Toe Fractures: Demographics and Management of a Common Digital Injury

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Purpose

Although common, toe fractures are often dismissed as trivial despite the propensity to lead to significant pain and disability when improperly managed. The goal of the current study was to analyze patient demographics and fracture characteristics of isolated toe fractures in a level 2 trauma center while reviewing patient referrals and follow-up treatments within our institution's podiatry clinic.

Literature

Toe fractures are the most common fractures of the forefoot and have a reported incidence of 14 to 39.6 cases per 10,000 persons per year[1-2]. All together, these injuries represent approximately 9% of fractures treated in a primary care setting[3-5]. Unfortunately, there is little evidence-based literature on fracture management guidelines of toe fractures. Most recently, Eves et al. had evaluated toe fractures over a 12-month period which suggested fractures that were open, had >2 mm of displacement or with intra-articular involvement needed follow-up and referral to a specialist[6]. Furthermore, they revealed <2% of the referrals required surgical intervention[6].

Methodology and Procedure

There were 242 patients included in this study diagnosed with an isolated toe fracture that presented to the emergency department (ED) within a two-year period. Exclusion criteria included patients with the following: multiple simultaneous toe fractures, concomitant fractures or injuries of the lower extremity, had previously received fracture care, and those without radiographs. Demographic data (gender, age and injury laterality), mechanism of injury, ED treatment provided, and whether a podiatric follow-up was scheduled was extracted from electronic medical records. Radiographic fracture assessment was independently performed by the lead authors (M.K.M, K.L.I). Fracture characteristics analyzed included the following: digit injured, phalanx involved, presence of fracture comminution, distance of displacement (0, <2mm, 2 to 5mm or >5mm), degree of angulation (0 degrees, <20 degrees or >20 degrees), involvement of the articular surface, and whether the injury was open or closed. We analyzed the proportion of patients who had a scheduled podiatric follow-up and determined whether they cancelled their appointments. Of the patients who were seen in the podiatry department, their clinic notes were reviewed to determine if the providers rendered any additional treatments or recommendations that differed from the ED encounter.

Table 1. Patient Demographics

Demographic	Patients
Gender	
Female	148 (61.2%)
Male	94 (38.8%)
Laterality	
Left	122 (50.4%)
Right	120 (49.6%)
Mechanism of Injury	
Crush	56 (23.1%)
Fall	18 (7.4%)
Hyperflexion	7 (2.9%)
Stubbing	146 (60.3%)
Trauma	5 (2.1%)
Twisting	7 (2.9%)
Unknown	3 (1.2%)
Digit Fractured	
Hallux	87 (36%)
Second digit	23 (9.5%)
Third digit	16 (6.6%)
Fourth digit	31 (12.8%)
Fifth digit	85 (24%)

Table 2. Toe Fracture Characteristics

Characteristics	Patients
Fracture Pattern	
Simple	179 (74%)
Comminuted	63 (26%)
Fracture Displacement	
0mm	186 (76.9%)
<2mm	37 (15.3%)
2-5mm	18 (7.4%)
>5mm	1 (0.4%)
Fracture Angulation	
0 deg	220 (90.9%)
<20 deg	17 (7%)
>20 deg	5 (2.1%)
Articular Involvement	
Intra-articular	78 (32.2%)
Extra-articular	164 (67.8%)
Open vs. Closed Injury	
Open	21 (8.7%)
Closed	221 (91.3%)

Abbreviations: mm, millimeter; deg, degree

Table 3. Emergency Department Treatment and Podiatry Clinic Follow-Up

Treatment Plan	Patients
ED Treatment	
Conservative Cares	
RICE/Buddy Tape	203 (83.9%)
Minor Procedure	
Closed Reduction	13 (5.4%)
Laceration Repair	17 (7%)
Nail Avulsion	7 (2.9%)
Trephination	3 (1.2%)
Surgery	
ORIF	4 (1.7%)
Amputation	2 (0.8%)
Podiatry Clinic Follow-Up	
Not Scheduled	98 (40.5%)
Scheduled	144 (59.5%)
Completed	117 (81.3%)
Cancelled/No-Show	27 (18.7%)
Podiatry Follow-Up Treatment	
Post-Surgical/Procedural Cares	40 (34.2%)
No Change in ED Plan	77 (65.8%)
Change in ED Plan	6 (5.1%)
Surgery	3 (50%)
Other	3 (50%)

