J Shoulder Elbow Surg (2016) 25, 1155–1162

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Rotator cuff repair using an original iliotibial ligament with a bone block patch: preliminary results with a 24-month follow-up period

Shuzou Mihara, MD[a,*], Takeshi Fujita, MD[b], Teruyasu Ono, MD[a], Hirofumi Inoue, MD[a], Tetsurou Kisimoto, MD[a]

[a]*Department of Orthopaedic Surgery, Saiseikai Yamaguchi General Hospital, Yamaguchi, Japan*
[b]*Department of Radiology, Ube Industries Ltd Central Hospital, Ube, Yamaguchi, Japan*

Background: Our first-line choice of surgical method for massive shoulder rotator cuff tears not amenable to primary repair is a patching method that uses a graft consisting of a section of the iliotibial band with an attached bone block. The objective of this study was to examine the functional and structural results.
Methods: The study included 5 patients who were not eligible for primary repair, received iliotibial band autografts with an attached bone block, and could be monitored for 2 years or more. The grafting method involved suturing the ligament part of the graft to the remaining rotator cuff and fixing the bone part to the greater tubercle of the humerus by means of a suture-bridge technique. Clinical evaluation was performed for 24 months postoperatively. Postoperative structural evaluation was performed using computed tomography at 3 to 4 months and magnetic resonance imaging at 6, 12, and 24 months.
Results: A clear improvement was seen at the final clinical evaluation. Fusion of the bone graft with the greater tubercle of the humerus was confirmed on computed tomography in all patients. No retearing was observed on magnetic resonance imaging at the 24-month point, and the thickness of the ligament part of the graft was maintained.
Conclusion: The patching method using an iliotibial band with an attached bone block as the graft enabled good reconstruction of the rotator cuff, including the greater tubercle footprint. Moreover, good clinical results were seen at 24 months.
Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Rotator cuff; rotator cuff augmentation; autograft; iliotibial ligament; bone block; arthroscopy

Despite the development of instruments and techniques for arthroscopic surgery, the retear rate after surgery for extensive rotator cuff tears remains high, and this is still a challenging field.[9,15,23] Reinforcement with a patch is an effective method of repair in such cases[1,14] and can be expected to lead to biologic and biomechanical improvements.[20,21] Use of several

This retrospective review was approved by the Saiseikai Yamaguchi General Hospital Institutional Review Board.

*Reprint requests: Shuzou Mihara, MD, Department of Orthopaedic Surgery, Saiseikai Yamaguchi General Hospital, 2-11 Midori-cho, Yamaguchi 753-8517, Japan.

E-mail address: smihara@yamaguchi.saiseikai.or.jp (S. Mihara).

1058-2746/$ - see front matter
http://dx.doi.org/10.1016/j.jse.2015.11.015

different types of biologic patches has recently been reported.[4,7,13,17,21] Some examples are porcine small intestinal mucosa[21] (Restore; DePuy, Warsaw, IN, USA), human skin[3] (GraftJacket; Wright Medical Technology, Arlington, TN, USA), bovine skin[4] (TissueMend; TEI Biosciences, Boston, MA, USA), and autologous fascia lata.[6] However, with these types of grafts, there are concerns about fusion with the part of the greater tubercle that connects with the rotator cuff (ie, that it is difficult to achieve engraftment of soft tissue and osseous tissue).[8]

We therefore aimed to achieve bone-to-bone healing by using part of the iliotibial band with an attached bone block as a patch.[17] With the use of this patch, we were able to achieve the objectives of patch reinforcement, including avoidance of foreign-material reactions or rejection and early magnetic resonance imaging (MRI) and computed tomography (CT) evidence of graft integrity. Our objective was to report the details of the surgical technique along with the 2-year clinical and radiographic follow-up of our first 5 patients.

