

Arthroscopic Subscapularis Augmentation Using the Long Head of the Biceps Tendon for Anterior Shoulder Instability



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Abstract: The limitations of transferring the coracoid process along with the conjoined tendon are coracoacromial arch damage, technical difficulty, and nerve injury. The long head of the biceps tendon (LHBT) proximal transposition technique has a weaker sling effect and a risk of nerve injury. The arthroscopic subscapularis augmentation technique may have risks of shoulder external rotation restriction and subscapularis transection. Herein, we introduce an arthroscopic technique for the transfer of the LHBT for subscapularis augmentation to address these risks. Indications of this technique were patients younger than 45 years of age who engage in competitive sports, require forceful external rotation and abduction, have a related capsule-ligament insufficiency, and have a glenoid bone loss <25%. The steps include detaching the LHBT at the upper edge of the pectoralis major, transecting and braiding the LHBT, establishing a scapular tunnel, placing a guide suture through the upper third of the subscapular and scapular tunnel, passing the LHBT through the established tunnels, and fixating the LHBT. This technique achieves stability of the anterior shoulder by transecting and transferring the distal end of the LHBT to press on the upper third of the subscapularis muscle.

When treating anterior shoulder instability with glenoid bone loss, the simple Bankart repair that reattaches the torn labrum to the rim of the glenoid has a high rate of recurrent dislocations.^{1,2} There are various surgical techniques that improve the stability of the anterior shoulder with glenoid bone loss by enhancing the subscapularis muscle. For instance, the Latarjet procedure, or transfer of the coracoid process along with the conjoined tendon, is an effective

treatment for anterior shoulder instability with bone loss.³ Modified techniques of Latarjet, such as the Bristow and Latarjet procedure, wherein transfer of the conjoined tendon–coracoid tip complex and others, have been reported with overall satisfactory results.^{4–6} However, these techniques are limited by technical difficulty, with a long learning curve and risks of short-term postoperative complications, such as axillary nerve injury and coracoacromial arch damage.^{7,8}

Although the sling effect of the long head of the biceps tendon (LHBT) proximal transposition technique is weaker than the conjoined tendon, biomechanically LHBT transfer achieves superior peak resistance force to anterior displacement than conjoined tendon transfer.⁹ Regrettably, the risk of vascular and nerve injury is also unavoidable in LHBT transfer.⁵ The arthroscopic subscapularis augmentation (ASA) technique, which is characterized by partial tenodesis of the upper third of the subscapularis tendon in combination with Bankart repair, has been effective for treating anterior shoulder stability with less than 25% glenoid bone loss.¹⁰ Nonetheless, its use has been reduced by the potential risks of limiting shoulder external rotation and transecting the subscapularis.

Herein, we introduce an arthroscopic technique of transfer of the LHBT (ASA-LHBT) for subscapularis

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The authors report the following potential conflicts of interest or sources of funding: This study was supported by Xiamen Superior Sub-specialty construction project of Arthroscopic minimally invasive Orthopedics department (No. 2018296) and Xiamen Key Specialty construction project of Traumatic Orthopedics department (No. 2015347). Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

Received October 12, 2021; accepted December 22, 2022.

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2212-6287/211461

<https://doi.org/10.1016/j.eats.2021.12.040>

Table 1. Indications and Contraindications for the Arthroscopic Subscapularis Augmentation Using the Long Head of the Biceps Tendon (ASA-LHBT) Technique

Indications for ASA-LHBT
<ul style="list-style-type: none"> • Patients younger than 45 years of age • Participating in competitive sports • Requiring forceful external rotation and abduction of the shoulder • Having capsule-ligament insufficiency, such as general laxity or capsule defect • Glenoid bone loss less than 25%
Contraindications for ASA-LHBT
<ul style="list-style-type: none"> • More than 50% rupture of the LHBT • Patients not requiring anterior shoulder augmentation

augmentation to improve anterior shoulder stability and to minimize the risks of shoulder external rotation limitation and subscapularis damage associated with the ASA technique.¹¹ This technique enhances the stability of the anterior shoulder joint by pressing the upper third of the subscapularis with the LHBT while performing a conventional Bankart repair. The indications of ASA-LHBT include patients younger than 45 years of age who participate in competitive sports, require external rotation and abduction, have a related capsule-ligament dysfunction, and have a glenoid bone loss <25%. Anterior shoulder instability patients with superior labrum from anterior to posterior tear performed with LHBT insertion repair also are eligible for ASA-LHBT. The contraindications for ASA-LHBT include more than 50% of LHBT tears and those who do not require anterior shoulder augmentation (Table 1).

