

# Arthroscopic Primary Medial Collateral Ligament Repair With Suture Anchor



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**Abstract:** A medial collateral ligament (MCL) tear is common in cases of isolated injury or in those combined with anterior cruciate ligament injury. Although conservative treatment for an MCL tear is popular, some cases result in residual instability. Thus, the treatment approach of grade III MCL injury remains controversial. In this Technical Note, we present the technique of arthroscopic primary MCL repair with suture anchor. With this technique, proximal MCL injuries can be repaired with minimal invasion. This technique improves valgus stability and enables early rehabilitation, including range of motion and weight-bearing exercise.

A medial collateral ligament (MCL) tear is a common injury among the athletic population.<sup>1,2</sup> As the MCL has a good healing capacity, conservative treatment is popular.<sup>3,4</sup> Most MCL tears can be treated conservatively and healed without instability, even in cases of grade III MCL injury. In general, when combined with an anterior cruciate ligament (ACL) tear, an MCL tear can be treated conservatively and an ACL tear can be treated operatively.<sup>3</sup> However, there are some cases that leave residual instability after conservative treatment. Thus, the treatment approach of grade III MCL injury remains controversial.<sup>5</sup>

In this article and [Video 1](#), we report the surgical technique of arthroscopic primary MCL repair with suture anchor that can be used in cases of isolated MCL injury, combined ACL and MCL injury, or multi-ligamentous knee injury.

## Surgical Technique (With Video Illustration)

### Preoperative Evaluation and Radiographic Imaging

Findings of the patient's physical examination should include a positive valgus stress test. We also conduct other physical examinations, such as range of motion (ROM), tenderness, instability including the Lachman test, the anterior drawer test, and posterior drawer test, and the McMurray test. It is important to pay attention to other combined symptoms, including multiligament injury. A routine radiograph is required to exclude the presence of a fracture, as an avulsion fracture of femoral attachment of MCL should be treated operatively.<sup>4</sup> The preoperative valgus stress radiograph shows valgus instability at 20° flexion and extension ([Fig 1](#)). Magnetic resonance imaging (MRI), which is also important for diagnosing other concomitant injuries, showed deep MCL and superficial MCL tears at the femoral side ([Fig 2](#)); therefore, this case was diagnosed as grade III MCL injury.<sup>3</sup> The preoperative location of the MCL tear should be confirmed because this surgical technique is indicated for femoral-side MCL tear.

### Surgical Technique

Knee arthroscopy is performed with the patient in the supine position under general or spinal anesthesia. A tourniquet is placed on the operative thigh and used if necessary. Routine arthroscopic evaluation is performed to assess intra-articular lesions using anteromedial and anterolateral portals. Arthroscopic evaluation of the medial compartment should be performed during valgus stress. Arthroscopic evaluation

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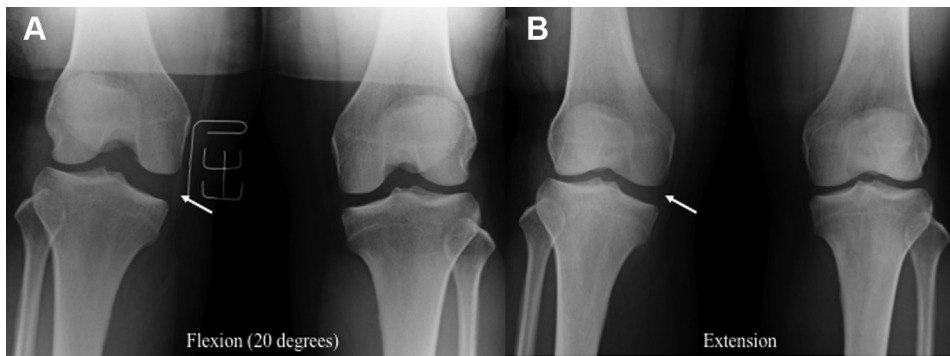
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**Fig 1.** Preoperative valgus stress radiograph. Right knee shows valgus instability (white arrow) at 20° (A) flexion and (B) extension.

