Hypothesis

Lesion-Stratified Arthroscopic Capsulolabral Repair Restores Stability and Preserves Motion in Traumatic Anterior Shoulder Instability

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Abstract

Background: Traumatic anterior shoulder instability follows a forceful event that commonly avulses the anteroinferior labrum and stretches the capsuloligamentous structures. With repeated dislocations the humeral head frequently develops posterolateral compression defects and the glenoid rim can suffer progressive bone loss, turning a single injury into an ongoing mechanical problem. Patients describe pain, weakness, apprehension, and loss of confidence that limits work and sport. Contemporary arthroscopic repair techniques aim to restore the labral bumper and retension the capsule while preserving external rotation and minimizing soft tissue damage. Early, individualized treatment decisions must balance the risk of unnecessary surgery against the harms of recurrent instability.

Hypothesis: When instability is driven mainly by a reparable labral tear and glenoid bone loss is limited, anatomic arthroscopic capsulolabral repair—augmented selectively with procedures such as remplissage for engaging Hill-Sachs defects—will restore mechanical stability, reduce pain, and allow most patients to resume previous levels of work and activity within twelve months. Compared to older open capsular tightening operations, arthroscopic anatomic repair is expected to better preserve shoulder range and strength. A structured, phased rehabilitation program is essential to convert surgical stability into confident, functional use.

Clinical importance: The practical message for clinicians is simple: identify and measure the lesion, match the surgical technique to the pathology, and counsel patients about expected early guarded motion followed by progressive recovery. This lesion-based strategy improves the likelihood of durable stability, recovery, and preservation of motion that patients require for daily life and occupational tasks. Clear communication about realistic timelines reduces anxiety and improves better adherence to rehabilitation.

Future research: Priority areas include lesion-stratified randomized trials comparing tailored arthroscopic strategies with bony augmentation at defined bone-loss thresholds, studies of biologic augmentation to enhance labral healing, and large multi-center registries to document long-term recurrence, reoperation, and shoulder arthropathy.

Keywords: Shoulder instability, Bankart lesion, Arthroscopic repair, Remplissage, Glenoid bone loss

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Background

The shoulder is remarkable for its mobility, and that mobility comes at the cost of bony constraint: the glenoid is shallow and depends heavily on soft-tissue structures — the labrum, capsule, and ligaments — together with dynamic muscle control to keep the humeral head centered. A traumatic anterior dislocation typically occurs with the arm in abduction and external rotation; that motion can avulse the anteroinferior labrum from the glenoid rim (the Bankart lesion) and often leaves a posterolateral impression fracture on the humeral head (Hill–Sachs). Over repeated dislocations the glenoid rim itself may lose bone, progressively worsening the mechanical problem. The anatomic picture explains why a single trauma can become a chronic instability problem for many patients [1].

Large clinical series and epidemiologic studies show that younger patients, those involved in contact or overhead sports, and people with generalized laxity are at higher risk of recurrence after nonoperative treatment. The clinical consequence is straightforward: recurrent instability is not merely episodic inconvenience — it increases cumulative soft-tissue damage and bone loss, complicates later repair, and may accelerate degenerative change. This risk profile motivates earlier definitive treatment in select high-risk patients rather than a blanket period of observation [2–4].

Surgical approaches evolved because early open methods, while effective at preventing recurrence, sometimes traded stability for lost motion, subscapularis dysfunction, and longer recovery. Arthroscopic techniques were developed to reattach the labrum anatomically while minimizing soft-tissue disruption. Over the past two decades, improvements in anchor technology, suture techniques, and arthroscopic skills have closed the gap between arthroscopic and open repairs for well-selected patients. Contemporary arthroscopic Bankart repair focuses on restoring the labral bumper and retensioning the anteroinferior capsule while preserving external rotation and subscapularis integrity [5, 10–11].

A crucial modern insight is that not all instability is the same. Small, non-engaging humeral defects and minimal glenoid loss are usually handled well with soft-tissue repair, but when glenoid bone loss reaches a critical threshold or when a Hill–Sachs lesion engages the rim in functional positions, soft-tissue repair alone may fail. This realization moved practice from a blunt "open vs arthroscopic" debate to a lesion-based algorithm: arthroscopic anatomic repair for soft-tissue–dominant cases, remplissage for engaging humeral lesions, and bone augmentation (for example, coracoid transfer or bone grafting) when glenoid deficiency is significant. Matching the procedure to lesion mechanics reduces the chance that the humeral head will re-engage the glenoid rim and redislocate [6–8, 12, 19].

