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CASE REPORT

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The fasciocutaneous iliotibial band perforator flap in soft tissue and tendon reconstruction of the foot: A case report

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Abstract

In cases of large defects of the limbs, post-traumatic deformity and disability can have devastating effects on patients' quality of life. The purpose of this report is to describe the technique for raising a fasciocutaneous iliotibial perforator flap and present its application in the reconstruction of a complex soft tissue defect of the foot. The patient was a 13-year-old male who had suffered a crush injury to the foot in a motor vehicle accident 5 years earlier. Due to retraction of the skin, together with the extensor tendons of the digits, the patient could not flex the digits II, III, IV, and V. To reconstruct the defect, the authors harvested a fasciocutaneous flap based on a perforator branch of the superior lateral genicular artery and accompanying veins. The immediate postoperative course was uneventful, with progressive and complete recovery of power and range of motion in the foot and knee within 6 weeks. Despite the tendency to form hypertrophic scars again, the functionality of the operated foot was excellent 29 months after the reconstruction. According to the American Orthopedic Foot and Ankle Society scale, the patient scored 100 points on the midfoot section and 93 points on the section forefoot rays two to five. The iliotibial perforator flap could be a new tool for a state-of-the-art functional reconstruction of soft tissues defects of the limbs and head and neck.

1 | INTRODUCTION

Reconstructing the lower limb after post-traumatic defects is a complex undertaking. In recent years, perforator-based pedicled propeller flaps have become popular for covering lower extremity defects (Bekara et al., 2018). Local flaps, in general, offer several advantages: they replace like with like, have limited donor site morbidity, a reduced operating and hospitalization time and do not require microvascular anastomosis (Bekara et al., 2018; Nelson et al., 2013). However, in cases of large posttraumatic defects of the soft tissues of the limbs, local flaps and perforator-pedicled propeller flaps may not be sufficient (Bekara et al., 2018; Nelson et al., 2013). Thanks to microvascular free tissue transfer, successful limb-saving procedures and reconstructions are possible even for extensive defects (Duteille, Lim, & Dautel, 2003; Engel, Lin, & Wei, 2011). Some reports have focussed on pediatric cases (Duteille et al., 2003; Lin, Mardini, Wei, Lin, & Chen, 2006; Momeni, Lanni, Levin, & Kovach, 2017; Rinker, Valerio, Stewart, Pu, & Vasconez, 2005; Zakaria & Burezq, 2011). The latissimus dorsi free flap has been used in the reconstruction of extensive soft tissue defects of the lower extremity (Duteille et al., 2003; Rinker et al., 2005; Zakaria & Burezq, 2011). The flap is bulky and suitable for filling up cavities or augmenting volume

(Lin et al., 2006). However, it is far from ideal when the soft tissue envelope should be thin, especially if harvested as a musculocutaneous flap. Therefore, a skin graft is used to cover the muscle. Finally, the latissimus dorsi muscle lacks a thick fascia, necessary for functional reconstruction of tendons. On the contrary, fasciocutaneous perforator free flaps offer the advantages of a robust yet thin cover and the possibility of functional tendon reconstruction. Moreover, their donor site morbidity is minimal (Engel et al., 2011; Momeni et al., 2017).

The purpose of this report is to describe the technique for raising a fasciocutaneous iliotibial perforator flap and present its application in the reconstruction of a complex soft tissue defect of the foot in a patient.

2 | CASE REPORT

A 13-year old presented with an invalidating posttraumatic contracture of the extensor tendons of his right foot (Figure 1). Five years before, the patient had suffered a crush injury to the foot in a motor vehicle accident. The patient did not report any fractures; however, due to retraction of the skin together with the extensor tendons of the digits, became unable to flex the digits II, III, IV, and V. The metatarsophalangeal joints (MTP) II, III, and IV were fixed in hyperextension. A Duplex sonographic investigation of the lower limb demonstrated a perforator at the level of the lateral condyle.

FIGURE 1 (a) Preoperative situation: invalidating posttraumatic contractures of the foot. (b) Intraoperative picture after removal of the scarred tissues

A two-team approach was possible. After opening the forefoot and releasing the skin contractures, the intraoperative findings confirmed the involvement of the tendons of the extensor digitorum longus. Due to their structural damage for a length corresponding to the metatarsals, one team had to resect approximately 8 cm of the extensor digitorum longus tendons II, III, IV, and V. The authors could preserve the main proximal portion of the inferior extensor retinaculum.

