



BASIC SCIENCE

Early postoperative repair status after rotator cuff repair cannot be accurately classified using questionnaires of patient function and isokinetic strength evaluation



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Background: This study investigated if patients with an intact tendon repair or partial-thickness re-tear early after rotator cuff repair display differences in clinical evaluations and whether early tendon healing can be predicted using these assessments.

Methods: We prospectively evaluated 60 patients at 16 weeks after arthroscopic supraspinatus repair. Evaluation included the Oxford Shoulder Score, 11-item version of the Disabilities of the Arm, Shoulder and Hand, visual analog scale for pain, 12-item Short Form Health Survey, isokinetic strength, and magnetic resonance imaging (MRI). Independent *t* tests investigated clinical differences in patients based on the Sugaya MRI rotator cuff classification system (grades 1, 2, or 3). Discriminant analysis determined whether intact repairs (Sugaya grade 1) and partial-thickness re-tears (Sugaya grades 2 and 3) could be predicted.

Results: No differences ($P < .05$) existed in the clinical or strength measures. Although discriminant analysis revealed the 11-item version of the Disabilities of the Arm, Shoulder and Hand produced a 97% true-positive rate for predicting partial thickness re-tears, it also produced a 90% false-positive rate whereby it incorrectly predicted a re-tear in 90% of patients whose repair was intact. The ability to discriminate between groups was enhanced with up to 5 variables entered; however, only 87% of the partial-retear group and 36% of the intact-repair group were correctly classified.

Conclusions: No differences in clinical scores existed between patients stratified by the Sugaya MRI classification system at 16 weeks. An intact repair or partial-thickness re-tear could not be accurately predicted. Our results suggest that correct classification of healing in the early postoperative stages should involve imaging.

The University of Western Australia (RA/4/1/4872) Human Research Ethics Committee (HREC) approved this research.

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Rotator cuff surgical repair is common, with in excess of 250,000 performed each year.¹⁸ Despite advances in surgical techniques and the increasing use of adjunct biologic therapies to stimulate or enhance repair, or both, the postoperative failure rate remains a concern.^{3,8,9} Although patients with retears or failed healing may experience a reduction in pain, functional outcomes, including strength levels, are significantly lower compared with patients with evidence of completely healed tendons.^{6,10,16,20,32} These inferior functional results may be satisfactory for an older or less active population, or both, but patients who require a return to sport or work where physical strength is important may be dissatisfied with the outcome.

A primate model of rotator cuff repair showed that a significant proportion of Sharpey fibers start to reconstitute at 3 months, with maturation seen at 4 months.²⁹ Kluger et al²⁴ reported that most recurrent tears occur in the first 3 months after rotator cuff surgery, highlighting that this early phase of tendon healing up to 3 to 4 months postoperatively is critical for longer-term success. Early confirmation of tendon healing is reassuring for the patient in the early postoperative stages. Likewise, identification of impaired healing or partial disruption of the tendon repair could affect management after surgery. This may include modifying the patient's ongoing rehabilitation program, more focused patient education on potentially provocative or damaging movements and activities, recommending restrictions in future work and sport practices, ongoing surveillance of future patient symptoms and imaging, and even consideration for further surgery. Therefore, identifying the presence of incomplete tendon healing at an early stage after surgery using clinical and strength evaluation could prove beneficial.

The routine use of postoperative imaging studies to evaluate the outcome of rotator cuff surgery can be costly. Ultrasound (US), although readily available and cost-effective, is operator dependent for accuracy.^{17,30} Magnetic resonance imaging (MRI) is generally considered to be superior to US^{2,11} but remains an expensive imaging modality. Several researchers have attempted to determine whether the clinical progress of a nonoperatively treated rotator cuff tendon tear can be predicted using common clinical shoulder assessments, albeit with limited success.^{1,23,25} At the time of writing, we are unaware of any other studies that have investigated whether common shoulder clinical assessments can predict the early postoperative success of rotator cuff repair surgery.

Therefore, this study aimed to (1) investigate if differences in common shoulder patient-reported outcome (PRO) measures and isokinetic strength tests could be observed between patients with completely intact repairs or partial-thickness tendon retears, classified by MRI, at 16 weeks after rotator cuff repair surgery; and (2) determine if these PRO measures and strength tests could predict the early (16 weeks) postoperative success of rotator cuff repair.

Materials and methods

Patients

This prospective comparative study recruited 60 consecutive patients with rotator cuff tears isolated to the supraspinatus (Table I). Patients were recruited between November 2011 and February 2013 and were included if they presented with a symptomatic full-thickness tear of the supraspinatus, confirmed preoperatively by MRI or US and intraoperatively by arthroscopic evaluation. Patients with supraspinatus partial tears or tears exceeding 20 mm in the anteroposterior dimension were excluded, as were patients with concomitant subscapularis or infraspinatus tears, or both, identified on preoperative US or MRI or intraoperative examination. Patients were excluded if they had any or all of a history of previous rotator cuff surgery, labral tearing, significant osteoarthritis of the glenohumeral joint, rheumatologic, neuromuscular, or autoimmune disease, or cervical disc herniation. Patients were further excluded if they presented with any contralateral shoulder symptoms or had ongoing workers' compensation claims.

A priori power calculation based on our first study goal was determined from the recommendations of Cohen.¹² The minimal clinically important difference reported for the 11-item version of the Disability of the Arm, Shoulder and Hand (QuickDASH) questionnaire varies, ranging from 14.0 to 17.1 for patients with shoulder pathology,^{15,31,35} equating to an effect size of 0.75 to 0.98. Therefore, to detect this degree of difference (effect size of 0.85) with 80% power at $\alpha = 0.05$, we estimated that 18 patients in each of the intact-repair (Sugaya grade 1) and partial-retear (Sugaya grade 2 and 3 pooled) groups would be required for this study.

Surgical technique

All surgery was performed by the senior author (A.W.). Briefly, all procedures were performed with the patient in the lateral decubitus position under general anaesthesia with an interscalene nerve block. The arm was placed in 4 kg of traction and positioned in 30° of arm flexion and abduction. The presence of a full-thickness supraspinatus tear was initially confirmed by diagnostic

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