

## Technical Note

## Arthroscopic Lateral Retinacular-Lengthening Procedure

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**Abstract:** Anterior knee pain is a common musculoskeletal complaint that is often due to an excessively tight lateral retinaculum, which normally plays a role in patellar tracking and stabilization. Several etiologies underlie lateral soft-tissue tightness in the knee, including lateral patellar compression syndrome, patellofemoral arthritis, patellofemoral instability, and patellofemoral pain syndrome. Stretching the lateral retinaculum through conservative treatment may be helpful, but lateral retinacular lengthening may be indicated. Since this surgical procedure has classically been performed in an open fashion, the purpose of this Technical Note is to describe an arthroscopic technique designed to limit complications, improve patient outcomes, and reduce operative and recovery times.

The lateral retinaculum is a fibrous expansion composed of various soft tissues, including the iliotibial band, vastus lateralis obliquus, lateral patellofemoral ligament, lateral patellomeniscal ligament, quadriceps aponeurosis, and lateral patellotibial ligament.<sup>1</sup> These lateral soft-tissue structures act collectively to stabilize the extensor mechanism of the knee and the patellofemoral joint. However, imbalances in this system can generate clinical symptoms. Laxity or disruption of the lateral retinaculum can lead to medial dislocation and instability, and excessive tightness of the lateral retinaculum can lead to lateral patellar facet overload, anterior knee pain, lateral patellofemoral osteoarthritis, and lateral patellar instability.<sup>1-3</sup> Lateral-sided surgical procedures, such as lateral retinacular release and lateral retinacular lengthening, can address patellofemoral pathologies.

Lateral retinacular release was first described by Merchant and Mercer in 1974 as a simple, low-risk procedure to address patellar pain and instability.<sup>4</sup> However, several complications have been reported in the literature since then, including medial instability, quadriceps weakness, quadriceps atrophy, pain, and lateral patellar instability.<sup>5-13</sup> A valid alternative to lateral retinacular release is lateral retinacular lengthening, which has several benefits and better outcomes reported in the literature.<sup>14</sup> It may avoid quadriceps atrophy, medial instability, synovial herniation, and joint swelling. It also allows for controlled elongation of the lateral retinaculum. Disadvantages and complications include overlengthening, incomplete release, and recurrence of lateral retinacular tightness.<sup>15</sup>

Lateral retinacular lengthening can be performed in isolation to help address lateral patellar compression syndrome, patellofemoral pain syndrome, and lateral patellofemoral arthritis.<sup>2,14,16-20</sup> However, it should not be done in isolation to treat lateral patellar instability because it will not address the insufficiency of medial patellar restraints. Instead, it should be added as an adjunct to medial patellofemoral ligament reconstruction if lateral retinaculum tightness is diagnosed.<sup>21-24</sup> The lateral retinaculum is considered overly tight if the patellar tilt is 20° or more on axial imaging with the knee in extension and/or if the patellar tilt test (Fig 1) is positive, meaning the lateral border of the patella cannot be passively corrected to 0° with the knee in full extension and the patella held in the center of the trochlea.<sup>15,25</sup>

