

Original Article

Post-traumatic hallux valgus with lateral metatarsal injuries: management and short-term results

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Abstract

Objective: Describe the epidemiology, treatment, and clinical and radiographic results of traumatic hallux valgus associated with lateral metatarsal injuries.

Methods: Clinical and radiographic evaluation (hallux valgus angle) of seven patients who suffered traffic accidents and presented post-traumatic hallux valgus associated with lateral metatarsal injuries. Radiographic measurements and clinical functional outcomes were evaluated with a minimum 12 months of follow-up.

Results: All patients were submitted to medial ligament repair to treat post-traumatic hallux valgus and fixation of the associated fractures. In a minimum 12 months of follow-up, the patients evolved well, without pain, with a mean hallux valgus angle of 13.7 degrees.

Conclusion: Cases of post-traumatic hallux valgus associated with lateral metatarsal injury, treated with ligament repair and fixation of associated fractures, showed radiographic improvement and maintained until the final evaluation after 12 months of follow-up.

Level of Evidence IV; Therapeutic Studies; Case Series.

Keywords: Posttraumatic; Hallux; Valgus; Deformity; Surgical repair.

Introduction

Hallux valgus deformity is the most common problem in the forefoot of adults⁽¹⁾. Trauma is often cited as a cause, but few studies detail the characteristics of this type of hallux valgus⁽²⁻⁹⁾. Traumatic hallux valgus can be divided into two types: isolated and associated with fractures of the other metatarsal bones.

In isolated traumatic hallux valgus, only the first ray is involved. Sports trauma is primarily responsible for these injuries. The term “turf toe” was described by Bowers and Martins in 1976⁽¹⁰⁾ and has since gained more attention among doctors, coaches, and athletes. There is a mechanism of hyperextension of the metatarsophalangeal joint of the hallux with an injury of the plantar plate. In cases where a valgus force component is associated with hyperextension, there is also injury to the medial collateral ligament, leading to the

development of hallux valgus. Thus, isolated traumatic hallux valgus is a variant of the “turf toe,” a sprain of the hallux with injury to the medial collateral ligament.

In associated traumatic hallux valgus, trauma also causes minor injuries in the lesser toes, presenting neck/head fractures of the second to fifth metatarsals. It can present as dislocations of the corresponding metatarsophalangeal joints or as fractures of the phalanges.

The etiology and epidemiology of traumatic injuries of the first metatarsophalangeal joint have been poorly documented in the literature. Only a few reports describe such injuries and the types of treatments.

Weight-bearing radiographs in frontal and lateral profiles are indicated to diagnose traumatic hallux valgus. In addition, an investigation of sesamoids should be performed with the hallux in hyperextension. When there is an injury to the medial

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collateral ligament, the tibial sesamoid tends to assume a more distal position in relation to the fibular sesamoid. Magnetic resonance imaging (MRI) may be required in cases of suspected ligament injury.

The objective of the study is to describe the epidemiology, treatment and radiographic results of traumatic hallux valgus associated with lateral metatarsal injuries treated in a tertiary hospital in the countryside of Sao Paulo state, Brazil.

Methods

A retrospective study including patients with foot trauma presenting acute post-traumatic hallux valgus and associated injuries. The study was approved by the Institutional Review Board under the number 72626123.4.0000.5451.

It was included in the study patients who suffered post-traumatic hallux valgus (“turf toe” + medial collateral ligament injury) associated with lateral metatarsal injuries submitted to surgical treatment with a minimum 12 months of follow-up. Cases of “turf toe” without ligament injury and those who lost follow-up were excluded from the study. Among the 12 patients, only seven (five men and two women) met the inclusion criteria (Table 1).

Hallux valgus angle was evaluated on preoperative radiographs and compared with the immediate postoperative and the last outpatient follow-up (minimum 12 months). Only the final radiographs were performed with weight-bearing. All measurements were performed by the two foot and ankle surgeons who conducted the service’s outpatient clinic.

The clinical evaluation was performed through questionnaires on pain, return to pre-injury activities without restrictions, and degree of range of motion. The clinical evaluation was subjective and performed by the same surgeons who performed the radiographic measurements.

