



Clinical and radiologic results of arthroscopic biceps tenodesis with suture anchor in the setting of rotator cuff tear

Hyun Il Lee, MD^a, Min Soo Shon, MD^b, Kyoung Hwan Koh, MD^c, Tae Kang Lim, MD^d, Jaewon Heo, MD^e, Jae Chul Yoo, MD^{e,*}

^aDepartment of Orthopaedic Surgery, Gangneung Asan Hospital, University of Ulsan College of Medicine, Gangneung, South Korea

^bDepartment of Orthopaedic Surgery, National Medical Center, Seoul, South Korea

^cDepartment of Orthopaedic Surgery, Seoul Medical Center, Seoul, South Korea

^dDepartment of Orthopedic Surgery, Wonkwang University Sanbon Hospital, Gunpo-si, South Korea

^eDepartment of Orthopaedic Surgery, Samsung Medical Center, Sung Kyun Kwan University School of Medicine, Seoul, South Korea

Background: The purpose of this study was to report clinical and radiologic results of arthroscopic biceps tenodesis with 1 suture anchor in rotator cuff tear patients.

Methods: During a 2-year period, 84 consecutive patients (45 men; 39 women) who underwent arthroscopic tenodesis were evaluated retrospectively. Mean age was 58 years. The primary indication for surgery was rotator cuff tear in 96.4%. Tenodesis was performed with 1 suture anchor placed in the bicipital groove with 2 knots, 1 lasso-type and 1 that pierced the tendon. At final follow-up at a mean of 33.2 months, visual analog scale pain (pain-VAS) score, shoulder scores (American Shoulder and Elbow Surgeons [ASES] and Constant score), Popeye deformity (PD), anterior arm pain, and elbow flexion power were evaluated. Postoperative magnetic resonance images were evaluated in 60 patients to determine the integrity of the tenodesis and the location of the suture anchor.

Results: The average pain-VAS decreased from 5.3 to 1.4 ($P < .001$). ASES and Constant scores significantly increased, from 42.9 and 56.2 to 85.2 and 82.5, respectively. PD occurred in 11 patients (12.9%), and 2 (2.3%) had self-consciousness; however, no patients complained about the deformity and the PD did not correlate with poorer clinical scores. Six patients (7.1%) complained of anterior cramping pain. Elbow flexion power was similar compared with the contralateral side. In postoperative magnetic resonance image analysis, 15 patients (25%) showed distal migration of tenodesed biceps tendon, although only 6 (7.1%) had clinical PD. Postoperative clinical outcomes were not influenced by the location of the suture anchor within the bicipital groove.

Conclusions: Arthroscopic biceps tenodesis with 1 suture anchor resulted in good clinical outcomes at 2 years postoperatively. PD was seen in 12.9% of the patients.

The Samsung Medical Center Institutional Review Board (IRB) approved this study on March 19, 2012 (IRB No.: 2012-03-044).

*Reprint requests: Jae Chul Yoo, MD, Department of Orthopaedic Surgery, Samsung Medical Center, Sungkyunkwan University School

of Medicine, 50 Irwon-dong, Gangnam-gu, Seoul 135-710, South Korea.

E-mail address: shoulderyoo@gmail.com (J.C. Yoo).

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

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Keywords: Shoulder; biceps; arthroscopy; suture anchor; tenodesis; Popeye deformity

The role of the biceps tendon as a source of shoulder pain has been well documented.^{1,18,21} Several pathologic entities affect this tendon, including tendonitis, tear, subluxation, and superior labrum anterior and posterior tear. However, the isolated case of biceps pathology is not common and is usually accompanied with rotator cuff tear requiring surgical intervention.⁸ In this setting, discriminating whether the patient's shoulder pain originates solely from the rotator cuff tear or is intermixed from a biceps lesion is difficult. Owing to concern of residual pain, even after successful rotator cuff repair, most surgeons prefer to perform the biceps procedure, such as tenotomy or tenodesis, in addition to rotator cuff repair.^{2,3}

Although tenotomy is a simple procedure not requiring strict rehabilitation,⁹ some surgeons are concerned about the development of Popeye deformity (PD) and muscle power compromise. In these patients, tenodesis might become the alternative, and is especially recommended for young and high-demand patients. Tenodesis of the biceps can be performed by an open or arthroscopic approach.^{7,12} Biceps tenodesis by the arthroscopic technique is gaining popularity because it can be performed with a short additional surgical time and a less invasive approach.

