

# Arthroscopic suture anchor repair of posterior root attachment injury in medial meniscus: technical note

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**Abstract** A root attachment injury (root tear) of the meniscus can abolish the ability of the meniscus to bear hoop stress and predispose to increase articular contact stress which contribute to femorotibial degenerative changes. A pull out suture technique to repair the root tear has been described, but the procedure making the tibial tunnel may be difficult and troublesome. This article describes a repair technique using a suture anchor and posterior *trans-septal* portal.

**Keywords** Meniscus · Root tear · Suture anchor · Posterior *trans-septal* portal

## Introduction

Tear of the root attachment of the medial meniscus can occur by a single traumatic event, or, more commonly, may follow chronic degenerative meniscal disease [8]. Regardless of the cause, the medial meniscus root tear destroys the ability of the meniscus to withstand hoop stress and thereby predispose to early onset medial femorotibial osteoarthritis

[10]. To author's knowledge, two kinds of techniques: suture anchoring and pull out suture, were reported to repair the root tear of the medial meniscus, but these techniques have their shortcomings in the technical view point [3, 6, 7]. The purpose of this article is to present a surgical technique that provides a good visualization and simplicity to repair the medial meniscus root tear.

## Technique

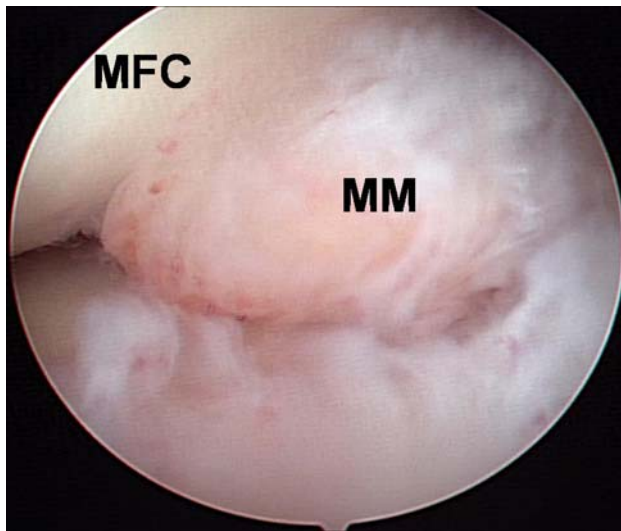
Initially, a routine arthroscopic examination of the knee joint was performed using the standard anterolateral and anteromedial portals. These portals were made immediately adjacent to the lateral and medial border of the patellar tendon and 1 cm above the joint line in order to allow an easy passage through the intercondylar notch into the posterior compartment of the knee joint. Under the view through the anterolateral portal, posterior root area of medial meniscus was inspected and the amount of the extrusion of the medial meniscus was checked.

The posterior *trans-septal* portal was established as described in Ahn et al. [1]. A posteromedial portal was established under direct visualization with a 30° arthroscope placed through the intercondylar notch (between the PCL and the medial femoral condyle) via the anterolateral portal. A transillumination technique was used to make the posteromedial portal viewable. A high posteromedial portal is established more than 2 cm proximal from the joint line, which is about the upper margin of transilluminated area. An anchor can be placed more vertically, therefore more securely fixed on tibia, via a high posteromedial working portal. A posterolateral portal was established under direct visualization with a 30° arthroscope placed through the intercondylar notch (between the ACL and lateral femoral

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**Fig. 1** Posterior *trans*-septal portal via posterolateral portal provides a clear view of complete radial tear of the posterior horn of the medial meniscus (*MM*). *MFC* medial femoral condyle

condyle) via the anteromedial portal. Under the arthroscopic view through the posteromedial portal, the posterior septum was pushed medially by a switching stick inserted through the posterolateral portal. The posterior *trans*-septal portal was created with a motorized shaver inserted through the anteromedial portal and reached the posteromedial compartment. After the posterior *trans*-septal portal was established, an arthroscope was introduced into the posteromedial compartment from the posterolateral portal through the posterior *trans*-septal portal. The posteromedial compartment was well visualized and the tear of the root attachment of the medial meniscus was confirmed (Fig. 1).

