Arthroscopic repair of full-thickness rotator cuff tears

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Background
Rotator cuff tears are among the most common conditions affecting the shoulder. Despite their ubiquity, there is substantial debate concerning their management. Arthroscopic repair methods have been developed, with the promise of more rapid patient recovery.

Purpose
The aim of this study was to describe the surgical technique and to evaluate the clinical results of arthroscopic repair of different-sized full-thickness rotator cuff tears using bone suture anchors.

Patients and methods
The study was conducted in the Department of Orthopaedic Surgery, El-Hadara Orthopaedic and in Traumatology University Hospital, Alexandria University (Egypt) from 2008 to 2010. Eighty shoulders in 80 patients, 38 men and 42 women, with symptomatic chronic full-thickness rotator cuff tears were included in the study. Arthroscopic cuff repair (using bone suture anchors) with subacromial decompression was applied to all patients. The age of the patients varied from 37 to 78 years with a mean of 61.15 years. There were 38 men (47.5%) and 42 women (52.5%). The patients were prospectively followed up clinically for a mean of 30 months (range: 20–37 months). The clinical assessment was performed with the modified University of California at Los Angeles score (55 points).

Results
The modified University of California at Los Angeles score improved significantly from a mean of 24.85 points preoperatively (range: 16–38 points) to a mean of 43.83 points postoperatively (range: 16–55 points) ($P < 0.001$). Seventy-six (95%) of the 80 shoulders were considered by the patients to be much better or better as a result of the operation. There were no intraoperative or postoperative complications.

Conclusion
Arthroscopic repair of full-thickness rotator cuff tears using bone anchors offered good results, provided a stable construct that can allow early rehabilitation without failure, and enabled tendon–bone healing. Arthroscopic rotator cuff repair was successful for large and small tears. Moreover, the earlier the operative intervention, the better was the outcome.

Keywords:
arthroscopic cuff repair, full-thickness tears, rotator cuff tears, shoulder arthroscopy, University of California at Los Angeles score

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Introduction

The important role played by the rotator cuff in the stability and mobility of the glenohumeral joint makes it susceptible to damage and injuries [1,2]. The etiology of rotator cuff injury is probably multifactorial [3].

Rotator cuff tears are among the most common conditions affecting the shoulder. Despite their ubiquity, there is substantial debate concerning their management. There has been considerable confusion surrounding the indications for rotator cuff surgery, with many factors influencing the decision to operate and the postoperative outcome. It is important to understand, as completely as possible, the type and extent of abnormality before embarking on any surgical program [4].

With the advent of arthroscopic surgery, rotator cuff repair has evolved from an all-open technique to a combined arthroscopic and miniopen technique. Recently, arthroscopic repair methods have been developed, with the promise of more rapid patient recovery. The all-arthroscopic rotator cuff repair has increased in popularity over the past several years, paralleling improvements in arthroscopic instrumentation and technique [5].

Arthroscopic repair of rotator cuff tears is technically demanding. The results of arthroscopic repair have not been as thoroughly studied as those after open repair [6]. The arthroscopic operation has the advantages of glenohumeral joint inspection, treatment of intra-articular lesions, smaller incisions, no deltoid detachment, less soft tissue dissection, less postoperative pain, and more rapid rehabilitation [7]. However, these advantages must be weighed against the technical difficulty of the method, which limits its application.

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Youm *et al*. [5] performed a comparison of clinical outcomes and patient satisfaction following arthroscopic and miniopen rotator cuff repair. They found that, at greater than 2 years of follow-up, arthroscopic and miniopen rotator cuff repairs produced similar results for small, medium, and large rotator cuff tears with equivalent patient satisfaction rates.

The aim of this study was to describe the surgical technique and to evaluate the clinical results of arthroscopic repair of full-thickness rotator cuff tears using bone suture anchors.