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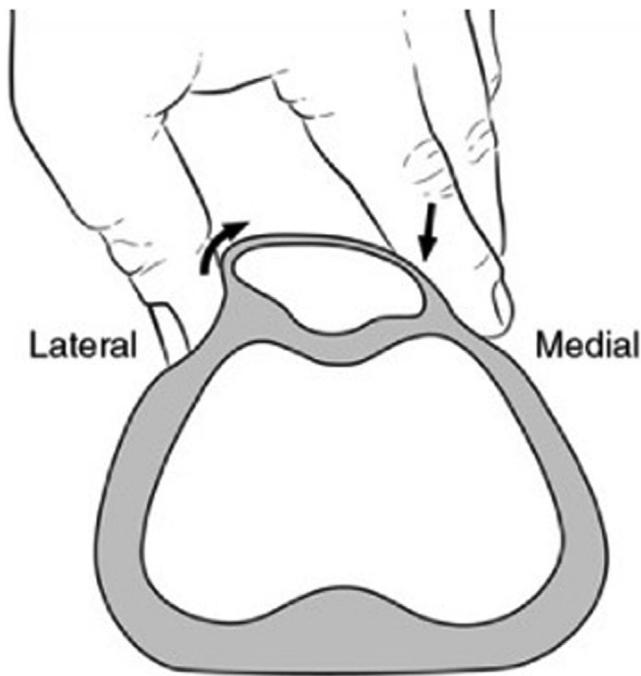
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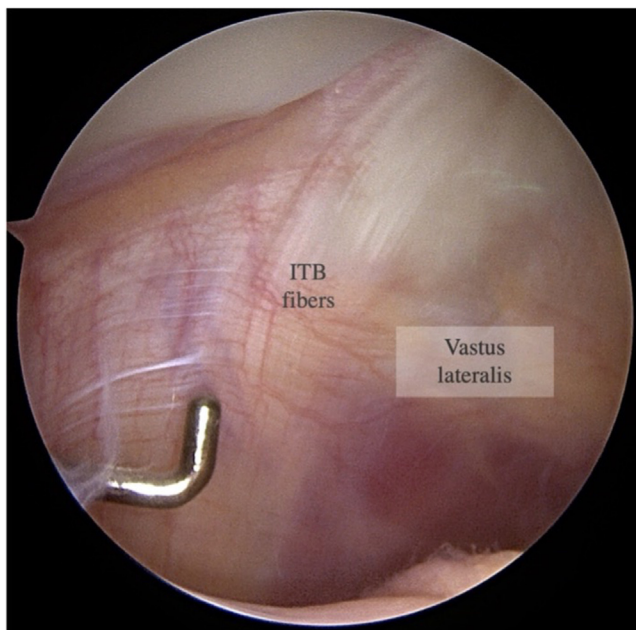
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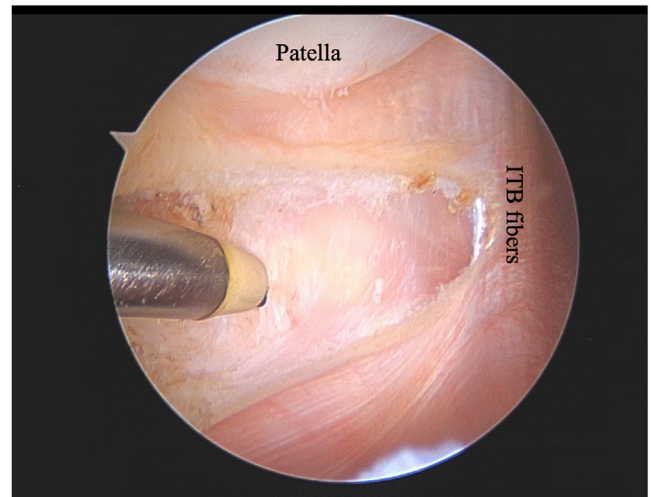
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**Fig 1.** The figure demonstrates a negative patellar tilt test of the left knee since the lateral patellar border was able to be pulled up to neutral compared to the medial border. A positive test, indicating that the lateral retinaculum may be overtightened, would be a lateral border of the patella that could not be pulled up to the neutral position.



**Fig 2.** The arthroscopic image through the anteromedial portal of the left knee in full extension shows the proximal border of the lateral retinaculum with fiber contributions from the ITB as well as the lateral retinacular fibers that will be lengthened with the described procedure. Care should be taken not to disrupt the proximal border fibers through the lengthening procedure. (ITB, iliotibial band.).



**Fig 3.** The arthroscopic image through the anteromedial portal of the left knee in full extension shows a single linear lengthening of the inner layer of the retinaculum with the ITB fibers left intact. Incised area expands with saline pump pressure. (ITB, iliotibial band.).

