

# Does Suture Technique Affect Re-Rupture in Arthroscopic Rotator Cuff Repair? A Meta-analysis



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**Purpose:** To evaluate the effects of suture configuration, repair method, and tear size on rotator cuff (RC) repair healing. **Methods:** We conducted a literature search of articles that examined surgical treatment of RC tears published between January 2003 and September 2014. For single-row (SR) repairs, we calculated rerupture rates for simple, mattress, and modified Mason-Allen sutures while stratifying by tear size. All double-row repairs—those using 2 rows of suture anchors (DA) and those using a suture bridge (SB)—were performed using mattress sutures, and we compared rerupture rates by repair method while stratifying by tear size. A random-effects model with pooled estimates for between-study variance was used to estimate the overall rerupture proportion and corresponding 95% confidence interval for each group. Statistical significance was defined as  $P < .05$ . **Results:** A total of 682 RC repairs from 13 studies were included. For SR repairs of tears measuring less than 3 cm, there was no significant difference in rerupture rates for modified Mason-Allen sutures versus simple sutures ( $P = .18$ ). For SR repairs of tears measuring 3 cm or more, there was no significant difference in rerupture rates for mattress sutures versus simple sutures ( $P = .23$ ). The rates of rerupture did not differ between SB and DA repairs for tears measuring less than 3 cm ( $P = .29$ ) and 3 cm or more ( $P = .50$ ). **Conclusions:** For SR repairs, there were no significant differences in rerupture rates between suture techniques for any repair method or tear size. All DA and SB repairs were secured with mattress sutures, and there were no differences in the rates of rerupture between these methods for either size category. These findings suggest that suture technique may not affect rerupture rates after RC repair. **Level of Evidence:** Level IV, systematic review of Level I through IV studies.

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Rotator cuff (RC) tears may be associated with pain and reduced physical functioning, and they often become more prevalent with age.<sup>1-3</sup> Repair may be warranted if failure of nonoperative treatment occurs. The goal of surgery is to obtain healing of the RC to its footprint and subsequently improve functioning and patient satisfaction; however, findings in the literature remain controversial.<sup>4</sup> The importance of RC healing has been shown by many studies,<sup>5,6</sup> although other

studies have shown functional improvement in the absence of RC healing.<sup>7-10</sup>

Factors that influence the successful healing of RC tears include age, comorbidities, bone quality, tear size, tissue quality, and activity level.<sup>4</sup> However, all of these factors are inherent to the patient and thus non-modifiable. Repair technique and suture technique may also affect healing and are under the surgeon's control.<sup>4</sup> Many authors have compared healing for single-row (SR) and double-row (DR) repairs, but findings remain controversial.<sup>11-14</sup> Suture technique is another factor under the surgeon's control, and common techniques include simple, mattress, and Mason-Allen sutures. The weakest point of the repair has been shown to be the suture-tendon interface, with suture pullout being the most common cause of repair failure.<sup>15,16</sup> Biomechanical studies have shown the superiority of mattress sutures for SR repairs and modified Mason-Allen sutures for DR repairs.<sup>17,18</sup> However, very few clinical studies have compared outcomes of various suture techniques after RC repair.<sup>18-20</sup>

The primary purpose of our study was to evaluate the effects of suture configuration, repair method, and tear

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size on RC repair healing. We hypothesized that for larger tears, DR repair methods would be preferable to SR repair methods and that suture technique would also influence RC rerupture rates.

