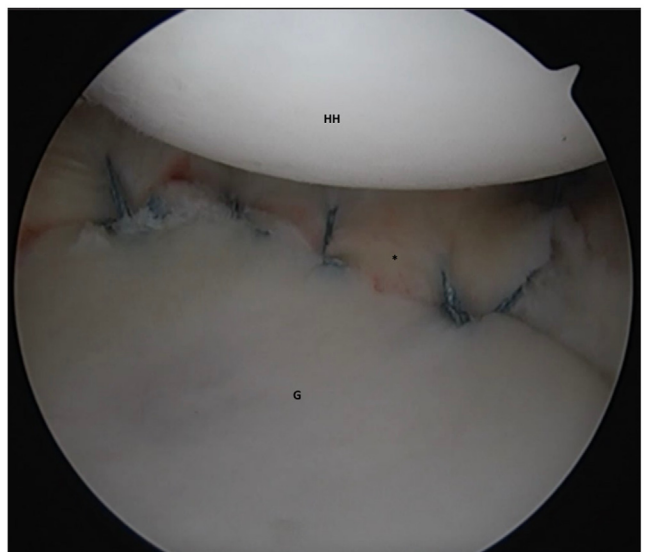


**Fig 5.** Arthroscopic image of suture placed out from the anterior portal for later retensioning viewed through the anterosuperior portal. The asterisk denotes the labrum, G, glenoid cartilage; HH, humeral head.



**Fig 6.** Arthroscopic image of FiberTak (Arthrex) knotless suture placed at 10 o’clock position through 7 o’clock portal. Suture left out of anterior portal for retensioning. Viewed through the anterosuperior portal. The asterisk denotes the labrum, G, glenoid cartilage, HH, humeral head.

labrum than with other posterior labral injuries. A capsular shift is performed concurrently to mobilize the posterior inferior glenohumeral ligament (PIGHL) from inferior to superior. Pleats of tissue are mobilized ~1 cm off the glenoid rim, and about an hour lower on the clock face. The suture is preliminarily tightened and tied, and then placed out the anterior portal for later retensioning. This pinch tuck configuration technique is repeated at the 8 o’clock and the 10 o’clock positions (Fig 6). Once all of the anchors have been placed, the labral attachment is once again visualized to ensure



**Fig 7.** Arthroscopic image of final construct viewed through anterosuperior portal. The asterisk denotes the labrum. G, glenoid cartilage; HH, humeral head.

**Table 1.** Advantages and Disadvantages of Posterior Labrum Repair with Knotless Fixation

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Shorter operation time</li> <li>• Preserves articular cartilage due to a lower suture profile</li> <li>• Decreased risk of knot migration</li> <li>• Decreased risk of knot loosening</li> </ul>	<ul style="list-style-type: none"> <li>• Steeper learning curve when compared to the traditional knotted technique</li> </ul>

adequate reduction, stability, and capsulorrhaphy without overconstraint. The repair sutures are then cut short (Fig 7). Prior to closure, stability of the construct is manually assessed anteriorly and posteriorly.

### Postoperative Rehabilitation

Wrist and elbow mobility and grip strengthening begins on postoperation day 1 and continues for 3 weeks, while the shoulder remains immobilized. At 3 weeks postoperation, shoulder forward flexion, internal rotation, and external rotation exercises are begun, with restriction of shoulder adduction. Once 140° of forward flexion is achieved, generally around 6 weeks postop, weight is added to these movements. Adduction training can also begin, starting with active range-of-motion training and progressing to weight when the athlete is ready. This is done via isometric holds, bands, and light weights (1-5 lbs). Once the athlete reaches weeks 10 to 11, closed-chain crossbody adduction exercises are started, with side-lying active range of motion and implementation of other dynamic movements. At ~3 months postoperation, range of motion, as tolerated by the athlete, is allowed along with sports-specific training. Once the athlete reaches 4-4.5 months postoperation, crossbody power production through batting or swinging is gradually progressed. Throwing can also be started at 4.5 months, and maximum medical improvement usually occurs by 12 months postoperation.

This progression differs from typical posterior labrum rehab protocols, emphasizing greater cross-body adduction exercises as the athletes progress through physical

therapy. Cross-body movement is essential in returning batters and other club-swinging sports to play, specifically when the injury is in the lead-swinging arm, as seen in Batter's Shoulder. This emphasis in return-to-play protocols for swinging sports helps to limit reinjury and pain following surgery.