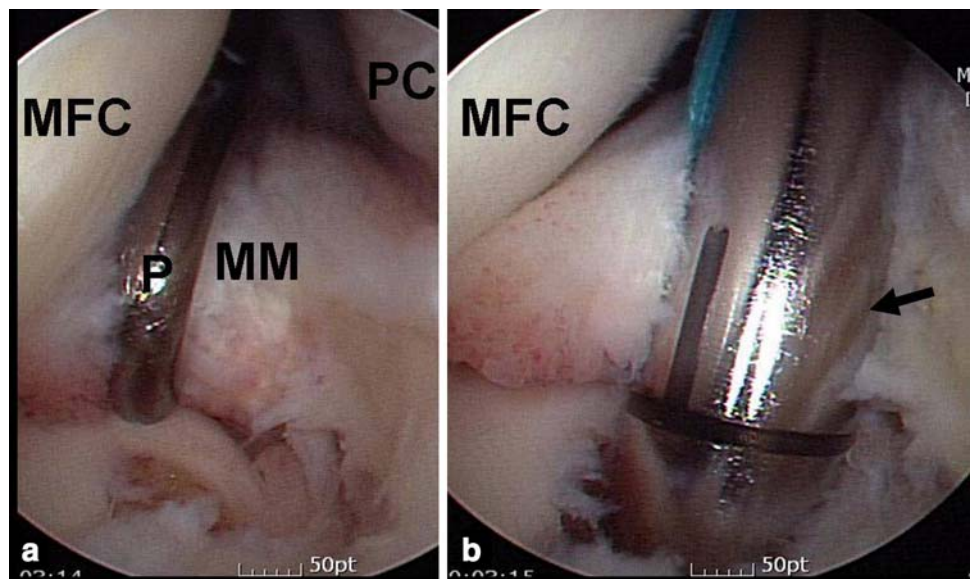
A round burr was introduced through the posteromedial portal and the cortical bone just medial to the insertion site

of the posterior horn of medial meniscus was removed (Fig. 2a). The cortical bone was removed enough to create a sufficient contact surface between the meniscal substance and the cancellous bone of the tibia. Even though further flexion up to 100° makes the access to the posterior horn a little easier, it is generally unnecessary to flex the knee to that extent. Therefore, we performed the operation with the knee flexed 80°–90° by gravity.

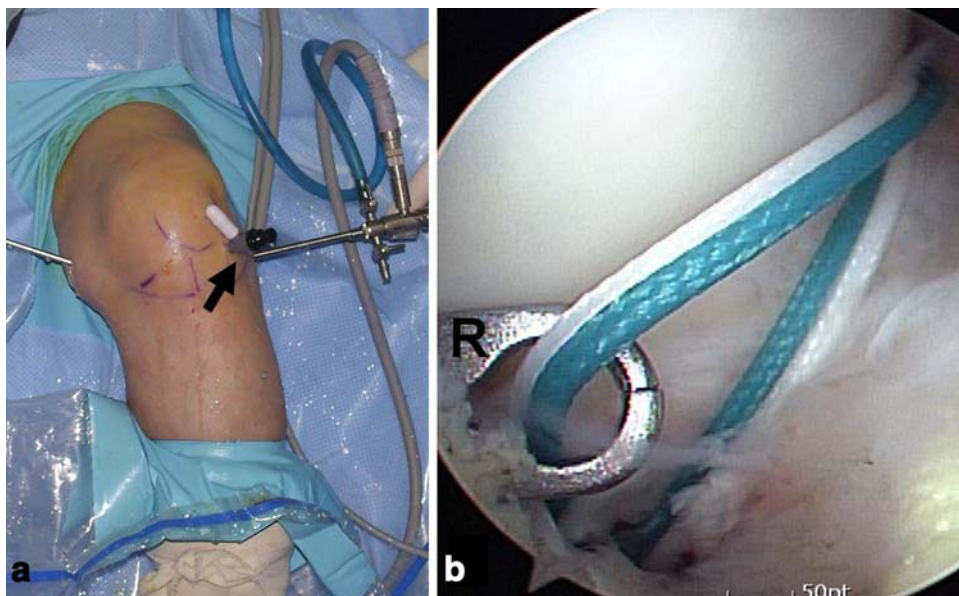
We used Duet™ suture anchor (ConMed, Linvatec, Largo, FL, USA) to repair the meniscal root tear. Under visualization through posterior *trans*-septal portal via the posterolateral portal, a punch was introduced through the posteromedial portal and a hole was created just medial to the posterior insertion site of medial meniscus. A suture anchor was advanced into the hole until the laser line located on the driver in flush with the bone (Fig. 2b). The driver was pulled back gently to release the preloaded sutures from the driver and the pre-attached needles were removed. Then, a 5.5 mm cannula (ConMed, Linvatec, Largo, FL, USA) was inserted between the medial femoral condyle and cruciate ligaments via anterolateral portal (Fig. 3). Two strands of the suture from the same side of anchor were retrieved through the cannula.

