

Bilateral fracture-dislocation of the calcaneus: a rare case report

Fratura-luxação bilateral de calcâneo: relato de caso raro

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ABSTRACT

The calcaneus is the most commonly fractured tarsal bone. However, locked fracture-dislocation of the calcaneus is a rare condition because of the bone and ligament stability between the calcaneus, talus, and cuboid. We report the unique features of a case of bilateral fracture-dislocation of the calcaneus, including open fractures, bilateral fibular dislocation, and bilateral interposition of the flexor hallucis longus tendon at the fracture site. A literature review identified only 19 cases of locked fracture-dislocation, but none of these cases involved the combination of injuries observed in this case. Fracture of the calcaneus may be associated with a variety of injuries requiring proper diagnosis and treatment.

Level of Evidence V; Therapeutic Studies; Expert Opinion.

Keywords: Fracture-dislocation; Calcaneus/surgery; Subtalar joint; Minimally invasive surgical procedures.

RESUMO

O calcâneo é o osso do tarso mais fraturado, contudo a fratura-luxação bloqueada do calcâneo é uma condição rara, devido à estabilidade óssea e ligamentar entre o calcâneo, o tálus e o cuboide. Relatamos o caso de uma paciente com fratura-luxação bilateral do calcâneo, com características únicas na literatura: ambas expostas, com luxação bilateral dos fibulares, além de apresentar a interposição bilateral do tendão flexor longo do hálux nos focos de fratura. Uma revisão da literatura identificou apenas 19 casos dessa fratura-luxação já descritos, nenhum deles com a combinação de lesões encontradas neste relato. A fratura do calcâneo pode exibir ampla variedade de lesões associadas que requerem um diagnóstico e um tratamento adequado.

Nível de Evidência V; Estudos Terapêuticos; Opinião de Especialista.

Descritores: Fratura-luxação; Calcâneo/cirurgia; Articulação talocalcânea; Procedimentos cirúrgicos minimamente invasivos.

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INTRODUCTION

The calcaneus is the most commonly fractured tarsal bone, accounting for approximately 2% of tarsal fractures⁽¹⁾. Fracture of the calcaneus involves a variable degree of injury severity and is usually associated with high morbidity and

different types of injuries. However, locked fracture-dislocation of the calcaneus is rare because of geometric bone stability and the actions of strong ligaments that connect the calcaneus to the talus and cuboid⁽²⁾. A literature review by Fransen et al.⁽²⁾ in 2010 identified 19 cases of this injury.

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In some calcaneal fractures, the superolateral fragment remains part of the lateral wall. This remnant fragment and the posterior tuberosity dislocate laterally, maintaining contact or proximity to the lateral malleolus, leading to locking of these fragments⁽¹⁾. This injury was first described by Merle D'Aubigne et al.⁽³⁾ (apud Fransen, 2010) in 1936 as fracture-dislocation of the calcaneus. This fracture may be a result of different injuries, including dislocation of the fibular tendons, ligamentous lesion with talar tilt, fracture by impaction of the fibula, and tendon interposition at the fracture site^(1,4).

We report the unique features of a case of bilateral fracture-dislocation of the calcaneus, including open fractures in both feet, bilateral fibular dislocation, and bilateral interposition of the flexor hallucis longus tendon at the fracture site.

CASE REPORT

This study was approved by the Research Ethics Committee and was registered on the Brazil Platform under the CAAE number: 77403717.2.0000.0082.

We report a case of a 42-year-old woman who fell 15 metres after a suicide attempt. The patient was initially treated by the pre-hospital trauma team. She was admitted to our

unit secured to a spinal board and with a cervical collar in haemodynamically stable condition with a Glasgow score of 15. She complained of severe pain in the lumbar region and exhibited deformity of the left knee accompanied by pain and swelling, in addition to bilateral deformity of the feet with cuts and blunt injuries on the medial surfaces of both hindfeet with active bleeding. The patient did not exhibit neurovascular deficits of the lower limbs.

After clinical stabilization, the patient was subjected to cleaning and debridement of the open fracture and transarticular external fixation for temporary stabilization of the fractures of the tibial plateau and calcaneus for damage control (Figure 1). Radiographs on admission showed explosion fractures in L3 and L4, fracture-dislocation of the left tibial plateau, and open bilateral fracture-dislocation of the calcaneus (Figures 2 and 3).

