ORIGINAL ARTICLE

Integrity & Functional Outcome after Massive Rotator Cuff Repair in Double Row Repair Manner: A Prospective Study.

Arsalan Ahmed Abro[1], Muhammad Sufyan[2], Matiullah Shah[3], Muhammad Mairaj Khan[4], Kazim Rahim Najjad[5], Syed Kamran Ali Shah[6], Hifza Bashir[7]

[1]Senior Registrar, Department Orthopaedic, K-Block, Liaquat National Hospital, Karachi
[2]Assistant Professor, Department Orthopaedic, K-Block, Liaquat National Hospital, Karachi.
[3]Sports Fellow, Department Orthopaedic, K-Block, Liaquat National Hospital, Karachi.
[4,7]House Officer, Department Orthopaedic, K-Block, Liaquat National Hospital, Karachi.
[5]Associate Professor, Department Orthopaedic, K-Block, Liaquat National Hospital, Karachi
[6]Assistant Professor, Department Fazaia Ruth Pfau Medical College, Faisal Hospital, Base Faisal, Shah Rah e Faisal, Karachi

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Each author of this article fulfilled ALL 04 Criteria of Authorship:
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2. Drafting the manuscript or revising it critically for important intellectual content.
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Corresponding author:
Arsalan Ahmed Abro
E-mail: arsalanabro@yahoo.com

ABSTRACT

Objective: To assess the efficacy of shoulder cuff restoration by means of arthroscopic repair in dual row repair fashion and demonstrate 30 months practical result using a scoring system based on modified American Shoulder & Elbow Score System (ASES)

Materials And Methods: This is a descriptive cross-sectional study and includes 23 patients who underwent repair of massive rotator cuff tears in double row manner arthroscopically. Study was carried out at Liaquat National Hospital during January 2018 June 2019 at orthopedics department. The clinical evaluation was done by the operative surgeon on the patients reported for surgery in outpatient department pre-operatively and then at follow up postoperatively at 6 weeks, 3 months, 6 months ,1 year and final evaluation done on average of 30 months. Preoperative and postoperative functional evaluation done and compared by assessing the function on basis of a scoring system based on modified ASES score

Results: The average functional outcome scores based on Patient Self Assessed Questionnaire improved significantly at the time of the final follow-up ($p < 0.01$). 12 months postoperatively, repair integrity was assessed by magnetic resonance imaging, which revealed that 16 patients had a type-I repair; 2 patients had a type II repair, while only 1 patient had type III repair. As per this study Re tear rate was 5% for large and massive tears. The shoulders with a type-III repair demonstrated significantly inferior functional outcome in terms of overall scores and strength compared with the other types of repairs ($p< 0.01$).

Conclusion: In this study, we found arthroscopic double row repair technique is an effective procedure in terms of massive rotator cuff tears repair with very little risk of re-tear and significant improvement in functional activities.

Keywords: Rotator cuff repair, Modified American shoulder & elbow score system (ASES), Dual row repair

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INTRODUCTION

Rotator cuff tendons are the key stabilizers of shoulder articulation and injuries to these tendons are quite common, and most prevalent is supraspinatus amongst all of them. Rotator cuff tear having symptoms as well require surgical intervention, hence arthroscopic double row repair technique has shown better clinical outcomes.[1] Consequently with advancement in treatment options a key hole surgery is considered to be standard treatment option for majority of rotator cuff tear cases, hence the arthroscopic double row repair technique has become benchmark treatment option.[2]

Double row technique recreates the tendon anatomic footprint hence increases the contact area between bone and tendon thus enhances the healing chances. In accordance with literature, double row repair technique has been studied extensively and multiple studies have revealed its dominance in relation to single row repair biomechanically[3,4],

however; based on functionality very little evidence showed its supremacy and there is very little evidence in terms of long term radiological and functional outcome[5]. The effectiveness of repaired rotator cuff tear is strongly related with the level of activity after surgery, Tudisco et al observed less number of re-rupture in patients treated with double row repair but did not distinguish the two techniques on functional grounds.[6,7]

