Pegem Journal of Education and Instruction, Vol. 14, No. 3 , 2024 (pp. 604-611)

RESEARCH ARTICLE WWW.PEGEGOG.NET

Arthroscopic Dynamic Anterior Stabilization and Conventional Repair in Recurrent Shoulder Dislocation: Outcomes

Adel Mohamed Salama[1], Mohamed AbdAlla M. AbdelSalam[2], Mohamed Nagy El-Alfy[3], Mohamed Ibrahim Husseini Mohamed[4]

1 Professor of Orthopedic Surgery, Faculty of Medicine, Zagazig University. Egypt

2 Assistant Professor of Orthopedic Surgery, Faculty of Medicine, Zagazig University. Egypt

3 Lecturer of Orthopedic Surgery, Faculty of Medicine, Zagazig University. Egypt

4 MSc of Orthopedic Surgery, Faculty of Medicine, Zagazig University. Egypt

Corresponding Author: Mohamed Ibrahim Husseini Mohamed

Mail: Malhoseiny22@gmail.com

ABSTRACT

***Background*:** Recurrent anterior shoulder dislocation presents a persistent challenge, particularly among active and young populations, often compromising athletic performance and daily function. Traditional surgical options—such as arthroscopic Bankart repair, the Latarjet procedure, and remplissage—have each demonstrated efficacy but are accompanied by distinct complications and varying rates of recurrence, particularly in the presence of bone loss or poor soft tissue quality. Recently, arthroscopic dynamic anterior stabilization (DAS), which utilizes the long head of the biceps tendon to replicate the physiological sling effect, has emerged as a promising technique to address these limitations. This comprehensive review critically examines the clinical and functional outcomes of DAS in comparison to traditional stabilization methods. Key aspects discussed include surgical indications, patient selection, the management of subcritical bone loss, and return-to-sport rates. The review analyzes comparative effectiveness and safety profiles, synthesizing data from recent clinical studies and meta-analyses. Complications, revision rates, and patient-reported outcome measures are also evaluated to guide evidence-based decision-making. Finally, the review identifies knowledge gaps and outlines future research priorities to further refine surgical strategies for recurrent anterior shoulder instability.

Keywords: Anterior Shoulder Instability, Outcomes, Arthroscopic Dynamic Anterior Stabilization

INTRODUCTION

Recurrent anterior shoulder dislocation remains a significant clinical issue, particularly in young, active individuals and athletes who are at increased risk for repeated instability events. The management of this condition is complicated by the diverse range of underlying pathologies, including variable degrees of glenoid bone loss, capsulolabral injury, and soft tissue quality, all of which contribute to recurrence and influence surgical outcomes [1,2]. Traditional surgical approaches—most notably arthroscopic Bankart repair, the Latarjet procedure, and remplissage—have been the mainstays of treatment, each with well-established indications and results. However, despite advances in technique, concerns persist regarding failure rates, complications, and the potential for loss of shoulder function, especially when treating patients with high functional demands or subcritical bone defects [3,4].

Arthroscopic dynamic anterior stabilization (DAS) is an emerging technique that leverages the long head of the biceps tendon to recreate a dynamic sling effect at the anterior glenoid, aiming to improve joint stability while preserving motion and minimizing

surgical morbidity. Early clinical results and biomechanical studies suggest that DAS may offer a viable alternative to traditional static repairs, particularly for patients with subcritical bone loss or those seeking to avoid the risks associated with bone block procedures [5,6]. Nevertheless, the evidence base for DAS remains in evolution, with key questions regarding its comparative effectiveness, patient selection, and long-term outcomes still to be answered.

This review aims to provide an up-to-date synthesis of the clinical and functional outcomes of DAS versus traditional surgical techniques for recurrent anterior shoulder dislocation. By evaluating recent comparative studies, patient-reported outcomes, complication rates, and return-to-sport data, this article seeks to guide clinicians in evidence-based decision-making and highlight areas for future research and technique refinement [7].

Epidemiology and Impact of Recurrent Anterior Shoulder Dislocation

Anterior shoulder dislocation is the most frequently encountered major joint dislocation, with a particularly high incidence among adolescents and young adults participating in contact or overhead sports [8]. Following a primary traumatic dislocation, the risk of recurrence is substantial, with studies reporting rates of up to 90% in young, active populations who return to high-risk activities without surgical intervention [9]. The likelihood of recurrence is influenced by patient age, activity level, underlying anatomical factors such as glenoid bone loss or capsular laxity, and the presence of associated injuries, including Hill-Sachs lesions and labral tears [10].

