

Face-Off: Tenotomy Versus Tenodesis



By: **Xavier A. Duralde, MD** and **Walter B. McClelland Jr, MD**

Two orthopaedists take sides on treatment of biceps tendon pathology

The biceps tendon is a frequent contributor to shoulder pain and functional limitation. Although this pathology can be seen occasionally in isolation, in the majority of cases, it occurs concurrent with rotator cuff disorders. Abnormality of the biceps can take many forms, including tendinosis, tenosynovitis, partial or complete tear, hypertrophy, instability, and SLAP (superior labrum anterior to posterior) lesions.

Biceps tendon pathology may be treated in several ways. Whether to treat with tenodesis (anchoring the tendon to prevent any further excision) or tenotomy (dividing the tendon and enabling it to retract), however, is a matter of much debate. This month, two orthopaedists from the Peachtree Orthopaedic Clinic in Atlanta face-off to argue for their choice of treatment.

Tenodesis!

Xavier A. Duralde, MD

The biceps tendon is a significant pain generator in the shoulder and requires management on a regular basis. Missed biceps pathology can result in ongoing pain that will ruin the results of an otherwise successful surgery. As in many areas of orthopaedics, high-quality studies on the treatment of biceps pathology are lacking and most information regarding biceps surgery is based on level IV studies.

Controversy exists over whether the biceps should be tenodesed or tenotomized, and about the level of tenodesis (Fig. 1) and the frequency with which this procedure should be performed. The noted French surgeon and researcher, Pascal Boileau, MD, has identified biceps pathology in 95 percent of patients with rotator cuff disease and recommends routine tenotomy. Pathology in these patient can include instability of the origin at the superior labrum, partial tearing, tendinitis, and instability in the bicipital groove. Even with MRI and arthroscopy, biceps pathology can be easily missed and has thus been described as a "hidden lesion."

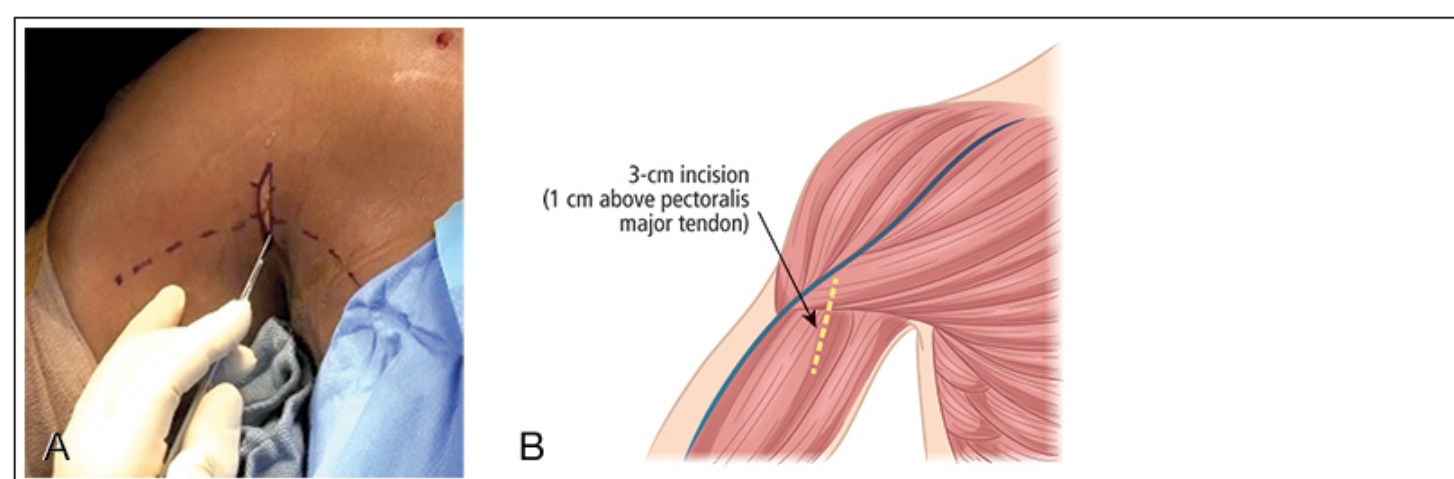


Fig. 1 Intraoperative photograph (A) and illustration (B) show the incision for subpectoral biceps tenodesis. A 3-cm longitudinal incision is made, with its proximal edge 1 cm superior to the inferior edge of the pectoralis major insertion.

Reproduced from Chalmers P, Sherman SL, Ghodadra N, Mather RC, Romeo AA: *Biceps tenotomy and tenodesis*, in Flatow E, Colvin AC, eds: *Atlas of Essential Orthopaedic Procedures*. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2013, pp 25-29.

It is incumbent upon the surgeon to obtain a careful history, perform a careful physical examination, and evaluate the biceps carefully at the time of surgery. Significant overlap exists between the symptom complex of the biceps and the rotator cuff inflammation, further challenging the surgeon's ability to make the diagnosis.

Tenodesis and tenotomy demonstrate similar results in meta-analyses in terms of overall patient satisfaction, functional outcome, and pain relief. Tenodesis, however, wins in terms of frequency of cramping, elbow supination strength, and residual deformity.

Proponents of tenotomy state that their procedure is simpler to perform, requires less time, has no implant costs, requires less postoperative physical therapy, and allows a faster return to activity. Biceps deformity, however, is obvious in 24 percent of patients who undergo tenotomy versus only 8 percent of patients who undergo tenodesis.

Cramping can occur in up to 20 percent of patients following tenotomy and tends to be a significant problem in manual laborers. Any cost savings seen with tenotomy are quickly lost when revision surgery is required due to residual cramping or patient dissatisfaction with strength deficits and the cosmetic appearance of the biceps. In the Worker's Compensation arena, deformity and cramping give the patient two more reasons for revision surgery and delaying return to work.

