Comparison of Clinical Outcomes of Arthroscopic versus Mini-Open Rotator Cuff Repair: Systematic Review and Meta-Analysis

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Abstract

Background: The Rotator cuff is prone to injury and essential to the shoulder joint's health. The shoulder joint requires mobility, strength, and stability since it is essential for positioning the upper limb in functional postures. our research's objectives Systematic Review and Meta-Analysis of the Clinical Outcomes of Arthroscopic vs Mini-Open Rotator Cuff Repair.

method: There will be a meta-analysis and a retrospective observational secondary investigation of published studies. Timeframe: 6 to 12 months after the research ethical committee's permission.

results: 670 participants from six RCTs were included. The combined data showed no discernible functional difference between arthroscopic and mini open rotator cuff repair (very low quality, 4 RCTs, 495 patients, SMD 0.00, 3-month; very low quality, 4 RCTs, 495 patients, SMD 0.01, 6-month; very low quality, 3 RCTs, 462 patients, SMD 0.09, 12-month). In the extremely low quality trials (three RCTs, 254 patients, MD -0.21, 3-month; three RCTs, 254 patients, MD -0.03, 6-month; and two RCTs, 194 patients, MD -0.35, 12-month), there were no statistically significant changes in pain levels across groups.

Conclusion: differences between arthroscopic and mini-open rotator cuff repairs are not clinically significant at 3-, 6-, or 12-month follow-up. A surgeon's experience, the patient's value of aesthetics, and the surgeon's significance to the patient's financial condition should thus be taken into consideration when choosing the surgical approach.

Keyword; Arthroscopic, Mini-Open Rotator Cuff Repair, Systematic Review, Meta-Analysis

Introduction

The Rotator cuff, which is vulnerable to damage, must be in excellent shape for the shoulder joint to function correctly. Since the shoulder joint is necessary for placing the upper limb in useful postures, it must be mobile, strong, and stable. The humeral head can move extensively for the joint's widest range of motion because to its short, shallow glenoid. Unlike other socket joints, like the hip, where stability is predominantly given by the bony structure, the shoulder's stability is primarily produced by its muscles. This details the pivotal function of the rotator cuff muscles as well as the series of events that occur when cuff integrity is weakened [1]. One in five individuals in the general population and one in three patients with shoulder problems get rotator cuff tears. Rotator cuff tears are more common in older persons, those who work hard, males, and people who have previously had shoulder injuries, according to Yamamoto et al.[2]. One of the most frequent surgical procedures done on the shoulder, rotator cuff repair has a number of well-established benefits [3]. Over the last ten years, the method of treating rotator cuff issues has changed from an open surgery to an arthroscopic (mini-open) aided technique to an all-arthroscopic strategy. When used to fix non-massive rips of 5 cm, typical open rotator cuff repairs provide good outcomes. Deltoid separation, arthrofibrosis, and/or severe post-operative pain are the morbidities connected to this surgery, though [4]. Mini-open repairs were created because they have produced outcomes that are comparable to open repairs and because they may result in a smaller decrease in deltoid morbidity [5]. Many surgeons are now doing whole arthroscopic repairs as a result of recent advancements in arthroscopic methods. Reduced discomfort, a quicker recovery, the possibility to treat intra-articular lesions, fewer skin incisions, less soft-tissue dissection, and a very low risk of deltoid detachment are some possible advantages of this procedure. The arthroscopic method has shown successful short- and long-term outcomes [6].While the rotator cuff repair procedure for completely arthroscopic surgery uses implanted suture anchor devices, mini-open surgery provides a number of repair alternatives, including the utilization of bone tunnels.

Due to the requirement for additional tools, equipment, disposable instruments, and implanted suture anchor devices, the whole arthroscopic rotator cuff surgery may be more costly than the mini-open surgical technique. Complete arthroscopic repair

is more clinically effective than open surgery, but it is technically challenging and demands substantial training [7].

Methods

A retrospective observational secondary study of published research and a meta-analysis will be done. Duration: 6 to 12 months after approval of the research ethics committee.

