J Shoulder Elbow Surg (2016) 25, 1303–1311

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

SHOULDER

2013 Neer Award: predictors of failure of nonoperative treatment of chronic, symptomatic, full-thickness rotator cuff tears

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Background: The purpose of this study is to help define the indications for rotator cuff repair by identifying predictors of failure of nonoperative treatment.
Methods: A prospective, multicenter, cohort study design was used. All patients with full-thickness rotator cuff tears on magnetic resonance imaging were offered participation. Baseline data from this cohort were used to examine risk factors for failing a standard rehabilitation protocol. Patients who underwent surgery were defined as failing nonoperative treatment. A Cox proportional hazards model was fit to determine

This study was approved by Institutional Review Boards at the University of Colorado (CRV009-1), Hospital for Special Surgery (2013-123-CR2), University of Iowa (200605752), Brany (07-08-88-122), Avera (2006.049), The Ohio State University (2006H0154), University of California, San Francisco (10-00940), Vanderbilt University (060109), and Washington University in St. Louis (201103049).

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http://dx.doi.org/10.1016/j.jse.2016.04.030

the baseline factors that predicted failure. The dependent variable was time to surgery. The independent variables were tear severity and baseline patient factors: age, activity level, body mass index, sex, Single Assessment Numeric Evaluation score, visual analog scale score for pain, education, handedness, comorbidities, duration of symptoms, strength, employment, smoking status, and patient expectations.

Results: Of the 433 subjects in this study, 87 underwent surgery with 93% follow-up at 1 year and 88% follow-up at 2 years. The median age was 62 years, and 49% were female patients. Multivariate modeling, adjusted for the covariates listed previously, identified patient expectations regarding physical therapy ($P < .0001$) as the strongest predictor of surgery. Higher activity level ($P = .011$) and not smoking ($P = .023$) were also significant predictors of surgery.

Conclusion: A patient's decision to undergo surgery is influenced more by low expectations regarding the effectiveness of physical therapy than by patient symptoms or anatomic features of the rotator cuff tear. As such, patient symptoms and anatomic features of the chronic rotator cuff tear may not be the best features to use when deciding on surgical intervention.

Level of evidence: Level I; Prospective Cohort Study; Prognosis Study

Keywords: Atraumatic rotator cuff tear; nonoperative treatment; patient expectations; activity level; prospective cohort; rehabilitation; outcomes; prognosis study

Currently, consensus on indications for surgical treatment of rotator cuff tears is lacking. Oh et al conducted a systematic review to identify factors that affect the treatment outcome and indications for surgery.[30] Although the findings were based primarily on multiple case series, the authors suggested that weakness or functional disability may be the best indications for surgical intervention, and older age did not predict a poorer outcome. Wolf et al[38] offered a treatment algorithm for rotator cuff tears, based on expert opinion supported by their sampling of the literature. Because there are no high-level comparative investigations to which one can turn to assist with clinical decision making, it is not surprising that surveys of physicians yield little agreement on the approach to patients[9] and substantial geographic variation exists in surgical repair rates.[36]

Nonoperative treatment of rotator cuff tears is effective for many patients.[1,18,26] This is not surprising because rotator cuff tears are prevalent, affecting 10% of persons over age 60 years in the United States.[31] On the basis of 2010 US census data, this would mean that close to 6 million US citizens have rotator cuff tears.[37] Industry estimates suggest 75,000 to 250,000 repairs occur in the United States annually,[18] which would mean fewer than 5% of subjects with cuff tears in the United States undergo surgery each year.

Interestingly, in patients who do undergo cuff repair, failure rates range from 25% to 90%[2,10-12,16,25,35,42]; however, in several studies, subjects with failed repairs had patient-reported outcomes similar to subjects with healed repairs.[10,32,33] Given that subjects in these studies likely participated in physical therapy after surgery, it is possible that the postoperative rehabilitation could explain why these 2 groups (healed vs failure to heal) have similar outcomes.

The intention of this study is to identify predictors of surgery using a multicenter, prospective, cohort study design. We hypothesized that age and activity level would predict failure of nonsurgical treatment and these criteria could be used as indications for surgery.

Materials and methods

The Multicenter Orthopaedic Outcomes Network (MOON) Shoulder consortium has been described in detail previously, as have the inclusion and exclusion criteria, data collection details, outcome measures, institutional review board approval, and standardized physical therapy protocol used in this cohort study.[18]

Patient expectations of the results of treatment (rehabilitation) were measured using 6 items from the Musculoskeletal Outcomes Data Evaluation System (MODEMS) survey. Each item is scored from 1 (lowest level of expectations) to 5 (highest level of expectations), and a mean score for the 6 items is calculated. Patient expectations were measured at baseline, 6 weeks, and 12 weeks.

We really do not know which atraumatic rotator cuff tears need to be fixed.[9,30,38] Identifying factors that differentiate those undergoing surgery from those that do not could lead to a better understanding of the indications for surgery and perhaps assist with surgical decision making. This article describes the baseline factors associated with failure of nonoperative treatment, with the primary endpoint being time to surgery, after enrollment of 433 subjects.

Statistical methods

A Cox proportional hazards model was fit to identify baseline features that predicted failure of the physical therapy program leading to surgical intervention. The dependent variable was time to surgery; the independent variables were tear severity and baseline patient factors (age, activity level, body mass index, sex, visual analog scale score for pain, education, handedness, comorbidities, symptom duration, forward elevation strength, occupation, smoking status, and patient expectations). Statistical analyses were completed using open-source R software.