## Methods

### Literature Search

We conducted a literature search using PubMed, the Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials to find articles on RC repair published between January 2003 and September 2014. Search terms included RC, supraspinatus, therapy, repair, healing, and imaging. The literature search was limited to journal articles published in English. The references of included articles were also reviewed to identify any additional articles that may not have been captured by our literature search. The search process was outlined with a flow diagram modeled after the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement.<sup>21</sup>

The title and abstract were reviewed for all articles identified through our search. Clinical studies that examined the results of surgical treatment for RC tears were examined in more detail. The inclusion criteria were as follows: full-thickness RC tears were studied; preoperative tear size was reported; surgical approach, repair method, and suture technique were reported; a simple, mattress, or modified Mason-Allen suture technique was used; tendons were treated by primary arthroscopic repair; and RC healing was assessed at least 1 year postoperatively using magnetic resonance imaging, ultrasonography, or arthrography (or a combination of these imaging techniques). The exclusion

criteria were insufficient data, RC integrity assessed less than 1 year postoperatively or not assessed, subscapularis tears, open repair, partial-thickness tears, non-suture repair, nonoperative treatment, revision surgery, use of a graft in the repair, and studies examining the effect of platelet-rich plasma on RC repairs.

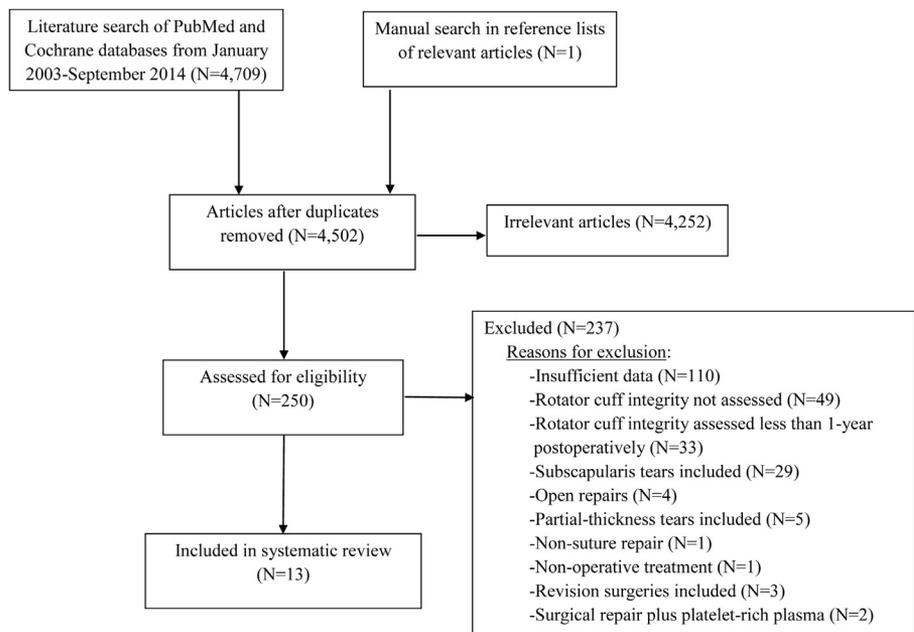
The methodologic quality of each study was assessed with the Quality Appraisal Tool (QAT), which is commonly used in orthopaedic systematic reviews and is used to evaluate all types of study designs.<sup>22</sup> Two of the authors (M.J.B., M.A.K.) independently reviewed and computed QAT scores for each study. The highest possible score on the QAT is 30, and a higher score represents higher methodologic quality.

### Statistical Analysis

The following data were extracted from each study: first author, publication year, study design, level of evidence, sample size for analyses, patient age, preoperative tear size, repair method, suture technique, imaging follow-up time, imaging method, and structural healing rate. Preoperative tear size was categorized either as less than 3 cm or as 3 cm or more. Arthroscopic repair methods were divided into SR and DR repairs, with DR repairs further divided into those using 2 rows of anchors (DA) and those using a suture bridge (SB). The suture techniques examined were simple sutures, mattress sutures, and modified Mason-Allen sutures. Structural tendon healing was categorized as complete or reruptured.

The association between structural healing rates and suture techniques was examined. This analysis was restricted to SR repairs because this was the only repair method for which suture techniques could be compared. For each study, the numbers of complete and reruptured

**Fig 1.** PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram for meta-analysis examining effects of suture configuration and rotator cuff healing after surgical repair.



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