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Editorial

Is Peroneus Longus Tendon the Ideal Graft for ACL Reconstruction?

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The peroneus longus tendon (PLT) was first introduced as a graft option for anterior cruciate ligament (ACL) reconstruction in 1997 by Prof. Dr. Ahmet Uğur Turhan and colleagues at Karadeniz Technical University. Between 1997 and 2008, ACL reconstruction using the PLT autograft was performed in 64 patients, with the outcomes of these cases published in 2008 [1]. Since then, the PLT has gained growing popularity as a graft choice in ACL surgery, as reflected by a steady increase in related publications.

This growing interest in the PLT as a graft option naturally brings several critical considerations and questions to the forefront of surgeons' evaluations. When evaluating a new graft option for ACL reconstruction, four key questions typically arise: Is the graft biomechanically strong enough? What are the clinical outcomes associated with its use? How easy is it to harvest? And does its use lead to a high rate of donor site morbidity that causes considerable discomfort or functional impairment for the patient?

To address these questions, recent studies have focused on evaluating the clinical and functional outcomes of using PLT in ACL reconstruction. Meta-analyses comparing the peroneus longus graft with hamstring tendons have demonstrated similar or even superior clinical and functional outcomes for the PLT [2-4]. Additionally, a review of the literature suggests that the peroneus longus graft offers promising results comparable to other graft choices in ACL reconstruction [2,5,6].

ACL reconstruction aims to restore knee stability while maintaining its native kinematics. Therefore, the selected graft must possess biomechanical properties capable of withstanding the loads typically borne by the native ACL. Biomechanical studies have demonstrated that various graft options, including bone–patellar tendon–bone, hamstring tendons, quadriceps tendon, tibialis anterior, tibialis posterior, PLT, Achilles tendon, tensor fascia lata, and iliotibial band, exhibit similar in vitro biomechanical characteristics. Notably, most of these grafts, including the PLT, have been shown to be biomechanically superior to the native ACL [7].

Several techniques for harvesting the PLT have been described in the literature, including single-incision or double-incision approaches with full-thickness tendon harvesting, partial-thickness split harvesting, and harvesting combined with peroneus brevis tenodesis [1,8]. The PLT is particularly notable for being easily palpable beneath the skin, relatively free from adhesions, and thicker and stronger than hamstring tendons. These characteristics make it a convenient option for harvesting, providing a thick, predictable, and robust graft [7,9].

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A key concern in the literature regarding using the PLT as a graft is donor site morbidity. Although numerous studies have reported minimal short- and medium-term donor site morbidity, discussions on this issue remain ongoing [10,11].

What is the function of the PLT? The peroneal tendons contribute to foot eversion and plantarflexion of the ankle and play a crucial role in foot biomechanics. Specifically, the PLT stabilizes the first metatarsal head and assists in locking the first metatarsal against the medial cuneiform, providing additional structural support [12,13]. Cadaveric studies have demonstrated that the PLT is essential for maintaining the stability of the medial longitudinal arch of the foot, with its insufficiency potentially leading to structural deformities [14]. Moreover, one study showed that transecting the PLT significantly increases medial displacement of the transverse arch, resulting in complications such as an increased intermetatarsal angle (IMA) and metatarsus primus varus [15]. Some authors have further suggested that PLT insufficiency may lead to severe foot complications, resembling those observed in posterior tibial tendon dysfunction [16]. A dynamic pedobarographic study conducted in 2024 evaluated the short-term outcomes of peroneus longus tendon (PLT) harvesting and reported significant alterations in pedobarographic data compared to the non-operated side. However, no significant differences were observed in clinical scoring. The authors highlighted several limitations of their study, including the inability to perform isokinetic strength testing, the absence of gait analysis, a small sample size, and a short follow-up period [17].

Are these concerns valid? A thesis by the original group that introduced the PLT graft into clinical practice evaluated 26 of the 64 patients who underwent ACL reconstruction using this graft between 1997 and 2008. With an average follow-up period of 19.5 years, the study found no evidence of structural or functional donor site morbidity in the ankle or foot. Notably, the graft was harvested using a double-incision technique without the application of peroneus brevis tenodesis [18]. So, if there is no donor site morbidity in the long term, how can this be explained? The answer may lie in a 2008 MRI study conducted by the same research team. This study demonstrated that following the harvesting of the PLT, MRI scans revealed tendon regeneration within the tendon sheath [19]. Although it cannot be definitively stated that the regenerated tissue is identical to the original tendon, its presence suggests that the structural support provided to the ankle and foot is preserved, potentially preventing the long-term structural complications previously mentioned. Furthermore, another study highlighted the complex nature of the PLT's anatomical attachment, which extends from the cuneiform bone to both the first and second metatarsals. This anatomical complexity may contribute to maintaining structural integrity, indicating that grafting the PLT is unlikely to result in catastrophic structural damage based on this mechanism [20].

In the early postoperative period, a decrease in the active range of motion and strength parameters may be expected. However, long-term neuromuscular adaptations are likely to compensate for these impairments, ultimately restoring functional capacity [21]. Despite this, studies examining eversion strength have yielded conflicting results. While some studies report no statistically significant differences between the operated and non-operated sides, others have observed reductions in eversion torque. Nevertheless, even when eversion strength is diminished, the remaining capacity typically remains sufficient for daily activities and most sports [19, 20]. When reviewing complications associated with graft harvesting, very rare occurrences have been reported, including compartment syndrome, peroneal nerve injury leading to foot drop, and sural nerve injury [22,23]. With appropriate surgical technique and a meticulous approach, the incidence of peroneal and sural nerve injuries has been reported to be as low as 0.01% [24]. Compartment syndrome may arise from tight closure of the peroneal fascia or bleeding within the compartment. Although nerve injuries are rare, they may occur due to improper surgical technique or uncommon anatomical nerve variations. Injury to the superficial sensory nerve is also quite common with other grafting options, such as saphenous nerve injury after bone-patellar tendon-bone and hamstring tendon harvesting [25].

In conclusion, the PLT appears to be an attractive autograft option for ACL reconstruction due to its ease of harvesting, predictable size, tensile strength, and positive functional outcomes, as evidenced by existing literature [17]. Further long-term dynamic pedobarographic analyses and gait studies with larger patient cohorts are needed to define donor site morbidity after PLT harvesting better. Another area for future research involves clinical and functional outcomes as well as donor site morbidity studies in elite athletes. While the peroneus longus graft seems to be advancing as an ideal graft option, several unresolved issues remain. As with all aspects of science, time and continued research will ultimately reveal the truth.

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