# Occult Fractures of the Talus

*A case presentation of a severe ankle sprain in which the patient was nonresponsive to routine therapies is presented. Repeat radiographs and computerized axial tomographic scans (CAT Scans) lead to the final diagnosis of a sagittal plane fracture of the talus. The clinical and radiographic evaluation leading to the diagnosis will be presented, and the surgical and postoperative managements will be discussed.*

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Fractures of the talus are highly represented in traumatic ankle injuries. Berndt and Harty (1), and Hawkins (2), classified many different types of talar fractures based on location and degree of displacement. Fabrizius (3) described the importance of talar fractures as early as 1608. Talar fractures represent 0.14% (4) to 0.32% (5) of all fractures. This percentage places talar fractures among fractures of rare occurrence. The biomechanical and functional aspects of the talus and the rearfoot depend largely on the articular surfaces of the talus and its anatomical alignments.

Major therapeutic challenges can be anticipated in the management of talar fractures. Open reduction and internal fixation followed by early mobilization can achieve good results of displaced fractures (6). Canale and Kelley (7) concluded that good results depend on anatomic reduction and fixation to prevent post-traumatic arthrosis, and they emphasized the importance of an active rehabilitation program. Management of major talar fractures are based on precise diagnosis, extent, and location of the fracture.

Normal radiographic examinations may not show fractures associated with ankle injuries. Computed axial tomography can aid in the diagnosis associated with initial ankle injuries. This manuscript presents an occult fracture of the talus; and addresses the diagnosis, radiographic, surgical and postoperative management.

## Case History

This 27-year-old male carpenter presented with a chief complaint of left ankle pain after falling from a roof at work. The patient was initially treated in a free standing outpatient center, placed in an elastic wrap, and diagnosed with severe left ankle sprain. He presented to the authors approximately 6 hr after initial treatment. Past medical history was unremarkable. The patient related no allergies or present medications.

Upon physical examination, pain was noted upon palpation of the lateral collateral ligaments, especially the calcaneal fibular. No palpable pain on the calcaneus, interosseous ligament or fibula was noted. The patient exhibited a mild amount of edema around the ankle. Neurovascular status was intact with pulses bilateral and symmetric. Radiographic views were exposed of the left foot and ankle. Left ankle mortise appeared intact without widening of the mortise. A possible avulsion fracture of the calcaneal fibular ligament from the calcaneus was noted (Fig. 1A). Some irregularity was noted between the middle and anterior facets of the calcaneus, however, no breaks in trabecular patterns were seen (Fig. 1B). The patient was diagnosed with a lateral ankle sprain, rupture of the lateral collateral ligaments, and an avulsion fracture as described previously.

He was placed in a posterior splint, dispensed crutches, and trained nonweightbearing on the left lower extremity. The patient was scheduled for a return visit in 5 days. Tylenol #3,[4] one or two tablets every 6 hr as needed for pain, and Motrin 800 mg.,[5] one tablet every 8 hr for 5 days, were prescribed. Upon return, a significant amount of edema was noted to the left ankle.

Palpable pain was recorded only to the calcaneofibular and anterior talofibular ligaments. The patient was to continue with the present treatment plan and return in 2 days.

The following visit demonstrated no change in the patient's physical examination except for a slight decrease in edema. Repeat radiographs, including an axial

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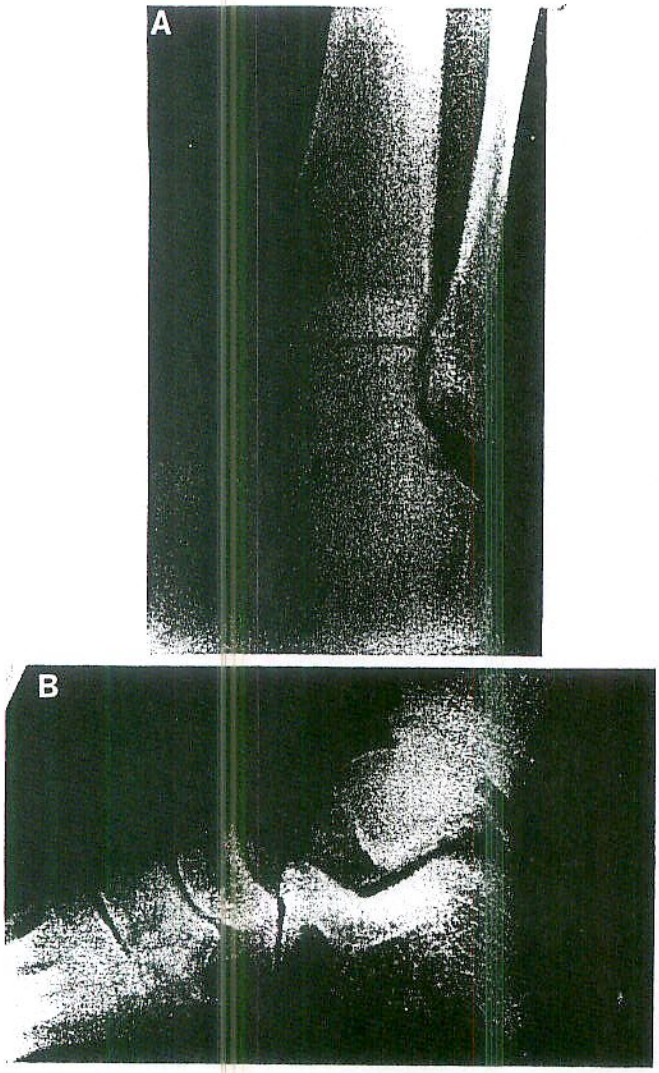


