

## Technical Note

# Lateral Patellofemoral Ligament Reconstruction

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**Abstract:** Medial dislocation of the patella is a disabling condition; there are several reports in the literature describing this condition and its association with failed lateral retinacular release. The diagnosis and treatment of medial subluxation of the patella may be difficult. Direct repair or imbrication of the lateral retinaculum provides initial stability but a noticeable increase in medial excursion usually reappears. In this article, we describe a simple and reproducible technique to reconstruct the lateral patellofemoral ligament with autogenous tissue that is based on the basic principles of all ligament reconstruction. Reconstruction of the lateral patellofemoral ligament is useful in eliminating the symptoms related to medial instability of the patella after failed lateral retinacular release; however, it must be considered a salvage procedure because it does not address the pathomechanics that led to the initial patellofemoral symptoms. **Key Words:** Lateral release—Lateral patellofemoral ligament—Patella—Dislocation.

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Medial dislocation or subluxation of the patella is a serious complication that can occur after an isolated arthroscopic lateral release, after an isolated open lateral release, or after lateral release in combination with tibial tubercle transfer or medial soft-tissue imbrications. Several reports are found in the literature describing this disabling condition as well as its association with lateral retinacular release.<sup>1-8</sup>

Kinematic magnetic resonance,<sup>9</sup> ultrafast computed tomography,<sup>10</sup> dynamic arthroscopic assessment,<sup>11</sup> computed tomography scan,<sup>12</sup> and magnetic resonance imaging<sup>8,13</sup> have been used to show medial subluxation and dislocation. Stress radiography, with the technique described by the senior author (R.A.T.),<sup>14</sup> has proven to be a useful diagnostic tool to document and quantify objectively medial patellar subluxation or dislocation (Fig 1).

Techniques to repair the lateral retinaculum can be found in the literature,<sup>7,13</sup> as well as descriptions of reconstruction with local soft-tissue augmentation (fascia lata, patellar tendon).<sup>3,15</sup> In our experience with lateral retinacular repair and imbrication, a noticeable increase in medial excursion usually would reappear after the first postoperative year. This led us to develop a technique for lateral patellofemoral ligament reconstruction following the principles of all ligament reconstruction:

1. Selection of a sufficiently strong and stiff graft
2. Isometric graft placement
3. Adequate fixation
4. Correct tension
5. No condylar rubbing or impingement

## GRAFT SELECTION AND HARVESTING

The quadriceps tendon provides a reliable graft but bone–patellar tendon–bone and Achilles allograft can also be used. With the knee in extension, a 6- to 8-cm skin incision is made midway between the lateral epicondyle and the lateral edge of the patella. A 4- to 5-mm × 1-cm partial-thickness quadriceps tendon is obtained. The posterior quadriceps tendon is left intact

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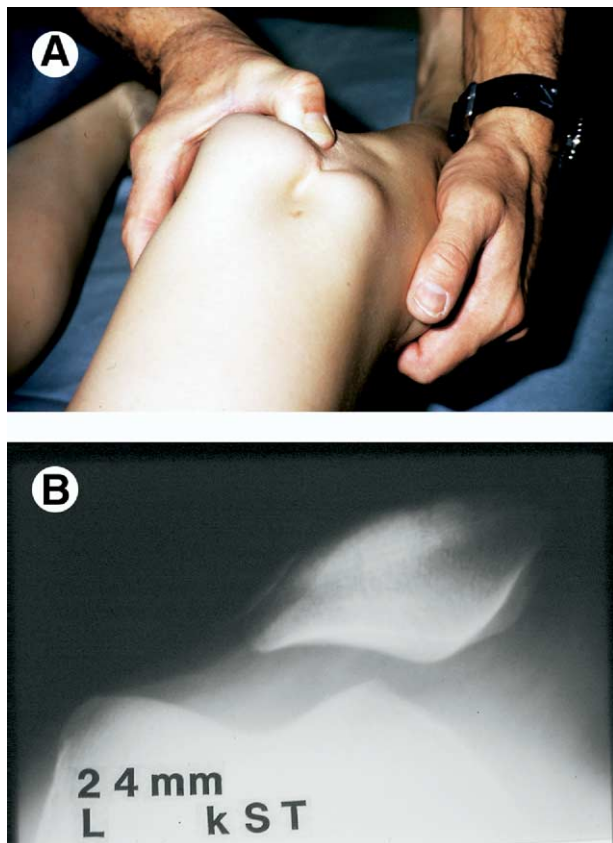
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**FIGURE 1.** (A) Medial subluxation of the right patella. Note the prominence of the lateral femoral condyle and the soft-tissue defect as a consequence of aggressive lateral release. (B) Medial stress radiograph shows medial subluxation with 24 mm of medial displacement.

