The medial patellofemoral ligament has been recognized as the structure primarily responsible for preventing patellar subluxation or dislocation. Anatomic dissection studies identified the medial patellofemoral ligament as a band of tissue connecting the femoral medial epicondyle to the proximal part of the medial edge of the patella (Figure 1).

Imaging studies and surgical exploration reports have shown that medial patellofemoral ligament injury is associated with patellar dislocation. These studies concluded that insufficiency of the medial patellofemoral ligament is the major factor in recurrent patellar dislocation. However, few reports are found in the literature describing details of reconstruction of the medial patellofemoral ligament to treat recurrent patellar dislocation.

This article presents a simple and reproducible technique for reconstruction of the medial patellofemoral ligament using autogenous tissue following the basic principles of all ligament reconstruction:

- Selection of a sufficiently strong and stiff graft,
- Isometric graft placement,
- Correct tension,
- Adequate fixation, and
- No condylar rubbing or impingement.

**MATERIALS AND METHODS**

Reconstruction of the medial patellofemoral ligament has been performed in our institution since 1982 in 172 patients. Adductor longus tendon was used in 107 cases whereas quadriceps tendon was used in 65 cases. Quadriceps tendon graft is preferred for cases with trochlear dysplasia based on the concept that a stronger structure is needed to compensate for inadequate support provided by a flat trochlea.

**Surgical Technique**

Graft Selection and Harvesting. With the knee in extension a 4- to 6-cm skin
incision is performed midway between the medial epicondyle and medial edge of the patella. Dissection is carried through the subcutaneous fat and fascia over the vastus medialis is opened. The vastus medialis is elevated off the intermuscular septum, which is then split longitudinally to expose the adductor tendon (Figure 2). A tendon stripper is used to strip the adductor longus tendon and a whipstitch (approximately 10 cm long) is placed in the free end. The diameter is then measured by passing it through a sizer, most conveniently a 3.5 or 4.5 drill sleeve.

**Alternative Technique with Quadriceps Tendon.** A 1 cm$^2 \times 5$ mm thick bone is removed from the superior central one third of the patella with a small oscillating saw. The posterior quadriceps tendon is left intact to avoid scarring in the synovial suprapatellar pouch. The graft is harvested from the quadriceps tendon, as far proximal as feasible, and generally 8-10 cm can be obtained before the muscle fibers of the vastus lateralis and vastus medialis converge.

**Isometric Location.** The graft must be located isometrically to avoid overstretching it to failure during joint motion or over constraining patellar motion. A transverse 2.5-mm hole is placed through the patella far anteriorly at about the junction of the proximal and mid one-third height. A 1.5-cm incision is made on the lateral side of the patella and a strand of #2 Vicryl is passed through the hole with a small loop tied on the medial aspect to pass over a 2.5-mm Kirschner wire, which is
inserted into bone near the medial epicondyle. A pneumatic Isometer (Synthes, Paoli, Pa) is inserted into the hole in the lateral patella and the #2 Vicryl isometric measurement suture is passed through (Figure 3). The knee is placed through a full range of motion while the change in length between the medial epicondylar K-wire and the medial border of the patella is read on the isometer. The string tension is set at 3 lb. Adjustments in the position of the K-wire around the medial epicondyle are made until no excursion is read on the isometer during the full range of knee motion. Once the isometric point is located, a tunnel is drilled from the insertion of the adductor tendon to the isometric measurement point and the graft is pulled through this tunnel. A second tunnel the diameter of the graft is drilled through the patella at the site of the 2.5-mm hole used to measure isometry. The graft is passed deep to the vastus medialis and then pulled into the patellar tunnel (Figure 4).

Correct Tension. The ligament is not a dynamic structure that pulls the patella medially, but rather a static restraint that prevents it from moving too far laterally. The tension set in the graft must be enough to limit lateral excursion to an amount that approximates that of the normal contralateral knee. Tension was set with the knee flexed 60°-90° to hold the patella centered in the trochlea and to avoid risk of pulling it too far medial. Tension should not be set with the knee in extension and the patella outside the trochlea, as no reference exists to determine where it is centered.

Secure Fixation. Tendon through bone tunnel provides the greatest stable fixation, and an adequate bone tunnel can be placed transversely through the patella with 3.5-, 4.5-, or 6-mm drills depending on the diameter of the graft. After passing the graft from medial to lateral it is turned superficially onto the anterior surface of the patella where it is sutured to the medial retinaculum where it exits, and the quadriceps expansion. If the graft is long enough, extra sutures can be placed from its free end to the medial tendon before it enters the patellar tunnel (Figure 5).

When quadriceps tendon is used, the bone block is countersunk into the femur and fixed with a 4.0-mm fully threaded cancellous lag screw.

Avoid Impingement. The range of motion must be tested to ensure unrestricted patellar or knee motion. The graft should not rub against the medial femoral condyle. If impingement on the medial femoral condyle wall is detected, the graft can be placed on the anterior surface of the patella and pulled into the lateral tunnel in a medial direction.

Postoperative Management
Postoperative treatment includes full range of motion, full weight bearing, continuous passive motion, and active exercises, with avoidance of stairs, squatting, and resistive leg extension until the tendon has healed into the tunnel. A knee brace in extension is used for ambulation during the first 3-6 weeks to protect against falling due to quadriceps inhibition. Patellar fracture at the patellar instability.2 Chondroplasty or tibial or femoral osteotomy also does not address the ligament. These operations are common components of patellar “realignment” or “stabilization” surgery, but fail to address the primary pathology.

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DISCUSSION
To move the tibial tubercle distally, medially, or anteriorly does not usually result in increasing the tension-restraining capacity of the medial patellofemoral ligament. Likewise, operations that involve advancing the medial musculature will not affect the medial patellofemoral ligament unless the ligament is inadvertently advanced at the same time as the tendon is moved, shortened, or redirected. A release of the lateral capsule, lateral patellofemoral ligament, or quadriceps tendon does not shorten or strengthen the medial patellofemoral ligament.

The lateral retinaculum has been shown to provide a secondary restraint against lateral subluxation or dislocation. Patients with patellar instability often have underlying limb malalignment or morphologic abnormalities, such as limb torsional or trochlear deformities. No consensus exists regarding when to treat underlying bony abnormalities (eg, excessive femoral antversion, tibial torsion, trochlear dysplasia, or excessively lateral tibial tubercle).

We recommend the isolated reconstruction of the medial patellofemoral ligament as
the procedure of choice to treat patellar lateral instability for three different clinical pictures: 1) when no underlying alignment or morphologic abnormality is identified; 2) when many underlying subtle alignment or morphologic abnormalities are identified (ie, increased femoral anteverision, patella alta, trochlear dysplasia, and genu valgum), but it is not possible to detect which of these deformities contribute the most to the instability; and 3) when one underlying alignment or morphologic abnormality is identified (ie, increased femoral anteverision or trochlear dysplasia), but the magnitude and the risks of the procedure to correct that deformity outweigh its potential benefits.

Reconstruction of the medial patellofemoral ligament is a reliable and reproducible procedure with predictable outcomes...

References
