


Full-Thickness Peroneus Longus Tendon Autograft Harvest

Carlos E. Franciozi,^{*†‡} MD, PhD, Enzo S. Mameri,^{*§||} MD, MSc , Felipe C. Schumacher,^{*} MD, Marcos V. Credidio,^{*} MD, Marcelo S. Kubota,^{*} MD, and Marcus V. Luzo,^{*} MD, PhD

Investigation performed at the Department of Orthopedics and Traumatology—Escola Paulista de Medicina (EPM) / Federal University of São Paulo (UNIFESP), São Paulo, Brazil

Background: Despite extensive evidence of excellent biomechanical and clinical outcomes of ligament reconstructions with bone-patellar tendon-bone, hamstring tendon, and quadriceps tendon autografts, these are not without limitations, including knee-related donor site morbidity, decreased range of motion, and potential for anterior knee pain. Therefore, researchers have explored other options, including the peroneus longus (PL) autograft.

Indication: Anterior cruciate ligament (ACL) reconstruction (both primary and revision), as well as multiligament reconstruction, particularly in areas where access to allografts is limited.

Surgical Technique: A 3-cm longitudinal skin incision is placed 2 fingerbreadths (or 3 cm) proximal to the tip of the lateral malleolus, and 3 mm posterior to the fibula. The PL and peroneus brevis tendons are identified and isolated, followed by a tenodesis at the distal limit of the incision. The PL is whipstitched proximal to the tenodesis site, and then incised between the tenodesis and whipstitched portion. A closed tendon stripper is inserted and advanced proximally until the PL graft is released.

Discussion/Conclusion: PL autograft harvest has been shown to generate thicker and longer grafts relative to the semitendinosus, with demonstrated efficacy in terms of both biomechanical and clinical outcomes. Current literature points largely to a good safety profile, although there is still conflicting evidence in terms of foot and ankle morbidity and no mid- to long-term follow-up data available.

Patient Consent Disclosure Statement: The author(s) attests that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form.

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VIDEO TRANSCRIPT

Knee ligament surgery is one of the most common orthopaedic procedures, with increasing incidence globally.⁷ Its

^{||}Address correspondence to Enzo S. Mameri, MD, MSc, Department of Orthopedics and Traumatology—EPM, UNIFESP, 740 Botucatu Street, 1st Floor, 04038-001, São Paulo, Brazil (emails: enzo_mameri@gmail.com / enzo_salviatomameri@rush.edu).

^{*}Department of Orthopedics and Traumatology—EPM, UNIFESP, São Paulo, Brazil.

[†]Hospital do Coração, São Paulo, Brazil.

[‡]Hospital Israelita Albert Einstein, São Paulo, Brazil.

[§]Instituto Brasil de Tecnologia da Saúde, Rio de Janeiro, Brazil.

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success is critically dependent on various factors, including the type of graft used.⁸ An ideal autograft should have an acceptable amount of strength, be of adequate size, and be easily and safely harvested, with minimal donor-site morbidity. Currently, bone-patellar tendon-bone, hamstring tendon, and quadriceps tendon autografts are the most commonly used options for knee ligament reconstruction, particularly of the anterior cruciate ligament (ACL), both in primary and revision cases.^{3,13}

Despite extensive evidence of excellent biomechanical and clinical outcomes, these grafts are not without limitations, including knee-related donor-site morbidity, decreased range of motion, and potential for anterior knee pain.^{1,8} Therefore, researchers have explored other options.

Currently, the peroneus longus (PL) autograft is a promising alternative for knee ligament reconstruction due to its consistently bulky diameter, and tensile strength, reported as at least comparable to traditional autografts.¹⁰ In addition, the PL autograft offers several advantages pertaining to reduced knee-related morbidity,¹⁴ and is particularly advantageous in areas where access to allografts is limited, such as in developing countries or areas with limited medical resources, where autograft choice in revision and/or multiligament knee surgery is often complicated.²



Therefore, this article will describe the technique for full-thickness PL autograft harvest, discussing its pearls, potential advantages, and available outcome studies.

Harvest of an ipsilateral full-thickness PL tendon autograft is possible with the patient in supine positioning under spinal anesthesia or general anesthesia with regional blocks. In other words, it does not require additional equipment or different positioning or patient preparation relative to a standard ligament reconstruction.

A padded tourniquet is positioned and inflated, and an assistant performs internal rotation of the foot and ankle, with the heel positioned over a padded bump. A 3-cm longitudinal skin incision is placed 2 fingerbreadths (or 3 cm) proximal to the tip of the lateral malleolus and 3-mm posterior to the fibula. Superficial dissection is carried out through the superficial fascia, revealing the common tendon sheath over the peroneal tendons, which is incised longitudinally. The PL tendon is identified more superficially, isolated with a curved snap, and tagged. Next the peroneus brevis tendon is identified deep to the longus and contains some muscle fibers.

