

ARTHROSCOPIC REPAIR OF FULL THICKNESS TEAR OF SUPRASPINATUS AND INFRASPINATUS TENDONS USING DOUBLE ROW SUTURE ANCHORS

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ABSTRACT:

Background: Lesions of the rotator cuff (RC) are a common occurrence affecting millions of people across all parts of the globe. RC tears are also rampantly prevalent with an age-dependent increase in numbers. Other associated factors include a history of trauma, limb dominance, contralateral shoulder, smoking-status, hypercholesterolemia, posture and occupational dispositions. The challenge lies in early diagnosis since a high proportion of patients are asymptomatic. Pain and decreasing shoulder power and function should alert the heedful practitioner in recognizing promptly the onset or aggravation of existing RC tears.

Aim of the work: The present study aims to conduct a systematic review and meta-analysis about arthroscopic repair outcomes in patients with full thickness rotator cuff tear, using double row suture anchor techniques.

Patients and Methods: Systematic review and Meta-analysis study. The literature search identified 50 studies for consideration; however, 7 studies were excluded following abstract screening. For the remaining studies, examination of the full-text manuscripts was conducted, and only 9 of the 33 articles met all eligibility criteria and were included in the analysis.

Results: The study yielded the following results: the average pain score improved from 7.4 points preoperatively to 0.7 point postoperatively. The subjective outcome was excellent or good in 220 (90.9%) of the 242 shoulders. the average increase in the Constant score after the operation was 25.4.

Conclusion: Nine studies were selected which met all eligibility criteria because of lack of studies containing these criteria. Also meta-analysis was used to get this conclusion. Nevertheless, this study does not include uniform studies as currently there is no consensus on same data of selected studies; however it includes repair by double row technique only.

Keywords: Arthroscopic repair, Infraspinatus tendons, Double row suture anchors.

INTRODUCTION

Lesions of the rotator cuff (RC) are a common occurrence affecting millions of people across all parts of the globe. RC tears are also prevalent with an age-dependent

increase in numbers. Other associated factors include a history of trauma, limb dominance, contralateral shoulder, smoking-status, hypercholesterolemia, posture and occupational dispositions⁽¹⁾.

Rotator cuff tear is frequent, mainly involving supraspinatus tendon. Although the exact pathogenesis is controversial, a combination of intrinsic factors proposed by Codman and extrinsic factors theorized by Neer is likely responsible for most rotator cuff tears⁽²⁾.

Magnetic resonance imaging remains the gold standard for the diagnosis of rotator cuff tears, but the emergence of ultrasound has revolutionized the diagnostic capability⁽²⁾.

Surgical repair of rotator cuff defects focuses on recreating the anatomy of the intact rotator cuff with tension-free reinsertion of the torn tendons. The final goal is to achieve tendon healing and painless recovery of shoulder function⁽³⁾.

In patients unresponsive to non-operative measures, surgical treatment of supraspinatus and infraspinatus tears provides satisfactory functional and anatomical outcomes⁽³⁾.

Even though mini-open rotator cuff repair is still commonly performed, and results are comparable to arthroscopic repair, all-arthroscopic repair of rotator cuff tear is now fast becoming a standard care for rotator cuff repair. Appropriate knowledge of pathology and healing pattern of cuff, strong and biological repair techniques, better suture anchors, and gradual rehabilitation of post cuff repair have led to good to excellent outcome after repair⁽²⁾.

In Arthroscopic technique, Failure rates with single-row arthroscopic repair were initially greater than with open surgery, as the insertion onto the greater tubercle could not be restored⁽⁴⁾.

To improve greater tubercle coverage, reconstruction solidity and tendon compression, double-row techniques were developed, but entail a risk of re-tear at the myotendinous junction, with increased operative time and complexity and

consequent higher costs challenging the cost/benefit ratio of the technique⁽⁴⁾.

It is hypothesized that independent double-row supraspinatus and infraspinatus repair facilitates surgery and improves results⁽⁴⁾.

AIM OF THE WORK:

The present study aims to conduct a systematic review and meta-analysis about arthroscopic repair outcomes in patients with full thickness rotator cuff tear, using double row suture anchor techniques.

MATERIALS AND METHODS:

Type of the study: Systematic review and Meta-analysis study.

Data sources and searches: The PUBMED (from 2000 to 2019), Cochrane Register of Controlled Trials, EMBASE (from 2000 to May 2019) and Scopus (2019) databases were searched. All related studies on the efficacy and safety of arthroscopic tear repair, DR repair and SB repair based on the following search terms were collected: (rotator cuff tear) AND (therapy OR surgery OR treatment OR complications OR adverse effect) AND clinical trial; (Rotator Cuff Injuries/adverse effect OR Rotator Cuff Injuries/surgery OR Rotator Cuff Injuries/treatment) AND clinical trial .

Inclusion criteria: The inclusion criteria were as follows:

- (1) Studies published in the English language;
- (2) Studies on supraspinatus and infraspinatus tears;
- (3) Arthroscopic repair;
- (4) Suture anchors usage;
- (5) 6 months to one year minimum follow up period.

Exclusion criteria:

Were as follows:

- (1) Case reports;
- (2) Conference presentations;
- (3) Editorials, reviews;
- (4) Expert opinions;
- (5) Cuff tear repaired by open surgery.

Outcome assessment: The primary

outcome for analysis was the functional and imaging studies (MRI) outcomes as (satisfaction, success rate, and healing rate).

Methods: The current review followed the guidelines of preferred reporting items for systematic reviews and meta-analysis statement 2009 (PRISMA)⁽⁵⁾. The detailed steps of methods were described elsewhere as well as PRISMA checklist⁽⁶⁾.

RESULTS:

Table (1): Summary of patients and study characteristics.