Asian population shoulder differs than non-Asian population shoulders in relation to anatomical and wide range of daily life activities.[8] Despite this much importance of shoulder joint the number of shoulder surgeries in subcontinent is extremely low due to majority of factors including surgical technique (to create a reliable, strong, tension free rotator cuff repair by maximizing bone tendon healing[9], cost, lake of local evidence to support the effectiveness of double row repair in terms of integrity and functional outcome. There is limited data worldwide that supports long term arthroscopic massive rotator cuff tear repair in terms of functional outcome[10]. The aim of this article is to fill the void gap in local literature and evaluate effectiveness of double row repair technique in arthroscopic rotator cuff tear repair in terms of strength and functional outcome in local (subcontinent) population.

MATERIALS AND METHODS

Ethical approval: Ethical Review Committee of Liaquat National Hospital Karachi approved this study. The informed consent was from each participant.

Study design: A prospective observational study includes twenty-three patients who underwent the repair of massive rotator cuff tears in double row manner arthroscopically.

Study was carried out at Liaquat National Hospital, which included patients who underwent this surgery during January 2018 June 2019 at orthopedics department. All enrolled patients were evaluated by clinical examination, radiograph and confirmation of diagnosis suspected on clinical findings on MRI.

Inclusion Criteria: Patients who presented with rotator cuff tears, age ≤ 60 years, those who had painful and symptomatic rotator cuff tears but failed to respond to conservative treatment and patients with high functional demands were included in study.

Exclusion Criteria: Patients, who had massively retracted tendon, diminish pull along with immense lesions, Glenoid labrum tear cases, patients who underwent acromioplasty and those who had lateral clavicle resection.

Participants: The clinical evaluation was done by the operative surgeon on the patients reported for surgery in outpatient department pre-operatively and for follow up at 6 weeks, 3 months, 6 months ,1 year and final evaluation done on average of 30 months postoperatively. Rotator cuff tear size was assessed by means of pre-operative MRI shoulder and findings were confirmed at the time of shoulder arthroscopy, Repair Integrity was assessed by means of magnetic resonance imaging (MRI) of shoulder which was done on average of twelve months post operatively and categorized into three different types with type i) indicating sufficient thickness with homogenous low intensity, type ii) indicating insufficient thickness without discontinuity and type iii) indicating presence of discontinuity (minor / major). Preoperative and postoperative functional evaluation done and compared by assessing the function on basis of scoring system based on modified ASES score and divided into four groups, Group A (Poor), Group B (Fair), Group C (Good) and Group D (Excellent)as explained below in table. Postoperative functional evaluation done every six monthly and final outcome taken at 30 months. Twenty-three patients were included in this study. Nineteen patients were males and four were females with the mean age of 38 years.

Data collection: The American Shoulder and elbow society (ASES) rating score is a standard method for analyzing the shoulder function developed by the Research Committee of the American Shoulder and Elbow Surgeons (ASES) in 1993. Many clinicians agree that this standard evaluation method helps to associate multiple clinical trials to musculoskeletal function and helps health care administrators to have useful data for the benefit of general public. The key variables of this scale consist of three key features[1] ease of use;[2] method for assessing activity of daily livings;[3] inclusion of patient's self-evaluation[11].

We used a simple patient self-rated questionnaire based on the Modified American Shoulder and elbow society (ASES) score and questionnaire is divided in three sections. First section concerned about pain (score weightage 30 points) consists of six components, three as yes / no, while three questions as open ended and allotted 0

(NO) and 5 (Yes) point per component) and these included whether they have any pain or not, site of the pain and whether pain at night. The next was about use of narcotics to control their pain. The patients were asked to record the number of tablets per day. The visual analogue scale was used to enquire about the severity of the pain for 0 (no pain at all) to 10 (the worst pain)[11,12,13].