After damage control measures were applied, the foot and ankle surgery team performed a more extensive physical examination and requested additional examinations for surgical planning to treat the injuries. The examination showed enlargement and flattening of the hindfeet, palpable fibular tendons displaced from their usual region (which was not diagnosed on admission), and mild bilateral flexion of the hallux, suggesting incarceration of the flexor hallucis longus.



Figure 1. Images of the patient's foot after an emergency procedure. A. Right. B. Left.
Source: Author's personal archive.



Figure 2. Radiograph on admission showing fracture of the calcaneus, with lateralization of the body under the fibula, and the double-density sign on the profile radiograph. A. Right. B. Left.
Source: Author's personal archive.

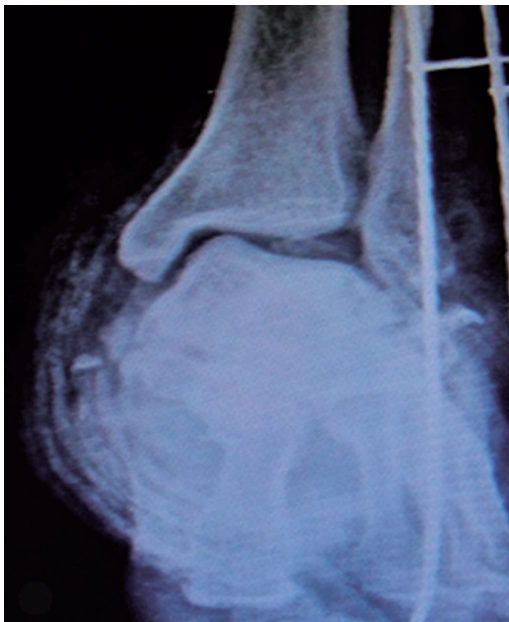


Figure 3. Anteroposterior radiograph of the foot showing varus tilt of the talus in the distal tibiofibular joint due to severe ligamentous injury.
Source: Author's personal archive.

Computed tomography (CT) of both ankles revealed bilateral intra-articular fractures of the calcaneus with subtalar displacement of a lateral fragment towards the fibula, impacting the fibular bone (Figure 4). The fractures were classified as Sanders III according to the Sanders tomographic classification.

While awaiting improvement of the skin conditions of the calcaneal region, the patient underwent osteosynthesis of the tibial plateau and lumbar spine. The surgical team asked the trauma team to remove the external fixation of the ankles to allow magnetic resonance imaging (MRI) and prevent interference from the fixation in the images. Calcaneal MRI was performed for complementary evaluation of soft-tissue injuries, confirming bilateral dislocation of the fibular tendons, lateral ligamentous injury, and bilateral interposition of the flexor hallucis longus tendon (Figure 5).

After surgery and approval of patient discharge by the spine and knee surgical team, the patient presented with a urinary tract infection, and osteosynthesis of the calcaneus was contraindicated. Shortly after improvement of the skin conditions of both ankles and patient discharge from the infectology ward, the patient underwent definitive surgery of the calcaneus 19 days after the trauma. Subfibular impact correction, reduction of fibular tendon dislocation, and reduction of subtalar dislocation were performed. Because of the severity of the patient's clinical status, the surgical team selected a lateral route and Kirschner-wire fixation without anatomical reduction due to fracture comminution and the long post-trauma period. After consulting with the patient, the team chose not to mobilize the flexor hallucis, and the flexor was not released to avoid increased surgical time and surgical morbidity.

The patient remained immobilized with a cast boot without loading and was followed-up weekly for 12 weeks.

