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Arthroscopic Rotator Cuff Repair: Double Row Suture Bridge Technique (About 50 Cases)

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Abstract **Original Research Article**

Rotator cuff tear occurs in young adults as a result of degenerative and/or traumatic tendon pathology. This retrospective study presents outcomesin 50 patients who had undergone arthroscopic rotator cuff repair. This work has shown that the double row suture bridge technique seems to be more anatomical. By applying the tendon on the previously prepared footprint which is located in the greater tuberosity and thus restoring the tendons to their approximate premorbid positions, which significantly improves the patient's quality of life.

Keywords: Reinsertion - Rotator cuff - Arthroscopy.

INTRODUCTION

Rotator cuff tear is a common injury, and occurs in patients older than 40 years of age. An early diagnosis and treatment effectively prevent the functional and painful sequelae of the shoulder. The indications for arthroscopic treatment of rotator cuff tears was initially limited to minor injuries, nowadays it is the most commonly performed technique for all types of cuff tears according to various authors. Compared to open surgery, arthroscopy can be easier for the patient but sometimes harder for the surgeon. There are several methods of arthroscopic rotator cuff repair among them the double row suture bridge technique which is the subject of our study.

MATERIALS AND METHODS

A retrospective monocentric study of 50 patients who had undergone surgery for rotator cuff tear using suture bridge technique in the department of orthopedic surgery at Gonesse hospital center (France) over a period of 3 years and 10 months from january 2014 to october 2017. All our patients had undergone : preoperative physical examination to identify clinical signs of conflict or rotator cuff tear, a radiological assessment including anteroposterior view of the shoulder and scapular outlet or 'Y' (Lamy) view and ct arthrography. Functional assessment was carried out by recording the Pre and postoperative Constant score and performing an ultrasound examination of the shoulder at the last follow up. Patients with symptomatic rotator cuff tear confirmed by CT arthrography, were included in this study. Patients who had undergone surgical techniques other than suture bridge technique were excluded. To carry out this study, we have developed a data extraction form to gather all the necessary information about each patient included in this study. Statistical analysis of all data collected was performed using the EPI INFO software.

SURGICAL TECHNIQUE

All patients were operated by a single surgeon specialised in shoulder surgery. The shoulder arthroscopy was performed in a routine fashion, under general anesthesia in beach chair position. 5 different portals were used: Posterior standard portal, anteromedial and anterolateral instrumental portals, and 2 accessory portals situated in front of the anterior ant posterior corner of the acromium. The mean duration of the procedure was 2 hours and 30 minutes. The exploration of the gleno humeral joint is initialy performed to evaluate: the long head of biceps and subscapularis tendons quality, anterior and posterior glenoid labrum integrity, humeral head and glenoid cartilage quality, and the deep aspect of rotator cuff tendons. Biceps tenotomy was performed in all patients.

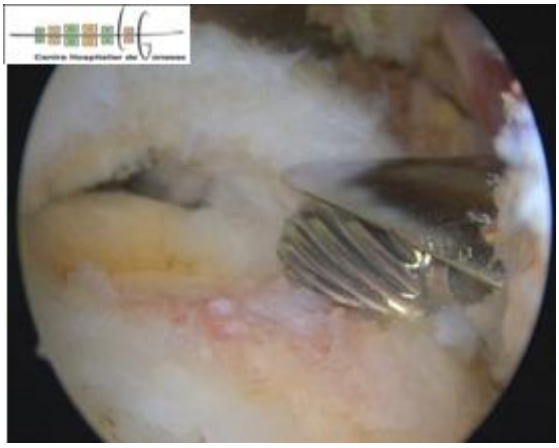

Fig-1: footprint preparation using a motorized shaver

The Subacromial bursoscopy allows to perform: bursectomy in order to completely visualize the rotator cuff bursal surface looking for potential tears, debridment of supraspinatus tendon ends, and debridement of the footprint, to obtain a bleeding bony surface, using a motorized shaver (Figure-1).