Surgical Technique (With Video Illustration)

Patient Position, Portal Creation, and Arthroscopic Examination

Place the patient in the lateral decubitus position under general anesthesia and brachial plexus block, with the affected arm kept in 30° abduction with traction of 10 lb. Create standard anterior, posterior, and anterosuperior portals. In addition, perform a routine arthroscopic examination to detect all pathologies (Table 2).

Detaching, Extracting, and Braiding the LHBT

Release the rotator cuff space through the posterior portal during arthroscopic observation, then establish the anterolateral portal that is located at the level of the coracoid process and approximately 2 cm lateral to the anterior midline of the arm. Identify the LHBT between the distal bicipital groove and superior edge of the pectoralis major with an exchange rod, and then create the anterodistal portal in the superior edge of the pectoralis major. Through the anterodistal portal, fix the distal end of the LHBT in the superior edge of the pectoralis major using a 4.5-mm rivet (Smith &

Nephew, Andover, MA) and transect the LHBT at the proximal end of the fixed suture.

Insert the arthroscope into the joint via the posterior portal, and then retrieve the LHBT out of the rotator cuff space through the anterosuperior portal. Braid the biceps tendon with two no. 2 high-strength sutures (ULTRABRAID; Smith & Nephew) outside the incision in a whipstitch style. Ensure that the braided length of the tendon segment is approximately 3 cm and the braided width measures 4 mm to 5 mm (Fig 1).

Creating the Glenoid Tunnel

Place the arthroscope into the joint via the anterosuperior portal. Under arthroscopic observation, insert a tibial guider (Arthrex, Naples, FL) into the joint through the posterior portal for anterior cruciate ligament reconstruction. Set the locator to the minimal angle and place the tip located at the 9 o'clock position (left shoulder) with the guide rod passing through the bare spot of the glenoid. Drill a 2-mm K-wire into the glenoid that is typically 7 mm below the surface from posterior to anterior. The posterior entry point of the K-wire is located at the 3-o'clock position (left shoulder). Create a glenoid tunnel that approximately measures 30 to 35 mm in length by overdrilling the K-wire with a 4.5- or 5-mm cannulated drill (Figs 2 and 3).

Passing the Braiding Suture and LHBT Through the Glenoid Tunnel

Arthroscopic observation is performed through the anterolateral portal. Pull the braiding suture through a cannula that is guided by a 3-mm rivet to the subscapularis from posterior to anterior via the upper third of the subscapularis and the myotendinous junction. Then, maintain the cannula and remove the inner core. Expose the anterior side of the subscapularis, pass the suture lasso through the upper third of subscapular muscle at tendon muscle abdominal junction, and then place a lead wire. Fold the polydioxanone II suture into the hollow cannula and pass through the glenoid tunnel from posterior to anterior using a suture retriever that pulls out the suture across the subscapularis. Find the guide suture anterior to the subscapularis muscle

Table 2. Step-by-Step Surgical Procedure

1. Identify the LHBT in the superior edge of the pectoralis major, fix the LHBT, and transect the proximal end of the fixed suture
2. Pull the LHBT out of the joint via the anterosuperior portal
3. Braid the LHB with 2 high-strength sutures
4. Create a glenoid tunnel
5. Pass a guide suture through the glenoid tunnel from posterior to anterior and then through the subscapularis to the anterior side
6. Pull out the polydioxanone II suture across the subscapularis
7. Pass 2 braided sutures through the two middle holes of the miniplate
8. Tie all braided sutures to the miniplate

LHBT, long head of the biceps tendon.

