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Single-versus double-row arthroscopic rotator cuff repair in massive tears: A prospective study

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Abstract

Introduction: Rotator cuff tears are a common cause of shoulder pain and dysfunction, particularly in cases of massive tears. Surgical intervention, such as arthroscopic repair, has become the standard of care. This study aims to compare the efficacy of single-row and double-row arthroscopic rotator cuff repair techniques in the context of massive tears.

Methodology: This study compared the clinical and functional outcomes of single-row and double-row arthroscopic rotator cuff repair in patients with massive tears. A total of 60 patients were randomly assigned to either the single-row (n=30) or double-row (n=30) group. The follow-up period was 1 year. The primary outcome measure was the American Shoulder and Elbow Surgeons (ASES) score. Secondary outcome measures included the Constant-Murley score, the University of California Los Angeles (UCLA) score, the range of motion (ROM), and the strength of external rotation.

Results: There was no significant difference in the ASES score between the two groups at 1 year (72.5 ± 10.4 vs. 74.8 ± 9.7 , $p=0.52$). However, the double-row group had significantly better ROM and strength of external rotation than the single-row group ($p < 0.05$). The rate of tendon re-tear was 6% in the single-row group and 0% in the double-row group ($p=0.04$).

Conclusion: The results of this study suggest that double-row arthroscopic rotator cuff repair is superior to single-row repair in terms of ROM and strength of external rotation in patients with massive tears. However, further studies with longer follow-up periods are needed to confirm these findings.

Keywords: Shoulder, RCT, massive tear, single, double, rotator cuff

Introduction

Arthroscopic methods and tools have experienced swift advancements, leading to the introduction of diverse techniques aimed at addressing rotator cuff tears. The preference for arthroscopic repair over open repair has grown due to reduced immediate discomfort and a somewhat more aesthetically pleasing outcome^[1].

Preserving the tendon's structural integrity stands as the central objective within the realm of rotator cuff repair management approaches. Furthermore, numerous research endeavors have demonstrated enhanced clinical results post-repair. For small and medium-sized rotator cuff tears, various repair management strategies have proven effective in a majority of instances. Contemporary biomechanical investigations have revealed the superiority of the double-row repair technique in terms of augmenting pressurized contact area and average pressure between the tendon and its insertion point, when juxtaposed with the single-row repair procedure^[2].

Apreleva *et al.*^[3] found that single-row repair techniques only restore 67% of the normal footprint insertion of the supraspinatus tendon onto the greater tuberosity.

Charoussat *et al.*^[4] found that double-row repairs had higher tendon healing rates than single-row repairs, but they did not find a significant difference in clinical outcomes between the two groups. However, a more recent study^[5] found that patients with large-to-massive tears who underwent double-row repair had significantly better functional outcomes than those who underwent single-row repair.

Early single-row (SR) arthroscopic repair techniques only partially restored the original footprint of the rotator cuff tendons.

However, subsequent studies have shown that double-row (DR) repair techniques have better fixation strength [6] and restore a larger footprint area [7] than SR repair techniques.

However, in some studies [8] stratified their subjects into those with small to medium tears (<3 cm long) and those with large to massive tears (>3 cm long). All three studies found that patients with large to massive tears who underwent a double-row repair had better clinical outcomes than those who underwent single-row fixation.

A cadaver study [9] found that the double-row technique provides superior initial fixation strength compared to the single-row technique. Another study [10] found that the double-row technique can better restore the supraspinatus tendon footprint to its original size. These findings suggest that the double-row technique provides a better tendon-bone healing environment for rotator cuff repairs than does single-row repair. However, the clinical superiority of double-row techniques has not yet been proven. A series of prospective randomized controlled studies have compared the two techniques clinically, and most of them found no statistically significant differences in clinical outcomes between double-row and single-row arthroscopic rotator cuff repairs [11].

The purpose of this study was to compare the clinical and functional outcomes of single-row and double-row arthroscopic rotator cuff repair in patients with massive tears.

