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Comparative Study between Arthroscopic and Mini Open Repair of Rotator Cuff Tear

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Abstract

Rotator cuff tears are common amongst the elderly and athletes. Aim of the work : To assess the functional outcome of arthroscopic rotator cuff repair and mini-open rotator cuff repair. Correlation of any improvement of functional scores with all possible variables to predict factors affecting outcome. A systematic review was conducted in adult patients with rotator cuff tears other than massive or irreparable tears to compare clinical outcomes of patients undergoing all-arthroscopic versus mini-open rotator cuff repair. The review was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines. 15 studies evaluating arthroscopy and mini-open repair for rotator-cuff repair were included in the review . The included evidence was based on comparative studies assessing clinical outcomes or providing sub-group data on outcomes of interest in patients with rotator-cuff tear. ASES was used in 7 studies and showed to be increased post operation in both procedures the mean preoperative score was 36.1 , 34.2 in mini open and arthroscopic groups respectively which increased to 90.7, 88.89 post operative respectively .Pain was detected by VAS score in 9 studies and mean preoperative score was 6, 6.5 in mini open and arthroscopic groups respectively which decreased to 3, 2.6 post operative respectively. Arthroscopy repair and mini-open repair are associated with similar clinical outcomes. The choice of the operating technique depends upon the tear size and surgeon's preference.

Keywords: Arthroscopic, Mini open repair, Rotator cuff tear, Systematic review.

1. Introduction

The treatment of rotator cuff pathology has evolved with an improved understanding of rotator cuff anatomy, more sophisticated instrumentation, and advances in surgical technique. The most effective method of surgical repair is controversial given that both arthroscopic and mini-open rotator cuff repairs have been shown to produce satisfactory clinical results [1].

There has been growing interest in arthroscopic rotator cuff repair, and it is believed to be at least as effective as mini-open rotator cuff repair with the added advantages of reduced surgical morbidity, reduced postoperative stiffness, and, potentially, a more rapid return to baseline shoulder function once rotator cuff healing has occurred [2].

2. Aim of the work

To assess the functional outcome of arthroscopic rotator cuff repair and mini-open rotator cuff repair. Correlation of any improvement of functional scores with all possible variables to predict factors affecting outcome.

3.Material and method

3.1Study design

A systematic review was conducted in adult patients with rotator cuff tears other than massive or irreparable tears to compare clinical outcomes of patients undergoing all-arthroscopic versus mini-open rotator cuff repair. The review was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines.

Our search for these phrases returned 268,200,193, 24 and 5 manuscripts, respectively. We reviewed the abstracts of the manuscripts for mention of studies comparing all-arthroscopic and mini-open or arthroscopically assisted rotator cuff repair surgeries. after exclusion of non English articles, duplicated studies Fifteen research were included such manuscripts were found, and these were reviewed manually.

3.2 Data sources

A systematic literature search of electronic databases for relevant studies between 2000 to May 2019 was conducted through Embase, MEDLINE, Cochrane CENTRAL, and CINAHL. Studies published in English language were identified using search terms like 'rotator cuff', 'arthroscopy', 'mini-open', and 'supraspinatus'.

3.3Data Extraction and strategy

The principal outcomes of interest included details of operative time, postoperative functional outcomes (ASES, American Shoulder and Elbow Surgeons; UCLA, University of California at Los Angeles; Constant-Murley score), range of motion, pain score as well as reported complications (re tear rate, adhesive capsulitis).

3.4 Types of studies

We include randomized controlled trials, including cluster RCTs, controlled (non-randomized) clinical trials or cluster trials, prospective and retrospective comparative cohort studies. We exclude cross-sectional studies, case series, case reports and literature not in English.

3.5 Criteria of accepted studies

- Published only, full text articles and English literature only.
- Article type: clinical trial, comparative study and case study.

3.6 Exclusion criteria

- Duplicated articles for the same authors unless with longer follow up studies.

- Non-English papers.
- Articles with no clinical data.

4.Methods of the review

4.1Locating and selecting studies

Abstracts of articles identified using the above search strategy were viewed, and articles that appear to fulfill the inclusion criteria was retrieved in full, when there is a doubt, a second reviewer were assessed the article and consensus was reached.

4.2Statistical considerations:

Outcomes from included trials were combined using the systematic review manager software and manually screened for eligibility to be included. PRISMA flowchart was produced based on the search results and the inclusion/exclusion criteria [3].