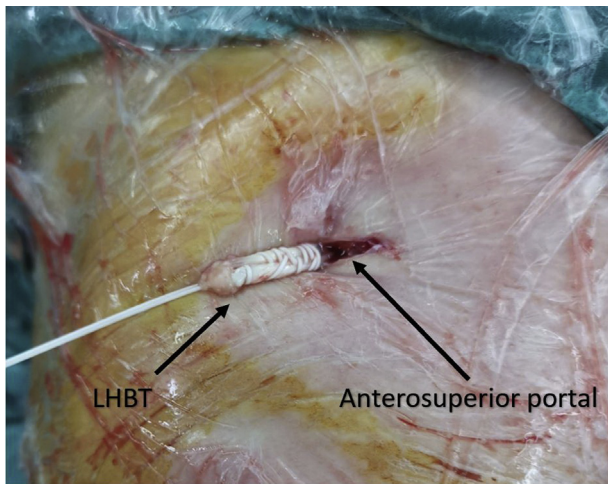


Fig 1. External view of the left shoulder showing the braided long head of the biceps tendon (LHBT). After the LHBT is transected at the upper edge of the pectoralis major, it is pulled out from the anterosuperior portal and braided with two no. 2 high-strength sutures outside the incision in a whipstitch style. Ensure that the braided length of the tendon segment is approximately 3 cm and the braided width measures 4 to 5 mm. Arrows point out the LHBT and anterosuperior portal, respectively.

and then introduce the LHBT braidings. Pull the distal end of the transferred LHBT through the subscapularis into the glenoid tunnel (Fig 4).

Fixation of the LHBT

Manually enlarge the posterior portal incision to approximately 2 cm in length and fully separate the soft tissue around the posterior portal using hemostatic forceps. Then, move the 2 ends of each braided suture through the middle 2 holes of the miniplate (ENDO-BUTTON; Smith & Nephew) separately. Push the miniplate into the incision along the braided suture using

knot pushers. Feel the soft-tissue elasticity by repeatedly pushing the miniplate to ensure that the miniplate firmly attaches to the bone surface. Keep the knot pusher against the miniplate and feel the tension of the LHBT by tightening the 2 sutures, relaxing the shoulder traction device, and repeatedly rotating the shoulder joint inward and outward. After ensuring no obvious limitation of external rotation of the glenohumeral joint, keep the glenohumeral joint at the neutral position of external rotation and tie all the braided sutures to the miniplate (Figs 5 and 6). The complete surgical procedure is shown in Video 1 along with a list of pearls and pitfalls that the authors have found helpful (Table 3).

Discussion

Anterior shoulder instability is a common clinical condition that is most frequently caused by a previous trauma with shoulder joint dislocations or subluxations.² Although the open anterior capsulolabral reconstruction (Bankart repair) has been deemed as the gold standard for the treatment of recurrent anterior shoulder instability,¹² it suffers high failure rate. For instance, a meta-analysis that pooled the results of 28 studies with 1,652 repairs found that the estimated redislocation rate was 7.7% for open Bankart repair and 15.1% for arthroscopic Bankart repair.¹³ Previous studies have identified risk factors for Bankart repair failure such as a younger age at operation,¹⁴ decreased glenoid retroversion,¹⁵ glenoid bone loss $\geq 15\%$,¹⁶ greater level of sports performance, as well as exercise requiring external rotation and abduction of the glenohumeral joint.^{17,18}

Simple Bankart repair is not suitable for anterior shoulder instability with significant glenoid bone loss due to its high recurrence rate.¹⁹ A recent

