MEDIAL COLLATERAL LIGAMENT RECONSTRUCTION USING ACHILLES TENDON ALLOGRAFT

Iftach Hetsroni MD
Department of Orthopedic Surgery,
Meir General Hospital, Sackler Faculty of Medicine,
Tel Aviv University, Tel Aviv, Israel

Robert G. Marx MD, MSc, FRCSC
Hospital for Special Surgery,
Weill Medical College of Cornell University,
New York, New York, USA

The medial collateral ligament (MCL) is the primary restraint to valgus stability of the knee. At 25 degrees flexion it provides approximately 80% of the restraining force, while at full extension it provides approximately 60% of the restraining force, with the posteromedial capsule, posterior oblique ligament, and ACL providing the remaining restraint.[1] The superficial part of the MCL originates on an average of 3.2 mm proximal and 4.8 mm posterior to the medial epicondyle and inserts on the proximal tibia, just anterior to the postero-medial crest of the tibia, and posterior to the pes anserinus insertion. The deep part of the MCL originates inferior to the medial epicondyle and inserts 1 cm below the joint line on the tibia.[2,3]

Non operative treatment of MCL injuries usually results in a satisfactory outcome.[4,5] When MCL tears fail to heal, surgical reconstruction may be advised to address chronic instability of the knee, or to prevent valgus overload on a reconstructed cruciate ligament.[6,7]

We present here a technique that uses Achilles tendon allograft with anatomic insertions on the femur and tibia to obtain an isometric graft. We believe this technique is simple, reproducible, and adds the advantage of avoiding extensive soft tissue dissection on the medial aspect of the knee, thereby decreasing the risk of postoperative stiffness.

After confirming valgus laxity of the knee under anesthesia, as well as opening of 1cm or more between the medial tibial plateau and the medial femoral condyle under valgus stress during arthroscopy, we fix ACL or PCL reconstruction on the femoral side. We then perform the MCL reconstruction is as follows (pictures 1–5). We defer tibial fixation of the MCL until the PCL and subsequently ACL are fixed on the tibial side, respectively.

1. The Achilles allograft for the MCL is prepared on a side table, creating a 9mm diameter and 18mm long bone plug (picture 1).

Picture 1

2. A three centimeter longitudinal skin incision is performed over the medial femoral epicondyle.
3. A guide pin is inserted 3–5mm proximal and 3-5mm posterior to the medial femoral epicondyle, parallel to the joint line from medial to lateral, and in 15 degrees anterior direction to avoid the inter-condylar notch. Location of the guide pin is confirmed with fluoroscopy (picture 2).

Picture 2

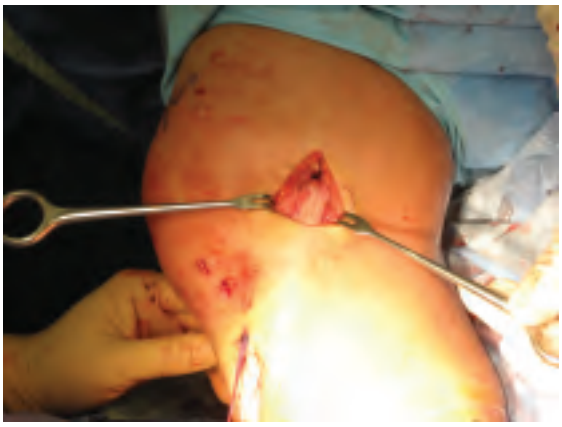
4. The skin is undermined with the index finger and Metzenbaum scissors from the femoral guide pin to the anatomic MCL insertion on the tibia, creating a tunnel for the MCL graft under the subcutaneous fat (picture 3).
5. Nonabsorbable suture loop is placed around the femoral guide pin and brought distally under the skin in the tunnel just created.

Picture 3

6. The distal tip of the suture loop is firmly held against the tibia at the estimated anatomic insertion point, just posterior to the pes anserinus insertion. Isometricity of the suture loop is checked through knee motion from 0–90 degrees. In case isometricity is not obtained, the tibial insertion point is changed until the loop is isometric.
7. The isometric point is marked on the tibia.
8. The soft tissue around the femur guide pin is debrided to allow for the future insertion of the Achilles bone plug.
9. A 9mm reaming is performed over the femur guide pin to a depth of 20mm.
10. The Achilles allograft bone plug is inserted into the femoral tunnel and fixed with a 7mm by 20mm interference screw.
11. The Achilles tendon tissue is passed under the skin and brought to the point of the previously marked tibial insertion for the MCL.
12. The cruciate grafts are tensioned and fixed on the tibia.
13. The knee is then brought to 20 degrees of flexion and varus stress is applied. The MCL graft is then tensioned distally and fixed on the tibia with a spiked screw and washer (picture 4).