Under visualization from the same portal, a suture hook (Linvatec, Largo, FL, USA), with a straight or curved neck, was inserted. A straight suture hook is better in terms of accessibility to posterior horn of meniscus. A curved suture hook is difficult to insert through the meniscus with the femoral condyle hindering the movement, but suturing itself is easier than with a straight hook. There is no specific indication of using a straight or curved suture hook. We usually used a 45° curved suture hook. By handling the suture hook, one-third of the peripheral portion of the torn meniscus was hooked from the femoral side to the tibial

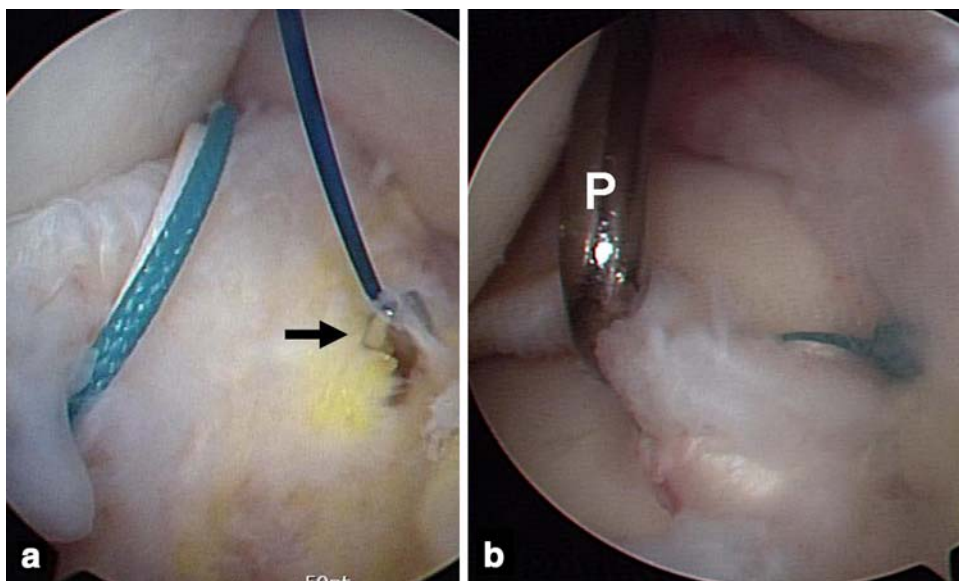
**Fig. 2** **a** The cortical bone just medial to the insertion site of the medial meniscus was removed using a round burr. **b** A suture anchor (*arrow*) was inserted into the hole that was made on decorticated area. *MFC* medial femoral condyle, *P* probe, *PC* posterior capsule, *MM* medial meniscus



**Fig. 3** **a** A 5.5 mm cannula (*arrow*) was inserted between the medial femoral condyle and cruciate ligaments via anterolateral portal. **b** The two strands of the suture were retrieved through the cannula. *R* retriever



