

CASE REPORT

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The Maisonneuve fracture with medial and posterior malleolar fractures: A case report

José Guilherme De Souza Nóia Gonçalves, Daniel Antunes Pereira, Arthur Bomfim Amaral, Bruno Povoleri Marano, Marco Orsini, Antônio Marcos da Silva Catharino

ABSTRACT

Introduction: Maisonneuve's fracture is named after the French surgeon who first described it in 1840. This injury is rare and is characterized by a combination of a fracture of the ipsilateral fibula and an injury to the medial structures of the ankle, and there may also be a rupture of the syndesmosis, tibiofibular and deltoid ligament, followed by rupture of the anteroinferior tibiofibular ligament and rupture of the interosseous ligament and interosseous membrane.

Case Report: A 70-year-old female patient reported pain in the right lower limb. Clinical examination, after excluding possible fractures associated with age group, revealed hematoma on the ankle, edema on the topography of the right lateral malleolus and on the lateral aspect of the right knee. Radiographs revealed lateral subluxation of the right ankle, increased medial free space associated with fracture of the medial malleolus, fracture of the posterior malleolus, and proximal fracture of the ipsilateral fibula. The patient was admitted for urgent

orthopedic surgery. Lateral access distal to the fibula was used in the distal fibulotibial joint, anatomical reduction of the ankle with reduction forceps and placement of a 3.5 mm third-barrel plate and two 3.5 mm cortical screws with sizes of 50 and 45 mm under fluoroscopy.

Conclusion: A Maisonneuve fracture is an orthopedic emergency that needs to be identified quickly because it usually requires surgery. Surgery must be well planned and requires an adequate postoperative period to rehabilitate the patient to avoid sequelae such as early osteoarthritis and chronic pain.

Keywords: Maisonneuve fracture, Malleolar fracture, Osteoarthritis

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INTRODUCTION

The Maisonneuve fracture, first described by Dr. Jacques Maisonneuve in 1840, refers to a combination of a fracture of the ipsilateral fibula and a medial ankle structures injury [1]. Maisonneuve fracture appeared in the literature during the 1960s, mainly thanks to B.G. Weber, a Swiss surgeon [2]. In the medical setting, Maisonneuve fractures are a unique and uncommon

type of injury that is often overlooked initially [3]. It is caused by a pronation-external rotation mechanism [4]. In addition to the proximal fibular fracture, there is also a rupture of tibiofibular syndesmosis and deltoid ligament, followed by rupture of the anteroinferior tibiofibular ligament and rupture of the interosseous ligament and interosseous membrane. Some reports do not include all the injuries mentioned above about the Maisonneuve fracture, as currently there is still no defined consensus, and different variants are reported with slight differences, such as non-rupturing of the deltoid ligament or fracture of the medial malleolus [3]. The Gold standard treatment is the surgical treatment that includes a reduction of the distal tibiofibular joint and fixation with a syndesmotic screw. The outcome of patients who underwent surgical treatment for Maisonneuve fractures is not well documented in the literature [5]. To our knowledge, a Maisonneuve fracture, a lateral malleolus fracture, and ankle deltoid ligament injury were described only once by Hensel and Harpstrite in 2002 [6].

CASE REPORT

A 70-year-old female patient was admitted to the clinic with pain in her right lower limb after falling down the stairs. She had severe pain in her ankle and right knee after the trauma, with the inability to walk. Clinical examination, after excluding possible fractures associated with age group, revealed hematoma on the ankle, edema on the topography of the right lateral malleolus and on the lateral aspect of the right knee. The patient had no neurological or vascular changes.

Leg radiographs were taken in anteroposterior (AP) and PROFILE position which revealed lateral subluxation of the right ankle, increased medial clear space associated with fracture of the medial malleolus, fracture of the posterior malleolus, and proximal fracture of the ipsilateral fibula (Figure 1A and B).

The patient was hospitalized for urgent orthopedic surgery, requesting tests and surgical risk. The patient underwent spinal anesthesia associated with sedation. Distal lateral access to the fibula at the distal fibulotibial joint was used, anatomical reduction of the ankle with reduction forceps and placement of a 3.5 mm third barrel plate and two 3.5 mm cortical screws with sizes of 50 and 45 mm under fluoroscopy. Subsequently, closed reduction of the fracture of the medial malleolus was performed with the percutaneous placement of two 3.5 mm cancellous fixation screws, measuring 50 and 45 mm. The maintenance of divergence between the screws was performed with fluoroscopy.

Control radiographs were performed after the surgery (Figure 1C–E). As a result, anatomical reduction and perfect stability were observed, preserving the functional range of motion of the ankle and knee, as well as alignment and rotation (Figure 1F–J).

