

Is the Nomenclature of Massive Rotator Cuff Tear Used Correctly?

Systematic Review

Alper Deveci¹, Hakan Dur¹, Erkan Alkan¹

Abstract

Background: The term massive refers to a quantitative measure of the rotator cuff tears. Irreparable rotator cuff tear is indicated by ratings that qualitatively evaluate the reparability of the tendon. These two terms should be considered separately.

Methods: Between 2016 and 2022, publications in the last about 5 years were searched from Pubmed and MEDLINE online databases. The search terms (irreparable OR massive) AND (rotator cuff tear), (reparable OR massive) AND (rotator cuff tear), (massive OR retracted) AND (rotator cuff tear), (irreparable OR retracted) AND (rotator cuff tear) "were used. For each search term, it was checked whether the title of the search term was mentioned in the title of the article, and whether the title and the content were compatible in the studies in which the searched term was mentioned in the title.

Results: Of the 934 scanned articles, 69 of them were evaluated in terms of study title and material-method compatibility. 22 articles with the term "massive rotator cuff tear" in the title were identified. It was seen that in 11 of these 22 articles (50%), the title and the material method were compatible and in 11 of them (50%) the title and the content were incompatible, and the term "massive" was used instead of the term "irreparable".

Conclusions: We see that most of the studies on massive tears were actually done to emphasize irreparable tears. Since most of the massive tears are repairable, the quality feature of massive tears, which are in the group that poses a problem, as irreparable rotator cuff tear or massive irreparable rotator cuff tear should be emphasized.

Level of evidence: Level 3, systematic review

Keywords: Rotator cuff tears, Shoulder, Arthroscopy, Irreparable, Massive

Introduction

Massive rotator cuff tears (RCTs) are shoulder lesions with a wide spectrum that cause pain and significant loss of function. Large-to-massive RCTs comprise up to 40% of all rotator cuff tears [1]. Its treatment is very challenging and surgical treatment options are also very controversial. An average of 10% is irreparable. Majority of massive RCTs are repairable tears [2]. While challenging, most massive RCTs are repairable and other factors like tendon retraction, atrophy, arthritis, and mobilization must be taken into account. Massive RCTs are divided into repairable and non-repairable massive tears. Massive RCTs describe rotator cuff tears larger than 5 cm in which at least 2 rotator cuff elements are involved [3, 4]. The term 'massive' refers to a quantitative measure of the RCT. The term 'irreparable' refers to a qualitative state of the RCT. IRCT is indicated by ratings that qualitatively evaluate the reparability of the tendon, such as Patte grade 3 retraction, Fush grade 3-4 fatty degeneration, tangent sign, narrowing in the acromiohumeral interval, [5-11].

Most of the irreparable tears are massive. However, an irreparable tear may not be massive, but may be large [12-14]. The type of surgery to

be performed determines whether the tear is repairable or irreparable, not whether it is massive. Advances in anchors, suture strength, techniques of release and repair with loads haringrip-stop fixation, interval 0, slides, etc., the definition of irreparable continues to evolve [15,16]. In the literature, the term massive is used instead of the term irreparability in many studies. This may be due to a significant portion of irreparable tears are massive tears. Also, the rate of rerupture after primary repair of massive tears is higher than other types of tears (medium, large) is effective in this. However, this may lead to mistakes in the definition of RC tear, inconsistency in the title and study content, and causes misconceptions about all massive tears cannot be repaired primarily.

In this study, we aimed to emphasize that the terms "irreparable" and "massive", which are used to describe a rotator cuff tear, are erroneously used interchangeably in the literature. We think that these two terms should be used correctly in terms of intelligibility and definability.

Method

Systematic Review

A systematic literature review was performed following the Preferred Reporting Items for Systemic Reviews (PRISMA) and Meta-Analyses checklist and flow diagram [17] (Fig 1). Between 2016 and 2022, publications in the last about 5 years were searched from Pubmed and MEDLINE online databases. The main search terms (irreparable OR massive) AND (rotator cuff tear) (IR&M),

¹Department of Orthopaedics and Traumatology, Faculty of Medicine, Yuksek Ihtisas University, Ankara, Turkey.