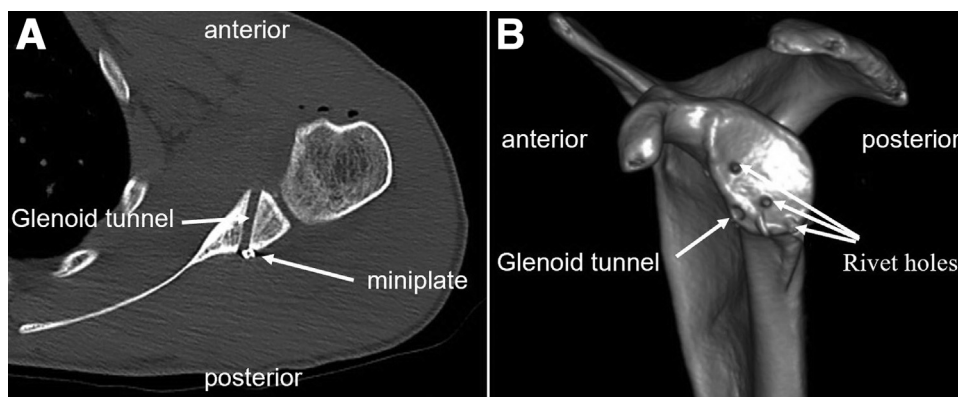


Fig 2. (A) Postoperative computed tomography (CT) of the left shoulder showed that the glenoid tunnel measures approximately 30 to 35 mm in length and 4.5 to 5 mm in diameter. Arrows point out the glenoid tunnel and miniplate, respectively. (B) Postoperative CT 3-dimensional reconstruction of the left shoulder showed that the glenoid tunnel was established at about 9 o'clock in front of the glenoid and 7 mm below the articular surface. Arrows point out the glenoid tunnel and rivet holes, respectively.

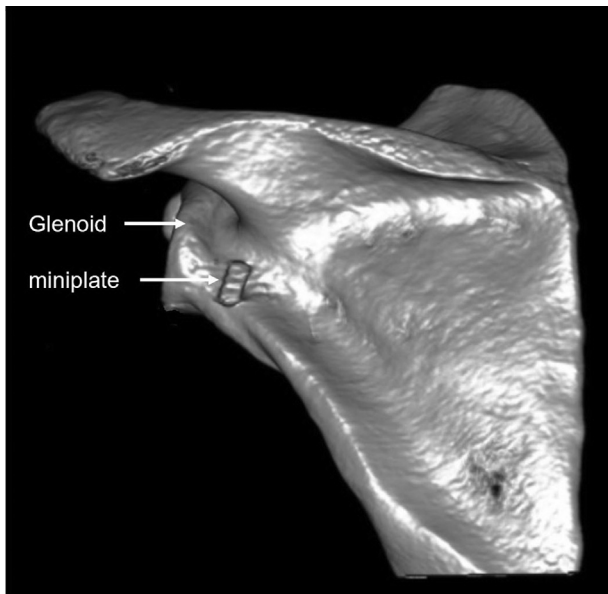


Fig 3. Postoperative computed tomography 3-dimensional reconstruction of the left shoulder showing the location of the miniplate for fixation of the long head of the biceps. Arrows point out the glenoid and miniplate, respectively.

biomechanical study suggested that a glenoid bone loss >21% may cause instability and limit the range of motion of the shoulder after Bankart repair.²⁰ However, there are multiple surgical techniques that may enhance the subscapularis to improve the stability of the anterior shoulder with glenoid bone loss.²¹ Moreover, bony reconstruction procedures like Bristow, Latarjet, Eden–Hybinette, and others are often needed when the glenoid bone loss exceeds 20% to 25%.^{4,22–24} All these techniques achieve stability augmentation of the anterior shoulder by using the

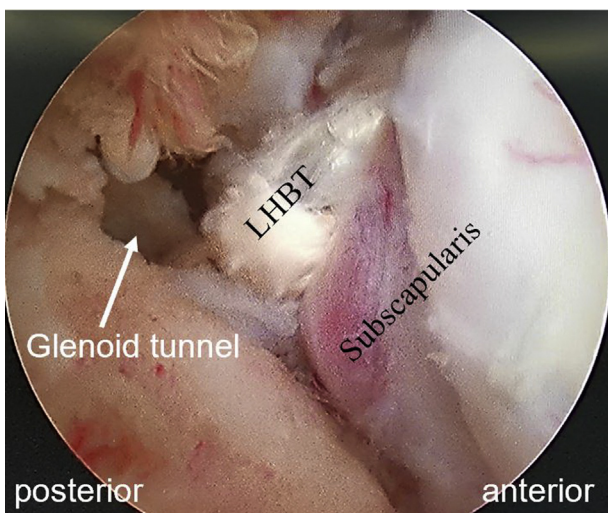


Fig 4. Arthroscopic view of the left shoulder from the anterosuperior portal in the lateral decubitus position. The long head of the biceps was pulled into the glenoid tunnel. Arrow points out the glenoid tunnel.

