CASE REPORT

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New Retear Pattern after Rotator Cuff Repair at Previous Intact Portion of Rotator Cuff

Chang-Hyuck Choi, Sung-Guk Kim✉, Jun-Ho Nam

Department of Orthopaedic Surgery, Daegu Catholic University Medical Center, Daegu, Korea

Retear patterns after arthroscopic rotator cuff repair are classified into two patterns according to retear location. Type 1 is when the retear pattern occurs directly on the tendon at the bone repair site using the suture anchor repair method. Type 2 is when the retear pattern occurs at the musculocutaneous junction with a healed footprint in patients who undergo the suture bridge method. Here, the authors report another retear pattern, which was identified as a type 2 retear on magnetic resonance imaging in patients who had undergone arthroscopic rotator cuff repair by the suture-bridge technique. This pattern was different from the type 2 retear and occurred at the portion of the cuff away from the healed rotator cuff under the view of the arthroscope.
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Key Words: Rotator cuff; Retear of rotator cuff; Arthroscopic rotator cuff repair

While successful outcomes of patients treated by arthroscopic rotator cuff repair have been reported by virtue of recent advances in arthroscopic techniques and their instrumentation, overall rates of retear from 21% to 26% were reported in patients after rotator cuff repair according to the repair technique.[1] Retear patterns after arthroscopic rotator cuff repair can be classified into two patterns according to the retear location. Type 1 is when the retear pattern occurs directly on the tendon at the bone repair site using the suture anchor repair method. Type 2 is when the retear pattern occurs at the musculocutaneous junction with a healed footprint in patients who undergo the suture bridge method.[2] This classification is widely used to differentiate retear type after rotator cuff repair. These retear patterns might be caused by a mismatch on the tension applied on the tendon.

However, not all retears of the rotator cuff were applicable to this classification.[3] Here, the authors report another retear pattern, which was identified as a type 2 retear on magnetic resonance imaging (MRI) in patients who had undergone arthroscopic rotator cuff repair by the suture-bridge technique. This pattern was different from the type 2 retear and occurred at the portion of the cuff away from the healed rotator cuff under the view of the arthroscope.

Case Report

Case 1

A 60-year-old female patient presented continuous pain in the right shoulder for 2 months. In her previous history, she had undergone rotator cuff repair of the right shoulder for a medium-sized suprasupinatus tear (2×2 cm size, crescent type) by the arthroscopic suture bridge technique 3 years ago in this clinic. Two medial suture anchors and two lateral suture anchors were used for the arthroscopic suture bridge technique. Torn cuff tendon was repaired with slightly anteriorly weighted tension to restore the foot print without excessive tension. The patient showed improved symptoms after the operation. She repeatedly practiced yoga beyond the normal range of motion of the shoulder with a yoga trainer. Without any special traumatic event, symptoms gradually worsened. Routine serial ultrasonography revealed that the repaired cuff maintained normal thickness until 1 year

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✉**Correspondence to:** Sung-Guk Kim
Department of Orthopaedic Surgery, Daegu Catholic University Medical Center, 33 Duryugongwon-ro 17-gil, Nam-gu, Daegu 42472, Korea
Tel: +82-53-650-4276, **Fax:** +82-53-626-4272 , **E-mail:** p10001@hanmail.net
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follow-up. There was no definite retear of the rotator cuff upon serial ultrasonography for 1 year before the appearance of symptoms. Upon physical examination, range of motion of the shoulder decreased from 170° of flexion, 60° of external rotation, and T 9 of internal rotation of the right shoulder to 160°, 40°, and L1 at the clinic visit after the appearance of symptoms. The empty can test was negative. With respect to functional scores, she showed a reduced Korean Shoulder Score (KSS), University of California Los Angeles score (UCLA), and Constant scores from 95, 34, and 88 at the last follow-up before the appearance of symptoms to 41, 19, and 45 after symptoms, respectively. Visual analogue score (VAS) was 6. Upon ultrasonography, there was no definite retear of the rotator cuff (Fig. 1A). With symptoms failing to be alleviated after conservative management and standardized rehabilitation, the right shoulder was investigated by MRI, which showed that the type 2 retear of the full-thickness rotator cuff tear was in the coronal images of the right shoulder (Fig. 1B). She was subjected to arthroscopic evaluation for revisional rotator cuff repair.

