Intra-articular Arthroscopic Tenodesis of the Long Head of the Biceps Using a Knotless Threaded Anchor: Surgical Technique

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ABSTRACT
Introduction: Shoulder pain associated with pathologies of the long head of the biceps—such as tenosynovitis, SLAP lesions, instability (pulley lesions and dislocation), and tendon tears (partial or complete)—is common. **Objective:** To describe, step by step, an intra-articular arthroscopic tenodesis of the long head of the biceps using a high-strength suture passed through the tendon with a Penetrator® suture passer and fixation with a 4.75-mm knotless threaded anchor. **Conclusion:** This technique is simple, easy to learn, minimally invasive, and yields good postoperative outcomes.
Keywords: Long head of the biceps; SLAP lesion; tenotomy; tenodesis.
Level of Evidence: V

Tenodesis articular de bíceps proximal mediante artroscopia y fijación con anclaje sin nudo. Técnica quirúrgica

RESUMEN
Introducción: Los distintos cuadros de la porción larga del bíceps proximal, como tenosinovitis, lesión SLAP, inestabilidad (lesión de poleas y luxación), desgarros (parciales o completos) históricamente han generado consultas frecuentes por dolor de hombro. **Objetivo:** Describir paso a paso una técnica de tenodesis articular de la porción larga del bíceps mediante artroscopia y toma del tendón con sutura de alta resistencia con pinza Penetrator® y fijación con un anclaje roscado sin nudo de 4,75 mm. **Conclusión:** Esta técnica es un método simple de aprender, poco invasivo y consigue buenos resultados posoperatorios.
Palabras clave: Porción larga del bíceps proximal; lesión SLAP; tenotomía; tenodesis.
Nivel de Evidencia: V

INTRODUCTION

Disorders of the long head of the biceps (LHB), such as tenosynovitis, superior labrum anterior to posterior tear (SLAP), instability (pulley lesion and dislocation) and tears (partial or complete) have historically generated frequent consultations for shoulder pain.[1-4] The LHB originates at the supraglenoid tubercle and the superior labrum, crosses the glenohumeral joint distally, and then enters the bicipital groove.[5,6]

On physical examination, passive and active range of motion are assessed, together with rotator cuff and biceps strength, and specific provocative maneuvers for LHB pathology (e.g., Speed, Yergason, O'Brien). Ancillary studies typically include ultrasound, radiographs, and magnetic resonance imaging to evaluate the aforementioned conditions.

Surgery is indicated if conservative treatment fails. In many articles, similar outcomes have been reported for LHB tenotomy and tenodesis.[7,8] However, at present, better outcomes are achieved with tenodesis in terms of strength, pain relief, and aesthetics (lower rate of the Popeye deformity).[9]

The aim of this article is to describe a step-by-step intra-articular arthroscopic LHB tenodesis technique.

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SURGICAL TECHNIQUE

General anesthesia is administered with the patient in the lateral decubitus position and the arm under traction (we prefer this position with the arm in extension, because it decreases the probability of complications, such as postoperative Popeye's sign) with the stretcher inclined at 25°. Standard arthroscopic portals are used—posterior viewing and anterior working portals, in this case.

Through the posterior intra-articular portal, a 30° arthroscope is introduced to perform diagnostic arthroscopy, looking for labral, glenohumeral, rotator cuff and LBH lesions. The LHB is examined from its origin along its intra-articular course to the bicipital groove, and the biceps pulley is inspected (Figure 1).

Figure 1. The intra-articular posterior portal is entered for arthroscopic exploration. A SLAP lesion is observed.

Once tenodesis has been indicated, an intramuscular needle is used to mark the skin and determine the position of the anterior working portal at the intended level of fixation (Figure 2). The humeral bone bed is prepared by removing articular cartilage and periosteum until bleeding bone is obtained. For this purpose, a 4.5-mm shaver and a curette are used.

Through the working portal, a high-strength suture is loaded onto a penetrating suture passer (Penetrator®) (Figure 3). A double pass is made through the tendon to create a lasso-loop that securely captures the LHB (Figure 4). On some occasions, for greater safety, the same maneuver is then performed with a second high-strength suture.

