Effect of Open Rotator Cuff Repair on Shoulder Pain and Function

Abstract

Introduction: Rotator cuff problems may account for up to 70% of shoulder pain as well as limitation of motion and function. Treatment for rotator cuff injuries and tears includes supportive care as the first line and surgical intervention as the second line. The aim of this study is to evaluate the impact of open rotator cuff repair on pain intensity and shoulder function in patients who are candidates for surgery.

Materials & Methods: In a cross-sectional study, 37 patients who had undergone open shoulder surgery were studied with an average follow-up of 11 months (2-42 months). Age, gender, pain levels, tear size, duration of the tear, range of motion (ROM), and patient function were recorded in a checklist before surgery. Postoperative ROM and function were also documented. Pain levels were measured using the Visual Analog Scale (VAS), and function was assessed by the American Shoulder and Elbow Surgeons (ASES) score. The data obtained from the questionnaires and checklists were analyzed using SPSS v.26 software.

Results & Discussion: The analysis of mean function, pain, abduction, and internal and external rotation of the shoulder before and after surgery showed improvement in all the cases, the clinical status of the patients improved ($p < 0.05$). shoulder function improved but did not reach a score of100, while the patients experienced a reduction in pain, but did not reach zero. there was an overall increase in range of motion, this increase was more pronounced in internal rotation and abduction movements.

Conclusion: The results of this study suggests that, if conservative treatment fails and when there is no major contraindication for surgery, the patients should be offered, open rotator cuff repair in order to enhance quality of life.

Keywords: Rotator cuff injuries, Range of motion, Shoulder pain, Functional status.

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Introduction

Shoulder pain is the second most common cause of musculoskeletal pain after lower back pain. Rotator cuff injuries are the most prevalent cause of shoulder pain and dysfunction[1-4]. Rotator cuff disease is recognized as one of the most common causes of chronic shoulder pain in adults. The rotator cuff consists of four muscles and their associated tendons, which play a crucial role in stabilizing the shoulder while also providing a broad range of motion. The four muscles that comprise the rotator cuff are the subscapularis, supraspinatus, infraspinatus, and teres minor. Additionally, the long head of the biceps tendon contributes to the function of the rotator cuff by stabilizing the head of the humerus within the glenoid cavity and preventing superior migration of the humeral head[5]. The treatment of this condition is becoming increasingly important due to the aging population and advancements in diagnosis and treatment. The primary goal of rotator cuff surgery is to improve pain and shoulder function[6-11]. In 2014, it was estimated that 4.5 million patients in the United States sought medical attention for rotator cuff-related issues, with 40,000 undergoing surgical procedures[12]. Rotator cuff tears primarily affect middle-aged and older individuals. Observational data indicate a nearly linear increase in the incidence of rotator cuff tears over time[12-14]. The etiology of rotator cuff tears is multifactorial, involving trauma, degeneration, impingement of the tendon between the acromion and the greater tuberosity of the humerus, as well as high mechanical loads[15].

As most tears are due to age-related degeneration, individuals over the age of 40 are at a higher risk[16]. Rotator cuff tears can be classified as acute, chronic, or subacute[17]. Generally, rotator cuff tears are categorized into complete and partial tears. In complete tears, the size of the tear can vary: small (less than 1 cm), medium (1 to 3 cm), large (3 to 5 cm), or massive (greater than 5 cm)[18].

This cross-sectional study (before-after) was conducted on patients who visited the orthopedic clinic of Arya Hospital in Mashhad, Iran, between 2023 and 2024. In all patients, rotator cuff tears were confirmed through clinical examination and MRI. At the time of the patients' visits, a comprehensive history was taken, including details about their current condition, previous illnesses, medications, surgical history, and social history. The study involved 37 patients, comprising 3 men (8.1%) and 34 women (91.9%), with an average age of 51.59 years. Patients were followed up for one month after their surgery. Inclusion criteria for this study required that all patients be 18 years of age or older and have either complete or partial tears (at least 50% tendon thickness) accompanied by symptoms of pain or weakness that had not improved with conservative treatment.

Patients were excluded from the study if they had any of the following conditions: previous shoulder surgery, a history of prior fractures in the affected shoulder, radiological signs of glenohumeral osteoarthritis or nerve injury, rheumatoid arthritis, frozen shoulder, or if they were unwilling to participate or unable to understand or sign the informed consent form. Additionally, patients with any medical condition that contraindicated any surgical procedures were also excluded. In this study, preoperative ASES and VAS scores, tear size, duration of the tear, age, gender, and angles of abduction, internal rotation, and external rotation were recorded.

One-month post-surgery, VAS and ASES scores along with angles of abduction, internal rotation, and external rotation were measured and recorded after 6 months again.

Subsequently, each of the VAS and ASES scores, as well as abduction and internal and external rotation angles, were analyzed separately for before and after surgery based on gender, age (under or over 50 years), tear size (less than or greater than 3 cm), and duration of the tear (less than or greater than 12 months).