Search Strategy and Articles Selection:

By integrating the following keywords in every conceivable way, the following search terms will be used in the PubMed (Medline), Cochrane Central Register of Controlled Studies (CENTRAL), Scopus (ELSEVIER), Egyptian Knowledge Bank, and literature searches: shoulder, rotator cuff, rotator cuff tear, rotator cuff repair, arthroscopic, Arthroscopic-assisted, mini-open, treatment outcome, and outcome. **Inclusion criteria: Original articles having the following criteria:**

All patients who underwent mini-open Rotator cuff repair.

Data Extraction and Statistical Analysis :

Two researchers independently assessed the titles and abstracts after the duplicates were eliminated in order to eliminate pointless studies and find relevant publications for the full-text review. The remaining publications were then separately assessed by two reviewers, who used the inclusion criteria outlined above to choose which articles to include in this review. The Mantel-Haenszel technique will be used to analyses the data using meta-analyst software.

Results

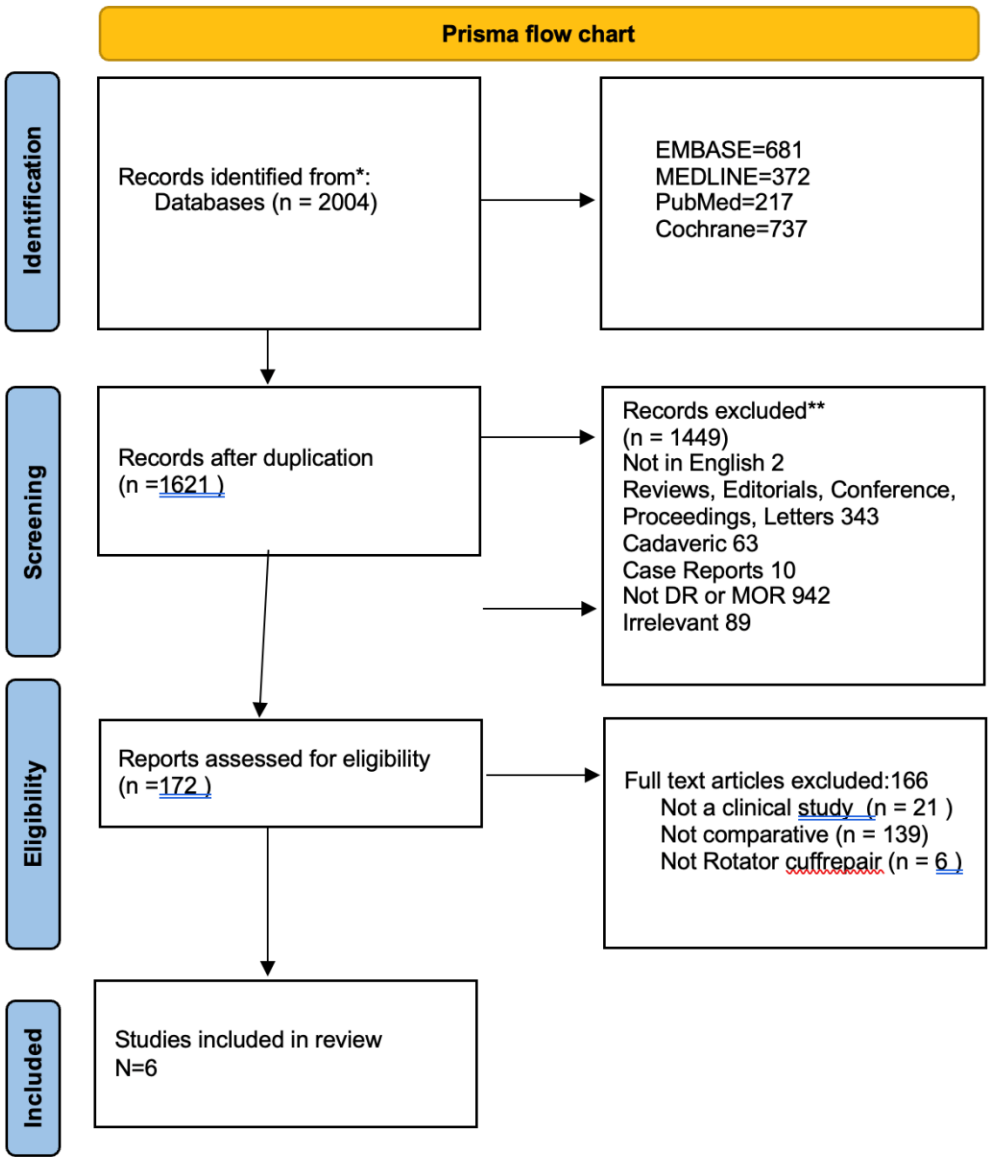
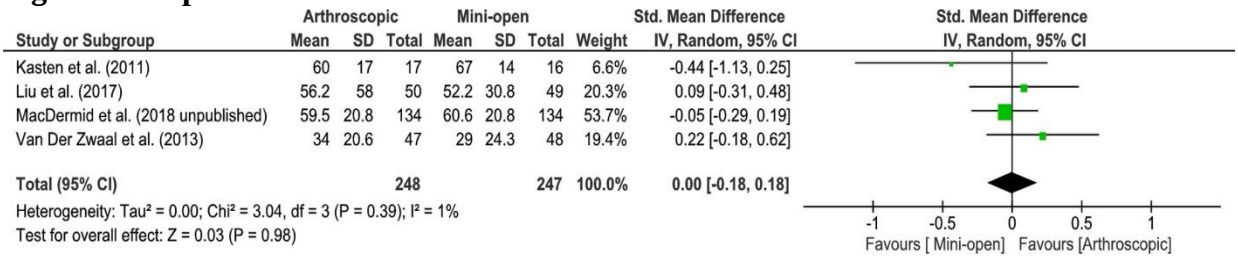