5.Results

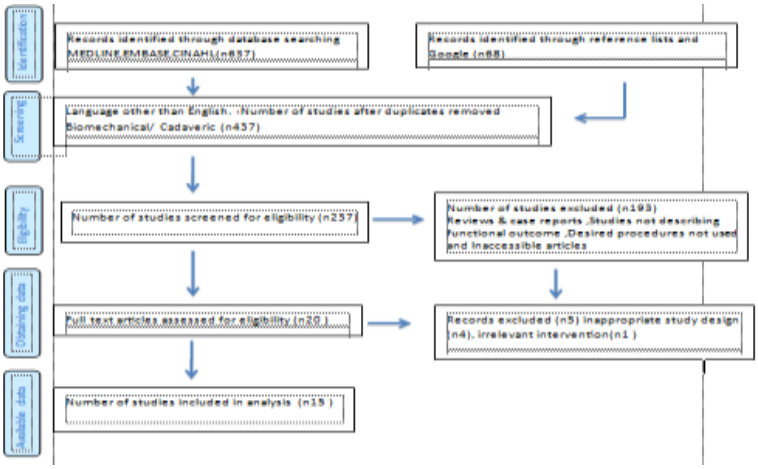

Fig (1) PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram for study selection.

Table (1) outcome measures analyzed by ULCA and ASES score

Author	Method	ASES pre	ASES post	UCLA pre	UCLA post
	Mini-open	ND	ND	ND	ND
Zayed Z(4)	Arthroscopic	ND	ND	ND	ND
	Mini-open	ND	91.2	ND	ND
Kholief (5)	Arthroscopic	ND	92.6	ND	ND
	Mini-open	ND	ND	ND	ND
Vicenti G (6)	Arthroscopic	ND	ND	ND	ND
	Mini-open	ND	ND	ND	ND
Liu J(7)	Arthroscopic	ND	ND	ND	ND
	Mini-open	ND	91	ND	ND
Fink Barnes LA (8)	Arthroscopic	ND	82.7	ND	ND
	Mini-open	42.3	89.9	9.94	28.4
Zhang Z(9)	Arthroscopic	39.55	91.34	10.01	30.94
	Mini-open	ND	ND	ND	ND
Van der Zwaal P (10)	Arthroscopic	ND	ND	ND	ND
	Mini-open	48.26	86.9	ND	ND
Kasten P (11)	Arthroscopic	44.3	81	ND	ND
	Mini-open	ND	ND	ND	11
Osti L (12)	Arthroscopic	ND	ND	ND	11
	Mini-open	ND	ND	10.6	28.8
Köse K.Ç (13)	Arthroscopic	ND	ND	11.2	29.76
	Mini-open	ND	ND	14	27
Pearsall AW(14)	Arthroscopic	ND	ND	14	24
	Mini-open	ND	95.1	ND	ND
Verma NN (15)	Arthroscopic	ND	94.6	ND	ND
	Mini-open	ND	90.2	ND	32.3
Youm T (16)	Arthroscopic	ND	91.1	ND	33.2
	Mini-open	ND	ND	ND	ND
Warner JJ (17)	Arthroscopic	ND	ND	ND	ND
Kim SH (18)	Mini-open	18	95	ND	33
	Arthroscopic	19	95	ND	33

Table (2) outcome measures analyzedby operative time and VAS score

Author	Method	Operative time\min	VAS(pain) Score re	VAS(pain) Score aftar
	Mini-open	70	ND	ND
Zayed Z	Arthroscopic	85	ND	ND
	Mini-open	ND	ND	4.6
Kholief A	Arthroscopic	ND	ND	1.73
	Mini-open	35.4	ND	6.9
Vicenti G	Arthroscopic	55.7	ND	6.1
	Mini-open	64.7	ND	2.6
Liu J	Arthroscopic	71.9	ND	2.9
	Mini-open	ND	ND	0.84
Fink Barnes LA	Arthroscopic	ND	ND	1.54
	Mini-open	ND	ND	ND
Zhang Z	Arthroscopic	ND	ND	ND
	Mini-open	ND	7	3.74
Van der Zwaal P	Arthroscopic	ND	6.9	3.28
	Mini-open	ND	ND	4.7
Kasten P	Arthroscopic	ND	ND	3.3
	Mini-open	32	ND	ND
Osti L	Arthroscopic	31	ND	ND
	Mini-open	ND	ND	ND
Köse K.Ç	Arthroscopic	ND	ND	ND
	Mini-open	ND	7.8	4.8
Pearsall AW	Arthroscopic	ND	7.8	3.9
	Mini-open	ND	ND	0.4
Verma NN	Arthroscopic	ND	ND	0.7
	Mini-open	ND	ND	ND
Youm T	Arthroscopic	ND	ND	ND
	Mini-open	ND	ND	ND
Warner JJ	Arthroscopic	ND	ND	ND
Kim SH	Mini-open	ND	3.2	1
	Arthroscopic	ND	4.2	0.7

