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Case report

An Uncommon Ankle Injury: Maisonneuve Fracture Case Report

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Abstract

Maisonneuve fracture is a rare and complex ankle fracture characterized by a triad of injuries, including a medial malleolar fracture, injury to the inferior tibiofibular syndesmotic complex, and a proximal fibula fracture.

This case report presents the case of a 53-year-old female who sustained a Maisonneuve fracture following a fall on the stairs. Physical examination revealed tenderness and swelling in the left ankle, and radiographs confirmed fractures of the medial and posterior malleolus of the left ankle. Despite receiving conservative treatment in the form of a plaster cast, the patient subsequently presented to the hospital with severe pain in the left ankle and proximal fibula. Further imaging examinations confirmed a Maisonneuve fracture accompanied by a proximal fibula fracture, medial malleolar fracture, and posterior malleolar fracture. The patient underwent successful open reduction and internal fixation of the left ankle.

This clinical case underscores the significance of a thorough examination and imaging to precisely diagnose rare and complex fractures such as the Maisonneuve fracture, which may be overlooked in clinical practice. Therefore, clinicians should be vigilant of the potential for a Maisonneuve fracture in patients with ankle injuries to ensure timely and appropriate treatment.

Key words: Maisonneuve fracture, tibiofibular syndesmotic complex, proximal fibular fracture, rare ankle fracture, clinical case.

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Introduction

The Maisonneuve fracture is a special type of ankle fracture that involves injury to the medial structures of the ankle (such as a tear of the deltoid ligament or a medial malleolar fracture), the tibiofibular syndesmosis (such as a tear of the posterior or anterior inferior tibiofibular ligament, or injury of the interosseous ligament), and a fracture of the proximal fibula [1]. Jules Germain François Maisonneuve originally described this type of fracture in 1840 [2]. Although it is a rare type of ankle injury, Maisonneuve fractures account for approximately 7% of all ankle fractures, highlighting the importance of physicians being aware of this type of fracture when diagnosing patients with ankle injuries [3].

The mechanism of injury for Maisonneuve fracture typically results from excessive external rotational force being applied to the deltoid and syndesmotic ligaments of the ankle. According to the Lauge-Hansen classification system, ankle fractures are classified into four categories: supination external rotation, supination adduction, pronation external rotation, and pronation abduction. Maisonneuve fracture is classified as a pronation-external rotation mechanism, according to the Lauge-Hansen classification system [1]. Additionally, it is classified as a Type C ankle fracture according to the Denis-Weber classification system and as a Type C3 (Suprasyndesmotic) according to the AO classification of fibular fractures [4].

It is believed that the injury mechanism for Maisonneuve fracture starts with an injury to the medial structures of the ankle, resulting in a fracture of the medial malleolus or rupture of the deltoid ligament, followed by the rupture of the anterior inferior tibiofibular ligament and interosseous membrane. Finally, it culminates in the fracture of the proximal fibula of the lower limb [5].

To restore anatomical congruence to the ankle joint, treatment for ankle fractures, including Maisonneuve fractures, is necessary to improve ankle function and prevent post-traumatic osteoarthritis. Conservative management with cast immobilization can be used for nondisplaced fractures of the medial malleolus. However, displaced fractures of the medial malleolus typically require open reduction or closed reduction methods, which may involve internal fixation of the syndesmosis if there is a tear of the distal tibiofibular syndesmosis present [6].

Purpose of the message - to highlight the importance of thorough examination and imaging to accurately diagnose rare and complex fractures, such as the Maisonneuve fracture, which may be overlooked in clinical practice. It also emphasizes the need for clinicians to be aware of the potential for a Maisonneuve fracture in patients with ankle injuries to ensure timely and appropriate treatment.

Case presentation

A 53-year-old woman presented at the emergency department of city hospital after falling on the stairs at the entrance of a store. The patient's main complaint was pain in her left ankle. During the physical examination, swelling and tenderness were observed on the left ankle. Radiographs of the left ankle in two views showed fractures of the medial and posterior malleolus (Figure 1). The patient received conservative treatment in the form of a plaster cast and was referred for outpatient care.