Material and methods

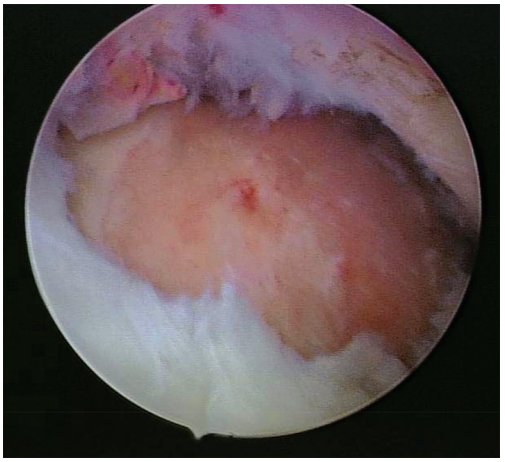
The study was conducted in the Department of Orthopaedic Surgery, El-Hadara Orthopaedic and in Traumatology University Hospital, Alexandria University (Egypt) from 2008 to 2010. Eighty shoulders in 80 patients, 38 men and 42 women, with symptomatic chronic full-thickness rotator cuff tears were included in the study. In this study, pain during overhead daily activities (87.5%), nocturnal pain (97.5%), and/or weakness of the affected shoulder during daily activities (90%) were considered indications for surgical treatment after failure of conservative treatment (subacromial steroid injection and physiotherapy) for at least 3 months. Patients with associated biceps tendon pathology, symptomatic acromioclavicular arthritis, or cuff tear arthropathy were excluded. The mean age of the patients was 61.15 years (range: 37–78 years). The right shoulder was affected in 50 patients. The time lag before presentation varied between 0.25–5 years with a mean of 0.83 year. Seventy-eight patients were right handed (97.5%), whereas only two patients were left handed (2.5%).

All patients underwent thorough clinical examination followed by radiologic evaluation with plain radiograph and MRI. A modification of the University of California at Los Angeles (UCLA) score system (55 points) was used in this study to monitor the shoulder state before and after at least 6 months from the operative intervention.

At the time of surgery, arthroscopic repair of the cuff tears together with subacromial decompression were performed. The patients were operated upon under general anesthesia and in semisitting position. The technique initiated with arthroscopic evaluation of the glenohumeral joint through the posterior portal, and then the scope was directed upward to the subacromial space where subacromial decompression took place using shaver and bone burr inserted through the lateral portal. Dealing with the full-thickness tear was carried out through the following steps: identification of the tear (Fig. 1), preparation of the footprint, bone anchor insertion into the footprint (5 mm; Mitek or Smith & Nephew) double loaded with No. 2 Orthocord or Ultrabraid suture threads (Fig. 2), retrieval of the suture threads of the anchor through the cuff tendon and back again into the lateral portal using a suture passer instrument (Elite Pass, Smith & Nephew or Expressew, Mitek) (Fig. 3), and finally arthroscopic knot tying and closure of the defect (Figs 4 and 5). One to three bone anchors were used depending on the size of the tear. In massive tears, side-to-side suturing of the tear was applied first (the margin convergence technique) then the tendon was sutured to the footprint using the bone anchors.

A sling or an abduction brace was applied postoperatively in all patients depending on the size of the tear, quality of the tissue, and security of the repair.

Figure 1



Identification of the full-thickness tear.

Figure 2

Bone anchor insertion after preparation of the footprint.

Three-phase rehabilitation program was then started: 6 weeks passive exercises, 6 weeks active assisted exercises, and 4 weeks strengthening exercises.