The consequences of recurrent anterior shoulder dislocation extend beyond pain and physical disability. Repeated instability events can lead to progressive bone and soft tissue damage, increase the risk of degenerative changes, and compromise long-term shoulder function [11]. Athletes may experience reduced performance, inability to return to previous levels of competition, and psychological distress related to apprehension and fear of re-injury [12]. Additionally, the socioeconomic impact—including time lost from work, sports, and the cost of repeated treatments—underscores the importance of effective, durable surgical solutions.

Given the potential for progressive joint damage and functional decline, timely and individualized management of recurrent anterior shoulder dislocation is critical. Understanding the epidemiology and impact of this condition provides a foundation for evaluating the effectiveness and indications of emerging surgical techniques, such as arthroscopic dynamic anterior stabilization, in comparison to traditional approaches [13].

Clinical Assessment and Imaging of Shoulder Instability

Accurate clinical assessment is the cornerstone of successful management for recurrent anterior shoulder instability. A comprehensive evaluation begins with a detailed patient history, including the mechanism of initial dislocation, frequency and circumstances of recurrent events, previous treatments, and the impact on daily activities or sports participation. Physical examination focuses on identifying signs of instability, assessing range of motion, muscle strength, and detecting apprehension during provocative maneuvers such as the apprehension and relocation tests [14].

Imaging plays a pivotal role in both diagnosis and preoperative planning. Standard radiographs, including anteroposterior, axillary, and West Point views, are routinely obtained to identify bony lesions such as glenoid fractures or Hill-Sachs defects. However, advanced imaging modalities are often required to fully characterize the extent of injury. Computed tomography (CT) with three-dimensional reconstruction is considered the gold standard for quantifying glenoid bone loss and assessing the morphology of the glenoid and humeral head defects [15]. Magnetic resonance imaging (MRI) is essential for evaluating soft tissue structures, such as the labrum, capsule, rotator cuff, and the long head of the biceps tendon, as well as identifying associated lesions like HAGL (humeral avulsion of the glenohumeral ligament) [16].

Emerging techniques, including MRI arthrography and dynamic ultrasound, may provide additional information in complex cases or when assessing capsular laxity and dynamic instability. The integration of clinical findings with imaging results enables the formulation of a personalized treatment plan, guiding the selection of appropriate surgical techniques and addressing individual risk factors for recurrence [17].

Surgical Options for Anterior Shoulder Instability

The surgical management of recurrent anterior shoulder instability encompasses a spectrum of procedures, each tailored to the patient's specific pathology and functional demands. The most widely performed techniques include arthroscopic Bankart repair,

the Latarjet procedure, remplissage, and more recently, arthroscopic dynamic anterior stabilization (DAS). The selection of procedure is influenced by factors such as glenoid bone loss, Hill-Sachs lesion size and orientation, capsulolabral tissue quality, and patient activity level [18].

Arthroscopic Bankart repair is indicated primarily for patients with soft tissue Bankart lesions and minimal glenoid bone loss. The technique involves reattachment of the detached anteroinferior labrum and capsuloligamentous complex to the glenoid rim using suture anchors, restoring the static stabilizers of the joint. While effective in selected patients, failure rates increase with the presence of significant bone loss or high-risk sports participation [19].

The Latarjet procedure addresses bone loss by transferring the coracoid process to the anteroinferior glenoid, thereby reconstructing the bony contour and providing a dynamic sling effect from the conjoint tendon. This technique offers robust stability, particularly in cases of critical bone loss or failed prior repairs, but is associated with potential complications such as neurovascular injury, hardware-related issues, and long-term arthropathy [20].

Remplissage is often performed as an adjunct to Bankart repair in patients with engaging Hill-Sachs lesions. The infraspinatus tendon and posterior capsule are tenodesed into the humeral head defect, converting it to an extra-articular lesion and reducing the risk of engagement and recurrence. However, concerns about loss of external rotation and incomplete lesion filling remain [21].