Arthroscopic investigation showed that there was no definite tear at the previous repaired site (Fig. 2A, B), except for widening of the rotator interval which seemed like retear site in MRI

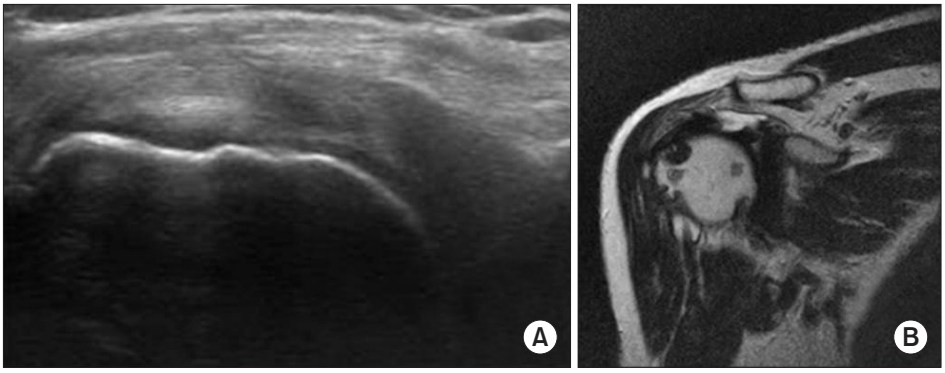

Fig. 1. Image evaluations of the ultrasound and magnetic resonance imaging (MRI). (A) No definite tear was seen on the ultrasound. (B) T2 coronal MRI showed the type 2 retear (rupture in the musculotendinous junction remaining the footprint).

