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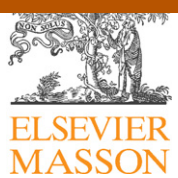

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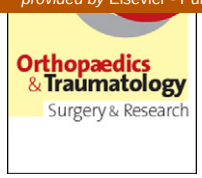

ORIGINAL ARTICLE

Arthroscopic treatment of rotator cuff tear in the over-60s: Repair is preferable to isolated acromioplasty-tenotomy in the short term

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KEYWORDS
Shoulder;
Rotator cuff repair;
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Biceps tenotomy;
Tendon healing

Summary
Introduction: The principal study objective was to compare clinical results for arthroscopic repair of rotator cuff tear and acromioplasty-tenotomy in patients aged over 60 years.
Hypotheses: Repair provides better clinical results than isolated acromioplasty-tenotomy. Shoulder function is improved when healing is obtained.
Patients and methods: One hundred and forty-two patients aged over 60 years (mean age, 67 years) presenting with reparable supraspinatus tear, extending to a greater or lesser degree to the infraspinatus, agreed to take part in a randomized prospective study. Fifteen were excluded from statistical analysis. All underwent acromioplasty and biceps tenotomy. They were randomly assigned to arthroscopic rotator-cuff repair (CR group) or not (AT group). The principal evaluation criterion was mean weighted Constant score at one year's follow-up. Healing in the CR group was assessed on ultrasound at one year.
Results: The complications rate was 7.9%. Mean weighted Constant score was significantly better in group CR: 75.8%, versus 68.8% in AT. In the CR group, the 1-year healing rate was 67.6%. Healing significantly impacted mean weighted Constant score: 80% with healing, versus 66.9% in iterative tearing. Whatever the size of the tear, mean weighted Constant score was significantly better in patients with than without (no repair or iterative tear) tendon healing.
Discussion: The study demonstrated the interest of arthroscopic rotator cuff repair in patients aged over 60 years. The benefit of repair compared to isolated acromioplasty-tenotomy depended on tendon healing.
Level of evidence: Randomized prospective study, level II.

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Introduction

The prevalence of full-thickness rotator-cuff tear is estimated at 5 to 40% and increases with age [1]. In the over-60s, it was estimated at 28% by Sher [2]. In this age group, rotator-cuff tear may be asymptomatic, but symptoms are more severe the more extended the tear [3]. Fehringer [4] demonstrated significant reduction in functional scores in over-65 year-olds presenting with rotator-cuff tear. Surgical rotator-cuff 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. There have been recent reports of series of arthroscopic rotator-cuff tear repair in elderly patients [5—7]. Several studies, however, reported advanced age as a risk factor for tendon healing after rotator-cuff tear repair [8—11]. Tashjian et al. [12] attributed the high rate of healing failure in the over-60s to biological factors. In this age group, the alternative to rotator-cuff repair is acromioplasty with tenotomy of the long head of the biceps [13,14]. According to Walch et al. [14], tenotomy is the treatment of choice for patients with low functional demand; they associate acromioplasty if the humeral head is well centered. Acromioplasty and biceps tenotomy are more effective when tearing is limited to the supraspinatus. Anterior extension forward to the subscapularis is an unfavourable factor [13].

To date, no prospective randomised studies have compared repair and palliative treatment in this population. The principal objective of the present study was to compare clinical results (weighted Constant score [15]) at one year between arthroscopic rotator-cuff repair and palliative acromioplasty-tenotomy in patients aged over 60 years. The principal hypothesis was that repair would improve clinical results compared to isolated acromioplasty-tenotomy. The secondary objectives were:

- to analyse the impact of tear size on clinical results according to treatment strategy;
- and to assess the impact of healing, assessed on ultrasound, on clinical results.

