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Efficacy of partial repair as a treatment modality in massive irreparable rotator cuff tear in adults: A systematic review

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Abstract
Patients with massive irreparable rotator cuff tears pose a challenge for treatment, as there are a variety of options to manage this condition, like debridement, biceps tenotomy or tenodesis, complete repair of tear, partial repair, superior capsular reconstruction, balloon arthroplasty, tuberoplasty and reverse shoulder arthroplasty. In this study, we aim to evaluate the efficacy of partial repair of massive IRCTs. We conducted an internet search for articles with key words "Partial arthroscopic repair" and "Management of Massive irreparable rotator cuff tears" and numerous articles were analysed and selected according to our inclusion and exclusion criteria. The studies included were assessed for demography, clinical and functional scores, re-tear rates and complications. Seven studies were included in our review with a total of 246 patients. All patients reported excellent to good satisfaction with improvements in pain, clinical and functional scores compared to their pre op status. From our review, we conclude that partial repair of massive IRCTs is a safe and salvageable treatment option with low complication rates and high patient satisfaction.

Keywords: partial repair, massive ircts (Irreparable Rotator Cuff Tears)

Introduction
Massive tears of the rotator cuff tendons usually cause pain, loss of shoulder function, atrophy and fatty degeneration of the cuff muscles [1]. A variety of treatment options are available to manage these tears including debridement with possible biceps tenotomy or tenodesis, open or arthroscopic partial repair, muscle or tendon transfer, superior capsule reconstruction, synthetic patch augmentation, balloon arthroplasty, tuberoplasty and reverse total shoulder arthroplasty (RTSA) [2]. Despite all these options, irreparable, massive RCTs are difficult to manage and treat effectively. Partial repair of massive cuff tears was originally conceived by Burkhart *et al* as an open procedure involving the inferior half of the infraspinatus to create a balanced force couple. S.S. Burkhart was the first to introduce this concept and of the "functional rotator cuff tear". It is an anatomically deficient yet biomechanically intact tear. Patients with this functional tear have normal function despite unrepaired holes in the cuff [3].
A functional rotator cuff tear must satisfy 5 biomechanical criteria as defined by Burkhart SS [3].

1. Force couples must be intact in the coronal and transverse planes.
2. A stable fulcrum kinematic pattern must exist.
3. The shoulder's "suspension bridge" must be intact.
4. The tear must occur through a minimal surface area.
5. The tear must possess edge stability.

An arthroscopic modification of this technique was described in 2001, and it is best used in situations involving massive rotator cuff tears with an irreparable supraspinatus, a reparable infraspinatus, and an intact or reparable subscapularis tendon [10]. In fact, if the repair of the supraspinatus tendon is not possible, the reattachment of the subscapularis and infraspinatus tendons provides significant clinical improvement because of restoration of the cable attachment, preservation of rotator cuff function, restoration of balanced force couples, and re-establishment of a stable fulcrum of motion [3].

Materials and Methods
An online search was conducted with key words "Partial arthroscopic repair" and "Management of Massive irreparable rotator cuff tears" and numerous articles were analysed, out of which, articles dealing with open or arthroscopic partial repair of massive IRCTs (irreparable rotator cuff tears) were selected, which had minimum of 12 month clinical follow up, and which studied pre and post op clinical and functional outcome variables, which is our inclusion criteria. Our exclusion criteria included articles which studied completely reparable massive RCTs, comparative studies, other modes of management of massive RCTs, studies with less than 12 month clinical follow up, studies which does not assess pre and postoperative clinical or functional variables, case reports, expert opinions.

Results
Seven articles were included in our study which are eligible according to inclusion-exclusion criteria. 5 studies were published between 2012 to 2017, 1 study by Gerber *et al*(8) in 2000 and 1 study by Burkhart *et al*(3) in 1994. All studies were retrospective case series studies with level 4 evidence except one study by Gerber *et al*(8) which is a prospective study with level 3 evidence. Patients in all the studies were managed by arthroscopic partial repair except the one study by Burkhart where open partial repair was done.