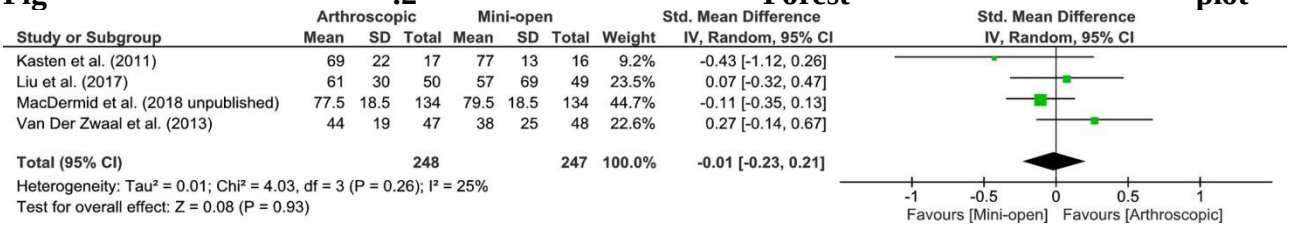
Fig 1. Forest plot



Four trials were combined to investigate the impact of arthroscopic and mini-open surgery on function at three months after surgery based on post-operative results

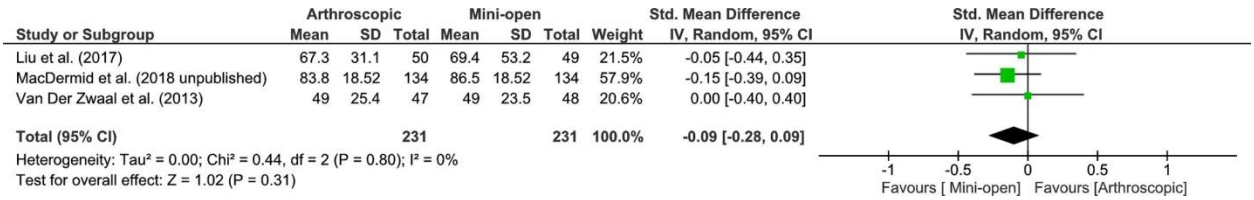
(function). The combined findings showed no discernible results among the arthroscopic outcomes .

Fig .2 Forest plot



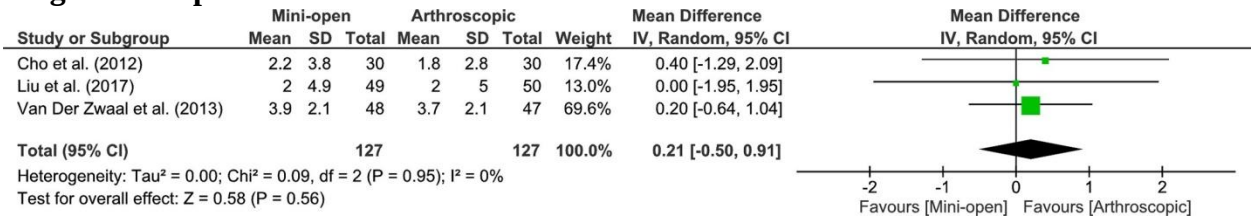
At a 6-month follow-up, we observed no discernible results among the arthroscopic.