Then a double loaded anchor measuring 4.5 mm in diameter was placed adjacent to the articular cartilage (Figure-2), and the sutures were passed through the medial part of the rotator cuff with a clever hook. Two more anchors measuring 5.5 mm in diameter were placed in the lateral aspect of the greater tuberosity (Figure-3). Both limbs of each suture from the 2 lateral anchors were passed through the lateral part of tendon, and then were tied with 2 suture limbs of the medial anchor using sliding knots to bring the supraspinatus tendon to the lateral edge of tuberosity.

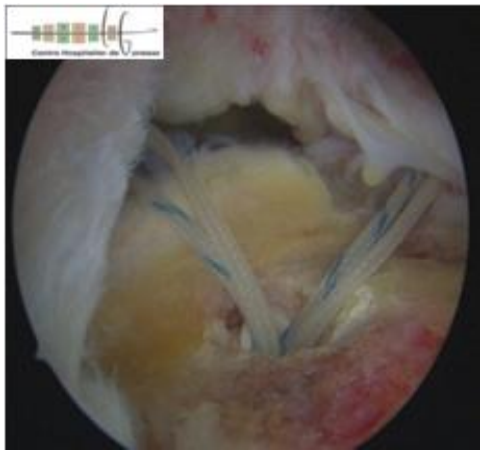

Fig-2: 4.5 mm anchor at the edge of articular cartilage

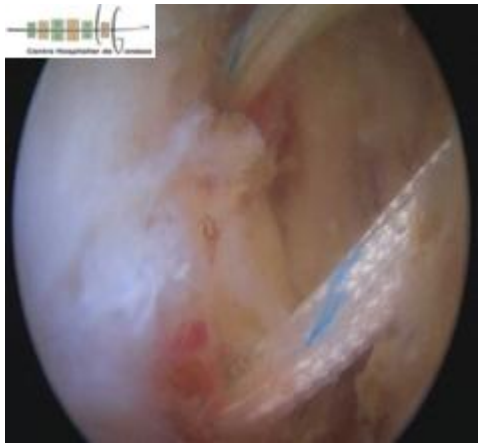

Fig-3: two 5.5 mm anchors placed on the lateral edge of greater tuberosity

The same process was repeated with the remaining suture limbs from the medial and the 2 lateral anchors in a criss cross fashion. Leading to a very good compression of the tendon against the footprint (Figure-4), whose quality was verified intraoperatively. Finally, we report that a minimal acromioplasty was performed systematically in all cases. After abundant lavage with physiologic saline solution, the incisions were colsed with 3-0 monocryl simple interrupted sutures.

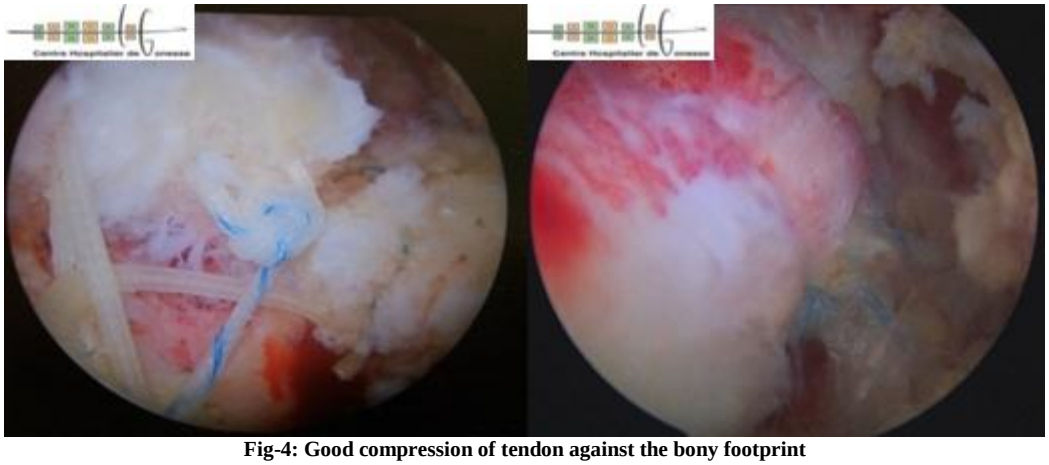

Fig-4: Good compression of tendon against the bony footprint

In the immediate post operative period, good analgesia was provided using paracetamol, NSAID, codeine, and antibiotic prophylaxis was continued for 48 hours postoperatively. Patients were immobilized for the first 6 weeks post operatively using abduction brace, and were seen in physical and rehabilitation medicine consultation 3 weeks after surgery and in orthopedic consultation 6 weeks after.