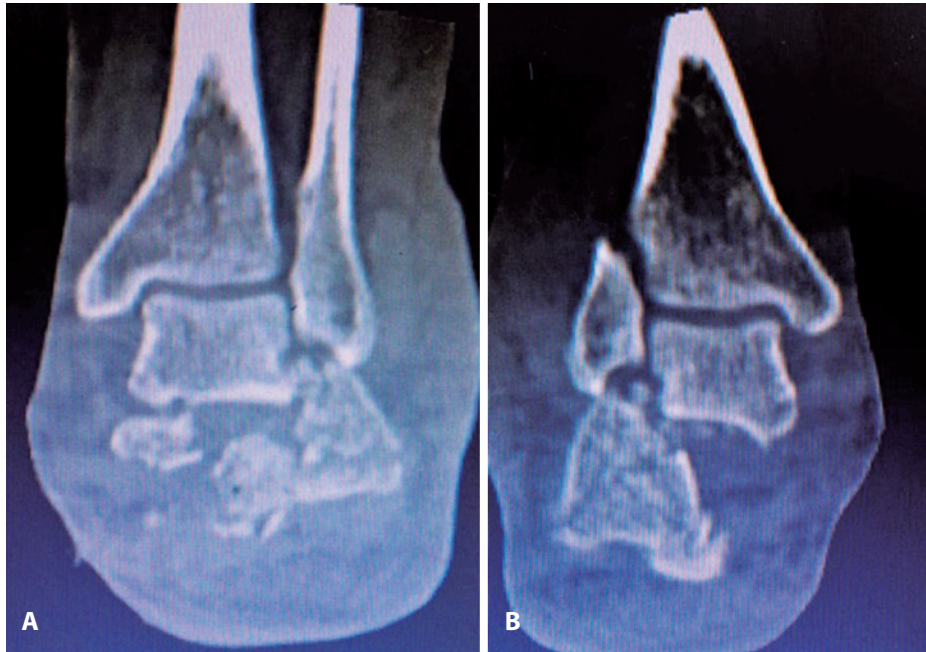


Figure 4. Computed tomography images in the coronal plane showing dislocation of the calcaneal body laterally under the fibula. A. Right. B. Left.

Source: Author's personal archive.

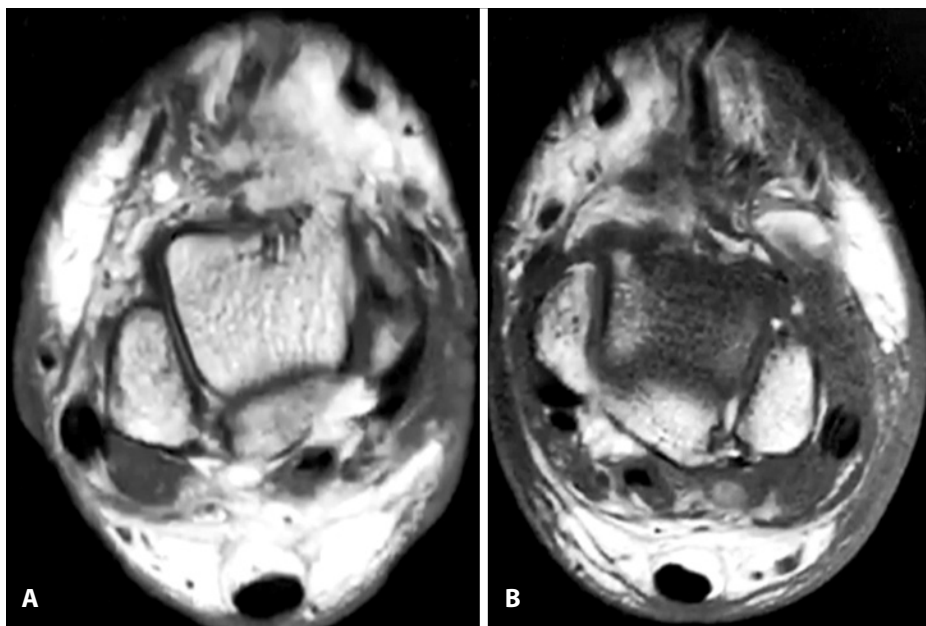


Figure 5. MRI showing dislocation of the fibular tendons. A. Right. B. Left.

Source: Author's personal archive.

The Kirschner wires were removed after total fracture consolidation and subtalar fusion were achieved (Figure 6). Physical therapy was immediately initiated to improve range of motion and allow progressive loads. No surgical

wound infections were observed. Eighteen months after surgery, the patient presented with painless gait but had a checkrein deformity on the left foot. The AOFAS score was 76 points after 1 year.