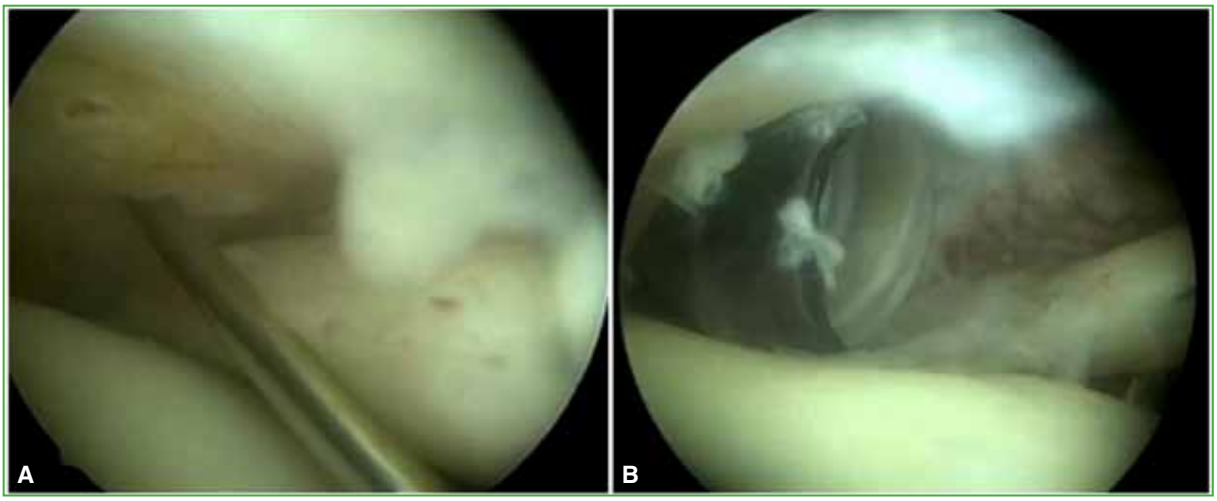

Figure 2. **A.** Skin marking with an intramuscular needle to locate the anterior working portal at the planned level of tendon fixation. **B.** Placement of a cannula.