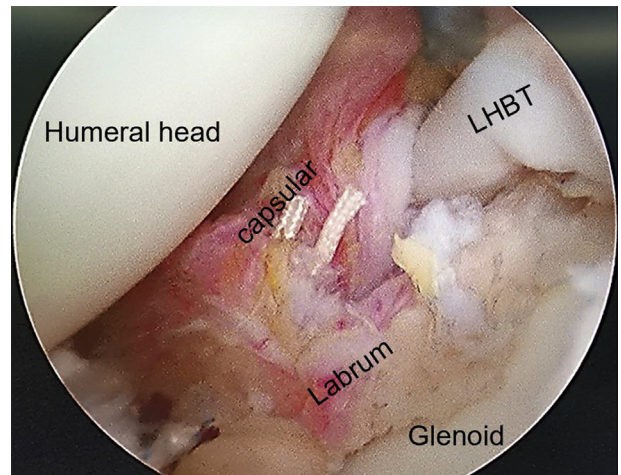


Fig 5. Arthroscopic view of the left shoulder from the posterior portal showing the long head of the biceps tendon transposition and capsular repair. (LHBT, long head of the biceps tendon.)

conjoined tendon to press the lower third of subscapularis. The Bristow–Latarjet procedure stabilizes the glenohumeral joint by creating a sling effect using the transferred conjoined tendon, enlarging the glenoid surface with the transferred coracoid process, and repairing the capsule to a coracoacromial ligament stump. However, these techniques are challenging and come with a very long learning curve.²⁵ Moreover,

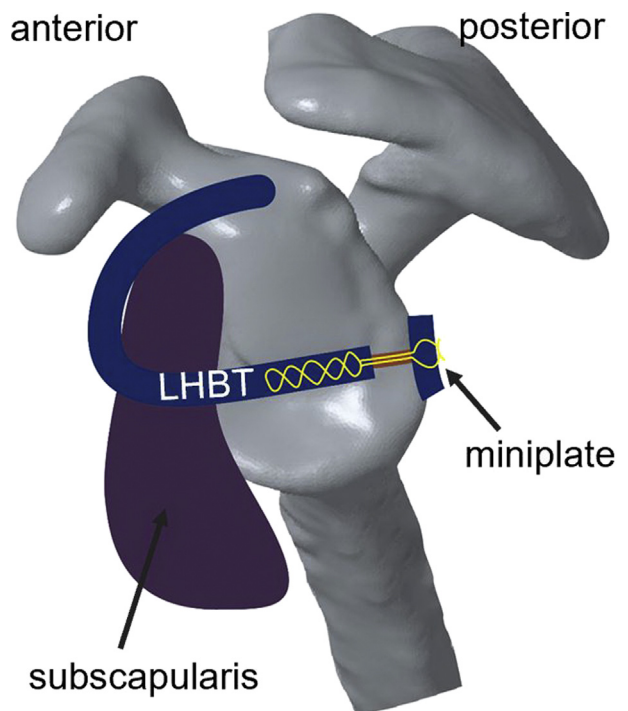


Fig 6. Schematic illustration of the left shoulder showing that the long head of the biceps tendon (LHBT) passes through the upper third of the subscapularis, and the distal end of the LHBT is fixed in the glenoid tunnel through the miniplate.

Table 3. Pearls and Pitfalls

Pearls	Pitfalls
Fix the LHBT in the superior edge of the pectoralis major, and transect the proximal end of the fixed suture.	The length of LHBT pull into the glenoid tunnel could affect the outcome of surgery.
Expose the anterior side of the subscapularis and make sure the guide suture did not pass through the capsule.	If the guide suture passed through the capsule, the repair of Bankart lesion and the rotation of shoulder would be affected.
When creating the glenoid tunnel, the tip of K-wire should be well protected under arthroscopy.	The K-wire may go across the subscapularis and cause the axillary nerve injury if its tip was not protected well.
After the LHBT is introduced into the glenoid tunnel, the internal and external rotation of the shoulder joint should be tested.	The limitation of the external rotation of the shoulder joint should be avoided.
When fixing the miniplate, the knot pusher can be used to push repeatedly to feel the hard impact to ensure that the miniplate is close to the bone surface and then tied the sutures.	

