

Mini Open Coracohumeral Ligament Release and Manipulation for Idiopathic Frozen Shoulder

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Abstract:

Background: Frozen shoulder (adhesive capsulitis) is a painful condition characterized by progressive stiffness and loss of both active and passive range of motion of the glenohumeral joint. Although the exact etiology of idiopathic frozen shoulder remains unclear, the condition is widely believed to involve chronic inflammation, capsular fibrosis, and contracture—particularly of the rotator interval structures, including the coracohumeral ligament (CHL). Traditional treatments range from physiotherapy and intra-articular injections to manipulation under anesthesia and arthroscopic capsular release. However, some patients continue to present with significant stiffness and functional limitation despite conservative therapy. Mini open CHL release combined with manipulation provides a targeted, less invasive option that directly addresses the pathology of the rotator interval and may enhance recovery while minimizing complications associated with larger surgical procedures or full arthroscopic release.

Keywords: Idiopathic frozen shoulder; Adhesive capsulitis; Coracohumeral ligament; Mini-open release; Manipulation under anesthesia; Shoulder stiffness; Rotator interval; Capsular contracture; Range of motion.

Introduction:

Idiopathic frozen shoulder, or primary adhesive capsulitis, is a common yet debilitating disorder characterized by progressive pain and marked limitation of both active and passive shoulder motion. The condition affects approximately 2–5% of the general population, predominantly middle-aged individuals, and is strongly associated with metabolic and systemic diseases such as diabetes mellitus and thyroid dysfunction. Pathologically, adhesive capsulitis is marked by chronic synovial inflammation followed by dense capsular fibrosis and contracture, particularly involving the rotator interval and coracohumeral ligament (CHL) (1).

The coracohumeral ligament has been identified as a major contributor to the restriction of external rotation and forward elevation in frozen shoulder. Histopathological studies have demonstrated significant thickening, fibrosis, and inflammatory changes within the CHL and capsule, suggesting it plays a central role in the pathomechanics of the disease. As a result, CHL release—whether arthroscopic or open—has become an important surgical target in refractory adhesive capsulitis. Several authors have emphasized that isolated CHL release may yield substantial improvement in range of motion due to its key function in limiting external rotation (2).

Although conservative treatments—including physiotherapy, corticosteroid injections, and hydrodilatation—remain first-line, up to 10–15% of patients continue to experience persistent stiffness and functional disability. In such resistant cases, surgical intervention is considered. While arthroscopic capsular release is widely used, it requires specialized equipment and carries risks such as intra-articular bleeding or iatrogenic injury. Mini open CHL release combined with manipulation under anesthesia offers a focused, less invasive alternative that directly addresses the pathological structure responsible for stiffness while reducing surgical morbidity. Recent

reports have shown promising outcomes, with improved range of motion and faster recovery in patients undergoing targeted CHL release (3).

The mini-open coracohumeral ligament (CHL) release, paired with manipulation under anesthesia, has become a favored minimally invasive method for restoring shoulder function in these cases. This literature review covers the anatomical considerations, surgical technique, clinical outcomes, and potential complications associated with this approach (4).

Surgical Technique: Mini-Open CHL Release and Manipulation

The mini-open technique for CHL release was developed to precisely address restrictive adhesions while minimizing tissue disruption. Unlike more technically challenging arthroscopic approaches, the mini-open method offers direct access to the CHL and rotator interval through a small, strategic incision (5).

Mini-open Coracohumeral ligament release is performed through a 3-cm incision. The Coracohumeral ligament is divided, and then the shoulder is manipulated without undue force (6).

Manipulation Under Anesthesia

Following CHL release, the shoulder is manipulated to address additional capsular restrictions (4):

- **External rotation with abduction** releases the inferior capsule,
- **Flexion with internal rotation** releases the posterior capsule.

These movements ensure comprehensive release across all planes of shoulder motion, facilitating full recovery of mobility. Combining manipulation with CHL release has been shown to significantly improve shoulder function and pain relief in patients (7).

Clinical Outcomes

Mini-open CHL release and manipulation under anesthesia yield favorable outcomes, with substantial improvements in pain reduction, range of motion, and overall shoulder function. Patients typically experience increases in external rotation and abduction, alongside a marked decrease in pain. This technique facilitates faster recovery and shorter rehabilitation periods due to the precision of the approach and reduced tissue disruption (8).

Complications and Considerations

Though considered safe, the mini-open CHL release and manipulation technique may lead to minor complications such as transient neuropraxia, infection, and hematoma. Careful handling of nearby neurovascular structures, particularly the brachial plexus, helps reduce the incidence of neuropraxia. Delayed initiation of early mobilization may also result in postoperative stiffness, underscoring the importance of postoperative physical therapy (9).

Comparison with Other Techniques

The mini-open approach provides several advantages over arthroscopy, particularly in terms of accessibility and recovery time. While arthroscopy offers enhanced joint visualization, it demands higher technical expertise and longer surgery duration. In contrast, the mini-open method offers direct CHL access with a more straightforward technique, promoting faster recovery. This approach's effectiveness in improving shoulder range of motion has been shown to be comparable to, or even superior to, arthroscopic methods, especially in severe cases of capsular contracture (10).

Capsular Release Techniques and ROM Outcomes

Studies have explored the impact of different extents of capsular releases on shoulder function, particularly the addition of posterior capsulotomy. Findings suggest that while posterior release may yield early improvements in internal rotation, these gains are not always sustained over time. Nonetheless, combined posterior release has been associated with early and lasting improvements in shoulder flexion. Comparisons

among surgical techniques, including a full 360-degree release, reveal that less extensive anterior-inferior releases often provide better functional and pain outcomes than more comprehensive approaches, possibly because of reduced invasiveness and tissue preservation (11).

