Journal of Orthopaedics 15 (2018) 396–400

Contents lists available at ScienceDirect

Journal of Orthopaedics

journal homepage: www.elsevier.com/locate/jor

Original Article

Clinical outcomes and structural integrity of arthroscopic double-row versus suture-bridge repair for rotator cuff tears

Hiroshi Hashiguchi[a,*], Satoshi Iwashita[b], Kentaro Sonoki[a], Kazumasa Abe[a], Minoru Yoneda[b], Shinro Takai[b]

[a] Department of Orthopaedic Surgery, Nippon Medical School Chiba Hokusoh Hospital, 1715 Kamakari, Inzai, Chiba, 270-1694, Japan
[b] Department of Orthopaedic Surgery, Nippon Medical School Hospital, 1-1-5 Sendagi, Bunkyo-ku, Tokyo, 113-8602, Japan

ARTICLE INFO

Level of evidence:
Level IV
Case series
Treatment study

Keywords:
Rotator cuff tear
Retear
Double row repair
Suture bridge repair
Repair integrity

ABSTRACT

The purpose of this study was to compare clinical outcomes and retear rate between arthroscopic double row (DR) and suture bridge (SB) repair for rotator cuff tears. Postoperative Constant score and MRI findings were compared between 52 patients underwent DR repair and 63 patients underwent SB repair with medium tear of the supraspinatus. There was no significant difference in Constant score between the two groups. Postoperative MRI revealed that retear rate of SB group was significantly lower than DR group. This study suggests that SB repair can provide better clinical and structural outcomes compared with DR repair.

1. Introduction

Arthroscopic rotator cuff repair (ARCR) is widely known in general as a surgical method that can deliver good improvement of pain and functional recovery. A variety of ARCR methods are performed due to the development and modification of the suture anchor, and reports are available on the successes of these treatment methods. In the early days, single row (SR) repair using suture anchors, was reported to have generally good clinical results, but a high rate of retear or non-healing of the rotator cuff was observed, because of a restricted area of contact with the footprint of the rotator cuff.[13] In comparison with SR repair, a significant decline in the rate of retear was observed with double row (DR) repair, which is assumed to have a larger area of contact with the rotator cuff footprint,[4,14] but no difference in clinical outcomes has been reported.[10,11] In recent years, suture bridge (SB) repair has been devised as a transosseous-equivalent method, and it has been reported that we can expect less retear and non-healing from this treatment method.[7] According to biomechanical researches of SB repair, the area of its contact with the footprint at the edge of a rotator cuff tear is approximately two times larger than that of DR repair, and its contact pressure has also been reported to be approximately 30% higher. Moreover, SB repair is significantly higher with regard to load to failure as well; furthermore, stress and distortion during shoulder motion are distributed among the anchors, and it has been reported that the distribution of stress is uniform among the anchors, especially during external rotation.[15] Therefore, SB repair is considered to be a method capable of delivering good tendon-bone healing, due to its strong initial rigidity, and contact pressure and area. Many reports have been made about good clinical results obtained from ARCR through SB repair. Also, with regard to retear, it has been reported that SB repair has significantly lower retear compared to SR repair. Several reports have seen that the clinical results of SB repair are equivalent to those of SR repair and DR repair, and that its rate of retear is equivalent or slightly lower, but opinion is divided with regard to the correlation between repair integrity and clinical results.[12,17]

Meanwhile, age, diabetes mellitus, smoking, size of cuff tear, atrophy and fatty infiltration of muscle have been cited as factors that affect healing process after rotator cuff repair.[1–3] In assessments of postoperative results and retear that have been included in previous reports, not enough factors influencing retear have been excluded, and therefore we believe these reports are not sufficient to compare treatment results by repair methods.

The purpose of this study was to compare the clinical results of two arthroscopic repair procedures (DR and SB repair) with respect to rotator cuff tears of equal size, excluding factors that influence healing, based on the hypothesis that SB repair can achieve better postoperative

* Corresponding author.
E-mail address: hashi.h@ac.auone-net.jp (H. Hashiguchi).

https://doi.org/10.1016/j.jor.2018.03.012
Received 10 November 2017; Accepted 16 March 2018
Available online 17 March 2018

clinical results and repair integrity.

2. Materials and methods

2.1. Patient selection

This retrospective study was approved by the ethics committee at our hospital, and consent was obtained from all patients for the research. We reviewed a database of all arthroscopic rotator cuff repairs performed by a single surgeon between 2006 and 2013. From among patients in which direct repair was performed in a primary rotator cuff surgery, we sorted patients according to various factors in order to conduct a strict examination of retear according to repair methods. Regarding age, patients were under 70 years of age. Regarding the size of rotator cuff tears, we selected only medium tear of the supraspinatus tendon with a width from 1.5 to 2.0 cm by intraoperative findings, and only those patients that were grade 2 or lower for fatty infiltration according to the Goutallier's classification[8] which were evaluated by MRI scan before surgery. We excluded cases that had a history of steroid injection, smoking, diabetes mellitus, long head of the biceps (LHB) tear, or tear of the subscapularis tendon, which could affect healing process and become risk factors for retearing.