LHBT, long head of the biceps tendon.

coracoacromial arch damage and axillary nerve injury are critical risks associated with these methods.^{23,26} Integrity of the coracoacromial arch is important as the Latarjet method can lead to increased superior translation and disrupted shoulder biomechanics.²⁷ In fact, a single-institution with extensive experience found that the early postoperative complications of Latarjet are common, with reoperations required in about two-thirds of graft failures and residual symptoms seen in one half of the overall nerve injuries.²⁸ Although the Bristow and Latarjet techniques are quite effective at restoring shoulder stability, they may be overused for anterior shoulder instability with glenoid bone defect between 5% and 20%.^{11,29,30}

For anterior shoulder instability with moderate glenoid bone loss, various surgical methods have been proposed, such as the LHBT proximal transposition technique. Although studies have shown that the sling effect of LHBT was weaker than that of coracoid process along with conjoined tendon, the latter technique requires special surgical instruments, limiting its use in the general population.^{31,32} Moreover, the risk of vascular and nerve injury cannot be completely avoided when the penetration site of the subscapularis is too low.

The ASA technique is an augmentation technique in which the upper third of the subscapularis is sutured and fixed on the anterior border of the glenoid rim by

rivet suture.³⁰ Although previous studies in anterior shoulder stability with glenoid bone loss and Hill–Sachs lesion have encouraging postoperative results with the ASA technique,^{10,30} it may have the risks of subscapularis transection and shoulder external rotation limitation. These risks are evidenced by a biomechanical study showing that the external rotation with the ASA was decreased to 60° abduction.²⁹

To effectively and conveniently improve the stability of the glenohumeral joint and avoid shoulder range of motion limitation and injury to the subscapularis,^{33–36} we introduce the ASA-LHBT technique. Compared with the classic ASA with tenodesis of the upper third subscapularis at the anterior border of the glenoid rim,³⁷ the LHBT was used to pass through and press down on the musculotendinous junction of the upper third of the subscapularis in ASA-LHBT. The advantage of this technique includes inward and outward mobility of the subscapularis along the muscle fiber direction when the glenohumeral joint rotates. This reduces the risks of the ASA technique due to suture fixation as mentioned (Table 4).

In contrast, the ASA-LHBT technique does not entail special instruments and is technically easy to perform with minimal risk of axillary nerve injury. The tibial guider used for the reconstruction of anterior cruciate ligaments is sufficient without the need for special

Table 4. Advantages and Disadvantages

Advantages	Disadvantages
This technique is easy to perform without the need for special instruments.	When fixing the LHBT, the tension should be well control. Too tight may limit the internal and external rotation of the shoulder joint.
The procedure is mostly performed under arthroscopy, with little risk of nerve injury.	Miniplate fixation is performed with blind knotting, with a risk of error.
The LHBT passes through upper one-third of the subscapularis muscle and is far away from the axillary nerve, which further reduces the risk of nerve injury.	
This technique hardly limits the internal and external sliding of subscapularis muscle, and it can avoid the limitation of the external rotation of the shoulder joint.	
The LHBT reduces the risk of cutting the subscapular muscle.	

LHBT, long head of the biceps tendon.

reverse drill; therefore, it is convenient to use at any time. Furthermore, the shoulder glenoid tunnel is drilled from posterior to anterior under arthroscopic monitoring without the risk of damaging the axillary nerve. Since the upper third of the subscapular tendon muscle abdominal junction is exposed under arthroscopy, and it is far away from the nerve and blood vessel due to its high position, the risk of axillary nerve injury was significantly reduced. However, performing miniplate fixation with blind knotting requires practice to ensure the firm attachment of the miniplate to the bone surface. In fact, the incision site can be enlarged to allow insertion of the index finger of the surgeon to confirm the attachment.

This study has several limitations. First, biomechanical study is warranted to assess the stabilizing effect of this procedure. Second, the comparison of the obtained shoulder rotation range with other techniques needs further study. Third, the clinical outcomes require a long-term follow-up.

We believe that the ASA-LHBT is a safe, effective, and arthroscopically less challenging procedure. However, long-term clinical follow-up studies are required to determine the efficacy and postoperative complications of ASA-LHBT.

