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Original Article

Peripheral talus fractures: epidemiology and short-term outcomes

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Abstract

Objective: To present the epidemiology and assess short-term clinical and radiological outcomes of peripheral talus fractures treated between 2013 and 2019 at a secondary hospital.

Methods: This is a retrospective study based on a series of 21 cases of peripheral talus fractures. Out of these 21 cases, 11 underwent functional assessment using the ankle-hindfoot scale of the American Orthopaedic Foot and Ankle Society (AOFAS) and radiological assessment after a mean period of 24.5 months.

Results: Regarding the epidemiology of the 21 reported cases, the mean age was 28.7 years and 76.2% of the patients were male. The left foot was affected in 71.4% of the cases, and the most frequent type of trauma was motorcycle accident (47.6%); 23.8% of the cases had open fractures. Complete peritalar dislocation occurred in 38.0% of the cases and the most common fracture was that of the lateral process of the talus, in 42.8% of the cases. Eleven patients returned for reassessment and presented a mean AOFAS score of 80.9 points. All fractures were consolidated at the moment of assessment, and one of them progressed to subtalar and talonavicular osteoarthritis, requiring triple arthrodesis.

Conclusion: The peripheral fractures studied here were caused by high-energy traumas with open fractures in one-quarter of the cases and were frequently associated with other fractures. The short-term functional outcome is good but has potential for severe complications such as stiffness and persistent pain.

Level of Evidence IV, Therapeutic Studies; Case Series.

Keywords: Talus/injuries; Ankle Fractures/diagnostic imaging; Fractures, bone/epidemiology; Treatment outcomes.

Introduction

Peripheral talus fractures affect the following segments of the talus: head, middle facet, and lateral, posterolateral, and posteromedial processes[1]. Overall, talus fractures are rare and comprise less than 2.5% of all fractures[2]. An incidence of only 4.6 cases per year was observed at a tertiary hospital in the city of São Paulo[3].

Among peripheral talus fractures, the lateral process fracture is the most frequent and has snowboarding accidents as its main cause. These fractures are overlooked in around 33% of initial assessments and present better functional outcomes when treated surgcally[4,5].

Literature on fractures of the posteromedial process of the talus and the talar head is based on limited case series and there are no significant conclusions regarding the best treatment[6,7].

Posterolateral process fractures usually have hindfoot stiffness and mild pain during physical activities as after effects[2].

The aim of the present study is to present the epidemiology and short-term clinical and radiographic outcomes of peripheral talus fractures treated between 2013 and 2019 at a secondary hospital in an inland city of the state of São Paulo.

Study performed at the Hospital Municipal Dr. José de Carvalho Florence, São José dos Campos, São Paulo, Brazil.

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Methods

This is a retrospective, single-centered, case series study and was approved by by the Institutional Review Board and registered on the Plataforma Brasil database under CAAE (Ethics Evaluation Submission Certificate) number: 19163819.8.0000.5451.

We selected adult patients (over 17 years old) who received treatment due to peripheral talus fractures between 2013 and 2019. All patients signed a free and informed consent form.

All cases in this study were treated and followed up by the hospital's Foot and Ankle Group, which consists of 4 specialist physicians accredited by the Brazilian Association of Medicine and Surgery of the Ankle and Foot, in addition to a physician in training in this specialty. The diagnosis of peripheral fractures was based on radiographic images and complemented by computed tomography images in all cases. Surgical treatment, when applicable, was performed by the 2 most experienced members of the Group and was based on the guidelines summarized by Berkowits et al. Small extra-articular avulsions, fragments measuring less than 1cm with displacements of less than 2mm, and non-displaced fractures were treated conservatively. Large fragments with articular displacement were treated with reduction and osteosynthesis. Simple resection was an option for large, comminuted fractures that did not allow fixation[8]. All cases were postoperatively followed up in an outpatient basis at the hospital by members of the Foot and Ankle group.

The epidemiology study was performed through the assessment of the following variables: age, sex, associated diseases, trauma mechanism, and fracture type.