shows the “drive-through” sign or “floating meniscus” sign, which indicates injury of the meniscocapsular junction (Fig 3).<sup>4,6,7</sup> Capsular tear and deep MCL tear are confirmed when evaluating the medial femoral epicondyle (Fig 4). A medial portal (MP) is established at the medial femoral epicondyle because attachment of the superficial MCL is in the posterior position of the medial femoral epicondyle (Fig 5A).<sup>8</sup> If it is difficult to identify the medial femoral epicondyle to establish MP, fluoroscopy may help in identifying radiographic bony landmark. A 1.5-mm JuggerKnot Soft Anchor (Zimmer Biomet, Warsaw, IN) is inserted at the medial epicondyle through the MP (Fig 5B). A far-anteromedial portal is established for suture relay. A 20-G needle with PROLENE (ETHICON, Johnson & Johnson, Blue Ash, OH) is penetrated through the MP to the joint capsule and deep MCL at femoral attachment, after which the suture relay is performed through the FAMP (Fig 5 C and D). This work is repeated and knot tying is performed at 20° to 30° flexion (Fig 5E). After knot tying, the capsular and deep MCL tear are repaired (Fig

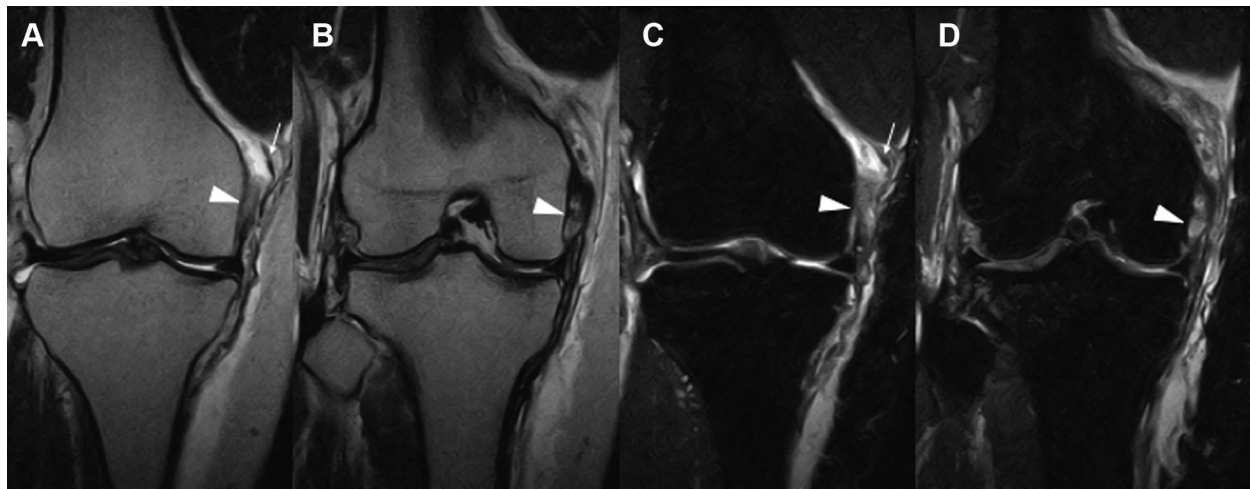
5F). Arthroscopic view of the medial compartment in the right knee shows improvement of the drive-through sign after MCL repair (Fig 6). Postoperative radiograph shows that valgus instability is improved after surgery (Fig 7). Pearls and pitfalls of this surgical technique are summarized in Table 1.

#### Postoperative Management and Rehabilitation Protocol

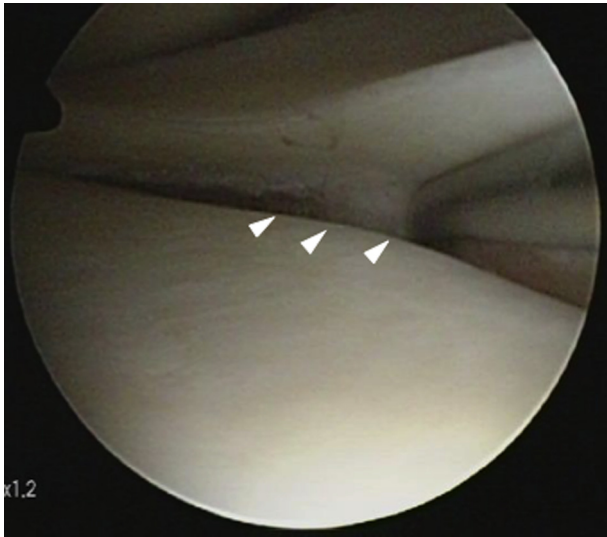
The primary purpose of rehabilitation is to obtain early ROM and normalized gait. Combined with other ligament injuries such as an ACL tear, a secondary surgery is planned to acquire a normal ROM. In general, patients wear a brace with weight-bearing as tolerated, which is locked in extension until quadriceps control is regained. ROM exercise is begun 1 week after surgery.