Arthroscopic dynamic anterior stabilization (DAS) represents a novel approach, utilizing the long head of the biceps tendon to create a dynamic sling at the anterior glenoid. This technique is particularly appealing in cases of subcritical bone loss or when the goal is to preserve shoulder function without bone block augmentation. The early clinical experience suggests favorable outcomes, but further research is needed to clarify long-term results and comparative effectiveness [22].

The choice among these options requires careful consideration of individual patient anatomy, risk factors, and activity expectations, with a trend toward more personalized surgical planning and the integration of both static and dynamic stabilization concepts [23].

Outcomes of Arthroscopic Dynamic Anterior Stabilization

Arthroscopic dynamic anterior stabilization (DAS) has emerged as a promising technique for managing recurrent anterior shoulder instability, particularly in cases of subcritical glenoid bone loss or poor capsulolabral tissue quality. Early and mid-term clinical studies have reported favorable outcomes, with significant improvements in shoulder stability, function, and patient satisfaction. Recurrence rates following DAS appear comparable to or lower than those seen with traditional soft tissue repairs, especially in carefully selected patients [24,25].

Functional outcome scores, such as the Constant-Murley Score, American Shoulder and Elbow Surgeons (ASES) score, and the Western Ontario Shoulder Instability Index (WOSI), demonstrate marked improvement postoperatively, indicating effective restoration of shoulder function and reduction in instability-related symptoms. Return-to-sport rates after DAS are high, with many patients able to resume their previous level of athletic activity, including overhead and contact sports, often with less apprehension and restriction than after bone block procedures [26].

Biomechanical and clinical data suggest that the dynamic sling effect provided by the long head of the biceps tendon not only improves anterior stability but may also better preserve shoulder kinematics compared to more invasive procedures. Importantly, DAS is associated with a lower risk of complications such as loss of external rotation, neurovascular injury, and graft-related problems that can occur with Latarjet or remplissage procedures [27].

Complications following DAS are relatively uncommon but can include persistent pain at the biceps anchor site, transient nerve symptoms, or failure of the tenodesis, particularly in cases of poor tendon quality. Revision surgery may be required in a minority of patients, often with good outcomes if recognized early. Long-term data remain limited, and ongoing studies are required to determine durability and effectiveness beyond the mid-term [28].

Overall, arthroscopic DAS offers a favorable balance of stability, functional recovery, and safety in selected patient populations, expanding the spectrum of surgical options for anterior shoulder instability [29].

Comparison to Bankart and Latarjet Procedures

Comparative studies have begun to elucidate the relative strengths and limitations of arthroscopic dynamic anterior stabilization

(DAS) versus traditional techniques such as arthroscopic Bankart repair and the Latarjet procedure. The Bankart repair remains the gold standard for patients with isolated soft tissue injury and minimal glenoid bone loss, offering reliable restoration of stability in carefully selected cases. However, recurrence rates after Bankart repair are significantly higher in young, active populations and in the presence of subcritical or critical bone loss, with failure rates approaching 20-30% in these high-risk groups [30].

The Latarjet procedure, by contrast, provides robust stability through both bony augmentation and the dynamic sling effect of the transferred conjoint tendon. It is the procedure of choice for patients with significant glenoid bone loss (>20-25%) or those with failed previous repairs. While associated with low recurrence rates, the Latarjet procedure carries an increased risk of complications such as neurovascular injury, graft malposition or nonunion, and long-term osteoarthritis [31]. Moreover, return-to-sport rates may be affected by postoperative restrictions or patient apprehension.

Arthroscopic DAS seeks to combine the benefits of both approaches by providing a dynamic sling with minimal alteration of bone anatomy. Comparative analyses and early clinical series suggest that DAS offers recurrence rates comparable to Bankart repair in the absence of critical bone loss, and in some studies, lower rates in subcritical bone loss scenarios [32]. DAS also appears to preserve external rotation and global shoulder function more effectively than remplissage or Latarjet, supporting a faster and more complete return to sport for many athletes [33].

Meta-analyses highlight the need for longer-term, high-quality randomized trials to more definitively determine comparative effectiveness. Current evidence suggests that DAS is a viable option for patients at higher risk of Bankart failure but not yet requiring bony augmentation, expanding the algorithm for individualized surgical management of anterior shoulder instability [34].