**Figure 1.** *A*, Mortise view of the left ankle; avulsion fracture of the calcaneus at the insertion of the calcaneal-fibular ligament. *B*, Lateral left ankle view: normal radiograph.

calcaneal view, were taken and again showed no signs of fracture or pathology of the left ankle (Figs. 2A, B). The patient was placed in a below-the-knee walking cast, partial weightbearing on the left lower extremity. Return visit was scheduled in 10 days.

The patient returned 3 days later with severe pain in the left ankle. The cast was removed and significant edema was noted. Since repeated radiographs were negative, a computerized axial tomographic scan (C.T. scan) was scheduled the following day. Results of the C.T. scan were discussed with the radiologist and confirmed a comminuted fracture of the body of the talus in the sagittal plane, which appeared to be significantly displaced (Fig. 3B). The fracture involved both the ankle and subtalar articular surfaces (Fig. 3A).

The condition was discussed with the patient and all options reviewed (closed reduction, casting nonweightbearing, fusion, open reduction). The authors believed

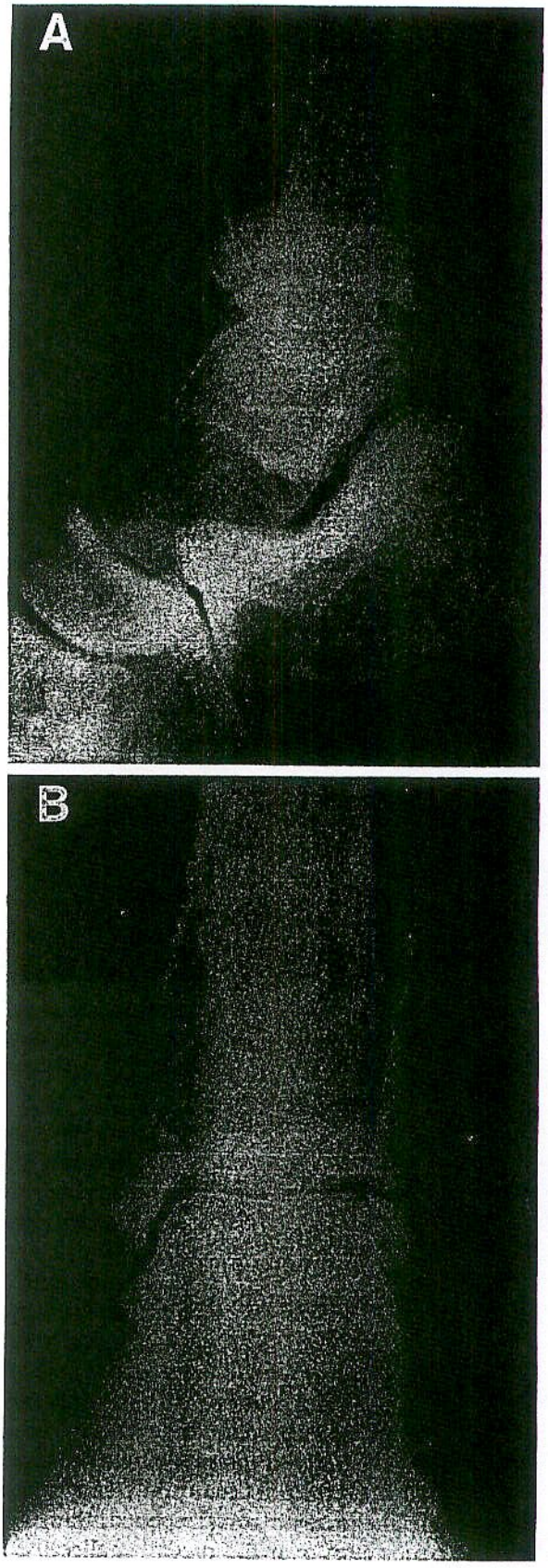


**Figure 2.** *A*, Lateral view of the left ankle: normal radiographic examination. *B*, Anteroposterior view of the left ankle: normal radiographic examination.