**Fig. 4** **a** A suture hook preloaded with a no. 0 PDS suture material (*arrow*) was inserted through the posteromedial portal and the torn meniscus was hooked from the femoral side to the tibial side in a vertical direction. **b** Arthroscopic view through the posterior trans-septal portal that shows a firmly reattached posterior root. *P* probe



side in a vertical direction (Fig. 4). Then, a no. 0 PDS (Ethicon, Somerville, NJ, USA) suture material, which was already loaded into the suture hook, was advanced. After sufficient length of the PDS was advanced, the suture hook was retracted. One limb of the PDS from the tibial side was retrieved using a suture retriever through the 8-mm cannula that was inserted from the anterolateral portal. The strand of the PDS was twisted to make a shuttle-relay and the strand of the anchor suture was hooked to the shuttle-relay. The limb of the suture that had been retrieved to the anterolateral portal could come out through the posteromedial portal passing the substance of the medial meniscus. A SMC knot was made and slid with a knot pusher under adequate reduction and tension, and additional securing half-hitch sutures were made. Because Duet™ suture anchor is

preloaded with two sutures, another knot can be made in the same process (Fig. 4).

## Discussion

Maintenance of the ‘hoop strain’ is the most importance function of the meniscus. Containment of this hoop strain allows for a relatively even distribution of axial loading, thereby protecting the underlying articular cartilage [8]. Disruption of the main circumferential collagen bundles resulting from meniscal root tear and large radial tear results in loss of the hoop strain [10]. Although some authors disagree with the repair of posterior root injury in the elderly due to degenerative meniscal tissue and low



healing potential [4], we believe that efforts should be made to restore the hoop strain of the meniscus even in the elderly.

Engelsohn et al. [6] reported two cases of marginal fractures of the medial tibial plateau associated with medial meniscal root tears in young patients. They repaired the medial meniscal root tear using a bioabsorbable suture anchor through the posteromedial portal and utilized a Viper (Arthrex Inc., Naples, FL, USA) suture passer to pass the sutures through the torn meniscal edge. Choi et al. [5] reported a meniscal repair technique of root tear using suture anchor recently. But they used an anterolateral portal as a viewing portal. According to our experience, the transcondylar notch view via anterolateral portal and posteromedial portal as a working portal could be an option to repair the posterior root tear of the medial meniscus. But this method did not provide a proper view in most cases, especially in the patients who have enlarged tibial spine, narrow intercondylar notch and degenerative surrounding soft tissues. The posterior *trans*-septal portal provided a thorough view of the root area of the medial meniscus in all cases.

The posterior *trans*-septal portal also has safety margin away from neurovascular structure. According to the Ahn's cadaver study [2], the distance between the popliteal artery and the posterior border of the midsubstance of the PCL at the level of the posterior *trans*-septal portal was about 17.6 mm after pump injection.

Ahn et al. [3] introduced an excellent technique to repair the medial meniscal root tear using a posterior *trans*-septal portal. They made the tibial tunnel to fix the torn meniscus using the ACL tibial drilling guide. But this pull out suture essentially creates the tibial tunnel and another skin incision, and accurate targeting of the meniscal insertion site may need repetitive drilling of the tibia.

The insertion of the posterior horn of the medial meniscus is attached to the anterior half of the posterior intercondylar fossa of the tibial plateau, directly anterior to the PCL tibial insertion [9]. This area can be well visualized through the posterior *trans*-septal portal and a torn meniscal root can be attached to the intended point by easy handling of the suture anchor. We inserted a suture anchor just medial to the original insertion site of the medial meniscus and this enhanced enough contact between the meniscus

and tibial bone bed. Our technique can provide several advantages; good visualization through the posterior *trans*-septal portal, easy localization of the reattachment site of the medial meniscus by using a suture anchor and elimination of tibial tunneling. We believe that suture anchor repair using the posterior *trans*-septal portal could constantly provide a firm and precise repair of the posterior root attachment injury of the medial meniscus.

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