Abbreviations: ED, emergency department; ORIF, open reduction internal fixation; RICE, rest/ice/compression/elevation

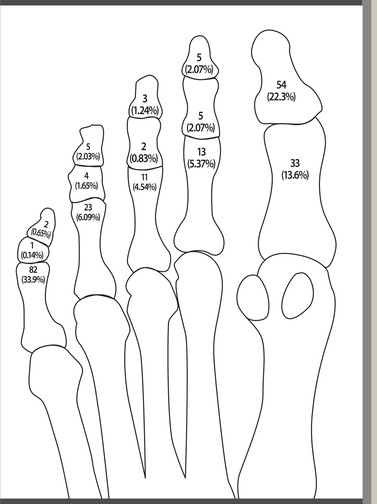

Figure 1. Frequency and Distribution of Toe Fractures (n = 242).

Results

Patient demographics are reported in Table 1. There was a female predominance (61.2%) and a mean patient age of 39.9 years at the time of injury. No predilection for right (49.6%) or left (50.4%) feet was established. In regards to the mechanism of injury, stubbing injuries accounted for 60.3% of fractures followed by crush injuries (23.1%). The hallux was the most frequently fractured digit (36%) and the proximal phalanx of the 5th digit was the most commonly fractured phalanx (33.9%) (Figure 1). Toe fracture characteristics are summarized in Table 2. A majority of fractures were simple (74%), extra-articular (67.8%), and non-displaced (76.9%). Emergency department treatment and podiatry clinic follow-up results are reported in Table 3. A total of 144 (59.5%) patients were scheduled follow-up at our institution's podiatry clinic, which included all 40 patients who underwent surgery or a minor procedure provided in the ED. There was an overall follow-up cancellation rate of 18.7%. Of the patients that presented for follow-up, only 3 patients (2.1%) eventually required non-emergent surgical intervention.

Analysis and Discussion

The demographics of our study largely confirm those found in other toe fracture literature. Our results demonstrated that the hallux was the most frequently fractured digit and the proximal phalanx of the 5th digit was the most frequently fractured phalanx. These findings were also consistent with those reported by Vliet-Koppert et al. in a recent toe fracture demographic study[1]. Similarly, our study also confirmed that a sagittal plane stubbing was the most common mechanism of injury encountered[3].

The results of our study may demonstrate that the conservative cares initially offered by ED providers (e.g. rest, ice, compression and elevation, weightbearing in a surgical shoe and/or buddy taping the affected digit) may negate the need for further specialty referral. Excluding the 40 patients that required follow-up from post-procedural cares, of the 144 referrals made from the ED to the Podiatry Clinic, only 6 patients (5.8%) had received additional treatments than those originally provided through the ED. Three of these patients eventually required surgery (1 fracture fragment excision, 1 open reduction internal fixation of a phalanx fracture and 1 terminal symes amputation), 1 required a repeat closed reduction, 1 required a nail avulsion, and 1 patient was provided a referral to the Physical Medicine and Rehabilitation department. These results indicate that, aside from post-procedural cares, the vast majority of patients referred from the ED to the Podiatry Clinic for an isolated toe fracture will not require any additional treatments than those originally provided through the ED.

We recognize several limitations to the current study. Our patient population only included those with isolated toe fractures, thus the implications of our report may not be applicable in cases of polytrauma. Our data was extracted from medical records as well as through diagnosis codes entered by ED providers which may pose a potential bias. Future studies should aim to better delineate which fracture patterns necessitate specialist follow-up to help guide appropriate referrals.

References

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