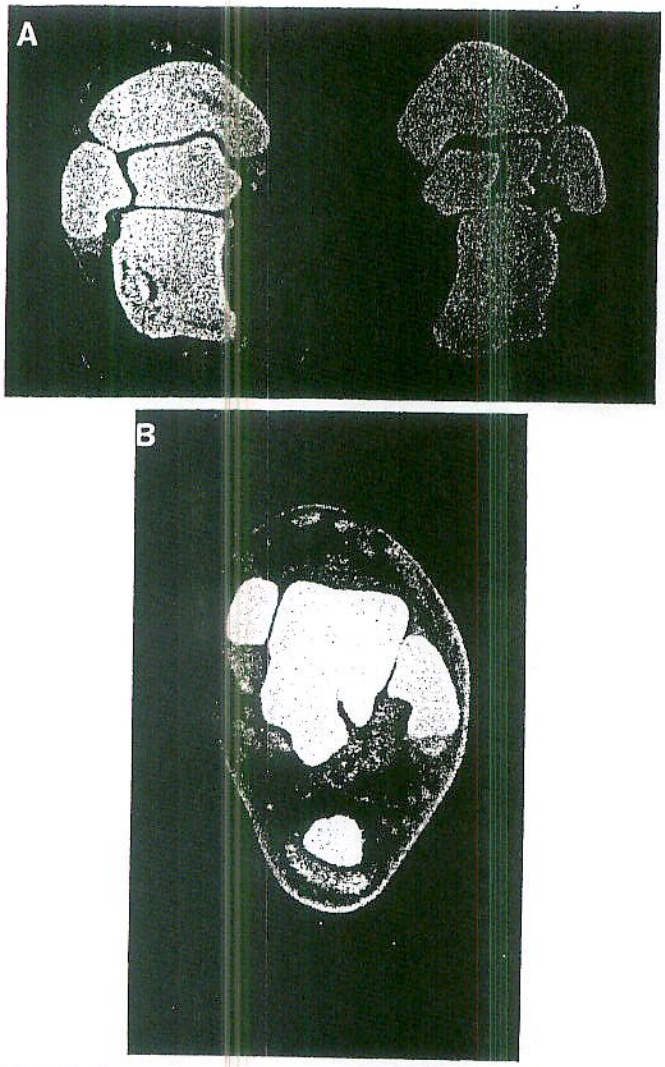


Figure 3. Computerized tomographic scans of the left talus. *A*, Coronal image. *B*, Transverse image. Both show sagittal plane fracture of the talus with displacement. Involvement of both the subtalar and the ankle joints as noted.

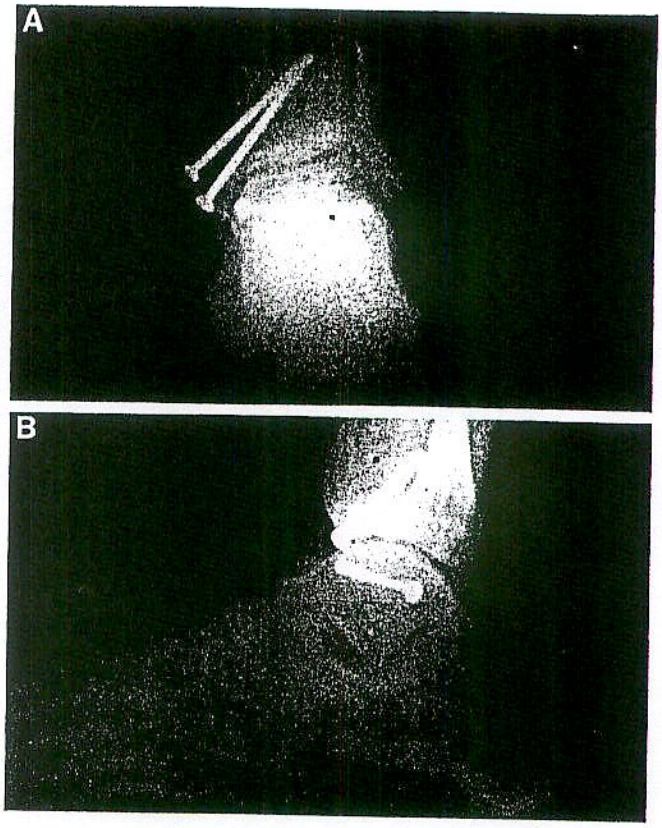


Figure 4. Immediate postarthrotomy of left ankle: reduction of talar fracture with medial malleolar osteotomy with fixation. *A*, Anteroposterior view of the left ankle. *B*, Lateral view of left ankle.