to avoid scar in the synovial pouch. A  $1\text{-cm}^2 \times 5\text{-mm}$  thick bone is removed from the superior central one third of the patella with a small oscillating saw. The graft is harvested from the quadriceps tendon, as far proximal as feasible, and generally 8 to 10 cm can be obtained before the muscle fibers of the vastus lateralis and vastus medialis converge (Fig 2). If a much smaller graft is obtained, it is difficult to use without destroying too many fibers to retain adequate strength. The graft is prepared by drilling a 2.5-mm hole through the bone block and then running a No. 2 Vicryl (Ethicon, Somerville, NJ) suture from the free tendon end toward the bone block and back using the Krackow technique.<sup>16</sup>

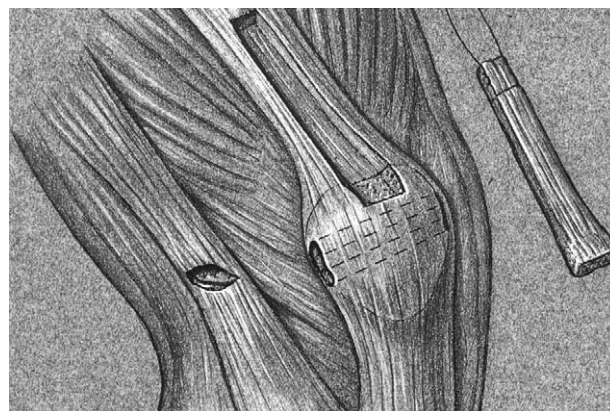
### ISOMETRIC LOCATION

The graft must be located isometrically to avoid overstretching it to failure during joint motion or to

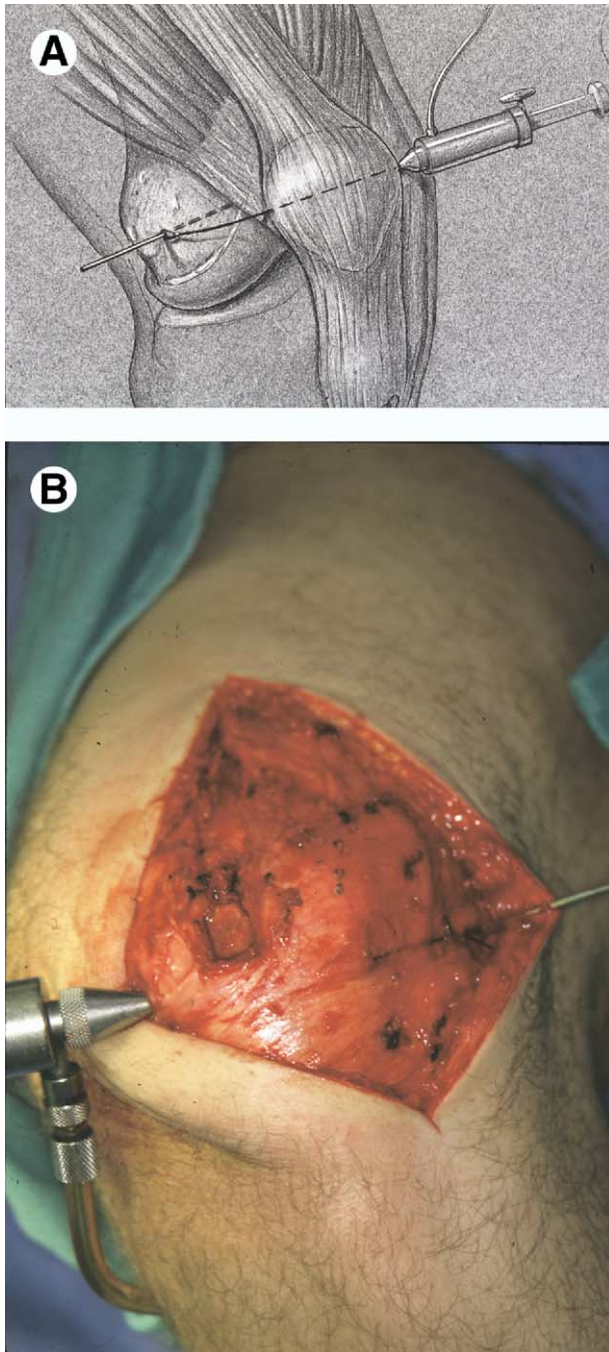
avoid overconstraining patellar motion. The epicondyle locates the center of rotation of the knee and the origin of the lateral patellofemoral ligament. A transverse 2.5-mm hole is placed through the patella fairly far anteriorly and at about the mid one third height. A strand of No. 2 Vicryl is passed through this hole and a small loop tied on the lateral aspect. A 2.5-mm K-wire is placed through this loop and into the bone of the lateral femoral condyle at about the position of the lateral epicondyle. Next, the Synthes pneumatic Isometer (Synthes, Paoli, PA) is inserted into the hole in the medial patella and the No. 2 Vicryl isometric measurement suture passed into it (Fig 3). This Isometer has been shown by Friederich and O'Brien<sup>17</sup> to be far more accurate an instrument than any other of the commercially available isometers. The knee is then placed through a full range of motion while the change in length of the lateral suture is read in the Isometer (Fig 4). The tension is set at 3 to 4 lb and adjustments in the position of the K-wire in the lateral condyle are made until no excursion is read in the isometer during the full range of motion.