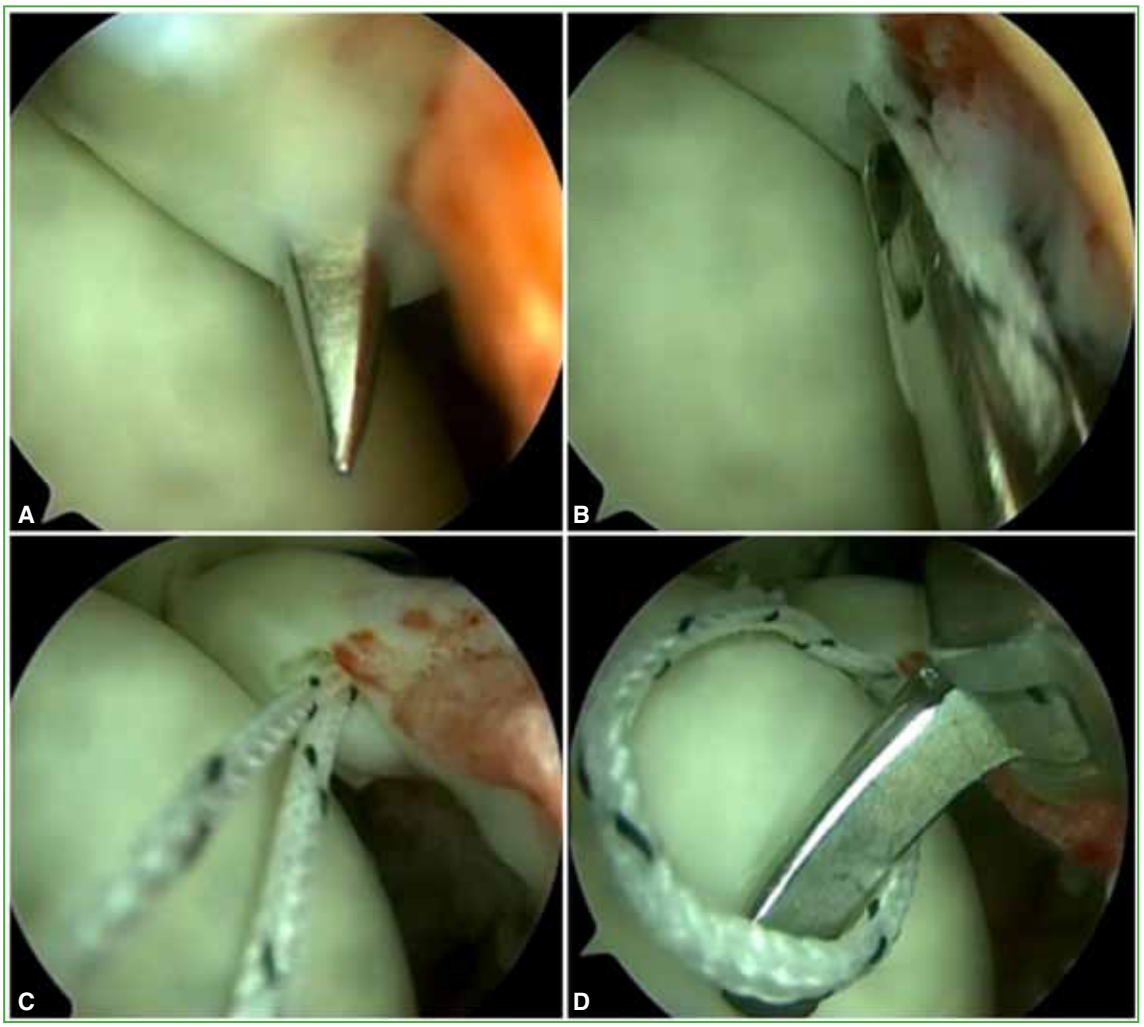

Figure 3. **A.** Preparation of a high-strength suture on a penetrating suture passer (Penetrator®). **B.** The suture is passed twice through the long head of the biceps to then retrieve the loop (**C and D**).

