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SINGLE-ROWVERSUS DOUBLE-ROW ARTHROSCOPIC ROTATOR CUFF REPAIR: A RETROSPECTIVE STUDY OF CLINICAL & FUNCTIONAL OUTCOME

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ABSTRACT

The purpose of this study was to compare the short term clinical and functional outcome of arthroscopic rotator cuff repair with single-row and double-row anchorage techniques. A retrospective study was conducted from January 2016 to June 2017 for 73 patients (31 males and 42 females) with an average age of 60.10 ± 6.11 years (range 50 -73) who underwent arthroscopic rotator cuff repair. Double-row repair (group A, n= 30, 14 males and 16 females) were compared with patients of single-row technique (group B, n= 43, 17 males and 26 females) and evaluated clinically for functional outcome using range of movements, UCLA score and VAS score preoperatively, and 12 months postoperatively. Statistical analysis was performed using t test. Significance was set at P < .05.There was no significant difference in postoperative UCLA score (group A=31.06±2.61, range 26-35 and group B=30.83±2.74, range 27-35; p=0.718) and VAS score (group A=1.1±0.54, range 0-2andgroup B=1.02±0.59, range 0-2; p=0.572) between two groups. The range of shoulder movements showed no significant difference between two groups ;forward flexion(group A=135.33°±26.48°, range 90-160°and group B=129.53°±27.59°, range 90-160°; p=0.369), external rotation(group A=81.00°±13.22°,range 50-90°andgroup B=77.44°±13.64°, range 50-90°; p= 0.268) and abduction(group A=142.66°±19.64°,range 90-160°and group B=137.44°±23.51°, range 90-160°; p=0.306).No significant difference was found in clinical and functional outcome between double- and single-row rotator cuff repair at short term follow up.

KEYWORDS: Shoulder; Arthroscopy; Rotator Cuff Repair; Single-Row; Double-Row; Clinical Outcome

The method of rotator cuff repair has evolved a lot recently, starting from the open technique, to arthroscopic assisted mini open technique, and now to complete arthroscopic technique. Results of complete arthroscopic repair have been promising (Gary FW 1974,PearsallAW et al 2007) and is replacing open and mini open techniques **(**Pearsall AW et al 2007, Ellman H et al 1986). Arthroscopic rotator cuff repair is done by 2 methods, single row anddouble row technique. Single row arthroscopic rotator cuff repairs apply suture anchors in a row using a simple or mattress suture, which partially (67%) re-stores the native supraspinatus tendon-to the greater tuberosity insertion and footprint (Apreleva M et al 2002) and may cause retearandpersistant defects (Boileau P et al 2005,Charousset C et al 2006).

Series of clinical studies reported that the clinical and functional outcomes of arthroscopic single-row and double-row rotator cuff repair were not different(Sugaya H 2005 ,Saridakis P et al 2010,MaHL et al 2012). Double-row suture anchor fixation restores the original tendon footprint of the rotator cuff to the tuberosity(Ma CB 2004,Mazzocca AD et al 2005) and increases repair strength and decreases gap formation (Park MC et al 2007) . Compared with the single-row repair techniquedouble row technique improves the cuff integrity rate andthere are very low chances of structural failure(Gartsman GM et al 2013,Quigley RJ et al 2013) good to excellent clinical results were obtained with respect to pain, range of motion, strength, and function with double row rotator cuff repair,the literature on the functional superiority of double row over standard single-row repair is poor and debatable (Sugaya H et al 2007, Laffosse L et al 2007).

MATERIALS AND METHODS

This was a retrospective study conducted in which 73 consecutive patients (31 males and 42 females) who were above 50 years of age with a average age of 60.10 ± 6.11 years (range 50 -73) and underwent arthroscopic repair of rotator cuff tear for a full-thickness tear of the rotator cuff were evaluated . 30 double row repair patients (group A- 14 males and 16 females)and 43 single-row repair patients (group B- 17 males and 26 females) were followed up for a period of one year. Informed consent was taken from all patients .Preoperatively all patients had been evaluatedfor the range of movements, UCLA score(Ellman H et al 1986)and VAS score. UCLA score assesses pain, function, ROM, strength, and patient satisfaction. Pain and function have a maximum value of 10, and the other components have a maximum value of 5. The component values are added to achieve the total score, which has a maximum of 35. A higher score indicates better shoulder function.A score of 34 or 35 points according to the UCLA Score was defined as excellent, a score of 29 to 33 points as good, and a score of less than 29 points as fair or poor.

