INTRODUCTION

Foot drop is characterized by the inability to dorsiflex the ankle, which causes patients to drag their toes along the ground and compensate with a high step gait. It is most commonly caused by common peroneal nerve injury, typically following trauma to the neck of fibular. Given that foot drop is caused by paralysis of the muscles of the anterior compartment of the leg, loss of these muscles secondary to compartment syndrome, muscle necrosis, or oncological resection will also cause foot drop.

Foot drop causes physical disability and psychological challenges associated with difficulties walking. Patients require ankle foot orthoses to mobilize and correct gait pattern, which impede their ability to mobilize and partake in physical activity barefoot. For children in particular, this causes additional difficulties, achieving developmental milestones, partaking in recreational physical activities, and integrating with playmates at nursery and school. Furthermore, visible points of difference associated with wearing ankle foot orthoses and an abnormal gait may draw unwanted attention and lead to bullying.

Dynamic reconstruction is a powerful tool in reconstructive microsurgery. This technique is well described for reanimation of elbow flexion in brachial plexus injuries, finger flexion in Volkmann contracture, and facial reanimation in facial nerve palsy. However, dynamic reconstruction for reanimation of active foot dorsiflexion secondary to loss of the anterior compartment of the leg has never been reported in the literature.

We report the use of a free functional gracilis muscle transfer coaptated to the common peroneal nerve to reanimate active foot dorsiflexion in two children (three limbs) with foot drop secondary to loss of the anterior compartment of the leg with successful functional outcomes demonstrated by Supplemental Videos 1 and 2.

See Video 1 [online], which shows patient one 48 months after bilateral free gracilis muscle transfers for reanimation of the anterior compartment. See Video 2 [online], which shows patient two at 48 months after unilateral free gracilis muscle transfer, demonstrating walking and running freely without ankle/foot orthoses.

PATIENTS AND MANAGEMENT

Patients

Two patients (three limbs) underwent free functional gracilis muscle transfers to restore active foot dorsiflexion. Patient one was a four-year-old boy who developed compartment syndrome in both legs secondary to Pneumococcal septicemia. He developed multiorgan failure requiring a 19-day admission to the intensive care unit for renal dialysis and inotropic support. Surgically, he required defunctioning sigmoid colostomy for ischemic rectal mucosa; removal of necrotic palatine tonsils; and debridement of necrotic muscle in the anterior and lateral compartments of both legs, and the posterior compartment of the left leg. At 12 and 13 months postsepsis, he underwent bilateral reconstruction.

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Received for publication June 21, 2021; accepted November 3, 2021.

Presented at 40ème Congrès du Groupe pour l’Avancement de la Microchirurgie 2018, and European Society of Plastic Reconstructive and Aesthetic Surgeons Congress 2018.

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DOI: 10.1097/GOX.0000000000004041

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Patient two was a 9-month-old girl who underwent a wide local excision of an infantile fibrosarcoma involving the anterior tibial bundle following neoadjuvant chemotherapy. The tibialis anterior and deep peroneal nerve were excised for tumour clearance. She underwent immediate reconstruction.

Reconstructive Operative Method and Rehabilitation

Under general anaesthesia the anterior tibial vessels and common peroneal nerve were identified. A contralateral gracilis muscle flap was raised in a standard manner, dissecting the nerve proximally to the level of its origin from the obturator nerve. The muscle was secured and tensioned proximally into the lateral tibial condyle using Mitek anchors (Stryker), and woven distally into the remaining tendons. The vessels were anastomosed end-to-end with good immediate flow, and the nerve was coaptated. In the index case (patient one, right leg), a sural nerve graft was required due to extensive scarring and need for proximal dissection of the common peroneal nerve. All wounds were closed primarily. The patients were transferred to the high dependency unit overnight for routine free flap observations and discharged 3 days (median) postreconstruction.

Postoperative rehabilitation involved passive and active movement of the foot and ankle. Once some evidence of reinnervation of the transferred muscle was evident clinically fun exercises were introduced to encourage muscle strengthening, including those using afferent feedback on uneven surfaces, wobble cushions, and walking on sand.

OUTCOMES

The follow-up period was 48 months for both patients. Video assessment of the patients gait post-reconstruction was captured and analyzed at this time. Both patients achieved excellent outcomes, evidenced by good balance and independent walking, running, hopping, and jumping barefoot and without the use of ankle foot orthoses, which are demonstrated in Supplemental Videos 1 and 2. (See Video 1 [online].) (See Video 2 [online].)

CONCLUSION

In select cases of foot drop in children, early neurotized free functional gracilis muscle transfers add a reliable and robust option for long-term reanimation of foot dorsiflexion.

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