Patients with at least a year of treatment follow-up were selected and underwent functional and radiographic assessment of the affected foot. Functional assessment was performed according to the ankle-hindfoot scale of the American Orhtopaedic Foot & Ankle Society (AOFAS); results varied from 0 to 100 points, and the higher the result, the better the outcome[9]. At the radiographic assessment, the following criteria were analyzed: fracture consolidation, signs of osteoarthritis on the ankle and hindfoot joints (considering joint space narrowing in weight-bearing radiography), and complications such as osteonecrosis (due to bone sclerosis) and disuse osteopenia, without applying a specific classification for each of them. Both assessments were performed by the Foot and Hindfoot Group after patient recruitment by the hospital. During the visit, radiographic images of the foot and ankle were updated, and the functional assessment scale was applied.

Results

Twenty-one patients with peripheral talus fractures were treated between November 2013 and March 2019. Of these, 11 had functional and radiographic assessments performed according to the methodology proposed by this study and 10 were not available for the final assessment but were included in the study's epidemiological assessment. The characterization of cases and treated fractures was performed with all 21 patients and is described in the following paragraphs.

Mean age was 28.7 years (minimum 17, maximum 48); 16 patients (76.2%) were male and 5 (23.8) were female. The left foot was affected in 15 (71.4%) patients and the right foot, in 6 (28.6%) cases. The most common trauma mechanism was motorcycle accident, in 10 (47.6%) cases, followed by fall from height in 5 (23.8%) cases, sprain in 4 (19.0%) cases, and bicycle and car accidents in 1 case each (4.8%).

Eight (38.0%) patients had complete peritalar dislocations associated with the fracture, of which 5 (62.5%) were medial and 3 (37.5%) were lateral. Five patients (23.8%) had open peripheral talus fractures. Fractures of the lateral process of the talus were the most common, in 9 (42.8%) cases, followed by posteromedial process fractures in 8 (30.8%) cases, posterolateral process fractures in 5 (23.8%) cases, talar head fractures in 5 (23.8%) cases, and middle facet fractures in 2 (9.6%) cases, totaling 29 fractures. Six patients had more than one type of concomitant peripheral talus fracture. Associated fractures in the ankle and ipsilateral foot regions were found in 7 (33.3%) patients; 3 patients had more than 1 type of fracture. The diagnosed fractures were: cuboid (3 cases), sustentaculum tali (2 cases), metatarsus (2 cases), navicular (1 case), anterior process of the calcaneus (1 case), and lateral malleolus (1 case).

When considering only the 11 patients who underwent final functional and radiographic assessments, the mean follow-up period was 24.5 months, with a minimum of 12 months and a maximum of 63 months. The distribution of fractures and treatments performed in this group is exhibited in table 1. Overall, 16 fractures (6 fractures of the lateral process of the talus, 3 of the posterolateral process of the talus, 3 talar head fractures, and 2 middle facet fractures). Three patients had complete peritalar traumatic dislocation associated with the fracture. Ten fractures were surgically treated, of which 7 were treated by reduction and osteosynthesis and 3, by resection of the fractured fragment. The other 6 fractures were treated conservatively.

The AOFAS score varied between 22 and 100, with a mean value of 80.9 points (median 84.4; standard deviation 22.7). All fractures were consolidated at the moment of assessment, and we did not evaluate time to consolidation. There were no cases of tibiotalar osteoarthritis, 2 cases progressed to subtalar osteoarthritis, and 1 case presented talonavicular osteoarthritis. There were no cases of talar necrosis and only 1 case of disuse osteopenia at final assessment (Table 2). One case required a triple arthrodesis due to stiffness and persistent pain.

Discussion

In this study, the left foot was affected in 71.4% of the patients, which was similar to results found by von Knoch et al.[10]. We attempted to correlate this finding with motorcycle accidents as the trauma mechanism, since a fixed left foot is required for shifting gears, but the distribution of cases among those who suffered this type of accident was of 6 fractures of the left foot vs 4 of the right foot (p=0.08 according to Fisher's exact test), thus not showing a statistically significant difference.