A scarred skin area of 12 × 4,5 cm was also resected (Figure 1b). The authors did an arthrolysis at the MTP II and repositioned the other MTP joints without the need for an arthrolysis. The authors dissected the dorsalis pedis artery and an unnamed tributary vein of the great saphenous vein. Meanwhile, a second team harvested a fasciocutaneous flap of 12 × 4,5 cm based on a perforator branch of the superior lateral genicular artery (SLGA) and accompanying veins (Figure 2b). The artery had a diameter of 1 mm, and the veins diameter was 1,5 mm. The vascular pedicle was clipped and detached at a length of 4 cm, corresponding to the point of origin of the perforator from the SLGA (Figure 2c). A tendon interposition plasty was done, utilizing the iliotibial band (ILTB) to bridge the defects in the extensor tendons (Figure 3). The authors could re-establish an appropriate tension and position of the toes using a suitable length of ILTB. An end to end anastomosis was done, between the dorsalis pedis artery and the perforator. Similarly, the accompanying veins were joined under the operating microscope. The skin of the flap was trimmed to fit the skin defect on the foot (Figure 3b). The ILTB defect was bridged with a polypropylene mesh (Prolene, Ethicon, Somerville, MA) and subcutaneous tissues and skin were closed primarily at the donor site.

After a gradual rehabilitation, the patient could walk normally within 6 weeks. Seventeen months later, a scar excision was done at the level of the foot. However, new hypertrophic scars formed again at the level of the MTP II, III, and IV, exerting traction on the second and third digits. Nevertheless, the patient could always use fashionable shoes. At the last follow-up, 12 months after the revision surgery and 29 months after the first reconstruction, the patient denied any pain or functional limitations. The patient had full range of active motion (Figure 4b) and full power in the foot and knee allowing him to walk, run, and play football. According to the American Orthopedic Foot and Ankle Society (AOFAS) scale, the midfoot section scored 100 points, and the forefoot section (rays two to five) scored 93 points (Kitaoka et al., 1994).

3 | DISCUSSION

A perforator branch of the SLGA is the vascular base for the ILTB transplant. The SLGA is the main branch of the vascular system of the lateral femoral condyle. Wong, Buerger, Iorio, and Higgins