Next section is about activity of daily living and in which 50 points were included. Ability to perform daily activities were assessed in this section (included ten components and allotted 5 points each). The patients were asked to mark score against each activity ranges from 0 to 5 keeping in mind regarding the activity performance (with ease / some difficulty, very difficult and unable to do so)[14].

Last section was about shoulder instability; visual analogue score was used to assess the severity of instability (ranged from 0 = stable to 10 = unstable).[15]

Based on this scoring system participants were divided on basis of functional outcome in four groups; Group A (Excellent outcome; Score >75), Group B (Good outcome; score 50 to 75), Group C (Fair outcome; score 25 to 50 score) and Group D (Poor outcome; score <25).

Surgical technique and postoperative care:
All patients in this study were operated by an experienced sports orthopedic surgeon in beach chair position, under general anesthesia (figure: 1). Standard portals were made arthroscopically as proposed by synder[14].The arm was drawn in 20° flexion and 45° abduction. Arthroscopic anterior and posterior portals were made to confirm the findings of tears identified on MRI. (figure; 2) and evaluate the efficacy of muscle tendon and cartilage, followed by preparation of bone bed with the smooth soft tissue shaver blade (Figure; 3).

Two titanium anchors were used in double row repair technique. One medial anchor (fig;4) was placed in the anatomical neck adjacent to the articular cartilage, while anchor in the lateral row was inserted at greater tubercle as per Lo and Burkhat[1,16]. Sutures passed through medial anchor was in U shaped manner while in lateral anchor suture were in simple manner. Both sutures were passed through the tendon, and tied in mattress fashion. After passing of the lateral row sutures the knots of the medial anchors were tied finally and the knots of the lateral anchors were fixed.

Polysling was applied to operated arm in all patients. The sling was worn for 6 weeks except during bathing and exercises. Active flexion and extension were encouraged. After 6 weeks the sling was discontinued and physiotherapy was initiated as per protocol of burkhatet al[1].

RESULTS

All the patients had follow ups on regular basis in outpatient department, 6 weeks, 12 weeks, 24 weeks, 12 months and final evaluation done on average of 30 months postoperatively. Total of twenty-three patients were included in study (nineteen were males & four were females).

Table 1:

	n = 19
Characteristics	**N (%) or mean ± SD**
Male	15 (78.9%)
Female	04 (21.1%)
Age	38 (26-60 years)
Mode of Injury	
Sports	16 (84.3%)
RTA	2 (10.5%)
Others	1 (5.2%)
Types of Injury	
Massive RCT	19/19(100%)

Table 2: Preoperative scoring grade of patients with shoulder injury (n=19)

Groups	No of Patients	Percentage
Group A (Excellent)	0	0
Group B (Good)	03	15.7 %
Group C (Fair)	10	52.6 %
Group D (Poor)	06	31.7 %
	19	100 %

Table 3: Postoperative ASES scoring grade after Cuff Repair (n=19)

Groups	No of Patients	Percentage
Group A (Excellent)	11	57.8 %
Group B (Good)	05	26.3 %
Group C (Fair)	01	5.3 %
Group D (Poor)	02	10.6 %
	19	100

Mean age was 38 years (40 +_ 7 years). No case of re tear was reported in this short period study follow up while functional outcome was evaluated by using Patient Self Rated questionnaire

based on modified ASES system which showed significant difference and improvement in pre and post operative functional results. Total of nineteen patients were evaluated in this study as four patients were lost to follow up and hence excluded from study.