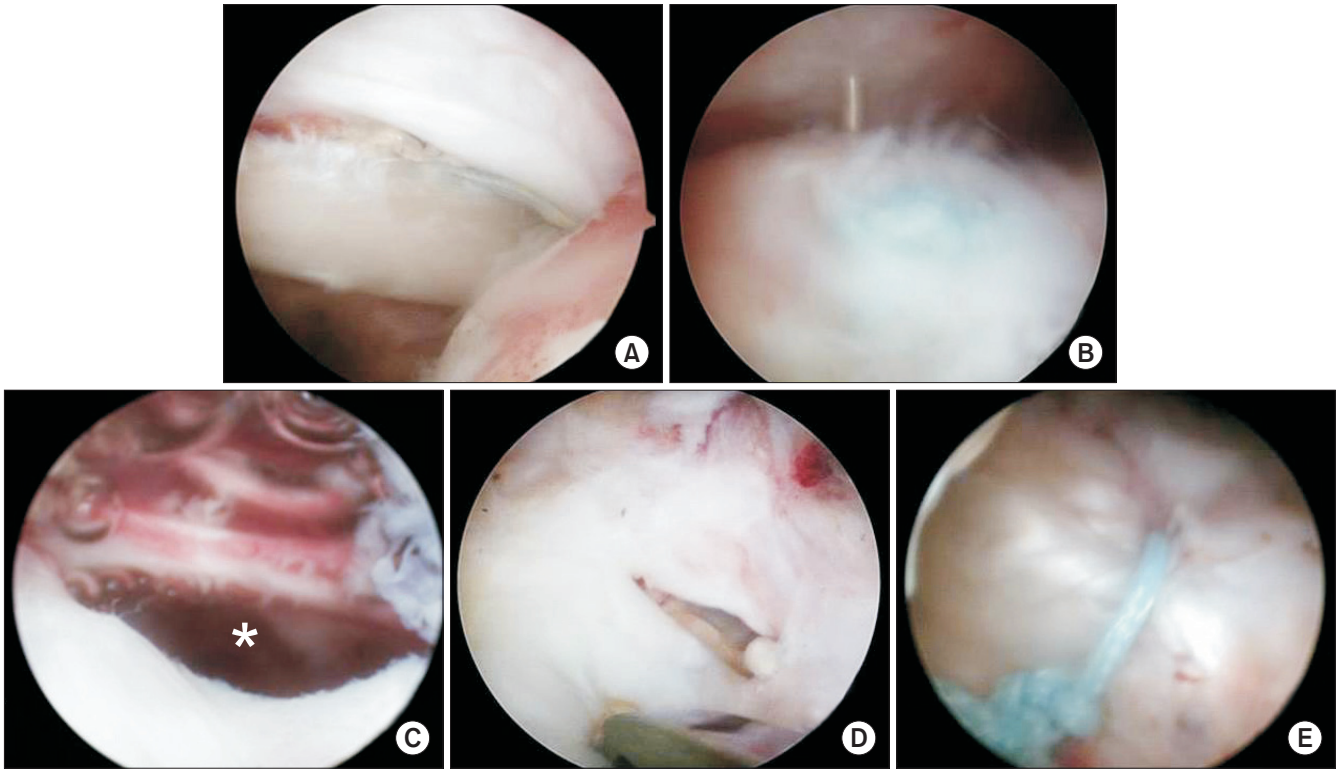

Fig. 2. Arthroscopic images for the right shoulder. (A) The intraarticular side of the ratotor cuff was healed up on the intraarticular view of the arthroscope through the posterior portal. (B) The bursal side of the rotator cuff was healed up on the subacromial view of the arthroscope through the posterolatral portal. (C) Large hole (asterisk) was seen at rotator interval which was mistaken for type 2 retear on magnetic resonance imaging. (D) The longitudinal splitting of the rotator cuff was noted and (E) repaired by the side-to-side technique with a nonabsorbable fiberwire (Ti-Con™).

(Fig. 2C). After removal of loose suture strands and debridement of the fraying margin of the repaired cuff, the integrity of the footprint was inspected and probed. Longitudinal splitting of the rotator cuff was noted, but the main stability of the footprint was intact (Fig. 2D). Side-to-side repair of the splitting was performed, and widening of the rotator interval was preserved (Fig. 2E). She underwent a standardized rehabilitation program postoperatively and finished the program of the yoga trainer. She showed improvement of KSS, ULCA, and Constant scores to 93, 32, and 85 at the last follow-up of 18 months, respectively. VAS was 1.

Case 2

A 64-year-old female presented ongoing pain in the right shoulder for 3 months. In her previous history, she underwent rotator cuff repair of the right shoulder for 1.5×2.0 cm suprasupinatus by the arthroscopic suture bridge technique 9 months ago at another clinic. She showed improved symptoms after the index surgery. Upon physical examination, range of motion of the shoulder was 160° of flexion, 40° of external rotation, and L1 of internal rotation of the right shoulder. The empty can test was positive. VAS was 6. The retracted rotator cuff was demonstrated by ultrasonography (Fig. 3A). With symptoms failing to be alleviated after conservative management and standardized rehabilitation, the right shoulder was investigated by MRI, which showed that the type 1 retear of the full-thickness rotator cuff tear was posterior to the area that had previously undergone rotator cuff repair (Fig. 3B). She underwent arthroscopic surgery on the right shoulder due to ongoing symptoms at another clinic. Arthroscopy showed no definite tear at the previous repair site (Fig. 4A), except for a 1×1 cm crescent-type rotator cuff tear on the 0.5 cm posterior side of the healed cuff, which is the same region in the MRI (Fig. 4B). After removal of the loose suture strands at the healed repair site, rotator cuff repair was carried out with the single row technique for the new tear, which was at the posterior side of the healed cuff (Fig. 4C). She underwent a standardized rehabilitation program postoperatively. VAS was 1. With respect to the functional scores, she showed improvement of KSS, ULCA, and Constant scores from 41, 15, and 47 to 89, 32, and 88 at the last follow-up of 18 months, respectively.