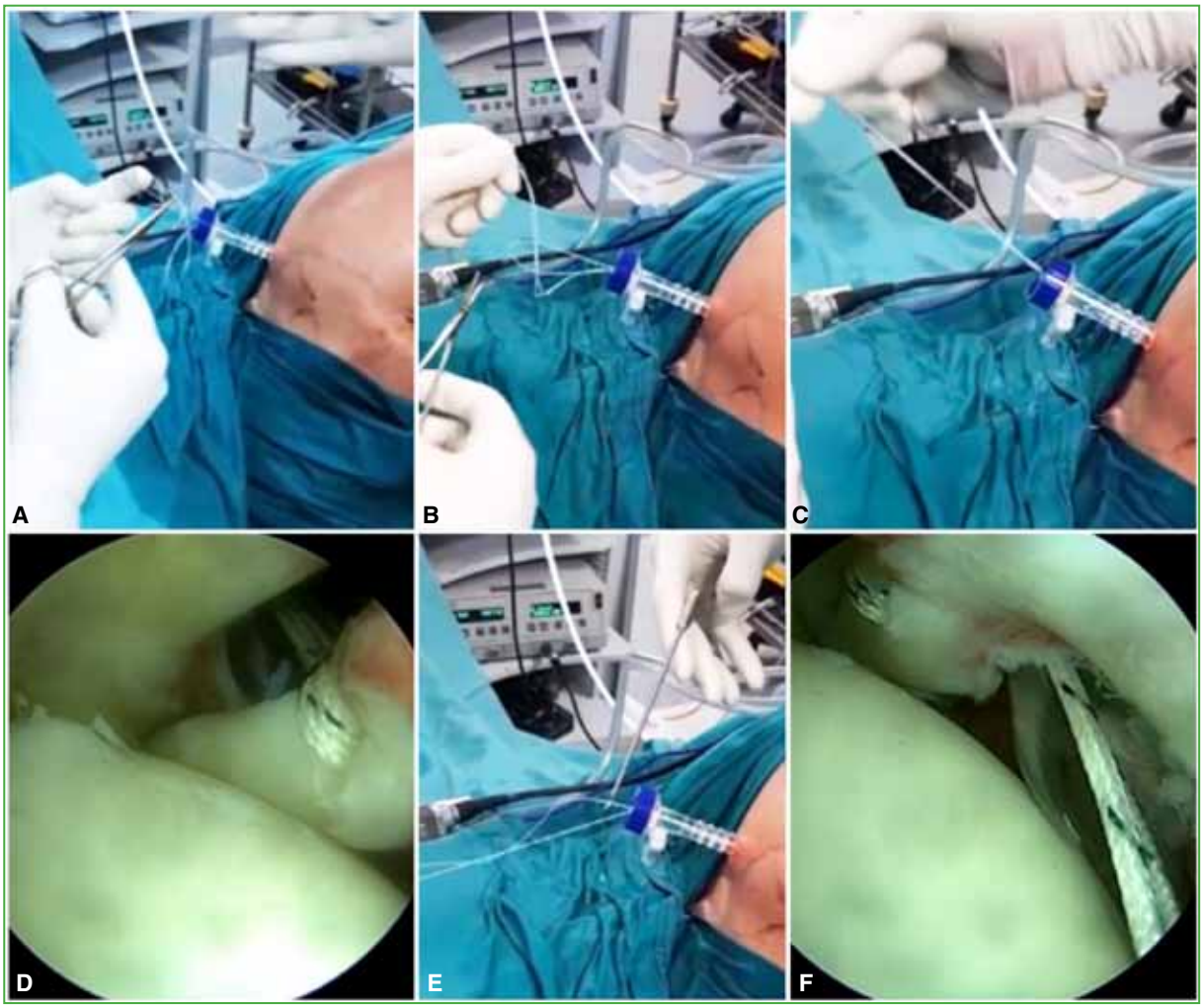

Figure 4. A and B. Creation of a simple double knot by passing the sutures inside. **C and D.** Advancing and tightening the know for a secure repair. **E.** Taking one of the sutures with a forceps, from one side of the tendon. **F.** Creation of a simple knot.

After the tendon has been captured, one or two 4.75-mm knotless threaded anchors are inserted for tenodesis of the LHB (Figure 5). Finally, tenotomy is performed and the proximal and distal stumps are coagulated (Figure 6).

Postoperative Management

A sling is indicated for one month. During the first week, pendulum and passive range-of-motion exercises are started. From week 3, passive and active range-of-motion exercises are progressed with the assistance of a kinesiologist. Finally, muscle strengthening exercises are indicated at the sixth week, in a progressive manner, evaluating the range of motion. The average recovery time is between 3 and 6 months, depending on the patient's activity level.

