CASE REPORT

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Cement Augmentation for Lateral Row Fixation in Rotator Cuff Repair: A Case Report

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One of the most important factors leading to a successful healing of rotator cuff tear is good bone quality to secure the suture anchor in the bone for a stable fixation. However, rotator cuff tear are commonly found in elderly patients, and their proximal humerus often shows osteoporosis or cystic lesions. Especially when the transosseous repair prevails for a torn rotator cuff, a weak metaphyseal cancellous bone is often the case, which associated with difficulty in stable fixation of the lateral row suture anchor. In this situation, we were able to augment the lateral row fixation with polymethylmethacrylate bone cement. Although there is a concern of disturbance in the blood flow and healing potential, our case showed good clinical results with respect to healing. If we suspect a weak fixation of the lateral row suture anchor, bone cement seems to be a good option for augmentation.
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Key Words: Rotator cuff injuries; Osteoporosis; Suture anchors; Polymethyl methacrylate; Bone cements

Rotator cuff tear is one of the most common causes of shoulder pain. When conservative treatments are non-responsive, surgical repair is usually recommended for active patients. Arthroscopic repair using a suture anchor is the mainstay of its surgical treatment, and a recent trend for repair of torn cuff tendon shifted the attention away from the traditional single row repair with open technique to arthroscopic double row or transosseous equivalent repair.[1)]

The healing or retear of repaired cuff tendon depends on several factors, including the biological condition surrounding the repaired tendon, biomechanical properties of repair construct, design of suture anchor, and bone quality. In fact, most degenerative rotator cuff tears are found in elderly patients, and considering the age distribution, these tears are commonly overlapped with osteoporosis.[2,3)] Since the poor local bone density in elderly patients might lead to the loosening of the suture anchor and may compromise the healing of repaired tendon;[3)] thus, the enhancement of fixation quality can be more important in these patients than other factors.[2,3)]

Several techniques have been introduced to improve the fixation strength of the suture anchor in the osteoporotic bone.[4-7)] However, in previous studies, the augmentation of suture anchor strength were conducted only on cadavers, and thus, clinical cases regarding augmentation techniques have rarely been reported.

The present report is a case of rotator cuff repair in which failed lateral row anchor was augmented by polymethylmethacrylate (PMMA) bone cement.

Case Report

A 59-year-old female patient visited our outpatient clinic due to an unresponsive conservative treatment of more than three months for pain in the right shoulder. Her shoulder pain began more than a year ago, which had gotten worse and aggravated four months prior to this visit. Conservative treatment consisted of pain medication, physiotherapy, and steroid injection. There was no prior history of trauma, surgery, or other inflammatory

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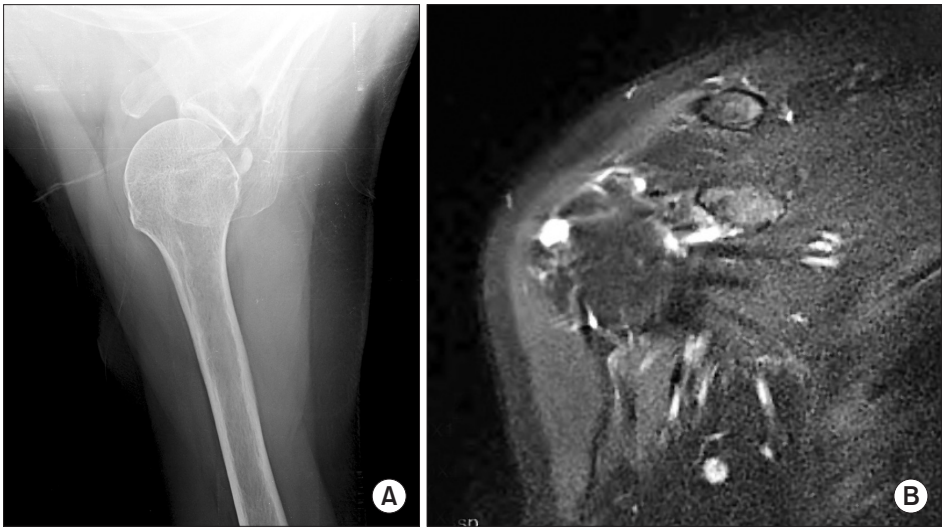

Fig. 1. (A) Plain radiograph showing a calcification with delineated margin. (B) Magnetic resonance imaging showing a nearly full-thickness bursal side partial tear on the insertion of supraspinatus tendon.

diseases.