N	Author	No. of shoulders	Gender		Average age (yr)	Follow up time (average months)	Dominant shoulder
			Male	Female			
1	Cole et al (2007) ⁷	49 in 47 patient	28	19	57	32	35
2	Franceschi et al (2007) ⁸	26	16	10	59.6	22.5	19
3	Huijsmans et al (2007) ⁹	242 in 238 Patient**	131	107	59	22	151
4	Sugaya et al (2007) ¹⁰	86	52	34	60.5	31	63
5	Lafosse et al (2007) ¹¹	105 in 95 patient	47	48	52	36	76
6	Kirshnan et al (2008) ¹²	23	15	8	37	26	NR
7	El – Azab et al (2010) ¹³	20	10	10	58	14	18
8	Tashjian et al (2010) ¹⁴	49	26	23	59	16	34
9	Cho et al (2011) ¹⁵	123 in 120 patient	59	61	55.4	25.2	102

Table (2): Summary of types of tears in all studies.

N	Author	Size of tear				Muscles affected			Cause	
		Small <1cm	Medium 1-3cm	Large 3-5cm	Massive >5cm	Supra-spinatus only	Supra spinatus and infra spinatus	Supraspinatus and conçoitant muscles	Traumatic	Degenerative
1	Cole et al (2007) ⁷	9	29	2	9	41	8	NR	NR	NR
2	Franceschi et al (2007) ⁸	0	0	21	5	15	9	2 (with subsca).	NR	NR
3	Huijsmans et al (2007) ⁹	16	121	41	32	NR	NR	NR	109	NR
4	Sugaya et al (2007) ¹⁰	26	30	22	8	NR	NR	NR	NR	NR
5	Lafosse et al (2007) ¹¹	36	0	47	22	NR	NR	NR	NR	NR
6	Kirshnan et al (2008) ¹²	NR	NR	NR	NR	18	5	NR	22	NR
7	El – Azab et al (2010) ¹³	NR	NR	NR	NR	20	NR	NR	8	12
8	Tashjian et al (2010) ¹⁴	24	0	0	25	24	24	1 with teres minor	14	NR
9	Cho et al (2011) ¹⁵	11	59	44	9	NR	NR	NR	NR	NR

Table (3): Summary of operative details in all studies

N	Author	Average Time from injury to surgery (mon.)	Mean no. of anchor	Concomitant procedures				
				Subacromial decompression	Distal clavicle resection	Long head biceps tenodesis	Biceps tenotomy	Acromioplasty
1	Cole et al (2007) ⁷	17	NR	NR	NR	19	4	NR
2	Franceschi et al (2007) ⁸	3	2.3	NR	NR	NR	NR	NR
3	Huijsmans et al (2007) ⁹	14	NR	NR	16	11	13	NR
4	Sugaya et al (2007) ¹⁰	NR	3.3	86	NR	NR	NR	NR
5	Lafosse et al (2007) ¹¹	NR	3.7	105	NR	50	9	NR
6	Kirshnan et al (2008) ¹²	6	2.5	22	13	2	NR	NR
7	El – Azab et al (2010) ¹³	Degenerative 8mon Traumatic 3.5 mon	NR	20	NR	20	NR	7
8	Tashjian et al (2010) ¹⁴	3	3.88	32	NR	NR	NR	NR
9	Cho et al (2011) ¹⁵	NR	NR	NR	NR	Exclud ed	NR	NR

Arthroscopic repair of full thickness tear of Supraspinatus and infraspinatus tendons....

Table (4): Summary of primary outcomes in all studies(Efficacy).

N	Author	Success rate	Rehabilitation Duration			Constant score ¹⁶		ASES ¹⁵		VAPS ¹⁶		UCLA ¹⁷	
			Passive movement	Active movement	Complete recovery	Pre-operative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative
1	Cole et al (2007) ⁷	NR	1 st 4 wk	6 wks	4-6 mon	49	76	43	85	5.9	1.4	NR	NR
2	Franceschi et al (2007) ⁸	NR	1 st 4 wks	6 wks	10-12 wks	NR	NR	NR	NR	NR	NR	10.1	33.3
3	Huijsmans et al (2007) ⁹	NR	1 st wk	6 wks	10 wks	54.9	80	NR	NR	7.4	0.7	NR	NR
4	Sugaya et al (2007) ¹⁰	NR	1 st 6 wks	>6 wks	3 mon	NR	NR	42.3	94.3	NR	NR	14.5	32.9
5	Lafosse et al (2007) ¹¹	89%	First 3-4 wks	At wk 6	NR	43.2	80.1	NR	NR	4.7	12.8	NR	NR
6	Kirshnan et al (2008) ¹²	21 (90%)	1 st 4-6 wks	At wk 7	6 mon	NR	NR	42	92	NR	NR	NR	NR
7	El – Azab et al (2010) ¹³	16 (80%)	1 st 3 wks	3-6 wks	3 mon	46	80	42	84	6.3	1.2	1.9	6.6
8	Tashjian et al (2010) ¹⁴	25 (51%)	1 st 6 wks	>6 wks	3 mon	NR	NR	45.5	82.4	5.93	2.06	NR	NR
9	Cho et al (2011) ¹⁵	NR	1 st 6 wks	At 6 th wk	6 mon	48	80.3	NR	NR	6.2	2.2	13.2	29.7

Table (5): Summary of secondary outcomes in all studies (Complications).

N	Author	Retear	Wound infection	Frozen Shoulder	Neurovascular Complication
1	Cole et al (2007) ⁷	11 (22%)	0	0	0
2	Franceschi et al (2007) ⁸	8 (30.1%)	0	NR	0
3	Huijsmans et al (2007) ⁹	32(15.2%)	5	44	13
4	Sugaya et al (2007) ¹⁰	NR	NR	NR	NR
5	Lafosse et al (2007) ¹¹	NR	NR	NR	NR
6	Kirshnan et al (2008) ¹²	NR	1 (4%)	NR	NR
7	El – Azab et al (2010) ¹³	4(20%)	0	1(5%)	0
8	Tashjian et al (2010) ¹⁴	NR	NR	NR	NR
9	Cho et al (2011) ¹⁵	29(33.3%)	NR	NR	NR