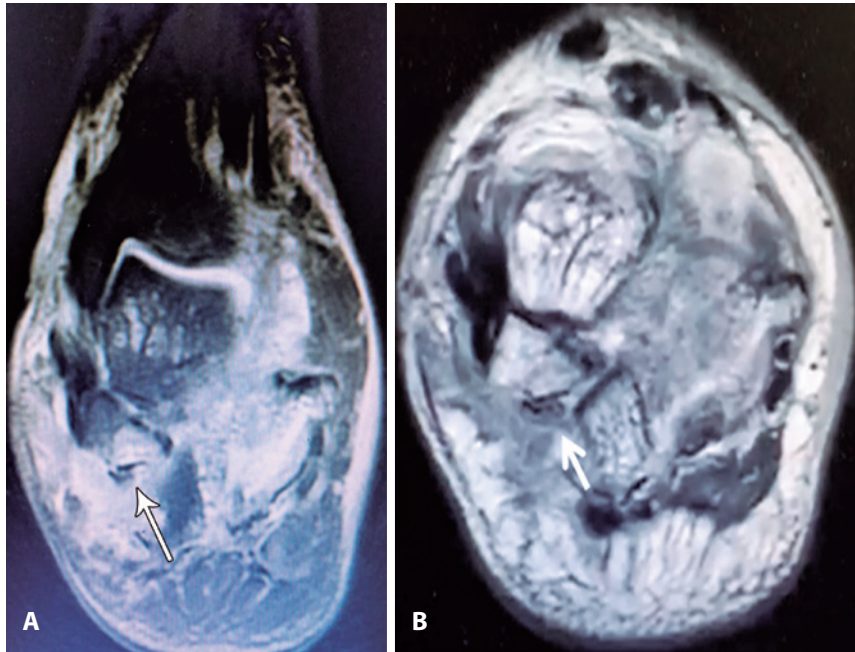


Figure 6. MRI showing interposition of the flexor hallucis longus tendon at the fracture site below the sustentaculum tali (white arrow). A. Right. B. Left.

Source: Author's personal archive.

DISCUSSION

Injuries defined as calcaneal fracture-dislocation involve a non-displaced fragment of the sustentaculum tali and a posterolateral fragment deflected toward the fibula, as observed in this case. In most cases, rupture of the lateral ligament complex, as observed in this patient, or lateral malleolus fracture promotes a varus tilt of the talus; this injury was described by Ebraheim et al.⁽⁵⁾ (Figure 3). The probable mechanism underlying these injuries is axial load, which is common in falls from height, combined with inversion of the talus with the foot in the pronated position⁽²⁾. This type of lesion was first described by Merle D'Aubigne in 1936, and only a few cases have been described⁽³⁾.

The first clinical indicator of fracture-dislocation of the calcaneus is displacement of the palpable fibular tendons beyond their normal position⁽¹⁾, which was observed in our patient. In addition to evidence of fracture and loss of subtalar congruence, radiographs may show an abnormal varus tilt of the talus^(1,2). The radiographic findings in this case indicated severe ligamentous injuries causing loss of joint congruence. These findings, together with palpation of the fibular tendons outside the posterior fibular gutter, were not consistent with the classic pattern of calcaneal fractures, and the unusual clinical and radiographic findings led the orthopaedist to suspect a higher fracture severity with greater potential for complications.

Kim e Berkowitz⁽⁶⁾ emphasized the importance of identifying fracture-dislocation of the calcaneus by a simple lateral radiography of the ankle. They described a variation of Sanders' double-density sign on lateral radiographs of the ankle corresponding to calcaneal overlap due to elevation of its lateral wall and displacement toward the fibula, thus facilitating diagnosis.

Randall and Ferretti (2004)⁽⁷⁾ demonstrated the importance of CT in a case of subtalar lateral dislocation, which clearly revealed a calcaneal fracture. CT is also essential for several intra-articular fractures in other regions of the body. For this reason, if available, CT should always be requested as a complementary tool for diagnosis and surgical planning.

Biga and Thomine⁽⁸⁾ described four patients with this type of fracture involving a fragment deflected posterolaterally under the fibula and suggested that surgical treatment is required for these fractures, as two patients who were treated conservatively progressed poorly. Surgery seems mandatory because of the loss of joint congruence and the possibility of associated soft-tissue injuries.