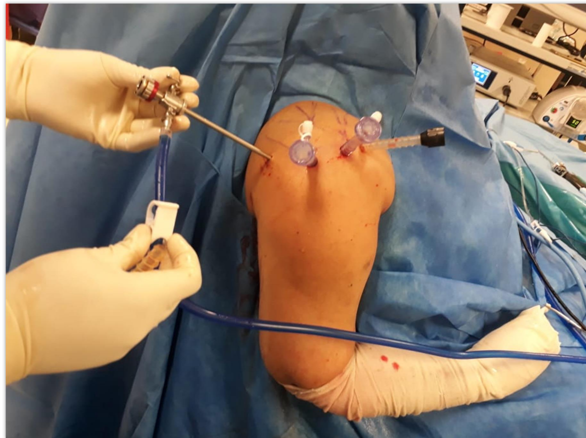

Fig 1: Beach Chair Position and Arthroscopic Portals

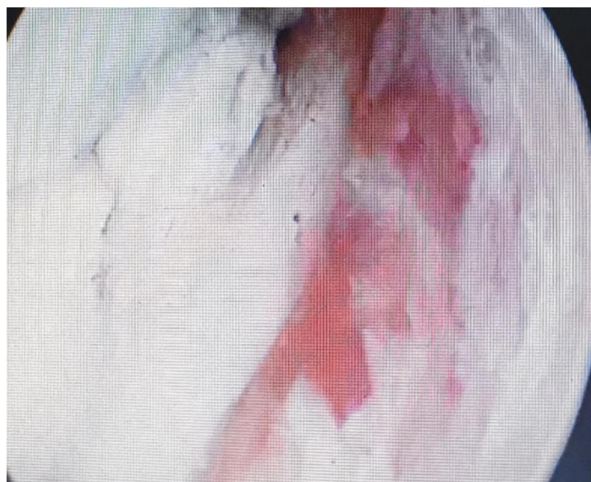

Fig 2: Showing Arthroscopic view of Cuff Tear

Demographics are further mentioned and simplified in below given table 1.

The average functional outcome scores based on Patient Self Rated Questionnaire were improved significantly at the time of the final follow-up ($p < 0.01$). Twelve months postoperatively, magnetic resonance imaging showed that sixteen patients had a type-I repair; two patient had a type ii repair, while only one cases of type iii repair.

As per this study Re-tear rate was about 5% for large and massive tears. The shoulder with a type-iii repair demonstrated significantly inferior functional outcome in terms of overall scores and strength compared with the other types of repairs ($p< 0.01$), Results summarized in tables 2 & 3.

The results of total patients participated in this study were divided in to four groups preoperatively and post operatively according to the Patient Self Rated Questionnaire based on ASES scoring grade. Results at the final follow-up showed significant improvement compared to the pre-operative status at the final follow-up as shown in table 2 and table 3.