#### Discussion

This is a Technical Note showing arthroscopic MCL repair with suture anchor. Our surgical technique is



**Fig 2.** Preoperative MRI of right knee. MRI shows a deep MCL tear (white arrowhead) and superficial MCL tear (white arrow). (A) and (B) show T2 coronal image and (C) and (D) show T2 fs coronal image. (fs, fat suppressed; MCL, medial collateral ligament; MRI, magnetic resonance imaging.)



**Fig 3.** Arthroscopic view of the medial compartment in the right knee shows the drive-through sign (white arrowhead) with the patient in the supine position (camera via AL portal, probe via AM portal). (AL, anterolateral; AM, anteromedial.)

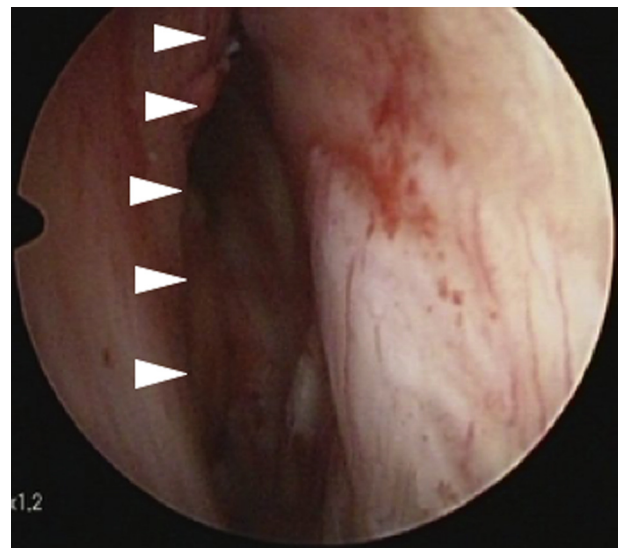
minimally invasive and allows patients to start functional rehabilitation (Table 2). This surgical technique preserves native MCL, and it can be expected that proprioception and biomechanical properties of native MCL are preserved.

Medial-side stabilizers of the knee consist of the superficial MCL, deep MCL (composed of the meniscotibial and meniscofemoral ligaments), and the posterior oblique ligament.<sup>3</sup> Black et al.<sup>6</sup> reported that rupture of these structures leads to medial meniscal destabilization and extrusion, making their stability of utmost importance during the rehabilitation phase of patient recovery.

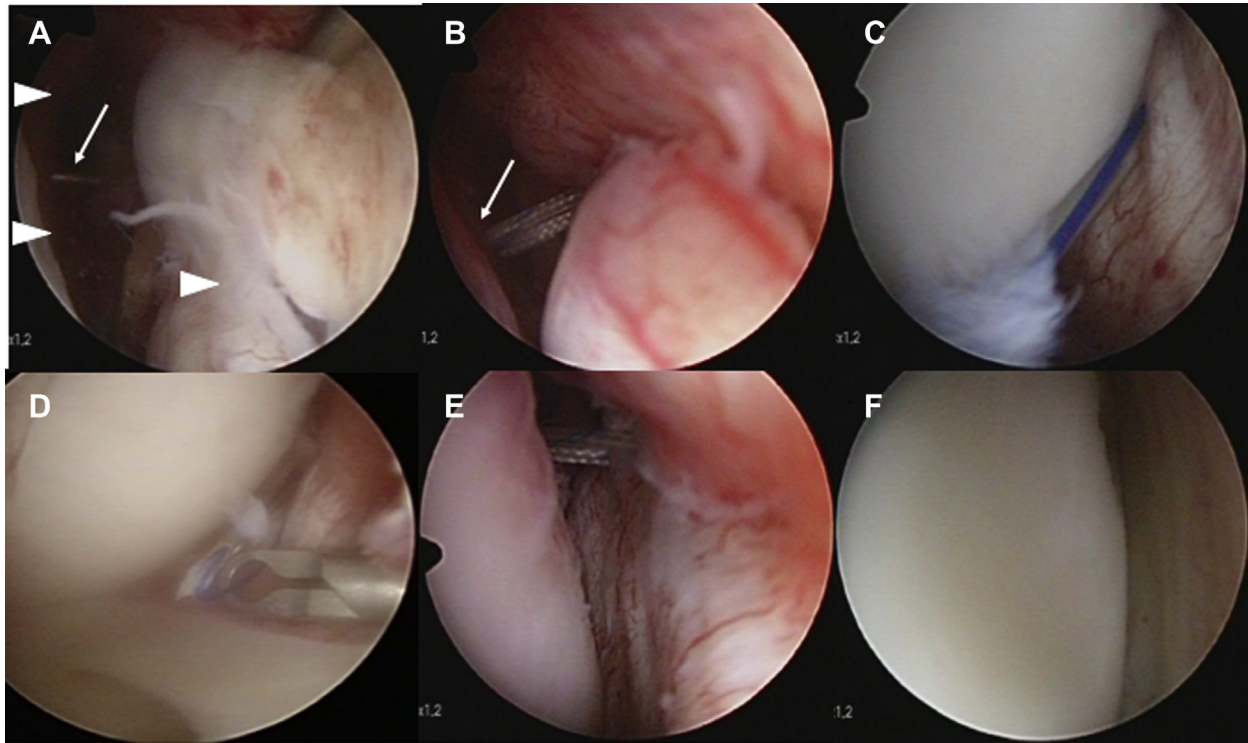
MCL tears are common injuries, and most of them can be treated conservatively and healed without instability, even in cases of grade III MCL injury. Reider et al.<sup>9</sup> reported positive outcomes of isolated MCL injuries in athletes with early functional rehabilitation. In addition, Halinen et al.<sup>10</sup> reported in their randomized controlled trial that nonoperative and operative treatments of MCL injuries lead to equally positive results in cases with early ACL reconstruction. These reports support the conservative treatment for grade III MCL injury; however, there are some cases that show residual instability after conservative treatment. Recent studies showed that the MCL was important in restoring anterior stability with ACL and MCL injury. Zhu et al.<sup>11</sup> reported that combined ACL and MCL reconstruction resulted in a better restoration of anterior stability compared with ACL reconstruction alone in a biomechanical study. Funchal et al.<sup>7</sup> reported that the “floating meniscus” sign was an indicator for surgical intervention in patients with combined ACL and