On the eleventh day after the injury, the patient presented with a complaint of severe pain in her left ankle and proximal fibula to the National Scientific Center of Traumatology and Orthopedics named after Academician Batpenov N.D. She was admitted to the Traumatology 5 Department of the National Scientific Center of Traumatology and Orthopedics named after Academician Batpenov N.D. for further examination and treatment.

Figure 1 - Anteroposterior and lateral radiographs of left lower ankle at day 1

History of past illness

• The patient was diagnosed with arterial hypertension approximately 10 years ago and has been regularly taking anti-hypertensive medication.

• The patient was also diagnosed with autoimmune thyroiditis via screening 5 years ago and has been regularly taking L-thyroxine medication.

Social and family history. The patient's social and family history were unremarkable.

Physical examination. Upon conducting a comprehensive physical examination of the patient, it was observed that the patient presented with a moderate severity pain syndrome. The patient was found to be conscious and adequate, with skin and visible mucous membranes exhibiting a pale pink color. Notably, the patient's body temperature was within the normal range, and all vital data were observed to be within normal limits. Respiratory sounds were found to be vesicular in all fields, while heart sounds were clear and rhythmic. Abdominal palpation did not elicit any pain or discomfort, with the abdomen found to be soft to the touch. Notably, a negative flank pain symptom was observed on both sides, and the patient was found to have free and independent urination.

Local status: Physical examination revealed a closed left ankle injury with tenderness on the medial aspect, swelling around the left ankle, tenderness in the left proximal fibula, and no neurological deficit in the left lower leg. The dorsalis pedis and tibialis posterior artery pulses were palpable.

Laboratory examinations. Laboratory evaluation, including complete blood count, blood biochemistry, and coagulation function revealed no significant abnormalities.

Imaging examinations. Full-length radiographs of the left lower leg were performed in the National Scientific Center of Traumatology and Orthopedics named after academician N.D. Batpenov and showed a displaced proximal fibula fracture, a secondary displaced medial malleolar fracture, and a secondary displaced posterior malleolar fracture (Figure 2).

Figure 2 - Anteroposterior and lateral radiographs of left lower limb at day 11

Final diagnosis. The final diagnosis was a displaced Maisonneuve fracture in the left ankle, which was accompanied by a displaced proximal fibula fracture, a displaced medial malleolar fracture, and a displaced posterior malleolar fracture.

Treatment. The patient underwent open reduction and internal fixation of the left ankle in the operating theater at the National Scientific Center of Traumatology and Orthopedics named after Academician Batpenov N.D. Spinal anesthesia was administered, after which the patient was placed in the supine position. A 6.0 cm curved incision was made along the medial surface of the lower leg, and the fracture site was accessed in layers. The multi-fragmented nature of the fracture and the displacement of the fragments were noted, and the fragments were repositioned and fixed with two Kirschner wires and a tension band.

The anatomical reduction was evaluated using C-arm, and the condition of the inferior tibiofibular syndesmosis was assessed. The fibula was distracted from the tibia with a bone hook, and opposing force was applied to prevent tibial motion. The fibula and distal tibia showed no significant motion, indicating a stable inferior tibiofibular syndesmosis.

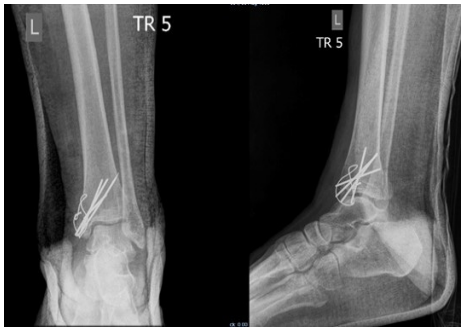

Figure 3 - Postoperative left ankle radiographs of anteroposterior and lateral views 2 days after the surgery

The size of the fractured posterior malleolus was evaluated under C-arm and was determined to be less than 25% of the total articular surface, so no fixation was performed. After the operation, the patient's left lower limb was immobilized in a posterior plaster splint for four weeks. Postoperative radiographs of the left ankle, taken on the second day after the surgery, showed relatively stable osteosynthesis and successful resolution of the displaced fracture fragments (Figure 3). The patient started physiotherapy (magnetotherapy) on the second day after the surgery.

