In the past three decades, a variety of methods to stabilize the knee in which the anterior cruciate ligament (ACL) has been torn have been tried and discarded. Techniques that have not withstood the test of time include primary repair of the torn ACL, lateral extra-articular reconstruction (Ellison, McIntosh), dynamic operations (pes anserinus), synthetic augmentation (ligament augmentation device), prosthetic replacement (Gortex, Leeds-Keio, Dacron), vascularized grafts and thermal shrinkage. Intra-articular replacement of the torn ACL with a biologic graft has evolved to be the most commonly used operation today. This is not a surprising development, since restoring normal anatomy has always been the goal of surgery.

The graft that is most commonly used graft to replace the torn ACL is the middle third of the patella tendon. This bone-tendon-bone graft can be either an autograft or an allograft. Other parts of the extensor mechanism, such as quadriceps tendon-patella, are occasionally taken for grafts. Hamstring tendons (semitendinosus and gracilis) are also commonly used as grafts.

**Bone-Patellar Tendon-Bone versus Hamstring Grafts**

Considerable debate continues as to whether a BPTB autograft or a multi-strand hamstring tendon autograft is preferable for ACL reconstruction. Both intra-articular reconstructions are well-established techniques\(^2\), \(^6\), \(^20\), \(^33\) and comparative studies have shown little difference between the two autografts in patient satisfaction and ligament stability outcome at medium-to long-term follow-up\(^2\), \(^3\), \(^7\), \(^9\), \(^11\), \(^12\), \(^14\), \(^18\), \(^20\), \(^24\), \(^26\), \(^27\), \(^29\), \(^30\). For more than two decades, the BPTB autograft has been regarded as the graft of choice in ACL reconstruction\(^8\), \(^10\), \(^15\), \(^34\). ACL reconstruction using multi-strand hamstring tendons has been advocated as an alternative standard procedure to using the BPTP graft to improve its several disadvantages such as slow recovery in quadriceps muscle strength, difficulties of full extension, and anterior knee pain\(^6\), \(^8\), \(^11\), \(^13\), \(^14\), \(^19\), \(^28\), \(^30\),\(^32\). However, some reports comparing the outcome of hamstring and BPTB surgeries have indicated preferable results from BPTB surgery with regard to knee stability and sporting activity recovery\(^4\), \(^6\), \(^11\), \(^13\), \(^17\), \(^32\).

**Allograft versus Autograft**

**Single Bundle versus Double Bundle Grafts**

Renewed interest has arisen in the double-bundle hamstring tendon technique\(^21\) in an attempt to reproduce more closely the natural anatomy of anteromedial and posterolateral bundles of the ACL. Recent in-vitro biomechanical studies have shown that the anatomic reconstruction of the ACL produces a better biomechanical outcome, especially close to knee extension\(^25\) and during rotatory loads\(^35\). However, it remains unclear whether these promising in-vitro results translate in improved clinical outcome. A few studies have found that the anterior laxity of the anatomic double-bundle ACL reconstruction was significantly better than that of the single-bundle reconstruction with the hamstring tendon graft\(^22\), \(^23\), \(^36\), \(^37\), although there were no significant differences in International Knee Documentation Committee evaluation scores\(^22\), \(^37\). Other clinical studies then again have reported that there were no significant differences in stability or clinical outcome between the single-bundle and double-bundle ACL reconstruction techniques\(^1\), \(^16\).

**Summary**

We believe that the mid-third patella tendon is a better graft than a hamstring graft because it allows bone-to-bone healing within the femoral and tibial tunnels. We have been able to minimize complications of taking a graft from the middle third of the patella tendon by utilizing an accelerated postoperative rehabilitation program, as described by Shelbourne. This requires the use of continuous passive motion (CPM) for 23 hours a day for the first seven days after surgery.

We prefer to use autografts in patients who are younger than about 40 years. If the patient is older than 40, we give the patient the option of choosing an allograft after explaining the benefits and potential risks. If the patient has had prior ACL reconstruction using an mid-third patella tendon autograft and has recurrent instability, we prefer to use a mid-third patella tendon graft allograft (and no postoperative CPM).

Since the results of using single bundle and double bundle grafts are reported to give similar results, we think it is better to use the single bundle method. This is less complicated to perform, requires less drilling of the femoral and tibial condyles, and has withstood the test of time.
References


