

## Analysis of 1723 Proximal Long Head of the Biceps Tendon Procedures

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### Summary:

We present the largest long head of the biceps tendon procedure study in the literature, with analysis by tenodesis technique and location.

### Abstract:

**Introduction:** Surgical treatment of long head of the biceps tendon (LHBT) lesions is controversial. Isolated tenotomy versus tenodesis with several techniques and location relative to the pectoralis have been described.

Post-operative complications including cosmetic "Popeye" deformity, biceps cramping, biceps weakness, persistent anterior shoulder pain, and proximal humerus fracture have been reported with these techniques. We present the largest series of surgical LHBT procedures and analyze their complications.

**Methods:** Following IRB approval, the records of patients who underwent a LHBT tenotomy +/- tenodesis at an integrated health care system by 84 surgeons, from 2006 to 2014, were retrospectively analyzed. Inclusion criteria were patients who underwent a shoulder arthroscopy where the LHBT was surgically released. Exclusion criteria included revision tenodesis, arthroplasty, neoplastic, or fracture surgery, age below 18, or incomplete data. Fixation methods, location of tenodesis, as well as indication for LHBT procedure, and complications were recorded.

**Results:** 1635 patients (1723 shoulders) were included in this study. 1132 patients were male (69%). The average patient age was 54.5 years (range 18-91). The average follow-up duration was 10.8 months.

There was no difference in persistent anterior shoulder pain between tenotomy (8.1%), tenodesis where LHBT was left in the groove (9.5%), or when LHBT was removed from the groove (8.1%;  $p=0.49$ ), and neither suprapectoral tenodesis (Odds ratio (OR): 0.85 (95% CI: 0.51, 1.43)) nor tenodesis at the joint (OR: 1.11 (95% CI: 0.68, 1.80)) had increased risk for post-operative shoulder pain when adjusted for pre-operative shoulder pain compared with subpectoral tenodesis.

Tenotomy, compared to tenodesis, had a significantly higher rate of cosmetic deformity (14.6% versus 4.6%;  $p<0.001$ , age-adjusted OR 3.9), postoperative cramping (10.1% vs 2.1%;  $p<0.001$ , age-adjusted OR 5.9), subjective biceps weakness (10.1% vs 5.6%;  $p=0.003$ , age-adjusted OR 2.0), and re-operation for biceps related complaints (3.0% vs 1.2%;  $p=0.009$ ). Soft tissue tenodesis had a higher rate of subjective weakness postoperatively (8.7% vs 3.9%;  $p<0.001$ ) versus implant tenodesis. There were significantly more biceps related revisions for implant tenodesis compared with soft tissue tenodesis (1.19% versus 0%;  $p=0.03$ ). Neither anchor size (mean 5.32mm; range 2.7mm-9mm), screw size (mean 6.71mm; range 2.7-9mm), nor tunnel diameter (mean 6.65mm; range 2.5mm-9mm) were associated with postoperative anterior shoulder pain.

One shoulder (0.12% of subpectoral implant tenodesis) following unicortical button tenodesis with a 3.2mm tunnel suffered a proximal humerus fracture. 18 (1.04%) nerve injuries/ neuropraxias were encountered, all of which resolved completely. Subpectoral tenodesis techniques had a significantly higher rate nerve injury ( $p = 0.047$ ), and bicortical drilling had the highest rate of nerve injury (3.3%).

**Conclusion:** We present the largest series of LHBT procedures. While tenotomy and tenodesis provide reliable pain relief with LHBT anterior shoulder pain, we found no difference in persistent post-operative anterior shoulder pain

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between tenotomy versus tenodesis, regardless of whether the technique left the LHBT in the groove or not. Tenotomy had a higher rate of biceps related complications, including cosmetic deformity, cramping, weakness, and revision compared with tenodesis. The overall nerve injuries were low and all recovered, but were significantly more frequent following subpectoral tenodesis.