



Is the arthroscopic modified tension band suture technique suitable for all full-thickness rotator cuff tears?

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Background: We aimed to identify the clinical and structural outcomes after arthroscopic repair of full-thickness rotator cuff tears of all sizes with a modified tension band suture technique.

Methods: Among 63 patients who underwent arthroscopic rotator cuff repair for a full-thickness rotator cuff tear with the modified tension band suture technique at a single hospital between July 2011 and March 2013, 47 were enrolled in this study. The mean follow-up period was 29 months. Visual analog scale scores, range of motion, American Shoulder and Elbow Surgeons scores, Constant scores, and Shoulder Strength Index were measured preoperatively and at the final follow-up. For radiologic evaluation, we conducted magnetic resonance imaging 6 months postoperatively and ultrasonography at the final follow-up. We allocated the small and medium tears to group A and the large and massive tears to group B and then compared clinical outcomes and repair integrity.

Results: Postoperative clinical outcomes at the final follow-up showed significant improvements compared with those seen during preoperative evaluations ($P < .001$). However, group B showed worse clinical results than group A. Evaluation with magnetic resonance imaging performed 6 months postoperatively and ultrasonography taken at the final follow-up revealed that group B showed a significantly higher retear rate than did group A (69% vs. 6%, respectively; $P < .001$).

Conclusion: Arthroscopic repair with the modified tension band suture technique for rotator cuff tears was a more suitable method for small to medium tears than for large to massive tears.

Level of evidence: Level IV; Case Series; Treatment Study

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Keywords: Shoulder; full-thickness rotator cuff tear; rotator cuff repair; arthroscopic repair; modified tension band suture technique; retear rate

This study was approved by the Institutional Review Board of Wonkwang University Hospital (WKUHIRB 201411-HRE-078).

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This paper was supported by Wonkwang university in 2016.

Boileau et al³ suggested that there are several advantages to using the arthroscopic tension band suture technique, in which an inverted horizontal mattress suture is medially placed and combined with a laterally placed self-locking anchor for full-thickness tears of the supraspinatus. They further

conducted arthroscopic rotator cuff repair using the tension band suture technique in 65 patients and reported that 71% of the patients showed complete tendon healing and 95% had satisfactory results. However, in their study, most of the patients (63/65 patients, 97%) had small to medium tears, and there were no patients with massive tears.

The purpose of this study was therefore to explore whether the modified tension band suture technique, which we suggest improves the biomechanics of the existing tension band suture technique, is appropriate for arthroscopic repair of full-thickness rotator cuff tears of all sizes. We achieved this by evaluating clinical outcomes and repair integrity.

Materials and methods

Patient data

This is a retrospective case-control study of 63 consecutive patients who underwent arthroscopic rotator cuff repair with the modified tension band suture technique in our hospital by a single surgeon (J.W.K.) from July 2011 to March 2013.

We excluded 4 patients who were diagnosed with partial-thickness tears during arthroscopy, 2 patients on whom we were unable to perform complete repairs because of severe retraction and poor tendon quality, 3 patients who required repair because of complete rupture of the subscapularis, and 2 patients who underwent revision surgery. In addition, 2 patients were lost to follow-up before 24 months postoperatively; postoperative magnetic resonance imaging (MRI) could not be performed in 2 patients; and 1 patient was unable to undergo postoperative ultrasonography. These patients were excluded from the study. Consequently, 47 patients were enrolled in this study.

The study group comprised 29 men and 18 women with a mean age of 59.9 years (range, 46-75 years). The mean follow-up period was 29 months (range, 24-41 months). The right shoulder was involved in 32 patients and the left shoulder in 15 patients. The size of each rotator cuff tear was measured arthroscopically by using a probe (AR-10010; Arthrex, Naples, FL, USA). The DeOrio and Cofield classification⁷ was used to categorize the tears as small (<1 cm), medium (1-3 cm), large (3-5 cm), or massive (>5 cm). We allocated the small and medium tears to group A and the large and massive tears to group B.