A tenodesis of the PL to the peroneus brevis is performed at the distal limit of the incision, with 2 to 3 mattress sutures. Next, the PL is isolated again and whipstitched proximal to the tenodesis site with no. 2 polyester suture, followed by a transverse incision creating the distal end of our graft. A closed tendon stripper is inserted, making sure not to damage the peroneus brevis tendon, and advanced proximally until the PL graft is released. Graft preparation ensues in a standard fashion with nonabsorbable sutures.

In this case example, a revision ACL reconstruction is performed with anterolateral ligament reconstruction and concomitant superficial medial collateral ligament reconstruction. The PL graft had sufficient length to be fashioned into a triple-strand, which was combined with a strand of gracilis for a 10-mm ACL graft, while the remaining strand of the gracilis was to be used for the anterolateral ligament reconstruction, using a common ACL femoral tunnel drilled with an outside-in technique. In this way, the less bulky and shorter semitendinosus graft could be used in the medial extra-articular reconstruction, without sacrificing the intra-articular diameter of our ACL reconstruction.

Pearls for full-thickness PL autograft harvest include (1) correctly identifying the PL tendon, which lies superficially and mostly free of muscle fibers; (2) respecting the distal margin of the incision to avoid damage to the superior peroneal retinaculum and thus avoiding potential tendon subluxation; (3) always performing a tenodesis to the peroneus brevis tendon, to minimize loss of strength in eversion or first ray plantar flexion; and finally, to (4) beware of advancing the tendon stripper too proximally, following release of the graft, as the peroneal nerve is located at 4- to 5-cm distal to the fibular head.

Emerging literature has characterized the properties, and clinical efficacy and safety of peroneal tendon autograft use. Although initial studies focused on harvesting the anterior portion of the PL tendon,¹⁶ extensive literature has since pointed to the efficacy and safety of a full-thickness PL harvest.^{5,6,14}

Biomechanical studies have found that a doubled PL graft yields superior tensile strength to that of the native ACL, and at least comparable to a 4-strand hamstring graft.^{10,14}

Clinical studies have further characterized the advantages in terms of graft diameter, with a doubled PL graft yielding up to a mean 8.8 mm, with no cases of graft diameter under the feared 8-mm-threshold for ACL reconstruction, whereas quadrupled hamstring grafts yielded inferior mean diameter in a more worrisome range, including a 6.5-mm minimum.^{6,12}

Several studies have highlighted the clinical efficacy of using a PL autograft for ACL reconstructions. These investigations were summarized in a recent systematic review of level 2 studies comparing PL and hamstring autografts.⁵ PL ACL reconstruction resulted in comparable postoperative knee stability and safety profile, but superior Lysholm and subjective International Knee Documentation Committee (IKDC) scores, relative to reconstructions using combined semitendinosus and gracilis grafts.⁵ Further studies have since reported good-to-excellent clinical outcomes at 1- and 2-year follow-ups, with no significant difference to hamstring ACL reconstructions.^{6,12,15} In addition to primary ACL studies, a recent level 4 study has reported significant improvement in functional outcome scores at 2 years following the use of PL autograft for revision ACL and multiligament reconstructions.⁴

In terms of the clinical safety regarding foot and ankle outcomes, the literature largely shows a good safety profile, with no significant postoperative differences in gait parameters, eversion and flexion strength, American Orthopaedic Foot & Ankle Society (AOFAS), and Foot and Ankle Disability Index (FADI) at up to 3 years of follow-up.^{4,6,9,11,12,14} However, a few studies suggest a slight functional deficit following PL harvest, with 1 study showing decreased eversion and plantar flexion strength at 6 months, albeit restored at 1-year follow-up.¹⁵ Additionally, a systematic review with a pooled sample of over 260 patients across 5 studies showed a slight but statistically significant decrease in AOFAS score postoperatively.⁵ Of note, there are no published studies to date assessing the mid-term or long-term consequences of PL harvest in terms of foot and ankle function.

In summary, we present the surgical technique for a full-thickness PL autograft harvest, which has been shown to generate thicker and longer grafts relative to a semitendinosus, with demonstrated efficacy in terms of both biomechanical and clinical outcomes, although there is still conflicting evidence in terms of foot and ankle morbidity and no mid- to long-term follow-up data.

Overall, we believe that, based on the available evidence and our experience in clinical practice, the PL autograft is a valid option, best suited for the multiligament or revision settings or even as an alternative for primary ligament reconstruction depending on the type of sport—which we advocate to avoid in modalities heavily reliant of ankle function, such as soccer, football, or beach sports.

ORCID iD

Enzo S. Mameri  <https://orcid.org/0000-0001-9642-4868>

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