grade II MCL injury. They described that the isolated ACL reconstruction group had a greater rate of ACL reconstruction failure and residual MCL laxity in cases of ACL and MCL injury with the “floating meniscus” sign.<sup>7</sup> Thus, treatment of grade III MCL injury remains controversial.<sup>5</sup> In case of failed conservative treatment, operative treatment is indicated.<sup>12</sup> As primary MCL repair is usually performed within 7 to 10 days of injury, it is not recommended after failed conservative treatment and is best replaced with MCL reconstruction or augmentation repair,<sup>4</sup> which has recently been performed with the InternalBrace (Arthrex, Naples, FL).<sup>13-15</sup> Our surgical technique did not require graft harvesting and may not affect ACL reconstruction in cases of combined MCL and ACL injury. Thus, it may be a good intervention for combined MCL and ACL injury.

Although positive outcomes of surgical treatment for avulsion fracture of femoral attachment of MCL have been reported,<sup>16</sup> the report by Calcei et al.<sup>17</sup> demonstrated a case that required operative treatment for painful nonunion avulsion fracture of the femoral attachment of the MCL. Thus, we also think these fractures should be treated operatively immediate after injury. In addition, there are 2 special MCL injuries that we believe are best treated using primary MCL repair. The first is the MCL tibial-side avulsion injury, which is called a Stener-like lesion.<sup>18,19</sup> Taketomi et al.<sup>20</sup> reported the presence of a “wave sign” on MRI and recommended primary operative treatments. The “wave



**Fig 4.** Arthroscopic view of the capsular tear at the medial femoral epicondyle in the right knee with the patient in the supine position (camera via AL portal). White arrowheads show capsular and deep MCL tear. (AL, anterolateral; MCL, medial collateral ligament.)