Her range of motion was not limited. Forward elevation was 180°, external rotation was 70°, and internal rotation was T7 vertebral body. Impingement sign and empty can test were positive with decreased strength. Her height and weight were 162 cm and 54 kg, respectively. Her bone mineral density showed T-scores of -1.0 in the hip and -1.3 in the spine, without any signs of osteoporosis.

Her plain radiograph showed small calcific material on her right shoulder, and magnetic resonance imaging (MRI) revealed approximately 1.4 cm of calcific material on the insertion site of the infraspinatus tendon. Moreover, there was nearly a full-thickness bursal side partial tear on great tuberosity of the insertion of supraspinatus tendon (Fig. 1). Preoperative pain visual analogue scale was 9, single assessment numeric evaluation score was 20% of the normal shoulder, and American Shoulder and Elbow Surgeons score was 27.

An arthroscopic removal of the calcific material as well as a concomitant repair of torn rotator cuff tendon were planned. Surgery was performed in a lateral decubitus position under general anesthesia. In the subacromial space, we were able to see the calcific material after a small longitudinal incision of the infraspinatus. After debridement of nearly all calcifications, the incised infraspinatus tendon was repaired in a side-to-side manner to close the defect. Just behind the biceps tendon, there was nearly a full-thickness partial bursal side tear. The medial row suture anchor was inserted, and the medial row sutures were tied. Lateral row fixation was performed using the knotless suture anchor (Footprint PK suture anchor; Smith & Nephew, London, UK). However, the lateral row anchor was easily pulled-out without resistance, and the bone was too weak for an anchor fixation (Fig. 2). We decided to use PMMA cement to make a strong fixation. PMMA cement was mixed at room temperature in accordance with the manufacturer's instructions.

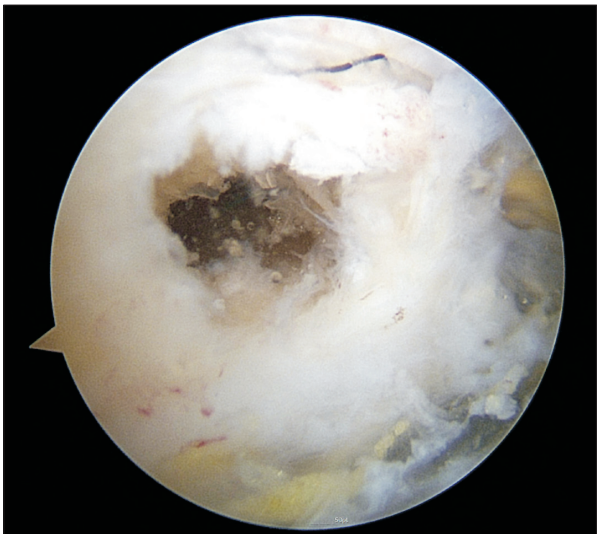

Fig. 2. Arthroscopic view from the posterolateral portal in the right shoulder shows week osteoporotic bone where the latera row anchor is pulled out with nearly no resistance.

A Jamshidi needle (supplied by the manufacturer) was used to make a channel between the outside of the shoulder and bone marrow. The PMMA cement in its early dough state was then injected until encountering a significant back pressure, leading to a cement hardening at the tip of the Jamshidi needle. When PMMA hardened to a doughy consistency, the lateral row suture anchor with suture limbs was then re-inserted into the hole and tensioned, while allowing the cement to be fully cured, according to the manufacturer's instructions (Fig. 3). The shoulder was kept in a sling with a small pillow for four weeks to protect the shoulder during the repair process. However, a pendulum exercise and a passive motion exercise were initiated two days after the surgery.

