

# Long Term Functional Outcomes of Hallux Amputations at Various Anatomic Levels

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## ABSTRACT

**Objective:** Hallux amputations have long been used for treatment of hallux osteomyelitis as a result of ulcerations at various levels of the hallux. Prior literature has shown that partial hallux amputations are favored over total hallux amputations and might result in lower reamputation rates. The aim of this study is to assess the long-term functional outcomes in patients with various levels of hallux amputations and determine whether there is an ideal anatomic level that will limit the amount of post-operative complications.

**Research Design and Methods:** A retrospective review of 72 feet with hallux amputations performed at various levels from 2013-2017 was performed. Two years minimum follow up was required for inclusion in the study. Reulceration, further amputation and healing of index procedure were evaluated. Statistical analysis utilizing chi square analysis was performed to calculate p values where <0.05 was statistically significant. Logistic regression analysis was used to measure the relationship between independent variables on outcomes where p<0.05 was statistically significant.

**Conclusions:** Although partial hallux amputations have historically been considered more successful than full hallux amputations, our study shows that amputating at the level of the MPJ may result in the least likelihood for further reulceration/further amputation.

## INTRODUCTION

Ulcerations of the foot are a common cause of morbidity in patients with diabetes and neuropathy. Nearly one third of all diabetic foot ulcers (DFUs) occur on the plantar hallux.<sup>1</sup> These ulcerations can be difficult to heal using local wound care methods and can often be complicated by infection of the bone or soft tissue.<sup>2</sup> Infected DFUs can be limb or life-threatening and often times require a partial first ray or hallux amputation to resect the infected tissue.<sup>3</sup> Greater than 80% of lower extremity amputations are preceded by foot ulcers.<sup>4</sup> However, up to two thirds of these amputation sites develop new ulcerations within 2 years after amputation, requiring further amputation.<sup>3</sup> Hallux amputation has a detrimental effect on lower extremity biomechanics.<sup>5</sup> Removal of the hallux at the metatarsal phalangeal joint disrupts the insertion of the plantar fascia and intrinsic muscles, causing loss of the windlass mechanism and medial longitudinal arch instability. This results in transfer of weightbearing forces laterally to the lesser metatarsals, which can cause metatarsalgia, lesser MTPJ instability and deformity.<sup>6</sup> The existing published data suggest that partial hallux amputations may be more biomechanically sound in preventing further amputation.

## RESEARCH DESIGN AND METHODS

### Study Subjects

Using CPT codes 28825, 28124, and 28820, we retrospectively identified 112 subjects who underwent a hallux amputation for osteomyelitis by the Podiatric Surgery team at BIDMC from 2013-2017. Subjects were included if they had a minimum of 2 years follow up. Subjects were excluded if a concurrent procedure was performed (lesser toe amputation/metatarsal head resections, etc.) that may potentially affect reulceration/further amputation rate. Of the 112 subjects, 72 subjects met the inclusion/exclusion criteria.

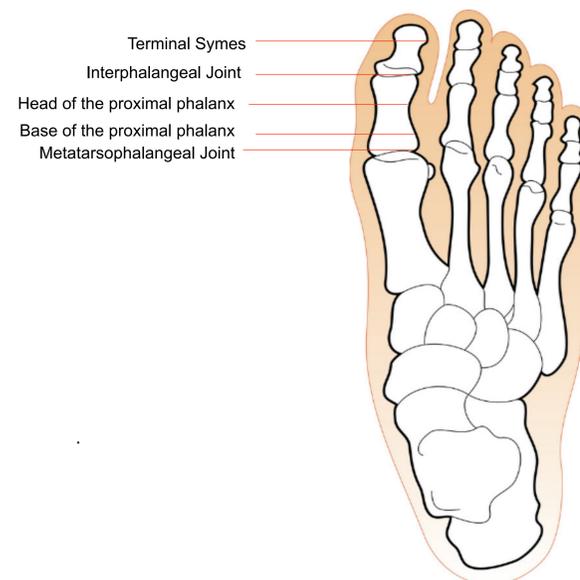
### Methods

Chart review was performed for hallux amputations performed during the mentioned time frame and of the included subjects, amputations were placed in different categories based on level of amputation. Index procedures included amputations at the level of the metatarsophalangeal joint, base of the proximal phalanx, head of the proximal phalanx, interphalangeal joint and terminal Symes. Complications for each these were assessed in terms of reulceration or more proximal amputation.

### Statistical Analysis

Chi square analysis was performed to calculate p values where <0.05 was statistically significant.

## RESEARCH DESIGN AND METHODS



## RESULTS

Table 1.

Tabulated Statistics: Level of Amputation, Reulceration/Reamputation

Rows: Level of Amputation	Columns: Reulceration/Reamputation		
	no	yes	All
Base of proximal phalanx	5	9	14
Head of proximal phalanx	12	5	17
Interphalangeal joint	6	9	15
Metatarsophalangeal joint	14	8	22
Terminal Symes	2	2	4
All	39	33	72

Cell Contents  
Count

## RESULTS

Table 2.

Tabulated Statistics: Level of Amputation, Reulceration/Reamputation

Rows: Level of Amputation	Columns: Reulceration/Reamputation		
	no	yes	All
Base of proximal phalanx	5	9	14
	35.71	64.29	100.00
	12.82	27.27	19.44
	6.94	12.50	19.44
Head of proximal phalanx	12	5	17
	70.59	29.41	100.00
	30.77	15.15	23.61
	16.67	6.94	23.61
Interphalangeal joint	6	9	15
	40.00	60.00	100.00
	15.38	27.27	20.83
	8.33	12.50	20.83
Metatarsophalangeal joint	14	8	22
	63.64	36.36	100.00
	35.90	24.24	30.56
	19.44	11.11	30.56
Terminal Symes	2	2	4
	50.00	50.00	100.00
	5.13	6.06	5.56
	2.78	2.78	5.56
All	39	33	72
	54.17	45.83	100.00
	100.00	100.00	100.00
	54.17	45.83	100.00

Cell Contents  
Count  
% of Row  
% of Column  
% of Total

Table 3.

Chi-Square Test

	Chi-Square	DF	P-Value
Pearson	5.802	4	0.214
Likelihood Ratio	5.890	4	0.208

2 cell(s) with expected counts less than 5.

## SUMMARY

In this preliminary study, we have found that hallux amputations at the level of the metatarsophalangeal joint yielded the lowest incidence of reulceration/further amputation. This is in contrast to the literature where several studies have shown that the reamputation rate was greatest with hallux amputations involving disarticulation at the first metatarsophalangeal joint. Although underlying etiologies such as long-standing peripheral vascular disease, renal disease and uncontrolled diabetes are likely similar between cohorts, the treatment regimen (off-loading, wound care etc.) following these amputations may play a key role in affecting the rate of reulceration/further amputation. The clinical significance remains unknown, and further studies with longer outcomes and a larger sample size will be necessary to evaluate whether there is an ideal level of hallux amputations.

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