Address of Correspondence

Dr. Alper Deveci,
Department of Orthopaedics and Traumatology, Faculty of Medicine, Yuksek Ihtisas University, Ankara, Turkey.
E-mail: alperdeveci57@gmail.com

Submitted: 06/02/2022; Reviewed: 21/02/2022; Accepted: 12/03/2022; Published: 10/06/2022

Trauma International ISSN 2455-538X | Available on www.traumainternational.co.in | DOI- 10.13107/ti.2022.v08i01.022

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License <https://creativecommons.org/licenses/by-nc-sa/4.0/>, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

(repairable OR massive) AND (rotator cuff tear), (massive OR retracted) AND (rotator cuff tear), (irreparable OR retracted) AND (rotator cuff tear) were used.

The inclusion criteria of systematically evaluated studies are as follows : (1) Level I to IV original articles, systemic reviews and reviews on rotator cuff repair, (2) Articles in general orthopaedic journals, sports medicine journals, shoulder and upper extremity surgery journals, (3) At least one of the search terms had to be in the article title, (4) English language.

The exclusion criteria included: (1) surgical technique, cadaveric studies, animal studies, conference papers, book chapters, technical reports, (2) the original articles on partial repair, partial repair and augmented auto-allograft applications in unreparable or massive RCT groups, (3) articles that had difficulty in classification and did not provide sufficient detail in the material-method section (4) non-English language.

Studies obtained according to inclusion criteria were divided into 5 subgroups: massive RCT, massive irreparable RCT, irreparable RCT, massive repairable RCT, repairable RCT. In the studies obtained in the literature review under each main search term title, those containing these 5 subgroups, namely massive RCT, massive irreparable RCT, irreparable RCT, massive repairable RCT, repairable RCT, were extracted as full text. Each subgroup was evaluated in terms of the suitability of the subject title with the working group included in the method section. We also cross referenced all references of included studies to avoid omitting relevant studies not included in the original search. In this way we sought to obtain as many studies as possible that would meet our inclusion criteria. Studies with the same title and author, which were obtained under different screening term groups, were evaluated together by all 3 authors and included in a single appropriate subgroup.

Quality Assessment

The index of studies, study design, and level of evidence were evaluated by the third author (A.E.). Levels of evidence were determined using the guide outlined by the Oxford Centre for Evidence Based Medicine [18].

Outcome Measures

For each selected study; a table was created indicating the author's name, publication year, study design, study level of evidence, journal index, title and content compatibility, and the search term used (version 2021; Microsoft). For each subgroup, it was checked whether the title of the search term was mentioned in the title of the article, and whether the title and the content were compatible in the studies in which the searched term was mentioned in the title.

Statistical Analysis

Descriptive statistics were used to analyze study characteristics and reported for proportion. The 22 studies that were examined were tabulated separately under the titles of "Design_of_Study", "Level_Of_Evidence", "Indexing" and "Compatibility" with the help of SPSS 22.0 package program in terms of frequency and percentage distributions. Thus, it has been quantitatively revealed

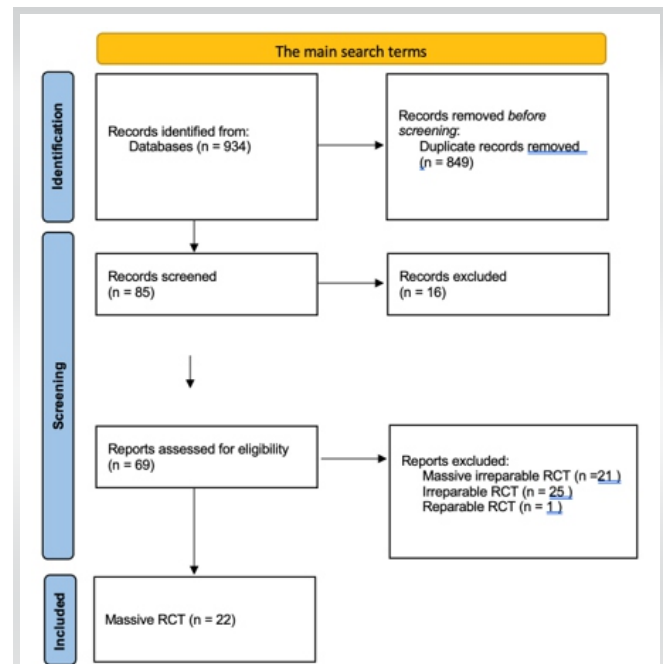


Figure 1: Systemic review algorithm using Preferred Reporting Items for Systemic Reviews and Meta- Analyses guidelines. Flow chart of trial identification and selection.