For patients, success means more than avoiding redislocation. They want pain relief, confidence, return to meaningful activity, and good range and strength. Disease-specific scores (Oxford Shoulder Instability Score, UCLA) and general health measures (SF-36) help quantify those outcomes, but the clinician must also measure objective range of motion and stability tests. Early postoperative stiffness is common and often transient — appropriate phased rehabilitation and realistic counseling about the recovery timeline are therefore essential parts of care [9,13–14].

Finally, real-world choices depend on surgeon experience, implant availability, and patient expectations. In many centers arthroscopy offers quicker recovery, less pain, and better cosmesis than historical open operations while preserving the option to add bony procedures when indicated. The modern management principle is simple: identify the dominant pathology (soft tissue versus bone), match the operation to that pathology, and support the repair with structured rehabilitation so the mechanical repair becomes durable, confident function [15–18].

Hypothesis

Primary clinical hypothesis

When traumatic anterior shoulder instability is primarily due to a reparable labral avulsion and glenoid bone loss is not critical, arthroscopic anatomic capsulolabral repair — with lesion-specific adjuncts when necessary (for example, remplissage for an engaging Hill–Sachs lesion) — will restore mechanical stability and lead to meaningful improvement in pain, function, and confidence, allowing most patients to return to prior levels of daily activity and work by 12 months while preserving near-normal external rotation and strength [11, 12].

Supporting mechanistic and prognostic hypotheses

1. Recovery timeline. Early postoperative stiffness is expected; however, with a staged rehabilitation program and anatomic repair, objective range-of-motion measures and patient-reported function will continue to improve through the first postoperative year and approach the contralateral shoulder by 12 months. This pattern reflects initial tissue healing followed by progressive restoration of mobility with strengthening. [13–16]

2. Lesion-matched durability. Outcomes are superior when the surgical plan is tailored: soft-tissue repair alone for limited bone loss; addition of remplissage for engaging humeral defects; and bony augmentation (such as coracoid transfer) when glenoid loss exceeds thresholds at which soft tissue fixation is unlikely to hold. A lesion-based algorithm reduces mechanical failure compared with applying a single technique indiscriminately [7,19–20].

3. Predictors and expectations. Younger age at first dislocation, high-demand sports, and multiple prior dislocations raise baseline recurrence risk; yet when repair is matched to lesion type the majority of these patients still achieve solid function and low absolute recurrence rates, although their relative risk may remain modestly higher than low-risk populations. Clear preoperative counseling and shared decision-making are therefore central [2, 3, 6].

4. Motion–stability balance. Arthroscopic anatomic repair preserves the subscapularis and external rotation better than several older open tightening procedures; thus it typically provides a favorable balance of stability without the motion-limiting complications historically associated with more aggressive open capsular plication [14–15].

Rationale and clinical implication

mechanically, restoring the labrum recreates the concavity-compression mechanism that resists anterior translation. When a Hill–Sachs lesion would otherwise engage, remplissage converts the defect into a non-engaging state by incorporating posterior soft tissue into the lesion; when substantial glenoid deficiency exists, bony reconstruction restores the articulating surface in a way soft tissue alone cannot. Therefore, the hypothesis predicts that properly matched treatment converts structural repair into durable, perceived, and functional stability, and that a lesion-stratified approach offers better long-term durability than a one-size-fits-all strategy [21–22].

Discussion

When the injury is dominated by soft-tissue damage and glenoid loss is limited, arthroscopic anatomic Bankart repair restores stability with the significant advantage of preserving motion and minimizing soft-tissue trauma — benefits that matter to active patients and workers. Advances in anchor technology, suture techniques, and arthroscopic skill have made anatomic arthroscopic repair both practical and reproducible; with careful case selection it now yields stability rates comparable to open methods while offering faster recovery and fewer motion-limiting complications. Comparative trials and systematic reviews support this parity in outcomes when patients are selected appropriately [5, 15, 21].

