The Impact of Prophylactic Tendo-achilles Lengthening with Transmetatarsal Amputation in Diabetic Patients

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STATEMENT OF PURPOSE

Primary aim: Retrospective study to quantify heel and forefoot wound incidence following transmetatarsal amputation (TMA) with tendo-achilles lengthening (TAL). Our secondary aim is to correlate the rates of major amputations with wound location.

LITERATURE REVIEW

Tendo-Achilles Lengthening is routinely performed in patients who undergo transmetatarsal amputation to reduce plantar forefoot pressures (Armstrong 1999, Garwood 2016). Electron microscopy has shown that the diabetes achilles tendon has abnormal changes in tendon fiber organization, having an irregular outline, smaller collagen fibrils, increased fibrillar density and adhesion (Grant 1997). With increased gastro-soleus forces, the pressures of the plantar foot changes from the hindfoot to midfoot and forefoot (Aronow 2006), decreasing joint range of motion, and increasing plantar peak pressures (La Fontaine 2008). A TAL procedure combats the mechanical advantage of the plantarflexors from the loss of the extensors. However, limited research is available on recurrence of forefoot and heel wounds after TAL. A study by Fontaine et al. (2008) showed initial ulcerations after an isolated percutaneous TAL in patients with TMA was 21%, and 35% rate of recurrent ulcerations.

METHODS

- 55 patients who underwent a TAL at the time of a TMA were identified.
- Non-pressure wounds (decubitus and ischemic ulcers, and dehiscence) were excluded.
- Data was collected on patients post TMA/TAL on rates of: wound development, time to wound development (Figure 2), and major amputation rate (below and above the knee) (Figure 3). Average follow up was 35 months (2.92 years).
- Level of Evidence: Level IV

RESULTS

Figure 1: Demographics of Entire Cohort, and patients who developed forefoot wound, heel wounds, or no wounds status post transmetatarsal amputation and tendoachilles lengthening

	Entire Cohort (n=55)	Forefoot Wound (n=8)	Heel Wound (n=10)	No Wound (n=38)
Age	61.7 (32-91) Mode:52	60..4 (32.76) Mode: 76	62.8 (50-74)	61.8 (39-91) Mode: 65
HbA1C	7.8 (4.5-15) Mode: 6.3	7.4 (4.5-9.0) Mode: 7.4	8.6 (6.3-15) Mode: 6.3	7.8 (4.7-13.5) Mode 8.3
DM	94.5% (52/55)	100% (8/8)	100% (10/10)	92.1 (35/38)
PVD	63.6% (35/55)	75% (6/8)	70% (7/10)	60.5% (23/38)
Smoker	58.2% (32/55)	50% (4/8)	60% (6/10)	57.9% (22/38)
Renal	41.8% (23/55)	50% (4/8)	60% (6/10)	36.8% (14/38)

Figure 2: Timeline of Wound Development Categorized into <3 months, 3-6 months, and >6 months

	Wound Developed in <3 months	Wound Developed in 3-6 months	Wound Developed in >6 mns
Forefoot Wound	1.8% (1/55)	3.6% (2/55)	9.1% (5/55)
Heel Wound	10.9% (6/55)	0% (0/55)	5.5% (3/55)

Figure 3: Rate of amputation status post transmetatarsal amputation and tendoachilles lengthening in entire cohort

	No Amputation	Proximal Amputation	Major Lower Extremity Amputation
Patients with forefoot wound	12.7% (7/55)	1.8% (1/55)	0% (0/55)
Patients with heel wound	10.9% (6/55)	1.8% (1/55)	5.5% (3/55)
No wound developed	58.2% (32/55)	1.8% (1/55)	9.1% (5/55)

IMAGES

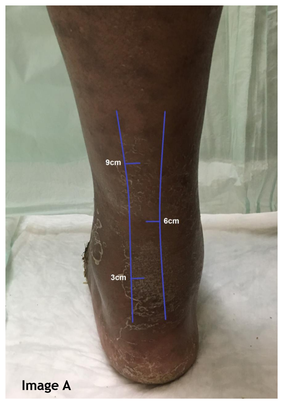

Image A


Image B

Image A: *Depiction of percutaneous incision locations for tendo-achilles lengthening. Incisions should be 3cm, 6cm, 9cm from the insertion of the achilles on the calcaneus extending proximally along the tendon, resepctively. If the heel is in varus, place the first and third cuts on the medial side. If the heel is in valgus place the first and third cuts on the lateral side.*

Image B: *Intra-operative photograph after TMA but before TAL. Foot lies at neutral position with forced dorsiflexion.*

Image C: *Intra-operative photograph after TMA and TAL. Forced dorsiflexion after TAL depicts a clear increase in maximum dorsiflexion range of motion.*


Image C

ANALYSIS & DISCUSSION

With the ultimate goal of limb preservation, evaluation of gastroc-equinus and care not to over-lengthen the Achilles tendon is essential when performing a prophylactic TAL with a TMA. Over-lenthening of the achilles tendon potentially leads to calcaneal gait, heel wounds and therefore higher risk of major lower extremity amputation (MLEA). Evaluation of gastroc-equinus in the postoperative period may show recurrent equinus leading to new forefoot wounds after TAL putting the patient at higher risk for reoperation. In this study, we aimed to correlate over lengthening after TAL to heel wound incidence and MLEA as well as recurrent equinus after TAL to forefoot wound incidence and MLEA.

This study found heel wounds occurred more frequently (10/55) postoperatively than forefoot wounds (8/55) after a prophylactic TAL with a TMA. In this cohort, 10.6% (6/55) developed a heel wound within <3 months postoperatively. We believe those heel wounds were iatrogenically created from over-lengthening since they occurred in the immediate postoperative period. With recognition, that some patients were developing wounds secondary to over-lengthening we hoped to further discover what detrimental effects this had on our patients. The overall rates of MLEA were highest at 9.1% (5/55) in the control group (no wound development). The rate of MLEA in heel wounds was 5.5% (3/55) and forefoot wounds was 0% (0/55) were both less than the control patients. In conclusion, even with iatrogenic over lengthening, TAL helps decrease the rate of forefoot wounds, and only a small portion of heel wounds progress to MLEA.

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