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Good and excellent result corresponds with a satisfactory result and that fair and poor results correspond with unsatisfactory result. They all underwent astandard preoperative radiological examination and magnetic resonanceimaging (MRI) of the shoulder.After tear patterns were recognized andevaluated, fixation techniques were performed accordingto surgeon preference. During surgery, we documented the pattern of rotatorcuff tear, location, shape, size, and retraction. The frontal andsaggital extent of the tear was documented. The retraction of the tear wasclassified into 3 stages, according to Patte classificationPatte D et al 1990);all the operations were performed in a standardizedmanner by 2 surgeons.

Surgical Technique

All patients were operated under general anesthesia. Hypotensiveanesthesia was used to facilitate clear intra operative visualization. Surgery was performed in sitting position. The shoulder positioner was raised and the patient flexed 80° at the waist. This brought the acromion parallel to the floor which facilitated access to the posterior portal. The patient's head was secured on a padded horseshoe positioned to stabilize the neckand was kept in neutral position. The torso was secured by special side supports. The arm was left free on a draped support .A single 'U' drape was placed in the axilla with the open end towards the head. The entire upper limb was painted with povidone iodine.

Four portals were used. Posterior and lateral portals were used mainly for standard 4 mm arthroscope (the viewing portals), while antero-medial and antero-lateral portals were used for the instruments (the working portals).The subacromial space was cleared of the adhesions, bursal tissue and reactive synovitis. Tendon mobility was improved by releasing superficial adhesions between the cuff and acromial arch. Limited debridement of degenerated tendon margins was performed. After adequate visualization, preparation and release of long head of biceps tendon, upper surface of greater tuberosity was lightly abraded with a burr, removing all soft tissue and cortical bone, to create a bleeding cancellous bone bed. Microfracture technique was performed with 1.8 mm drill to enhance vascularity without creating a trough.A tendon to bone repair placing the suture anchors in the lateral cortex of the Humerus was performed.

Single Row Technique

In single row technique one row of (2-3) anchors were placed in the greater tuberosity usually at the junction of the cartilage with the footprint on the greater tuberosity.Titanium double loaded suture anchors of 5.0 mm or 6.5 mm were inserted from anterior to posterior depending on the extent of tear and repaired using a simple or mattress suture.

Double Row Technique

Here one row of anchors were placed at the articular margin and the second row was placed lateral to the footprint, to re-establish the normal footprint of the rotator cuff .At least one suture of each color of medial row was retained to be used in the suture bridge lateral anchor. The antero-lateral portal was used to drill the anchor holes approximately 10 mm distal to the tip of greater tuberosity and at 5mm to 7mm intervals.A lateral suture bridge knotless anchor was used after threading the medial suture through its eyelet. A subacromial decompression with acromioplasty was performed as needed.

Postoperative Management and Patient Evaluation

All patients were given shoulder arm pouch for 6 weeks.Intravenous antibiotics were given for 2 days postoperatively. Scapular retraction exercises, shoulder pendulum exercises, elbow and wrist range of motion exercises were started on day 1. Shoulder Pendulum exercises were increased to safe range at 3 weeksand passive assisted exercises were allowed till 90°. Activerange of movements wasstarted from 6 weeks and continued up to 12 weeks. Accelerated shoulder strengthening exercises were started from 12 weeks.

All Post operative patients were evaluated at 6 months and 12 months by the operating surgeons. They were assessed using the UCLA and VAS scoring system.

OBSERVATIONS AND RESULTS

Double row technique had a mean preoperative UCLA score of 8.46 ±1.71 (range 5 to 11) and post operative UCLA score of 31.06 ± 2.61 (range 26 to 35). Mean preoperative UCLA score of single row was 8.62±1.78 (range 5 to12) and post operative UCLA score was 30.83 ±2.74 (range 27 to 35). The average postoperative UCLA score of patients operated with double row technique was found to be better compared to the single row, but it did not show any statistically significant difference(p=0.718). The average postoperative VAS score

of patients operated with single row technique was 1.02± 0.59 (range 0 to2) and that for operated with double row technique was 1.1±0.54 (range 0 to 2), which did not show any significant difference; (p=0.572) The range of shoulder movements also showed significant postoperative improvement in both the groups but had no statistically significant difference between the 2 groups (Table 1).