There are several methods of arthroscopic tenodesis. Soft tissue tenodesis, with a simple suture around the rotator interval, has been known as the simplest method.^{18,21} An arthroscopic technique using an interference screw was introduced with expectation of biomechanical superiority.^{6,11} The bony fixation method using a suture anchor is also widely reported.^{10,14,17,18} However, these reports usually are limited to technical notes or biomechanical results, and few reports have showed clear outcome improvement after arthroscopic biceps tenodesis, especially by suture anchor. Moreover, the clinical result after biceps tenodesis along with rotator cuff repair has not been adequately evaluated.

To address this issue, we evaluated our experience with arthroscopic biceps tenodesis. The purpose of this study was to evaluate the clinical and radiologic results of suture anchor biceps tenodesis performed arthroscopically. Our hypothesis was that arthroscopic biceps tenodesis with suture anchors, in the setting of a rotator cuff tear and repair, would provide acceptable clinical results in 2-year follow-up.

Materials and methods

Patient selection

This is a retrospective case series of a single surgeon's practice. Inclusion criteria were (1) an age older than 20 years, (2) minimum

2-year follow-up, (3) concomitant rotator cuff tear, and (4) biceps tenodesis performed arthroscopically with single suture anchor. Between 2006 and 2009, 109 patients underwent arthroscopic biceps tenodesis. Four patients were excluded after record reviews: 1 underwent another shoulder surgery after the index operation for an injury that occurred during an accident, 1 had a pre-existing brachial plexus injury, 1 had lately developed cervical radiculopathy resulting in shoulder muscle weakness, which could affect upper extremity muscle function, and the index surgery in 1 patient was a revision operation. Among the remaining 105 patients, 21 were lost during follow-up before 2 years after surgery, resulting in 84 patients. The overall follow-up rate was 80%.

Patient demographics

There were 45 men and 39 women, with mean age of 58 years (range, 43-77 years). Mean follow-up duration was 33.2 months (range, 24-71 months). The dominant hand was affected in 63 patients (71.6%). Average symptom duration (generic shoulder symptom) was 46.4 months (range, 2.0-367.3 months). All patients had rotator cuff tear, and 82 (97.6%) underwent rotator cuff repair. The primary indication for surgery was rotator cuff tear in 96.4%, comprising 9 massive (>5 cm), 20 large (3-5 cm), 39 medium (1-3 cm), and 6 small (<1 cm) full-thickness tears and 10 partial-thickness tears. Rotator cuff tear was repaired by side-to-side repair in 2 patients, single-row repair in 67, double-row repair in 5, and partially repaired in 8. Subscapularis tear was observed in 59 patients (67.0%); of these, 40 underwent simple debridement, and 7 and 12 patients underwent, respectively, simple or mattress suture repair using suture anchor. The other concomitant arthroscopic findings and the procedures performed are described in Table I. The arthroscopic finding of biceps pathology is reported in Table II.

Surgical procedure

Surgical indication was the presence of a biceps-specific physical finding of tenderness on the bicipital groove, positive result on a Speed or Yegerson test, and positive magnetic resonance imaging findings, including biceps subluxation, tendinitis, tendinosis, or superior labrum anterior posterior tear. These findings were confirmed during the arthroscopic examination. Although no exact age limit was set, tenodesis was preferentially performed in patients aged younger than 65 years instead of tenotomy. Even if the patient was older than 65 years, tenodesis was performed when the patient was actively participating in sports activity.

The surgery was performed under general anesthesia in the lateral position. Brachial plexus block was performed for intraoperative and postoperative pain management. The biceps tenodesis was performed first to the groove with suture anchors with the arm fully extended, and afterward, the removal of the tendon between the insertion of biceps and the tenodesis site was done. This enables the normal length of biceps to be maintained.

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