Picture 4

14. The reconstructed MCL graft is appreciated and tightness is confirmed (picture 5).



Picture 5

15. Subcutaneous tissue and skin are closed. Post-operative protocol:

If the PCL is reconstructed also, the post-operative protocol should follow PCL post-operative protocol guidelines. If the ACL is reconstructed but not the PCL, then the following post-operative guidelines are recommended:

- Immediate post-op: toe touch is allowed with a knee brace locked in extension for 2 weeks.
- At 2 weeks post-op: knee motion in the brace is allowed from 0 to 60 degrees.
- At 4 weeks post-op: knee motion is expected to reach 60 degrees flexion. Full weight bearing is allowed and knee flexion is allowed beyond 60 degrees to reach 90 degrees.
- At 6 weeks: brace removal is allowed and the patient is progressed to full range of motion.
- Crutches are used until gait is normal.

DISCUSSION

Several procedures have been described in the literature to reconstruct the MCL. Some of these used semitendinosus autograft with preservation of the tibial insertion.[8-11] Others used allografts and double bundle reconstructions to recreate a limb for the posterior oblique ligament,[12-14] requiring across the joint long incisions at the medial aspect of the knee. The current described technique is unique since it is performed with minimal skin incisions, creates an isometric reconstruction, avoids the need for extensive soft tissue dissection across the medial aspect of the joint, relatively simple and reproducible in surgical terms, and has provided excellent stability in our initial experience. We are currently in process of reviewing our results at minimum 2 year follow up.

CONCLUSION

The technique described is relatively simple technically in our opinion, and utilizes the advantage of a wide and strong allograft tissue with bone to bone healing at the femoral attachment. Our preliminary results indicate that this MCL reconstruction provides good stability, including cases that involve MCL reconstruction in conjunction with revision ACLR. In a small minority of our cases, an additional medial procedure such as posteromedial capsular plication may be performed for cases of extreme laxity, and each case should be evaluated individually.

REFERENCES

1. Grood ES, Noyes FR, Butler DL, et al. Ligamentous and capsular restraints preventing straight medial and lateral laxity in intact human cadaver knees. J Bone Joint Surg Am 1981;63:1257–1269.
2. La Prade RF, Engebretsen AH, Ly TV, et al. The anatomy of the medial part of the knee. J Bone Joint Surg Am 2007;89:2000–2010.
3. Feeley BT, Muller MS, Allen AA, et al. Isometry of medial collateral ligament reconstruction. Knee Surg Sports Traumatol Arthrosc 2009;17:1078–1082.
4. Kannus P. Long-term results of conservatively treated medial collateral ligament injuries of the knee. Clin Orthop Relat Res 1988;226:103–112.
5. Indelicato PA. Non-operative treatment of complete tears of the medial collateral ligament of the knee. J Bone Joint Surg Am 1983;65:323–329.
6. Larson RL. Combined instabilities of the knee. Clin Orthop Relat Res 1980;147:68–75.
7. Robins AJ, Newman AP, Burks RT. Postoperative return of motion in anterior cruciate ligament and medial collateral ligament injuries: the effect of medial collateral ligament rupture locations. Am J Sports Med 1993;21:20–25.
8. Lind M, Jakobsen BW, Lund B, et al. Anatomical reconstruction of the medial collateral ligament and posteromedial corner of the knee in patients with chronic medial collateral ligament instability. Am J Sports Med 2009;37:1116–1122.
9. Kim SJ, Lee DH, Kim TE, Choi NH. Concomitant reconstruction of the medial collateral and posterior oblique ligaments for medial instability of the knee. J Bone Joint Surg Br 2008;90:1323–1327.
10. Azar FM. Evaluation and treatment of chronic medial collateral ligament injuries of the knee. Sports Med Arthrosc Rev 2006;14:84–90.
11. Bosworth DM. Transplantation of the semitendinosus for repair of laceration of medial collateral ligament of the knee. J Bone Joint Surg Am 1952;34:196–202.
12. Borden PS, Kantaras AT, Caborn DNM. Medial collateral ligament reconstruction with allograft using a double-bundle technique. Arthroscopy 2002;18:E19.
13. Fanelli GC, Tomaszewski DJ. Allograft use in the treatment of the multiple ligament injured knee. Sports Med Arthrosc Rev 2007;15:139–148.
14. Feeley BT, Muller MS, Allen AA, et al. Biomechanical comparison of medial collateral ligament reconstructions using computer-assisted navigation. Am J Sports Med 2009;37:1123–1130.