Table 1. Study of cases and fractures of patients who underwent final functional and radiographic assessments

Case	Age	Sex	Side	Trauma mechanism	Open fracture	Peritalar dislocation	Treatment of dislocations	Type of fracture	Treatment of fractures
1	39	Female	Left	Motorcycle accident	No	Yes, medial	Closed reduction, plaster splint	Posteromedial	Conservative
2	31	Female	Left	Sprain	No	No	-	Posteromedial and posterolateral	Osteosynthesis
3	41	Female	Left	Bicycle accident	Yes	Yes, lateral	Closed reduction, plaster splint	Posteromedial and talar head	Posteromedial resection, conservative treatment of the talar head
4	30	Male	Left	Fall from height	No	No	-	Lateral and middle facet of the talus	Conservative treatment of the lateral fracture, osteosynthesis of the middle facet
5	20	Male	Right	Motorcycle accident	No	No	-	Lateral	Osteosynthesis
6	17	Male	Right	Sprain	No	No	-	Posterolateral	Conservative
7	21	Male	Right	Motorcycle accident	Yes	Yes, medial	Closed reduction, external fixation	Lateral	Conservative
8	24	Male	Left	Car accident	No	No	-	Lateral, middle facet, and talar head	Osteosynthesis of the 3 fractures
9	19	Male	Left	Motorcycle accident	No	No	-	Posterolateral	Conservative
10	28	Male	Left	Motorcycle accident	Yes	No	-	Talar head	Resection
11	22	Male	Left	Motorcycle accident	No	No	-	Lateral	Resection

Table 2. Final functional and radiographic assessments

Case	Follow-up time (months)	AOFAS score	Consolidation	Tibiotalar osteoarthritis	Subtalar osteoarthritis	Talonavicular osteoarthritis	Osteonecrosis	Disuse osteopenia
1	63	85	yes	No	No	No	No	No
2	51	67	yes	No	No	No	No	No
3	34	22	yes	No	Yes	Yes	No	No
4	22	82	yes	No	No	No	No	No
5	13	82	yes	No	No	No	No	No
6	13	100	yes	No	No	No	No	No
7	17	84	yes	No	No	No	No	Yes
8	13	97	yes	No	No	No	No	No
9	12	100	yes	No	No	No	No	No
10	14	71	yes	No	No	No	No	No
11	18	100	yes	No	Yes	No	No	No

AOFAS: American Orthopaedic Foot and Ankle Society.

The high rates of open fractures observed in this study (23.8% of all cases and 50% of the cases with peritalar dislocation) were larger than those described by Bibbo et al.[11], who reported 28.0% of open peritalar dislocations, and by Hoexum and Heetveld, who observed 22.5% of open injuries[7]. The high frequency of open injuries in this study may be explained by the fact that 76.2% of the cases were caused by high-energy traumas. Much lower incidences are found in studies that only consider fractures of the lateral process of the talus, which in European and North American countries are predominantly caused by snowboarding accidents[4,12]. Another consequence related to high-energy traumas are associated fractures in the ankle and foot regions, which were present in one-third of our cases (7 patients). Out of these 7 patients with associated fractures, 5 had motorcycle accident as cause.

Among our cases, we had 2 patients with a rare pattern of peripheral fracture. These presented fractures with impaction of the middle articular facet towards the subtalar and, from this impaction focus, a fracture line was extended to the talar head; this injury was incomplete in one case and complete in the other. Both cases had an associated fracture of the lateral process of the talus (Figures 1 and 2), and both impaction fractures were treated surgically. The diagnosis of this type of injury demands much attention in the analysis of images initially obtained for assessing trauma and can easily be overlooked. Computed tomography imaging is fundamental in understanding this type of injury, and even magnetic resonance may be necessary[13,14].

The outcome achieved in our cases, with a mean AOFAS score of 80.9 points, was below that reported by Valderrabano et al.[4] in the treatment of fractures of the lateral process of the talus. These authors reported AOFAS scores of 97 and 85 points, respectively, for cases treated surgically and conservatively. However, Wijers et al.[15] reported an AOFAS score of 78.7 points when treating fractures of the posterior process of the talus. Our result was negatively influenced by a case (number 3) that developed stiffness of the hindfoot and intense pain, requiring a triple arthrodesis with 34 months of follow-up. Regardless of this case, the fact that most patients had suffered high-energy traumas (of which 3 resulted in open fractures) led to a decrease in the expectation of good functional outcomes.