### SECURE FIXATION

Once the Isometer location is found, the graft must be fixed to the femur and to the patella. The bone block is countersunk into the femur and fixed with a 4.0-mm fully threaded lag screw. To create an accurate countersunk hole for the bone block in the femur, the bone block that has the 2.5-mm diameter hole in it is slid over the K-wire, which locates the isometric site on the femur. Then the bone block lays against the femur like a template while a thin chisel outlines the bone block and penetrates the cortex of the lateral



**FIGURE 2.** Quadriceps tendon bone graft.



**FIGURE 3.** (A) Use of isometer to identify the isometric location of the graft. (B) K-wire in the lateral epicondyle, Isometer in the medial opening of the transverse patellar tunnel.

femoral condyle. Because the femoral bone is often osteoporotic from disuse, cancellous bone is impacted instead of removed to create the recess for the patellar bone block. It is then fixed with a 4.0-mm lag screw.

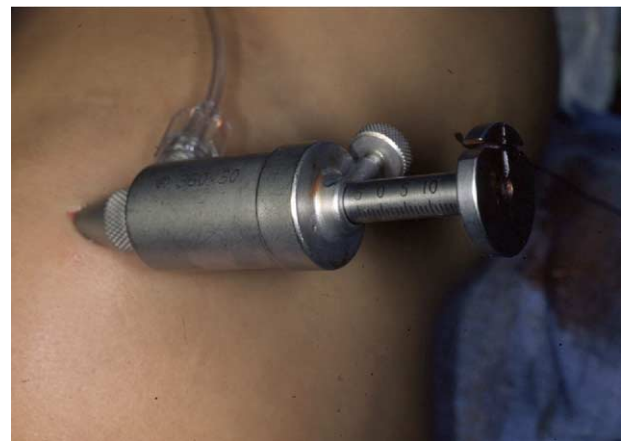
If the block is adequately tough, it should be predrilled with a 3.5- or 4-mm drill to obtain compression. If the block cracks, it can be secured with a small spiked ligament washer. This screw often needs to be removed after healing is complete.

Tendon through bone tunnel provides the greatest stable fixation and an adequate bone tunnel can be placed transversely through the patella with 2 parallel 4.5- to 6-mm drills, avoiding the anterior tension trabeculae in the patella and avoiding the articular surface.

Fixation of the quadriceps tendon to the patella is easily accomplished by pulling the tendon graft into the oval transverse tunnel in the patella, out the medial side, and turning it superficially onto the anterior surface of the patella, where it is sutured to the quadriceps expansion (Fig 5). The length of the tendon in the bone tunnel is sufficient to create a very solid fixation. The bone tunnel should not cut the anterior tension trabeculae of the patella because it may cause the patella to fracture. This is a particular risk when a quadriceps tendon–patellar bone autograft is used.