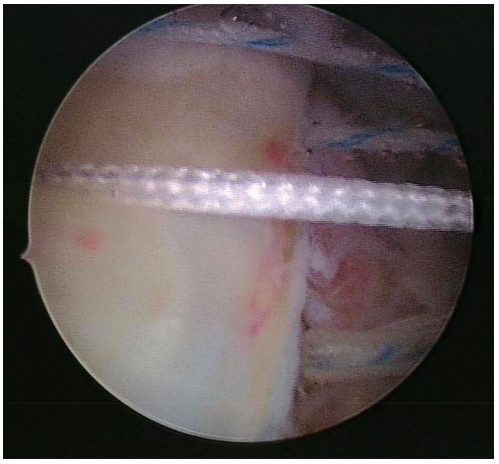
Results

The follow-up period ranged from 20 to 37 months with a mean of 30 months. The modified University of California at Los Angeles score improved significantly from a mean of 24.85 points preoperatively (range: 16–38 points) to a mean of 43.83 points postoperatively (range: 16–55 points) ($P < 0.001$). Seventy-six (95%) of the 80 shoulders were considered by the patients to be much better or better as a result of operation. The mean score of pain improved from 3 points (range: 1–6 points) preoperatively to 9 points (range: 4–10 points) postoperatively. The function score improved from a mean of 3.5 points (range: 1–6 points) preoperatively to 8 points (range: 4–10 points) postoperatively (Fig. 6). Twelve patients had small tears, 28 had medium tears, 20 had large tears, and 20 had massive tears. There was no statistical significant difference between the size of the tear and the postoperative result ($P = 0.68$) (Fig. 7). The mean time lag before presentation was 0.55 year (6.6 months) in patients with satisfactory results, whereas it was 0.87 year (10.44 months) in patients with unsatisfactory outcomes. The difference between both groups was statistically significant. In other words, the earlier the timing of repair, the better were the postoperative results ($P = 0.0164$).

Four patients showed unsatisfactory results: two of them had massive tears and the other two had medium-sized tears. Although they showed slight postoperative improvement regarding the pain and range of motion, the overall results were still unsatisfactory.

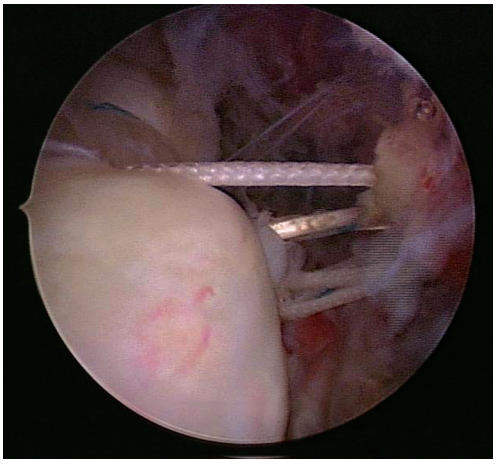
Figure 8 shows the preoperative and 25 months postoperative MRI pictures of one of the patients with large rotator cuff tear, denoting adequate tendon healing.

Figure 3



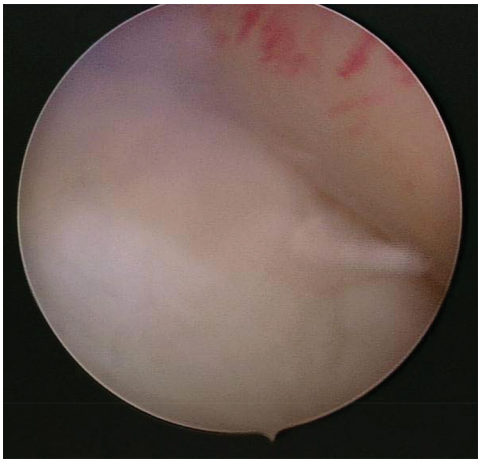
Suture threads passed through the cuff.

Figure 4



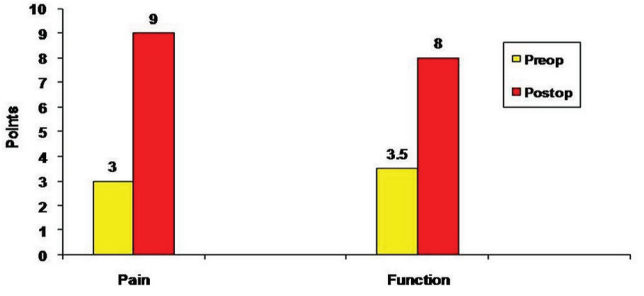
Arthroscopic knot tying and closure of the defect.

Figure 5



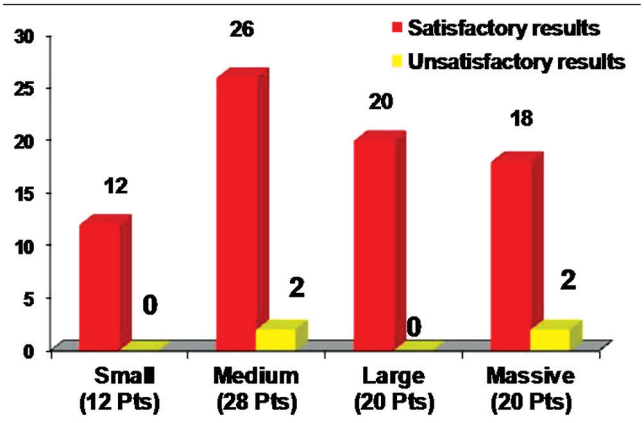
Intra-articular view showing fixation of the cuff to the footprint area.

