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ORIGINAL ARTICLE

Arthroscopic subscapularis repair using single-row mattress suture technique: clinical results and structural integrity

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Background: Rupture of the subscapularis (SSC) tendon, isolated or combined, is rare, and the treatment modalities are controversial. The purpose of this study was to evaluate, by magnetic resonance imaging (MRI), the clinical outcomes and structural integrity of the SSC tendon after all-arthroscopic repair with single-row mattress suture for isolated or combined SSC tendon tears.

Methods: This study included 68 patients who underwent all-arthroscopic repair using single-row mattress suture for isolated or combined SSC tendon tears between April 2011 and January 2013. The patients were evaluated by the visual analog scale for pain, American Shoulder and Elbow Surgeons score, Constant shoulder score, and SSC muscle strength measurement. MRI was used for assessment of the postoperative integrity of the SSC tendon.

Results: With a mean follow-up of 29.5 ± 4.0 months, the preoperative Constant shoulder and American Shoulder and Elbow Surgeons scores were 50.3 ± 21.0 and 46.6 ± 18.3, respectively, which improved at the last follow-up to 75.7 ± 16.6 and 81.3 ± 18.1, respectively, with statistical significance ($P < .001$). Belly-press and bear-hug test results showed some improvement in the last follow-up (>2 years) compared with the presurgical state ($P = .125$ and .650). A statistically significant SSC muscle strength deficit persisted in the postoperative state ($P = .015$). MRI evaluation showed a retear rate of 8.8%.

Conclusions: Arthroscopic repair of isolated or combined SSC tears with the single-row mattress suture technique results in significant clinical improvements and enduring tendon integrity, although SSC strength remains reduced from that on the normal side.

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

Keywords: Shoulder; rotator cuff; magnetic resonance imaging; muscle strength; clinical assessment; retear

The study was approved by the Institutional Review Board at the Sungkyunkwan University College of Medicine, Samsung Medical Center: No. 2015-10-030-004. All patients provided written informed consent.

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Arthroscopic treatment of subscapularis (SSC) tendon tear, although more challenging than that of supraspinatus (SSP) and infraspinatus (ISP) tears, has gained in popularity owing to the increasing recognition of the SSC tendon tear because of improved diagnosis, classification, and understanding of its pathophysiologic mechanism.[2,21]

SSC tendon tears have recently been given more attention because of advancements in arthroscopy. Developments in arthroscopic technique have allowed a less invasive method of treating SSC muscle tears, which have historically been treated by open surgery.[3,10] The use of the 70° arthroscope has been advocated as an effective modality to more fully evaluate and treat SSC tears, including the humeral insertion of the SSC.[2,4,34] However, despite the development of such equipment and techniques, many questions remain unanswered about the arthroscopic approach in SSC tendon tears, especially regarding the leading edge tears of the first facet.

The SSC tear can be an isolated tear, a part of the anterosuperior rotator cuff tear (SSC and SSP tendon tear), or a continuum of large and massive rotator cuff involvement.[26,28,37] Recently, the popularity of arthroscopic repair of SSC tendon lesions has increased.[32,35] Therefore, a considerable number of reports on SSC tendon integrity and clinical outcomes after operative repair of SSC tear, especially with the all-arthroscopic technique for combined SSC tears, have been published.[2,7,9,12,24] However, in most studies, researchers have used well-tested methods to assess clinical outcomes.[4,16,20,22,33] Thus, we approached this study with the question of whether a different measure can be used to assess clinical outcomes. Magnetic resonance imaging (MRI) has been a mainly studied and accepted imaging technique for identifying tendon tears.[1,13,25,29] A few studies have reported the radiologic results, especially the retear rate, of arthroscopic SSC tendon repair. However, in these studies, there was no common method for evaluation of SSC tendon integrity using MRI. In all studies, the method of analysis using MRI was different. Therefore, the evaluation of SSC tendon integrity using MRI required a standard protocol that can be used in such comparisons. On the other hand, standard single-row mattress repair is a widely proposed method for small and medium-sized SSP or ISP tears.[17] However, assessment of its efficacy in SSC repair cannot be found in the literature.

The purpose of this study was to report the clinical outcome of arthroscopic repair using a single-row mattress suture for SSC tendon tears, mainly as part of isolated or anterosuperior rotator cuff tears, and to evaluate the healing rate after single-row mattress repair by postoperative MRI.

Materials and methods

Selection of patients

This retrospective study consisted of 79 patients who received arthroscopic single-row mattress repair of isolated SSC tears or combined SSP and SSC tears between April 2011 and January 2013. All the index procedures were performed at our institution by a single senior surgeon.

The inclusion criteria were as follows: diagnosis of isolated SSC tendon tear based on physical examination and MRI; diagnosis of SSC and SSP with tendons <15 mm in anteroposterior length (although this might mean involvement of the ISP fibers, we considered this as SSP tendon only)[6,27]; >6 months of conservative treatment without success; and all tears for SSC tendon repair should be more than one-fourth of the tear of the leading edge SSC tendon. The tears were grade ≥II in the Lafosse classification[22] and type ≥IIB in the Yoo classification.[38]

The exclusion criteria included the following: large to massive rotator cuff tear; history of any previous surgical procedures or infection to the index shoulder; no postoperative MRI to evaluate tendon integrity; any related systemic diseases, such as rheumatoid arthritis, systemic lupus erythematosus, and ankylosing spondylitis; and rotator cuff tears or shoulder lesions on the opposite shoulder. After application of the exclusion criteria, 68 of the 79 patients were included.

Of the 68 patients, 59 (86.8%) attended outpatient visits for clinical and radiographic follow-up evaluations. The minimum follow-up time was 2 years.

The study group consisted of 31 men and 37 women, with a mean age of 62.6 years (range, 43-76 years) at the time of surgery. The dominant shoulder was involved in 48 patients. Thirty-two patients reported traumatic onset of symptoms, and the mean interval from onset of symptoms to surgery was 33.8 months (range, 3-157 months).

Clinical evaluation

All the patients were assessed the day before surgery and at 12 and 24 months after surgery. A single independent examiner, who is specialized in shoulder physiotherapy, performed all clinical assessments. Evaluation of clinical outcomes was performed by using the American Shoulder and Elbow Surgeons and Constant shoulder scores. The visual analog scale was used for assessment of pain (0, no pain; 10, unbearable pain) at each visit. Range of motion was assessed at each visit and included assessment of forward elevation, external rotation at the side, internal rotation, and abduction. Internal rotation was measured in the sitting position, based on the vertebral level reached by the tip of the thumb. Moreover, all patients underwent specific testing for assessment of the SSC muscle, which consists of the bear-hug test[4] and belly-press test as described by Gerber et al.[14] These specific tests were also conducted by a single independent examiner.

SSC strength evaluation

SSC function was evaluated by quantitative strength measurements using an electronic digital force gauge (FGN-20B; Shimpo, Kyoto, Japan). This SSC strength measurement was performed 1 year and 2 years after surgery. The SSC muscle strength measurement was performed in the standing position. The elbow was not dropped backward; that is, it remained in front of the trunk, and the digital force gauge was placed between the palm and abdomen of the patient. With the elbow held in place, the palm was pushed to the abdomen as far as possible. The force was then transmitted to the machine and measured. Force values (in kilograms) were evaluated by the calculating machine (Fig. 1). To avoid the influence of