Most descriptions of calcaneal fracture-dislocation apply to lateral dislocations. However, one case of medial dislocation was described by Anglen et al.⁽⁴⁾ and involved an injury previously unidentified by other authors—interposition of the long flexor hallucis tendon. This tendinous

injury may progress to checkrein deformity due to incarceration of the tendon, which was observed during the follow-up of our patient and may negatively affect gait and cause pain during detachment of the hallux (Figure 6).

Mallik et al.⁽⁹⁾ described a rare case of fracture-dislocation of the calcaneus with interposition of the medial neurovascular bundle, emphasizing that this complication is rare and requires special care when associated with the absence of a pulse or neurological deficits.

Carr⁽¹⁰⁾ found that locked fracture-dislocation of the calcaneus was associated with fracture of the contralateral calcaneus; however, the latter was not classified as fracture-dislocation. Here, we describe a case of bilateral locked fracture-dislocation of the calcaneus with severe

soft-tissue injuries. These features strongly affect the postoperative outcome and prognosis of fractures because delayed gait re-establishment increases the probability of complications and prolongs patient rehabilitation.

CONCLUSION

Fracture-dislocation of the calcaneus is rare and is associated with a variety of injuries requiring prompt identification. Clinical signs such as fibular dislocation, the double-density sign on profile radiography, and abnormal talar tilt in the distal tibiofibular joint are important signs indicative of this rare injury pattern, facilitating appropriate diagnosis and treatment of bone and soft-tissue injuries.

Authors' contributions: Each author contributed individually and significantly to the development of this study: RSB (<https://orcid.org/0000-0002-2870-2261>)* has conceived and planned the activities that led to the study, participated in the review process, has approved the final version; MBAG (<https://orcid.org/0000-0003-0007-5574>)* has conceived and planned the activities that led to the study, execution of surgeries, interpreted the study results, literature review, has written the article, participated in the review process, has approved the final version; BRM (<https://orcid.org/0000-0002-5306-2972>)* execution of surgeries, participated in the review process, has approved the final version; LZPO (<https://orcid.org/0000-0001-5849-5841>)* execution of surgeries, participated in the review process, has approved the final version. *ORCID (Open Researcher and Contributor ID).

REFERENCES

- Sanders RW, Clare MP. Fractures of calcaneus. In: Rockwood and Green's fractures in adults. 8th ed. Philadelphia: Lippincott Raven; 2016. Cap. 61, p. 2639-89.
- Fransen S, Poeze M, Verbruggen JPAM, Brink PRG. Injury Extra 2010; 41:13-6.
- d'Aubigne MR. Fracture isolee de la petite apophyse du calcaneum traitee par osteosynthese (Raport de M. Wilmoth). Mem Acad Chir 1936;62:1155.
- Anglen JO. Case report: irreducible fracture of the calcaneus due to the flexor hallucis longus interposition. J Orthop Trauma. 1996;10(4):285-8.
- Ebraheim NA, Elgafy H, Sabry FF, Tao S. Calcaneus fractures with subluxation of the posterior facet. A surgical indication. Clin Orthop Relat Res. 2000;(377):210-6.
- Kim DH, Berkowitz MJ. Double density sign variant in fracture dislocation of the calcaneus: clinical tip. Foot Ankle Int. 2012; 33(6):524-5.
- Randall DB, Ferretti AJ. Lateral subtalar joint dislocation: a case with calcaneal fracture. J Am Podiatr Med Assoc. 2004; 94(1):65-9.
- Biga N, Thomine JM. La fracture-luxation du calcaneum. A propos de 4 observations. Rev Chir Orthop Reparatrice Appar Mot. 1977;63(2):191-202.
- Mallik AR, Chase MD, Lee PC, Whitelaw GP. Calcaneal fracture-dislocation with entrapment of the medial neurovascular bundle: a case report. Foot Ankle. 1993;14(7):411-3.
- Carr JB. Varus of the talus in the ankle mortise secondary to a calcaneus fracture: a case report. Clin Orthop Relat Res. 1991;(263):206-9.