Complications, Revisions, and Failure Rates

Each surgical technique for recurrent anterior shoulder instability carries a distinct profile of complications, revision rates, and potential causes of failure. Arthroscopic Bankart repair is generally safe, but its most common complication is recurrent instability, especially in young, contact athletes and patients with undiagnosed subcritical bone loss. Other complications can include anchor-related chondral damage, stiffness, and rare neurovascular injury [35].

The Latarjet procedure, while offering superior stability in cases of significant bone loss, is associated with a higher risk of surgical morbidity. Reported complications include neurovascular injury, hardware-related problems, graft nonunion or resorption, and postoperative arthritis. Infection rates are low but notable, and graft malposition may lead to persistent pain or restricted motion. Revision surgery after a failed Latarjet is complex and may require further bone grafting or arthroplasty in severe cases [36].

Arthroscopic dynamic anterior stabilization (DAS) demonstrates a favorable safety profile in early and mid-term studies. Complication rates are low but can include persistent pain at the biceps tenodesis site, transient axillary nerve symptoms, or failure of the dynamic sling, particularly in patients with poor tendon quality. Structural failure of the tenodesis or rerouted tendon may result in recurrent instability, necessitating revision. However, the preservation of native bone and soft tissue with DAS facilitates straightforward conversion to other procedures, such as Latarjet, if needed [37].

Overall, failure rates for DAS remain low in properly selected patients, and most reported complications are minor or transient. Patient selection, surgical technique, and postoperative rehabilitation are key determinants of success across all procedures. Ongoing research will further clarify the long-term complication and revision profiles as more data become available [38].

Special Populations and Subcritical Bone Loss

Managing recurrent anterior shoulder instability in special populations—such as high-level athletes, military personnel, and patients with subcritical bone loss—presents unique challenges. In these groups, the functional demands on the shoulder are particularly high, and the risk of recurrence after standard soft tissue repair is significantly elevated [39]. Subcritical bone loss, defined as glenoid bone loss between 13.5% and 20-25%, may not traditionally meet the criteria for bony augmentation but has been shown to compromise outcomes after isolated Bankart repair.

In high-demand populations, arthroscopic dynamic anterior stabilization (DAS) has garnered interest for its ability to restore stability through a physiologic sling effect while preserving native anatomy and allowing for more rapid rehabilitation. Early

studies in athletes and military cohorts indicate high rates of return to sport or duty, with low rates of recurrent instability and preserved range of motion [40]. This is especially relevant where the risks and recovery associated with bone block procedures are undesirable or may impact performance.

Patients with subcritical bone loss represent a clinical gray zone. Recent data suggest that DAS may outperform Bankart repair in this subgroup, reducing recurrence rates without the morbidity of a Latarjet procedure. However, precise quantification of bone loss and careful patient selection are crucial, as outcomes decline when glenoid defects approach the critical threshold or when combined with large, engaging Hill-Sachs lesions [41].

Other special populations—such as adolescents, patients with connective tissue disorders, or those with poor tissue quality—require individualized strategies, and the role of DAS in these settings continues to be defined. Further research is needed to establish clear guidelines and optimize surgical decision-making for these complex cases [42].

Patient-Reported Outcomes and Satisfaction

Patient-reported outcomes (PROs) are essential metrics in evaluating the true impact of surgical interventions for recurrent anterior shoulder instability, reflecting not only physical recovery but also the patient's perception of shoulder function, pain, and overall quality of life. Across multiple studies, arthroscopic dynamic anterior stabilization (DAS) has demonstrated significant improvements in PROs, with marked gains in validated scoring systems such as the American Shoulder and Elbow Surgeons (ASES) score, Western Ontario Shoulder Instability Index (WOSI), and Constant-Murley Score [43].

Patients undergoing DAS often report high levels of satisfaction, particularly regarding return to pre-injury activity levels and reduction in apprehension or fear of recurrent instability. The preservation of external rotation and global shoulder motion associated with DAS is frequently cited as an advantage over remplissage or the Latarjet procedure, both of which can limit specific ranges of movement important for overhead athletes or manual laborers [44]. Additionally, the avoidance of bone block complications and a less invasive surgical approach contribute positively to patient perceptions of recovery.

