Progression of Single Ray Amputation to Transmetatarsal Amputation vs. Below Knee Amputation: Time Frames and Associated Comorbidities a Three Year Retrospective Study

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Introduction

Diabetic patients are generally at a higher risk for developing non-healing ulcerations of the lower extremity. It is estimated that 15% of patients with diabetes will develop lower extremity ulcerations at some point in their lifetime[1]. The overall incidence of diabetic lower extremity amputations in the United States is 195 per 100,000 per year[2]. A few of the common diabetes-related risk factors for developing ulcerations include peripheral neuropathy, vascular disease, and a history of ulceration or amputation[3].

A history of a lower extremity ulceration increases the risk for further ulceration, infection, and subsequent amputation. The best predictor of amputation is a history of previous amputation[3,4].

To our knowledge, the time frame between a single ray amputation to TMA or a BKA has not been well studied. Our aim is to study the time frame in which subsequent amputations happen to identify a "critical period" in which increased intervention may be beneficial.

Methods

The study design consists of a three-year retrospective chart review of patients who initially received a partial ray amputation, who subsequently required a TMA or a BKA. After approval was obtained by the Ochsner IRB, the research data miner was provided with the procedure codes and inclusion criteria. The charts were then further analyzed to see if they met the inclusion criteria. The inclusion criteria are displayed in Figure 3. Data was analyzed utilizing quantitative methods to determine the time frame from a single ray amputation to transmetatarsal amputation of the same limb. Data was also analyzed to determine the time frame from a single ray amputation to a below knee amputation .The comorbidities of diabetes, PAD, and end stage renal disease (ESRD) from the research patients were also included in the study for further analysis. Statistical analysis was completed utilizing SAS version 9.4. Tests were performed with significance level of α=0.05.

Results

From 2012 to 2015 there were 96 transmetatarsal amputations and 91 below knee amputations performed at Ochsner Clinic Foundation. From the patients with a history of transmetatarsal amputation, 41% (40) had previously undergone single ray amputation. From the patients with a history of below knee amputation, 25% (23) had previously undergone single ray amputation. Of the patients with a history of transmetatarsal amputation 87% (35) had diabetes, 70% (28) had peripheral vascular disease and 57% (23) had end stage renal disease. Of the patients with a history of below knee amputation 86% (20) had diabetes, 86% (20) had peripheral vascular disease and 56% (13) had end stage renal disease. Fig. 1

For the patients with a history of BKA, the comorbidities of ESRD, PVD and diabetes were all found to be statistically significant with a p value of .0001,.0068 and .0058 respectively. For patients with a history of TMA the comorbidity of diabetes was found to be statistically significant with a p value of .00029. The comorbidities of ESRD and PVD were not found to be statistically significant in patients with a history of TMA.

The average time from single ray amputation to transmetatarsal amputation was 55 days. The average time from single ray amputation to below knee amputation was 21 days. Fig. 2

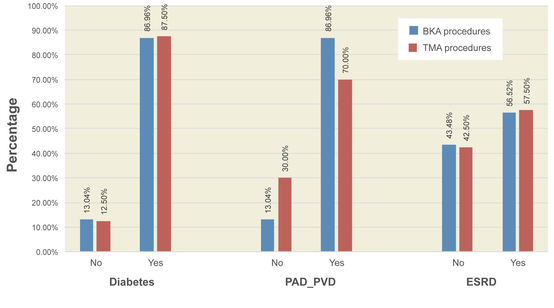

Fig. 1 Comorbidities of BKA vs. TMA patients.

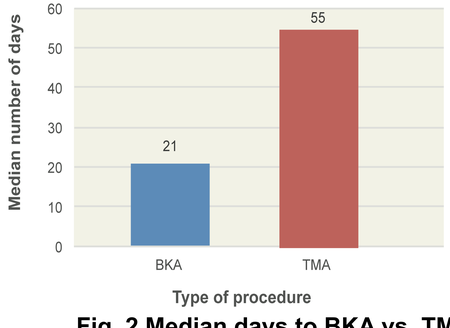

Fig. 2 Median days to BKA vs. TMA

Inclusion Criteria
Patients undergoing transmetatarsal amputation in the past 3 years of the same limb.
Patients undergoing a Below knee amputation in the past 3 years of the same limb.

Fig 3. Inclusion Criteria

Conclusions

Patients with a single ray amputation are at a higher risk for more proximal amputations such as a Transmetatarsal amputation and Below Knee amputation. The average time frame from single ray amputation to transmetatarsal amputation vs. below knee amputation could provide additional information regarding the "critical period" in which intervention is key in preventing more proximal amputation. The "critical period" for this study refers to the average time frame from a single ray amputation to a TMA vs. BKA, which were 55 days and 21 days respectively. The interventions during the critical period consist in tighter glucose control, lower extremity angiograms etc to address the underlying comorbidities of these patients. Further research is needed regarding the degree of effectiveness of these interventions and their ultimate success in limb salvage.

References

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