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Operative Techniques in

Sports Medicine

Technical Considerations in Posterior Cruciate Ligament Reconstruction. A Canadian Perspective

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The experience of two Canadian surgeons at separate university centers is discussed. The majority of posterior cruciate ligament (PCL) injuries encountered are associated with multiligament knee injuries and knee dislocations. Although not optimal, it is not unusual to have these injuries referred for orthopaedic assessment on a chronic basis. In the setting of multiligament injury we prefer to proceed with timely reconstruction of the PCL with a tendo-Achilles allograft in a single bundle construct. Other high-grade ligament injuries are repaired and/or reconstructed simultaneously as appropriate. Double bundle reconstructions are reserved for isolated PCL injury or in revision situations.

KEYWORDS posterior cruciate ligament, knee dislocation, multi-ligament knee injury

The posterior cruciate is a technically difficult ligament to reconstruct. Challenges to reconstruction include the relatively tortuous course taken by grafts, the consistent gravitational stress applied on the graft by the tibia (thereby necessitating a robust graft with firm tensioning and fixation), and the proximity of neurovascular structures at the back of the knee. These issues have been addressed in previous sections. We will attempt to outline some of the methods we employ for diagnosis and treatment of posterior cruciate ligament (PCL) injuries.

Patient Profile

Both authors work in level I, university affiliated trauma centers as well as in elective sport medicine clinic settings. Due to our trauma affiliations, we are somewhat more likely to observe acute PCL injuries in the setting of multiligament knee injuries. Injuries resulting from high-energy mechanisms (ie, motor vehicle accidents) are more commonly encountered than low (ie, sporting injuries) or "ultra-low" energy (obese patient, twisting) mechanisms. This does not preclude the occasional acute, isolated, sports-acquired PCL injury but these would be in the minority. Moreover, we are 2 of few Canadian surgeons who perform PCL reconstructions regularly and thus observe many chronic injuries (multiligament and isolated) as well. In general, the distribution is approximately; 50% acute multiligament injuries, 40% chronic multiligament injuries, and 10% isolated PCL injuries (spread relatively evenly between acute and chronic). Each of us would perform 10-20 PCL reconstructions per year on an average. This pattern of practice may also be influenced by the broad geographic population distribution and waiting times for subspecialty assessment in Canada. Although anecdotal, there is almost certainly a trend to conservative management of isolated PCL injuries in Canada, and an unfortunate paucity of surgeons with interest and expertise in reconstruction.

Assessment

Physical examination is the most useful tool in assessment of the PCL injured patient. Observation of static tibiofemoral "step-off" with the knee at 90° of flexion (to assess and quantify posterior sag) is the most commonly used maneuver.[1] (Fig. 1). Also, used are the quads-active and posterior drawer tests. The reverse pivot, dial test, and external and internal drawer test are useful to assess for rotational laxity if concomitant collateral ligament or posterolateral corner injury is suspected. There is recent relevant research in this area. Sekiya et al[2] have demonstrated in a cadaveric model that a grade 3 PCL injury (as assessed by posterior sag) invariably repre-