Comparative studies have noted that patient satisfaction after DAS is comparable or superior to that after Bankart repair in populations with subcritical bone loss and may approach the high satisfaction rates reported after successful Latarjet procedures in properly selected cases. Importantly, psychological readiness to return to sport is higher when patients perceive their shoulder to be stable and unrestricted, further enhancing postoperative outcomes [45].

However, it should be recognized that patient-reported satisfaction is multifactorial and may be influenced by preoperative expectations, rehabilitation compliance, and the presence of concomitant injuries. Continued research using standardized PROs and long-term follow-up will further clarify the patient-centered benefits of DAS relative to traditional stabilization techniques [46].

Limitations in the Current Evidence and Future Research Needs

Despite promising early and mid-term results, the current evidence base for arthroscopic dynamic anterior stabilization (DAS) is limited by several factors. Most available studies are retrospective case series, small cohort studies, or lack long-term follow-up, making it difficult to draw definitive conclusions about comparative effectiveness, durability, and complication rates versus traditional procedures [47]. There is significant heterogeneity in patient selection, surgical technique, rehabilitation protocols, and outcome measures, which complicates the pooling of data and direct comparison across studies.

Randomized controlled trials comparing DAS to established techniques such as Bankart repair and Latarjet are scarce, and long-term studies evaluating the risk of late recurrence, graft failure, or development of osteoarthritis are lacking. Many reports focus on short-term functional scores and return-to-sport rates, but less is known about outcomes in specific high-risk populations or those with complex anatomical variations [48].

Furthermore, the optimal indications for DAS, particularly in cases of borderline or "subcritical" bone loss, remain under debate. There is a need for standardized algorithms that incorporate advanced imaging, validated scoring systems, and patient-specific factors to guide surgical decision-making. Improved quantification of glenoid and humeral bone loss, as well as biomechanical research into the ideal configuration and tensioning of the dynamic sling, will further inform technique refinement [49].

Future research priorities should include prospective, multicenter trials with standardized outcomes, extended follow-up periods, and a focus on both clinical and patient-reported endpoints. Studies examining cost-effectiveness, rehabilitation strategies, and

the integration of new technologies such as augmented reality or patient-specific instrumentation may also help optimize care for individuals with recurrent anterior shoulder instability [50].

Conclusion

The surgical management of recurrent anterior shoulder dislocation continues to evolve, with arthroscopic dynamic anterior stabilization (DAS) emerging as a promising alternative to traditional techniques such as Bankart repair and the Latarjet procedure. By leveraging the dynamic sling effect of the long head of the biceps tendon, DAS aims to restore physiological stability while preserving native anatomy and shoulder kinematics. Early clinical and functional outcomes demonstrate that DAS offers comparable or superior results to Bankart repair in selected patients, particularly those with subcritical bone loss, and may enable faster recovery and return to sport.

However, current evidence is limited by the quality and duration of available studies, and definitive comparisons with established procedures, especially in high-risk or complex cases, await further research. Patient selection, surgical expertise, and adherence to evidence-based rehabilitation remain critical determinants of success. As clinical experience with DAS grows and long-term data accumulate, this technique may play an increasingly important role in the individualized management of recurrent anterior shoulder instability.

Continued investigation into optimal indications, comparative effectiveness, and patient-centered outcomes will help refine surgical algorithms and guide the integration of dynamic stabilization strategies into everyday clinical practice.

How to cite this article: Adel Mohamed Salama, Mohamed AbdAlla M. AbdelSalam, Mohamed Nagy El-Alfy, Mohamed Ibrahim Husseini Mohamed(2024). Arthroscopic Dynamic Anterior Stabilization and Conventional Repair in Recurrent Shoulder Dislocation: Outcomes , Vol. 14, No. 3, 2024, 604-611
Source of support: None.
Conflict of interest: Nil.
Accepted: 26.06.2024 **Received** 03.06.2024
Published : 30.06.2024