Clinical assessment

The range of motion (ROM), visual analog scale (VAS) scores, American Shoulder and Elbow Surgeons (ASES) scores, and Constant scores were measured preoperatively and at the final follow-up. Two independent observers reviewed the assessments. Isometric muscle strength was measured by using PrimusRS (BTE Technologies, Hanover, MD, USA), and the relative muscle strength was measured in terms of the Shoulder Strength Index (SSI).¹⁶ To calculate the SSI, muscle strength of the affected shoulder was divided by the muscle strength of the contralateral shoulder.

Radiologic assessment

The preoperative radiologic assessments were performed by using plain radiography and MRI. Four controlled plain radiographic views

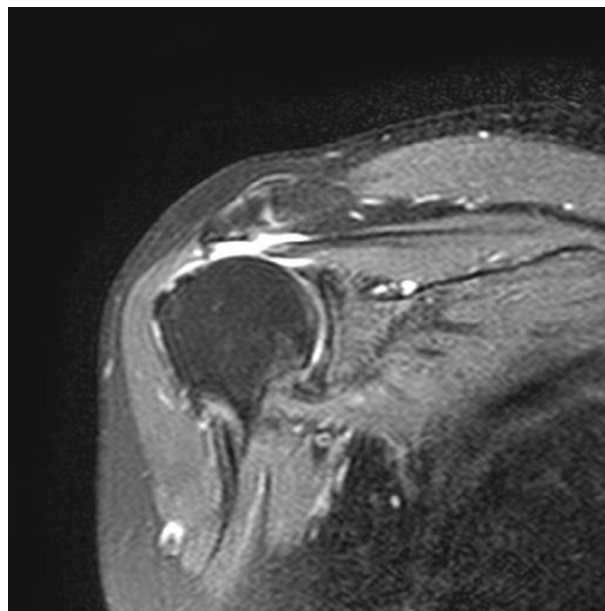


Figure 1 Preoperative MRI coronal view showing a full-thickness tear of the supraspinatus tendon.

were used, including the anteroposterior, axillary lateral, subacromial, and supraspinatus outlet views.

All 47 patients had a standardized MRI examination with a 3.0T TX scanner (Achieva; Philips Healthcare, Best, The Netherlands) (Fig. 1). MRI was performed before the operation and then again after the operation at the 6-month follow-up.

Fatty degeneration of the rotator cuff was evaluated by MRI using the Global Fatty Degeneration Index (GFDI)⁸ before surgery.

Repair integrity was assessed using MRI 6 months after surgery. We classified rotator cuff retears by using the Sugaya classification,¹⁷ on the basis of MRI findings; we defined types IV and V as retears. Two orthopedic surgeons (J.W.K and K.H.B.) and a radiologist reviewed the MRI scans, and they were informed that these were images of patients who had undergone a rotator cuff repair surgery. The different reviewers evaluated the images separately to minimize influence and errors. When there were discrepancies, the cuff was not considered to have completely healed. Cho et al⁵ classified retear patterns into 2 types. In type 1, a cuff tissue repaired at the insertion site of the rotator cuff is not observed to be present on the greater tuberosity; and in type 2, the remnant cuff tissue remains at the insertion site in spite of a retear. The retear pattern was evaluated according to this classification.

At the final follow up, ultrasonography was conducted by a radiologist to determine whether a retear had occurred.

Surgical technique

Surgery was performed with the patient under general anesthesia in the beach chair position. A brachial plexus block was typically conducted before surgery for postoperative pain control, and a sterilized Spider arm positioner (Smith & Nephew, St. Petersburg, FL, USA) was used with hypotensive anesthesia for intraoperative visualization.

The tear size and pattern were evaluated (Fig. 2), and the mobility and ability to repair the torn cuff were estimated.

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