2.2. Patient assessment

We made regular observations from the preoperative period until the final follow-up. In the range of motion of the shoulder joint, we examined active and passive abduction, flexion, external rotation, and internal rotation. We used the Constant score to evaluate clinical results. We also investigated intraoperative and postoperative complications.

2.3. Surgical procedure

Surgery was performed under general anesthesia in the lateral position. Diagnostic arthroscopy was performed on the glenohumeral joint, and a check was performed for intra-articular lesions, including the labrum and LHB. Next, the arthroscope was placed in the subacromial bursa, and pathological synovial bursa were excised to ensure better visibility. A rotator cuff tear was checked and observed for area, size, and delamination. The repair design was determined by conducting release and mobilization of the cuff. The footprint was prepared by removing the soft tissue and conducting bone abrasion. Subacromial decompression was performed in all cases.

The method of cuff repair, according to the DR method, used Corkscrew metal anchors (4.5 mm, double-loaded) (Arthrex, Naples, FL, USA) as both medial and lateral row anchors. One medial row anchor was inserted precisely on the border of the lateral cartilage of the humeral head, and two sutures were secured on the cuff so that each would create a horizontal mattress configuration. A simple suture was performed with two anchors inserted on the lateral row, and four threads secured at the edge of the cuff tear. After tying the sutures of the lateral row anchors, the sutures of the medial row anchors were tied. For the SB method, Corkscrew metal anchors (4.5 mm, double-loaded) (Arthrex) were used as medial row anchors, and Versalok metal anchors (Depuy-Mitek, Warsaw, IN, USA) were used as lateral anchors. One medial row anchor was inserted precisely on the border of the lateral cartilage of the humeral head, and two sutures were secured on the cuff so that each would create a horizontal mattress configuration. Then, two different ends were drawn to the lateral portal, and while adjusting tension on the tendon tissue, they were fixed on a lateral anchor approximately 1 cm distal from the lateral border of the greater tuberosity. The remaining suture threads were drawn to the lateral portal, and they were likewise fixed to a lateral anchor while making adjustments so that there would be no slack in the thread, and so that the tension on the tendon tissue would not be excessive. When the SB repair was first begun, the suture threads of the medial anchor were made into mattress sutures on the cuff, but the medial mattress sutures were not performed in patients after 2011 when medial cuff failure was a concern.

2.4. Postoperative rehabilitation

After surgery, immobilization was provided for three weeks for the both groups, with a shoulder abduction brace. The rehabilitation program began from the second postoperative day, with the patient supported by a physiotherapist to begin bowing and pendulum exercises, and passive range of motion exercise (ROMex). In the second week, the abduction pillow was removed, and assisted-active ROMex. Active ROMex was permitted from the third week. From the eighth week, a program was provided to start functional exercise of the rotator cuff and muscular strengthening around the shoulder girdle. A complete return to occupation and daily activity, including lifting heavy objects, was permitted beginning three months after surgery. For a return to sports, improvement of range of motion and muscular strength was evaluated on an individual basis, and permitted some time later more than three months after surgery.

2.5. Assessment of repair integrity

Evaluation of the postoperative repair integrity of the rotator cuff was conducted by MRI. MRI was performed with a 1.5 T scanner (GE Healthcare). Repair integrity was classified according to the five stages of the Sugaya's classification,[13] using the sagittal section, coronal section, and transverse section of T2-weighted images. Types 4 and 5 according to Sugaya's classification were considered as retear or non-healing. Following Cho et al[5] with regard to the pattern of retear, they were classified as "retracted type," in which no residual cuff tissue could be observed at the footprint of the greater tuberosity; or as "medial failure type," in which cuff tissue remained at the footprint of the greater tuberosity, but retear had occurred at the medial musculotendinous junction.

2.6. Statistical analysis

For statistical analysis, IBM SPSS Statistics 21 (IBM Japan, Tokyo, Japan) was used as software. The Mann-Whitney *U* test was used to compare differences between the two groups. Pre- and postoperative Constant scores were examined by the paired *t*-test, and postoperative cuff integrity was compared by the chi-square test. P value less than 5% was considered to be a significant difference.

3. Results

3.1. Patient demographics

115 patients of a full-thickness cuff tear that matched the criteria were examined. According to the method of ARCR, there were 52 patients in the DR group, and 63 patients in the SB group (Table 1). No significant difference was observed in terms of age or duration of the symptoms. The postoperative follow-up period was 37.2 (range, 24–88) months on average for the DR group, and 35.1 (range, 26–48) months on average for the SB group. Proportion of history of trauma in the SB group was significantly higher than in the DR group.

3.2. Clinical outcomes

There were no intra- and postoperative complications such as loosening of suture anchors, infection and neurovascular injuries. No significant difference was observed between the two groups, with the average preoperative Constant score at 63.6 ± 10.8 (range, 41–73) points for the DR group, and 55.9 ± 10.9 (range, 38–76) points for the