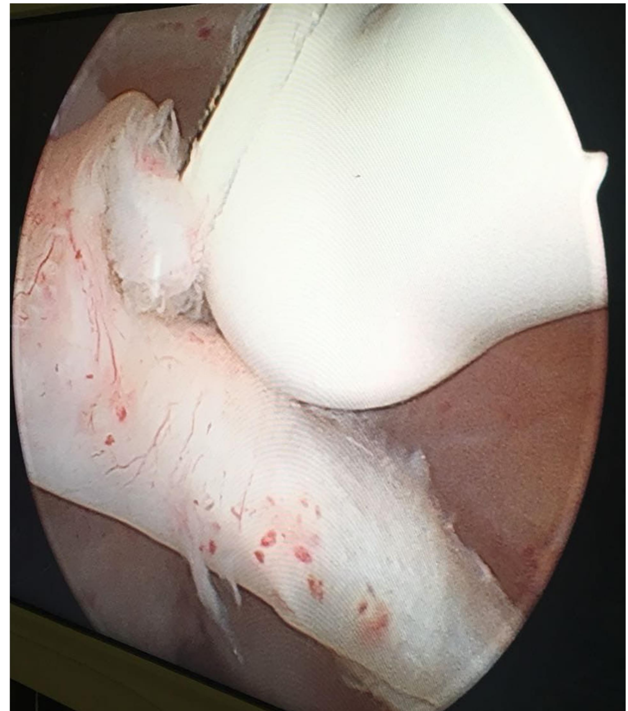

Fig 3: Bone Bed preparation with shaver blade

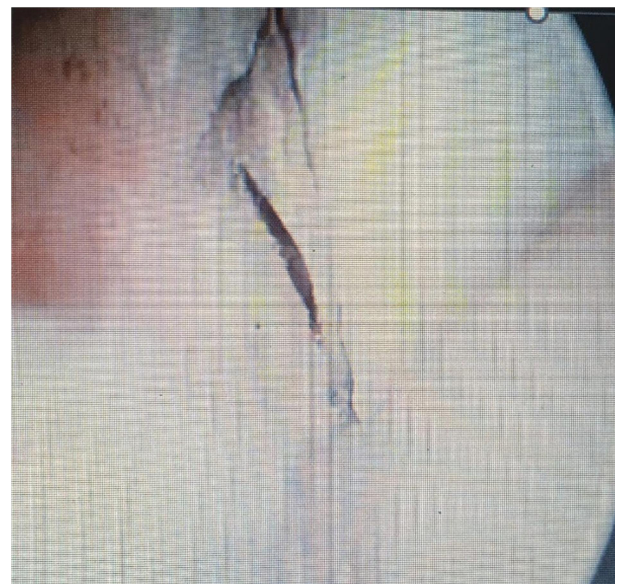

Fig 4: Showing Medial Anchor Suture

DISCUSSION

Arthroscopic rotator cuff repair is the procedure of choice worldwide. However; re-rupture rate with earlier simple technique is quite significant and compromises the functional outcome and patient satisfaction therefore; a modified arthroscopic approach with anchors was developed and titled as double row technique.[17]

In this study, the average functional outcome scores based on Patient Self Rated Questionnaire improved significantly at the time of the final follow-up ($p < 0.01$). 12 months postoperatively, repair integrity was assessed by magnetic resonance imaging, which revealed that 16 patients had a Type-I repair; 2 patient had a type II repair, while only 1 patient had type III repair. As per study Re tear rate was about 5% for large and massive tears. The shoulders with a type-III repair demonstrated significantly inferior functional outcome in terms of overall scores and strength compared with the other types of repairs ($p< 0.01$),

Several studies have shown benefits of double row technique in comparison to single row technique[11,15,16,18]. Kim et al.[18] observed his study on a cadaver that double row repair technique significantly lessened the abnormal gap compared to single row repair technique. While Ma et al.[19] also measured higher traction strength after repaired via double row technique in his cadaver. According to a study conducted by Tedesco et al.[20] who used 3-Tesla Magnetic resonance imaging for assessing the re-rupture rates in double row repair and single row repair group, which was 25% and 60% respectively.

According to the study carried by Sarandakos and Jones,[21] statistical difference was observed when only injuries greater than 3cm were taken under observation. Millet et al[22] in his meta-analysis concluded that there was no considerable variation between scores obtained using SR or DR repair, however; significant difference noted in the studies undertaken using size.

Concluded by Dennard et al.[23] in their retrospective study, who analyzed only massive rotator cuff lesions (greater than 5.0 cm) and compared the outcomes using ASES and UCLA scores. These authors deduced that the results of repair using DR group was 4.9times refined to the SR group.

Limitations:

Our study has some inherent limitations. First, smaller number of patients were available at our study duration. Next, Selection bias may be seen, as this study was a prospective one. Finally, short follow-up duration.

In this current study we report the short term functional outcome of 19 patients who underwent Arthroscopic Rotator Cuff Tendon Repair with Double Row Anchor Suture Repair Technique. Current study reveals that Rotator Cuff Repair with Double Row Technique provides superior functional outcome with less peri-operative morbidity.

CONCLUSION

In this study, we found arthroscopic double row repair technique is an effective procedure in terms of massive rotator cuff tears repair with very little risk of re-tear and significant improvement in functional activities.

Conflict of Interest: None

Grants/Funding: None

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