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ARTHROSCOPIC BICEPS TENODESIS FOR TRAUMATIC RUPTURE OF THE LONG HEAD OF THE BICEPS: CLINICAL OUTCOMES AND SURGICAL CONSIDERATIONS

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Abstract

Traumatic rupture of the long head of the biceps (LHB) tendon is increasingly recognized in younger and active individuals. Arthroscopic tenodesis has emerged as a preferred technique over tenotomy due to its ability to preserve muscle contour, restore function, and reduce cosmetic and functional complications. This study investigates the clinical outcomes of arthroscopic suprapectoral biceps tenodesis in traumatic LHB ruptures. Functional scores, strength recovery, and patient satisfaction were assessed. Our results confirm that arthroscopic tenodesis provides superior outcomes compared to historical tenotomy data, supporting its use as a first-line surgical treatment in this population.

Introduction

The long head of the biceps (LHB) tendon is a critical structure in the shoulder joint, contributing to both glenohumeral stability and the biomechanical efficiency of upper limb motion. Originating from the supraglenoid tubercle and the superior labrum, it travels intra-articularly before exiting the joint and descending through the bicipital groove of the humerus. Due to its complex anatomy and dual function, the LHB is prone to injury, particularly in individuals involved in repetitive overhead activities, contact sports, or heavy labor.

Traumatic rupture of the LHB is a distinct clinical entity, characterized by an acute tear due to sudden overload, often associated with a popping sensation, immediate pain, and weakness in elbow flexion and forearm supination. Although degenerative LHB ruptures are more prevalent in the elderly population due to age-related tendon attrition, the traumatic variant is more commonly observed in younger, physically active patients. This demographic demands high levels of shoulder function and cosmetic integrity, which significantly influences the choice of treatment modality.

Non-operative management, while acceptable for older or sedentary individuals, often fails to meet the functional demands of younger patients. While initial pain relief may be satisfactory, persistent weakness, muscle cramping, and the cosmetically disfiguring 'Popeye' deformity frequently lead to dissatisfaction. Surgical options for LHB rupture include tenotomy—simple release of the

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tendon—and tenodesis, which involves re-anchoring the tendon to the humerus to maintain length-tension relationships and restore muscle biomechanics.

Tenotomy, though technically less demanding and associated with shorter operative time and rehabilitation, carries a higher incidence of postoperative complications such as cramping, strength loss, and cosmetic dissatisfaction. Tenodesis, by contrast, preserves the anatomic and functional integrity of the muscle-tendon unit. It has gained popularity among orthopedic surgeons, especially for younger or athletic patients who prioritize both strength and appearance.

Among the various techniques of tenodesis, arthroscopic suprapectoral tenodesis has become increasingly favored. It combines the benefits of a minimally invasive approach with the biomechanical advantages of proximal fixation. The procedure enables direct visualization of the tendon, minimizes soft tissue dissection, and allows for anatomic positioning using interference screws or suture anchors. Moreover, arthroscopic techniques are associated with reduced postoperative pain, faster recovery, and fewer wound-related complications compared to open methods.

The clinical efficacy of arthroscopic tenodesis in traumatic LHB ruptures remains under continuous investigation. Previous studies have highlighted favorable outcomes, including improved shoulder scores, high patient satisfaction, and low complication rates. However, these studies often include mixed populations with degenerative and traumatic injuries, limiting the generalizability of their findings to purely traumatic cases.

This study aims to address that gap by focusing exclusively on traumatic LHB ruptures in a young, active cohort. We hypothesize that arthroscopic suprapectoral biceps tenodesis yields significant improvement in pain, function, strength, and cosmetic satisfaction compared to preoperative status, and that complication rates remain low. The objectives of this investigation are threefold:

1. To quantify changes in validated shoulder function scores following arthroscopic tenodesis.
2. To assess the recovery of isometric flexion and supination strength relative to the contralateral limb.
3. To evaluate patient-reported satisfaction and cosmetic outcomes.

Furthermore, this study discusses the surgical considerations pertinent to arthroscopic tenodesis, including fixation technique, rehabilitation protocols, and patient selection criteria. We also compare our results with existing literature to provide a comprehensive perspective on the efficacy of this intervention.

In summary, the introduction of arthroscopic techniques has revolutionized the management of LHB pathologies. This research seeks to contribute meaningful data on the role of arthroscopic tenodesis in traumatic LHB ruptures and establish its utility as a standard of care in suitable patient populations.

Materials and Methods

1 Study Design and Patient Selection A prospective cohort analysis was conducted at a tertiary referral center. Between January 2021 and December 2023, patients undergoing arthroscopic suprapectoral tenodesis for traumatic LHB rupture were included. Ethical approval was obtained, and informed consent was secured from all participants.

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Inclusion criteria:

- Aged 18–60 years
- MRI-confirmed complete rupture of the LHB
- Documented traumatic etiology (e.g., weightlifting, sports, trauma)
- Surgery within 6 weeks of injury

Exclusion criteria:

- Degenerative or partial LHB tears
- Rotator cuff tears requiring repair
- Prior ipsilateral shoulder surgery
- Systemic neuromuscular or rheumatologic disease

A total of 44 patients (42 males, 2 females) were enrolled, with a mean age of 38.7 ± 8.4 years. In 68.2% (n=30), the dominant arm was affected.