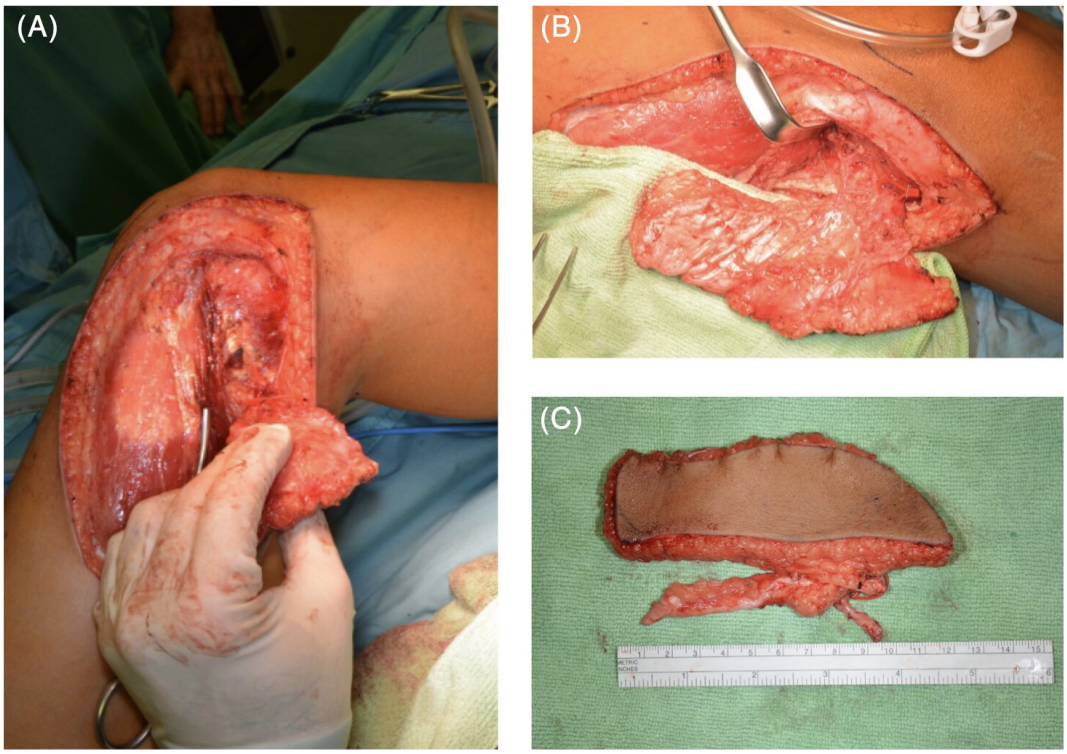

FIGURE 2 (a) Harvest of the ILTB perforator flap: overview. (b) Harvest of the ILTB perforator flap: detail. (c) ILTB flap after detachment. ILTB, iliotibial band

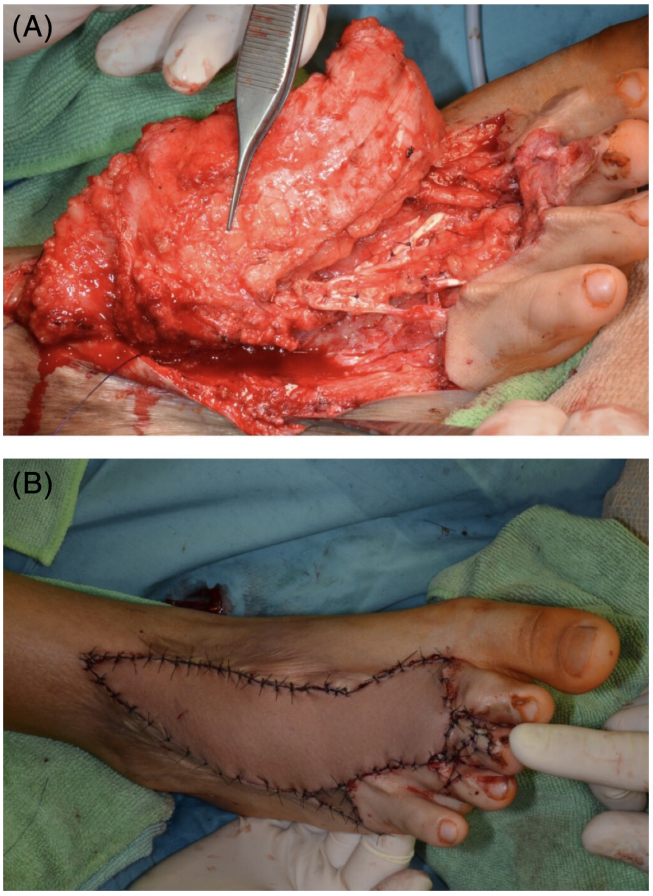

FIGURE 3 (a) Flap after tendon interposition plasty and anastomosis. (b) Flap after skin suture

(2015) investigated for the first time the vascular anatomy of the SLGA, focusing on the branches for the lateral condyle. Parvizi et al. (2016) described a branch for the ILTB originating from the superficial patellar branch of the SLGA and presented the first case of reconstruction of Achilles tendon with a vascularized ILTB flap. The SLGA is constant; however, this is not the case for its perforators (Parvizi et al., 2016). Given these anatomical variations, a Duplex sonographic investigation of the lower limb is mandatory in the preoperative workup. Jandali et al. (2018) have used the free medial sural artery perforator (MSAP) flap in a series of patients with foot and ankle defects. The MSAP is an ideal choice for small and midsize defects. However, it has some degree of donor site morbidity and lacks a strong fascia for tendon reconstruction. Lin et al. (2006) published a large series of pediatric cases, using the anterolateral thigh (ALT) flap with a segment of fascia lata for tendon reconstruction. According to these authors, in the long run, fasciocutaneous flaps outperform skin-grafted muscle flaps because of their lower rate of delayed contractures (Lin et al., 2006). The fasciocutaneous ILTB perforator flap offers the same advantages of the ALT; however, because the ILTB band is a strong thickening of the fascia lata (Drake, Vogl, & Mitchell, 2010), it could be a better option when a functional tendon reconstruction is indicated. The size of the vessels was adequate for anastomosis in this 13-year-old patient. In agreement with Duteille, the authors recommend a very gentle dissection to avoid vasospasm and damage to the vessels (Duteille et al., 2003). In case of difficulties locating a suitable perforator or damage to the vessels, the authors would suggest to close the