### Discussion

In this technical note, we describe a method for arthroscopic knotless suture fixation of a Batter's Shoulder. Batter's Shoulder is a subset of posterior labral instability, representing a minority of posterior labral instability cases.<sup>9</sup> The injury mechanism and resulting deformity is unique in that it occurs after an acute, traumatic subluxation of the humeral head on the glenoid during a baseball or other club sport's swing, instead of the more common repetitive micro-tear of the posterior labrum following loading of the glenohumeral joint. Recent studies have shown, regardless of fixation technique, between 91% and 100% of athletes with a Batter's Shoulder injury are able to return to their previous level of play following arthroscopic treatment with posterior labral fixation.<sup>9,10</sup> While these studies illustrate the benefits of arthroscopic fixation of a Batter's Shoulder injury, they fail to identify the specifics of the techniques and fixation used. This technical note provides a reproducible method of arthroscopic fixation for this specific injury.

Knotted fixation has been the traditional method of fixation in arthroscopic labral repair.<sup>10</sup> There has been a shift toward knotless fixation for anterior labral tears due to less knot abrasion, but there is a lack of research looking at knotless repairs of Batter's Shoulder. Research looking at biomechanics and clinical outcomes on anterior labral tears, could suggest there is a benefit in using knotless fixation for a Batter's Shoulder injury.<sup>11</sup> These benefits likely include shorter times to return to play and fewer postoperative complications.<sup>12,13</sup> This is especially intriguing for a Batter's Shoulder injury, as they are almost exclusively seen in competitive athletes; however, more research specific to posterior labral repair and outcomes is needed.

In this technical note, 4 knotless suture anchors were placed on the posterior capsule and labrum to

**Table 2.** Pearls and Pitfalls to Posterior Labrum Repair With Knotless Fixation

Pearls
Take care when placing the 7 o'clock portal to allow for proper trajectory of anchor placement.
Ensure that both anchor and suture material are below the cartilaginous surface of the glenoid rim.
Rehabilitation includes additional cross-body strengthening for sport-specific requirements and earlier return to play.
Pitfalls
Overtensioning of knotless suture repair can lead to radial tearing through labral tissue.
Excess capsulorrhaphy can lead to joint constraint and tightness, while undertightening can lead to recurrent instability in patients with capsular laxity.
Suture anchors placed too close to the articular surface can lead to iatrogenic cartilage damage and recurrence of pain.
Care should be taken to not take excessive capsular tissue bites the 6 o'clock position, as the axillary nerve is located just distally to this area.

approximate the labrum to the glenoid. A recent cadaveric study by Nolte et al. compared knotless suture fixation to knotted all-suture anchor fixation in SLAP II repairs.<sup>14</sup> No differences were seen in load to repair failure, load to ultimate failure, and load to dislocation between the 2 repair techniques. Another single institution study by Wu et al. compared outcomes at a mean of 4.8 years and found that there was no statistical difference in dislocation between knotless and knot-tying techniques, but the knotless suture technique had a lower rate of resubluxation.<sup>8</sup> Furthermore, knotless suture fixation decreases operative time in multiple shoulder arthroscopic fixations with less cartilage damage compared to other suture fixation techniques.<sup>12,13</sup> These data would suggest generalizability of knotless fixation as a viable approach, even in the unique biomechanics seen in Batter's Shoulder injuries.

The Knotless suture anchor fixation described in this technique piece has several benefits for a Batter's Shoulder injury over knotted repair (Table 1). First, surgical time, which may allay a cost and risk-benefit with less time under general anesthesia.<sup>13</sup> Increased OR times has been also shown to increase the risk of surgical site infection, and operative duration over 2 hours has been shown to have a 67% increase in total complications within orthopedic surgeries.<sup>15</sup> Second, cartilage within the shoulder joint is better preserved due to a lower profile in comparison to knotted suture fixation techniques without sacrificing stability.<sup>12</sup> Third, long-term (>4 years) outcomes were comparable to traditional knot tying techniques; however, with the added benefit of a lower rate of recurrent subluxation.<sup>8</sup>

The limitations and potential risks of this procedure are highlighted in Tables 1 and 2. The biggest limitation of this procedure is the learning curve, as placing knotless fixation is a different technique than traditional knotted fixation. There is a risk of overtightening the joint during capsulorrhaphy, particularly in patients without significant shoulder instability, as well as undertightening in patients with significant capsular laxity. Preoperative assessment, including physical findings and MRI evaluation are necessary for adequate capsulorrhaphy. Lastly, there is a risk of iatrogenic axillary injury if excessive capsular tissue is grabbed with the suture lasso device at the 6 o'clock position.

In conclusion, arthroscopic repair of a Batter's Shoulder injury via total knotless technique is a promising approach with the benefit of reduced morbidity and shorter operation times. Further study is needed to determine the long-term clinical outcomes of Batter's Shoulder repair with a retensionable all-suture knotless technique.

### Disclosure

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