Figure 4 - Postoperative left ankle radiographs of anteroposterior and lateral views 4 weeks after the surgery

Outcome and follow-up. The postoperative period was uneventful. On the third postoperative day, there were no signs of inflammation and dehiscence of the surgical wound. There were no complications of postoperative scarring on the medial surface of the left ankle joint. The patient was discharged on the sixth day after surgery, with improvement. The patient was instructed to walk with crutches, avoiding weight-bearing on the left lower limb for four weeks, and to undergo control radiography of the left ankle joint four weeks after surgery to determine further treatment methods. Radiographs taken four weeks after the surgery showed evidence of proper healing and alignment of the fracture (Figure 4). Active and passive mobilization of the left ankle started after removal of the plaster splint.

Discussion

According to a comprehensive review of the Maisonneuve injury, which analyzed 74 articles with 103 cases of Maisonneuve fractures, the most common fracture was a proximal fibular fracture, occurring in 101 cases (94.79%). 34 cases (32.08%) had a medial malleolus fracture, and 33 cases (31.13%) had a posterior malleolar fracture [7]. In this review, a total of 67 out of 88 cases (76.14%) were managed with one or two screws for syndesmosis fixation, while 21 cases (23.86%) did not require fixation of the syndesmosis, as in our case.

Maisonneuve fractures are often missed at the initial visit because patients complain of ankle pain rather than pain in the proximal region of the fibula [8]. In this case, the proximal fibular fracture was missed during the patient's first visit to the city hospital's emergency department because she only complained of ankle pain. As a result, the proximal fibula was not palpated, and full-length radiography of the left leg was not ordered. Eleven days after the injury, the patient was presented at the National Scientific Center of Traumatology and Orthopedics named after academician Batpenov N.D. due to left ankle pain and edema. The diagnosis of a Maisonneuve fracture was confirmed after careful physical examination and full-length radiography of the left lower leg. Therefore, it is important to avoid neglecting the palpation of the proximal fibula in all patients with ankle injuries.

Initially, the patient was treated conservatively with plaster immobilization for 11 days. Displaced Weber type C fractures, such as the one in this case, include a fibular fracture above the syndesmosis, which is associated with medial and posterior malleolar fractures. Nearly all Weber type C fractures are unstable and require open reduction and internal fixation as soon as possible to hasten the healing process and rehabilitation [9]. At the time of the patient's initial examination in the city hospital, she required emergency inpatient treatment for surgical treatment of the medial malleolus.

Typically, fixation of the medial malleolus involves two 4-mm cancellous lag screws that are placed perpendicular to the fracture [6]. In this case, however, the intraoperative revision revealed that the fracture of the medial malleolus was multi-comminuted, which was too small for screw fixation. As a result, it was decided to stabilize the fracture using two Kirschner wires and tension band. This type of fixation is frequently used for comminuted or extremely small fragments.

The treatment of ankle fractures involving the posterior malleolus remains a subject of debate among orthopedic surgeons. Most authors recommend fixation when the fracture involves more than 25% of the articular surface [10]. During the surgery, the size of the fractured posterior malleolus edge was less than 25% of the total articular surface, so it was decided to leave it without fixation.

The integrity of the syndesmosis can be evaluated during surgery using the Cotton test. This method is used to identify distal tibiofibular syndesmosis injury intraoperatively. The fibula is distracted by a bone hook, and opposing force is applied to prevent tibial motion while trying to separate it from the tibia [4,6]. In this case, there was no significant motion between the fibula and distal tibia, indicating that syndesmotic fixation was unnecessary.

According to Dietrich et al. (2022), conservative management with immobilization and protected weight-bearing can be considered for stable Maisonneuve fractures with a minimally displaced proximal fibular fracture [5]. However, if the fracture is significantly displaced or unstable, surgical intervention may be required for proper reduction and stabilization. In our case where the distal tibiofibular syndesmosis was intact and the proximal fibular fracture was stable and minimally displaced, conservative management may be preferred, with careful monitoring and frequent follow-up visits to ensure proper healing and alignment.