Figure 6



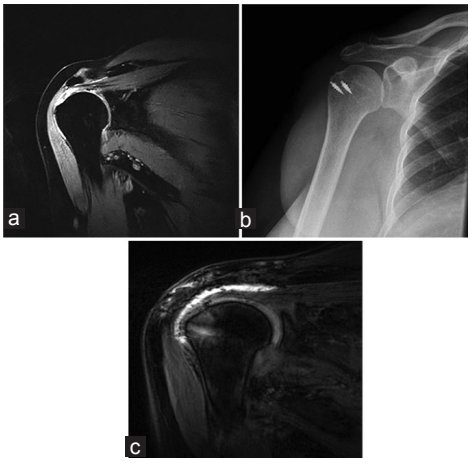
Preoperative and postoperative pain and function points (mean).

Figure 7



Postoperative results with respect to the size of the tear.

Figure 8



(a) Preoperative MRI showing full-thickness tear. (b) Postoperative radiograph showing the repair using two bone anchors, and (c) MRI after 25 months showing adequate tendon healing.

Discussion

Arthroscopic rotator cuff repair has undergone evident refinements during the past few years. Achieving a biomechanically stable construct is critically important, and this can now be performed through arthroscopic means [8].

Despite its prior reputation as an impractical operative technique, recent reports of arthroscopic rotator cuff repair have shown promising results that appear to be as good as, if not superior to, the results of open rotator cuff repair [9].

Pain and functional disability refractory to conservative care are the indications for arthroscopic surgical repair of rotator cuff tears [10]. Watson *et al.* [11] considered pain as the most common indication for surgery, and alleviating it was clearly an important goal. In the study published by Gartsman *et al.* [12], the primary indication for the arthroscopic repair of rotator cuff tears was persistent pain in the shoulder, not responding to a minimum of 6 months of conservative treatment.

Obtaining healing of rotator cuff repair is crucial. However, restoration of postoperative function is a major goal [13]. Current clinical as well as experimental evidence suggest that the technique of repair plays an important role in the prevention of failure of the repair [14]. Ideally, the technique of repair of a rotator cuff tendon should maximize the strength of fixation during the immediate postoperative period. Stronger fixation may allow early rehabilitation without complete failure and may also prevent the formation of a gap at the tendon–bone interface, which may inhibit the healing [15].

The clinical success rate in patients included in this study was 95%, which is comparable with that reported in the literature. Rebuzzi *et al.* [16] showed satisfactory results of 81.4%, whereas Boileau *et al.* [10] showed satisfactory results of 92%. Similarly, Jones and Savoie [17] showed a success rate of 88% in patients with arthroscopic repair of large and massive cuff tears. They concluded that the arthroscopic management of such tears could obtain results comparable with the reported outcomes following open repairs. Moreover, Buess *et al.* [18] performed a comparative study between open versus arthroscopic repair of rotator cuff tears in 96 patients. The authors reported that the arthroscopic repair had yielded equal or better results than open repair, even at the beginning of the learning curve. They found that the patients with an arthroscopic repair had a significantly better decrease in pain and a better functional result concerning mobility. This study showed successful results in different-sized tears; this is also reported by Buess *et al.* [18]. In their study, they concluded that the arthroscopic repair is successful for large and small tears, and, biomechanically, large tears might even benefit more than small ones.

Conclusion

Arthroscopic repair of full-thickness rotator cuff tears using bone anchors offered good results, provided a stable construct that can allow early rehabilitation without failure, and enabled tendon–bone healing. Arthroscopic rotator cuff repair was successful for large and small tears. Therefore, the size of the tear should not be considered to be a formal contraindication to an attempt of arthroscopic rotator cuff repair, if optimal functional recovery is the goal of treatment. Moreover, the earlier the operative intervention, the better was the outcome.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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