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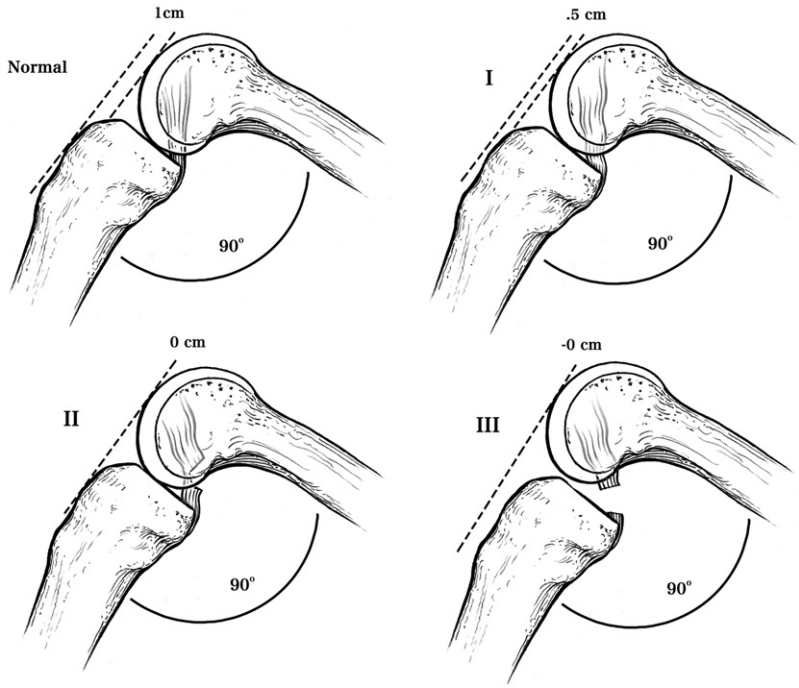

Figure 1 Clinical classification of posterior cruciate ligament (PCL) injuries using the tibiofemoral "step off." Grade 0, normal; grade I, decrease in the step off (less than 1 cm); grade II, flush step off (0 cm); and grade III, a negative step off. Step off is quantified from the palpable side of the medial femoral condyle to the medial tibial plateau with the knee at 90° flexion. (Reprinted with permission.[1])

sents a combined PCL and posterolateral corner injury. It has also been our experience that isolated PCL injuries do not allow posterior tibial subluxation (under the influence of gravity) beyond the level of the femoral condyles with the knee at 90° of flexion (ie, grade III step off).

The authors do not commonly use stress radiography because of concerns with reproducibility and consistency of these assessments. Admittedly, the use of Telos like devices may be the only objective tool by which to evaluate new reconstructive techniques in research applications. Magnetic resonance imaging can be misleading in chronic cases. Midsubstance PCL injuries have some capacity to heal (as compared to anterior cruciate ligament [ACL]). They can seem intact on magnetic resonance imaging, but are actually elongated and sometimes functionally incompetent clinically.[3] Even arthroscopic examinations can be misleading in these "stretch" injuries, and the importance of the physical examination is further emphasized.

Surgical Indications

PCL Repair Indications

PCL repair is indicated for avulsion injuries with a large associated piece of bone (almost always on the tibial side). However, a repair is not indicated for midsubstance injuries or smaller tibial avulsions.

Femoral-sided avulsions may be considered for repair, although this is not a strong recommendation and has been abandoned for the most part by both authors in favor of reconstruction. These femoral-sided injuries are often associated with some degree of interstitial stretch within the substance of the ligament. Although the ligament itself can be physically restored to its attachment site with the use of sutures through bone, it is the elongation within the ligament that is difficult to restore with this technique. Both authors question the strength of the repair achieved, as well as the effect of the unfavorable interarticular milieu on healing with this technique.

If repair is indicated, it is optimally performed within 3 weeks of injury.

PCL Reconstruction Indications

The main indication for PCL reconstruction is symptomatic instability. Such instability is admittedly rare after isolated PCL injury. The authors recognize however that disability in chronic isolated PCL injuries may be manifest by pain rather than instability. Persistent pain despite an adequate course of physiotherapy and nonoperative treatment may be alleviated by PCL reconstruction, particularly when the pain is referable to the medial and patellofemoral compartments. Physiotherapy commonly focuses on resolution of swelling, restoration of motion, and quadriceps strengthening over a course of at least 3 months after injury. Bracing may also be considered, although its exact effect on the isolated PCL deficient knee is questionable.

It is our opinion that PCL injuries should always be reconstructed when associated with high-grade collateral, posterolateral, or posteromedial corner injuries. In acute multiple ligament injuries, we prefer single stage reconstructions of all damaged ligaments within 2-3 weeks of injury. Repairs of collateral ligaments are performed if the component struc-