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Prognostic factors for recovery after arthroscopic rotator cuff repair: a prognostic study

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Background: Studies concerning prognostic factors of recovery after arthroscopic rotator cuff repair mostly focus on tendon integrity or functional recovery as an outcome. Little is known about how they influence quality of life after surgery. We therefore tried to identify prognostic factors having an impact on quality of life after arthroscopic rotator cuff repair.

Methods: This study included 30 patients who underwent arthroscopic rotator cuff repair. We assessed Western Ontario Rotator Cuff Index as primary outcome and RAND-36, Constant-Murley score, and a shoulder hindrance score as secondary outcomes. Patients were repeatedly measured: once preoperatively and 4 times postoperatively. Preoperative range of motion, obesity, fatty infiltration, and cuff retraction were preselected as prognostic factors.

Results: Patients were significantly improved at 3 months and 6 months after arthroscopic rotator cuff repair. In multiple regression analysis, none of the preselected factors could be identified as a prognostic factor influencing quality of life after arthroscopic rotator cuff repair (measured with the Western Ontario Rotator Cuff Index). For the outcome variables RAND-36 (6 months, 1 year) and shoulder hindrance score (1 year), fatty infiltration Goutallier stages 1 and 2 and retraction grades II, III, and IV were significant predictors.

Conclusion: Although fatty infiltration and retraction grade predict the RAND-36 and shoulder hindrance score, this study could not support preoperative range of motion, obesity, fatty infiltration, or retraction of the cuff as a prognostic factor for quality of life after arthroscopic rotator cuff repair. This study shows that if selection of patients is done properly, these factors do not influence a successful outcome.

Level of evidence: Level I, Prospective Cohort, Prognosis Study.

Keywords: Shoulder; rotator cuff lesion; arthroscopic repair; prognostic factors; quality of life

Ethical Committee approval: Lokale commissie Toetsing Medische Experimenten: LTME/Z-11.19/WORC. The Institutional Review Board of St. Antonius Hospital approved the protocol, and all patients gave informed consent.

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Shoulder rotator cuff lesion is a common shoulder disorder; prevalence ranges from 13% in people older than 50 years to >50% in people older than 80 years.[20] These lesions are mostly asymptomatic, usually because of their small size.[27] Approximately one third of these lesions are accompanied by symptoms such as pain, muscle weakness, and loss of range of motion in the shoulder joint, which may lead to restrictions in daily functioning.[2,16,22] An arthroscopic rotator cuff repair can be a solution for this symptomatic group.[11,24,25]

Although an arthroscopic rotator cuff repair is a relatively minor procedure, rehabilitation is long and intensive. The first weeks after surgery are often painful, and the patient should anticipate several months of physical therapy.[10,17] At the same time, the degree of recovery and the recovery period after an arthroscopic rotator cuff repair vary distinctly between patients.[16] This difference partly depends on which definition of recovery is used. Recovery has been described and measured in different ways ranging from functional recovery (questionnaires, goniometer, dynamometer) to quality of life (questionnaires), subjective variables (pain, satisfaction), and tendon healing (ultrasound or magnetic resonance imaging [MRI]).[8]

Several factors may affect the degree to which a person recovers after a cuff repair. In the literature, different types of prognostic factors are mentioned, encompassing demographics, clinical factors, cuff integrity, and factors concerning the surgical procedure.[5,15,21,22] Evidence related to these prognostic factors may lead to improved insight for physiotherapists and orthopedic surgeons as to why the recovery process is successful in some patients and unsuccessful in others. Therefore, patients can be more accurately informed about their expected recovery. Furthermore, it can contribute to the preparation of individualized protocols for surgery and rehabilitation.[6]

In an earlier systematic review, 12 variables were identified as prognostic factors for recovery after arthroscopic rotator cuff repair.[8] In the current prognostic study, 4 of these prognostic factors (preoperative range of motion, obesity, fatty infiltration, retraction) were studied to determine the level of influence on recovery after an arthroscopic rotator cuff repair. These specific factors were chosen because they can, in some way, be influenced preoperatively and thereby could contribute to achievement of better postoperative results. Range of motion and obesity can preoperatively be addressed through physical therapy, weight management, and exercise. This might be useful as part of a "better in, better out" principle or during an attempt at primary nonsurgical management. Fatty infiltration and retraction could be taken into account by timing of the operation or in deciding whether to operate because there might be tear size progression over time.[25,26] This could lead to a worse recovery, which indicates that timing of the operation is important.

The primary goal of this prognostic study was to determine the level of influence of preoperative range of motion, obesity, fatty infiltration, and retraction on recovery after an arthroscopic rotator cuff repair. The secondary goal was to study the course of recovery in the first year after surgery.

Materials and methods

Study design

In a prospective prognostic cohort study, we followed up 30 patients who underwent arthroscopic rotator cuff repair in the St. Antonius Hospital (Utrecht, The Netherlands) between February 2012 and March 2013. Patients were repeatedly measured: once preoperatively and 4 times postoperatively (6 weeks, 3 months, 6 months, and 1 year).

Patient recruitment and selection

Patients with shoulder complaints who visited the outpatient clinic of the Department of Orthopedic Surgery and who had (based on history taking and examination) a suspected rotator cuff lesion were asked to participate in this clinical trial. All patients were recruited by a single orthopedic surgeon (R.W.).

The criteria for inclusion were that patients (1) had clinical symptoms of a rotator cuff lesion; (2) were diagnosed with a partial- or full-thickness lesion assessed by MRI or ultrasound, which was confirmed by intraoperative assessment; (3) were 18 years or older; and (4) had signed an informed consent. Patients were excluded if they (1) could not understand the Dutch language well enough; (2) were not able to complete the used questionnaires independently; (3) had additional shoulder pathologic processes, such as adhesive capsulitis, labrum lesion, osteoarthritis of the glenohumeral joint, or fatty infiltration of the cuff Goutallier stage $\geq$3; (4) had previous surgery on the same shoulder; or (5) had a systemic disease that could negatively influence normal recovery.

Surgery and rehabilitation protocol

All surgical procedures were performed by 1 senior orthopedic surgeon (R.W.) with extensive experience in arthroscopic rotator cuff repair. Patients were operated on in a beach chair position under general anesthesia and a brachial plexus blockade. A bleeding surface of the footprint was obtained by using a curet to optimize ingrowth. Depending on the type of rotator cuff tear, double-row (n = 23), single-row (n = 3), or other repair techniques (n = 4, i.e., side-to-side/a combination of repair techniques) were used. A double-row fixation technique was the preferred technique. Next to the rotator cuff repair, an acromioplasty (n = 7), distal clavicular resection (n = 3), biceps tenotomy (n = 12), or biceps tenodesis (n = 1) was conducted. The first 6 weeks after surgery, the shoulder was immobilized in an antirotation sling. Under supervision of a physiotherapist, patients completed a standardized rehabilitation program, which consisted of passive range of motion exercises starting from the first day after surgery. Six weeks after the operation, strengthening of shoulder musculature was started.

Prognostic factors

The prognostic factors that have an impact on recovery after an arthroscopic rotator cuff repair were retrieved from an earlier