

# Analyzing the Pattern of Fracture After Pedal Level Amputation

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## Background

- 20% of diabetic foot infections lead to an amputation<sup>1</sup>
- After first ray amputation, there is a high risk of additional amputation within 1 year<sup>2</sup>
- Great toe or first ray amputation disrupts foot biomechanics by creating increased plantar pressure and shifts the excessive load to the adjacent rays<sup>3,4</sup>
- A pedal fracture is not typically regarded as a common post-operative complication following amputations
- There is limited data available on occurrence of pedal fractures following amputations

## Hypothesis

- Pedal fractures are an uncommon but significant post-operative complication following foot-level amputations, with limited data available on their frequency and patterns. Patients who undergo foot-level amputations are likely to experience pedal fractures

## Method

- 8-year retrospective analysis conducted at a large tertiary healthcare system, utilizing the cohort discovery tool (DataDirect) and searching with ICD-10 codes from both inpatient and outpatient clinics
- Two cohorts identified: No fracture after amputation and fracture after amputation

### Inclusion criteria:

- 18yo of age or older
- Type 1 or 2 diabetes mellitus with or without diabetic neuropathy
- History of pedal amputations
- History of foot ulcers

### Exclusion criteria:

- Multiple comorbidities
- Autoimmune disease
- History of trauma or self injury

### Outcomes:

- **Primary:** Fracture location, laterality, and timing after pedal amputation
- **Secondary:** Offloading devices used, pattern of developing Charcot arthropathy and incidence of re-ulceration