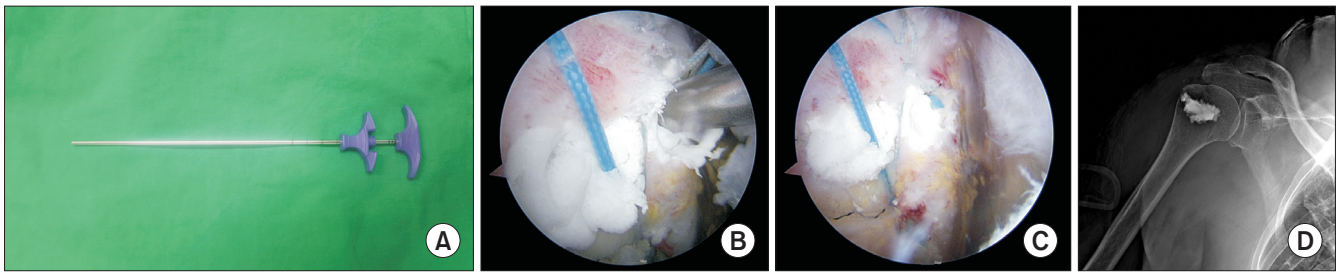

Fig. 3. (A) Jamshidi needle which is used for cement insertion. (B) The lateral row anchor is re-inserted and tensioned while the cement is hardened enough. The Jamshidi needle is used to insert additional cement and prevent back out of cement and anchor. (C) Final construct of the anchor hole augmented with a bone cement. (D) Final radiography.

Discussion

To repair the torn rotator cuff tendon, numerous suture anchors with variable designs and material have been developed. Such suture anchors were designed to obtain the optimal pull-out strength. Meanwhile, bone quality or bone density is another important factor affecting the strength of fixation, which may eventually impact the healing and clinical outcome of the tendon.[4]

Although osteoporosis could be determined by bone densitometry, a T-score of the hip and spine sometimes do not reflect the local bone quality of the proximal humerus bone, where the suture anchors are inserted. Suture anchors can often be pulled-out, especially in old-age female patients. There is one clinical study reporting the clinical outcome after PMMA cement augmentation of the medial row anchor to repair the rotator cuff of the osteoporotic bone.[8] In such a study, osteoportic bone with multiple cystic lesions was augmented by PMMA cement, and it showed an excellent initial fixation of the medial row anchor. Our case showed that the problem with the initial fixation strength in the osteoporotic bone can also happen in the lateral row fixation as well. In our case, the medial anchor was inserted into a good quality subchondral bone, while the fixation of the lateral anchor was not feasible due to the weak metaphyseal cancellous bone. There are also other options to consider when attempting to improve the stability of anchors, such as the insertion angle of varying degrees, implantation positions within the greater tuberosity providing the best bone quality, or the use of larger size of anchors with less tapping.[4,9] However, in patients with severe osteoporosis or poor metaphyseal bone quality, these options may not be the best solution. In our case, one of the two lateral anchors was inserted in a more inferior position with a different inserting angle. However, the proper fixation of the other lateral anchor could not be obtained, and thus, we performed an augmentation of the anchor with PMMA cement. The amount of injected cement could not be standardized or pre-determined in our case. We injected the cement until there was a significant back pressure. Moreover, the lateral anchor was re-inserted and tensioned, while the Jamshidi needle–used for cement injection–supported the anchor and cement. It was maintained until the leftover cement was sufficiently hardened.

Pulling out of the lateral anchor could be addressed with a similar technique proposed by Lee and Tae's.[8] A few methods have been introduced for augmentation of the suture anchor. They are injectable, bio-absorbable, fiber-reinforced cement,[4] PMMA cement,[5] and one additional cancellous screw with a washer.[7] In a biomechanical test, the cementing technique showed the highest pull-out strength.[5,10]

However, there maybe a few concerns related to healing or washout before fully curing of the cement. There is an exothermic curing in PMMA cement, and it could violate the surrounding tissues and nerves. A potential impairment of the footprint area by thermal damage during the cure of cement might be a concern. Thus, demonstrating the healing with a postoperative ultrasound or MRI in the long term is imperative. However, the symptoms in our patient was recovered completely, and the patient refused to take postoperative MRI with additional cost. Furthermore, in our case, cement was injected more inferiorly from the footprint of the rotator cuff, where the tendon would be healed. In Inferior metaphyseal area where lateral row anchor is fixed, anchor stability seems more important than the potential thermal injury to the surrounding tissue. Injecting a cement in its early dough state with Jamshidi needle could prevent a washout of the cement, and radiographic findings showed no evidence of breakage in the cement mantle. An ultrasound at 6 months after the surgery showed healing of the repaired tendon with good clinical results.

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