The current standard of care emphasizes lesion-specific decision-making. Quantifying glenoid bone loss and classifying Hill–Sachs lesions as engaging or non-engaging are essential because they determine whether soft-tissue repair will likely be durable. Remplissage has become an effective adjunct for engaging humeral lesions: by filling the defect with posterior soft tissue it prevents the catch-and-flip mechanics that cause redislocation. For significant glenoid deficiency, coracoid transfer or bone grafting restores the articular arc and adds a sling effect that soft tissue alone cannot reproduce. Using objective thresholds and anatomy-based reasoning therefore materially reduces unexpected failures [7–8, 12, 19].

Functional recovery — pain relief, confidence, range, strength, and return to work or sport — is the patient-centered measure of success. Patient-reported outcome scores commonly show large and meaningful gains after appropriately chosen stabilization. Clinically, many patients who have some stiffness at early follow up still achieve near-normal motion and high satisfaction by one year with good rehabilitation. That practical course should shape preoperative counseling: explain that early guarded motion is common, but progressive recovery is expected if rehabilitation is followed [9, 13–14].

Two pragmatic tensions remain. First, the timing of surgery after a first dislocation is debated. Early stabilization reduces recurrence among high-risk patients but may subject some to unnecessary surgery. The solution is not universal: shared decision-making using risk predictors (age, activity demand, imaging findings) identifies those who will likely benefit from early repair. Second, the long-term risk of arthropathy after instability and repair is incompletely defined. Recurrent instability plausibly accelerates degenerative changes, but robust long-term registry data are needed to quantify the comparative risks across strategies. These uncertainties highlight where future multicenter longitudinal work would be most valuable [6, 18, 22].

Technical details influence outcomes. Anchor number and placement, the degree of capsular tensioning, and decisions about adding remplissage or a bony procedure affect both mechanics and motion. Surgeon experience and a standardized rehabilitation pathway further modulate return-to-function times and recurrence risk. In centers with constrained resources, the decision matrix must balance ideal treatment with implant and imaging availability; nevertheless, the core principle — match the operation to the lesion — endures across settings [16–17, 23].

Looking forward, the highest-impact research will be lesion-stratified randomized trials comparing modern arthroscopic strategies (with standardized thresholds for adjuncts) against bony augmentation for defined bone-loss levels. Studies of biologic augmentation to improve labral healing and validated, evidence-based return-to-play algorithms will also change practice. Finally, multicenter registries that capture long-term recurrence, reoperation, and arthropathy rates will provide the durability data clinicians and patients need to make informed choices [24–25].

Clinical importance

For clinicians: measure the lesion and treat the lesion. Arthroscopic anatomic repair should be the default for traumatic anterior instability when glenoid bone loss is limited, because it restores stability while preserving motion. When objective imaging or intraoperative assessment shows an engaging humeral defect or substantial glenoid loss, augmentative procedures (remplissage or bony reconstruction) materially reduce recurrence. Clear preoperative counseling about early guarded recovery and disciplined rehabilitation improves adherence and functional return.

Future directions

Priority research should include lesion-stratified randomized trials comparing tailored arthroscopic strategies to bony augmentation, biologic approaches to promote labral healing, and standardized return-to-play protocols. Multi-center registries that capture long-term recurrence, reoperation, and arthropathy rates will supply the durability evidence clinicians need.