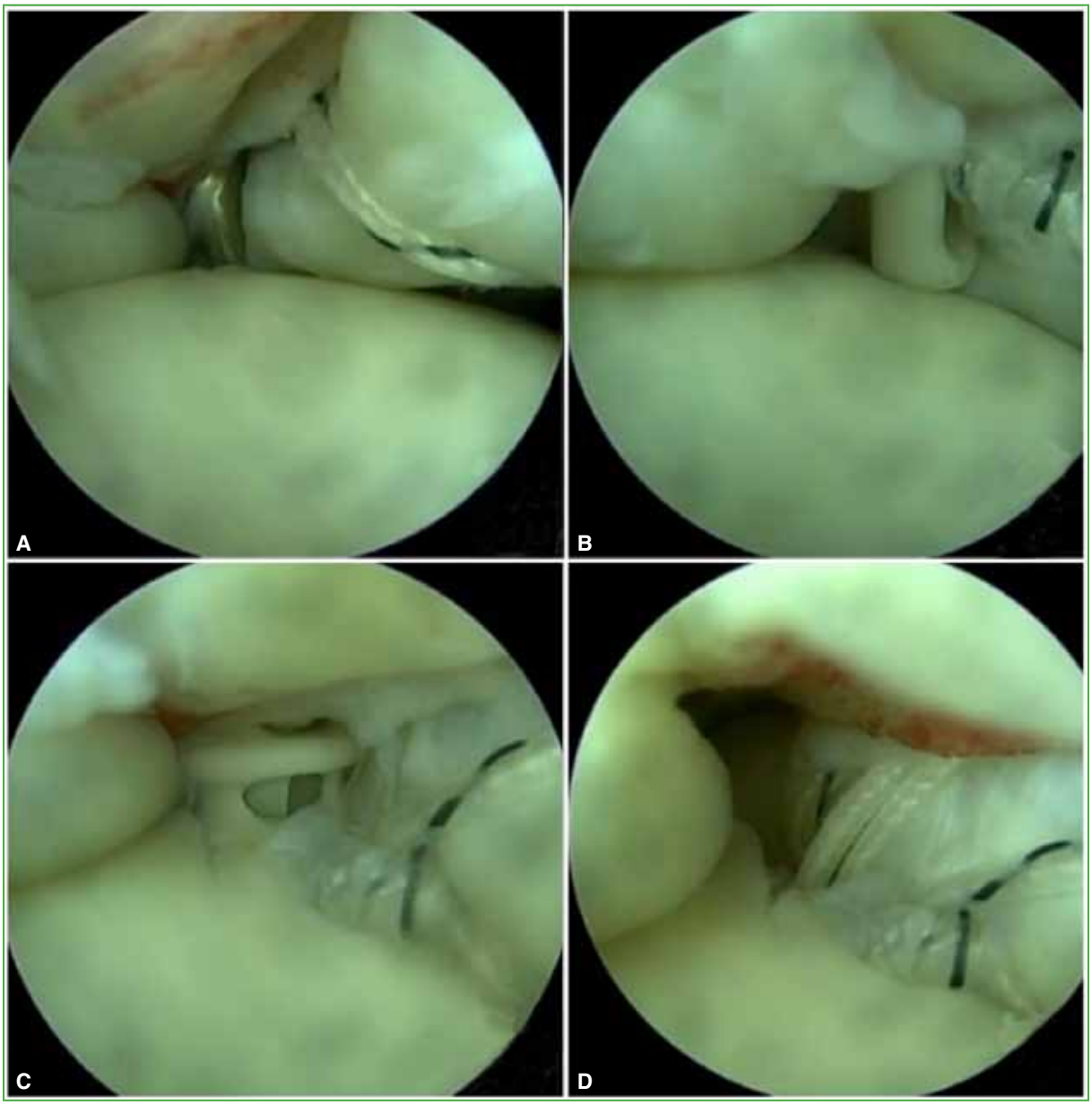

Figure 5. Once the tendon has been captured, one or two 4.75-mm knotless threaded anchors are used. **A.** Creation of the hole with the corresponding starter. **B and C.** Placement of the anchor and tensioning until the anchor reaches the threaded segment. **D.** Threading until it is fixed.