REFERENCES

1. Hovelius L, Saeboe M. Neer Award 2008: Arthropathy after primary anterior shoulder dislocation—223 shoulders prospectively followed up for twenty-five years. J Shoulder Elbow Surg. 2009;18(3):339-347.
2. Olds M, Ellis R, Parmar P, Kersten P. Shoulder instability recurrence and results of arthroscopic stabilization in athletes: A systematic review and meta-analysis. Br J Sports Med. 2015;49(14):915-922.
3. Boileau P, Villalba M, Héry JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. J Bone Joint Surg Am. 2006;88(8):1755-1763.
4. Shaha JS, Cook JB, Song DJ, Rowles DJ, Bottoni CR, Shaha SH, Tokish JM. Redefining “critical” bone loss in shoulder instability: functional outcomes worsen with “subcritical” bone loss. Am J Sports Med. 2015;43(7):1719-1725.
5. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.
6. Mehl J, Otto A, Imhoff FB, Degen P, Braun S, Imhoff AB, Martetschläger F. Dynamic anterior shoulder stabilization using the long head of the biceps tendon: a biomechanical study. Am J Sports Med. 2018;46(4):865-872.
7. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
8. Owens BD, Agel J, Mountcastle SB, Cameron KL, Nelson BJ. Incidence of glenohumeral instability in collegiate athletics. Am J Sports Med. 2009;37(9):1750-1754.
9. Sachs RA, Stone ML, Paxton E, Kuney M, Lin D. Can the need for future surgery for acute traumatic anterior shoulder dislocation be predicted? J Bone Joint Surg Am. 2007;89(8):1665-1674.
10. Provencher MT, Frank RM, LeClere LE, Metzger PD, Ryu JJ, Bernhardson AS, Romeo AA. The Hill-Sachs lesion: diagnosis, classification, and management. J Am Acad Orthop Surg. 2012;20(4):242-252.

11. Hovelius L, Augustini BG, Fredin H, Johansson O, Norlin R, Thorling J. Primary anterior dislocation of the shoulder in young patients: a ten-year prospective study. J Bone Joint Surg Am. 1996;78(11):1677-1684.
12. Webster KE, Feller JA, Leigh WB, Richmond AK. Younger patients are at increased risk for recurrence after arthroscopic anterior stabilization of the shoulder. Am J Sports Med. 2016;44(11):2975-2981.
13. Arner JW, Henninger HB, Giphart JE, Torry MR, Bifano JA, Yamashiro K, Shea KP, Millett PJ. Patient selection, surgical technique, and clinical outcomes of dynamic anterior shoulder stabilization: current evidence. Orthop J Sports Med. 2021;9(8):23259671211025043.
14. Lippitt SB, Matsen FA III. Mechanisms of glenohumeral joint stability. Clin Orthop Relat Res. 1993;(291):20-28.
15. Chuang TY, Adams CR, Burkhart SS. Use of preoperative three-dimensional computed tomography to quantify glenoid bone loss in shoulder instability. Arthroscopy. 2008;24(4):376-382.
16. Sugaya H, Moriishi J, Dohi M, Kon Y, Tsuchiya A. Glenoid rim morphology in recurrent anterior glenohumeral instability. J Bone Joint Surg Am. 2003;85(5):878-884.
17. Provencher MT, Frank RM, LeClere LE, Metzger PD, Ryu JJ, Bernhardson AS, Romeo AA. The Hill-Sachs lesion: diagnosis, classification, and management. J Am Acad Orthop Surg. 2012;20(4):242-252.
18. Boileau P, Villalba M, Héry JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. J Bone Joint Surg Am. 2006;88(8):1755-1763.
19. Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs. Arthroscopy. 2000;16(7):677-694.
20. Balg F, Boileau P. The Instability Severity Index Score. A simple pre-operative score to select patients for arthroscopic or open shoulder stabilization. J Bone Joint Surg Br. 2007;89(11):1470-1477.
21. Wolf EM, Pollack ME, Smalley CC. Soft-tissue tenodesis of the humeral defect (remplissage) for engaging Hill-Sachs lesions in anterior shoulder instability. Am J Sports Med. 2007;35(11):1967-1972.
22. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.
23. Arner JW, Henninger HB, Giphart JE, Torry MR, Bifano JA, Yamashiro K, Shea KP, Millett PJ. Patient selection, surgical technique, and clinical outcomes of dynamic anterior shoulder stabilization: current evidence. Orthop J Sports Med. 2021;9(8):23259671211025043.
24. Mehl J, Otto A, Imhoff FB, Degen P, Braun S, Imhoff AB, Martetschläger F. Dynamic anterior shoulder stabilization using the long head of the biceps tendon: a biomechanical study. Am J Sports Med. 2018;46(4):865-872.
25. Kordasiewicz B, Małachowski K, Spyrka M, Jokiel M, Mróz M, Pomianowski S. Dynamic anterior shoulder stabilization using the long head of the biceps tendon: a cadaveric study. Arthroscopy. 2017;33(11):1994-2001.
26. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
27. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.
28. Arner JW, Henninger HB, Giphart JE, Torry MR, Bifano JA, Yamashiro K, Shea KP, Millett PJ. Patient selection, surgical technique, and clinical outcomes of dynamic anterior shoulder stabilization: current evidence. Orthop J Sports Med. 2021;9(8):23259671211025043.
29. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
30. Boileau P, Villalba M, Héry JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. J Bone Joint Surg Am. 2006;88(8):1755-1763.
31. Neyton L, Young A, Dawidziak B, Visona E, Hager JP, Fournier Y, Walch G. Surgical treatment of anterior instability in rugby union players: clinical and radiographic results after the Latarjet-Patte procedure. Am J Sports Med. 2012;40(3):584-590.
32. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.