Fig . 3 Forest plot



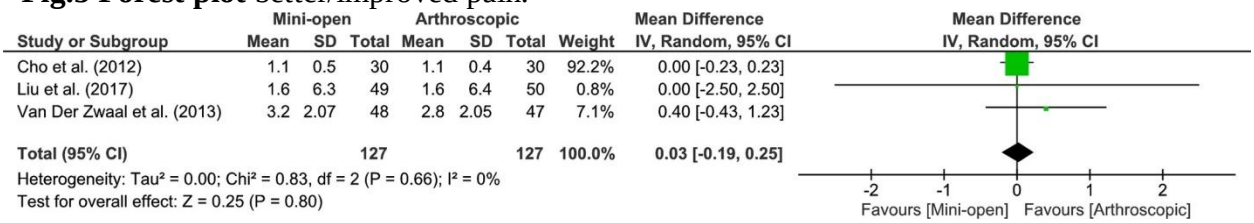
At a 12-month follow-up, we observed no discernible results among the arthroscopic outcome .

Fig.4 Forest plot



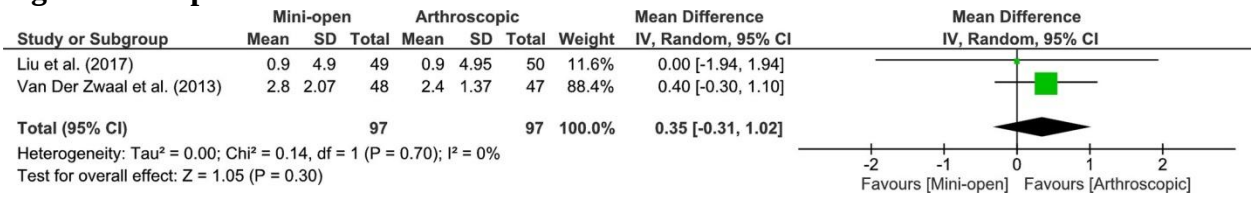
based on the discomfort experienced after surgery. No significant results among groups.

Fig.5 Forest plot better/improved pain.



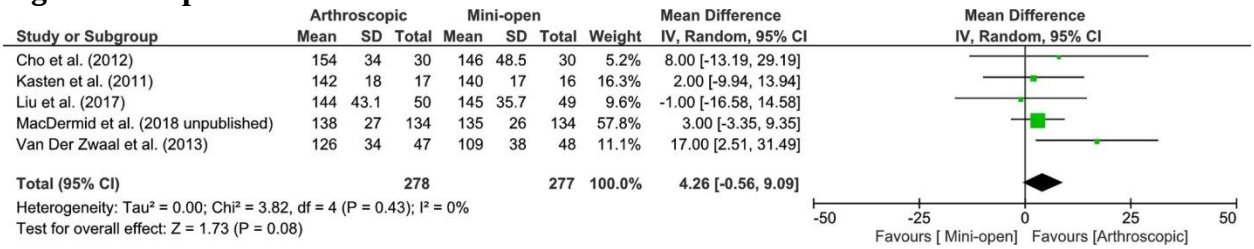
based on the discomfort experienced after surgery. there were no significant results among

Fig . 6 Forest plot



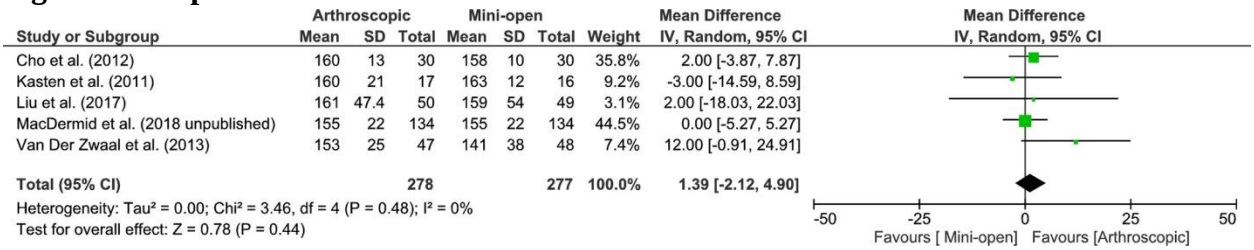
based on the discomfort experienced after surgery. There were results among the groups, and the quality was quite poor.