Some limitations of this study are the inclusion of different types of peripheral talus fractures, which could not be compared with each other due to the small number of cases. The retrospective and single-centered design of the study was also a negative aspect. Since this is a rare type of fracture, the inclusion of other centers that provide care to patients with this injury could have contributed to a larger number of cases. Another aspect to be considered is that final assessment was performed with only 11 patients, with a relatively short follow-up period to demonstrate the incidence of osteoarthritis.

Conclusion

The peripheral talus fractures observed in our environment were predominantly of the left foot, caused by high-energy traumas, open, and frequently associated with other fractures. Short-term functional outcomes are good, but there is potential for severe complications such as stiffness and persistent pain.

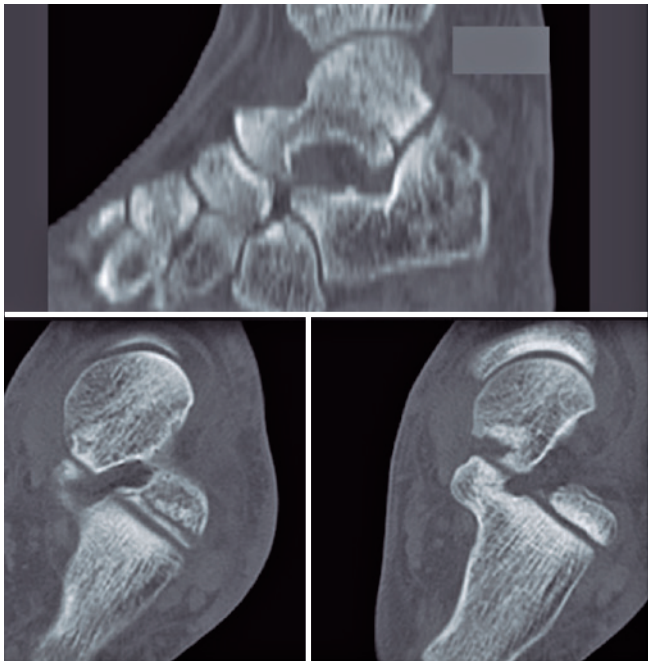

Figure 1. Fracture of the lateral process associated with a fracture of the middle facet of the talus.

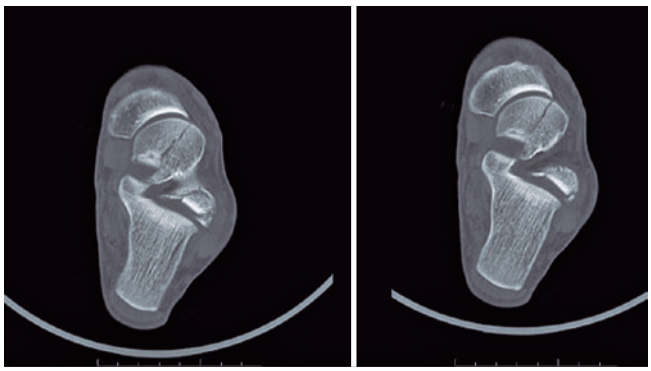

Figure 2. Fracture extension to the talar head and impaction of the middle facet.

Authors' contributions: Each author contributed individually and significantly to the development of this article: MHS *(https://orcid.org/0000-0001-7969-0515) conceived and planned the activities that led to the study, interpreted the results of the study, performed the surgeries; JMPB *(https://orcid.org/0000-0002-5280-1673) conceived and planned the activities that led to the study, bibliographic review; LNSP *(https://orcid.org/0000-0003-3711-0695) participated in the review process; CMRS *(https://orcid.org/0000-0002-0077-4087) data collection, clinical examination; KMM *(https://orcid.org/0000-0003-0804-4078) data collection, clinical examination. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID).

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