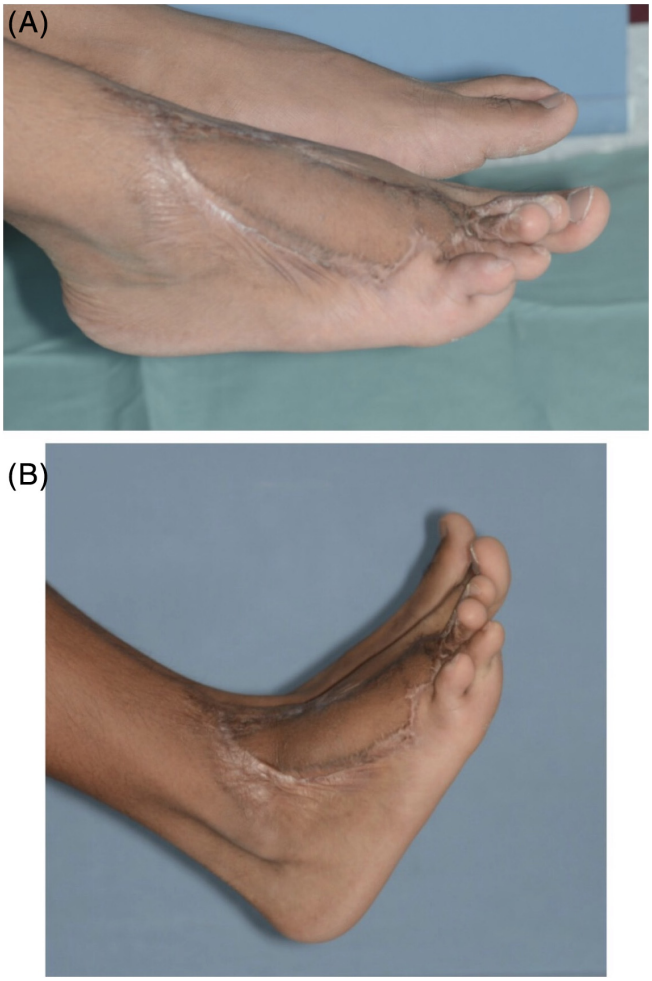

FIGURE 4 (a) Follow-up 29 months postreconstruction and 12 months post-scar revision: plantarflexion. (b) Follow-up 29 months postreconstruction and 12 months post-scar revision: dorsiflexion

incision and raise an ALT flap on the same side or to use the contralateral thigh as salvage options. A limitation of the ILTB perforator flap is the short vascular pedicle. Patil, Jayaprasad, Sharma, and Sharma (2012) reconstructed a similar defect of the foot using the gracilis tendon as a graft for replacing the extensor tendons, adding a free gracilis muscle flap, and a split-skin thickness graft to replace the soft tissue envelope. In the present case, the fasciocutaneous free perforator flap provided vascularized skin with its subcutaneous fat. The ILTB, which replaced the damaged tendons, was harvested together with its surrounding fascial envelope, allowing smooth gliding movement of the neo-tendons under the subcutaneous tissue. So far, this has been the authors' first and only case of ILTB perforator flap. A mesh was used to repair the defect in the ILTB to strengthen a potential area of weakness. The AOFAS scale confirmed an excellent foot function. To the author's knowledge, this was the first time that a fasciocutaneous ILTB perforator free flap was used in the reconstruction of the extensor tendons and the soft tissues of the foot.

The ILTB flap is thin, pliable, and yet robust, and may be ideal for functional reconstructions of the dorsum of the foot the hand, the skull base, the cheek, or the floor of the mouth.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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