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# Factors associated with clinical and structural outcomes after arthroscopic rotator cuff repair with a suture bridge technique in medium, large, and massive tears

**Sungwook Choi, MD[a], Myung Ku Kim, MD[b], Gyeong Min Kim, MD[a], Young-Ho Roh, MD[a], Im Kyung Hwang, MD[c], Hyunseong Kang, MD[a,*]**

[a]*Department of Orthopedic Surgery, Jeju National University Hospital, Jeju, South Korea*
[b]*Department of Orthopaedic Surgery, Inha University School of Medicine, Incheon, South Korea*
[c]*Department of Radiologic Medicine, Jeju National University Hospital, Jeju, South Korea*

**Background:** This study was conducted to evaluate clinical outcomes, maintenance of repair integrity, and retear rate after arthroscopic rotator cuff repair by a suture bridge technique among patients with medium, large, and massive rotator cuff tears.

**Methods:** We evaluated 147 patients who had undergone arthroscopic rotator cuff repair. Clinical and functional evaluations were performed with the Constant and University of California–Los Angeles scores. All patients were confirmed to have magnetic resonance imaging evidence of tendon healing at least 12 months postoperatively.

**Results:** The average postoperative time to follow-up magnetic resonance imaging was 23.4 months (range, 12-48 months). A total of 25 (17.0%) retears were observed. All clinical outcome scores were improved significantly at follow-up. Larger intraoperative tear sizes were correlated with higher retear rates. The incidence of retear was also higher in cases in which the preoperative fatty degeneration grade was higher. The incidence of retear increased with age and in the heavy worker group (e.g., farmers, carriers, car mechanics) but was not statistically significant.

**Conclusions:** Arthroscopic rotator cuff repair by a suture bridge technique yields improvements in clinical outcome measures and a relatively high degree of patient satisfaction despite the fact that repair integrity is not maintained in many cases.

**Level of evidence:** Level IV, Case Series, Treatment Study.



**Keywords:** Rotator cuff tear; arthroscopic repair; suture bridge technique; fatty degeneration; tear size; retear

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*Reprint requests: Hyunseong Kang, MD, Department of Orthopaedic Surgery, Jeju National University Hospital, Ara-1-dong, Jeju city, Jeju, South Korea.

E-mail address: oskanghs@gmail.com (H. Kang).

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In arthroscopic repair of rotator cuff tears, patient-related factors are likely to exert a strong influence on rotator cuff healing. The factors that influence repair integrity include patient age, tear size, and quality of bone and tendon (retraction, muscle atrophy, and fatty infiltration).[2,6,12] Furthermore, social history, especially occupation and smoking, may influence tear size, tendon quality, and repair integrity.[5]

The primary goal of rotator cuff repair is to maximize tendon healing. The suture bridge technique was introduced to maximize the utility of the repair construct and to compress the repaired tendon to the bone.[3,11,17] On the basis of biomechanical studies, the suture bridge repair technique resulted in better clinical and structural outcomes compared with other arthroscopic repair techniques.[3]

The aim of this study was to evaluate clinical outcomes, maintenance of repair integrity, and recurrence rate after use of the suture bridge technique in patients with medium, large, and massive rotator cuff tears. Furthermore, we evaluated the retear patterns in cases with structural failure after arthroscopic suture bridge repair with follow-up magnetic resonance imaging (MRI). Finally, we compared the clinical and radiologic outcomes between heavy and light workers.

## Materials and methods

### Patient selection

Between May 2008 and September 2010, 258 patients with full-thickness rotator cuff tears underwent arthroscopic double-row rotator cuff repair at Jeju National University Hospital (Jeju, Korea). The inclusion criteria were patients who had a full-thickness rotator cuff tear confirmed by preoperative MRI with failed initial nonoperative treatment and who consequently underwent a complete arthroscopic rotator cuff repair by a suture bridge technique. Patients were excluded if they had labral tears, glenohumeral arthritis, or inflammatory diseases. Patients undergoing revision procedures were also excluded, as were 49 patients with small tears and 19 patients with massive irreparable tears. Patients with small tears were excluded because, in most cases, the functional outcome was acceptable and the possibility of retear was low, making these inappropriate for the objectives of this research. A total of 12 patients were clinically lost to follow-up. An additional 31 patients were excluded because of lack of follow-up MRI after surgery. Subsequently, a retrospective review was performed for the remaining 147 patients (77.4%).