References

1. 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 Br. 1996; 78(6):968–72.
2. Dodson CC, Cordasco FA. Anterior glenohumeral joint dislocations. Orthop Clin North Am. 2008; 39(4):507–18.
3. Kaplan LD, Flanigan DC, Norwig J, Jost P, Bradley J. Prevalence and variance of shoulder injuries in elite collegiate football players. Am J Sports Med. 2005; 33(8):1142–6.
4. Taylor DC, Krasinski KL. Adolescent shoulder injuries: consensus and controversies. J Bone Joint Surg Am. 2009; 91(2):462–73.
5. Mohtadi NG, Chan DS, Hollinshead RM, Boorman RS, Hiemstra LA, Lo IK, et al. A randomized clinical trial comparing open and arthroscopic stabilization for recurrent traumatic anterior shoulder instability. J Bone Joint Surg Am. 2014; 96(5):353–60.
6. Liavaag S, Brox JI, Pripp AH, Enger M, Soldal LA, Svenningsen S. Immobilization in external rotation after primary shoulder dislocation did not reduce the risk of recurrence. J Bone Joint Surg Am. 2011; 93(10):897–904.
7. Rhee YG, Cho NS, Cho SH. Traumatic anterior dislocation of the shoulder: factors affecting the progress of dislocation. Clin Orthop Surg. 2009; 1(4):188–93.
8. 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):339–47.
9. Erkoçak ÖF, Yel M. The functional results of arthroscopic Bankart repair with knotless anchors for anterior glenohumeral instability. Eur J Gen Med. 2010; 7(2):179–86.
10. Bankart AS. Recurrent or habitual dislocation of the shoulder-joint. Br Med J. 1923; 2(3285):1132–3.
11. Fabbriciani C, Milano G, Demontis A, Fadda S, Ziranu F, Mulas PD. Arthroscopic versus open treatment of Bankart lesion of the shoulder: a prospective randomized study. Arthroscopy. 2004; 20(5):456–62.
12. Ee GW, Mohamed S, Tan AH. Long term results of arthroscopic Bankart repair for traumatic anterior shoulder instability. J Orthop Surg Res. 2011; 6:1–6.
13. Sedeek SM, Tey IK, Tan AH. Arthroscopic Bankart repair for traumatic anterior shoulder instability with the use of suture anchors. Singapore Med J. 2008; 49(9):676–81.
14. Scheibel M, Tsynman A, Magosch P, Schroeder RJ, Habermeyer P. Postoperative subscapularis muscle insufficiency after primary and revision open shoulder stabilization. Am J Sports Med. 2006; 34(10):1586–93.
15. Bottoni LP, Smith ME, Berkowitz MM, Towle CR, Moore CJ. Arthroscopic versus open shoulder stabilization for recurrent anterior instability: a prospective randomized clinical trial. Am J Sports Med. 2006; 34(11):1730–7.
16. Wang C, Ghalambor N, Zarins B, Warner JJ. Arthroscopic versus open Bankart repair: analysis of patient subjective outcome and cost. Arthroscopy. 2005; 21(10):1219–22.
17. O'Neill BD. Arthroscopic Bankart repair of anterior detachment of glenoid labrum: a prospective study. Arthroscopy. 2002; 18(8):755–63.
18. Pevny T, Hunter RE, Freeman JR. Primary traumatic anterior shoulder dislocation in patients 40 years of age and older. Arthroscopy. 1998; 14(3):289–94.
19. Chahal J, Marks PH, MacDonald PB, Shah PS, Theodoropoulos J, Ravi B, Whelan DB. Anatomic Bankart repair compared with nonoperative treatment and/or arthroscopic lavage for first-time traumatic shoulder dislocation. Arthroscopy. 2012; 28(4):565–75.
20. Mishra DK, Fanton GS. Two-year outcome of arthroscopic Bankart repair and electrothermal-assisted capsulorrhaphy for recurrent traumatic anterior shoulder instability. Arthroscopy. 2001; 17(8):844–9.
21. Privitera DM, Bisson LJ, Marzo JM. Minimum 10-year follow-up of arthroscopic intra-articular Bankart repair using bioabsorbable tacks. Am J Sports Med. 2012; 40(1):100–7.
22. Ahmed I, Ashton F, Robinson CM. Arthroscopic Bankart repair and capsular shift for recurrent anterior shoulder instability. J Bone Joint Surg Br. 2012; 94-B (14):1308–15.
23. Mishra A, Sharma P, Chaudhary D. Analysis of the functional results of arthroscopic Bankart repair in posttraumatic recurrent anterior dislocations of shoulder. Indian J Orthop. 2012; 46(6):668–74.
24. Srisuwanporn P, Cheecharern S, Sittiporn CP, et al. Assessment of failed arthroscopic anterior stabilization: factors and solutions. J Shoulder Elbow Surg. [details as per source].
25. (Consolidated long-term outcome studies and reviews cited in the thesis; full citation details available on request).

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