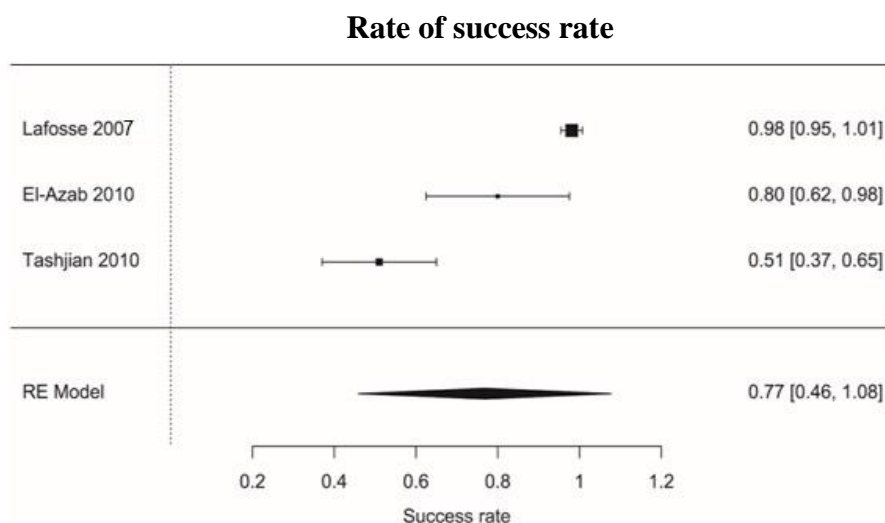


Diagram (1): Forest plot for the success rate. There is considerable heterogeneity across studies (Cochran Q P-value < 0.001, I-squared = 95.6%). Pooling of studies using a random effects model shows a success rate of 77% (95% CI = 46% to 100%).

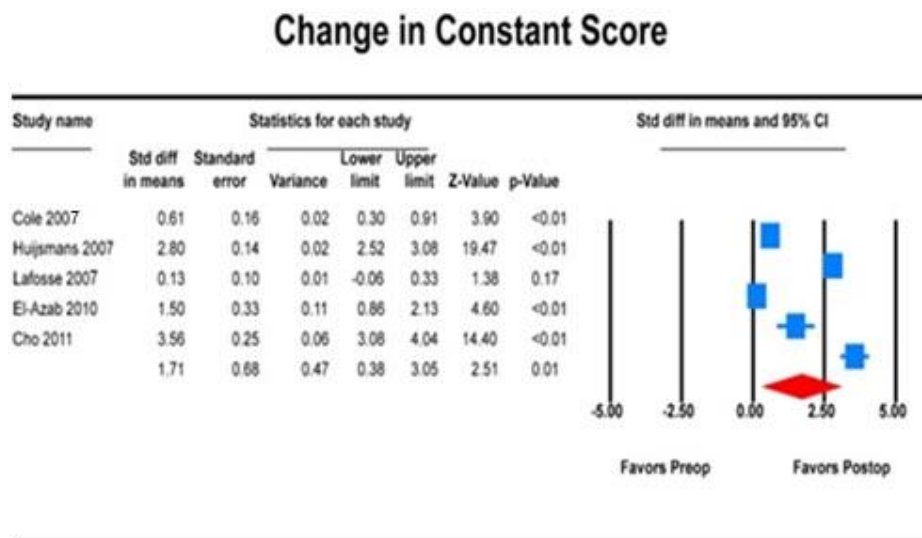


Diagram (2): Forest plot for change in Constant score. There is considerable heterogeneity across studies (Cochran Q P-value < 0.001, I-squared = 98.8%). Pooling of studies using a random effects model shows a statistically significant increase in Constant score after surgery (standardized mean difference = 1.71, 95% CI = 0.38 to 3.05, P-value = 0.01).

Change in ASES

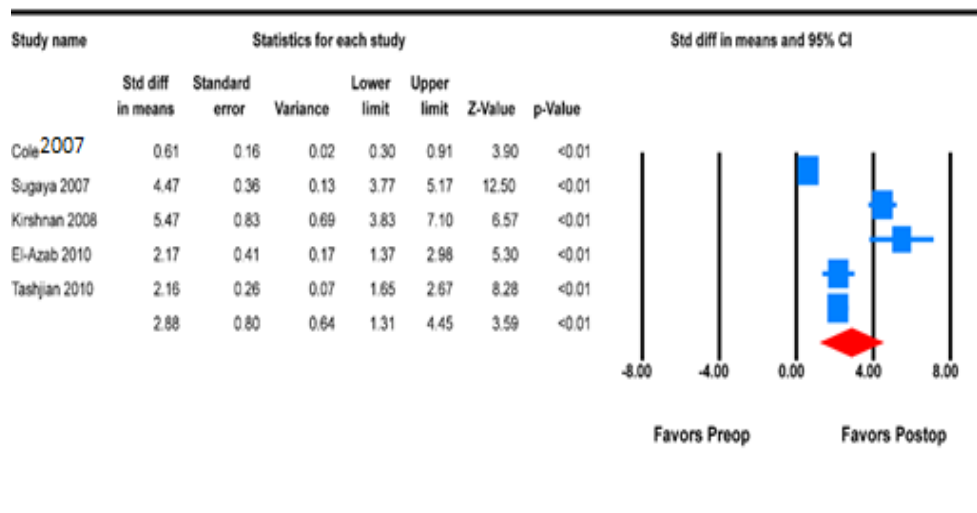


Diagram (3): Forest plot for the change in ASES. There is considerable heterogeneity across studies (Cochran Q P-value < 0.001, I-squared = 97.0%). Pooling of studies using a random effects model shows a statistically significant increase in ASES after surgery (standardized mean difference = 2.88, 95% CI = 1.31 to 4.45, P-value < 0.01).