Results

In terms of age, the minimum and maximum ages were 38 and 70 years, with a mean age of 51.59 ± 7.76 years. The distribution of rotator cuff tear sizes in this study revealed that 37.83% were classified as moderate tears, 51.35% as severe tears, and 10.81% as massive tears, with an average size of 3.38 ± 1.65 centimeters. In this study majority of the patients were women (91.9%), and Over 50% of the tears were classified as large. Additionally, all Tears in men were categorized as massive while medium and large tears were exclusively found in women, with only one Case of a massive tear occurring in a female patient. Patient were monitored for 6 months, and their data were Recorded before surgery and 6 months postoperatively. Additionally, all cases of massive rotator cuff tears in men had a duration of more than 12 months. A total of 37 shoulders from 37 patients underwent surgery, with 20 cases (54/1%) involving the left shoulder and 17 cases (45.9%) involving the right shoulder. The shortest duration of rotator cuff tear was 2 months, while the longest duration was 42 months, with a mean duration of 11/19 months. Overall, a significant difference was observed when comparing the mean ASES scores before and after surgery. When analyzing ASES scores based on gender, the difference was more pronounced in the female group (P-Value =0.0001). However, due to the small number of male participants, further investigation is needed. The ASES scores before and after surgery showed no correlation with age, tear size, or duration of the tear. A comparison of the mean pain levels before surgery (7.13±2.32) and after surgery (0.95±0.99) indicated a clear improvement in pain levels postoperatively(P-Value<0.0001). A significant difference was observed in the average pain levels before and after surgery in women compared to men (P-Value <0.0001). However, pain levels showed no correlation with age, tear size, or duration of the tear, and a reduction in pain was noted across all groups (P-Value<0.0001). The shoulder abduction post-surgery improved significantly, with a mean of 165.81± 19/88 degrees compared to the preoperative mean of 149.59± 31/12(P-Value =0.0001). Although shoulder abduction increased in both genders after surgery and showed significant improvement in female patients when comparing pre-operative and post-operative measurements (P-Value =0.0001). An analysis of shoulder abduction based on age, tear

size, and duration revealed an increase in range of motion across all cases, with no correlation found between abduction and these factors. Overall, a significant difference was observed between the mean external rotation before and after surgery (P-Value =0.043). This difference was more pronounced in women compared to men (P-Value <0.05). However, there was no correlation between the improvement in external rotation and the patients' age, duration of the tear, or tear size. The range of internal rotation clearly increased postoperatively (P-Value =0.010), with this increase being more significant in women than in men (P-Value<0.05). Comparison of pre- versus post-operative internal rotation revealed age-dependent outcomes, with significantly better improvement in patients under 50 years compared to those over 50 (P-Value =0.020). No correlation was observed between internal rotation (pre- or post-operative) and either tear chronicity or tear dimensions.

Discussion

Rotator cuff injuries cause shoulder dysfunction and pain[1], making their treatment essential. The first-line treatment is conservative management, while surgery is considered second-line therapy[19]. This study aimed to investigate the impact of open rotator cuff repair on pain and shoulder function in 37 shoulders from 37 patients with a mean age of 51.59 years who were candidates for open rotator cuff tear repair. All assessed parameters, including ASES, VAS, abduction, internal rotation, and external rotation, showed improvement after surgery, with more pronounced changes observed in women. However, due to the small number of male participants in this study, further investigation is warranted in this gender.

The range of motion for external rotation and abduction, as well as VAS and ASES scores, did not correlate with age, tear size, or duration of the tear. In contrast, when comparing the range of motion for internal rotation before and after surgery, it was noted that there is a relationship with age, particularly in patients younger than 50 years. Although postoperative pain improved significantly, it did not reach zero levels. In a 2004 study conducted by Murat Bozburun et al. in Turkey titled "Long-Term Results of Open Rotator Cuff Repair" involving 90 shoulders from 88 patients, the demographic distribution showed 40.9% female and 8.1% male participants, with a mean age of 57 years - contrasting with our study's mean age of 59.51 years[20].

Their clinical evaluation assessed both active and passive range of motion (flexion, extension, abduction, internal/external rotation) and muscle strength pre- and post-operatively, whereas our study focused specifically on abduction, internal rotation, and external rotation. Shoulder function was evaluated using the Constant-Murley score in their study versus the ASES questionnaire in ours. Notably, Murat's study did not report gender-based differences in functional or ROM outcomes, unlike our findings. Both studies demonstrated effective improvement in pain, active ROM, and patient function following open rotator cuff repair. A 2015 Iranian study by Mohammadreza Giti and Amir Sobhani Iragi titled "Open Rotator Cuff Repair Using the Deltopectoral Approach" evaluated cost-effective repair for patients unable to afford arthroscopic techniques. Their cohort of 80 patients (60% male, 40% female, mean age 60 years) differed demographically from ours[21]. While both studies documented VAS and ASES score improvements at 6-month follow-up, they didn't separately analyze ROM gains as we did. Sgouris et al.'s 2018 US meta-analysis "Rotator Cuff Repair: Postoperative Rehabilitation"[22] corroborated our findings regarding postoperative shoulder function and ROM improvement, though unlike our study, they didn't quantify pain reduction. Pivotal 2023 Brazilian research by Rafael Pirami et al. ("Clinical Outcomes and Cost Analysis of Rotator Cuff Repair") compared open (n=16) versus arthroscopic (n=346) approaches[23].

Their open repair subgroup (7M:9F, mean age 59.75) showed superior 12-month quality-of-life improvements in females, potentially due to higher postoperative reporting rates - a trend we observed in our 37-patient study (mean age 59.51) where women demonstrated more pronounced pain relief and functional recovery, possibly influenced by our male-female ratio.

Conclusion

Considering that the range of motion, pain levels, and all Function outcomes in patients improved following open Rotator cuff surgery performed exclusively by single surgeon and is recommended for patients who do not respond To conservative treatment and do not have contraindications For surgery.

Limitations and Recommendations

Our study had several limitations, including its single-center design and relatively small sample size. Additionally, the low number of male participants may have influenced the results. Therefore, we recommend future multicenter studies with larger sample sizes to improve the precision of findings. We further suggest comparative studies evaluating open versus arthroscopic surgical approaches.

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