Transposition of Tibialis Anterior to the Cuboid after Tarsometatarsal Amputation

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ABSTRACT

Forefoot and midfoot amputees are prone to develop nonhealing ulcers at the closure site. This mainly occurs due to the limited dorsiflexion ability of the ankle and associated loss of protective function as seen in diabetics. One of the proposed methods to prevent these postamputation ulcers includes tendoachilles lengthening during the procedure. We describe three cases with nonhealing ulcers on the lateral aspect after a midfoot amputation. All of the cases underwent a tibialis anterior transposition to the lateral aspect of the foot to correct the deformity and at the same time also achieved healing of the ulcers.

Keywords: Amputation, Diabetic foot, Midfoot, Tendon transfer, Tibialis anterior, Transmetatarsal.

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INTRODUCTION

A diabetic patient has a 12 to 25% lifetime risk of developing a foot ulcer,¹ making it the most common cause of diabetic patients' hospitalization.² Following amputation, these patients are at risk of recurrent ulcers. Apart from decreased sensations in the foot, decreased dorsiflexion has been implicated in the cause of recurrent ulcers. The limited dorsiflexion prevents the leg from rolling over the foot during the late stance phase of gait, leading to raised plantar pressures.³⁻⁶

Tendoachilles lengthening is done for recurrent ulcers so as to increase the range of dorsiflexion that will reduce the plantar pressures, hence reducing the skin breakdown.⁴⁻⁷ In the current series, tendoachilles lengthening was not done for any of the cases. All the stumps developed nonhealing ulcers. The feet also went into supination owing to the tendon imbalance.

Based on studies by Turan,⁸ the tibialis anterior tendon was transposed to the lateral cuneiform. This transposition

not only addressed the problem of the supination deformity but also helped in promoting the ulcer healing.

MATERIALS AND METHODS

We studied three patients diagnosed with diabetic foot where all of them had undergone a transmetatarsal amputation. Postoperatively, at an average of 1 year after the procedure, these patients presented with a nonhealing ulcer at the site of wound closure. Local examination revealed a supple foot with good range of dorsiflexion at the ankle and a correctable supination deformity of the foot.

Case 1 (Figs 1A to F)

Surgical Methods

The patients were kept supine with a bump under the ipsilateral buttock. Positioning must allow exposure to medial and lateral foot and anterior aspect of distal leg. A dorsomedial incision is made over the insertion of the tibialis anterior into the navicular (Fig. 2). Pneumatic tourniquet was used in all the three cases. The insertion of tibialis anterior was sharply released from the navicular up to the periosteum to get the maximum length. A second incision was placed in the distal aspect of the anterior leg just proximal to the extensor retinaculum (Fig. 3).

The tibialis anterior tendon was brought out from the second incision. A whipstitch was used to tag the end of the tendon using No 5 polyester sutures (Fig. 4). A third incision was made dorsolaterally over the cuboid bone. The tendon was retrieved and delivered through this third incision. A guidewire was passed from the dorsolateral to plantar-medial surface of the cuboid (Figs 5 and 6); after confirming the guidewire position under fluoroscopy, the canal was reamed with a 6 mm cannulated drill bit. The prepared tendon was passed through the canal out to the plantar aspect of the foot. Then the interference screw was advanced from the dorsal to plantar surface to attach the tendon to the bone. While tightening the interference screw, maximum traction was given to the tendon and the foot was kept in dorsiflexion and eversion. The tendon was sutured to the surrounding tissue with absorbable sutures.

After irrigation, the surgical wounds were closed in layers (Fig. 7). The ankle was immobilized in a below-knee slab in eversion and dorsiflexion which after staple removal was converted to a below-knee cast for 4 weeks.

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Figs 1A to F: Nonhealing ulcer on the lateral and plantar aspect of the stump

After this period, ankle mobilization was done. The patient was kept strictly nonweight bearing for 6 weeks. When ankle mobilization was started, gradual weight bearing with restricted plantar flexion was allowed for 2 to 3 weeks. Follow-up was done at 2, 6 weeks, 3, and 6 months.

RESULTS

Postoperatively, good range of motion was retained in the ankle joint. Regular dressings were done for the ulcers in the three patients. The ulcers had completely healed in an average of 2 to 3 months following the procedure and regular dressings (Figs 8 and 9).

Fig. 2: Incision marked for the tibialis anterior tendon transfer in the supine position

Fig. 3: Incision marked for the tibialis anterior tendon transfer from the lateral aspect

Fig. 4: Tibialis tendon harvested and stitched with non absorbable suture

Fig. 5: Tendon routed through the leg and taken out in the lateral wound on the midfoot

Fig. 6: Tendon fixed with a biointerference screw

Fig. 7: Postoperative X-rays

Fig. 8: Three months after surgery the wound has healed completely—dorsal view

Fig. 9: Three months after surgery the wound has healed completely—plantar view

DISCUSSION

There are many options for treating the nonhealing ulcers. These include refashioning the stump, split transfer of the tibialis anterior, gastrocsoleus recession, and transposition of tibialis anterior to the lateral cuneiform or cuboid. Tendoachilles lengthening has been shown to reduce the risk of ulceration and improve healing of diabetic foot ulcers.⁴⁻⁷

The procedure increases the range of dorsiflexion and at the same time temporarily reduces the plantar flexor peak torque.⁶ However, in our cases, the three ankles had a good range of dorsiflexion.

After the primary midfoot amputation, the feet seemed to invert on plantar flexion due to the overactive tibialis anterior. They also developed ulceration on the

anterolateral aspect of the closure site. Since the ankles had good range of motion without any tendoachilles tightening, the senior surgeon (PM) transposed the tibialis anterior to the cuboid bone. Following the procedure, the supination disappeared while retaining the range of motion at the ankle joint. The ulcers healed in the follow-up period of around 4 to 6 months. A tendo-achilles lengthening would have increased the range of dorsiflexion, hence increasing the risk of heel ulcerations.

CONCLUSION

A tibialis anterior transposition could prove to be more effective than a tendoachilles lengthening in cases where the foot has a good range of dorsiflexion but at the same time has an inversion deformity.

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