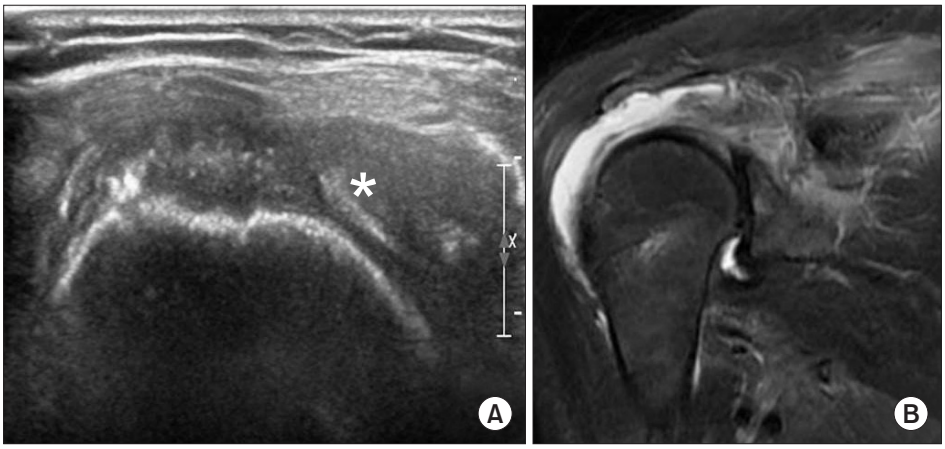

Fig. 3. Image evaluations of the ultrasound and magnetic resonance imaging (MRI). (A) The retracted cuff (asterisk) was shown on the ultrasound. (B) The type 1 retear (rupture in the tendon-bone) was noted on the fat-suppressed T-2 coronal MRI.

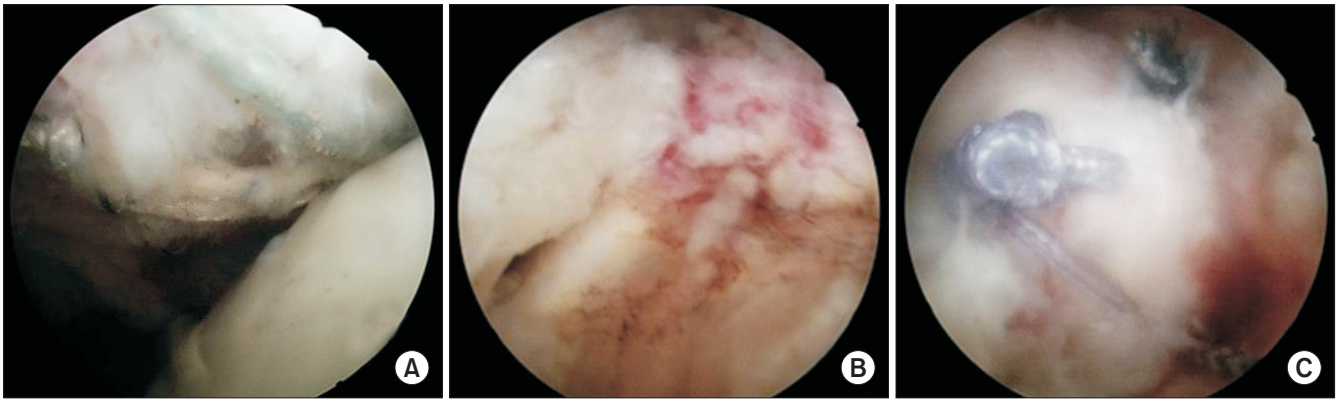

Fig. 4. Arthroscopic images for the right shoulder. (A) The intraarticular side of the previous torn ratotor cuff was healed up on the intraarticular view of the arthroscope through the posterior portal. (B) Retear was noted at the posterior side to the previous repaired rotator cuff on the subacromional view of the arthroscope through the posterolateral portal. (C) The single-row repair was done for the reteared cuff with a suture anchor.