Change in VAPS

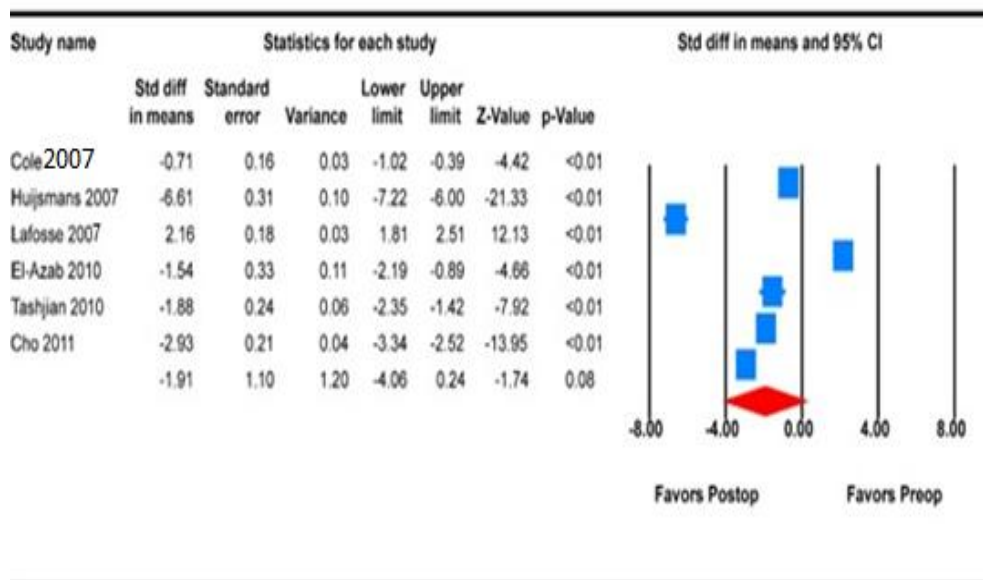


Diagram (4): Forest plot for change in VAPS. There is considerable heterogeneity across studies (Cochran Q P-value < 0.001, I-squared = 99.3%). Pooling of studies using a random effects model shows a decrease in VAPS after surgery (standardized mean difference = -1.91, 95% CI = -4.06 to 0.24) which did not reach statistical significance (P-value = 0.08).

Change in UCLA Score

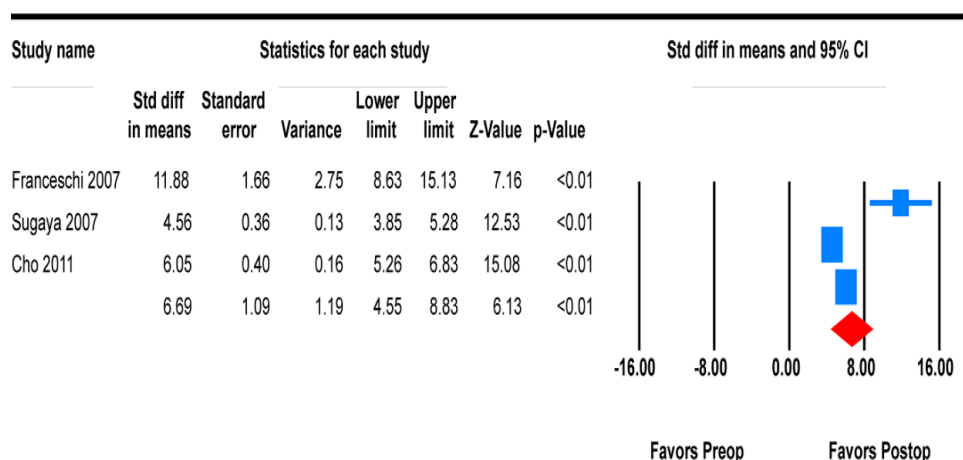


Diagram (5): Forest plot for change in UCLA score. There is considerable heterogeneity across studies (Cochran Q P-value < 0.001, I-squared = 91.4%). Pooling of studies using a random effects model shows a statistically significant increase in UCLA score after surgery (standardized mean difference = 6.69, 95% CI = 4.55 to 8.83, P-value < 0.01).

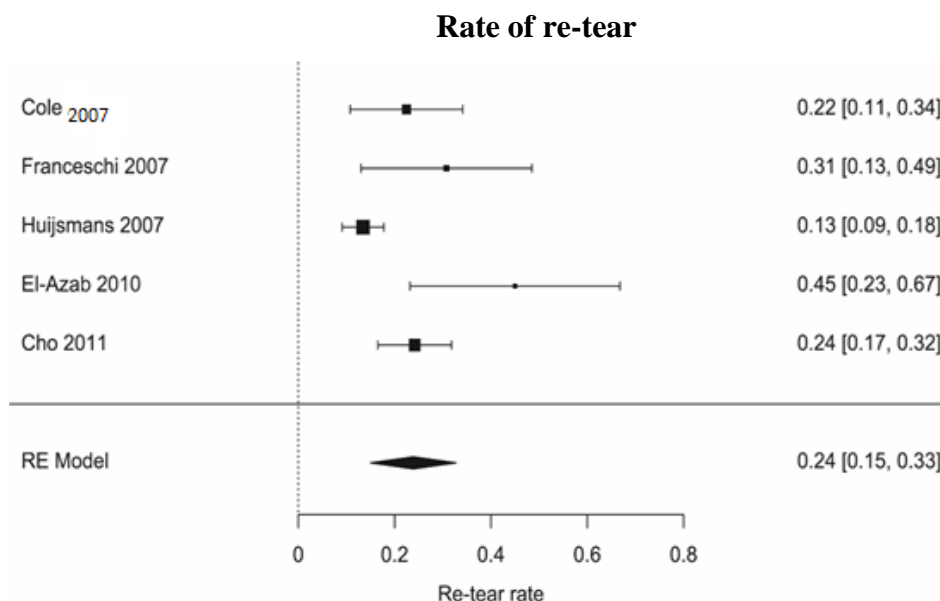


Diagram (6): Forest plot for the rate of re-tear. There is substantial heterogeneity across studies (Cochran Q P-value = 0.004, I-squared = 73.6%). Pooling of studies using a random effects model shows a re-tear rate of 24% (95% CI = 15% to 33%).