Table (3) outcome measures analyzed by Murley score

Author	Method	Murley score pre	Murley score after	Forward flexion	External rotation	Internal rotation
	Mini-open	ND	79.8	150	65	30
Zayed Z	Arthroscopic	ND	82.1	155	70	35
	Mini-open	ND	ND	ND	ND	ND
Kholief A et al	Arthroscopic	ND	ND	ND	ND	ND
	Mini-open	39.5	75	ND	ND	ND
Vicenti G e	Arthroscopic	39	74	ND	ND	ND
	Mini-open	ND	50.9	159.1	69.2	ND
Liu J	Arthroscopic	ND	52.8	160.7	68.2	ND
	Mini-open	ND	ND	ND	ND	ND
Fink Barnes LA	Arthroscopic	ND	ND	ND	ND	ND
	Mini-open	ND	ND	ND	ND	ND
Zhang Z	Arthroscopic	ND	ND	ND	ND	ND
	Mini-open	42	62	107± 38	47 ± 23	ND
Van der Zwaal P	Arthroscopic	42	65.8	107 ± 38	46 ± 22	ND
Kasten P	Mini-open	ND	20.8	150	70 at 90 Abduction	ND
	Arthroscopic	ND	25.2	170	90 at 90 Abduction	ND
	Mini-open	ND	ND	157	126	38
Osti L	Arthroscopic	ND	ND	157	125	38
	Mini-open	45.6	79.56	ND	ND	ND
Köse K.Ç	Arthroscopic	46.2	83.56	ND	ND	ND
	Mini-open	ND	ND	ND	ND	ND
Pearsall AW	Arthroscopic	ND	ND	ND	ND	ND
	Mini-open	ND	ND	169.4	70.2	9.2
Verma NN	Arthroscopic	ND	ND	170.5	68.2	9.8
	Mini-open	ND	ND	ND	ND	ND
Youm T et al	Arthroscopic	ND	ND	ND	ND	ND
	Mini-open	ND	ND	150	50	ND
Warner JJ	Arthroscopic	ND	ND	145	50	ND
Kim SH	Mini-open	ND	ND	ND	ND	ND
	Arthroscopic	ND	ND	ND	ND	ND

Table (4) complications

Author	Method	complications number	type of complications
Zayed Z	Mini-open	1	Stiffness
	Arthroscopic	NO	NO
	Mini-open	5	Wound infection (2),stifness (3)
Kholief A	Arthroscopic	2	stifness
	Mini-open	2	retear
Vicenti G	Arthroscopic	1	retear
	Mini-open	4	retear (4), , adhesive capsulitis(8)
Liu J	Arthroscopic	5	retear (5), adhesive capsulitis(6)
	Mini-open	2	thickness defect
Fink Barnes LA	Arthroscopic	51	thickness defect
	Mini-open	7	retear
Zhang Z	Arthroscopic	17	NO
	Mini-open	14	Retear(6),Adhesive capsulitis (6),Biceps tendinopathy (1),(Superficial infection1)
Vander Zwaal P	Arthroscopic	15	Retear(8),Adhesive capsulitis (5),Biceps tendinopathy (1),Anchor pullout (1)
Kasten P	Mini-open	6	thinning of the tendon
	Arthroscopic	9	thinning of the tendon
	Mini-open	ND	ND
Osti L	Arthroscopic	ND	ND
	Mini-open	3	Retracted tears
Köse K.Ç	Arthroscopic	3	Retracted tears
	Mini-open	NO	NO
Pearsall AW	Arthroscopic	NO	NO
	Mini-open	9	retear (9),failed repairs (8)
Verma NN et al	Arthroscopic	9	retear(9),failed repairs (2)
	Mini-open	3	failed repairs (3)
Youm T	Arthroscopic	1	failed repairs (1)
	Mini-open	1	ND
Warner JJ	Arthroscopic	2	ND
Kim SH	Mini-open	2	Hypertrophic scar
	Arthroscopic	0	no

5.1Identification of relevant studies

15 studies evaluating arthroscopy and mini-open repair for rotator-cuff repair were included in the review . The included evidence was based on comparative studies assessing clinical outcomes or providing sub-group data on outcomes of interest in patients with rotator-cuff tear. Of the 15 included studies, 5 studies were retrospective studies, 2 RCTs and 8 prospective studies.

5.2Patient demographics

The majority of patients are diabetic and old age. A minority are traumatic. Preoperative patient characteristics did not show any significant difference between these two groups with respect to the number of patients, gender and age.