## Results

Figure 1. Flowchart of the research process

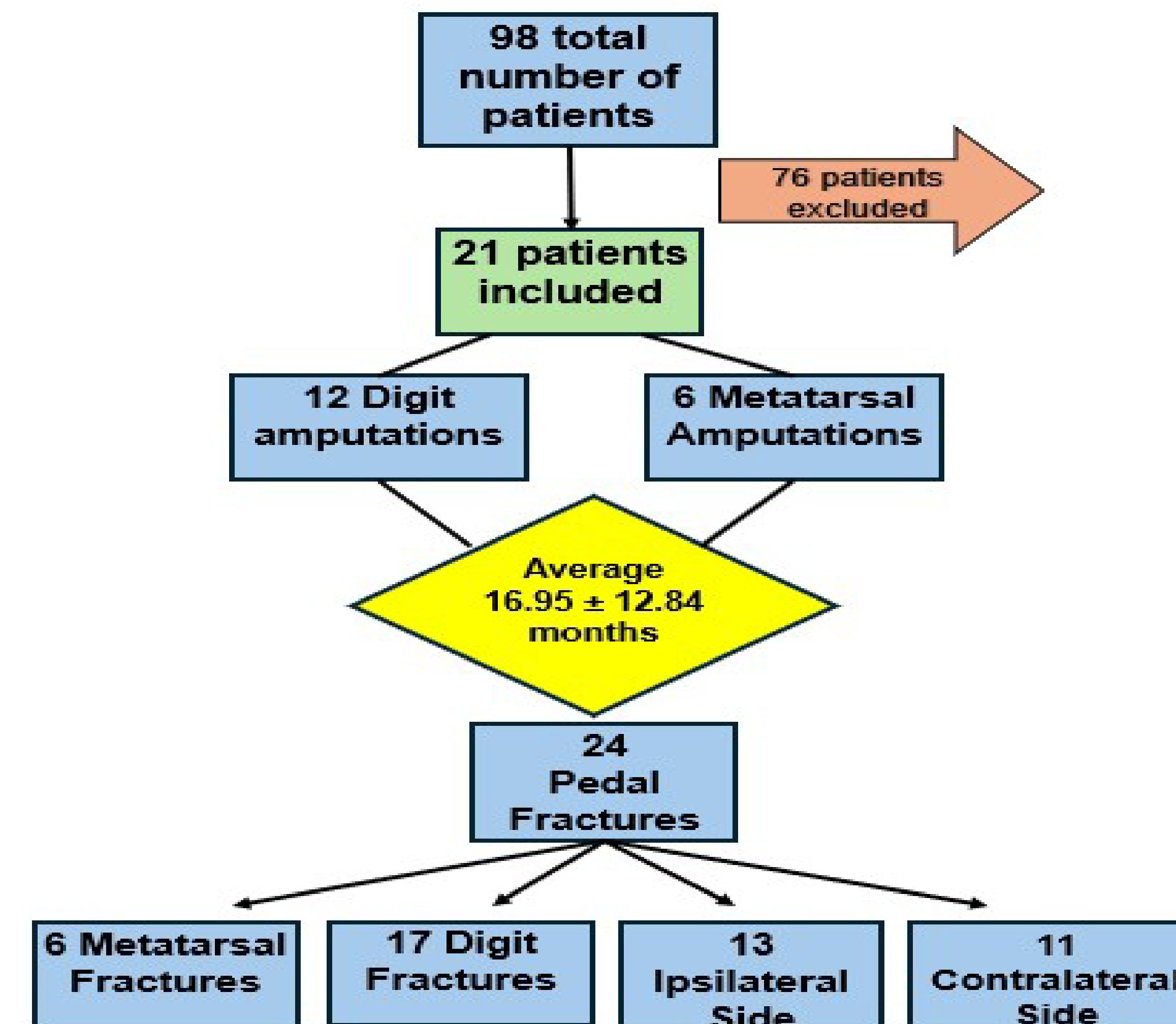


Table 1. Patient demographics and clinical characteristics between cohorts

Patient Characteristic	No Fracture n=21	Fracture n=21	p-value
Age (years), mean ± SD	55.2 ±12.6	60.7 ± 11.0	0.14
Sex, female, n (%)	6 (30)	4 (20)	0.47
Caucasian, n (%)	19 (90.4)	19 (90.4)	1.00
Type 2 Diabetes, n (%)	9 (40)	11(55)	0.52
Cardiovascular, n (%)	13(62)	15(71)	0.66
Renal (CKD), n (%)	13(62)	15(71)	0.66
Vascular (PAD), n (%)	8(40)	8(40)	1.00
Infection, n (%)	15 (57)	15 (33)	0.21
Re-ulceration, n (%)	11 (50)	13 (60)	0.76
HbA1c (%), mean ± SD	7.17 ± 1.7	7.89 ± 2.1	0.24
Vitamin D (ng/ml), mean ± SD	30.64 ± 14.0	30.6 ± 15.7	0.78
Calcium (mg/dL), mean ± SD	9.13 ± 0.8	9.18 ± 0.6	0.82

## Analyses

- Cohorts were compared with Fischer's exact test (categorical) and paired t tests (continuous). An alpha ≤ 0.05 was used for statistical significance.

## Discussion

- 54% of patients had fractures on the ipsilateral side of the amputation
- Likelihood of additional amputation to the ipsilateral or contralateral extremity within 4 years is 50%<sup>5</sup>
- Fracture occurred after amputation at an average of **17 months**
- 33% of the fractures were **great toe amputations** and fractures most frequently occurring on the ipsilateral side, which can be related to the changes of biomechanics
- Recurrence of ulceration after amputation occurred **60%** of the patients
- Ipsilateral reulceration rate of 43.8% amongst patients with partial first ray amputation<sup>6</sup>
- There were **no** notable differences in comorbidities or bone density outcomes associated with evaluating vitamin D and calcium between the two cohorts

### Limitations:

- Retrospective review
- Incomplete data to evaluate the correlation between bone density, offloading device, and fracture incidence
- Small patient population

## Conclusion

- Individuals who undergo pedal amputations have a **likelihood of fractures**
- **Great toe amputations** resulted in the most fractures, which most often occurred on the **ipsilateral side**
- Future prospective research to evaluate the use of post-operative offloading devices after amputation and correlate with the incidence of fracture development

## References

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