I perform biceps tenodesis routinely with total shoulder arthroplasty. In patients with rotator cuff disease, I perform biceps tenodesis if any sign of biceps pathology—even minimal fraying—is identified at the time of surgery.

During arthroscopy, I take the arm out of the arm holder and place it in full forward elevation to confirm that the biceps moves freely into the bicipital groove and does not subluxate out of the groove. In cases of rotator cuff tears, I typically tenodesise the biceps at the superior aspect of the bicipital groove, using a suture anchor technique. Despite frequently significant synovitis and biceps tendon fraying in the bicipital groove itself, my patients rarely report residual pain. I believe that the pain in the biceps comes from motion in the groove and once the biceps has been stabilized it scars into place and the pain resolves.

Other authors have recommended tenodesis inferior to the bicipital groove. I do not routinely use the interference screw technique in the proximal diaphysis because I am concerned about the risk of fracture with repetitive torsional loading, especially in overhead athletes.

In summary, I recommend tenodesis over tenotomy for the more reliable cosmetic result, the avoidance of muscle cramping, greater strength in elbow flexion and supination, and fewer concerns regarding revision surgery. I am willing to take the necessary time in the operating room and perform a more technically demanding operation for the overall benefit of my patient.

Tenotomy!

Walter B. McClelland Jr, MD

In the appropriate clinical scenario, both biceps tenodesis and tenotomy have been shown to be highly effective for pain relief, and both procedures reliably result in good-to-excellent clinical and subjective outcomes. The debate over which procedure is preferred is long-standing, and the current literature provides limited guidance, as most studies are limited by confounding variables, and conclusions are often contradictory. Which procedure is superior boils down to three primary issues: strength, pain, and cosmesis.

Strength—Theoretic concerns regarding tenotomy include elbow flexion/supination weakness and muscle fatigability. This is of greatest concern in younger patients, particularly those involved in manual labor. One study found that patients who underwent tenotomy had lower supination peak torque compared to those who had tenodesis. However, the researchers did not see any difference in elbow flexion strength, or in flexion/supination endurance. Another study reported decreased elbow flexion endurance in patients who had undergone biceps tenotomy, as measured by the number of biceps curls they could perform.

In contrast, multiple studies have failed to identify any objective difference between the two cohorts when all comers are included. In an effort to focus on the most relevant cohort, one study isolated patients younger than 55 years old. It found no difference in strength or endurance in terms of elbow flexion or forearm supination. Given high subjective outcome measures reported for both procedures, it appears that strength deficits, if present, are primarily a biomechanical finding and not of great clinical significance.

Pain—Tenotomy has been criticized for the risk of cramping pain in the biceps, whereas tenodesis carries an increased risk of ongoing pain at the tenodesis site. Therefore, it appears that a risk of persistent pain exists with both procedures, and it should be noted that both types of pain can exist after either procedure is performed. One study found no difference in pain complaints between tenotomy and tenodesis groups. In my experience, both sources of pain tend to diminish with time and are infrequently an ongoing complaint at final follow-up.

Cosmesis—Simple tenotomy has an accepted increased risk of "Popeye" deformity, with two recent literature reviews showing an overall incidence of 43 percent and 41 percent. Several techniques have been proposed to decrease this occurrence, such as releasing a portion of the superior labrum along with the biceps tendon, or wrapping the biceps postoperatively to limit descent of the muscle belly.

What the literature shows us, however, is that even when a Popeye deformity is identified by the surgeon, only a percentage of these are recognized by the patient, and only a small portion of those are bothersome. It should be highlighted that tenodesis does not eliminate the risk of Popeye deformity, which may still occur if the tenodesis ruptures or if it is performed with inadequate tension. Therefore, to assume that tenotomy risks cosmetic deformity while tenodesis does not is overly simplistic.

Because I performed my shoulder fellowship in France, it's not surprising that I have a very low threshold for releasing the biceps. Indications in my practice include obvious pathology at the time of arthroscopy, abnormality on preoperative MRI, or a positive preoperative exam for biceps pathology. As Dr. Duralde notes, the near-universal abnormality of the biceps in the setting of rotator cuff tears has been demonstrated.

Surgeons should remember that microscopic assessment of the biceps does not always correlate with macroscopic appearance, and a grossly normal appearing tendon may actually demonstrate significant internal abnormality. As a result, I rarely repair the rotator cuff without also releasing the biceps tendon.

I think one of the most important elements of satisfaction following a biceps procedure is patient expectation, particularly as it pertains to risk of Popeye deformity. As part of the informed consent process, I counsel all potential tenotomy patients preoperatively about the possible alteration in biceps appearance. If they express concern, I explain the additional process of a tenodesis, and I let them consider the risk/benefit profile for them. If patients have a strong desire to avoid a cosmetic deformity, then I will proceed with tenodesis.

With respect to the three points of contention described, the literature is inconclusive on differences in strength and pain. Although tenotomy has a higher percentage of Popeye deformity than tenodesis, these deformities are more commonly identified by practitioners than patients, and are infrequently of concern to the patient.

We cannot forget that biceps tenotomy has several clear benefits over tenodesis—it is technically simpler with few associated surgical complications, it is quicker and reduces valuable operating room time, it does not require any specific postoperative restrictions, and it is less expensive because no additional equipment or implants are required. Depending on how one elects to perform a tenodesis, additional implant costs range from \$300 to \$700 in our surgery center. As payment models evolve, I wonder how committed surgeons will be to the advantages of tenodesis when the cost of the implant is deducted from their bundled payment reimbursement. Although there are certainly indications for biceps tenodesis, I would argue that tenotomy is acceptable for most patients.

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