Systematic Review

Is Double-Row Rotator Cuff Repair Clinically Superior to Single-Row Rotator Cuff Repair: A Systematic Review of Overlapping Meta-analyses

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Purpose: Multiple meta-analyses of randomized clinical trials, the highest available level of evidence, have been conducted to determine whether double-row (DR) or single-row (SR) rotator cuff repair (RCR) provides superior clinical outcomes and structural healing; however, results are discordant. The purpose of this study was to conduct a systematic review of meta-analyses comparing SR and DR RCR to elucidate the cause of discordance and to determine which meta-analysis provides the current best available evidence. **Methods:** In this study we evaluated available scientific support for SR versus DR RCR by systematically reviewing the literature for published meta-analyses. Data were extracted from these meta-analyses for patient outcomes and structural healing. Meta-analysis quality was assessed with the Oxman-Guyatt and Quality of Reporting of Meta-analyses (QUOROM) systems. The Jadad algorithm was then applied to determine which meta-analyses provided the highest level of evidence. **Results:** Eight meta-analyses met the eligibility criteria: 4 including Level I evidence and 4 including both Level I and Level II evidence. Six meta-analyses found no differences between SR and DR RCR for patient outcomes, whereas 2 favored DR RCR for tears greater than 3 cm. Two meta-analyses found no structural healing differences between SR and DR RCR, whereas 3 found DR repair to be superior for tears greater than 3 cm and 2 found DR repair to be superior for all tears. Four meta-analyses had low Oxman-Guyatt scores (<3) indicative of major flaws. After application of the Jadad algorithm, 3 concordant high-quality meta-analyses were selected, all of which found significantly better structural healing with DR compared with SR RCR. **Conclusions:** According to this systematic review of overlapping meta-analyses comparing SR and DR RCR, the current highest level of evidence suggests that DR RCR provides superior structural healing to SR RCR. **Level of Evidence:** Level II, systematic review of Level I and II studies.

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Rotator cuff tears occur in over 30% of individuals aged older than 60 years, with 150,000 to 200,000 rotator cuff repairs (RCRs) performed annually in the United States.[1,2] Although numerous case series have shown excellent clinical outcomes,[3-7] failure rates after RCR vary widely from 5% to 94%.[3-9] Although RCR was historically[10] performed by an open approach,[8] surgeons have transitioned to the arthroscopic approach to reduce surgical morbidity. Early comparative studies showed high failure rates with arthroscopic repairs,[8] which were thought in part to be due to the inability of single-row (SR) repairs to restore the footprint.[6,11-14]

Double-row (DR) RCRs came about in response to these concerns. DR repair uses both medial- and lateral-row anchors to facilitate improved coverage of the rotator cuff footprint with the supraspinatus,[15] and early reports showed retear rates of 11% to 22%.[3,6,7] More recently, several authors have recommended augmenting DR repairs with suture connections between the medial and lateral rows using a transosseous-equivalent

(TOE) technique to compress the tendon to the footprint.[13,16-19] Although some biomechanical analyses have shown DR and TOE repairs to have increased contact area, decreased gap formation, and increased load to failure,[12,16,20] others have been less conclusive.[13,17,21,22] Randomized clinical trials (RCTs) and controlled clinical trials (Level I to Level III evidence) are conflicted as to whether DR fixation affects structural healing or clinical outcomes.[8,9,19,21,23-30] To attempt to resolve this conflict, numerous authors have systematically reviewed the existing RCTs and controlled clinical trials with or without meta-analysis.[30-37] Although some of these studies have concluded that DR RCR provides superior structural healing to SR RCR,[31,33,37-39] others have concluded that no difference exists and SR is thus superior because it is less expensive and less technically demanding intraoperatively.[32,34,35] Similarly, whereas some of these systematic reviews have concluded that DR RCR provides superior clinical outcomes to RCR,[37] others have concluded that no difference exists[30-36] except in the setting of large to massive tears (>3 cm).[31,37] Meta-analysis of Level I RCTs theoretically provides the highest available level of evidence for clinical decision making,[40] but how shall we proceed when the highest available evidence conflicts?