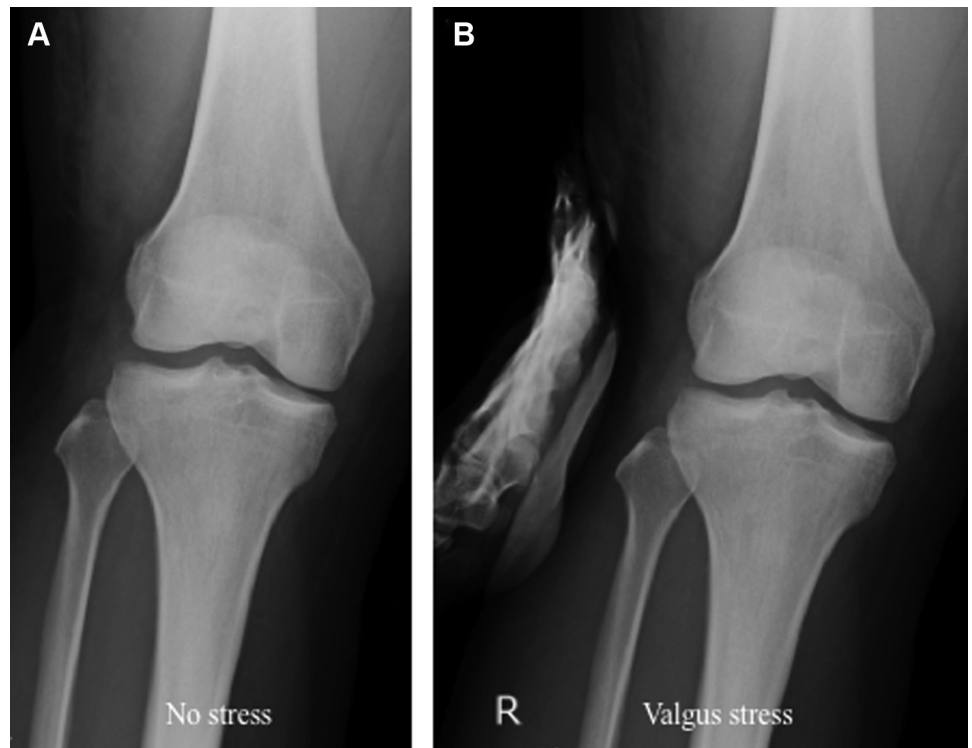
**Fig 5.** Arthroscopic MCL repair in the right knee with the patient in the supine position (camera via AL portal). (A) A 20-G needle penetrates at the medial femoral epicondyle and the medial portal is established at the medial femoral epicondyle. White arrow shows the 20-G needle and white arrowhead shows capsular tear. (B) A suture anchor is inserted at medial femoral epicondyle though the medial portal. White arrow shows the suture anchor. (C) A 20-G needle with PROLENE (ETHICON, Johnson & Johnson) penetrates the joint capsule and deep MCL. (D) Suture relay is performed though the far-anteromedial portal. (E) Knot tying is performed at 20° to 30° of flexion. (F) After knot tying, capsular and deep MCL tear is repaired. (AL, anterolateral; MCL, medial collateral ligament.)

sign" is a characteristic finding on MRI in the case of a distal superficial MCL tear.<sup>21</sup> The second is proximal deep medial collateral ligament injury, which Narvani

et al.<sup>22</sup> reported that no patients with injured deep MCL responded to conservative treatment and were, therefore, treated operatively. Nonetheless, all patients were



**Fig 6.** Arthroscopic view of the medial compartment in the right knee with the patient in the supine position (camera via AL portal). Arthroscopy shows the improvement of the drive-through sign after MCL repair. (AL, anterolateral; MCL, medial collateral ligament.)



**Fig 7.** Postoperative radiograph in the right knee at extension under anesthesia. (A) No stress radiograph. (B) Valgus stress radiograph. Valgus instability is improved after surgery.

able to return to their sports after surgery. In addition, deep MCL may affect the persistent symptoms following low-grade MCL injury. Jones et al.<sup>23</sup> reported that, in patients with persistent medial joint pain following grade I/II MCL sprain, pain from the deep MCL must be considered. Our surgical technique may be good indication for the deep MCL injury.

There are some disadvantages for this surgical technique (Table 2). First, an arthroscopic technique including knot tying is required. Second, indication of this surgical technique is only for a femoral-side MCL

injury. Third, this technique is not effective on an isolated superficial MCL tear because a suture anchor is inserted at the medial femoral epicondyle and deep MCL suturing is performed in this technique.

In conclusion, we have presented the surgical technique of arthroscopic primary MCL repair with suture anchor. With this technique, proximal MCL injuries (especially deep MCL injuries) can be repaired with minimal invasion. This technique provides valgus stability and enables early rehabilitation including restored ROM and performance with weight-bearing exercise.

**Table 1.** Pearls and Pitfalls of Arthroscopic Primary MCL Repair With Suture Anchor

Pearls	Pitfalls
To identify the MCL tear location and other concomitant injuries	Poor visualization
Immediate coagulation using a radiofrequency probe	Secure knot tying
To establish the medial portal in correct position	
Viewing from anterolateral portal and working through the anteromedial and far-anteromedial portal.	
Insert suture anchor at MCL footprint	

MCL, medial collateral ligament.

**Table 2.** Advantages and Disadvantages of Arthroscopic Primary MCL Repair With Suture Anchor

Advantages	Disadvantages
Minimally invasive technique	Arthroscopic technique is needed
The native MCL is preserved	Indication of this technique is only for the femoral side of MCL injury
Concomitant intra-articular pathology is addressed	This technique is not effective on superficial MCL tears
Early restored range of motion is possible	
There is a lower risk of residual laxity compared with conservative treatment	

MCL, medial collateral ligament.

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