

STATEMENT OF PURPOSE

Primary aim: Retrospective study of a risk adjusted matched cohort to evaluate if there is an increased risk of heel ulcerations and major lower extremity amputations (MLEA) after a transmetatarsal amputation (TMA) with versus without a tendo-achilles lengthening (TAL.)

Level of Evidence: III

LITERATURE REVIEW

Tendo-Achilles Lengthening is routinely performed in patients who undergo transmetatarsal amputation to reduce plantar forefoot pressures (Armstrong 1999, Garwood 2016). A TAL procedure combats the mechanical advantage of the plantarflexors from the loss of the extensors. Electron microscopy has shown that the diabetic 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). Over-lengthening is a known complication of TAL, possibly leading to calcaneal gait, heel ulcerations, and ultimately major lower extremity amputation (MLEA). With limited prior research available, this study aims to evaluate if there is an increased risk of heel ulcerations and MLEA after a TMA with compared to without a TAL.

METHODS

- Sixty-seven patients who underwent a TMA with TAL and 39 patients who underwent a TMA without TAL (control) were retrospectively reviewed and placed into a risk adjusted matched cohort consisting of 37 patients each (74 patients total).
- Propensity scores were matched based on age, diabetes, peripheral vascular disease, smoking status and chronic kidney disease.
- Average follow up 31.9 months

RESULTS

Figure 1: Demographics of Entire Cohort, and patients who had a transmetatarsal amputation with and without a tendo-achilles lengthening

	Entire Cohort (n=106)	TMA with TAL (n=67)	TMA without TAL (n=39)
Age	61.7 (32-91) Mode:72	60.4 (32.76) Mode: 76	62.8 (40-84)
HbA1C	7.64 (3.5-15) Mode: 8.3	7.4 (4.5-9.0) Mode: 7.4	7.37 (3.5-10.5) Mode: 7.7
DM	91.5% (97/108)	100% (8/8)	87.2% (34/39)
PVD	66.0% (70/108)	75% (6/8)	76.9% (30/39)
Smoker	58.5% (62/108)	50% (4/8)	53.9% (21/39)
Renal	46.2% (48/108)	50% (4/8)	56.4% (22/39)

Figure 2: Incident of heel wounds, forefoot wounds, MLE and post operative ambulation with statistical analysis after TMA with or without TAL.

	Heel Wound Developed	Forefoot Wound Developed	Major LE amp (BKA/AKA)	Post op Ambulator
TMA without TAL	16.2% (6/37)	18.9% (7/37)	18.9% (7/37)	81.1% (30/37)
TMA with TAL	27.0% (10/37)	21.6% (8/37)	16.2% (6/37)	86.5% (32/37)
P-value	0.2587	0.7725	0.7600	0.5282

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, respectively. 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

The purpose of this study was to evaluate if, after risk adjustment, the rate of heel ulcerations and ultimately MLEA increases after a TMA with a TAL compared to without a TAL. It has become standard practice to consider a TAL when performing a TMA, often with limited preoperative evaluation of equinus or consideration of the devastating consequences of over-lengthening the Achilles. With this risk adjusted matched cohort of 74 patients we found there was no statistically significant difference in development of heel ulcerations ($p=0.25$) or incidence of MLEA ($p=0.76$) after performing a TMA with TAL compared to without. We conclude these data show performing a TAL with a TMA does not appear to increase the risk of heel ulcerations or MLEA. However, given the high rate of failure post TMA, consideration of adjunctive soft tissue procedures is an important factor in providing the greatest chance of avoiding further breakdown post operatively. Proper preoperative evaluation and post operative risk consideration should always be performed in order to correctly chose these procedures whether it be a split tibialis anterior tendon transfer, tendo-achilles lengthening or no adjunctive procedures.

REFERENCES

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