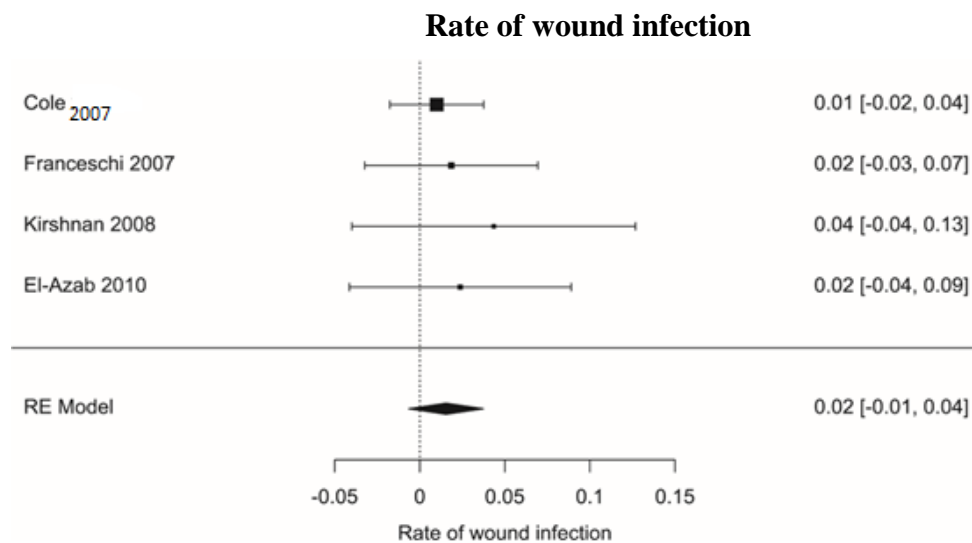


Diagram (7): Forest plot for the rate of wound infection. There is no heterogeneity across studies (Cochran Q P-value = 0.882, I-squared = 0%). Pooling of studies using a random effects model shows a wound infection rate of 2% (95% CI = 0% to 4%).

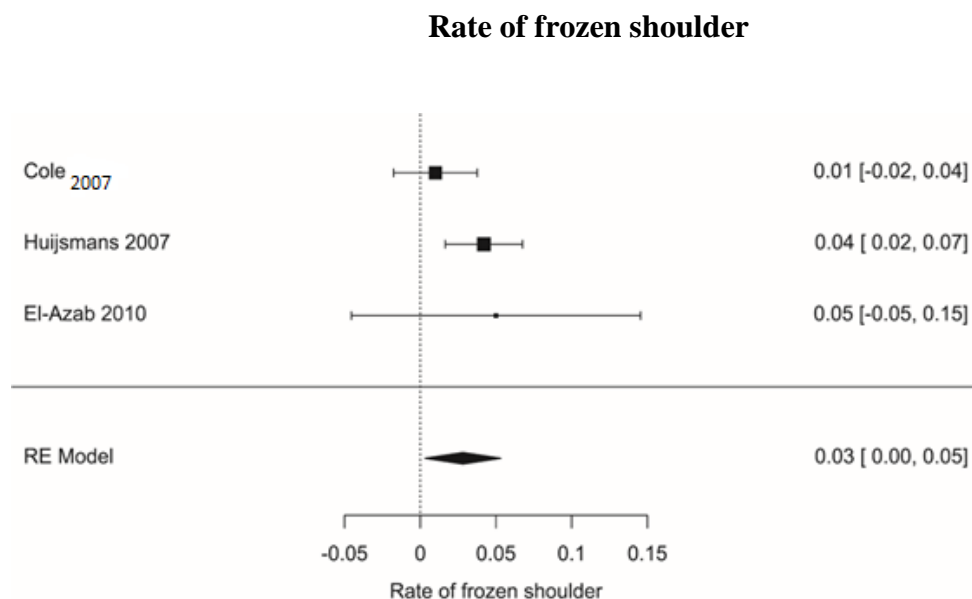


Diagram (8): Forest plot for the rate of frozen shoulder. There is unimportant heterogeneity across studies (Cochran Q P-value = 0.223, I-squared = 33.4%). Pooling of studies using a random effects model shows a frozen shoulder rate of 3% (95% CI = 0% to 5%).

DISCUSSION:

1- In Cole et al., (2007)⁷:

Regarding assessment of 138 patients

with symptomatic, full-thickness rotator cuff tears arthroscopic repair results at a minimum of 2 years postoperatively, were prospectively enrolled in **Cole et al.**, study.

The strength of the unaffected contralateral shoulder was measured as a control.

All patients underwent at a minimum of 2 years follow-up, repair integrity was evaluated using MRI.

Exclusion criteria: included a history of previous shoulder operation, ipsilateral greater tuberosity or clavicle fracture, ongoing litigation, concomitant tears in the labrum, subscapularis or teres minor tear, and adhesive capsulitis.

Limitations of the study included: most notably, the fact that only 32 of 49 patients had follow-up data at 1 year. Authors recognized that their findings of significant improvement in multiple areas from year 1 to year 2 might have been significantly different had a complete data set been available for analysis. Furthermore, they recognize that their inability to detect significant differences between intact and re-tear groups with respect to Constant, ASES and VAPS scores may have resulted from limited power and sample size.

The study yielded the following results: there were 49 evaluated shoulders in 47 consecutive patients. The American Shoulder and Elbow Surgeons score, Constant and Murley score and Visual Analog Pain Scale all improved significantly ($P < .001$) between the preoperative and final follow-up evaluations. MRI found 22% of repairs had recurrent tears. The presence of a recurrent tear correlated significantly with patient age ($P < .009$) and extension of the tear to the infraspinatus ($P < .009$). At minimum 2-year follow-up, arthroscopic repair of rotator cuff tears produced significant improvements in both patient-derived and objectively measured variables.

2- In Franceschi et al., (2007)⁸:

Franceschi et al., hypothesized that there is no difference in clinical and imaging outcome between single-row and double-row suture anchor technique repairs of

rotator cuff tears; therefore, a randomized controlled trial was conducted.