Table 1: Comparison of UCLA Score, VAS SCORE and ROM of Single Row and Double Row

Variable	Double Row (A)	Single Row (B)	P value
No. of cases	30	43	-
Mean age (years)	60.7 ± 5.98 (50- 73)	59.6 ± 6.23(50 – 73)	-
No. of Men/women	14/16	17/26	-
Postop UCLA score (total)	31.06 ± 2.61 (26-35)	30.83 ± 2.74 (27-35)	0.718
Postop VAS score (total)	1.1 ± 0.54 (0-2)	1.02 ± 0.59 (0-2)	0.572
Post op forward flexion (º)	135.33°±26.48°(90- 160°)	129.53°± 27.59°(90- 160°)	0.369
Post op external rotation (º)	81.00°±13.22° (50-90°)	77.44°±13.64° (50-90°)	0.268
Post op abduction (º)	142.66°±19.64° (90-160°)	137.44 °± 23.51°(90-160°)	0.306

DISCUSSION

The primary goal of surgical management of rotator cuff tears is pain relief and improvement of function. Previous studies said that at short-term and long term follow up, arthroscopic rotator cuff repair with the double-row technique showed no significant difference in clinical and functional outcome compared with single-row repair[10-25]. In ourstudy also there was no statistically significant difference in the average postoperative UCLA score[3], VAS score, and average improvement in the range of movements of the shoulder at one year for patients operated with double row technique compared to the single row.

In the present study, 57 patients (78 %) had a good or excellent result and 16 (22%) had a fair result at one year. There was marked improvement in each of the components of the shoulder-rating system. All patients i.e. 73 (100 per cent) were satisfied with the surgery.

There were no intra-operative or peri-operative complications in this study. There was no neural injury, wound infection, or drainage from the wound.Neither the suture anchors nor the suture materials cause any complications in either of the techniques. No patient needed manipulation for postoperative stiffness. No revision of any of the procedures was done.

Limitation of this study was a sample size with a relatively short follow up. We excluded patients who had massive tears. We evaluated our patients with UCLA score and VAS score, other shoulder scores like Constant scoreand the Shoulder Index of the American Shoulder and Elbow Surgeons were not used. The structural outcome and the integrity of repair of the cuff repair could not be evaluated with MRI or ultrasonography. We did not consider the tears in individual rotator cuff tendons. Rotator cuff was considered as a single unit . We also did not consider the patient variables like body mass index, profession etc. in the study. The long term survivorship of the repair cannot be evaluated by such a short term study.

The strength of this study was thatthe patients with other concomitant pathologies like the labrum tear, Bankart's tear etc were excluded. So the confounding effect of these pathologies on the cuff repair was avoided. Two surgeons operated on all the patients and same technique of repair was used.Rehabilitation to all the patients was given by one physical therapist.Pre as well as post operative forward flexion, abduction, external rotation and internal rotation was measured which gives a fair idea regarding the function of shoulder.

CONCLUSION

There is significant relief of pain, better range of motion and strength of the involved shoulder following the arthroscopic rotator cuff repair and gave good to excellent short term functional outcome in majority of the patients. Arthroscopic rotator cuff repair with the double-row technique showed no significant difference in clinical outcome compared with single-row repair.

REFERENCES

Gary F. Wolfgang, 1974. Surgical repair of tears of the rotator cuff of the shoulder. Factors influencing the result. J Bone Joint Surg Am., **56**(1):14-26.

Pearsall A.W., Ibrahim K.A. and Madanagopal S.G., 2007. The results of arthroscopic versus mini-open repair for rotator cuff tears at mid-term follow-up. J Orthop Surg., **2**:24.

Ellman H., Hanker G. and Bayer M., 1986. Repair of the rotator cuff: end-result study of factors influencing reconstruction. J Bone Joint Surg., **68**A:1136.

Apreleva M., Ozbaydar M., Fitzgibbons P.G. and Warner J.J., 2002. Rotatorcuff tears: The effect of the reconstruction method on three-dimensional repair site area. Arthroscopy, **18**:519-526.

Boileau P., Brassart N., Watkinson D.J., Carles M., Hatzidakis A.M. and Krishnan S.G., 2005. Arthroscopic repair of full-thickness tears of the supraspinatus: does the tendon really heal? J Bone Joint Surg Am., **87**:1229-1240.

Calvert P.T., Packer N.P., Stoker D.J., Bayley J.I. and Kessel L., 1986. Arthrography of the shoulder after operative repair of the torn rotator cuff. J Bone Joint Surg Br., **68**:147-150.

