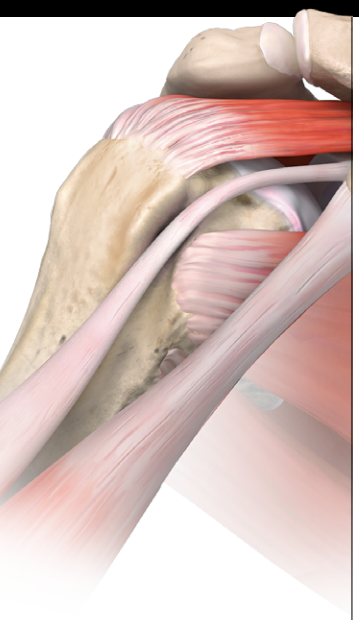
Biceps Tenodesis: When and Where Scientific Update



There is controversy both about when and where to perform biceps tenodesis. One must understand the incidence of pathology and literature indicating where to perform tenodesis. Then, a decision is made about location of the tenodesis.

Incidence of Pathology

The evidence indicates that biceps pathology is common in the setting of a rotator cuff tear. Notably, the arthroscopic appearance of the biceps often underestimates the disease as microscopic studies demonstrate that findings are common regardless of gross appearance. This information should be considered when assessing studies that compare rotator cuff repairs with and without treatment of the biceps.

Desai SS, Mata HK

Long head of biceps tendon pathology and results of tenotomy in full-thickness reparable rotator cuff tear. *Arthroscopy.* 2017;33(11):1971-1976. doi:10.1016/j.arthro.2017.06.018

- Prospective evaluation characterizing the arthroscopic appearance of the biceps in 141 shoulders undergoing arthroscopic cuff repair of a full-thickness tear.
- The overall incidence of biceps pathology was 36%.
- Biceps pathology increased with tear size:
  - 27% with small and medium cuff tears
  - 45% with large tears
  - 70% with massive tears
- Biceps pathology was most common in patients with subscapularis tears
  - 67% with a supraspinatus and subscapularis tear
  - 100% with a combined supraspinatus/infraspinatus and subscapularis tear

Takeaways

- **Biceps pathology is common with rotator cuff tears and increases in incidence with increasing tear size.**
- **There is a strong association between biceps pathology and tears of the subscapularis such that identification of one should alert the surgeon to the other.**

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Walch G, Nové-Josserand L, Boileau P, Levigne C

Subluxations and dislocations of the tendon of the long head of the biceps. *J Shoulder Elbow Surg.* 1998;7(2):100-108. doi:10.1016/s1058-2746(98)90218-x

- Retrospective evaluation of 71 cases of biceps subluxation treated with open or arthroscopic surgery.
- In 24% of cases, the biceps subluxation or dislocation was not identified by preoperative CT arthrogram.
- In 97% (69 of 71) of cases, there was an associated subscapularis tear.
  - The remaining 2 had a supraspinatus tear.

Takeaways

- **Biceps subluxation can be missed in a quarter of cases on advanced imaging such as CT arthrogram.**
- **The presence of biceps subluxation is always associated with a rotator cuff tear, particularly of the subscapularis tendon.**

Murthi AM, Vosburgh CL, Neviaser TJ

The incidence of pathologic changes of the long head of the biceps tendon. *J Shoulder Elbow Surg.* 2000;9(5):382-385. doi:10.1067/mse.2000.108386

- Prospective evaluation of 200 consecutive patients undergoing shoulder arthroscopy.
  - A tissue sample was taken and underwent histological examination in all cases
  - In 80 cases, the biceps was felt to be torn or degenerated and was tenodesed
  - In 120 cases, the biceps was normal on inspection
- In the tenodesis or “grossly abnormal” group, all showed microscopic changes.
- In the “grossly normal” biceps group, 63% had microscopic evidence of chronic inflammation.
  - 89% of cases with a full-thickness rotator tear had microscopic evidence of disease
  - 84% of cases with a partial rotator cuff tear had evidence of disease

Takeaways

- **Arthroscopic appearance underestimates microscopic inflammation of the biceps tendon.**
- **In the vast majority of rotator cuff tears, the biceps is inflamed despite normal arthroscopic appearance, with a rate of up to 89% for a full-thickness tear.**

When to Perform Tenodesis

As seen above, there is a high incidence of biceps pathology, particularly in the setting of a rotator cuff tear. Literature regarding when to treat the biceps and leave the biceps is sparse with few comparative studies. Much is inferred from the fact pathology of the biceps is common based on histological evaluation and the biceps is often grossly affected on arthroscopic visualization. It is clear that the biceps is a common source of pain (as evidenced by improvement after treatment). Tenodesis leads to improvement in outcomes when the subscapularis requires repair. Biceps tenodesis may also improve short-term outcomes of a rotator cuff repair.

Edwards TB, Walch G, Sirveaux F, Molé D, Nové-Josserand L, Boulahia A, Neyton L, Szabo I, Lindgren B

Repair of tears of the subscapularis. *J Bone Joint Surg Am.* 2005;87(4):725-730. doi:10.2106/JBJS.D.02051

- Retrospective evaluation of 84 shoulders that underwent subscapularis repair.
  - In 80 cases, the biceps was treated with tenodesis or tenotomy.
  - In 4 cases, the biceps was recentered and left.
- The patients treated with recentering had poorer outcomes.