how the studies subject to the analysis differ in terms of study designs-types, evidence-finding levels, indexes of the journal in which they are published, and compatibility status.

Results

Figure 1 shows the flow chart of the trials identification and selection. The search provided a total of 934 citations. After the first exclusion step, the full text of the remaining 69 citations was examined in more detail. Among these remaining articles, we removed the articles titled massive irreparable RCT, irreparable RCT, repairable RCT and we have 22 articles titled massive RCT. These 22 articles were reviewed in detail (Table 1).

It was seen that in 11 of these 22 articles (50%), the title and the material method were compatible, in 11 of them (50%) the title and the content were incompatible, and the term "massive" was used instead of the term "irreparable".

Discussion

The main finding of this study is; many studies in the literature are using the term massive RCT instead of irreparable RCT. The most important reason why these two terms are used incorrectly as equivalents is that these two values, one qualitative and the other quantitative, intersect to a significant extent.

RCTs are quantitatively classified as small, medium, large and massive. The definition of massive tear is used correctly as a quantitative term in this classification, but its definition is still controversial. It is emphasized on the basis of Gerber and Cofield criteria that more than 5 cm or 2 or more tendons are affected [3, 4]. When we evaluate it according to the functional-based Colin classification, the term massive gains a different meaning [19]. These measurement methods can change according to the patient size and the patient's shoulder position at the time of measurement,

Design of study	Frequency	Percent (%)
Systematic review	10	45.5
Network meta-analysis	2	9.1
Randomized controlled trial	2	9.1
Review article	4	18.2
Retrospective cohort	1	4.5
Single-arm prospective	2	9.1
Case series	1	4.5
Total	22	100

Level Of Evidence	Frequency	Percent (%)
Level 1	2	9.1
Level 2	4	18.2
Level 3	1	4.5
Level 4	15	68.2
Total	22	100

Indexing	Frequency	Percent (%)
Non-SCI	3	13.6
SCI-expanded	19	86.4
Total	22	100

Compatibility	Frequency	Percent
Compatible	11	50
Uncompatible	11	50
Total	22	100

Table 1: Comparison of the articles included in the final evaluation.

Author and year	Indexing	Level of evidence	Design of study	Compatibility
Sellers 2018	non-SCI	Level 4	Systematic review	compatible
Maillot 2019	SCI-expanded	Level 2	Network meta-analysis	compatible
Sachinis 2021	SCI-expanded	Level 1	Randomized controlled trial	compatible
Karuppalah 2019	SCI-expanded	Level 4	Systematic review	uncompatible
Haleem 2021	SCI-expanded	Level 4	Systematic review	compatible
Gillespie 2016	SCI-expanded	Level 4	Review article	uncompatible
Cowling 2020	SCI-expanded	Level 3	Retrospective cohort	uncompatible
Sochacki 2019	SCI-expanded	Level 4	Systematic review	uncompatible
Duchman 2018	SCI-expanded	Level 4	Review article	uncompatible
Thorsness 2016	SCI-expanded	Level 4	Review article	compatible
Shah 2021	SCI-expanded	Level 4	Systematic review	compatible
Lin 2020	SCI-expanded	Level 1	Systematic review	uncompatible
Piekaar 2018	non-SCI	Level 2	Single arm prospective	uncompatible
Ma 2019	SCI-expanded	Level 2	Network meta-analysis	compatible
Ono 2017	SCI-expanded	Level 4	Systematic review	uncompatible
Gervasi 2016	SCI-expanded	Level 2	Single arm prospective	compatible
Villatte 2021	SCI-expanded	Level 4	Network meta-analysis	uncompatible
Ferguson 2016	SCI-expanded	Level 4	Systematic review	compatible
Memon 2018	SCI-expanded	Level 4	Systematic review	uncompatible
Malahias 2020	SCI-expanded	Level 4	Systematic review	uncompatible
Vequerro 2022	SCI-expanded	Level 4	Case series	compatible
Goldenberg 2020	non-SCI	Level 4	Review article	compatible