Charousset C., Duranthon L.D., Grimberg J. and Bellaiche L., 2006. Arthro-C-scan analysis of rotator cuff tears healing after arthroscopic repair: analysis of predictive factors in a consecutive series of 167 arthroscopic repairs [in French]. Rev Chir Orthop Reparatrice Appar Mot., **92**:223-233.

Gerber C., Fuchs B. and Hodler J., 2000. The results of repair of massive tears of the rotator cuff. J Bone Joint Surg Am., **82**:505-515.

Goutallier D., Postel J.M., Bernageau J., Lavau L. and Voisin M.C., 1994. Fatty muscle degeneration in cuff ruptures, Pre- and postoperative evaluation by CT scan. Clin Orthop., **304**:78-83.

Sugaya H., Maeda K., Matsuki K. and Moriishi J., 2005. Functional and structural outcome after arthroscopic full-thickness rotator cuff repair: Single-row versus dual-row fixation. Arthroscopy, **21**:1307-1316.

Charousset C., Grimberg J., Duranthon L.D., Bellaiche L. and Petrover D., 2007. Can a double-row anchorage technique improve tendon healing in arthroscopic rotator cuff repair? A prospective, nonrandomized, comparative study of double-row and single-row anchorage techniques with computed tomographic arthrography tendon healing assessment. Am. J. Sports Med., **35**:1247-1253.

Franceschi F., Ruzzini L. and Longo U.G., 2007. Equivalent clinical results of arthroscopic single-row and double-row suture anchor repair for rotator cuff tears: A randomized controlled trial. Am. J. Sports Med., **35**:1254-1260.

Park J.Y., Lhee S.H., Choi J.H., Park H.K., Yu J.W. and Seo J.B., 2008. Comparison of the clinical outcomes of single- and double row repairs in rotator cuff tears. Am. J. Sports Med., **36**: 1310-1316.

Wall L.B., Keener J.D. and Brophy R.H., 2009. Clinical outcomes of double- row versus single-row rotator cuff repairs. Arthroscopy, **25**:1312-1318.

Nho S.J., Slabaugh M.A. and Seroyer S.T., 2009. Does the literature support double-row suture anchor fixation for arthroscopic rotator cuff repair? A systematic review comparing doublerowand single-row suture anchor configuration. Arthroscopy, **25**:1319-1328.

Sheibani-Rad S., Giveans M.R., Arnoczky S.P. and Bedi A., 2013. Arthroscopic single-row versus double-row rotator cuff repair: a meta-analysis of the randomized clinical trials. Arthroscopy, **29**(2):343-8.

Chen M., Xu W., Dong Q., Huang Q., Xie Z. and Mao Y., 2013. Outcomes of single-row versus double-row arthroscopic rotator cuff repair: asystematic review and meta-analysis of current evidence. Arthroscopy, **29**(8):1437-49.

Zhang Q., Ge H., Zhou J., Yuan C., Chen K. and Cheng B., 2013. Single-row or double-row fixation technique for full-thickness rotator cufftears: a meta-analysis. PLoS One, **8**(7):e68515.

Aydin N., Kocaoglu B. and Guven O., 2010. Single-row versus double-row arthroscopic rotator cuff repair in small- to medium-sized tears. J. Shoulder Elbow Surg., **19**(5):722-5.

Burks R.T., Crim J., Brown N., Fink B. and Greis P.E., 2009. A prospective randomized clinical trial comparing arthroscopic single- and double-row rotator cuff repair: magnetic resonance imaging and early clinical evaluation. Am. J. Sports Med., **37**(4):674-82.

Dines J.S., Bedi A., Elattrache N.S. and Dines D.M., 2010. Single-row versus double-row rotator cuff repair: techniques and outcomes. J. Am. Acad Orthop Surg., **18**(2):83-93.

Grasso A., Milano G., Salvatore M., Falcone G., Deriu L. and Fabbriciani C., 2009. Single-row versus double-row arthroscopic rotator cuff repair: a prospective randomized clinical study. Arthroscopy, **25**(1):4-12.

Ma H.L., Chiang E.R., Wu H.T., Hung S.C., Wang S.T., Liu C.L. and Chen T.H., 2012. Clinical outcome and imaging of arthroscopic single-row and double-row rotator cuff repair: a prospective randomized trial. Arthroscopy, **28**(1):16-24.

Reardon D.J. and Maffulli N., 2007. Clinical evidence shows no difference between single- and double-row repair for rotator cuff tears. Arthroscopy, **23**(6):670-3.

