Chapter 7
Maisonneuve Ankle Injuries

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Case Presentation

This is a 37-year-old male patient without significant past medical history who sustained a twisting injury to his left lower extremity while playing soccer. He reports that he was planting his leg while trying to pivot into another direction, and felt pain about the ankle. He denies any other injuries. He localizes the pain along the affected lower extremity; it is centered over the ankle, but also is present diffusely about the length of the lower leg. He reports that he is unable to weight bear to the affected extremity.

On examination, the leg is diffusely swollen. There are no open injuries. He has tenderness primarily over the medial ankle and the anterolateral aspect of the ankle. There is also diffuse tenderness along the length of the leg,

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FIGURE 7.1 AP radiograph of the left ankle, revealing a displaced medial malleolus fracture

primarily along the anterior and lateral lower leg. Compartments are soft, and his neurovascular status is intact. His range of motion is limited due to pain. He has a positive squeeze test.

Imaging examinations of the ankle revealed a medial malleolus fracture (Figs. 7.1 and 7.2). However, given the above clinical examination, a tibia/fibula radiographic series was obtained, which revealed a proximal oblique fibular fracture (Figs. 7.3 and 7.4).

FIGURE 7.2 Lateral radiograph of the left ankle, revealing a displaced medial malleolus fracture

Given the above findings, the patient was diagnosed with a Maissoneuve fracture. He was recommended for operative stabilization of his injury, given the inherent instability of the ankle joint and the risks of mortise instability. Risks and benefits were discussed with the patient, and informed consent was obtained.

FIGURE 7.3 AP radiograph of the left tibia, revealing an associated proximal fibular shaft fracture

FIGURE 7.4 Lateral radiograph of the left tibia, revealing an associated proximal fibular shaft fracture

Treatment

After the patient was anesthetized and placed supine on the operative table, the leg was sterilely prepped. Contralateral fluoroscopic imaging was obtained as a guide for syndesmotic reduction.

Attention was paid first to the medial malleolus fracture. A standard medial approach was generated, and the medial malleolus was reduced under direct vision. Surgical stabilization was achieved with partially threaded cancellous lag screws (Fig. 7.5). The wound was closed in standard fashion.

FIGURE 7.5 Intraoperative fluoroscopic image, demonstrating stabilization of the medial malleolus fracture

Next, attention was paid to the fibula. Because the fibula was not significantly shortened and rotated (as compared to the contralateral fluoroscopic imaging), the fibula fracture proximally did not undergo open reduction and internal fixation. A collinear clamp was utilized to help obtain and maintain syndesmotic reduction. Adequacy of syndesmotic reduction was

FIGURE 7.6 Intraoperative fluoroscopic image, demonstrating stabilization of the syndesmosis with two 3.5-mm tricortical screws

based on comparisons to the contralateral fluoroscopic imaging, utilizing the position of the fibula along the tibial plafond laterally as the primary gauge for reduction. With the reduction held, two 3.5-mm cortex screws were applied in tricortical fashion (Fig. 7.6). After the clamp was removed, fluoroscopic imaging verified adequacy of implant position, maintenance of acceptable reduction, and mortise stability (with Cotton stress tests). The wound was closed in standard fashion.

Rehabilitation

The patient was kept nonweight bearing for approximately 8 weeks. He was permitted to perform range of motion as tolerated. He was allowed to progress with partial weight bearing after 9–12 weeks. At his 12-week post-op mark, he was permitted to be full weight bearing with a CAM walking boot.

Discussions were held with the patient regarding the risks and benefits of syndesmotic screw removal versus retention, and the patient elected to retain the screws.

At the last follow-up at 9 months, the patient had returned to activities and sports without limitations (Figs. 7.7 and 7.8).

Figure 7.7 AP radiograph of the left ankle at the patient's 9-month postoperative mark

FIGURE 7.8 Lateral radiograph of the left ankle at the patient's 9-month postoperative mark

Salient Points/Pearls

- Maissoneuve fractures are associated with extensive interosseous disruption and syndesmotic instability. Because of the higher position of the fibular fractures, these injuries can be potentially missed on standard ankle radiographic series. Therefore, in addition to obtaining a complete ankle radiographic series, full-length tibia/fibula radiographs are also warranted.
- The absence of fibular and medial malleolus fractures does not rule out the presence of syndesmotic injuries. Such variants include ligamentous deltoid disruptions (which act similarly to a medial malleolus fracture) and/or significant interosseous membrane disruption without a

FIGURE 7.9 AP radiograph of a left ankle, revealing a subtle avulsion fracture of the medial malleolus

concomitant fibular fracture (Figs. 7.9 and 7.10). Although these variants are less common, these must be adequately evaluated and excluded.

- Stress radiographs are necessary in order to determine the stability of the ankle joint (Fig. 7.11) and, when coupled with proximal tibia/fibula radiographs, help reveal the diagnosis (Figs. 7.12 and 7.13).

FIGURE 7.10 Lateral radiograph of a left ankle, revealing a subtle avulsion fracture of the medial malleolus

- Additionally, the patient may also respond to provocative tests, such as the squeeze and external rotation stress tests. The squeeze test is performed by applying a compressive force between the fibula and the tibia superior to the midpoint of the calf with the knee bent at 90°. A positive test indicates syndesmotic injury. The external rotation test is positive if pain is reproduced with external rotation of the foot and ankle relative to the tibia. Caution should be used

FIGURE 7.11 Stress view of the left ankle (from Figs. 7.9 and 7.10), revealing medial clear space widening. Because of the absence of a "visualized" fibular fracture, the physician must assume the presence of a fibular fracture and/or syndesmotic instability as contributory elements to the patient's ankle instability

to stabilize the tibia but not the fibula during this test to avoid a false-negative result [1].

- Treatment for Maissoneuve fractures requires anatomic reduction of the syndesmosis and stabilization of the ankle mortise; this is accomplished through reduction of the fracture(s) and syndesmosis. Stabilization must be accomplished along the medial column (medial malleolus or

FIGURE 7.12 AP radiograph of the left tibia (from Figs. 7.9 and 7.10), confirming the presence of a proximal fibular fracture

deltoid ligament disruption) and the lateral column (syndesmosis and fibula). To accomplish reduction of the syndesmosis in the setting of a high fibular fracture, open reduction of the fibular fracture to correct length and rotation can result in improved anatomic reduction of the syndesmosis [2]. Stabilization of the syndesmosis can be accomplished with screws of varying configurations or suture techniques, as controversy exists as to the optimal methodology and construct for stabilization.

- Reduction and fixation of the medial malleolus is accomplished through standard techniques. In cases of deltoid ligament disruption, primary repair may be warranted when the mortise does not adequately reduce despite adequacy of fibular reduction. In such instances, suspected interposition of capsular tissues or hematoma may block reduction [3].

Figure 7.13 Lateral radiograph of the left tibia (from Figs. 7.9 and 7.10), confirming the presence of a proximal fibular fracture

- For postoperative rehabilitation, most surgeons recommend a period of nonweight bearing for a minimum of 6 weeks to prevent fixation failure, while others have recommended 12 weeks of nonweight bearing to allow for further ligamentous healing [4]. Furthermore, the role of routine syndesmotic hardware removal also remains controversial [5, 6]. The author does not recommend routine removal of the screws and keeps these patients nonweight bearing for 8 weeks.

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