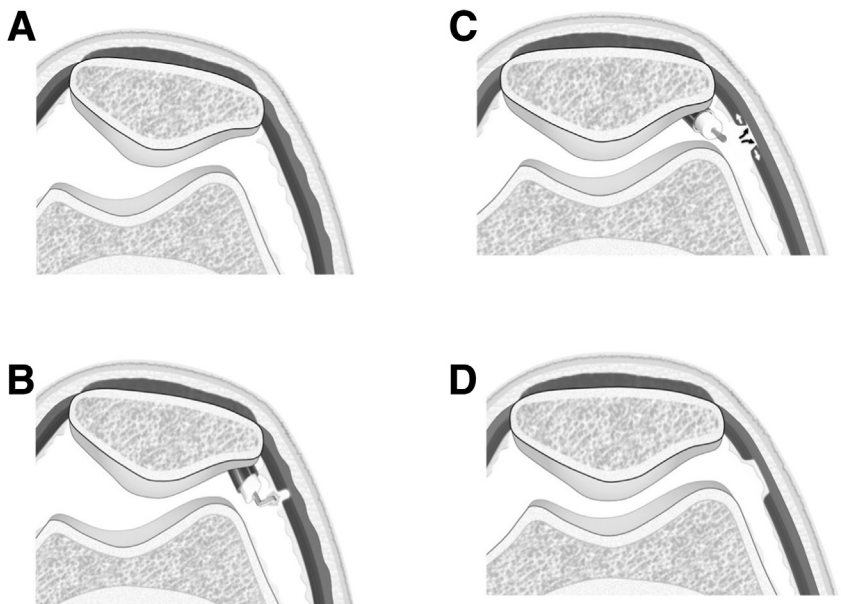
When lateral soft-tissue balancing is indicated in a patient, lateral retinacular lengthening has classically been performed in an open fashion. In open lateral retinacular lengthening, a 5- to 6-cm incision is made 1 cm lateral to the lateral aspect of the patella. The incision starts at the superolateral aspect of the patella and extends just proximal to the Gerdy tubercle. The depth of the incision extends only to the superficial oblique fibers of the lateral retinaculum, leaving the deep fibers undisturbed. The superficial oblique fibers and deep transverse fibers are carefully dissected. After about 1.5 to 2 cm of dissection has been completed, a second incision is made through the deep fibers of the retinaculum and superficial capsule. Finally, the medial free edge of the deep retinaculum is sutured to the lateral free edge of the superficial retinaculum, allowing for elongation of the lateral retinaculum.<sup>15,26</sup>

The purpose of this Technical Note is to describe an arthroscopic method for lateral retinacular lengthening. Advantages, in comparison with the open technique, include avoidance of an arthrotomy, less soft-tissue dissection, better visualization of intra-articular structures, and the ability to directly visualize patellar tilt and amount of correction.

### Surgical Technique (With Video Illustration)

The procedure is performed with the patient in the supine position with the use of general anesthesia. The patient is positioned on the operating room table and a tourniquet can be placed in the operative leg proximally; however, it is not recommended to inflate the tourniquet during the procedure. A standard diagnostic knee arthroscopy is performed using anterolateral and

**Fig 4.** Arthroscopic lateral retinacular-lengthening procedure. (A) Pre-lengthened state showing patellar tilt of the right knee due to tightened inner capsular layer of retinaculum. (B) Small incision is made in inner capsular layer using a radiofrequency probe but outer layer is kept intact. (C) Arthroscopic fluid pressure distends the incised inner layer effectively lengthening the retinaculum and neutralizing the patellar tilt. (D) Lengthened inner layer heals to outer layer in lengthened position.



anteromedial portals. Identification of concomitant pathology and any additional surgical procedures are initially performed.

The arthroscope is moved to the anteromedial portal to allow for optimal viewing of the lateral retinaculum, as seen in [Video 1](#). This affords ease of access to the lateral retinaculum with instrumentation through the anterolateral portal. With the knee in full extension, an electrocautery device (CoVac 70 Coblation Wand; Smith & Nephew, Andover, MA) is introduced via the anterolateral portal. The proximal border of the lateral retinaculum, characterized by a whitish thickening of the fibers due to fiber contribution from the iliotibial band, needs to be identified ([Fig 2](#)). Care should be taken not to disrupt all of the iliotibial band fibers with the lengthening procedure, as lateral patellofemoral forces can then be transmitted to the distal vastus lateralis muscle/tendon and cause pain. Starting distal to the proximal border of the iliotibial band lateral retinacular fibers, electrocautery is used to dissect the intra-articular layer of lateral retinaculum (lateral patellofemoral ligament-capsule) from proximal to distal ([Fig 3](#)). Care must be taken to avoid dissection of the outer layer of lateral retinaculum, leaving the superficial fibers intact ([Fig 4](#)). Since the artery cannot be identified before performing this technique, care should also be taken to make the retinacular cut a significant distance from the border of the patella to reduce the potential of any decrease in vascularity to the patella. If any bleeding is encountered during the cut, cauterize it immediately. As a reminder, it is recommended to not use a tourniquet at any time during the procedure. Release should continue distally until