The authors recruited 60 patients. In 30 patients, rotator cuff repair was performed with a single-row suture anchor technique (group 1). In the other 30 patients, rotator cuff repair was performed with a double-row suture anchor technique (group 2).

Patients were included in the study who had a rotator cuff tear diagnosed on clinical grounds, no episodes of shoulder instability, no radiographic signs of fracture of the glenoid or the greater or lesser tuberosity, MRI evidence of cuff tear, duration of symptoms of at least 3 months, inadequate response to non-operative management and an un-retracted and sufficiently mobile full-thickness rotator cuff lesion to allow a double-row repair found at the time of surgery.

Patients were **excluded** from the study if they had inflammatory joint disease, retracted and insufficient mobile lesions to allow a double-row repair found at the time of surgery, prior surgery on the affected shoulder, or inability to complete questionnaires because of language problem or cognitive disorder.

Regarding **strengths and limitations**, authors acknowledged that they did not perform a formal power analysis, and that they planned the choice of the number of patients to enroll in the study according to what they know their unit could deliver within the time they chose to allocate to the study. However, despite this partial weakness of the present investigation, their selection and recruitment process, their assessment criteria, and their follow-up were extremely rigorous, and performed in strict scientific fashion. Also, with the numbers of patients enrolled, the results of their study are unequivocal.

Franceschi et al., concluded that single- and double-row techniques provide comparable clinical outcome at 2 years. A

double-row technique produces a mechanically superior construct compared with the single-row method in restoring the anatomical footprint of the rotator cuff, but these mechanical advantages do not translate into superior clinical performance.

3- In Huijsmans et al., (2007)⁹:

Regarding arthroscopic rotator cuff repair with double-row fixation, 264 patients underwent an arthroscopic rotator cuff repair with double-row fixation.

Conservative treatment had failed for all of the chronic rotator cuff tears included in this study. Patients younger than 60 years of age who had a full-thickness tear for less than 3 months following a traumatic event.

Patients with an identifiable tear of the subscapularis tendon were excluded from this study.

The study yielded the following results: the average pain score improved from 7.4 points preoperatively to 0.7 point postoperatively. The subjective outcome was excellent or good in 220 (90.9%) of the 242 shoulders. the average increase in the Constant score after the operation was 25.4.

Ultrasonography demonstrated an intact rotator cuff in 83% (174) of the shoulders overall, 47% (fifteen) on the thirty-two with a repair of massive tear, 78% (thirty-two) of the forty-one with a repair of a large tear, 93% (113) of the 121 with a repair of a medium tear, and 88% (fourteen) of the sixteen with a repair of a small tear. Strength and active elevation increased significantly more in the group with an intact repair at the time of follow-up.

Huijsmans et al., concluded that arthroscopic rotator cuff repair with double-row fixation can achieve a high percentage of excellent subjective and objective results. Integrity of the repair can be expected in the majority of the shoulders treated for a large, medium, or small tear, and the strength and range of motion provided by an intact repair

are significantly better than those following a failed repair.

4- In Sugaya et al., (2007)¹⁰:

Regarding repair integrity and functional outcome after arthroscopic double-row rotator cuff repair, a consecutive series of 106 patients with full-thickness rotator cuff tears underwent arthroscopic double-row rotator cuff repair with use of suture anchors and were followed prospectively.

The criteria for **inclusion** in this study were a full-thickness rotator cuff tear between one and two years postoperatively along with a preoperative magnetic resonance imaging scan. Forty-four patients were **excluded**, and 106 patients were enrolled in this study. Of those patients, twenty were lost to follow-up before two years postoperatively or were unable to have a postoperative magnetic resonance imaging scan.

The study yielded the following results: the average clinical outcome scores all improved significantly at the time of the final follow-up ($p < 0.01$). At a mean of fourteen months postoperatively, magnetic resonance imaging revealed that the retear rate was 5% for small-to-medium tears, while it was 40% for large and massive tears. The shoulders with a type-V repair demonstrated significantly inferior functional outcome in terms of overall scores and strength compared with the other types of repairs ($p < 0.01$).

Sugaya et al., concluded that arthroscopic double-row repair can result in improved repair integrity. However, the retear rate for shoulders with large and massive tears remains higher than that for smaller tears, and shoulders with large repair defects (type V) demonstrate significantly inferior functional outcomes.

5- Lafosse et al., (2007)¹¹:

Regarding the outcome and structural

integrity of arthroscopic rotator cuff repair with use of the double-row suture anchor technique, a prospective series of 105 consecutive shoulders undergoing arthroscopic double-row rotator cuff repair of the supraspinatus or a combination of the supraspinatus and infraspinatus were evaluated at a minimum of two years after surgery.

The study yielded the following results: The mean Constant score (and standard deviation) was 43.2 ± 15.1 points preoperatively and 80.1 ± 11.1 points postoperatively. Twelve of the 105 repairs failed. Intact rotator cuff repairs were associated with significantly increased strength and active range of motion.

Lafosse et al., concluded that Arthroscopic repair of a rotator cuff tear with use of the double-row suture anchor technique results in a much lower rate of failure than has previously been reported in association with either open or arthroscopic repair methods. Patients with an intact rotator cuff repair have better pain relief than those with a failed repair. After repair, large and massive rotator cuff tears result in more postoperative weakness than small tears do.

6- Krishnan et al., (2008)¹²:

Regarding arthroscopic repair of full-thickness tears of the rotator cuff in 23 patients younger than 40 years, authors retrospectively reported results and mean follow-up was 26 months.

Regarding **strengths and limitations**, this is a retrospective review, but the lack of a dedicated control group is a limitation, there were a number of concomitant procedures being performed in addition to RCT repair.

The study yielded the following results: Twenty-one patients (90%) returned to their previous level of activity and employment, including 9 (90%) with WC claims. All patients (100%) reported

diminished pain, and 22 (95%) reported improvement with activities of daily living. Given the choice, 22 patients (95%) would have same procedure again.

Krishnan et al., concluded that excellent outcomes were observed following arthroscopic rotator cuff repair both with and without concomitant procedures. Successful repair returns patients to their pre-injury level of function.

