Arthroscopic and Fluoroscopic Guidance Removal of Intratendinous Broken Instrument During Rotator Cuff Repair

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Abstract: Instrument breakage during arthroscopic rotator cuff repair is a rare complication of shoulder arthroscopy, especially when the broken instrument has been left inside the tendon part of the rotator cuff. We propose a combined arthroscopic and fluoroscopic guidance technique to ease the removal of the broken instrument and repair the torn rotator cuff after removal.

Introduction

Arthroscopic rotator cuff repair is now a common procedure among orthopaedic surgeons. Although retained broken instrument during arthroscopic rotator cuff repair is a complication not as common as infection, cartilage injury, or fluid extravasation, it can make the procedure even more difficult. There is no consensus for a treatment option. A literature review shows mostly case report studies.1-4 Option of treatments varies ranging from conservative treatment, open removal of the instrument, and arthroscopic-assisted removal. Retained instrument can migrate to a vital structure or cause recurrent pain and swelling,5 so removal of the broken instrument may prevent more serious complications. We propose a technique to ease the procedure that combines arthroscopic and fluoroscopic guidance to remove the intratendinous-retained foreign body and repair the torn rotator cuff after the broken instrument is removed.

Surgical Technique

Indications

This technique is indicated for patients with broken instrument retained at the intratendinous part of the rotator cuff (Fig 1).

Positioning

In a case of arthroscopic rotator cuff repair, a patient is routinely placed in the beach chair position. A C-arm fluoroscope is placed behind the patient. An anteroposterior shoulder radiograph is taken with the patient’s arm placed in neutral rotation. Then the C-arm is horizontally rotated to create internal and external oblique views of the shoulder (Fig 2).

Surgical Procedure

After the broken instrument is found by using C-arm fluoroscopy, an anteroposterior image of the shoulder is taken. A No. 18 spinal needle is used, and the tip of the needle is guided percutaneously from the anterolateral part of the shoulder (Fig 3) under fluoroscopic guidance toward the broken instrument. Both the internal and external oblique views should be used to confirm the position of the spinal needle tip as it touches the broken instrument (Fig 4).

The subacromial space is entered arthroscopically. A posterolateral portal is used as the viewing portal and a lateral portal is used as the working portal (Fig 3). Removal of subacromial bursa by using a 4.5-mm DYONICS platinum FR shaver instrument (Smith &
Nephew, London, England) and identification of the spinal needle are performed. Turbovac Coblation electro-cauterization (ArthroCare, Sunnyvale, CA) is used to follow the spinal needle to the rotator cuff. After the rotator cuff is reached, electrocauterization can be used to create a small hole in the cuff and followed down to the tip of the needle (Fig 5). The broken instrument should be found close to the tip and removed with arthroscopic grasping instrument (Fig 6). However, if the broken piece cannot be found, the fluoroscope is used to check for the position of the broken piece again and the tip of the needle can be redirected accordingly.

After the broken piece is removed, the created tendon tear is repaired with a side-to-side stitch. Then, the rotator cuff tear is repaired according to familiarity of each surgeon (Video 1).

**Postoperative Protocol**

The patient is immobilized with an arm sling. Passive range of motion exercise begins on the first postoperative day. The arm sling is removed and gentle active range of motion exercises begin at 4 to 6 weeks. At 12 weeks’ postoperatively, strengthening exercises and more aggressive range of motion exercises are started. Full sport activities can be resumed after 6 to

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*Fig 1.* Intraoperative fluoroscope anteroposterior view of the right shoulder revealed the broken tip of the suture instrument that was left inside the subacromial space (red arrow) while repairing the right rotator cuff in beach-chair position.

*Fig 2.* Position of a C-arm fluoroscope to create internal and external oblique views and identify the lost broken instrument that was left inside the right rotator cuff tendon in beach-chair position. (A) The trajectory of internal oblique view from the C-arm fluoroscope in neutral rotation of the shoulder, from the anteroposterior shoulder trajectory of the C-arm, horizontally rotated the C-arm medially about 20°. (B) The trajectory of external oblique view from the C-arm fluoroscope in neutral rotation of the shoulder, from the anteroposterior shoulder trajectory of the C-arm, horizontally rotated the C-arm laterally about 20°.
9 months. Advantages/disadvantages, pearls/pitfalls, and indication of the procedure are further described in Table 1.

**Discussion**

Retained broken instrument is a rare complication of shoulder arthroscopic surgery. Oztekin\(^6\) reported of a broken arthroscopic probe that was treated via conservative treatment; the patient remained asymptomatic for years. However, symptoms can develop, as Weber and Kauffman\(^7\) have shown in regards to the migration of a bioabsorbable screw that was used in Bankart surgery. It moved to the medial border of the scapular, which caused pain and stiffness. Thus, we

**Fig 3.** Patient with a broken instrument left inside the right rotator cuff tendon in beach-chair position. A No. 18 spinal needle was used percutaneously from the anterolateral part of the shoulder (red circle) to locate the position of the broken instrument under fluoroscopy. Posterolateral portal (PL) was used as a viewing portal and lateral portal (L) was used as a working portal.

**Fig 4.** Intraoperative fluoroscopy view of the right shoulder in patient with broken instrument (red circle) left inside the torn tendon while repairing the right rotator cuff in beach-chair position. (A) The tip of the spinal needle is directed to the broken instrument in an internal oblique view. (B) The tip of the spinal needle is directed to the broken tip in external oblique view.

**Fig 5.** An arthroscopic image from a posterolateral viewing portal of the right shoulder with the broken instrument in rotator cuff tendon. A Turbox Clavage electrocauterization (ArthroCare) was used to follow the spinal needle to the rotator cuff. After the rotator cuff is reached, electrocauterization can be used to create a small hole in the cuff and followed down to the tip of the needle. SSP, supraspinatus.
recommend removal of broken instruments, especially those with sharp cutting edges.

During removal of broken instruments with arthroscopy, both inflow and outflow should be stopped to avoid pushing the broken instrument further into a non accessible area.\(^8\) We recommend the same technique. However, in the subacromial space, with the broken instrument left embedded within the tendon, maintenance of the inflow fluid while preventing the outflow of fluid is preferred to clear up the visual field. If the foreign body is visible by the arthroscope, a large grasping instrument, such as pituitary rongeur or a large grasper, should be used to retrieve it.

Lee et al.\(^9\) revealed a surgical technique describing the removal of intra-articular foreign-body from knee, hip, and sacroiliac joint with an arthroscope. Schmiddem et al.\(^8\) reported a case of a missing piece of instrument that was left inside the deltoid muscle. However, currently, there is no report of broken instrument that is left inside the rotator cuff. Thus, we report a technique to find the missing piece of broken instrument and repair the torn rotator cuff.

In a previous article by Allum,\(^10\) the author recommended pushing foreign bodies that cannot be removed into the nonweight-bearing area of the knee joint without performing an arthrotomy procedure because of risk for further damages to the knee structures. However, we should be concerned about the future risk of osteoarthritis from these foreign objects.

In conclusion, our removal technique is considered as an option for removing a broken instrument left inside the rotator cuff tendon. It provides a minimally invasive approach that allows for removal of retained instruments and avoidance from future undesirable symptoms and complications.

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