Discussion

We report two cases of a new type retear pattern, which involved the anterior and posterior sides of the repaired tendon after arthroscopic rotator cuff repair using the suture-bridge technique. The patterns of the retear in this report were shown to be a type 2 retear in one patient and type 1 retear in the other patient by MRI. In fact, type 2 retear and type 1 retear shown in the MRI occurred on the anterior and posterior sides, respectively, of the previously repaired tendon, which was intact after the index operation. To our knowledge, this new retear pattern with the intact previous repaired site after arthroscopic suture-bridge rotator cuff repair has not been reported previously.

Prior studies on retear patterns after arthroscopic rotator cuff repair revealed that the prevalence of type 2 retear is higher than type 1 retear using the suture bridge technique as compared with the single-row technique.[2,3] The suture bridge technique tended to better preserve the cuff tissue repaired at the insertion site of the rotator cuff and give more mechanical strength than the single-row technique.[4] In a systematic review by Hein et al.,[1] the rate of retear was lower in the methods of rotator cuff repair using medial row fixation, including double-row technique and suture-bridge technique, than the method using the single-row technique. In a biomechanical study by Sano et al.,[5] however, the tendon around the medial fixation experienced the highest amount of stress. Trantalis et al.[6] revealed that tension overload of the suture-tendon interface at the medial row is a likely cause of medial cuff failure in double row rotator cuff repair. Those studies might provide a scientific basis for the type 2 retear pattern.

However, all retears of the rotator cuff were not applicable to this classification. The retear patterns of this report after arthroscopic suture-bridge repair were different from the previously suggested retear patterns according to the location of the retear. The retear could occur on the anterior or posterior sides of the previously repaired rotator cuff if the musculotendinous area maintained its integrity. There might be several causes for retears, including poor quality of tendon tissue, pullout of suture anchor, suture breakage, and inappropriate rehabilitation.[2] The suture-bridge technique provides broad tissue compression by the strand configuration from medial row fixation to lateral row fixation. However, fixing the tendon into the correct location with minimal tension at the medial row is sometimes difficult, and the technical difficulty causes uneven stress distribution at medial row fixation. According to the location of the increased stress, whether the location of the retear is on the anterior or posterior side of the previously repaired tendon could be determined if the repaired cuff achieved restoration of the footprint and underwent sufficient strong tendon-bone healing. Moreover, both sides of the repaired cuff using the suture-bridge technique are potential retear areas since these areas might be concentrated stress areas for shoulder motions, especially in internal and external rotations. Degeneration could progress in the intact cuff during rotator cuff repair, whereas the repaired cuff was supported mechanically by the sutures of the anchors and achieved bone-tendon healing. The new cuff tear could occur at the previous intact cuff as in this report.

In this report, the rotator interval was mistaken for a type 2 retear on the coronal MRI, but no retear was identified in the ultrasound. The misleading retear pattern in the MRI could be caused by a more oblique slice-plane than the anatomical axis of the scapular in the coronal MRI. The integrity of the repaired rotator cuff in the case was intact based on the serial follow-up of the ultrasound. The serial follow-up of the ultrasound after rotator cuff repair could prevent temporal changes in the retear of the rotator cuff and evaluate dynamic motion of the cuff. Considering the strength of the MRI and ultrasound, it is important to compare the integrity of the repaired cuff between the two image modularity in the patient with recalcitrant pain after rotator cuff repair for further treatment.

The causes of recalcitrant pain after rotator cuff surgery vary, and it is unclear whether or not these defects are the cause for the patients' symptoms. Notwithstanding these variables, identifying the retear pattern is important to understand the stress-increasing effect of the repair techniques and help the surgeon develop a strategy for management to reduce pain after rotator cuff repair based on the MRI and serial follow-up of the ultrasound.

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