7- In El-Azab et al., (2010)¹³:

Regarding Assessment of repair integrity and clinical outcome after arthroscopic repair of rotator cuff tears in double-row suture-bridge technique with the use of a new knotless suture-anchor system, The first treated 25 patients with arthroscopic rotator cuff repair in the suture-bridge technique using a novel knotless anchor and chain-link suture system were evaluated. Patients with isolated full-thickness supraspinatus tears were selected. They were followed clinically with functional scores (Constant score, ASES index), visual analog scale (VAS). The repair integrity was evaluated with MRI at an average of 14 months postoperatively.

Inclusion criteria were patients with symptomatic isolated full-thickness SSP-tears, failed to improve to initial conservative treatment (physiotherapy and analgesics). Findings were confirmed during surgery, and the tendon repair was performed with a complete reconstruction in double-row suture-bridge technique.

Exclusion criteria were combined tendon tears (subscapularis, infraspinatus or teres minor tears), partial-thickness SSP lesions, incomplete repair of the SSP, humeral head or glenoid fracture, patients with shoulder instability, osteoarthritis of the shoulder, rheumatoid arthritis, recurrent rotator cuff tears or previous surgery on the rotator cuff and cuff arthropathy.

Complications: there were no intraoperative or perioperative

complications. One patient developed a secondary frozen shoulder 3 months postoperatively, which was successfully conservatively treated with oral prednisolone for 4 weeks and physiotherapy.

Regarding **strengths and limitations**, weaknesses in this study include the overall small sample size. The short-term follow-up may also influence results, in particular the clinical outcomes. However, according to Goutallier et al., we do not expect a re-tear of the rotator cuff to occur later than 14 months postoperatively. Another limitation of this study was the small number of failures; therefore, comparisons between both groups of repair regarding functional results cannot yield a powerful conclusion. However, a powerful issue in this study is the selection of isolated SSP-tears, as most of the studies present the outcome of rotator cuff repair with multiple tendon involvement, which may lead to a bias of their results.

The study yielded the following results: significant improvement of pain, strength, range of motion, and functional scores occurred ($P < 0.05$). There was a re-tear rate of 20%. The subjective parameters (VAS and ASES Index) showed non-significant (n.s.) differences between the re-tear and intact repair groups, whereas the objective parameters (Constant score, muscle power and active ROM) showed significant differences between both groups ($P < 0.05$).

El-Azab et al., concluded that the functional outcome has improved significantly with this new knotless anchor-chain system and was more superior in shoulders with intact repair, whereas the resulted repair integrity was not better than other types of double-row repair techniques mentioned in the recent literature. However, this early report of the novel technique may show limited power for comparison due to the relatively small sample size.

8- Tashjian et al., (2010)¹⁴:

Regarding factors affecting healing rates after arthroscopic double-row rotator cuff repair, **Tashjian et al.**, conducted case series study. 48 patients (49 shoulders) who had a complete arthroscopic rotator cuff repair (double-row technique) were evaluated with ultrasound at a minimum of 6 months after surgery. Outcome was evaluated at a minimum of 1-year follow-up with standardized history and physical examination, visual analog scale for pain, active forward elevation, and preoperative and postoperative shoulder scores according to the system of the ASES. Quantitative strength was measured postoperatively.

Patients were **included** with primary repairs in which a complete double-row repair was successfully performed. **Exclusion** criteria included revision repairs, partial repairs, repairs involving only margin convergence, or tears in patients with inflammatory diseases.

Regarding **strengths and limitations**, limitations of this study include the overall study size. Although 49 shoulders, including 25 massive tears, is not an extremely small sample, several evaluated correlations may have been insignificant because of a lack of power. A second limitation is the lack of preoperative MRI scans that would allow an analysis of muscle quality on healing status. A third possible limitation is the relatively short minimum ultrasound follow-up for patients (6 months). A fourth limitation is that a relatively unique suture configuration was used to attempt to replicate a Mason-Allen stitch. This technique has not been used by other authors; it may have an effect on healing; and it may limit the ability to compare the results with other double-row studies using other suture patterns. A final limitation regards the comparison of their results to those of the historical control population of single-row repairs of massive rotator cuff tears.

The study yielded the following results: ultrasound and physical examinations were performed at a minimum of 6 months after surgery (mean, 16 months) and outcome questionnaire evaluations at a minimum of 12 months after surgery (mean, 29 months). Of 49 repairs, 25 (51%) were healed. Healing rates were 67% in single-tendon tears (16 of 24 shoulders) and 36% in multitenon tears (9 of 25 shoulders). Older age and longer duration of follow-up were correlated with poorer tendon healing ($P=.03$). Visual analog scale for pain, active forward elevation, ASES scores, and Simple Shoulder Test scores all had significant improvement from baseline after repair ($P<.0001$).

Tashjian et al., concluded that increased age and longer duration of follow-up were associated with lower healing rates after double-row rotator cuff repair. The biological limitation at the repair site, as reflected by the effects of age on healing, appears to be the most important factor influencing tendon healing, even after maximizing repair biomechanical strength with a double-row construct.

9- Cho et al., (2011)¹⁵:

Regarding arthroscopic rotator cuff repair using a suture bridge technique, **Cho et al.,⁽¹⁵⁾** conducted a case series study. To evaluate the clinical results and repair integrity after arthroscopic rotator cuff repair using a suture bridge technique for patients with rotator cuff tears, 123 shoulders (120 patients) that underwent arthroscopic suture bridge repair for full-thickness rotator cuff tear were enrolled for this study. The mean duration of follow-up was 25.2 months (range, 16-34 months). The postoperative repair integrity was analyzed with use of magnetic resonance imaging (MRI) in 87 shoulders. According to the retear patterns on postoperative MRI, the cases were divided into type 1 (failure at the original repair site) or 2 (failure around the medial row).

Regarding **strengths and limitations**, **Cho et al.,⁽¹⁵⁾** study has a few limitations. First, being retrospective in nature. However, we conducted a retrospective analysis of the prospectively collected patients' data on surgical procedures performed by a single surgeon. Second, with regard to preoperative or postoperative imaging evaluation, analysis of the postoperative repair integrity by use of MRI was not conducted in all cases.