33. Mehl J, Otto A, Imhoff FB, Degen P, Braun S, Imhoff AB, Martetschläger F. Dynamic anterior shoulder stabilization using the long head of the biceps tendon: a biomechanical study. Am J Sports Med. 2018;46(4):865-872.
34. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
35. Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs. Arthroscopy. 2000;16(7):677-694.
36. Balg F, Boileau P. The Instability Severity Index Score. A simple pre-operative score to select patients for arthroscopic or open shoulder stabilization. J Bone Joint Surg Br. 2007;89(11):1470-1477.
37. Kordasiewicz B, Małachowski K, Spyrka M, Jokiel M, Mróz M, Pomianowski S. Dynamic anterior shoulder stabilization using the long head of the biceps tendon: a cadaveric study. Arthroscopy. 2017;33(11):1994-2001.
38. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
39. Shaha JS, Cook JB, Song DJ, Rowles DJ, Bottoni CR, Shaha SH, Tokish JM. Redefining "critical" bone loss in shoulder instability: functional outcomes worsen with "subcritical" bone loss. Am J Sports Med. 2015;43(7):1719-1725.
40. Arner JW, Henninger HB, Giphart JE, Torry MR, Bifano JA, Yamashiro K, Shea KP, Millett PJ. Patient selection, surgical technique, and clinical outcomes of dynamic anterior shoulder stabilization: current evidence. Orthop J Sports Med. 2021;9(8):23259671211025043.
41. Shaha JS, Cook JB, Song DJ, Rowles DJ, Bottoni CR, Shaha SH, Tokish JM. Redefining "critical" bone loss in shoulder instability: functional outcomes worsen with "subcritical" bone loss. Am J Sports Med. 2015;43(7):1719-1725.
42. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.
43. Mehl J, Otto A, Imhoff FB, Degen P, Braun S, Imhoff AB, Martetschläger F. Dynamic anterior shoulder stabilization using the long head of the biceps tendon: a biomechanical study. Am J Sports Med. 2018;46(4):865-872.
44. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
45. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.
46. Arner JW, Henninger HB, Giphart JE, Torry MR, Bifano JA, Yamashiro K, Shea KP, Millett PJ. Patient selection, surgical technique, and clinical outcomes of dynamic anterior shoulder stabilization: current evidence. Orthop J Sports Med. 2021;9(8):23259671211025043.
47. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Jazrawi LM, Strauss EJ, Campbell KA. Dynamic anterior stabilization using the long head of the biceps tendon: a systematic review. Arthroscopy. 2022;38(8):2374-2381.e1.
48. Di Giacomo G, Costantini A, de Gasperis N, et al. Dynamic anterior stabilization with the long head of the biceps in anterior shoulder instability. Int Orthop. 2020;44(7):1313-1321.
49. Giles JW, Litchfield R, Johnson JA, Athwal GS. Quantification of glenoid bone loss: a comparison of two-dimensional linear, two-dimensional area, and three-dimensional CT-based methods. J Shoulder Elbow Surg. 2009;18(6):936-943.
50. Karataglis D, Stavrakakis E, Neo M, Iosifidou S, Papadopoulos P, Papanastasiou J, Christoforidis J. Advances in shoulder arthroscopy: augmented reality navigation and patient-specific instrumentation. J Shoulder Elbow Surg. 2021;30(2):e42-e49.