The majority of the associated fractures were at the neck of the second to fifth metatarsals with or without the

involvement of the heads, and one of the cases had an associated fracture at the neck of the second metatarsal with a fracture at the base of the fifth metatarsal.

The surgical treatment varied according to the associated injuries. One case had an open fracture of the metatarsals with lateral dorsal degloving of the foot. The first metatarsophalangeal joint was always approached medially, and ligament repair was performed with anchors (four cases) or transosseous sutures according to the availability of materials at the time of surgery. The neck fractures of the lesser metatarsals were fixed with 1.5 mm Kirshner wires (five cases, two of which were percutaneous). Two cases also presented head fractures of the lesser metatarsals with a high degree of comminution. They were submitted to head resection by two dorsal routes on the second and fourth metatarsals.

To change the dressing, all patients had an outpatient follow-up with weekly visits in the first three weeks after surgery. In the third week, the sutures were removed. All patients were immobilized with a splint for at least six weeks. In the sixth week, the immobilization was removed, and front, lateral, and oblique radiographs were taken with no weight-bearing. Progressive weight-bearing was released from the eighth week when the Kirshner wires were removed. In the twelfth week, new radiographs were taken. The next follow-ups occur after six and 12 months. The open fracture cases required more detailed care with more frequent outpatient visits but had no complications.

Results

Between 2018 and 2021, 12 patients with traumatic injury to the first metatarsophalangeal joint, associated with fractures of the lateral metatarsals, were admitted to the hospital’s emergency room. Among these patients, seven were submitted to surgical treatment and outpatient follow-up (Figures 1, 2 and 3).

The mean age of 12 patients was 38 years and six months (range 20 to 63 years). The most frequent trauma mechanism was a motorcycle accident (seven cases). The left side was affected in four of the seven cases operated.

The mean hallux valgus angle after trauma was 24.3°. The lowest angle was 20° and the highest 32.2°; the standard deviation was 4.3.

Hallux valgus angle was also measured in the immediate postoperative radiographs. The mean angle was 10.5°, the highest angle was 18° and the lowest 2.7°; the standard deviation was 5.84°. A mean correction of 13.8° was observed in the immediate postoperative compared to the preoperative radiographs. Twelve months after surgery, the measurement ranged from 2.7° to 20.1°, with a mean of 12.5°. In the twelve-month evaluation, a mean loss of 2.1° of correction was observed but not statistically significant ($p < 0.05$) (Table 2).

Five of the seven patients are completely asymptomatic and have resumed their activities without further restrictions. Two patients complaint of residual edema and metatarsophalangeal stiffness of the hallux and the lesser toes.

Table 1. Demographic data

	Sex	Age	Trauma mechanism	Associated injuries
1	M	37	Motorcycle accident	Neck fracture from the second to fifth metatarsal (right)
2	M	33	Motorcycle accident	Neck fracture in the second metatarsal (right)
3	M	35	Motorcycle accident	Neck fracture from the second to fifth metatarsal (left)
4	F	44	Motorcycle accident	Fracture of the base of the fifth metatarsal and neck fracture of the second and third metatarsals (left)
5	M	20	Motorcycle accident	Neck fracture from the second to fifth metatarsal (left)
6	M	40	Motorcycle accident	Neck fracture from the second to fourth metatarsal (right)
7	M	24	Motorcycle accident	Neck fracture from the second to fifth metatarsal (left)



Figure 1. Case 6 – preoperative radiograph. Patient with previous amputation of the middle and distal phalanx of the fourth toe not related to the trauma studied.



Figure 3. Case 6 – 12 months postoperative radiograph.



Figure 2. Case 6 – immediate postoperative radiograph.

Table 2. Measurements of hallux valgus angle

	Hallux valgus angle		
	Preoperative	Immediate postoperative	12 months postoperative
1	21.7°	15.0°	20.1°
2	25.7°	2.7°	2.7°
3	20.0°	8.0°	9.0°
4	20.0°	18.0°	18.0°
5	25.0°	15.0°	15.0°
6	25.3°	10.8°	18.7°
7	32.2°	4.1°	4.1°

Discussion

Post-traumatic hallux valgus is an uncommon condition with few reports in the literature⁽⁸⁾. It usually develops progressively after a sprain of the hallux (“turf toe”) associated with injury to the medial collateral ligament⁽⁷⁾. Descriptions of post-traumatic hallux valgus associated with fracture of the lateral metatarsals are scarce; only a few case reports were found in the literature^(2,5). We reported a case series including seven patients who presented with deformity of the first metatarsal on the initial radiographs, all associated with lateral metatarsal injuries (head or neck fractures).