Patients and methods

Patients

A single-center randomised prospective study was run from February 2007 to September 2008. The inclusion criteria were: age 60 years and over; rotator-cuff tear involving the supraspinatus tendon with greater or lesser extension to the infraspinatus; symptomatic; considered reparable; resistant to medical management; with flexible shoulder. Preoperative CT arthrogram and/or MRI were mandatory. Tears were preoperatively deemed reparable when supra- and infraspinatus fatty infiltration was equal to or less than Goutallier grade 2 [16,17]. Exclusion criteria were: history of surgery to the shoulder in question; osteoarthritis of the shoulder; tear extension to the subscapularis or spontaneous long-head biceps tear found clinically or on imaging. The minimum number of patients required per group was 54 to achieve a β-risk of 10% (90% power) and an expected 10-point difference in weighted Constant score, allowing for 10% loss to follow-up. During the period, 142 patients meeting the inclusion criteria agreed to participate. On the day before surgery, randomisation was performed and the patient was informed as to which technique had been attributed: biceps acromioplasty-tenotomy and repair (group CR) or isolated biceps acromioplasty-tenotomy (group AT). Twelve patients in whom non-reducible retracted rotator-cuff tear or spontaneous long-head biceps tear found peroperatively were excluded.

Surgical technique

All the surgery was performed under arthroscopy, in lateral decubitus with axial traction. The first step consisted of glenohumeral and subacromial exploration to assess lesion size (distal, intermediate or retracted [18]) and confirm reparability, and check that there was no spontaneous long-head biceps tear or subscapularis extension (exclusion criteria). Acromioplasty and biceps long-head tenotomy were performed in all cases. In the repair group, metallic suture anchors were used systematically, with single-row suture in 24 cases and double-row in 44 after rasping the greater tuberosity. Postoperative course in both groups comprised early self-rehabilitation with partial immobilization in a simple sling for four weeks.

Methods

All clinical examinations were made by an independent examiner other than the surgeon, preoperatively and at one year's follow-up. They comprised assessment on Constant's criteria [15] and active and passive range of motion measurement. The principal assessment criterion was the weighted Constant score for age and sex. All patients were followed up at one and three months postsurgery to check for complications and perform control X-ray. At one year postoperatively, control X-ray was again performed for all patients, and the CR group all underwent ultrasound examination by the same experienced radiologist using the same equipment, to determine tendon healing.

Statistical analysis was performed according to group, respecting the exclusion criteria described above and excluding patients lost to follow-up (FU) or deceased. Mean values were expressed with their standard deviations and ranges. Qualitative variables were compared on Chi^2 contingency test. Simple regression and Student tests were used to compare quantitative and qualitative variables. Correlations were completed using Bartlett and Fischer tests. The significance threshold was set at 5% ($P < 0.05$).

Results

Ten patients had at least one postoperative complication. No revision surgery was required. There were no postoperative infections. Three patients had spontaneously reversible neurapraxia of the brachial plexus. Three showed painful postoperative stiffness due to adhesive capsulitis; all showed persistently impaired passive range of motion at

Figure 1 Migration of a lateral metal anchor detected on X-ray 1 month postoperatively in a 75-year-old patient.

last follow-up. In four cases, metal anchor migration was found on X-ray at one month postoperatively (Fig. 1); these patients showed iterative tear on ultrasound check-up at one year; their mean weighted Constant score was 59; mean age was 72 years.

At the 1-year follow-up, two patients were lost and one had died. Data for 127 patients (68 in CR and 59 in AT) underwent statistical analysis. Table 1 shows demographic data for the two groups, for which there were no significant differences.

At 1-year follow-up, mean weighted Constant score showed significant improvement in the series as a whole: 72.6% ± 11 (43—95) versus 43.6% ± 12 (18—73) preoperatively. All items showed significant improvement (Table 2). Mean weighted Constant score in the CR (repair) group was 75.8% ± 10 (44—95), significantly higher than in AT: 68.8% ± 6.8 (43—93). The pain, activity and force scores were likewise significantly better in the CR group CR (Table 3); the difference in motion score, however, was not significant.

In distal cuff tears (49 patients), the mean weighted Constant score at one year's FU was 77.4% ± 8.8 (60—95) in the 24 cases of repair, and 74.4% ± 11.6 (43—93) in the 25 cases of acromioplasty-tenotomy; this difference was not significant. In intermediate tears (51 cases), 26 were repaired and 25 treated by isolated acromioplasty-tenotomy, with mean weighted Constant scores of respectively 76.4% ± 7.9 (53—86) and 66.2% ± 10.6 (54—91), this difference being significant; differences were in fact significant on all Constant component scores (pain, activity, motion and force). In retracted tears (27 cases), mean weighted Constant score at one year was 71.8% ± 13.7 (44—93) after repair (18 cases) versus 65.6% ± 13 (49—83) after acromioplasty-tenotomy (nine cases), but numbers were too small to achieve significance.