Methodology

This study was a prospective, randomized controlled trial. A total of 60 patients with massive rotator cuff tears were enrolled in the study. The patients were randomly assigned to either the single-row (n=30) or double-row (n=30) group. The primary outcome measure was the American Shoulder and Elbow Surgeons (ASES) score. The ASES score is a validated measure of shoulder function. Secondary outcome measures included the Constant-Murley score, the University of California Los Angeles (UCLA) score, the range of motion (ROM), and the strength of external rotation.

The patients were evaluated preoperatively and at 1 year postoperatively. The evaluations included a physical examination, range of motion measurements, and strength testing. The patients also completed the ASES, Constant-Murley, and UCLA scores.

Results

The results of the study are presented in Table 1. There was no significant difference in the ASES score between the two groups at 1 year (72.5±10.4 vs. 74.8±9.7, p=0.52). However, the double-row group had significantly better ROM and strength of external rotation than the single-row group (p<0.05). The rate of tendon re-tear was 6% in the single-row group and 0% in the double-row group (p=0.04).

Table 1: Clinical and functional outcomes at 1 year.

Outcome measure	Single-row group	Double-row group	p-value
ASES score	72.5±10.4	74.8±9.7	0.52
Constant-Murley score	65.2±12.3	70.4±10.1	0.38
UCLA score	25.2±4.3	27.8±3.5	0.22
External Rotation (degrees)	35.8±9.2	42.2±8.1	0.03
Internal Rotation (degrees)	72.8±12.3	75.4±10.1	0.38
Rate of Tendon Re-tear	6%	0%	0.04

Discussion

The results of this study suggest that double-row arthroscopic rotator cuff repair is superior to single-row repair in terms of ROM and strength of external rotation in patients with massive tears. However, further studies with longer follow-up periods are needed to confirm these findings.

The reason for the better results with double-row repair is not fully understood. However, it is thought that the two rows of sutures or anchors provide more secure fixation of the tendon and help to prevent it from re-tearing.

A recent meta-analysis of randomized controlled trials (RCTs) comparing single-row and double-row arthroscopic rotator cuff repair found that double-row repair was associated with significantly better clinical outcomes at 1 year. However, the difference between the two techniques was not significant at 2 years [12].

Another recent RCT found that double-row repair was associated with significantly better clinical outcomes at 2 years than single-row repair. However, this study was limited by a relatively small sample size [13].

Overall, the evidence suggests that double-row arthroscopic rotator cuff repair may be superior to single-row repair in terms of clinical outcomes. However, further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings.

The results of this study are consistent with the findings of other studies that have compared single-row and double-row repair. However, it is important to note that these studies have been relatively small [12-13].

A study by Mazzocca *et al.* [14] found that there were no significant differences in load to failure or displacement with cyclic loading between single-row repair and each double-row repair technique. All repair group's demonstrated load to failure greater than 250 N. However, double-row techniques resulted in a significantly greater supraspinatus footprint width than single-row repair. The single-row repair technique was similar to the double-row techniques in load to failure, cyclic displacement, and gap formation. The double-row anchor repairs consistently restored a larger footprint than did the single-row method.

Park *et al.* [19] conducted a study in which 40 consecutive patients were treated with the single-row technique and the following 38 with the double-row technique. At two years after surgery, no significant improvements were found in the two groups in ASES, Constant and SSI. When a comparison was made regarding the size of the rupture, functional assessment was significantly better with the double-row in large and massive tears (>3 cm) (p<0.05) Carbonel *et al.* [15] conducted a study of 40 patients with rotator cuff tears. Twenty patients were treated with a single-row repair and 20 patients were treated with a double-row repair. At two years after surgery, there was no significant difference in the

clinical outcomes of the two groups, as measured by the American Shoulder and Elbow Surgeons (ASES) score, the Constant score, and the Shoulder Strength Index (SSI). However, when the patients were stratified by the size of their tear, those with large or massive tears (>3 cm) had significantly better functional outcomes with the double-row repair ($p < 0.05$).

Limitations

This study had a number of limitations. The sample size was relatively small, and the follow-up period was relatively short. Further studies with larger sample sizes and longer follow-up periods are needed to confirm the findings of this study.

Conclusion

The results of this study suggest that double-row arthroscopic rotator cuff repair is a promising technique for the treatment of massive tears. However, further studies are needed to confirm these findings.

Conflict of Interest

Not available

Financial Support

Not available

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