Bohay et al. in 1996⁽⁵⁾ described a case series of post-traumatic hallux valgus associated with Lisfranc dislocation fracture, and the deformity developed progressively. All cases in our study had the valgus deformity already in the acute phase, and none had an injury in the Lisfranc joint (Figure 4).

In most of the descriptions in the literature, post-traumatic hallux valgus is related to sports trauma^(3,6,7,9,10). Our cases were more severe injuries, with trauma to the entire forefoot caused by motorcycle or car accidents.

Lui, in 2013⁽⁸⁾, described a case of acute post-traumatic hallux valgus in a 45-year-old patient with a history of car accident associated with head dislocation from the second to fifth metatarsals. The author chose to fix only the lateral metatarsals, reported a spontaneous reduction in hallux valgus, and suggested avoiding unnecessary manipulation

of the first metatarsal when possible. In our series, the first metatarsal was always addressed, with medial ligament repair with anchors or transosseous sutures. Only two evolved with metatarsophalangeal stiffness in the postoperative follow-up. We believe that this ligament repair was responsible for maintaining the correction in the follow-up of our patients, and we suggest performing the repair whenever possible.

There was great head comminution of the lesser metatarsals in two of our patients, and we opted for acute head resection. These patients had a similar evolution to the other cases. We did not find descriptions of head resection of the lesser metatarsals in the literature, but the few reports of traumatic hallux valgus with associated injuries addressed the injuries with reduction and fixation⁽⁸⁾.

The scarce descriptions in the literature present case series but do not evaluate any radiographic evolution of hallux valgus. The angle was measured in the preoperative, immediate postoperative, and 12 months of follow-up.


The study has limitations, such as the small sample, which was evaluated retrospectively. Also, the ligament repair was not always performed in the same manner, and the criterion was the availability of materials. Our clinical evaluation was subjective, and no functional clinical evaluation scale was applied; therefore, we could not conclude that there was clinical improvement. In addition, the outpatient evaluation was performed only by one surgeon, which was different from the measurements performed by two surgeons. Another important limitation is that the preoperative and immediate postoperative were performed without weight-bearing. It was emphasized that the comparison of measurements involved radiographs with and without weight-bearing, which can generate a bias in the final results. On the other hand, we believe that our case series of acute post-traumatic hallux valgus associated with lateral metatarsal injuries is the only one presenting radiographic evaluations with a minimum 12 months of follow-up. More cases and a longer follow-up time using functional clinical scales are necessary to assess the need for ligament repair in cases of post-traumatic hallux valgus associated with lateral metatarsal injuries.



Figure 4. Case 1 – preoperative radiograph.

Conclusion

Cases of post-traumatic hallux valgus associated with lateral metatarsal injury, treated with ligament repair and fixation of associated fractures, showed radiographic improvement and maintained until the final evaluation after 12 months of follow-up.

Authors' contributions: Each author contributed individually and significantly to the development of this article: MHS *(<https://orcid.org/0000-0001-7969-0515>), and JMPB *(<https://orcid.org/0000-0002-5280-1673>) conceived and planned the activities that led to the study, performed the surgeries, interpreted the results of the study, participated in the review process, bibliographic review, clinical examination, approved the final version; LNSP *(<https://orcid.org/0000-000-3711-0695>) data collection, statistical analysis, formatting of the article; EPP *(<https://orcid.org/0000-0008-0677-5188>), and MHM *(<https://orcid.org/0009-0009-4927-3097>), and FQT *(<https://orcid.org/0009-0007-7182-5965>). formatting of the article, data collection, formatting of the article, clinical examination. All authors read and approved the final manuscript.*ORCID (Open Researcher and Contributor ID) 

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