Conclusion

In conclusion, Maisonneuve fractures are an uncommon type of injury that is often misdiagnosed in patients with ankle injuries. To ensure an accurate diagnosis, a thorough physical examination and full-length radiography should be performed during the patient's first visit. The mechanism behind these fractures is of great significance, as it has the potential to lead to new insights into the treatment of Maisonneuve fracture.

Conflict of interest. The authors declares no conflicts of interest.

Ethical aspects. The patient gave written consent to the publication of her medical information in an open access journal in the form of an article with confidentiality.

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Сирек кездесетін тобық сынығы: Мезоннев сынығының клиникалық жағдайы

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Түйіндеме

Мезоннев сынығы – сирек кездесетін тобықтың күрделі сынуы. Ол ішкі тобықтың сынуы, төменгі жілікаралық синдесмотикалық кешенінің жарақаты және проксимальды асық жілігі шыбығының сынуы секілді жарақаттар триадасымен сипатталады.

Бұл мақалада баспалдақтан құлағаннан кейін Мезоннев сынығын алған 53 жастағы әйелдің клиникалық жағдайы сипатталды. Физикалық тексеру кезінде сол жақ тобық буынында ауырсыну мен ісіну анықталды, рентгенограммада сол жақ тобықтың ішкі және артқы бөлігінің сынықтары анықталды. Гипстік иммобилизация түрінде консервативті ем алғанына қарамастан, 11 күннен кейін науқас сол жақ тобығының және проксимальды асық жілігі шыбығының ауырсынуымен қайтадан ауруханаға түседі. Рентгенограмма зерттеулері ішкі тобықтың сынуы, төменгі жілікаралық синдесмотикалық кешенінің жарақаты және проксимальды асық жілігі шыбығының сынуымен жүретін Мезоннев сынығын растады. Науқасқа сол жақ тобыққа ашық репозиция және ішкі фиксация отасы сәтті түрде жасалды.

Бұл жағдай клиникалық тәжірибеде назардан тыс қалуы мүмкін Мезоннев сынығы сияқты сирек және күрделі сынықтарды дәл диагностикалау үшін мұқият қарау, пальпация жасау және рентгенологиялық тексеру маңыздылығын көрсетеді. Сондықтан, науқастарға уақтылы және тиісті емдеуді қамтамасыз ету үшін тобық жарақаттары бар жағдайда Мезоннев сынығын әрқашан ескеру керек.

Түйін сөздер: Мезоннев сынығы, төменгі жілікаралық синдесмотикалық кешені, проксимальды асық жілігі шыбығының сынығы, сирек кездесетін тобық сынығы, клиникалық жағдай.

Редкая травма лодыжки: клинический случай о переломе Мезоннева

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Резюме

Перелом Мезоннева - редкий и сложный перелом лодыжки, характеризующийся триадой повреждений, который включает перелом медиальной лодыжки, повреждение нижнего межберцового синдесмотического комплекса и перелом проксимального отдела малоберцовой кости.

В данной статье представлен клинический случай 53-летней женщины, которая получила перелом Мезоннева в результате падения с лестницы. Физикальное обследование выявило болезненность и припухлость в левой лодыжке, а рентгенограммы подтвердили переломы медиальной и задней лодыжек левой лодыжки. Несмотря на консервативное лечение в виде гипсовой повязки, пациентка впоследствии обратилась в больницу с сильной болью в области лодыжек и проксимальном отделе малоберцовой кости. Дальнейшие рентгенологическое исследования подтвердили перелом Мезоннева, сопровождающийся переломом проксимального отдела малоберцовой кости, переломом медиальной лодыжки и переломом задней лодыжки. Пациентке была успешно проведена открытая репозиция и внутренняя фиксация лодыжек спицами и проволокой.

Данный клинический случай подчеркивает важность тщательного обследования и визуализации для точной диагностики редких и сложных переломов, таких как перелом Мезоннева, который может быть упущен из виду в клинической практике. Поэтому клиницисты должны быть бдительны в отношении потенциального перелома Мезоннева у пациентов с травмами лодыжки, чтобы обеспечить своевременное и соответствующее лечение.

Ключевые слова: перелом Мезоннева, межберцовый синдесмотический комплекс, перелом проксимального отдела малоберцовой кости, редкий перелом лодыжки, клинический случай.