The purpose of this study was (1) to conduct a systematic review of meta-analyses comparing SR and DR RCR, (2) to propose a guide through the currently discordant best available evidence to provide treatment recommendations, and (3) to highlight gaps in the literature that require future research.

Methods

A systematic review of the literature was performed using the PubMed database, Cochrane Database of Systematic Reviews, Scopus database, and Embase database. The following search terms were used: single-row, double-row, rotator cuff, meta-analysis. The search was performed on January 20, 2014, and was limited to articles written in English. Broad search query terms were used to include all possibly applicable studies. All reviewed articles were then manually cross referenced to ensure that all potential studies were included.

The abstracts that resulted from these searches were reviewed by 2 of the authors. The inclusion criteria were meta-analyses that compared arthroscopic SR and DR RCR techniques and English-language literature. Cadaveric studies were excluded. The exclusion criteria included narrative reviews or those without an organized and reported search algorithm, reviews of open procedures, and studies without clinical outcomes data. We also excluded systematic reviews that did not pool data or perform a meta-analysis. We then obtained full articles for those studies that met both the inclusion and exclusion criteria. The references for each of these citations were then manually screened to ensure that no studies were missed. The table of contents for the past 2 years of the *Journal of Bone and Joint Surgery*, the *American Journal of Sports Medicine*, *Clinical Orthopaedics and Related Research*, *Arthroscopy*, and the *Journal of Shoulder and Elbow Surgery* were manually searched as well for any additional studies. A PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram shows our study selection algorithm (Fig 1).

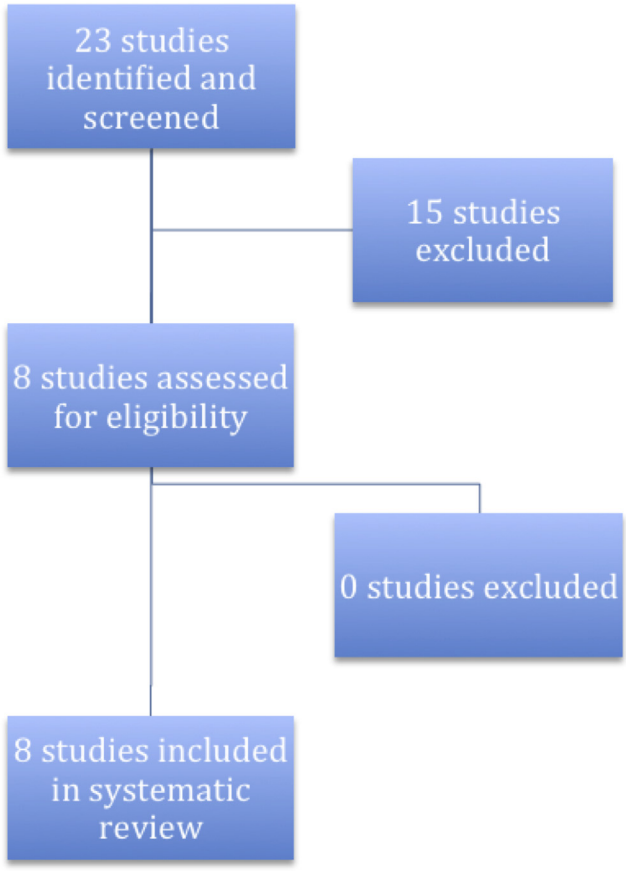

Fig 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram showing the results of application of the study algorithm to the number of studies included, with the number of studies removed after application of each exclusion criterion.

From those studies that met the inclusion criteria, the following data were extracted: author; journal of publication; year of publication; conflicts of interest; levels of evidence included; number of studies included; dates of studies included; inclusion criteria; exclusion criteria; whether heterogeneity analytics were performed; sample size; patient demographic data; length of follow-up; tear size; blinding protocols; strength in all tested planes; range of motion; patient satisfaction; and time to return to work, as well as rate of return to work. The following standardized outcome scores were collected: Constant scores, American Shoulder and Elbow Surgeons (ASES) scores; University of California, Los