***Demographics*:** A total of 246 patients were studied, with mean age of 61.6 years (range 38-77) and a minimum follow up of 24 months in all studies except one by Burkhart with mean follow up of 21 months(range 9-62 months). ***Clinical Outcomes*:** Range of motion was measured in 4 studies (57.1%), muscle strength in 2 studies (28.5%) and patient's satisfaction in 2 studies (28.5%). Assessment of Constant score was done in 4 studies(57.1%), UCLA shoulder score(University of California, Los Angeles) in 2 studies(28.5%), ASES score(American shoulder and elbow society) in 2 studies(28.5%), VAS score(Visual Analogue Scale) in 3 studies(42.8%) and SST(Subjective Shoulder Test) was assessed in 2 studies (28.5%). All the studies included in this review showed significant improvements in the scores at final follow up than the pre op scores. All studies reported excellent to good patient satisfaction at final follow up except one study by Shon *et al* [7] which reported poor satisfaction in 50% of patients at final follow up. All studies reported significant improvement in pain and activities of daily living (3-9). 4 studies which measured ROM also showed significant improvements than pre op values and 2 studies which measured muscle strength in forward flexion and abduction also reported improvements than their respective pre op values [4, 9]. Studies by Gerber *et al* [8]. and Chen *et al* [6]. reported re-tear rates of 37% and 41% respectively, in spite of which they reported excellent to good clinical outcomes, which again reinforces the concept of 'functional cuff repair' proposed by Burkhart.

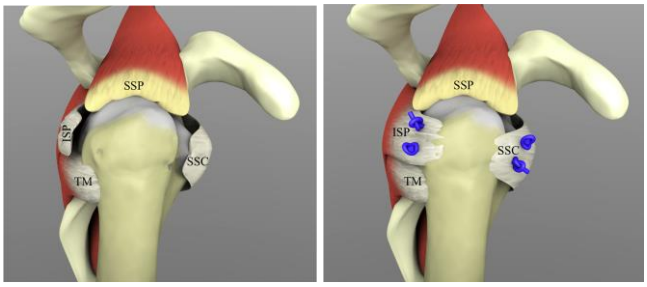

Fig 1: Shows complete tear of supraspinatus (SSP), infraspinatus (ISP), and subscapularis (SSC) with intact teres minor(TM) and repair of ISP and SSC with retracted unrepaired SSP.

Table 1: Partial repair of irreparable RCTs: Demographics, preop and post op clinical outcome variables of different studies.

Study by	Sample size	Mean age (years)	Mean follow up (months)	Pre op					Post op				
				UCLA	CS	ASES	Flexion	Abduction	UCLA	CS	ASES	Flexion	Abduction
Burkhart *et al* Arthroscopy 1994	14	56	21	10			60		28			150	
Wellman *et al* Arthroscopy 2013	38	65	47		56		130	110		71		160	150
Benedetto *et al* Acta biomed 2017	72	67	62		46		96	78		74		140	126
Chen *et al* Arthroscopy 2017	37	60	30			46					79		
Gerber *et al* JBJS 2000	27	56.1	37		31		92	82		70		142	137
Kim *et al* Arthroscopy 2012	27	62.3	41.3	10.5	43.6				25.9	74.1			
Shon *et al* American J of sports medicine 2015	31	65.9	40.5			41.9					73.7		

