

Arthroscopic treatment of isolated subscapularis lesions: our experience

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Abstract. *Background and aim of the work:* Subscapularis tendon lesions, in particular the isolated ones, are often not recognized and undervalued, so in the literature they are described with a variable incidence. Aim of the work is presenting our experience with the short to medium term follow up results of the arthroscopic repair of isolated subscapularis lesions. *Methods:* We retrospectively analyzed 311 shoulder arthroscopies performed by a single senior surgeon, from which we have found 10 isolated subscapularis lesions. After the arthroscopic repair of subscapularis tendon the patients have been evaluated with a median follow up of 17.7 months with specific tests for the subscapularis (Napoleon's and lift off tests) and clinical scores (Constant and UCLA scores). *Results:* We have obtained the tests negativization with an internal rotation level up to D8. The Constant score reached 86.7 with a median improvement of 49.4 points. The UCLA score at the last follow up was 30.8 with a median improvement of 20.1 points. *Conclusions:* Isolated subscapularis lesions are uncommon and often they are not correctly diagnosed. Arthroscopy has a decisive role in both the diagnostic and therapeutic side, with good short to medium term results. (www.actabiomedica.it)

Key words: arthroscopy, subscapularis, isolated lesion, surgical treatment

Introduction

Already in 1835, Smith firstly described subscapularis lesions in 5 of 7 patients associated with other lesions of the rotator cuff (1). Subsequently, over the years the importance of the subscapularis was gradually scaled within the rotator cuff, to the point that Lo and Burkhart have defined it as "the forgotten tendon" (2).

Only recently the subscapularis has regained interest, both from a physiological and pathological point of view.

Anatomy and Function

The subscapularis represents the anterior part of the rotator cuff in the shoulder. It originates from the

subscapularis pit on the anterior surface of the scapula and it is directed anteriorly and laterally running between the scapular neck and the coracoid process. It becomes tendinous at the glenoid and it inserts on the smaller tuberosity and the bicipital groove.

Its insertions is comma-shaped with a tendinous wider superior portion and an inferior part mainly muscular (3, 4).

The superior and inferior subscapular nerves, which originate from the posterior cord of the brachial plexus, are responsible of its innervation.

The subscapularis muscle has a static and a dynamic role: as regards the first one the muscle acts as an anterior stabilizer for the humeral head and from the dynamic point of view it internally rotates the humerus. There also additional functions such as abduction for the superior fibers and adduction for the inferior ones (3, 5).

Epidemiology

In the literature, the incidence of subscapularis lesions is widely reported. These variations depend significantly on the surgical technique used. For example, with an open surgical approach it is difficult to correctly identify partial thickness lesions, especially those on the articular side (6). On the other hand arthroscopy allows a better view also of these kind of lesions through a standard posterior portal.

In confirmation of this finding, literature studies reporting about open approaches tend to underestimate the incidence of subscapularis lesions compared with arthroscopic studies.

Furthermore, cadaveric studies report prevalence between 29% and 37% while in the clinical trials it is about 27% (5). However, this prevalence involves lesions in association with other torn tendons within the shoulder.

Indeed the finding of an isolated lesion of the subscapularis is much more infrequent.

This is confirmed by the work of Ryuzo Arai, who showed the involvement of the subscapularis in 119 out of 435 (27.4%) of its shoulder arthroscopies performed to repair the rotator cuff. Just 3 of these shoulders presented an isolated lesion with an intact postero-superior rotator cuff (7).

The subscapularis lesion usually affects males between 44 and 56 years (8). The etiology is variable: in young patients trauma is more often the cause while older patients usually present degenerative lesions.

In the literature, an association with the subcoracoid stenosis and with the coracoid impingement syndrome has been found. These conditions may determine a tension increase within the tendon, determining the onset of TUFF (Tensile Undersurface Fiber Failure) lesions (9). However, some authors believe that the impingement may be considered an effect rather than the cause of the lesion. Indeed an insufficient tendon may determine an anterior subluxation of the humeral head, thus impinging against the coracoid process.

An association with the medial instability of the long head of the biceps brachii is frequently reported, the subscapularis tendon being involved in the formation of the pulley (10).

The lesions are usually located at the proximal third of the insertion, which is mainly tendinous.

Materials and methods

We examined retrospectively 311 shoulder arthroscopies performed from January 2007 to May 2009 in our hospital by a single surgeon with a pre-operative diagnosis of suspected rotator cuff tear.

Ten patients with an intra-operative diagnosis of isolated subscapularis tendon tear (3.2%) were identified and selected for this study.

There were 8 males and 2 females with a mean age of 56 years. The dominant upper limb was involved in 7 out of 10 patients. A traumatic etiology was certainly reported by 7 of these patients with a mean time between trauma and operation of about 4 months. Patients usually complained of a trauma in abduction and external rotation with subsequent persistence of pain especially on the anterior aspect of the shoulder.

All patients were assessed preoperatively and postoperatively with a mean follow-up of 17.7 months with medical history, specific clinical tests for the subscapularis tendon (Napoleon test, lift off test and extent of internal rotation) and clinical scores (Constant and UCLA score).

Pre-operatively, clinical tests were positive in all patients with an internal rotation reaching on average L3. Mean Constant score was 37,3 points while UCLA was 10,7.

Furthermore in the pre-operative phases a radiography in the antero-posterior, axillary and outlet view and a MRI of the affected shoulder were performed.

Radiological studies did not show any bone lesions while MRI confirmed the suspicion of a full-thickness tear of at least a portion of the subscapularis tendon without highlighting areas of significant fatty degeneration within the muscle belly.

The operations were performed in general anesthesia and interscalene regional block.