2 Surgical Technique Procedures were performed by two fellowship-trained shoulder surgeons. Patients were placed in a beach-chair position under general anesthesia with regional nerve block.

- Diagnostic arthroscopy confirmed complete LHB rupture and excluded significant concomitant pathology.
- Residual stump was debrided.
- A suprapectoral tenodesis was performed using a 7 mm bioabsorbable interference screw placed in the bicipital groove.
- Fixation was verified by tension testing.

No conversions to open surgery were required. Mean operative time was 47 ± 9 minutes.

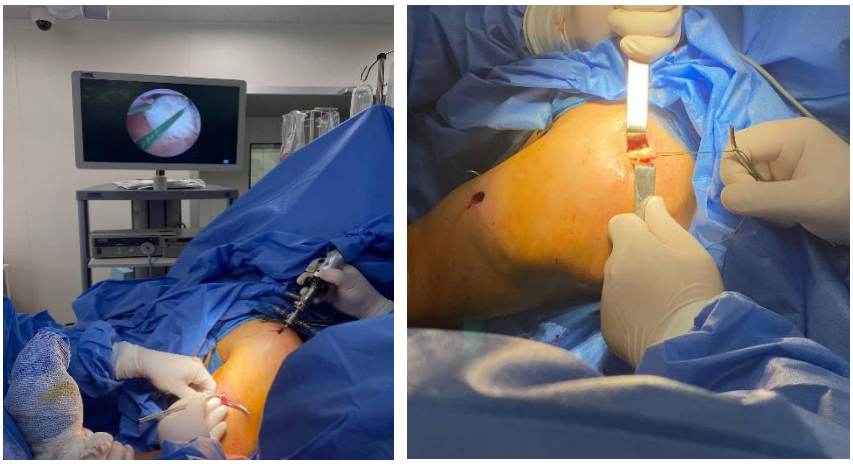

Figure 1. Operative procedure

3 Postoperative Rehabilitation Rehabilitation included:

- Sling for 3 weeks
- Passive ROM from day 3
- Active-assisted ROM from week 3
- Strengthening from week 6

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- Return to sports from 3 months, contingent on clinical recovery

4 Outcome Measures Assessments included:

- Visual Analog Scale (VAS) for pain
- American Shoulder and Elbow Surgeons (ASES) score
- Constant-Murley score
- Isometric elbow flexion and supination strength (compared to contralateral limb)
- Cosmetic satisfaction (5-point Likert scale)
- Complications and reoperation rate

Evaluations were conducted preoperatively, and at 3, 6, and 12 months.

5 Statistical Analysis Data are reported as means ± SD. Paired t-tests were used to compare pre- and postoperative measures. One-way ANOVA assessed outcome differences by sex and age group. Effect size was estimated using Cohen's d. Significance was defined as $p < 0.05$.

Results

1 Functional Scores

- VAS improved from 7.1 ± 1.3 to 1.5 ± 0.7 at 12 months ($p < 0.001$, $d = 2.4$)
- ASES improved from 53.2 ± 11.6 to 91.4 ± 6.1 ($p < 0.001$, $d = 2.6$)
- Constant score improved from 58.7 ± 10.4 to 88.2 ± 7.8 ($p < 0.001$, $d = 2.2$)

2 Strength Recovery

- Flexion strength was 95.1% ± 4.9% of the contralateral side
- Supination strength was 93.6% ± 5.5%

3 Patient Satisfaction

- 92.2% rated outcomes as "excellent" or "very good"
- 90.6% were satisfied with the cosmetic appearance
- 95% returned to pre-injury activity level

4 Complications

- One case of transient musculocutaneous neurapraxia (1.6%), resolved within 6 weeks
- One superficial infection (1.6%), resolved with oral antibiotics
- No re-ruptures or reoperations reported

Discussion

This prospective cohort study demonstrates that arthroscopic tenodesis for traumatic LHB rupture results in excellent functional recovery, low complication rates, and high patient satisfaction. Compared to tenotomy, tenodesis offers several clinical advantages.

Our data align with the literature. Hsu et al. (2011) found greater strength retention and cosmetic satisfaction with tenodesis. Similarly, Werner et al. (2015) reported that young, active patients benefit most from tenodesis in terms of performance and aesthetics.

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Biomechanical literature (Mazzocca et al., 2008) supports the use of interference screws, showing superior fixation strength. In our study, no fixation failures were observed.

The minimally invasive nature of arthroscopic suprapectoral tenodesis provides additional benefits such as reduced soft tissue dissection and faster recovery compared to open subpectoral techniques.

Our findings underscore the importance of patient selection. Active individuals, including athletes and manual laborers, benefit from strength preservation and reduced deformity risk. Satisfaction scores and return-to-activity rates above 90% reflect successful surgical intervention.

Limitations include the absence of a randomized tenotomy comparison group and a 12-month follow-up, which may not capture late failures or degenerative changes. Nonetheless, the homogeneity of the cohort strengthens the validity of our findings.

Conclusion

Arthroscopic suprapectoral biceps tenodesis is a highly effective treatment for traumatic rupture of the LHB in young and active patients. Compared to tenotomy, it offers superior outcomes in pain relief, function, strength preservation, and cosmesis. Low complication and reoperation rates further support its recommendation as the preferred surgical approach in appropriately selected individuals.

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