5.3Outcomes

The principal outcomes of interest included details of operative time, postoperative functional outcomes (ASES, American Shoulder and Elbow Surgeons; UCLA, University of California at Los Angeles; Constant-Murley score), range of motion, pain score as well as reported as shown in.

ASES was used in 7 studies and showed to be increased post operation in both procedures the mean preoperative score was 36.1 , 34.2 in mini open and arthroscopic groups respectively which increased to 90.7, 88.89 post operative respectively(table1)**.**

Mean operative time was 50.5 min in mini open group and was 60.9 min in arthroscopic group. (table2)

UCLA was used in 6 studies the mean preoperative score was 11.51, 11.73 in mini open and arthroscopic groups respectively which increased to 26.75, 26.9 post operative respectively Table (1).

Pain was detected by VAS score in 9 studies and mean preoperative score was 6, 6.5 in mini open and arthroscopic groups respectively which decreased to 3, 2.6 post operative respectively Table (2)**.**

Constant-Murley score was used in 6 studies the mean preoperative score was 42.3 , 42.4 in mini open and arthroscopic groups respectively which increased to 61.7, 63.5 post operative respectively Table (3)

5.4 Complications

Complications were founded in among 59 mini open group and in 115 arthroscopic group (stiffness and retear founded mainly in mini open group) (table4)

6. Discussion

The present study aimed to assess the functional outcome of arthroscopic rotator cuff repair and mini-open rotator cuff repair. Correlation of any improvement of functional scores with all possible variables to predict factors affecting outcome.

The present study is a qualitative description of the clinical results of published articles on arthroscopic and mini-open rotator cuff repairs.

The results of our review are consistent with the previously conducted systematic reviews [19],[21] concluding that the two techniques (mini-open rotator cuff repair and arthroscopic repair) have similar outcomes and can be considered as alternative treatment options.

In a study by Vermaet al., there was no difference in the outcome measure for VAS (pain) and ASES score between the intact and failed repair group, indicating that excellent symptomatic relief can be achieved regardless of tendon healing. However, significant differences existed between intact and failed repairs in the restoration of forward flexion, showing an adequate repair remains vital, if strength is to be restored[15].

In our review we found that Complications were founded in among 59 mini open group and in 115 arthroscopic group (stiffness and retear founded mainly in mini open group).

In a study by Chung et al[22]evaluating postoperative stiffness in 288 patients with full-thickness rotator cuff tears, patients who underwent mini-open repair had more stiffness compared to all-arthroscopic group at the final follow-up ($p= 0.02$).like our findings.

On the other hand another review by Nho SJ et al [23] appeared to be a higher percentage of complications in the mini-open group, including revision, arthrofibrosis, and postoperative impingement; however, the mini-open studies also tended to have longer follow-up, which might allow for a greater number of complications. In the retrospective cohort studies, there were approximately two times the number of revisions and cases of arthrofibrosis in the mini-open group. Specifically, there were four revisions and six cases of arthrofibrosis in the mini-open group, compared with two revisions and three cases of arthrofibrosis in the arthroscopic group.

Arthroscopic repairs are thought to be better able to reproduce rotator cuff anatomy because the three-dimensional evaluation allows for the recognition of tear configuration, thereby allowing the surgeon to formulate a strategy that is most appropriate for that particular pattern [24],[25].

In contrast, the visualization during a mini-open procedure is limited by the size of the lateral split, which may not allow adequate access to the rotator cuff and can compromise one's ability to perform necessary surgical releases, perhaps resulting in less-optimal repairs[26],[27].

Tear size is an important factor for achieving satisfactory results, with more patients with large or massive cuff tears obtaining unsatisfactory response outcomes [28].

Zhang et al.[9]noted that patients treated with arthroscopic group displayed better shoulder strength but a significantly higher retearing rate as compared to mini-open group at 24-month follow-up. For full-thickness tears, retearing rates were 74% for the arthroscopic group and 35% for the mini-open group ($p< 0.05$). For partial-thickness tears, no significant difference was detected.

Kim et al.[18] Conclude that surgical outcomes depend upon the size of the tear, rather than the method of repair. The operative time for arthroscopic repair was also significantly longer than that for mini-open repair [29]and this similar our finding.

Koseet al.[13]reported preference of mini-open repair due to its low cost and high patient satisfaction, while also providing similar results to arthroscopic surgery .

7. Conclusion

In conclusion, arthroscopy repair and mini-open repair are associated with similar clinical outcomes. The choice of the operating technique depends upon the tear size and surgeon's preference. Future research should focus on tear patterns, size, degree of delamination, mobility, and outcomes from surgical repair.

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