FUNCTIONAL REHABILITATION

All patients benefited from the same rehabilitation protocol (Table-1) with passive exercises in the first 6 weeks followed by active exercises after 6 weeks.

Table-1: Rehabilitation protocol for our patients

Day 0 to 45	After 6 weeks
• Dynamic head recentering exercises • passive motion exercises in the plane of the scapula without rotations • Pendulum exercises • Shoulder flexion and external rotation in supine position	• Active assisted motion exercises in the plane of the scapula with no restrictions on range of motion. • Strengthening external and internal rotators • strengthening pectoralis major, latissimus dorsi and teres major • Balneotherapy if possible

RESULTS

Fifty patients (15 males, 35 females) with a mean age of 62 years (56–69 years) were included. The right shoulder was involved in 40 patients (80 %). We noted that the degenerative disease was the most frequent cause of rotator cuff tears in our serie, found in 41 patients (82%). The other causes ranked by frequency were: direct trauma of the shoulder in 7 patients (14 %), sport injury in one patient (2%) and work-related accident in one patient (2%). All patients had pain and functional disability of the affected shoulder, and a positive neer and jobe's test were found during clinical examination. The mean preoperative Constant score was 60 points (54-67). Preoperative radiological assessment of all patients inluded a anteroposterior view of the shoulder and scapular outlet or 'Y' (Lamy) view. According to Bigliani and Morrisson classification, the shape of acromion was recorded as type 2 in 15 cases (30 %), and as type 3 in 35 cases (70 %). CT arthrography, also performed in all patients, detected a full-thickness tear of the supraspinatus tendon with distal retraction in 40 patients (80%) and partial in 10 patients (20%). Fatty degeneration assessed using the Goutallier and Bernageau classification, was less than or equal to stage 2 in all cases (stage 0 in 28 patients, stage 1 in 16 patients, and stage 2 in 6 patients). After a mean follow up of 20 months (10–28), we had satisfying functional outcomes: mean constant scores improved significantly, it was 78.2 points (70–84) at the last follow-up, recovery of daily life anatomy and a return to leisure sport activity in all cases. The ultrasonic evaluation of the repair integrity was satisfying and showed an absence of re-rupture in 47 patients (94%), 3 cases of re-rupture (6%). The re-tear occurred in elderly patients aged more than 75 years, without significant clinical dysfunction, and thus revision surgery wasn't necessary in these cases. No infectious or neurovascular complications were noted in our study.

DISCUSSION

The estimated prevalence of full thickness rotator cuff tears is ranging from 5 to 40 % and increases with age [1]. Its estimated at in population over the age of 60 years [2]. The most relevant innovation in rotator cuff surgery was represented by the development and introduction of the arthroscopic technique, which was first used in subacromial decompression and later was combined with arthrotomy (mini-open repair) in order to repair rotator cuff tear [3, 4] by spliting deltoid fibers without detaching the muscle from the acromion. In 1995, G Gartsman reported the first outcomes of all arhtroscopic cuff repair [5]. Biceps long head pathology is often associated with cuff tears, and its arhtroscopic treatment during rotator cuff repair is necessary but the technique usedremain a topic of debate: tenotomy [6-8] or tenodesis [9, 10], each having advantages and disadvantages [11, 12]. Patients are involved in theoperative decision making, which is affected by many clinical and radiographical arguments to evaluate the tear, its functional repercussions, and its prospective repair and funcional recovery after surgery [12]. Acromioplasty is performed systematically during arthroscopic rotator cuff repair, at best before tendons repair, and thus allowing a good exposition of the rotator cuff and providing a large space to facilate instrument passage [12].

There are several techniques of fixation, that are splitted into two groupes:

- Distal tendon reinsertion in single row fashion
- Proximal and distal tendon reinsertion by a double row of sututre anchors, with reduction of the tendon to the so-called footprint, the insertion area of the tendon onto the greater tuberosity [12].