Table 2: List of all included articles. SCI= Science Citation Index.

they are not very reliable, although they are quantitative values. When viewed from this perspective Gerber classification is more reliable as it is based on the number of affected tendons. But in this classification, supraspinatus and infraspinatus are taken as the main 2 tendons. And this classification has two adjacent tendon conditions. From a functional point of view, there are also cases of massive tears where the two conditions are not together. Again, it is not in the massive group, but is present in irreparable tears. This makes the definition of massive tear debatable. [12, 13]. Hereby, most of the irreparable RCT tears occur quantitatively in massive tears. However, most of the massive RCT is repairable tears as qualitatively.

In addition to irreparability, an important problem in rotator cuff tears is re-tear. The re-tear rate is statistically high in massive tears, [2]. Because the important thing here is that although re-tear is seen proportionally more in large tears, the main reason is biomechanical and biological factors, which are qualitative problems [2, 20]. This situation is mainly related to the factors that create the irreparable feature of the tendon rather than the size of the tendon tear.

In many studies, we see that the problem that is actually emphasized in the studies done under the title of massive is irreparability. In our study, we found that in 11 of 22 articles that only had the term massive in the title, the content of the article was actually about irreparable tears. In our study, the articles in which the title-content mismatch was most common were the studies in which the study design was systemic review. 10 of these 11 studies, except one, were published in SCI-expanded journals. The vast majority are level of evidence 4 studies. When we look at Karuppaiah's review article titled 'Scaffolds in the management of massive rotator cuff tears'; according to the inclusion criteria of the study, we see that the studies they actually discussed emphasize irreparable tears rather than massive tears [21]. In the level 3 retrospective cohort study conducted by Cowling et al., it is seen that the study group actually has irreparable tears in the sub-title of "treatment allocation and interventions" in the methods

section [22]. We also encounter the same situation in the systemic review articles by Sochacki, Duchman, Lin, Ono, Villatte, Memon and Malahias [23-29]. When we look at Piekaar's level 2 single arm prospective study titled 'Early promising outcome following arthroscopic implantation of the subacromial balloon spacer for treating massive rotator cuff tear', we see that all the cases included are patients with irreparable tears [30]. (Table 2).

When we look at the literature, there are debates about the definition of the term massive. However, the criteria for irreparability are clearer and there is a general consensus among researchers. Although this problem has been mentioned very little in the literature, it has not been the main subject of the study and has been underlined. We think that our study is important because it is a study in which this problem is emphasized for the first time through data and a large literature review on this subject is made. The shortcomings of our study may be that the number of articles included in the evaluation is relatively low, since we only scanned the studies from Pubmed and Medline and included the last 5 years. Another shortcoming is that we only included scientific studies. However, we know that there is such a topic in many meetings and courses. However, it was very difficult to document them and at the same time, when we used references, medicolegal problems could be created. We also know that the larger number of studies scanned and the inclusion of the use in congresses, panels and courses other than the included studies will not change the result we have determined.

Conclusion

We see that most of the studies on massive tears were actually done to emphasize irreparable tears. Since most of the massive tears are repairable, the quality feature of massive tears, which are in the group that poses a problem, as irreparable rotator cuff tear or massive irreparable rotator cuff tear should be emphasized.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of Interest: None, **Source of Support:** None

