A Novel Technique for Medial Patellofemoral Ligament Reconstruction Using Vertical Patellar Tunnels and Use of a Single Implant. Technical Note

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Patellar instability is a common pathology with an estimated incidence in the general population of 5.8 cases per 100,000, increasing to 29 cases per 100,000 in younger groups (10 to 17 y). This condition presents a rate of recurrence after the first dislocation episode of 15% to 44% and over 50% after the second episode. It also presents a high persistence of mechanical symptoms after the first episode of dislocation, where 50% of patients not resuming their previous physical activity are described and up to 70% suffer some degree of functional limitation.[1]

This pathology has a multifactorial etiology, with anatomic and biomechanical aspects involved, within which a patellar malalignment, genu valgus, patella alta, and increased patellar tilt can be found, in addition to predictors of redislocation such as the presence of trochlear dysplasia. The medial patellofemoral ligament (MPFL) is deemed as 1 of the main stabilizing structures of the patella, mainly in the first 30 degrees of flexion, which is frequently injured in cases of patellar instability, up to 94% in some series.[2]

Reconstruction of the MPFL can be performed alone or in combination with a tibial tubercle osteotomy, usually carried out with a tibial tuberosity-trochlear groove measurement >20 mm. Our group generally performs an isolated reconstruction of the MPFL, reserving the distal realignment only for those cases with clinical lateral patellar chondrosis, as recommended by Elizabeth Arendt.[3]

Regarding MPFL reconstruction, we present a technique that to the best of our knowledge, has not been published, with which we have had good preliminary clinical results with a low rate of redislocation (3 cases in 86 operated knees) and improvement in Kujala scores (37 to 79 in our series).

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The authors declare that they have nothing to disclose.

For reprint requests, or additional information and guidance on the techniques described in the article, please contact Diego Edwards, MD, at edwardsdiego@gmail.com or by mail at Knee surgery division, Hospital La Florida, Froilán Road 6542, La Florida 7690888, Santiago, Chile. You may inquire whether the author(s) will agree to phone conferences and/or visits regarding these techniques.

ANATOMY

The anatomy of the medial side of the knee was described by Warren and Marshall in 1979, who established 3 layers or levels of dissection, layer 1 corresponding to the superficial medial retinaculum, layer 2 being an intermediate layer where the MPFL is located, and layer 3, which includes the medial patellomeniscal ligament.

The origin of MPFL has been classically described between the medial femoral epicondyle and the adductor tubercle. There is also a radiologic reference of the femoral insertion point, described by Schottle et al[4] and supported in multiple studies.

The MPFL consists of 2 bands, 1 inferior (straight) and the other superior (oblique), which run anterior and medial, with an average length of 56 mm.

In its biomechanical aspect, the MPFL plays an important stabilizing role on the patella, especially in the first 20 to 30 degrees of flexion with up to 60% of the force, being the main static stabilizing agent of the patella.

Surgical Technique

The patient is positioned supine on the operative table, the knee is positioned in flexion of 70 degrees, and stabilized with a proximal lateral support at the level of the greater trochanter and a second distal support at the level of the foot. A tourniquet is installed.

A complete examination of the knee is performed under anesthesia, evaluating the joint range and degree of instability. The surgeon then performs a diagnostic arthroscopy evaluating the condition of the femoropatellar cartilage and searching for loose bodies, which must be removed or repaired according to each case.

The surgery consists of a triple approach, being 1 for harvesting the graft, a second for performing the patellar bone bridges, and the last located on the femoral insertion of the ligament. The details are further described:

- Harvesting of the graft: an incision should be made on the pes anserina at its tibial insertion, then identify and harvest the tendon of the gracilis alone, this should be harvested at least 16 cm long, due to the distance between the patella and the femur described above. Should the right length be unable to be achieved, a harvest of the semitendinosus might be performed instead.
- Patellar approach: the medial edge of the patella should be identified and a 3 to 4 cm vertical incision is made; then bursal and retinacular layers 1 and 2 should be dissected, exposing the patellar subperiosteum. Then, 2 vertical confluent tunnels are made on the patellar anteromedial face (in an anteroposterior direction), at 45 degrees using a 4.5 mm drill bit (Mitek Johnson and Johnson) belonging to anterior cruciate ligament reconstruction instrumentation,