Surgical rotatorcuff tear repair was long reserved for patients under 60 years of age. Given the increasing functional demand in the over-60s,

however, and the improvements in surgical technique, indications are being increasingly extended to this age group [14, 15]. Rotator cuff repair in the over 60s improve clinical results compared to isolated acromioplasty-tenotomy, and in the elderly patients, the use of regenerative therapies may be helpful to improve tendon healing rate and functional outcomes [16]. Flurin *et al*., in a study conducted in 2013, reported very good clinical results with a constant score exceeding 75 points and high tendon healing rate confirmed by postoperative ultrasound evaluation, after rotator cuff repair in patient older than 70 years [17]. Arthroscopic double row suture bridge repair provides better anatomical footprint restoration [18], and present several advantages: decreased scarring, less soft-tissue damage, faster functional recovery, decreased blood loss and lower risk of infection. Biomechanical and clinical outcomes of suture bridge repair seem to be encouraging. However, no study has shown the superiority of double row technique over single row [13]. In their study of 129 patients (single row group: 64, double row group: 65), Charousset *et al*., reported significant improvement in postoperative constant and simple shoulder test (STT) score ($p<0.01$) in both groups. On the other hand, better tendon healing and lower retear rates was noted in the double row group ($p=0.04$), in addition to an improved healing quality [13]. MRI is the gold standard for assessing tendon healing after surgery. P collin and al, in a prospective comparative study of 62 cases, reported that ultrasound is as efficient as MRI in the assessment of supraspinatus healing after double row arthroscopic repair, and a valid and reproducible tool for detecting iterative tears [19]. Likewise, In 2003, Prickett and al reported also that ultrasound is reliable for diagnosis of iterative tears [20]. The complication rate, after arthroscopic rotator cuff repair, varies according to the different series reproted in the literature: Verma *et al.*, [15] found a complication rate of 7.7 % (1 pneumopathy, 1 hematoma, and 1 infection), while Fehinger *et al*., [21] found 2 complications among 42 operated shoulders in patients over 65 years of age (1 infection and 1 thrombophlebitis with pulmonary embolism). Dezaly *et al*., reported 2 cases of anchor migration [16]. Holding strentgh of anchors may be improved by minimizing great tuberosity preparation [14] and by using anchors with a large diameter as recommended by Brady *et al*., [22]. Different rates of iterative tears after arthroscopic repair were reported in the literature: fehringer and al reported a rate of 21 % in patients over 65 years of age noted on ultrasound at one year follow up [21]. Dezaly *et al*., found a rate of 32.4 % in patient over 60 years [16]. Charousset *et al*., have also found a retear rate of 42 % in patients over 65 years noted on CT arthrogram at 6 months follow up [13].

Functional outcomes following arthroscopic rotator cuff repair depend on the tear size, the age and activity level of the patient. The occurrence of iterative tear negatively influences clinical outcomes, except that the presence of pain is not always associated with poor subjective results [18].

The aim of functional rehabilitation is not to get a high mobility, but to mobilize the shoulder without pain in order to protect the repair and to reduce inflammatory process [12]. A four stage rehabilitation protocol is proposed [24]:

- First phase: the rest is intended to protect the repair.
- Second phase: aims to restore passive range of motion.
- Third phase: aims to restore the active range of motion and neuromuscular control of the shoulder.
- The goals of the fourth phase (strengthening): gradual increase in the forces produced by rotator cuff muscles and return to normal activity and sport.

CONCLUSION

Our study has a number of limitations because of the retrospective nature of the study and small patient population. Furthermore, its a short term study with a mean follow up of 20 months. Indeed, a larger series with a long term follow up are needed to confirm that the benefit obtained by such a technique is sustainable. Despite its reliability, ultrasound evaluation of repaired rotator cuff remains difficult and operator dependent. Ct arthrography is more accurate but more invasive [23].

In summay, we have shown that double row suture bridge technique provides: anatomical tendon to bone repair and satisying healing (in 94 % cases of our series), and significantly improves the constant score of patients: 78.2 points at last follow up. Our results are comparable with those in the literature.

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The authors report no conflict of interests.

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