Complications and Safety Considerations

The risk of axillary nerve injury is a primary concern during open inferior capsular release, though incidences appear low with meticulous technique. Studies like those by **Jerosch et al (12)** have reported no axillary nerve injuries following careful inferior capsular release that stays proximal to the glenoid rim. **Yoo et al. (13)** indicated that maintaining the arm in an abduction-neutral position during release helps preserve axillary nerve integrity. However, scarring from prior surgeries or anatomical variations can increase nerve injury risk. For patients with complicated anatomy or past surgical interventions, manipulation under anesthesia may be preferred over direct capsular release to avoid nerve damage.

Influence of Adjunct Procedures on Outcomes

Arthroscopic capsular releases are frequently accompanied by adjunct procedures, such as manipulation under anesthesia and subacromial decompression. Manipulation in forward elevation and abduction-external rotation can supplement inferior capsular release by reducing risk to the axillary nerve. Some studies have also incorporated subacromial decompression for patients with concurrent subacromial bursitis, but findings suggest no additional ROM or functional benefits from these adjunct procedures (14).

Mini-Open CHL Release with and without Posterior Capsulotomy

The effectiveness of posterior capsulotomy in enhancing outcomes of mini-open CHL release has been supported in recent studies, where the addition of posterior release shows more significant internal rotation improvements compared to anterior-inferior release alone. **Diwan et al. (15)** reported that patients undergoing a combined anterior and posterior capsular release achieved more sustained postoperative ROM improvements than those with standard anterior-inferior release alone. However, the effect of sustained internal rotation improvement may be influenced by the intensity and early timing of postoperative rehabilitation.

Despite these promising results, posterior capsulotomy's role remains debated, as some studies suggest similar long-term outcomes with anterior-inferior release alone. Factors such as patient variability, disease chronicity, and rehabilitation protocols may contribute to the diverse findings reported in the literature (16).

Safety and Complications

Adding posterior capsulotomy to CHL release has a low complication rate when performed with a meticulous approach. However, the proximity of the axillary nerve to the inferior capsule raises concerns for potential nerve injury, particularly during inferior capsule release. Studies suggest that maintaining an appropriate distance from the glenoid rim can minimize the risk of nerve damage. **Jerosch et al. (12)** reported no postoperative axillary nerve injuries in patients undergoing extensive capsular release, underscoring the safety of a carefully executed procedure. Manipulation under anesthesia can further reduce the need for aggressive release, potentially lowering risks.

References:

1. Zuckerman JD, Rokito A. Frozen shoulder: A consensus definition. *J Shoulder Elbow Surg.* 2011.
2. Itoi E, Arce G, Bain GI, et al. Shoulder stiffness: current concepts and concerns. *Arthroscopy.* 2016.
3. Cho CH, Bae KC, Kim DH. Treatment strategy for frozen shoulder. *Clin Orthop Surg.* 2020.
4. Hagiwara Y, Kanazawa K, Ando A, Sekiguchi T, Yabe Y, Takahashi M, et al. Clinical outcomes of arthroscopic pan-capsular release with or without entire coracohumeral ligament release for patients with frozen shoulder. 2020;4(4):826-32.

5. Tamborrini G, Müller A, Szöllösy G, Bianchi S, Haeni D, Wurm M, et al. Shoulder Ultrasound: Sonoanatomy and Sonopathology Atlas of the Shoulder Including Anatomy, Radiography and Arthroscopy: BoD–Books on Demand; 2023.
6. Eid A. Miniopen coracohumeral ligament release and manipulation for idiopathic frozen shoulder. *Int J Shoulder Surg.* 2012;6(3):90-6.
7. Wenschhof B. Manual Therapy Approaches for a Patient Post-Operative a Latarjet Surgery for Anterior Shoulder Instability: A Case Report: Marymount University; 2022.
8. Millar NL, Meakins A, Struyf F, Willmore E, Campbell AL, Kirwan PD, et al. Frozen shoulder (Primer). 2022;8(1).
9. Gomez J, Wilson D, Black P, Friedman L, Roche AM. Physical and Occupational Therapy. Complex Head and Neck Microvascular Surgery: Comprehensive Management and Perioperative Care: Springer; 2023. p. 201-29.
10. De la Serna D, Navarro-Ledesma S, Alayón F, López E, Pruimboom LJFiM. A comprehensive view of frozen shoulder: a mystery syndrome. 2021;8:663703.
11. Sivasubramanian H, Chua CXK, Lim SY, Manohara R, Ng ZWD, Kumar P, et al. Arthroscopic capsular release to treat idiopathic frozen shoulder: How much release is needed? 2021;107(1):102766.
12. Jerosch J, Nasef NM, Peters O, Mansour AMRJKs, sports traumatology, arthroscopy. Mid-term results following arthroscopic capsular release in patients with primary and secondary adhesive shoulder capsulitis. 2013;21:1195-202.
13. Yoo JC, Kim JH, Ahn JH, Lee SHJATJoA, Surgery R. Arthroscopic perspective of the axillary nerve in relation to the glenoid and arm position: a cadaveric study. 2007;23(12):1271-7.
14. Kanbe KJJoos, research. Clinical outcome of arthroscopic capsular release for frozen shoulder: essential technical points in 255 patients. 2018;13:1-7.
15. Diwan DB, Murrell GAJATJoA, Surgery R. An evaluation of the effects of the extent of capsular release and of postoperative therapy on the temporal outcomes of adhesive capsulitis. 2005;21(9):1105-13.
16. Zhang K, Kanakamedala A, Sheean AJ, Vyas DJATJoA, Surgery R. Management of concomitant preoperative rotator cuff pathology and adhesive capsulitis: a systematic review of indications, treatment approaches, and outcomes. 2019;35(3):979-93.