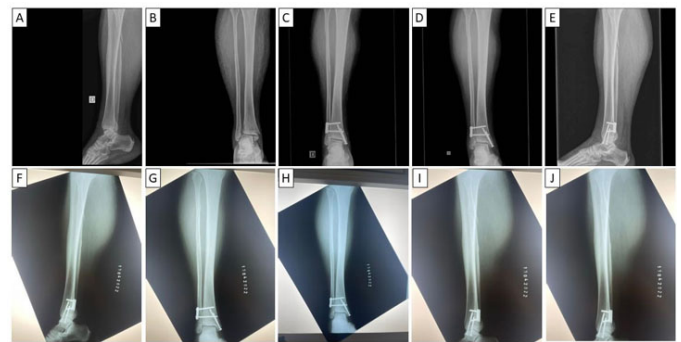


Figure 1: (A) and (B) Medial malleolus fracture with syndesmosis injury generating a fracture in the proximal 1/3 of the fibula; (C)–(E) Osteosynthesis of the medial malleolus and closure of the syndesmosis with a plate and two screws (immediate postoperative period); (F) and (G) Three weeks after surgery; (H)–(J) Six weeks postoperatively: consolidated fracture.

Postoperative care

The patient progressed in the immediate postoperative period without significant pain complaints, which allowed the immediate start of active and passive knee and ankle mobilization under medical and physiotherapeutic guidance.

Postoperative control radiographs were performed after 15 and 30 days, when partial load was released with the aid of two crutches. The total load was released 60 days after surgery.

The patient returned to work 90 days after the operation with preserved range of motion and no pain complaints.

DISCUSSION

The Maisonneuve fracture was first described in 1840 by Jacques Maisonneuve [1]. It is a rare injury, occurring around 7% of all ankle fractures [7]. It is a fracture of the proximal third of the fibula with a rupture of the distal tibiofibular syndesmosis, interosseous membrane, and associated injuries (e.g., medial malleolus fracture, posterior malleolus fracture, and deltoid ligament tear) [1].

Maisonneuve fracture occurs through a pronating force and external rotation of the ankle with transmission of force through the interosseous membrane causing a proximal fibular fracture. This forefoot pronation causes an avulsion fracture of the medial malleolus or rupture of the deltoid ligaments. This is followed by an external rotation force that causes disruption of the syndesmotic ligaments and the interosseous membrane, and the energy pattern continues along the path of the interosseous membrane and exits at the proximal region of the fibula [4].

Pankovich [8] reported a series of 17 Maisonneuve fractures with detailed clinical and operative findings. He found that the fibular fracture showed two patterns. In ten cases out of the 17 described (or 58%), the fracture

was similar to that described for an external pronation–rotation fracture. In other two cases, the fracture resembled an external supination–rotation fracture. Although the mechanism producing Maisonneuve's fracture must be external rotation of the foot relative to the tibia, it is unclear whether the foot is in pronation or supination during the injury. A third possibility is that the foot changes its position while the injury is occurring.

Our case report showed the existence of an ankle fracture considered “bimalleolar,” which the main trauma mechanism is external supination–rotation, together with a Maisonneuve fracture, as above-mentioned. This demonstrates that the possibility of the foot to change its position while the injury is occurring should be considered.

Hensel and Harpstrite [6] reported a Maisonneuve fracture associated with a bimalleolar ankle fracture–dislocation. The patient in this study had a distal fibular fracture, a lateral ankle dislocation, a Maisonneuve fracture of the proximal part of the fibula, and a medial malleolar fracture.

Del Castillo and Geiderman described the importance of taking proximal tibiofibular radiographs when patients present with ankle pain [9]. The suspicion of Maisonneuve fracture should occur when there is isolated fracture of the posterior tibial tubercle with evidence of rupture of the deltoid ligament or medial malleolus fracture in the absence of a lateral malleolus fracture or in case of tenderness over the anteromedial capsule of the syndesmosis or tenderness over the syndesmosis.

We can propose, according to our case report, that even if the ankle radiograph shows a well-established fracture, radiography including the whole leg in two different views is necessary to avoid non-detection of a Maisonneuve fracture.

Described more than 180 years ago, the surgical treatment still remains controversial regarding the number of syndesmotic screws, their necessary size and the exact insertion in the distal fibula (Table 1).

The case we describe here is an atypical pattern of Maisonneuve fracture, which is even rarer to occur and requires caution and extreme attention to its diagnosis.

Table 1: Study comparison table

McBryde et al. [10]	Recommended placing the syndesmotic screw 2 cm proximal to the joint line.
Sproule et al. [5]	Recommended placing the screw 4 cm proximal to the tibiotalar joint.
Weening and Bhandari [11]	Reviewed the technical aspects of syndesmotic screw fixation and found that despite variations in treatment, most patients achieved good quality of life and functional outcomes.

CONCLUSION

Maisonneuve fracture is an orthopedic emergency that must be diagnosed early, because in most cases a surgical procedure is required. Surgery must be well planned to anatomically restore the ankle joint without causing neurovascular damage. In addition, it needs an adequate postoperative period to rehabilitate the patient. This set of actions will contribute to not bring sequelae to the patient such as early osteoarthritis and chronic pain. Finally, this is a fracture that requires early diagnosis for definitive treatment to optimize the patient's recovery and reduce joint sequelae.

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José Guilherme De Souza Nória Gonçalves – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that

questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Daniel Antunes Pereira – Conception of the work, Design of the work, Acquisition of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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