References

- Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: Significance of the inverted-pear glenoid and the humeral engaging Hill–Sachs lesion. *Arthroscopy* 2000;16:677-694.
- Hurley ET, Matache BA, Wong I, et al. Anterior shoulder instability part I—diagnosis, nonoperative management, and Bankart repair—an international consensus statement [e-pub ahead of print July 29, 2021]. *Arthroscopy*. <https://doi.org/10.1016/j.arthro.2021.07.022>
- Hurley ET, Matache BA, Wong I, et al. Anterior shoulder instability part II—Latarjet, remplissage, and glenoid bone-grafting—an international consensus statement [e-pub ahead of print July 29, 2021]. *Arthroscopy*. <https://doi.org/10.1016/j.arthro.2021.07.023>
- Boileau P, Mercier N, Roussanne Y, Th  lu C, Old J. Arthroscopic Bankart-Bristow-Latarjet procedure: The development and early results of a safe and reproducible technique. *Arthroscopy* 2010;26:1434-1450.
- Tang J, Zhao J. Arthroscopic transfer of the conjoined tendon-coracoid tip complex for anterior shoulder instability. *Arthrosc Tech* 2018;7:e33-e38.
- Kordasiewicz B, Kiciński M, Małachowski K, Boszczyk A, Chaberek S, Pomianowski S. Arthroscopic Latarjet stabilization: Analysis of the learning curve in the first 90 primary cases: Early clinical results and computed tomography evaluation. *Arthroscopy* 2019;35:3221-3237.
- Castricini R, De Benedetto M, Orlando N, Rocchi M, Zini R, Pirani P. Arthroscopic Latarjet procedure: Analysis of the learning curve. *Musculoskelet Surg* 2013;97:93-98 (suppl 1).
- Goodloe JB, Traven SA, Johnson CA, Woolf SK, Nutting JT, Slone HS. Increased risk of short-term complications and venous thromboembolism in Latarjet-Bristow procedures compared with bankart repairs. *Arthroscopy* 2021;37:806-813.
- Bokshan SL, Gil JA, DeFroda SF, Badida R, Crisco JJ, Owens BD. Biomechanical comparison of the long head of the biceps tendon versus conjoint tendon transfer in a bone loss shoulder instability model. *Orthop J Sports Med* 2019;7. 2325967119883549.
- Maiotti M, Massoni C, Russo R, Schroter S, Zanini A, Bianchedi D. Arthroscopic subscapularis augmentation of bankart repair in chronic anterior shoulder instability with bone loss less than 25% and capsular deficiency: Clinical multicenter study. *Arthroscopy* 2017;33:902-909.
- Russo R, Della Rotonda G, Cautiero F, et al. Arthroscopic Bankart repair associated with subscapularis augmentation (ASA) versus open Latarjet to treat recurrent anterior shoulder instability with moderate glenoid bone loss: Clinical comparison of two series. *Musculoskelet Surg* 2017;101:75-83.
- Castagna A, Garofalo R, Conti M, Flanagan B. Arthroscopic Bankart repair: Have we finally reached a gold standard? *Knee Surg Sports Traumatol Arthrosc* 2016;24:398-405.
- Rollick NC, Ono Y, Kurji HM, et al. Long-term outcomes of the Bankart and Latarjet repairs: A systematic review. *Open Access J Sports Med* 2017;8:97-105.
- Nakagawa S, Mae T, Sato S, Okimura S, Kuroda M. Risk factors for the postoperative recurrence of instability after arthroscopic Bankart repair in athletes. *Orthop J Sports Med* 2017;5. 2325967117726494.
- Li RT, Sheehan A, Wilson K, et al. Decreased glenoid retroversion is a risk factor for failure of primary arthroscopic Bankart repair in individuals with subcritical bone loss versus no bone loss. *Arthroscopy* 2021;37:1128-1133.
- Dekker TJ, Peebles LA, Bernhardson AS, et al. Risk factors for recurrence after arthroscopic instability repair—the importance of glenoid bone loss >15%, patient age, and duration of symptoms: A matched cohort analysis. *Am J Sports Med* 2020;48:3036-3041.
- Balg F, Boileau P. The instability severity index score. A simple pre-operative score to select patients for arthroscopic or open shoulder stabilisation. *J Bone Joint Surg Br* 2007;89:1470-1477.
- Adam M, Attia AK, Alhammoud A, Aldahamsheh O, Al Ateeq Al Dosari M, Ahmed G. Arthroscopic Bankart repair for the acute anterior shoulder dislocation: Systematic review and meta-analysis. *Int Orthop* 2018;42:2413-2422.
- DeFroda S, Bokshan S, Stern E, Sullivan K, Owens BD. Arthroscopic Bankart repair for the management of anterior shoulder instability: Indications and outcomes. *Curr Rev Musculoskelet Med* 2017;10:442-451.
- Itoi E, Lee SB, Berglund LJ, Berge LL, An KN. The effect of a glenoid defect on anteroinferior stability of the shoulder after Bankart repair: A cadaveric study. *J Bone Joint Surg Am* 2000;82:35-46.
- DeFroda SF, Gil JA, Owens BD. Recurrent shoulder stabilization with open bankart repair and long head biceps transfer. *J Orthop* 2018;15:401-403.
- Boileau P, Bicknell RT, El Fegoun AB, Chuinard C. Arthroscopic Bristow procedure for anterior instability in