In the repair group (CR), the tendon-healing rate on ultrasound at one year was 67.6%. It was significantly poorer in patients over 70 years of age (52.4% versus 74.4% in under-70s). It was 79.2% in distal, 65.4% in intermediate and 55.6% in retracted tear, although numbers precluded significance. In the CR group, tendon healing significantly impacted weighted Constant score at one year: 80% ± 6 (64—93) with healing versus 66.9% ± 11 (54—90) without. No significant difference in one-year Constant score was found between the AT and CR patients with iterative tear. Table 4 compares mean weighted Constant score at one year between patients with healed tendons and torn tendons (non-repair or healing defect after repair): regardless of initial tear size, scores at one year were better in case of healing.

Discussion

The present study showed that rotator-cuff repair in patients over the age of 60 years gave better short-term functional results than isolated acromioplasty-tenotomy performed in reparable tear. Benefit of repair was especially clear in intermediate tears. The functional result depended on tendon healing.

The study involved a certain number of methodological limitations. The simple randomisation procedure led to a difference in number between the two groups; block or stratified randomisation would have given groups of equivalent size and limited selection bias. Given the size of the study population, however, simple randomization seemed

Table 1 Characteristics of the two groups (no differences were significant).

	Group CR	Group AT
Number of patients	68	59
Mean age (years)	67.5 ± 4.6 (61—81)	68.1 ± 5.6 (60-81)
Sex	38 female (55.9%) 30 male (44.1%)	31 female (52.5%) 28 male (47.5%)
Mean preop weighted Constant (%)	44 ± 12.1 (19—73)	43.5 ± 12.3 (18—68)
Distal tear (number of cases)	24 (35.3%)	25 (42.5%)
Intermediate tear (number of cases)	26 (38.2%)	25 (42.5%)
Retracted tear (number of cases)	18 (26.5%)	9 (15.2%)

Table 2 Preoperative and 1-year Constant score items and weighted Constant score for the series as a whole.

	Preoperative	1-year FU
Pain	5.5 ± 2.7 (0–10)	12.8 ± 2.6 (5–15)*
Activity	9.5 ± 2.8 (2–17)	16.3 ± 2.5 (9–20)*
Mobility	22.8 ± 7.4 (6–36)	34.1 ± 5.1 (16–40)*
Strength	6 ± 3.1 (0–16)	9.2 ± 4.1 (4–20)*
Weighted Constant	43.8% ± 12.2 (18–73)	72.6% ± 11.6 (43–95)*

* $P < 0.05$.

Table 3 Constant score items and weighted Constant score for groups CR and AT at 1 year's follow-up.

	Group CR	Group AT
Pain	13.4 ± 2.3 (5–15)	12.2 ± 2.7 (5–15)*
Activity	17.1 ± 2.1 (10–20)	15.5 ± 2.7 (9–20)*
Mobility	33.2 ± 4.6 (24–40)	34.9 ± 5.6 (16–40)
Strength	10.3 ± (2–18; SD = 3.9)	7.9 ± 3.9 (4–20)*
Weighted Constant	75.8% ± 10 (44–95)	68.8% ± 6.8 (43–93)*

* $P < 0.05$.

sufficient [19]. The arthroscopic repair technique was not homogeneous, but it remains to be demonstrated that double-row suture provides benefit over single-row suture [20]. The study was short-term, with a follow-up of one year: longer follow-up would be needed to confirm lasting benefit from repair; a three-year clinical follow-up of both groups is currently underway. Postoperative ultrasound cuff analysis is difficult and operator-dependent; CT arthrogram is more effective, but more invasive [9]; moreover, Prickett et al. in 2003 showed that ultrasound reliably detects iterative tear [21].