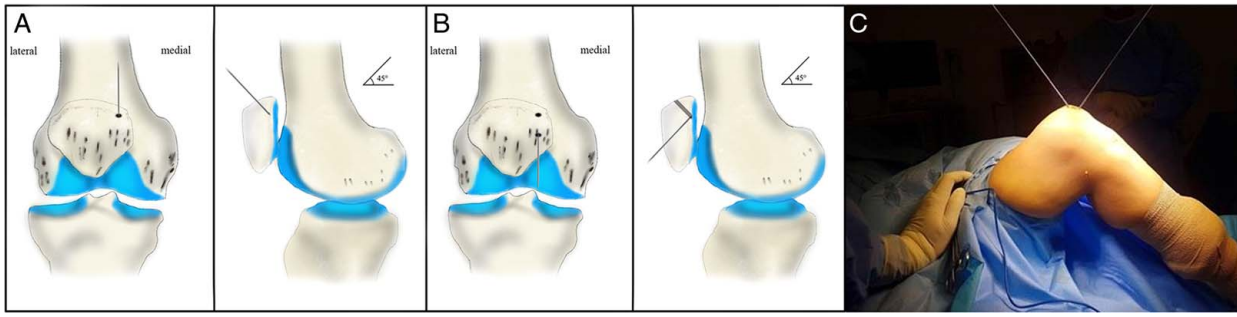

FIGURE 1. A and B, Creating an anteromedial vertical tunnel in 45 degrees. C, Intraoperative view.

after the passage of the guide wire. The first tunnel is positioned in the anterior-superomedial patellar portion and the second confluent tunnel is made at the junction of the upper and middle third of the patella, always on the anteromedial face (Figs. 1A–C). Subsequently, the communication of the tunnels in a "V" shape is confirmed to insert and give way to the previously harvested and prepared graft (Figs. 2A–C).

- Femoral approach: a femoral approach is performed on the epicondyle. Under fluoroscopy, the femoral insertion point of the MPFL is identified between the femoral epicondyle and the adductor tubercle, corresponding to the insertion site described by Schoettle and colleagues. A guide wire is passed in a superolateral direction and then reamed to the opposite cortical according to the diameter of the graft, using the anterior cruciate ligament instrumentation.

Then a dissection from the patellar incision to the femoral point described above is made, with the goal of creating a retinacular tunnel between layers 2 and 3, to achieve the passage of the graft from the patella to the femur (Fig. 3).

The passage of the graft through the femoral socket is performed, fixing the reconstruction with an interference Peek screw Miracle Advance (Mitek Johnson and Johnson), with a diameter 1 number greater to that of the graft and 23 mm long (Fig. 4). The fixation of the graft is recommended to be performed with the knee in 30 degrees of flexion, without over constraining the medial compartment. Proper patellar tracking should be evaluated.

Finally, the incisions are sutured, in addition to covering the wounds with sterile dressings. The use of splints or orthoses is not recommended.

Expected Outcomes

The results expected with the technique described above are to achieve adequate stability of the patella along with proper tracking, avoiding a hyperpressure on the medial compartment; for that it is essential to perform the fixation in low degrees of flexion, keeping the patella in a good position on the trochlear groove but avoiding a medial overtension at the time of fixation. Through this gesture, the patient should not have subluxation of the patella nor pain in the medial facet.

Complications

The potential complications of this technique are the same as expected with other techniques of stabilizing the patella (infection, loosening of osteosynthesis, and redislocation), adding as a possible complication the possibility of having a burst of the medial and/or anterior wall of the patella at the time of completion of the bone bridge; if this occurs, it can be resolved in several ways, being the 1 suggested by our team to fix the graft by means of 2 anchors placed in the medial wall remnant of the patella.

DISCUSSION

Numerous techniques have been described for the reconstruction of MPFL which have had multiple modifications over time. We present a technique that uses only 1 device, which could offer a lower risk of osteosynthesis complication and with which we have achieved satisfactory results and a low rate of complications.