Takeaway

- **Outcomes of subscapularis repair are improved when the biceps is also addressed with a tenodesis or a tenotomy.**

Boileau P, Baqué F, Valerio L, Ahrens P, Chuinard C, Trojani C

Isolated arthroscopic biceps tenotomy or tenodesis improves symptoms in patients with massive irreparable rotator cuff tears. *J Bone Joint Surg Am.* 2007;89(4):747-757. doi:10.2106/JBJS.E.01097

- Retrospective review of 68 patients who underwent biceps tenotomy or tenodesis for a massive irreparable rotator cuff tear.
  - Minimum 2-year follow-up
- 78% of the patients were satisfied with the treatment.
- The mean Constant score improved from 46 points preoperatively to 67 points postoperatively ($P < .001$).

Takeaway

- **Given the treatment of the biceps alone leads to improvement in symptoms, the biceps is a significant source of pain in massive rotator cuff tears.**

Godéneche A, Kempf JF, Nové-Josserand L, Michelet A, Saffarini M, Hannink G, Collin PI

Tenodesis renders better results than tenotomy in repairs of isolated supraspinatus tears with pathologic biceps. *J Shoulder Elbow Surg.* 2018;27(11):1939-1945. doi:10.1016/j.jse.2018.03.030

- Retrospective evaluation of 249 rotator cuff repairs 10 years following surgery.
  - 39% were open repairs; 61% were arthroscopic repairs.
  - In 120 cases, the biceps were observed to be normal.
    - 106 cases left intact
  - In 129 cases, the biceps were observed to be pathologic.
    - 120 cases treated with tenodesis or tenotomy
- There were no differences in postoperative Constant scores between those with a normal biceps who did not have treatment and those with a pathologic biceps that had treatment.
- Patients treated with a tenodesis had improved Constant scores compared to those who had a tenotomy ($P = .025$).

Takeaways

- **Long-term outcomes are not different in patients who have a concomitant biceps procedure in association with a rotator cuff tear.**

Notes

- **The results should be interpreted with the understanding that 39% were open repairs and therefore the presence of biceps pathology may have been underestimated.**
- **The results do not necessarily reflect short-term outcomes (see Watson et al).**

Watson ST, Robbins CB, Bedi A, Carpenter JE, Gagnier JJ, Miller BS

Comparison of outcomes 1 year after rotator cuff repair with and without concomitant biceps surgery. *Arthroscopy.* 2017;33(11):1928-1936. doi:10.1016/j.arthro.2017.05.009

- Retrospective review of 80 patients 1 year following arthroscopic rotator cuff repair (ARCR).
  - In 35 cases, the biceps was left untreated
  - In 45 cases, the biceps was tenodesed or tenotomized
- Patients who had biceps treatment had lower ASES scores at baseline (49 compared to 59; $P = .032$).
- Patients who had biceps treatment had greater improvement in postoperative scores.
  - ASES scores (43 with compared to 24 without; $P = .002$)
  - Pain (49 compared to 36; $P = .020$)

Takeaway

- **Addressing the biceps leads to improved early outcomes (1 year) in the setting of ARCR compared to leaving the biceps intact with ARCR.**

Where to Perform Tenodesis

In terms of location, some authors have reported concern about location of the tenodesis. However, most of these studies are small patient cohorts or case series only. The largest studies (see McCrum et al for example), as well as randomized controlled trials, show that tenodesis location does not impact outcomes. What appears most important is the quality of fixation.

McCrum CL, Alluri RK, Batech M, Mirzayan R

Complications of biceps tenodesis based on location, fixation, and indication: a review of 1526 shoulders. *J Shoulder Elbow Surg.* 2019;28(3):461-469. doi:10.1016/j.jse.2018.09.005

- Retrospective evaluation of 1526 patients who underwent biceps tenodesis from the Kaiser Health System.
  - 996 tenodeses were done out of the groove (subpectoral).
  - 530 tenodeses were done in the groove (arthroscopic).
- No difference in postoperative pain based on location.
- Revision was higher for procedures in the groove (1.5% compared to 0.6%; $P = .001$).
- Infection was higher for open procedures (2.3% compared to 0.6%; $P = .029$).
- Soft-tissue tenodeses had higher new onset post-op pain (11.9% compared to 2.6%; $P < .001$) and subjective weakness (8.5% compared to 3.9%; $P < .001$) compared to the use of an anchor.

Takeaways

- **Postoperative pain does not vary based on location of tenodesis.**
- **For complications, there is a trade-off based on location of the tenodesis (revision vs infection).**
- **Tenodesis performed with an implant is more reliable than soft-tissue tenodesis alone.**

Mardani-Kivi M, Keyhani S, Ebrahim-Zadeh MH, Hashemi-Motlagh K, Saheb-Ekhtiari K

Rotator cuff tear with concomitant long head of biceps tendon (LHBT) degeneration: what is the preferred choice? open subpectoral versus arthroscopic intraarticular tenodesis. *J Orthop Traumatol.* 2019;20(1):26. doi:10.1186/s10195-019-0531-5

- Randomized controlled trial of 60 patients undergoing arthroscopic rotator cuff repair.
  - 30 arthroscopic tenodeses (high in the groove with a suture anchor)
  - 30 open tenodeses (subpectoral with an interference screw)
- There were no differences in outcomes at 6 months or 2 years postoperative.

Takeaway

- **Level 1 evidence indicates no difference in functional outcomes based on location of tenodesis either at 6 months or 2 years postoperative.**