Fig .7 Forest plot



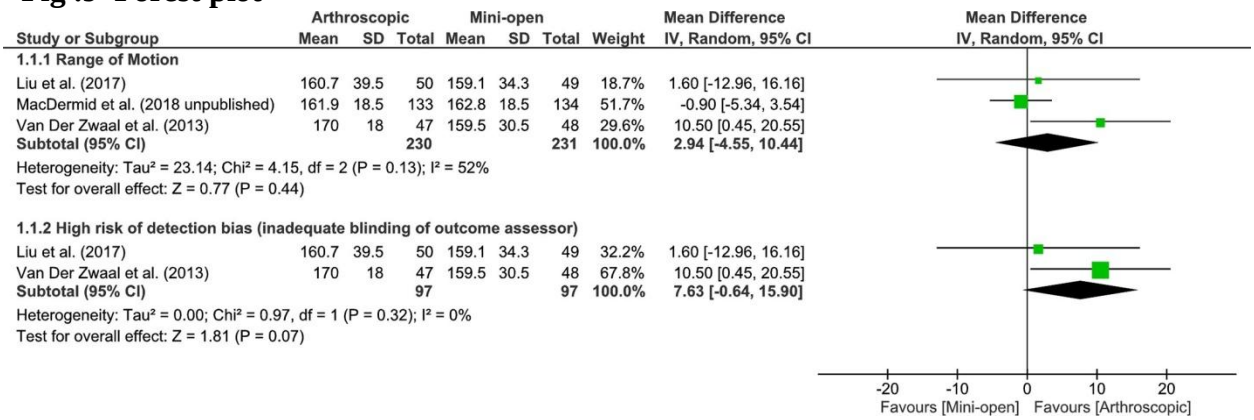
According to the Forward Flexion post-operative result. The combined findings revealed no significant results among the groups.

Fig . 8 Forest plot



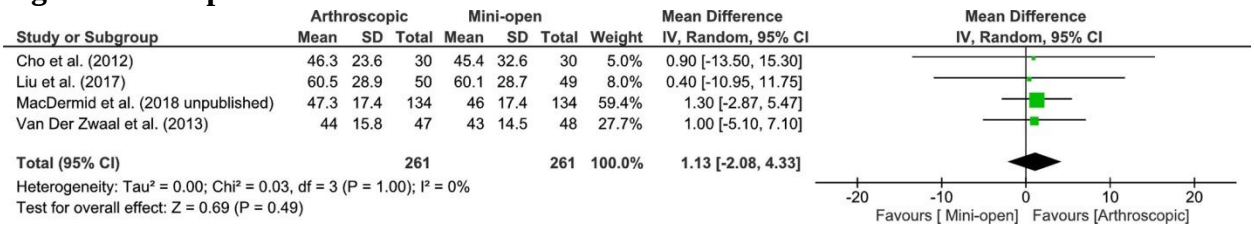
There was no significant results among the groups, according to the post-operative result (Forward Flexion).

