Systematic Review

Repair of Full-Thickness Rotator Cuff Tears in Patients Aged Younger Than 55 Years

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Purpose: The purpose of this study was to conduct a systematic review of the available evidence regarding clinical outcomes after open or arthroscopic repair of full-thickness rotator cuff tears in young patients. **Methods:** Medline, PubMed, and Embase were reviewed to find all studies examining full-thickness rotator cuff repairs in patients aged younger than 55 years and with a minimum of 1 year of follow-up. **Results:** We found 7 studies that met the inclusion criteria. The mean patient age was 41.7 years (range, 16.2 to 54 years), and the mean time from injury was 66.1 months. Eighty-one percent of the included patients had a traumatic tear. The rotator cuff repair was supplemented by acromioplasty in 96.6% of patients, distal clavicle resection in 34.6%, and biceps tenodesis in 16.1%. Postoperative American Shoulder and Elbow Surgeons Standardized Shoulder Assessment was the most commonly reported outcome score, with a mean postoperative score of 82.0 (4 studies). Improvement was shown in all studies that reported on postoperative strength. All studies that assessed pain showed an improvement in the postoperative setting. Overall, 82% of the shoulders had satisfactory results. **Conclusions:** Full-thickness rotator cuff tears in patients aged younger than 55 years are mostly traumatic in origin and respond well to open and arthroscopic rotator cuff repair, as shown by good patient-reported outcomes, significant pain relief, improvement in strength, and high satisfaction postoperatively. **Level of Evidence:** Level IV, systematic review of Level IV studies.

Whereas rotator cuff repair (RCR) in the general population is understood to achieve good patient outcomes, the majority of studies examining outcome have focused on older patient populations or on mixed-age populations.[1] It is known that full-thickness tears develop less commonly in younger patients than in older patients, that younger patients are more likely to have a traumatic tear etiology, and that younger patients tend to have higher demands in daily life.[1-8]

Biological factors may support improved rotator cuff healing after repair in young patients, with younger patients shown to have better vascular supply and tendon quality.[9] Furthermore, humeral head osteopenia, which has been associated with full-thickness rotator cuff tears, is less common in younger patients.[10] However, these factors may be offset by increased demand and activity level in many younger patients.[1]

In comparison with older patients with rotator cuff tears, outcomes after surgery in younger patients are less well defined. The purpose of this systematic review was to summarize the available evidence regarding both patient-reported and functional outcomes after RCR in patients aged younger than 55 years. We hypothesized that RCR in this younger cohort of patients would result in good functional outcomes and high satisfaction rates.

Methods

Literature Search

We searched all published literature from Medline (1946 to week 1 of March 2014), PubMed (1948 to 2013), and Embase (1980 to week 10 of 2014) using a title search for the following terms: rotator cuff AND

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(age* OR young* OR year*). To ensure completeness, we used the following techniques: (1) text search strategy, (2) manual cross-referencing of relevant research, and (3) manual searches of the published records from 2011 to 2013 of the conferences of the American Academy of Orthopaedic Surgeons, Combined Meeting of Orthopaedic Research Societies, American Orthopaedic Society for Sports Medicine, and Arthroscopy Association of North America.

Our inclusion criteria were as follows: (1) studies reporting clinical outcomes after open or arthroscopic repair of a full-thickness rotator cuff tear, (2) adult patients aged between 16 and 54 years, and (3) follow-up of 12 months' minimum. Our exclusion criteria were as follows: (1) partial rotator cuff tear repairs, (2) outcome studies that did not report results for complete rotator cuff tears separately from partial tears, (3) technique papers with fewer than 10 patients, and (4) case reports.

Data Abstraction

Two independent researchers reviewed each study to ensure that it was appropriate for inclusion in this investigation before data abstraction. In terms of data abstraction, study data included study characteristics, patient demographic characteristics, and procedure details. Study characteristics included study type, year of publication, level of evidence, number of shoulders enrolled, follow-up time, patients lost to follow-up, and dates of recruitment period. Patient demographic characteristics collected included age, gender, handedness, traumatic etiology of symptoms, time to surgery, tear size and pattern, athlete status and work-related complaint status, and concomitant procedures performed. Procedure details analyzed included number of operating surgeons, surgical technique, and open or arthroscopic repair.

Multiple studies reported on postoperative scores including the American Shoulder and Elbow Surgeons (ASES) score, Constant score, and Single Assessment Numeric Evaluation (SANE) score.[11-13] Outcomes also included active range of motion with respect to external rotation (ER), internal rotation (IR), and forward flexion (FF). Satisfaction and surgical complications (as noted by the authors) were also used as endpoints. Moreover, individual studies reported results using the Western Ontario Rotator Cuff (WORC) score; the Short WORC score; the Simple Shoulder Test score; and the University of California, Los Angeles score.[14-16]

Analysis

Descriptive statistics were used to analyze patient characteristics as well as study characteristics and outcomes. Weighted means were used whenever possible. Most of the studies did not present means with standard deviation data, which precluded a formal meta-analysis.

Results

Literature Search

The search produced 442 abstracts. After removal of duplicates, 162 abstracts remained. General search terms were used to capture all abstracts reporting on young patients; however, this generated a large number of inappropriate articles. A screen of abstracts allowed narrowing of the article base to 12 manuscripts. The manuscripts were reviewed, and after removal of those that failed to meet the eligibility criteria, 7 articles remained.[1,2,4,17-20]

Study Characteristics

Of the 7 clinical studies that met the inclusion criteria, all were retrospective case series (Table 1).[1,2,4,17-20] The mean follow-up period was 64.3 months (range, 24 to 194 months), and the effective follow-up rate across studies was 82.2% (range, 76% to 100%).[1,2,4,17-20]

Patient Demographic Characteristics

In total, 249 patients were pooled from the studies. The mean patient age was 41.7 years, and 146 of 249 patients (58.9%) were male patients (Table 2).[1,2,4,18,19] Handedness was reported in 2 studies, and 38 of these 72 cases (52.8%) involved the dominant shoulder.[1,2] The suspected etiology of symptoms was recorded in

Table 1. Characteristics of Included Studies

Author	Age Criteria (yr)	Technique	Type of Study	Level of Evidence	No. of Shoulders at Final Follow-up	Effective Follow-up (%)	Mean Follow-up Length (Range) (mo)
Dwyer et al.,[19] 2014	<55	Arthroscopic	Case control	IV	84	100	24 (23-25)
Hawkins et al.,[2] 1999	≤40	Open	Case series	IV	19	100	68 (25-144)
Krishnan et al.,[4] 2008	<40	Arthroscopic	Case series	IV	23	100	26 (24-29)
Lin et al.,[1] 2013	<45	Arthroscopic	Case series	IV	53	76	38.5 (13.9-59.1)
Ma et al.,[20] 2000	<40	Open	Case series	IV	12	100	59.5 (36-100)
Solomon et al.,[17] 2005	<55	Arthroscopic	Case series	IV	29	100	39.7 (24-59)
Sperling et al.,[18] 2004	≤50	Open	Case series	IV	29	81	194.4 (156-NR)

NR, not reported.