Saridakis P. and Jones G., 2010. Outcomes of single-row and double-row arthroscopic rotator cuff repair: a systematic review. J. Bone Joint Surg. Am., **92**(3):732-42.

Ma C.B., MacGillivray J.D., Clabeaux J., Lee S. and Otis J.C., 2004. Biomechanical evaluation of arthroscopic rotator cuff stitches. J. Bone Joint Surg. Am., **86**:1211-1216.

Mazzocca A.D., Millett P.J., Guanche C.A., Santangelo S.A. and Arciero R.A., 2005. Arthroscopic single-row versus double-row suture anchor rotator cuff repair. Am. J. Sports Med., **33**:1861-1868.

Kim D.H., Elattrache N.S. and Tibone J.E., 2006. Biomechanical comparison of a single-row versus double-row suture anchor technique for rotator cuff repair. Am. J. Sports Med., **34**:407-414.

Meier S.W. and Meier J.D., 2006. The effect of double-row fixation on initial repair strength in rotator cuff repair: A biomechanical study. Arthroscopy, **22**:1168-1173.

Park M.C., ElAttrache N.S., Tibone J.E., Ahmad C.S., Jun B.J. and Lee T.Q., 2007. Part I: Footprint contact characteristics for a transosseousequivalent rotator cuff repair technique compared with a double- row repair technique. J. Shoulder Elbow Surg., **16**:461-468.

Park M.C., Tibone J.E., ElAttrache N.S., Ahmad C.S., Jun B.J. and Lee T.Q., 2007. Part II: Biomechanical assessment for a footprint-restoring transosseous-equivalent rotator cuff repair technique compared with a double-row repair technique. J. Shoulder Elbow Surg., **16**:469-476.

Milano G., Grasso A., Zarelli D., Deriu L., Cillo M. and Fabbriciani C., 2008. Comparison between single-row and double-row rotator cuff repair: A biomechanical study. Knee Surg Sports Traumatol Arthrosc, **16**:75-80.

Sugaya H., Maeda K., Matsuki K. and Moriishi J., 2007. Repair integrity and functional outcome after arthroscopic double row rotator cuff repair. J. Bone Joint Surg Am., **89**:953-960.

Lafosse L., Brozska R., Toussaint B. and Gobezie R., 2007. The outcome and structural integrity of arthroscopic rotator cuff repair with use of the double-row suture anchor technique. J Bone Joint Surg Am., **89**:1533-1541.

Anderson K., Boothby M., Aschenbrener D. and van Holsbeeck M., 2006. Outcome and structural integrity after arthroscopic rotator cuff repair using 2 rows of fixation: Minimum 2-year follow-up. Am. J. Sports Med., **34**:1899-1905.

Huijsmans P.E., Pritchard M.P., Berghs B.M., van Rooyen K.S., Wallace A.L. and de Beer J.F., 2007. Arthroscopic rotator cuff repair withdouble-row fixation. J. Bone Joint Surg. Am., **89**:1248-1257.

Ma C.B., Comerford L., Wilson J. and Puttlitz C.M., 2006. Biomechanical evaluation of arthroscopic rotator cuff repairs: Double-row compared with single-row fixation. J. Bone Joint Surg. Am., **88**:403-410.

Smith C.D., Alexander S. and Hill A.M., 2006. A biomechanicalcomparison of single and double-row fixation in arthroscopicrotator cuff repair. J. Bone Joint Surg. Am., **88**:2425-2431.

Ma C.B., MacGillivray J.D., Clabeaux J., Lee S. and Otis J.C., 2004. Biomechanical evaluation of arthroscopic rotator cuff stitches. J. Bone Joint Surg. Am., **86**:1211-1216.

Gartsman G.M., Drake G., Edwards T.B., Elkousy H.A., Hammerman S.M. and O'Connor D.P., 2013. Ultrasound evaluation of arthroscopic full-thickness supraspinatus rotator cuff repair: single-row versus double-row suture bridge (transosseous equivalent) fixation. Results of a prospective,

randomized study. J. Shoulder Elbow Surg., **22**(11):1480-7.

Quigley R.J., Gupta A., Oh J.H., Chung K.C., McGarry M.H. and Gupta R., 2013. Biomechanical comparison of single-row, double-row, and transosseous-equivalent repair techniques after healing in an animal rotator cuff tear model. J. Orthop Res., **31**(8):1254-60.

Patte D., 1990. Classification of rotator cuff lesions. Clin Orthop Relat Res., (254):816.