Material and methods

Patient selection

The study included 5 patients with massive rotator cuff tears who underwent surgery with a patch method[17] for symptoms, such as persistent pain, that were refractory to conservative therapy. Written informed consent was obtained from the patients for all procedures. All operations were performed by the same surgeon during the period from January 2013 through April 2013. Final evaluation of tear size was performed intraoperatively, and tears measuring 5 cm or more in anterior-to-posterior length or medial-to-lateral length were classified as massive tears.

Patients with one or more of the following criteria were excluded from consideration for surgery and inclusion in the study:

1. infection accompanying the injury;
2. preclusion of easy repair of the infraspinatus muscle and subscapularis muscle because the tear was too large (ie, reduction of the infraspinatus muscle and subscapularis muscle into the original footprint was not possible even by intraoperative retrieval of the rotator cuff stump);
3. severe atrophy of the rotator cuff muscles (ie, particularly severe fat degeneration among Goutallier IV cases);
4. markedly severe bone atrophy of the proximal segment of the humerus (ie, severe bone atrophy revealed by radiographic examination or lack of resistance to intraoperative bone drilling);
5. inability to receive postoperative rehabilitation (eg, presence of dementia); and
6. presence of shoulder osteoarthritis.

The knee on the side selected for ligament donation was checked for pain, range of motion, muscular strength, and presence or absence of disturbed activities of daily living approximately 3 months after surgery.

Patient assessment

All patients underwent radiography and MRI examinations for preoperative imaging evaluation. Postoperative assessments were performed using CT at 3 to 4 months and MRI ay 6, 12, and 24 months. Clinical evaluations were performed before the operation and at 6, 12, and 24 months after the operation. University of California at Los Angeles (UCLA) Shoulder Rating Scale, American Shoulder and Elbow Surgeons (ASES), simple shoulder test (SST), and visual analog scale (VAS) scores (0, no pain; 10, worst pain) were used in the evaluations. Range of mobility was assessed by measuring forward flexion, external rotation, internal rotation, and abduction in active exercise.

The statistical analysis used paired t tests to compare each score before and after surgery, with $P < .05$ considered to represent a significant difference.

Surgical procedures

Arthroscopy was performed with the patient under general anesthesia in the beach chair position. Concomitant lesions found in the glenohumeral joint were treated at the same time. The main procedures were synovectomy and débridement of deformities of the labrum and long head of the biceps tendon. If a deep incomplete tear was found in the long head of the biceps tendon in elderly patients, tenotomy was performed. In cases of a shallow incomplete tear, débridement was performed.

Next, bursoscopy was used to detach the stump of the rotator cuff sufficiently. The stump was then pulled toward the greater tubercle with a grasper to assess its repairability. This operative procedure is applicable when primary repair is not possible but repair of the subscapularis and infraspinatus muscles alone is possible. A tear in the subscapularis or infraspinatus tendon was repaired first, leaving only superior facet defects for repair (partial repair). A requirement for application of this procedure is that the tear remaining after the partial repair corresponds to the original part of the supraspinatus muscle.

Patch grafting was performed as follows:

1. After the partial repair, the size of the remaining tear was measured (inside to outside and front to back).
2. Four pieces of Prolene suture material (Ethicon, Somerville, NJ, USA) were passed through the remaining rotator cuff stump. Sutures emerging from the subacromial bursa side of the cuff were passed out of the body through the Neviaser portal, and sutures emerging from the glenohumeral joint side exited through the anterior portal. These sutures would be used later to create the relay used to introduce the transplanted ligament into the interior of the joint.
   A section of the iliotibial band with attached bone block was harvested according to the size measured in step 1 above. Because the ligament was to be later folded in half, the graft was harvested with a length equivalent to double the length of the measured size (medial to lateral) plus the length of the bone. The width of the harvested ligament is ordinarily 1.5 cm. The bone size is ordinarily 1.5 cm front to back × 1.0 cm inside to outside (because the anterior-to-posterior length of the superior facet is about 1.5 cm). A piece of Neoveil (GUNZE Ltd, Kyoto, Japan) cut to the appropriate size was used to