The average patient age at the time of surgery was 62.8 years (range, 46-79 years). The average postoperative follow-up duration was 31.2 months (range, 24-48 months). The sample included 65 men and 82 women, with the repairs being performed on 103 right and 44 left shoulders. The cuff tear was in the dominant arm in 137 cases and in the nondominant arm in 10 cases. A single tendon (supraspinatus) was involved in 109 cases (74.1%), with multiple tendon involvement (supraspinatus, subscapularis, or infraspinatus) in 38 cases (25.9%). All rotator cuff repairs were performed by an arthroscopic suture bridge technique. Patients reported a history of trauma in 46 cases (31.3%).

The patients were divided into 2 occupational groups. The heavy worker group included patients whose occupation required handling and moving objects or physically demanding work (e.g., farmers, carriers, car mechanics). The light worker group included patients whose occupation required relatively lower physical demands (e.g., housewives, office workers).

### Tear evaluation

During surgery, the rotator cuff tear was measured. We evaluated the repair integrity of cuff muscles with the classification proposed by Sugaya et al[19] through follow-up MRI: type I, sufficient thickness with homogeneous low intensity; type II, sufficient thickness with partial high intensity; type III, insufficient thickness without discontinuity; type IV, presence of a minor discontinuity; type V, presence of a major discontinuity (Fig. 1). We defined types IV and V as retears. We assessed the retear patterns on the basis of the description used by Cho et al[10]: type 1, no repaired cuff tissue remaining on insertion site; type 2, remnant cuff tissue remaining on the greater tuberosity.

We also evaluated individual fatty degeneration and global fatty degeneration (global fatty degeneration index) by the classification of Goutallier et al: grade 0, no fatty deposits; grade 1, some fatty streaks; grade 2, more muscle than fat; grade 3, as much muscle as fat; and grade 4, less muscle than fat.[14] Fatty degeneration of the cuff muscles was evaluated in soft tissue windows on sagittal MRI sections. For each injured shoulder, we evaluated fatty degeneration for individual cuff muscles and for all cuff muscles combined by calculating the global fatty degeneration index as the mean value of the grades for the supraspinatus, infraspinatus, and subscapularis. Tear size and fatty degeneration were examined by preoperative MRI (Achieva 3.0T; Philips, Amsterdam, The Netherlands). The tear sizes were confirmed intraoperatively under arthroscopy with a probe. The size of the rotator cuff tear was based on the greatest dimension of tendon tear as follows: small, $<1$ cm; medium, 1 to 3 cm; large, 3 to 5 cm; or massive, $>5$ cm. Repair integrity was evaluated by follow-up MRI studies, which were performed an average of 23.4 months (range, 12-48 months) after the respective rotator cuff repair.

### Clinical evaluation

Clinical evaluations were performed preoperatively and an average of 31.2 months (range, 24-48 months) postoperatively with the Constant score and the Shoulder Rating Scale of the University of California at Los Angeles (UCLA).[12] The Constant score includes the following four categories: pain, 15 points; activities of daily living, 20 points; range of motion, 40 points; and power, 25 points.[11]

### Surgical technique

All surgical procedures were performed by the same surgeon. Each operation was performed under general anesthesia, in a semilateral position. Subacromial decompression was performed with a burr in all patients.

Diagnostic glenohumeral arthroscopy was performed, and accompanying intra-articular lesions were identified. After insertion of an arthroscope into the subacromial space, subacromial decompression was performed. Tear size, tendon quality, and presence of delamination were identified at the time of surgery.