Discussion

The most important finding in our review is that all studies showed significant improvement of clinical outcome scores and range of motion in final follow up compared to pre op values, irrespective of re-tear rate. All studies reported good patient satisfaction at final follow-up except one study by Shon *et al* [7] which reported good satisfaction rates at initial follow-up at the end of 1 year, but at final follow-up 50% of patients reported poor satisfaction. All studies reinforce the concept which was originally perceived by Burkhart, that, functional repair of massive rotator cuff tear with regaining the force couples and maintaining the "Suspension bridge" is sufficient to give the patient, pain free satisfactory range of motion to perform activities of daily living and not necessarily a complete water tight closure of the tear. The studies included in our review also did not report any significant complications. From our review, it can be ascertained that partial repair of rotator cuff tear is a safe and salvageable option of treatment modality in cases where complete repair cannot be performed. While Kim *et al* [9] reported significant decrease in AHD (acromio humeral distance) after surgery, none of their patients progressed to osteoarthritic changes. But Shon *et al* (7) in their study showed more than one third of the patients with deteriorated radiographic outcomes at their final follow-up. But significance of these radiographic findings toward progression of osteoarthritis after partial repair of rotator cuff has to be evaluated by long term studies. All the studies in our review were retrospective case series studies with level 4 evidence except one by Gerber *et al*(8) which is level 3. The mean follow-up period in all studies ranged from 2 to 5 years approximately, which indicates only short to mid-term results. Hence new studies investigating long term outcomes are required to assess the therapeutic value of partial repair of rotator cuff tear. There are differences in surgical technique performed by different authors, as in, some authors performed margin convergence to reduce the cuff defect, some authors performed medialised repair to allow for tension-free repair. Also the study population in various studies are not homogenous, like, differences in size of tear, number of tendons torn, grade of fatty infiltration, level of tendon retraction, associated lesions etc.

Conclusion

From our review, it can be concluded that partial repair of massive irreparable rotator cuff tears is a safe and effective treatment modality which produces excellent to good clinical outcomes in short to mid-term, which improves pain and performance of activities of daily living. But the studies in our review were of low to moderate quality with level 3 and level 4 evidence. Hence, studies with good level of evidence and long term results are needed to confirm the efficacy of partial repair as a treatment modality for massive irreparable rotator cuff tears.

References

1. Castracini R, Galasso O, Ricelli DA, Familiari F, De Benedetto M, Orlando N *et al*. Arthroscopic Partial Repair of Irreparable, Massive Rotator Cuff Tears. Arthroscopy Techniques,2017:6(1):e143-7.
2. Abrams JS. Arthroscopic approach to massive rotator cuff tears. Instr Course Lect,2006:55:59-66.
3. Stephen S Burkhart, Wesley M Nottage, Darell J Ogilvie-Harris, Harvey S Kohn, Anthony Pachelli.

Partial repair of irreparable rotator cuff tears. Arthroscopy,1994:10(4):363-70.
4. Wellman M, Lichenberg S, da Silva G, Magosch P, Habermeyer P. Results of arthroscopic partial repair of large retracted rotator cuff tears. Arthroscopy,2013:29:1275-1282.
5. Di Benedetto ED, Di Benedetto P, Fiocchi P, Beltrame A, Causero A. Partial repair in irreparable rotator cuff tear: our experience in long term follow-up. Acta Biomed,2017:88:69-74.
6. Chen KH, Chang ER, Wang HY, Ma HL. Arthroscopic partial repair of irreparable rotator cuff tears: Factors related to greater degree of clinical improvement at 2 years of follow-up. Arthroscopy,2017:33(11):1-7.
7. Shon MS, Koh KH, Lim TK, Kim WJ, Kim KC, Yoo JC. Arthroscopic partial repair of irreparable rotator cuff tears: preoperative factors associated with outcome deterioration over 2 years. Am J Sports Med,2015:43:1965-75
8. Gerber C, Fuchs B, Holder J. The results of repair of massive tears of the rotator cuff. J Bone Joint Surg Am,2000:82:505-15.
9. Kim SJ, Lee IS, Kim SH, Lee WY, Chun YM. Arthroscopic partial repair of irreparable large to massive rotator cuff tears. Arthroscopy,2012:28:761-68.
10. Burkhart SS, Barth JR, Richards DP, Zlatkin MB, Larsen M. Arthroscopic repair of massive rotator cuff tears with stage 3 and 4 fatty degeneration. Arthroscopy,2007:23:347-54.