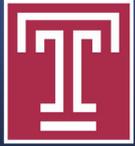


The Effect of Metatarsal Parabola Structure on Transmetatarsal Amputation Failure

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Statement of Purpose and Literature Review

Although generally considered to be both a durable and functional procedure for diabetic limb preservation, the transmetatarsal amputation in fact has high rates of complication, failure, revisional operation, and progression to more proximal amputation [1-5]. The etiology of this failure rate is likely multifactorial and attributable to some combination of impaired immune function, limb ischemia, and biomechanical structure/function.

The objective of this investigation was to determine the effect of remnant metatarsal parabola structure on clinical outcome following transmetatarsal amputation.

Methodology

A consecutive series of patients who underwent transmetatarsal amputation at an urban tertiary referral center with a limb salvage center was evaluated.

The primary outcome measure was considered the primary healing rate of the procedure at 90 days. Secondary analyses included patient demographics, frequency count of the performance of ancillary procedures (i.e. soft tissue balancing), length pattern of the remnant metatarsals relative to the metatarsal parabola, and the location of any incisional breakdown (medial vs. central vs. lateral). We considered 4 remnant metatarsal length patterns as described above.

Outcomes were considered categorical and analyzed by means of a Fisher's exact test.



We considered 4 transmetatarsal resection patterns relative to the metatarsal parabola: Type 1 (Normal parabola with the remnant 2nd metatarsal slightly longer than the 1st and 3rd with a gradual lateral taper), Type 2 (Relatively long remnant first metatarsal with a gradual lateral taper), Type 3 (Relatively long 5th metatarsal remnant without a taper), and Type 4 (Relatively short remnant first metatarsal with a relatively long second metatarsal and then subsequent gradual lateral taper).

Results

Seventy three transmetatarsal amputations in 73 patients were included in the analysis. 48 (65.7%) of these had a previous partial forefoot amputation performed prior to the complete transmetatarsal amputation while the other 25 (34.3%) were performed as the first partial foot amputation. 44 (60.3%) amputations were performed with either a tendo-Achilles lengthening or gastrocnemius recession. 48 (65.7%) were classified as a resection pattern type 1, 11 (15.1%) were classified as a type 2, 5 (6.8%) were classified as a type 3, and 4 (5.5%) were classified as a type 4. 38 (52.1%) of amputations healed primarily.

Of those amputations that did not heal primarily, 11 (35.4%) broke down along the lateral aspect of the incision, 9 (29.0%) broke down along the medial aspect of the incision, 9 (29.0%) broke down centrally, and 2 (6.5%) broke down both medially and laterally.

We observed no statistically significant difference in primary healing between those with a previous history of partial forefoot amputation prior to the completion transmetatarsal amputation ($p=0.1492$), with or without performance of a posterior compartment soft tissue lengthening ($p=0.8125$), or based on the resection pattern ($p=0.4251$; $p=1.00$; $p=1.00$; $p=0.6135$).

Discussion

As with any scientific investigation, critical readers are encouraged to review the study design and specific results and reach their own independent conclusions, while the following represents our conclusions based on the specific results. As scientists, we also never consider data to be definitive, but do think that these results are worthy of some attention and future investigation:

-These results appear to mirror the contemporary literature in terms of the primary healing rate of the transmetatarsal amputation, and did not indicate an effect of the remnant metatarsal resection length pattern, the performance of a posterior compartment soft tissue lengthening, or history of previous partial forefoot amputation on procedure outcome. This might indirectly indicate biologic, as opposed to structural, factors in the pathogenesis of procedure failure.

It is our hope that these results add to the body of knowledge and lead to further investigations into outcomes of diabetic limb preservation surgical interventions.

References

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