By means of the patellar bone bridge and graft passage through it, it is not necessary to use anchors or another method to achieve a patellar fixation, reducing the costs that these devices have. In addition, the use of confluent tunnels on the patellar anterior face could reduce the risk of

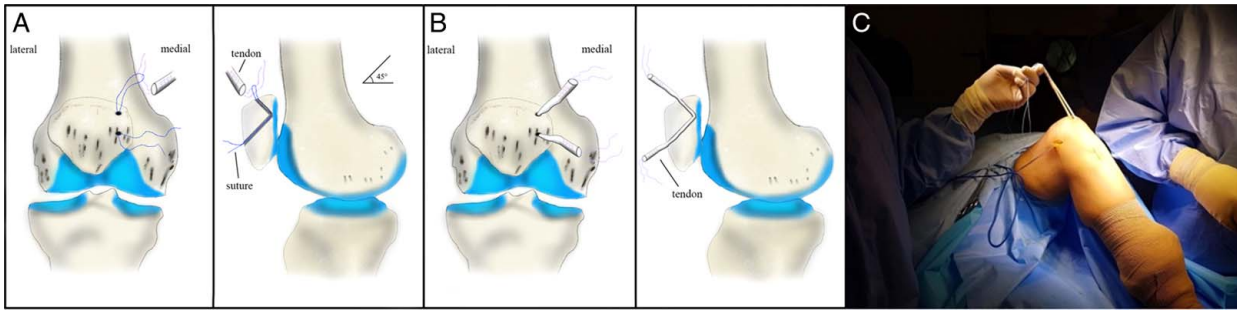

FIGURE 2. A and B, Graft passage through confluent tunnels. C, Intraoperative view.

FIGURE 3. Passage of graft by layer 2 to 3 on medial face and then through femoral socket.

intraarticular injury, compared with the medial tunnels classically described, because by passing the wire and then the drill in an anteroposterior manner, it is possible to clearly feel the arrival towards the subchondral region, unlike the tunnels also in "V" form but horizontal. It can also be mentioned as a possible benefit compared with the classic technique, the fact of being the anterior cortical of the patella the 1 that is maintained as a bridge, which is more resistant than the medial face of the patella, with which you could eventually have a lower risk of injury to the bone bridge that is created. In turn, the technique just described has the advantage over other techniques of leaving the graft fixed inside the bone tunnel and not supported by an anchor outside the bone, which facilitates the incorporation of the graft into the bone and avoids possible complications caused by the use of anchors in the patella.[5]

Regarding the bone bridge, it is worth mentioning that during the first year using this novel technique, there were 2 cases, in which an anterior patellar wall burst occurred due to a misplacement of the tunnels (insufficient space between them); both cases were resolved by the use of 2 anchors placed in the medial wall of the patella. We have not had this complication ever since.

Last but not least, the use of a single fixing device, used in the femoral socket, reduces the costs of surgery for both the patient and the health service, making it more affordable to the general population.

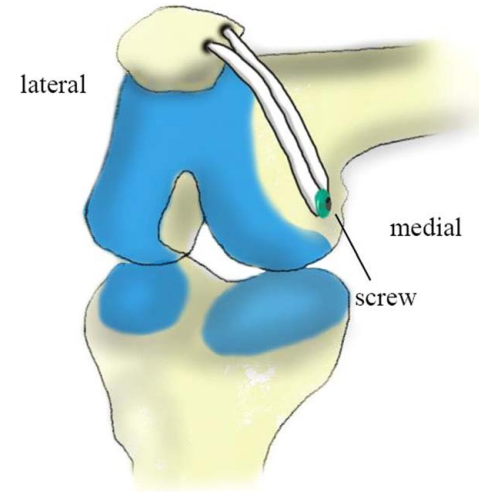

FIGURE 4. Graft passed through the vertical patellar tunnel and fixed in the femoral tunnel.

CONCLUSION

The reconstruction of the MPFL by the use of vertical confluent tunnels on the patellar anteromedial face is a valid option, which presents potential benefits compared with other described techniques, is versatile and has a lower cost than other described techniques due to the use of only 1 device.

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