References

1. Greenspoon JA, Petri M, Warth RJ, Millett PJ. Massive rotator cuff tears: pathomechanics, current treatment options, and clinical outcomes. *J Shoulder Elbow Surg* 2015;24(9):1493-1505. <https://doi.org/10.1016/j.jse.2015.04.005>
2. Henry P, Wasserstein D, Park S, Dwyer T, Chahal J, Slobogean G, Schemitsch E. Arthroscopic Repair for Chronic Massive Rotator Cuff Tears: A Systematic Review. *E.Arthroscopy* 2015;31(12):2472-80. <https://doi.org/10.1016/j.arthro.2015.06.038>
3. DeOrio JK, Cofield RH. Results of a second attempt at surgical repair of a failed initial rotator-cuff repair. *J Bone Joint Surg Am* 1984;66(4):563-7. <https://doi.org/10.2106/00004623-198466040-00011>
4. Gerber C, Fuchs B, Hodler J. The results of repair of massive tears of the rotator cuff. *J Bone Joint Surg Am* 2000;82(4):505-15. <https://doi.org/10.2106/00004623-200004000-00006>
5. Goutallier D, Postel JM, Bernageau J, Lavau L, Voisin MC. Fatty muscle degeneration in cuff ruptures. Pre- and postoperative evaluation by CT scan. *Clin Orthop Relat Res* 1994;304:78-83.
6. Burks RT, Tashjian RZ. Should we have a better definition of pseudoparalysis in patients with rotator cuff tears? *Arthroscopy* 2017;33:2281-3.
7. Fuchs B, Weishaupt D, Zanetti M, Hodler J, Gerber C. Fatty degeneration of the muscles of the rotator cuff: assessment by computed tomography versus magnetic resonance imaging. *J Shoulder Elbow Surg* 1999;8:599-605.
8. Omid R, Lee B. Tendon transfers for irreparable rotator cuff tears. *A Am Acad Orthop Surg* 2013;21:492-501.
9. Patte D. Classification of rotator cuff lesions. *Clin Orthop Relat Res* 1990;254:81-6
10. Williams MD, Lädermann A, Melis B, Barthelemy R, Walch G. Fatty