Fig .9 Forest plot



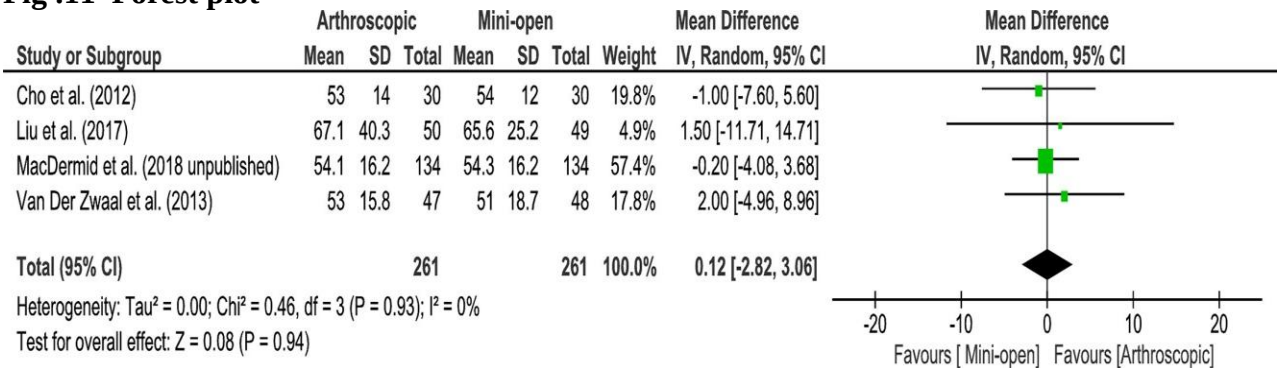
No significant results among groups was seen in the post-operative outcome (Forward Flexion), which was of extremely poor quality.

Fig . 10 Forest plot



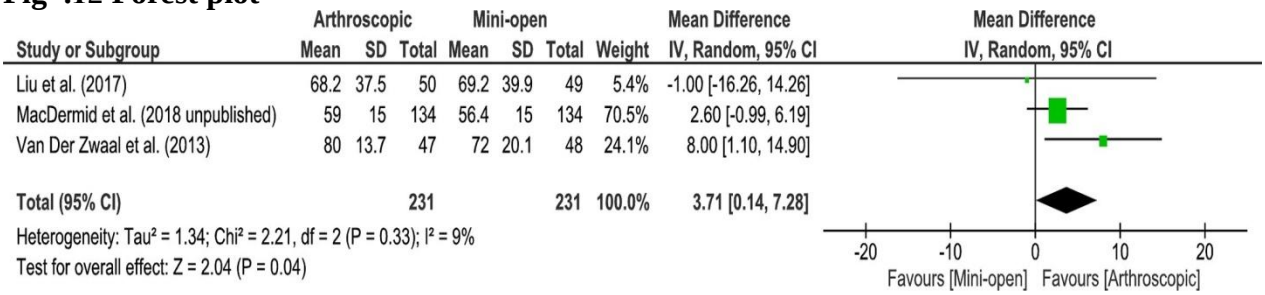
There was no results among the groups, according to the post-operative result (External Rotation).

Fig .11 Forest plot



No significant results among the groups could be seen in the combined data.

Fig .12 Forest plot



The combined data indicated that arthroscopic approach had a statistically significant increase in External Rotation compared to micro open procedure for postoperative outcome (External Rotation).

Discussion

Common rotator cuff injuries include discomfort, weakness, and restricted movement. A traumatic or degenerative rotator cuff injury is expected to affect 20.7% of the general population (aged 18 to 87). With age, this frequency will rise. Once all non-surgical options have been used up, there are various surgical methods for rotator cuff repair. These include all-arthroscopic rotator cuff repair,

mini-open procedures, and mini-open techniques with arthroscopic assistance. Based on Piper et al[8].

Over the last 20 years, the frequency of arthroscopic repairs has multiplied six-fold whereas the incidence of open repairs has climbed by 34%. These practices are currently thought of as the norm in healthcare. Although mini-open repairs have had good results, there are still concerns about the possibility of increased early postoperative discomfort, deltoid damage that might cause dislocation and/or weakening, and arthrofibrosis risk. Due to improvements in surgical methods and technology over the last ten years, doctors increasingly prefer an all-arthroscopic strategy. Even though research has proven that arthroscopic surgery is more patient-friendly and equally successful as mini-open surgery, there are still worries about the expense and the durability of bone-tendon fixation.Wang et al. 2020[9].

The contact area of the rotator cuff footprint and biomechanical strength at time zero have been improved with double row repair approaches compared to early arthroscopic repair methods that employed single row repair. Some studies suggest that two-row restorations have lowered failure rates, especially for significant rotator cuff tear patterns, despite conflicting clinical results for single- and double-row procedures[10].