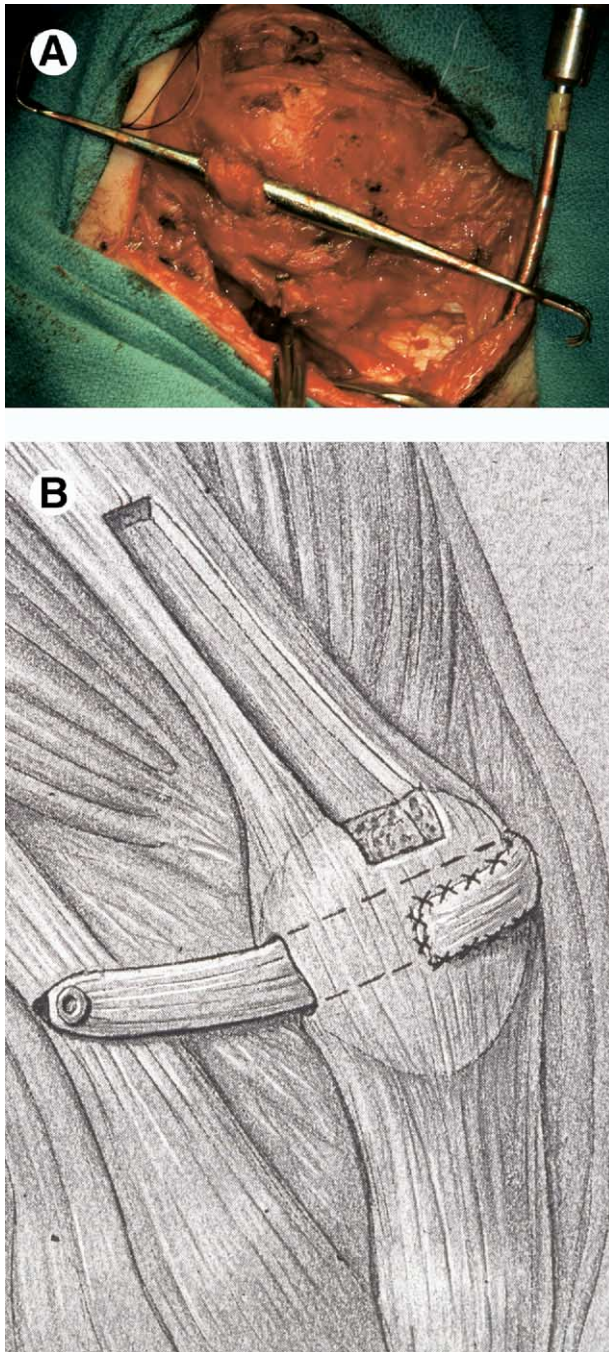
### CORRECT TENSION

The tension set in the graft must be enough to limit medial excursion to an amount that approximates that of the normal contralateral knee. We set the tension with the knee flexed 60° to 90° to avoid the risk of pulling too far lateral. Do not set the tension with the patella outside the trochlea. Realize that the ligament is not a dynamic structure that pulls the patella laterally, but rather a static restraint that holds the patella against moving too far medially.



**FIGURE 4.** Synthes Isometer: The change in length of the suture is read during the range of motion.





**FIGURE 5.** (A) The graft was passed through the bone tunnel and the bone block countersunk in the lateral condyle. (B) The graft was pulled out from the medial side and sutured onto the anterior surface of the patella.

### AVOIDING IMPINGEMENT

When the correct location is found, the patellar bone block is countersunk into the femur to avoid a

prominence producing an iliotibial band friction syndrome. The range of motion must be tested to ensure there is no restriction of patellar or knee motion. The graft should not be rubbing against the lateral femoral condyle. If impingement on the wall of the lateral femoral condyle is detected, the graft can be placed on the anterior surface of the patella and pulled into the medial tunnel in a lateral direction.

### POSTOPERATIVE MANAGEMENT

Postoperative treatment is to allow full range of motion, full weight bearing, continuous passive motion, active exercises (but avoiding stairs), squatting, and resistive leg extension until the patellar bone donor site has adequate time to heal.

### DISCUSSION

This procedure has been performed in our institution since 1982 in 60 patients. The results have been excellent when assessed from stability standpoint and none of the knees has lost the stability obtained at surgery. Three patients have sustained a patellar fracture, which occurred with a fall in the early postoperative phase; two of them have required open reduction and internal fixation. This is a salvage procedure for repair of medial iatrogenic instability. It does not address the original source of complaint. It clearly cannot improve or reverse osteoarthritis, chondromalacia, bony malalignment, or lateral instability caused by a medial patellofemoral ligament injury. Paradoxically, there are cases in which the lateral excursion is decreased by this graft, presumably because the direction of tension in the graft is medial when the patella is subluxated laterally.

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