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ORIGINAL ARTICLE

Comparison of outcomes with arthroscopic repair of acute-on-chronic within 6 months and chronic rotator cuff tears

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Background: The purpose of this study was to define preoperative and intraoperative findings of acute-on-chronic rotator cuff tears (RCTs). This study also compared the functional and clinical outcomes with acute-on-chronic RCTs and chronic RCTs.

Methods: This study was conducted between December 2007 and December 2013. An acute-on-chronic full-thickness RCT was diagnosed with preoperative and intraoperative findings on arthroscopy. The study group consisted of 36 patients with preoperative and intraoperative findings (surgery performed within 6 months of trauma) indicative of an acute-on-chronic RCT. Another 36 patients matched for age, sex, and tear size, who underwent arthroscopic rotator cuff repair after 6 months of onset of symptoms (chronic RCT group), were selected from our institution's database within the same time frame. Postoperative indirect magnetic resonance arthrogram was obtained 6 months after the repair, and rotator cuff integrity was graded according to the guidelines as described by Sugaya. Patients were evaluated using the visual analog scale for pain, American Shoulder and Elbow Surgeons Shoulder Assessment score, and Constant scores. Scores and measurements were obtained preoperatively and at 6, 12, and 24 months after surgery.

Results: The clinical outcomes and range of motion recovery were better in the acute-on-chronic RCT group. Although statistically not significant, the acute-on-chronic RCT group's repair appeared closer to the complete repair and was associated with a lesser incidence of retear than the chronic RCT group.

Conclusion: Early repair of an acute-on-chronic full-thickness RCT results in a statistically and clinically superior improvement in outcomes compared with repairs of chronic RCTs.

Level of evidence: Level III; Retrospective Cohort Design; Treatment Study

Keywords: Rotator cuff tear; acute rotator cuff tear; chronic rotator cuff tear; acute on chronic; arthroscopy; arthroscopic finding; MRI; MRA

Rotator cuff tears (RCTs) are mostly considered to be degenerative lesions associated with aging.[9,12,15] However, RCTs are also frequently observed in acute trauma. The proportion of traumatic RCTs ranges from 2.3% to 17.7% in the literature.[8,9] An acute traumatic RCT results in acute pain and

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loss of function[1] and is diagnosed in previously asymptomatic patients who can clearly identify a traumatic incident leading to sudden onset of symptoms such as severe pain, immediate loss of strength, and functional impairment (inability to raise the arm for eating, combing of hair, or other similar actions) of the involved shoulder[2]. Early surgical interventions in these patients may result in better clinical outcomes because tissues are robust and mobile.[4,7-9,13]

A few studies have reported outcomes of acute traumatic RCT repair. According to a recent study by Duncan et al,[7] early repair of acute RCTs within 6 months of trauma resulted in improved outcomes. Bassett and Cofield,[1] in a series of 37 patients with full-thickness RCTs, reported acceptable pain relief irrespective of the time from injury to surgical repair, as long as the surgery was performed within 3 months of the injury. Bjornsson et al[2] reviewed 42 patients and found no difference in outcomes when surgical repair was performed within 3, 6, or 12 weeks of sustaining the injury. They recommended surgical repair within 3 months of injury for acute RCTs.

Many physicians acknowledge the presence of acute-on-chronic RCTs, with a broad consensus that these acute tears are related to a chronic condition of the rotator cuff, either small- to medium-sized tears or severe degeneration of the tendon prior to the injury. However, there is no clear definition of the acute component of such a tear or its surgical findings in literature. The primary purpose of this study was to compare the clinical outcomes of acute-on-chronic tears with those of chronic tears. This study also attempted to define the preoperative and intraoperative findings of acute-on-chronic RCTs. Our hypothesis was that acute-on-chronic RCTs have better clinical outcomes than chronic RCTs.