The overall complications rate in the series was 7.9%. Verma et al. [7] reported a rate of 7.7% (one pneumopathy, one hematoma and one infection) in a series of cuff repairs in over-70s. Fehringer et al. [22] reported two complications in 42 repaired cuffs in over 65-year-olds (one infection and one thrombophlebitis with pulmonary embolism). In the present series, complications following cuff repair in the elderly mainly implicated anchor migration; this complication was rarely reported in the literature, where resorbable anchors are generally used [6,7]. Charousset et al. [6] reported two cases. Benson et al. [23] recently reported a rate of 2.4%, with elevated risk in retracted tear. In the elderly, risk is increased by osteoporosis [24]. Anchorage can be improved by limiting greater tuberosity rasping [5] and using large-diameter anchors as recommended by Brady et al. [25]. Regarding adhesive capsulitis secondary to arthroscopic rotator-cuff repair, Huberty et al. [26] showed that age less than 50 years and a context of work accident were the main risk factors; the patients in the present series were spared such risk, accounting for the discrepancies with younger series [8,27]. Charousset et al. [6] reported a 4% rate of stiffness in the over-65 s, but with systematic resolution within six months, unlike the present findings. From the present results and those of the literature, the complications risk would not seem to be increased in patients aged over 60 years.

The literature contains several results of rotator-cuff repair in the elderly. In 1999, Worland et al. [28] reported a 78% rate of satisfactory results after open repair of massive tears in over-70s; they stressed the importance of tendon repair quality. Grondel et al. [29] obtained comparable results with mini-open surgery, where Lam et al. reported much less encouraging results, with only 44% satisfactory results [30]. The first series of arthroscopic rotator-cuff repair in the over-60s was that of Rebuzzi et al. [5] in 2005, with 64 cases; at a mean 27 months' FU, there were 81% good results with UCLA scores greater than or equal to 28 points. Recently, Verma et al. [7] reported a series of 44 arthroscopic rotator-cuff repairs in over-70s, 39 being

Table 4 Comparison of mean weighted Constant scores between patients with cuff healing after repair and those with persistent tear (healing defect or palliative treatment), for the series as a whole and according to initial tear size.

	Cuff healed	Cuff not repaired or not healed
Whole series (%)	80.1 ± 6 (64–93)	68.6 ± 11.9 (43–93)*
Distal tear (%)	80.1 ± 5.7 (71–95)	73.6 ± 11.5 (43–93)*
Intermediate tear (%)	78.9 ± 6 (71–86)	67 ± 10.5 (45–91)*
Retracted tear (%)	81.6 ± 7.6 (73–93)	68.6 ± 11.7 (44–83)*

* $P < 0.05$.

followed-up for at least two years. As in the present series, subscapularis extension was excluded. At last FU, 94.3% of patients were satisfied with their result; mean weighted Constant score was 97% in men and 88% in women; healing was not checked for. The present results are in agreement with Charousset et al. [6], who followed up 81 patients over the age of 65 years (mean age, 70 years) following arthroscopic rotator-cuff repair; at more than two years' FU, mean non-weighted Constant score was 76.9. Systematic CT arthrogram control at 6 months found 42% iterative tear, compared to 32.4% in the present series, although theirs had a greater rate of distal tear (68% versus 35.3% in the present CR group), possibly because 28.4% of tears extended to the subscapularis, with 50% iterative tear in that subgroup. They demonstrated that healing was influenced by tear size; the present series showed the same trend, but with insufficient power to demonstrate significance. In agreement with Charousset et al. [6], the present clinical results were better in case of cuff healing. In 2009, Fehringer et al. [22] reported a series of 42 rotator cuff repairs in over 65-year-olds, with ultrasound control at more than one year's FU: they found 21% iterative tear; mean Constant score was significantly higher in case of cuff healing (85 points versus 58 points with iterative tear). They compared these results with a group of 44 non-operated cuff tears and 156 patients with intact cuffs: patients operated on had Constant scores equivalent to those of tear-free patients. In the present series, healing failure was associated with clinical results equivalent to those of isolated acromioplasty-tenotomy. Comparison of weighted Constant scores between healed cuff and torn cuff (healing defect or non-repair) was in agreement with Fehringer et al. [22].

The benefit of repair over isolated acromioplasty-tenotomy was statistically demonstrated in intermediate tear but not in isolated supraspinatus tear. Benefit over isolated acromioplasty-tenotomy remains to be proven in distal rotator cuff tear, requiring a dedicated study with a larger series and longer follow-up.

Conclusion

Rotator-cuff tear repair in patients aged over 60 years improves clinical results as compared to isolated acromioplasty-tenotomy. In this population, repair shows benefit if tendon healing is obtained. In elderly patients, the use of biologic healing activators or reinforcement systems could improve healing rates and functional results.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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