Chronic Lateral Collateral Injuries

Lateral collateral ligament (LCL), popliteus tendon and popliteo-fibular ligament (PFL) are the main static stabilizers on the lateral side of the knee and resist abnormal varus and external rotation. Isolated injuries of the lateral stabilizing structures are rare and most of the injuries are associated with damage to the ACL or PCL. Unrecognized posterolateral injury also places abnormal loads on ACL or PCL grafts and might lead to early failure of the reconstruction. Management of chronic lateral injuries starts with a thorough clinical examination of the knee ligaments with special emphasis on varus stress test, dial test and postero-lateral drawer test in varying degrees of knee flexion, and varus-hyperextension thrust during walking. Stress X-rays are helpful to quantify the amount of laxity. Weight-bearing full length radiographs are mandatory since varus extremity alignment leads to abnormal loads on the lateral reconstruction and should be corrected before ligament surgery is attempted. It is important to distinguish between varus alignment due to lateral laxity and tibial metaphyseal varus, since only the latter needs corrective osteotomy.

Medial open wedge proximal tibial osteotomy is preferred in patients with varus extremity alignment due to its low morbidity and preservation of bone stock. Tibial slope changes have an effect on the ACL & PCL. Increasing the tibial slope may be helpful in PCL deficient knees but places abnormal loads on the ACL. Approximately a third of the patients may not require ligament surgery after open wedge tibial osteotomy (1). Ligament reconstruction may be performed after the healing of osteotomy during implant removal in symptomatic cases. MRI is useful to determine the status of the menisci and amount of cartilage damage.

In patients with normal extremity alignment, a single stage surgery with correction of all components of the instability should be performed. Historically non-anatomical techniques utilizing imbrication, biceps transfers or bone block advancements have been performed with limited success. Current techniques involve anatomical reconstruction of the three main components of lateral restraining structures. This usually includes the reconstruction of ACL/PCL followed by an anatomic reconstruction of the involved lateral structures (2). Graft choice depends on the tissues used in previous surgery and the availability of allografts. The contralateral knee may be used as a graft source when allografts are not an option. Tendon grafts are preferred for reconstruction of the lateral structures due to their length and size. Split Achilles tendon allografts with bone blocks may also be utilized. Anatomic reconstruction of the LCL, popliteus and popliteo-fibular ligament is performed using the technique described by LaPrade et al., utilizing tunnels in anatomical insertion points of the ligaments (2) (Figure 1).

Figure 1: Schematic drawing of anatomical lateral reconstruction described by LaPrade et al. Red graft reconstructs LCL and PFL, green graft reconstructs the popliteus.
Rehabilitation following surgery is variable and depends on the reconstructed ligaments and stability of fixation. A hinged brace with partial weight bearing is used for 6-8 weeks. Prone knee flexion may be started in the early weeks. Return to sports should not be before 9-12 months.

The clinical outcome of anatomical reconstructions are favorable and a significant improvement compared to the pre-operative state can be obtained (3,4). Abnormal external rotation can be effectively corrected (or even overconstrained) with anatomical techniques. Most studies show full restoration of varus stability, however one study has shown that this may not always be possible (5). Comparative studies have shown anatomical reconstruction techniques to be superior compared to non-anatomical techniques (6). Failure after posterolateral reconstruction has been associated with nonanatomical graft reconstruction, untreated varus malalignment, and failure to successfully reconstruct all ruptured knee ligaments, including cruciates (7).

**Chronic Medial Collateral Injuries**

The main static stabilizers of the medial side of the knee are the superficial medial collateral ligament (sMCL), deep medial collateral ligament (dMCL) and the posterior oblique ligament (POL) otherwise described as the posteromedial capsule (PMC). Acute medial side injuries are the most common sports injuries; however due to its intrinsic healing ability, chronic medial collateral ligament injuries are less frequent compared to the lateral side. Most acute Grade III medial side injuries heal with conservative/functional treatment. Surgery is indicated for symptomatic grade III medial laxity in the chronic setting. Similar to the lateral side, symptomatic isolated medial collateral injuries are rare and most are associated with ACL and/or PCL injuries.

Valgus stress testing at full extension and 30 degrees of flexion is the most important clinical examination. Valgus laxity at 30 degrees is indicative of an MCL injury. Laxity in full extension suggests the involvement of POL and/or cruciates. Posteromedial and anteromedial drawer tests are also helpful in combined PCL or ACL injuries. Dial test may be positive in patients with rotatory laxity. Manual or instrumented valgus stress radiography is helpful in the diagnosis and objective evaluation of the surgical treatment. MRI is mandatory to evaluate associated meniscal and chondral lesions and injury to the cruciates.

All components of the instability must be corrected during surgery. This comprises reconstruction of the cruciates and addressing all meniscal & chondral pathology. Historical non-anatomical methods such as pes plasty, imbrication and bone block advancements have fallen out of favor and have been replaced by anatomical reconstructions. Three options are available for medial reconstruction(Figure 2).

![Figure 2: Schematic representation of techniques for medial reconstruction; a: Isolated sMCL reconstruction; b: Single femoral tunnel reconstruction of sMCL and POL; c: Anatomical reconstruction of sMCL and POL](image-url)
1. Reconstruction of sMCL only: This involves placing a graft between the anatomical insertion points of the sMCL on the medial epicondyle and tibia. Although hamstring tendon grafts are the most popular choices, Achilles allografts have also been used with success (8, 9). Large implants should be avoided on the medial epicondyle and the tibial insertion must be sufficiently distal from the joint line. Although these techniques correct valgus instability in flexion, residual laxity in full extension may still be a problem since laxity of POL is not addressed.

2. Reconstruction of sMCL and POL using a single femoral insertion. This technique involves a two-tailed graft fixed in a single tunnel on the medial epicondyle. One limb of the graft is used to reconstruct the sMCL and the other is used to reconstruct the POL using 2 different tibial fixation sites. Lind et al have reported excellent outcomes in 50 patients at 2 years with this technique, achieving IKDC normal & nearly normal knees in 74% of the cases(10).

3. Anatomical reconstruction of the sMCL & POL using 2 femoral & 2 tibial tunnels. This technique has been developed by La Prade et al. after extensive anatomical and biomechanical studies and involves reconstruction of the proximal and distal divisions of the superficial medial collateral and the posterior oblique ligament using two separate grafts placed in 4 anatomical tunnels(11). The POL graft is fixed in full extension while the sMCL is tensioned and fixed in 20 degrees of flexion. The author has reported excellent results with reduction of valgus laxity from 6.2 mm to 1.3 mm in 28 patients.

Whatever the technique, excellent knowledge of anatomy, correction of all components of the instability and extremity malalignment, stable fixation of grafts at anatomical insertion sites and early supervised rehabilitation are key points to achieve good results in chronic collateral injuries.

References


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