- infiltration of the supraspinatus: a reliability study. *J Shoulder Elbow Surg* 2009;18:581–7. <https://doi:10.1016/j.jse.2008.12.014>
11. Kissenberth MJ, Rulewicz GJ, Hamilton SC, Bruch HE, Hawkins RJ. A positive tangent sign predicts the reparability of rotator cuff tears. *J Shoulder Elbow Surg* 2014;23:1023–7. <https://doi:10.1016/j.jse.2014.02.014>
 12. Kim SJ, Kim SH, Lee SK, Seo JW, Chun YM. Arthroscopic repair of massive contracted rotator cuff tears: Aggressive release with anterior and posterior interval slides do not improve cuff healing and integrity. *J Bone Joint Surg Am* 2013;95:1482–8.
 13. Mori D, Funakoshi N, Yamashita F. Arthroscopic surgery of irreparable large or massive rotator cuff tears with lowgrade fatty degeneration of the infraspinatus: Patch autograft procedure versus partial repair procedure. *Arthroscopy* 2013;29:1911–21.
 14. Novi M, Kumar A, Paladini P, Porcellini G, Merolla G. Irreparable rotator cuff tears: challenges and solutions. *Orthop Res Rev* 2018;10:93–100.
 15. Burkhart SS, Denard PJ, Konicek J, Hanypsiak BT. Biomechanical validation of load-sharing rip-stop fixation for the repair of tissue-deficient rotator cuff tears. *Am J Sports Med* 2014;42: 457–2. <https://doi:10.1177/0363546513516602>
 16. Lo IK, Burkhart SS. Arthroscopic repair of massive, contracted, immobile rotator cuff tears using single and double interval slides: technique and preliminary results. *Arthroscopy* 2004;20: 22–33. <https://doi:10.1016/j.arthro.2003.11.013>
 17. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Int J Surg* 2010;8:336–341.
 18. Obremskey WT, Pappas N, Attallah-Wasif E, Tornetta P III, Bhandari M. Level of evidence in ortho- paedic journals. *J Bone Joint Surg Am* 2005;87:2632–2638.
 19. Collin P, Matsumura N, Lädermann A, Denard PJ, Walch G. Relationship between massive chronic rotator cuff tear pattern and loss of active shoulder range of motion. *J Shoulder Elbow Surg* 2014; 23(8):1195–1202. <https://doi:10.1016/j.jse.2013.11.019>
 20. Dwyer T, Razmjou H, Henry P, Gosselin-Fournier S, Holtby R. Association between pre-operative magnetic resonance imaging and reparability of large and massive rotator cuff tears. *Knee Surg Sports Traumatol Arthrosc* 2015;23:415–22.
 21. Karuppaiah K, Sinha J. Scaffolds in the management of massive rotator cuff tears: current concepts and literature review. *EFORT Open Rev* 2019;4:557–566. [doi: 10.1302/2058-5241.4.180040](https://doi:10.1302/2058-5241.4.180040)
 22. Cowling P, Hackney R, Dube B, Grainger AJ, Biglands JD, Stanley M, Song D, Conaghan PG, Kingsbury SR. The use of a synthetic shoulder patch for large and massive rotator cuff tears - a feasibility study. *BMC Musculoskelet Disord* 2020;21:213. [doi: 10.1186/s12891-020-03227-z](https://doi:10.1186/s12891-020-03227-z).
 23. Duchman KR, Mickelson DT, Little BA, Hash TW, Lemmex DB, Toth AP, Garrigues GE. Graft use in the treatment of large and massive rotator cuff tears: an overview of techniques and modes of failure with MRI correlation. *Skeletal Radiol* 2019; 48:47–55. [doi: 10.1007/s00256-018-3015-4](https://doi:10.1007/s00256-018-3015-4).
 24. Lin J, Sun Y, Chen Q, Liu S, Ding Z, Chen J. Outcome Comparison of Graft Bridging and Superior Capsule Reconstruction for Large to Massive Rotator Cuff Tears: A Systematic Review. *Am J Sports Med* 2020; 48:2828–2838. [doi: 10.1177/0363546519889040](https://doi:10.1177/0363546519889040).
 25. Malahias MA, Chytas D, Kostretzis L, Gkias I, Kokkineli S, Antonogiannakis E. Arthroscopic anatomic complete versus non-anatomic repair of massive rotator cuff tears: a systematic review of comparative trials. *Musculoskelet Surg* 2020; 104:145–154. [doi: 10.1007/s12306-020-00648-w](https://doi:10.1007/s12306-020-00648-w).
 26. Memon M, Kay J, Quick E, Simunovic N, Duong A, Henry P, Ayeni OR. Arthroscopic-Assisted Latissimus Dorsi Tendon Transfer for Massive Rotator Cuff Tears: A Systematic Review. *Orthop J Sports Med*. 2018; 6:2325967118777735. doi:10.1177/2325967118777735.
 27. Ono Y, Herrera DAD, Woodmass JM, Boorman RS, Thornton GM, Lo IKY. Graft Augmentation Versus Bridging for Large to Massive Rotator Cuff Tears: A Systematic Review. *Arthroscopy* 2017; 33:673–680. doi:10.1016/j.arthro.2016.08.030.
 28. Sochacki KR, McCulloch PC, Lintner DM, Harris JD. Superior Capsular Reconstruction for Massive Rotator Cuff Tear Leads to Significant Improvement in Range of Motion and Clinical Outcomes: A Systematic Review. *Arthroscopy* 2019; 35:1269–77. [doi: 10.1016/j.arthro.2018.10.129](https://doi:10.1016/j.arthro.2018.10.129).
 29. Villatte G, Erivan R, Nourissat G, Marcheix PS, Pereira B, Aubret S, Boisgard S, Descamps S. Allograft and autograft provide similar retear rates for the management of large and massive rotator cuff tears: a review and meta-analysis. *Knee Surg Sports Traumatol Arthrosc* 2022; 30:2039–59. doi:10.1007/s00167-021-06745-y.
 30. Piekaar RSM, Bouman ICE, van Kampen PM, van Eijk F, Huijsmans PE. Early promising outcome following arthroscopic implantation of the subacromial balloon spacer for treating massive rotator cuff tear. *Musculoskelet Surg*. 2018; 102:247–255. [doi: 10.1007/s12306-017-0525-5](https://doi:10.1007/s12306-017-0525-5).

How to Cite this Article

Deveci A, Dur H, Alkan E | Is the Nomenclature of Massive Rotator Cuff Tear Used Correctly? Systematic Review | January-June 2022; 8(1): 06-10.