The study yielded the following results: at the last follow-up, the University of California at Los Angeles (UCLA) score improved from the preoperative mean of 13.2 points to 29.7 points ($P<.001$). The rotator cuff was completely healed in 58 (66.7%) of the 87 shoulders, and there was a recurrent tear in 29 shoulders (33.3%). The incidence of retear tended to increase with age older than 60 years at the time of surgery ($P=.002$). When there was a larger intraoperative tear, the rate of retear was also higher ($P=.002$). When the severity of preoperative fatty degeneration of the cuff muscles was higher, there was a greater chance of a recurrent tear ($P<.001$). The retear patterns on postoperative MRI in 29 shoulders with recurrent failures were classified as type 1 in 12 shoulders (41.4%) and type 2 in 17 shoulders (58.6%). The preoperative cuff tear size did not have an influence on retear patterns ($P=.236$), but the percentage of type 1 retear increased with the severity of fatty degeneration or muscle atrophy ($P=.041, .023$).

Cho et al.,⁽¹⁵⁾ concluded that arthroscopic suture bridge repair of full-thickness rotator cuff tears led to a relatively high rate of recurrent defects. However, the mean 25-month follow-up demonstrated excellent pain relief and improvement in the ability to perform the activities of daily living, despite the structural failures. The factors affecting tendon healing were the patient's age, the size and extent of the tear, and the presence of fatty degeneration in the

rotator cuff muscle. The retear in cases with a suture bridge technique tended to be more frequently at the musculo-tendinous junction.

Conclusion:

The present study is considered as a step in the way of the rotator cuff repair through arthroscopic technique with double row construct which has more advantages than one row instruct as the best choice to treat the rotator cuff tear with high success rate, fair satisfaction and good healing.

Nine studies were selected which met all eligibility criteria because of lack of studies containing these criteria. Also meta-analysis was used to get this conclusion. Nevertheless, this study does not include uniform studies as currently there is no consensus on same data of selected studies; however it includes repair by double row technique only.

The results of this study suggest **Success rate** using double row technique 77.5% in average.

To assess the primary outcomes, it is reported:

Constant score⁽¹⁶⁾ with 48.12 average and 79.3 average preoperatively and postoperatively respectively, Regarding **ASES**⁽¹⁷⁾ (**American Shoulder and Elbow Surgeons**) with 42.94 average and 87.54 average preoperatively and postoperatively respectively, Regarding **VAPS**⁽¹⁸⁾ (**Visual analog Scale**) with 6.07 average and 3.39 average preoperatively and postoperatively respectively

And regarding **UCLA**⁽¹⁹⁾(**University of California Los Angeles.**) with 9.93 average and 25.63 average preoperatively and postoperatively respectively.

Also regarding 2ry outcomes:

Re-tear is reported with average 24.12 %; **Wound Infection** is reported with (3.2%); **Frozen shoulder** with (12.97%) average and **neurovascular complication** is reported in

with (6.19%).

However, the results of the present study were affected by some limitations as the low sample size, the narrow period of the study, limited specific published studies concerning comparison between single row technique and double row technique.

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إصلاح بالمنظار للقطع الكامل السماكة بوتر العضلتين فوق الشوكة وتحت الشوكة باستخدام خطاطيف مزدوجة الصف

الخلفية: إصابات الطوق الدوار بالكتف هي أمر شائع يصيب ملايين الأشخاص في جميع أنحاء العالم. أيضًا توجد الإصابات بشكل كبير مع زيادة في الأعداد تعتمد على العمر. وتشمل العوامل الأخرى المتعلقة مثل حدوث إصابات أو حوادث من قبل و الطرف المهيمن ، والكتف المقابل ، و التدخين ، زيادة نسبة الكوليسترول في الدم ، و وضعية الجسم والتصرفات المهنية . يكمن التحدي في التشخيص المبكر لأن نسبة عالية من المرضى لا تظهر عليهم أعراض. الألم وتقليل قوة الكتف ووظيفته عوامل تنبه الطبيب اليقظ في التعرف فوراً على بداية أو تفاقم تمزقات الطوق الدوار الموجودة بالكتف.

هدف العمل: تهدف الدراسة الحالية إلى إجراء مراجعة منهجية وتحليل بُعدى لنتائج الإصلاح بالمنظار في المرضى الذين يعانون من التمزق الكامل السماكة للطوق الدوار بالكتف ، باستخدام الخطاطيف المزدوجة الصف المرضى والطرق: مراجعة منهجية ودراسة التحليل البُعدى. حدد البحث خمسين دراسة للنظر فيها؛ ومع ذلك، تم استبعاد سبعة دراسات بعد الفحص التجريدي. بالنسبة للدراسات المتبقية، تم إجراء فحص للمخطوطات ذات النص الكامل، واستوفت تسع مقالات فقط من ثلاثة وثلاثون مقالة جميع المعايير وتم تضمينها في التحليل.

النتائج: أسفرت الدراسة عن النتائج التالية: تحسن متوسط درجة الألم من ٧،٤ نقطة قبل الجراحة إلى ٧،٠ نقطة بعد الجراحة. كانت النتيجة الذاتية ممتازة أو جيدة في ٢٢٠ (٩٠،٩٪) من ٢٤٢ كَتَفًا. كان متوسط الزيادة في النتيجة الثابتة بعد العملية ٢٥،٤.

الخلاصة: تم اختيار تسع دراسات استوفت جميع المعايير بسبب نقص الدراسات التي تحتوي على هذه المعايير. كما تم استخدام التحليل البُعدى للحصول على هذا الاستنتاج. ومع ذلك، لا تشمل هذه الدراسة دراسات موحدة حيث لا يوجد إجماع حاليًا على نفس البيانات من الدراسات المختارة؛ ومع ذلك فجميعهم يشمل الإصلاح بتقنية الخطاطيف المزدوجة الصف فقط.