- shoulders with a stretched or deficient capsule: The "belt-and-suspenders" operative technique and preliminary results. *Arthroscopy* 2007;23:593-601.
23. Tang J, Zhao J. Arthroscopic transfer of the long head of the biceps brachii for anterior shoulder instability. *Arthrosc Tech* 2017;6:e1911-e1917.
 24. Flurin PH, Antoni M, Métais P, Aswad R. Revision of failed Latarjet with the Eden-Hybinette surgical technique. *Orthop Traumatol Surg Res* 2020;106:223-227.
 25. Lafosse L, Boyle S. Arthroscopic Latarjet procedure. *J Shoulder Elbow Surg* 2010;19:2-12.
 26. Collin P, Lädermann A. Dynamic anterior stabilization using the long head of the biceps for anteroinferior glenohumeral instability. *Arthrosc Tech* 2018;7:e39-e44.
 27. Wellmann M, Petersen W, Zantop T, Schanz S, Raschke MJ, Hurschler C. Effect of coracoacromial ligament resection on glenohumeral stability under active muscle loading in an in vitro model. *Arthroscopy* 2008;24:1258-1264.
 28. Hendy BA, Padegimas EM, Kane L, et al. Early post-operative complications after Latarjet procedure: A single-institution experience over 10 years. *J Shoulder Elbow Surg* 2021;30:e300-e308.
 29. Schroter S, Kramer M, Welke B, et al. The effect of the arthroscopic augmentation of the subscapularis tendon on shoulder instability and range of motion: A biomechanical study. *Clin Biomech (Bristol, Avon)* 2016;38:75-83.
 30. Maiotti M, Russo R, Zanini A, Schroter S, Massoni C, Bianchedi D. Arthroscopic Bankart repair and subscapularis augmentation: An alternative technique treating anterior shoulder instability with bone loss. *J Shoulder Elbow Surg* 2016;25:898-906.
 31. Giles JW, Boons HW, Elkinson I, et al. Does the dynamic sling effect of the Latarjet procedure improve shoulder stability? A biomechanical evaluation. *J Shoulder Elbow Surg* 2013;22:821-827.
 32. Dines JS, Dodson CC, McGarry MH, Oh JH, Altchek DW, Lee TQ. Contribution of osseous and muscular stabilizing effects with the Latarjet procedure for anterior instability without glenoid bone loss. *J Shoulder Elbow Surg* 2013;22:1689-1694.
 33. Alexander S, Southgate DF, Bull AM, Wallace AL. The role of negative intraarticular pressure and the long head of biceps tendon on passive stability of the glenohumeral joint. *J Shoulder Elbow Surg* 2013;22:94-101.
 34. Rodosky MW, Harner CD, Fu FH. The role of the long head of the biceps muscle and superior glenoid labrum in anterior stability of the shoulder. *Am J Sports Med* 1994;22:121-130.
 35. Warner JJ, McMahon PJ. The role of the long head of the biceps brachii in superior stability of the glenohumeral joint. *J Bone Joint Surg Am* 1995;77:366-372.
 36. Pagnani MJ, Deng XH, Warren RF, Torzilli PA, O'Brien SJ. Role of the long head of the biceps brachii in glenohumeral stability: A biomechanical study in cadavera. *J Shoulder Elbow Surg* 1996;5:255-262.
 37. Ren S, Zhang X, Zhou R, You T, Jiang X, Zhang W. Arthroscopic subscapularis augmentation combined with capsulolabral reconstruction is safe and reliable. *Knee Surg Sports Traumatol Arthrosc* 2019;27:3997-4004.