The repairs were performed arthroscopically with patients in lateral position and with application of a longitudinal traction of 3-4 kg to the affected arm. Three standard portals (posterior, antero-superior and lateral) were used to approach the shoulder and even-

tually further surgical steps were performed through additional portals (9, 11, 12).

Lesions involved the upper third of the tendon in 8 cases out of 10, while in the remaining 2 also the middle third was involved. The repair was carried out implanting a double wire metal anchor in the former 8 patients, while 2 anchors were needed in the latter 2 patients with a larger lesion.

Intra-operatively the involvement of the rest of the rotator cuff was ruled out but we found 3 pulley lesions, 1 glenoid cartilage lesion and a degenerated and hypertrophic biceps brachii long head in 8 patients in whom its tenotomy was performed. Acromioplasty and bursectomy were also performed in all patients.

Postoperatively, a brace was used to keep the arm in slight abduction avoiding external rotation over the neutral position for about 4–6 weeks. Then progressive external rotation was allowed for the next 4–6 weeks. Muscular strengthening exercises were introduced at about 10–12 weeks after surgery (12–14).

Results

After the operation clinical tests negativization was obtained and patients managed to reach T8 in internal rotation. Mean Constant score was 86.7 with a mean improvement of 49.4 points. As regards UCLA score, a mean score of 30.8 was reached with a mean improvement of 20.1 points (Table 1). Shoulder stiffness was not found in any patient.

Discussion

Subscapularis tendon tears are often unrecognized and undervalued. In the past, with a standard open

approach these kind of lesions were rarely diagnosed, in particular those of partial thickness.

As Lafosse highlighted in his classification based on intraoperative findings and on computed tomography imaging, lesions tend to involve firstly deeper fibers, becoming hardly evaluable through an open approach (14). These partial thickness lesions, involving just the upper third of the tendon, correspond to Lafosse type I. In type II, lesions are full thickness but affecting again just the upper third of the tendon. Type III lesions involve also the medium third. Type IV lesions are described as complete injuries of the whole tendon insertion with a not dislocated humeral head and a fatty degeneration equal or inferior to grade 3. Type V lesions are complete tears of the tendon with retraction to the glenoid while humeral head is subluxed anteriorly and the muscle belly presents a fatty degeneration equal or greater than grade 3. This severe lesion is considered arthroscopically irreparable.

Fatty degeneration and muscle atrophy are considered negative prognostic factors for the repair outcome, as the muscular tissues lose progressively their contractile capacity (10, 15, 16). This issue involves mainly the dynamic role of the muscle, however it does not exclude the possibility of repairing the tendon to restore at least the static function of the subscapularis as anterior humeral head stabilizer (13).

Currently the diagnosis is based on several clinical tests, as the lift off test, the belly press test, the Napoleon test and the belly off test (17). Their diagnostic efficacy is proportional to the lesion grade. Indeed, for example, lift off test has a very high sensitivity for large lesions but it may be falsely negative for partial thickness and superior portion tears. On the other side Napoleon and belly off tests allow the identification of lesions limited to 25% of the tendon. Furthermore Barth et al proposed the bear hug test as the most sensitive objective test to recognize a lesion of the subscapularis tendon (13, 18). Thus it is clear that the combination of different clinical tests may improve their diagnostic efficacy. Imaging is crucial for diagnosis (5). X-ray allows to highlight any bone modification, as the greater tuberosity avulsion, the anterior subluxation of the humeral head or the presence of arthritic signs of the gleno-humeral joint.

Table 1. Clinical results

	Pre-operative	Post-operative
Mean Constant score	37,3	86,7
Mean UCLA score	10,7	30,8
Mean Internal rotation level	L3	T8
Napoleon test	+	-
Lift off test	+	-

MRI is able to show tendon injuries, any medial subluxation of the biceps brachii long head, any muscular retraction or fatty degeneration.

Ultrasonography can be also helpful, especially if the exam is performed dynamically.

Arthro-MRI may be very useful for the diagnosis highlighting the presence of contrast over the smaller tuberosity in complete lesions but also detecting partial thickness lesions. However, it is a more invasive exam, certainly less tolerated by the patient (12, 20).

Indications for surgical treatment are pain with positive clinical tests and a MRI finding of low-grade muscular atrophy and fatty degeneration. On the other hand; operation is contraindicated without significant symptoms or if severe atrophy or fatty degeneration have already occurred with arthritic changes within the joint (19, 20).

Arthroscopy allows to confirm the diagnostic suspicion and repair the lesion during the same surgical time, possibly associating any additional gesture, such as long head biceps brachii tenotomy or tenodesis and coracoplasty to recreate a physiological coraco-humeral space (19, 20).

The results obtained in our patients are positive, both from pain resolution and functional recovery point of view. Patients went back to their usual job and they were satisfied of operation outcomes.

We cannot forget that most of our patients were relatively young with grade II lesions according to Lafosse's classification. Moreover, in particular in those lesions with a traumatic etiology, surgical treatment was performed early enough to avoid significant muscular atrophy.

It is certainly mandatory to follow up these patients for a longer period of time, possibly repeating imaging examination to show possible tendon re-ruptures or evolution towards rotator cuff arthropathy.

Conclusions

Isolated tears of the subscapularis are quite rare and often not properly diagnosed.

If clinical tests are positive, it is important to suspect the presence of a subscapularis lesion and deepen the diagnostic pathway. The main aim is to repair the

tear in time to avoid the evolution towards irreversible lesions such as muscular degeneration and cuff arthropathy. Arthroscopy plays a decisive role both from diagnostic and therapeutic point of view, with short and medium terms good results.

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