the anterior lateral portal is reached ([Table 1](#)). The arthroscopic fluid pressure (45 mmH<sub>2</sub>O recommended) will widen the released inner portion of the retinaculum, thereby effectively lengthening the interval between the femur and patella. At this point, the patellar tilt test is reperformed ([Fig 1](#)), and if neutral, no further releases are performed. Additional, partial-thickness (pie-crusting) dissection through the outer layer can be considered only if more lengthening is desired. Care must be taken not to make a full-thickness release of the outer layer. After the procedure is complete, the saline should be drained from the knee and the portal sites closed with the surgeon's suture of choice.

## Discussion

The benefit of lateral retinacular lengthening compared with lateral retinacular release has already been established in the literature.<sup>14,15</sup> Lateral retinacular lengthening has classically been performed in an open fashion. Arthroscopic lateral retinacular lengthening is designed to build upon the benefits of the open technique by reducing operative and recovery times, limiting complications by avoiding an arthrotomy and limiting soft-tissue dissection, and improving patient outcomes by directly visualizing patellar tilt and amount of correction ([Table 2](#)). Moving forward, the clinical community would benefit from studies comparing outcomes between open and arthroscopic techniques.

In terms of postoperative rehabilitation, there is no need to limit range of motion, since the outer layer of the lateral retinaculum is intact. This is a major benefit,

**Table 1.** Pearls and Pitfalls of the Arthroscopic Lateral Retinacular-Lengthening Technique

| Pearls                                                                                     | Pitfalls                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place scope in the medial portal and work from the lateral portal.                         | Overthinning the retinaculum may lead to rupture of the retinaculum during return to sports, therefore making the procedure a lateral release.                                                                                    |
| Keep some intact retinaculum proximally (contribution of fibers from the iliotibial band). | Unrecognized bleeding during the procedure may lead to hemarthrosis.                                                                                                                                                              |
| Continue release until the lateral portal is reached distally.                             | This procedure may be performed with patellar instability, but care should be taken to not release the outer portion of the retinaculum and a MPFL reconstruction +/- tibial tubercle osteotomy should be performed concurrently. |
| Perform release using a pulling motion instead of pushing the RF wand.                     |                                                                                                                                                                                                                                   |
| Do not release both layers of the retinaculum.                                             |                                                                                                                                                                                                                                   |
| Do not use a tourniquet.                                                                   |                                                                                                                                                                                                                                   |
| Cauterize all bleeding.                                                                    |                                                                                                                                                                                                                                   |

MPFL, medial patellofemoral ligament; RF, radiofrequency.

since patients who undergo open lateral retinacular lengthening are often instructed to slowly increase range of motion over a period of 5 to 6 weeks. Regardless, patients will benefit from typical post-arthroscopy weight-bearing protocol, which may include 3 to 4 days of partial weight-bearing. Patellar mobilization in all planes can be started in postoperative week 1. The strengthening should emphasize techniques to minimize lateral patellar tracking including strengthening of the hip external rotators, abductors, and core.

**Table 2.** Advantages and Disadvantages of the Arthroscopic Lateral Retinacular-Lengthening Technique

| Advantages                                                                                                                                                                    | Disadvantages                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Technically simple.                                                                                                                                                           | Limited capacity for lengthening compared with open technique. |
| Arthroscopic approach instead of open.                                                                                                                                        |                                                                |
| May be considered with patellar instability cases, such as medial patellofemoral ligament reconstruction and tibial tubercle osteotomy since the outer retinaculum is intact. |                                                                |

## Disclosure

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