Verma et al. (2006) determined that the open group had a higher retear rate for rips under 3 cm and a lower retear rate for rips exceeding 3 cm; the open group had a lower retear rate and the arthroscopy group had a higher retear rate. However, no statistically significant difference was seen in this case[11].

The high rotator cuff retear rate cannot be explained without considering a number of factors, including tear size, preoperative symptom duration, cuff degeneration, fixation method, and hardware used, despite the fact that we did not compare the outcomes of rotator cuff repair depending on tear size in the current research. The technical complexity and steep learning curve of rotator cuff arthroscopic repair require a considerable time to master. in Buss et al., 2005[12].

Conclusion: The differences between arthroscopic and mini-open rotator cuff repairs are not clinically significant at 3-, 6-, or 12-month follow-up. A surgeon's experience, the patient's value of aesthetics, and the surgeon's significance to the patient's financial condition should thus be taken into consideration when choosing the surgical approach.

Fund: **none**

References

1. Grabowski, M., Gosheger, G., Schorn, D., Schneider, K. N., Klingebiel, S., & Liem, D. (2020). How shoulder immobilization influences daily physical activity–an accelerometer based preliminary study. BMC Musculoskeletal Disorders, 21(1), 1-6.

2.Harrison, J., , C., Britt, H., Haines, T., & Malliaras, P. (2020). General practice management of rotator cuff related shoulder pain: a reliance on ultrasound and injection guided care. PloS one, 15(1), e0227688.

3. Fatima, Arooj, et al. (2022)"Effects of High-Energy Extracorporeal Shockwave Therapy on Pain, Functional Disability, Quality of Life, and Ultrasonographic Changes in Patients with Calcified Rotator Cuff Tendinopathy." BioMed Research International).

4. Donohue, K. W., Ricchetti, E. T., Ho, J. C., & Iannotti, J. P. (2018). The association between rotator cuff muscle fatty infiltration and glenoid morphology in glenohumeral osteoarthritis. JBJS, 100(5), 381-387.

5. Blanchard, N. P., & Brockmeier, S. F. (2022). Diagnostic Shoulder Arthroscopy and Arthroscopic Anatomy. In MRI-Arthroscopy Correlations (pp. 155-165). Springer, Cham.

6. Aleem, A. W., Chalmers, P. N., Bechtold, D., Khan, A. Z., Tashjian, R. Z., & Keener, J. D. (2019). Association between rotator cuff muscle size and glenoid deformity in primary glenohumeral osteoarthritis. JBJS, 101(21), 1912-1920.

7.Alexander, João Gabriel, and Josemberg da Silva Baptista.2020) "Coexistence of a rare case of a suprascapular artery with other vascular abnormalities: case report and potential surgical relevance." Surgical and Radiologic Anatomy 42 : 239-242.

8.Hubbard, T. J., Gowd, A. K., Kunkel, J., Kaplin, L., , J. B., Coates, K. E., ... & Waterman, B. R. (2021). Clinical outcomes of superior capsular reconstruction for massive, irreparable rotator cuff tears: a systematic review comparing acellular dermal allograft and autograft fascia lata. Arthroscopy, Sports Medicine, and Rehabilitation, 3(1), e257-e268.

9.Jack II, R. A., Ciccotti, M. C., Cohen, S. B., & Ciccotti, M. G. (2021). Full-Thickness rotator cuff tears in the throwing athlete. Operative Techniques in Sports Medicine, 29(1), 150800.

10.Kwon, D. R., Kim, K. L., & Moon, Y. S. (2022). Regeneration of Chronic Rotator Cuff Tear in a Rabbit Model: Synergetic Benefits of Human Umbilical Cord Blood-Derived Mesenchymal Stem Cells, Polydeoxyribonucleotides, and Microcurrent Therapy. BioMed Research International, 2022.

11.Laskovski, J., Abrams, J., Bogdanovska, A., Taliwal, N., Taylor, M., & Fisher, M. (2019). Arthroscopic rotator cuff repair with allograft augmentation: Making it simple. Arthroscopy Techniques, 8(6), e597-e603.

12.McDonald, J., & Peng, P. (2022). Regional Block for Pain Therapy in Shoulder. In Regional Nerve Blocks in Anesthesia and Pain Therapy (pp. 265-280). Springer, Cham.