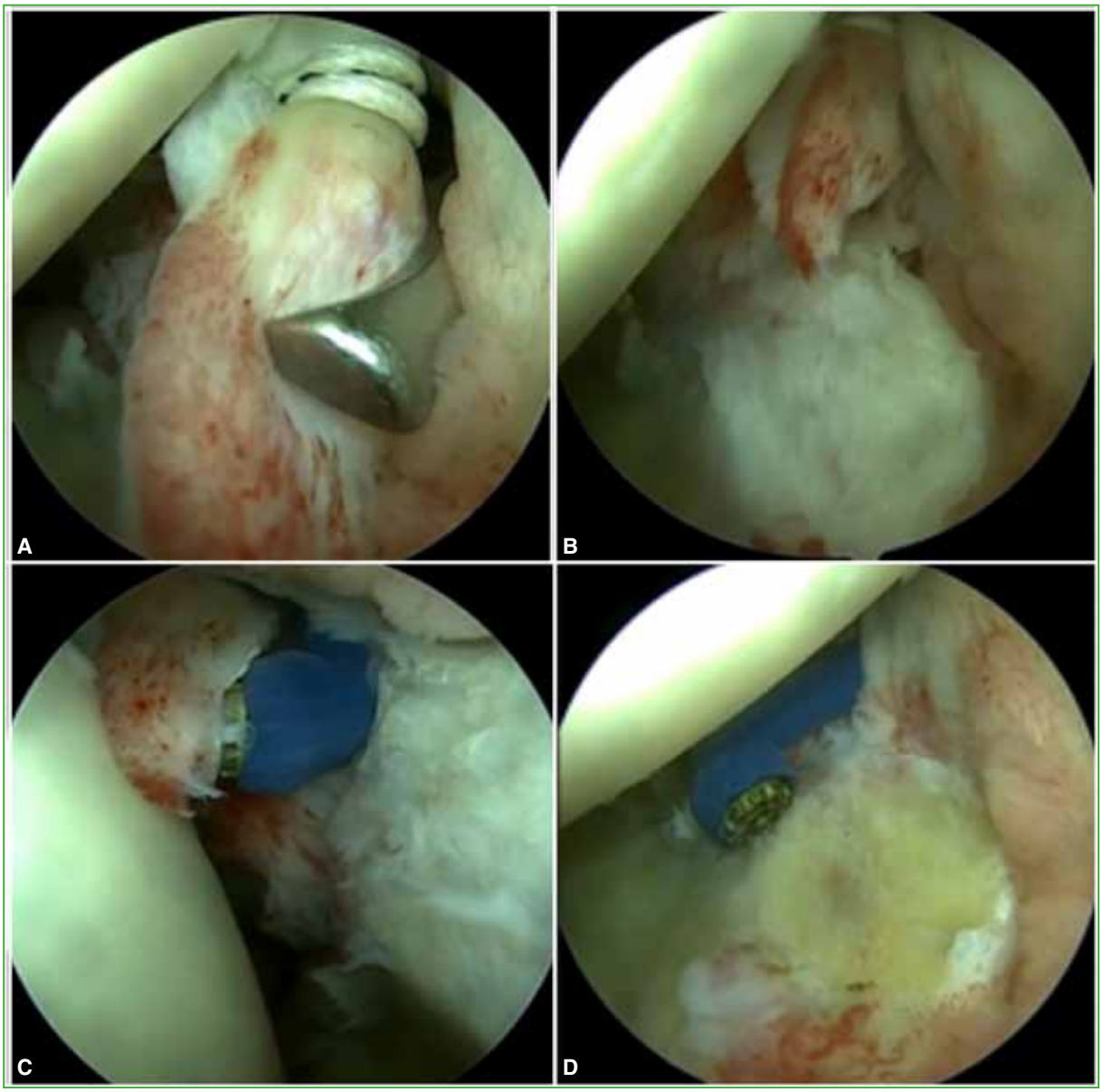

Figure 6. **A and B.** Tenotomy performed with arthroscopic scissors. **C and D.** Coagulation of the proximal and distal stumps.

DISCUSSION

The ideal surgical treatment for conditions of the LHB (tenosynovitis, SLAP lesions, instability due to pulley injury or dislocation, and tears) remains controversial and depends on the specific entity.

A particularly debated topic is the management of type II SLAP lesions. Different options have been proposed based on the patient's age, work or sports activity, expectations, and the demands to which the shoulder will be exposed. The current central question is the choice between labral repair and biceps tenodesis and their respective outcomes.[10] According to some authors, labral repair is mainly indicated for young patients (with a proposed cut-off around 30–35 years) without degenerative changes or biceps pulley lesions. However, Boileau et al. reported unsatisfactory results and a low rate of return to prior activity with repair compared with tenodesis

(repair: 40% satisfaction and 20% return to activity; tenodesis: 93% and 87%, respectively).[11] In addition, revision surgery is more frequent after repairs than after tenodesis (11.5% vs 0%).[12] In our experience, tenodesis is associated with higher patient satisfaction, greater predictability, and a better rate of return to previous activities.

Key considerations for tenodesis, whether performed arthroscopically or through a mini-open approach, include the fixation method (anchors of various types, such as suture-only, PEEK, or knotless systems), or the use of interference screws, and the fixation site (intra-articular, suprapectoral, or subpectoral).[13,14]

The advantage of tenodesis is that it maintains the biceps length–tension relationship and, as a result, offers cosmetic benefits (avoids the Popeye deformity), reduces discomfort, and preserves muscle strength compared with isolated tenotomy.[15]

In 2006, Lafosse et al. described, for LHB tendon harvesting, the initial use of a "harpoon" suture passer to place sutures and then apply their lasso-loop technique to secure the biceps.[16] In our practice, we prefer to first harvest the LHB tendon with one or two high-strength sutures, fix it with a knotless PEEK anchor, and then proceed with the tenotomy.

EXPERIENCE

This technique was performed in 88 patients (65 men and 23 women; age range, 18–71 years). Fifty-nine had pathology involving the bicipital groove (pulley lesions, cysts and lobulations within the groove or decentration, tenosynovitis, and partial tears); 5 had lesions at the subscapularis tendon insertion; and 24 had SLAP lesions. There were no systemic or infectious complications and no tendon detachment. Notably, in 10% of patients a palpable residual bulge was present at the level of the bicipital groove; this improved by month 6, and normal function was recovered after 8 months. All patients returned to their previous work or sports activity. Pre- and postoperative strength measurements were not compared.

CONCLUSION

The technique described is simple to learn, minimally invasive, and achieves good postoperative outcomes.

Conflicts of interest: The authors declare no conflicts of interest.

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