Materials and methods

This study was a retrospective case-control study of prospectively collected data of patients confirmed as having acute-on-chronic RCTs. Between December 2007 and December 2013, 1280 rotator cuff repairs were performed by a single senior surgeon (J.C.Y.) in our institution. Acute-on-chronic RCTs were defined by 2 major criteria: (I) preoperative findings, and (II) arthroscopic intraoperative findings (Table I).

The preoperative findings of acute-on-chronic RCTs were (i) definite history of trauma that occurred within 6 months of the first injury, (ii) severe loss of shoulder function caused by the trauma impairing daily activity for at least a few days, (iii) bony change (sclerosis) on the greater tuberosity (GT) and acromion on radiograph (sourcil sign), and (iv) full-thickness RCT (anterosuperior, posterosuperior, or 3-tendon tear) on magnetic resonance imaging (MRI). The defining intraoperative acute-on-chronic RCT findings were (i) arthroscopic confirmation of the full-thickness RCT, and (ii) the presence of distinct tendon bruise and ecchymosis on the smooth torn tendon edge as seen on arthroscopy.

The mechanisms of injury included forced axial compression (as in falling on outstretched arms from a standing height) in 21 patients, direct shoulder trauma (sustained when falling from a standing height or above) in 10 patients, traumatic shoulder dislocations in 3 patients, and passive traction forces (injury sustained while attempting to catch an object dropped from an overhead height) in 2 patients.

Table I Criteria for acute-on-chronic rotator cuff tears

I.	Preoperative symptoms and signs
i.	Definite history of trauma which the patient remembers that occurred within 6 months
ii.	Because of the trauma, the patient lost severe function of the shoulder, impairing daily activity for few days
iii.	Some sign of degeneration of the cuff and bony changes on greater tuberosity and acromion on radiograph
iv.	Full-thickness rotator cuff tear on magnetic resonance imaging (anterosuperior tear, posterosuperior, or 3-tendon tear)
II.	Intraoperative findings
i.	Arthroscopic confirmation of the full-thickness tear
ii.	Distinct tendon bruise and ecchymosis were seen on the smooth torn tendon edge

Preoperative radiographs were assessed for the presence of degenerative features (cystic lesions and sclerosis at the greater tuberosity, cortical thickening, and sclerosis at the undersurface of the acromion). During the outpatient visit, a senior professor checked the presence/absence of degenerative features on plain x-ray anteroposterior and 30° caudal tilt views for every patient. Presence of a full-thickness RCT was confirmed by preoperative indirect MRA.

Intraoperative findings were documented during each operation (prospective), medical records were analyzed for preoperative details, and all radiologic investigations were retrospectively reviewed to confirm that the criteria for the diagnosis of an acute-on-chronic RCT were met in all included cases. The study excluded patients with a history of shoulder operation, fracture, infections, systemic disease, or arthritis on the involved side.

Among the 1280 patients who underwent RCT repairs during the study period, 36 patients satisfied the inclusion criteria. All patients underwent arthroscopic repair of the RCT within 6 months of their injury (acute-on-chronic RCT group). Another 36 patients, matched for age, sex, and tear size, who underwent arthroscopic rotator cuff repair after 6 months of onset of symptoms and no definite history of trauma (chronic RCT group), were selected from our institution's database within the same time frame and included as the control group.

Patients in the control and the study group followed the same protocol for rehabilitation. Patients had a repeat indirect MRA examination 6 months after surgery to assess the integrity of tendon repairs and to detect retears. Operative records were reviewed to record the size of the tear, which was further classified as small (<1 cm), moderate (1-3 cm), large (3-5 cm), or massive (>5 cm).[5]

MRI measurement

Postoperative indirect MRAs were independently analyzed by 2 fellowship-trained orthopedic shoulder surgeons with a minimum of 1 year of experience. The reviewers were blinded to the clinical findings and were not involved in the operative procedure. The diagnosis of a retear was based on the definition provided by Sugaya et al[14] as a tendon-gap filled with fluid-equivalent signal or nonvisualization of the tendon (Sugaya type IV or type V) on