open reduction with internal fixation was necessary and would provide the best therapeutic treatment. The expected surgery is arthrotomy of the left ankle with medial malleolar osteotomy and internal fixation; open reduction with internal fixation of the comminuted fracture of the body of the talus, left foot (Figs. 4A, B).

### Operative Technique

A curvilinear incision approximately 12 cm. in length was placed over the body of the medial malleolus. The incision extended 6 cm. proximal and 6 cm. distal to the malleolus. The incision was deepened, thereby exposing the periosteum over the medial malleolus. Hemostasis was controlled by surgical cautery. The periosteum was incised in a transverse fashion at the level of the ankle plafond.

The posterior tibial tendon sheath was incised in a linear fashion and the tendon was retracted to expose the full body of the medial malleolus. The medial malleolus was prepared for osteotomy by predrilling for 4.0 cancellous screw. The holes were drilled and care taken not to invade the ankle mortise.

A transverse osteotomy was placed in the medial malleolus at the level of the ankle plafond. The malleolus was reflected both plantarly and anteriorly, exposing the medial gutter of the talus and the dorsal dome of the medial aspect of the talus. A sagittal plane fracture of the dorsal posterior aspect, involving more than 50% of the dorsal surface of the talar dome was visualized. The fracture appeared to demonstrate some incongruity, of a compression nature, of the proximal dorsal and posterior dome of the talus. Dissection was extended along the medial malleolar aspect of the talus, and medial posterior. The deltoid ligament was incised, and part of its posterior insertion was reflected to expose the medial posterior aspect of the talus. A 0.062-inch Kirschner wire was inserted into the proximal fracture piece, and used as a lever to create congruity on the dorsal dome surface of the talus. The pin was further

driven across the fracture site. Intraoperative radiograph demonstrated the pin was in excellent alignment, parallel to the plafond at the ankle, and adequately directed to avoid the articular surface on the lateral side of the talar dome. A 3.5-mm. drill hole was placed slightly anterior and parallel to the Steinman pin. A 45-mm. 4.0 cancellous screw was placed across the fracture site after appropriate countersinking and tapping. As the screw tightened the fracture fragment compressed. The cartilaginous surfaces on the dorsal dome of the talus appeared to be congruous. The pin was removed. Another radiograph was exposed to evaluate length and position of the screw. It revealed excellent reduction of the fracture at the level of the ankle joint. The deltoid ligament was reapproximated. The medial malleolus was returned to anatomic position. A 0.062-inch Kirschner wire was utilized to provide temporary fixation of the osteotomy. Alignment was found to be excellent both anteriorly, posteriorly, and laterally. Two 4.0-cancellous bone screws were inserted into the prepared channels. They measured 40 mm. in length. After insertion of the cancellous screws, the pin was removed and the osteotomy appeared to be quite stable.

The wound was irrigated with a solution of betadine[6] and saline in a one part to three parts mixture, throughout the course of the surgery. Attention was directed toward the posterior tibial tendon sheath, which was closed utilizing several simple sutures of 2–0 Dexon.[7] The subcutaneous tissue was maintained with several simple sutures of 5–0 Nylon.[8] A ¼-inch Penrose drain[9] was placed in the incision. The incision site was injected with 0.5% Marcaine[10] and Hexadrol.[11] A dry sterile dressing with adaptic[12] was applied. A large fluff dressing was applied with Webril.[13] The patient was placed in a posterior splint. Tourniquet was released and digital color and vascularity returned immediately. The patient tolerated the procedure well and left the operating room in good condition.

### Postoperative Treatment

The postoperative period proceeded without complications. He was admitted to the hospital following the surgery to monitor pain and immediate postoperative complications. No complications occured and patient was maintained with Tylenol #3[14] for pain. The patient was discharged from the hospital on the following morning. The posterior splint was retained for 10 days and the patient remained nonweightbearing on the left lower extremity. Sutures were then removed and a below-the-knee cast was applied in a slight equinus. Patient was maintained nonweightbearing for 12 weeks. During this time, serial x-rays were evaluated for Hawkins sign (6) or aseptic necrosis. Cast changes were performed biweekly. At 3 weeks the cast was changed to a below-the-knee walking cast.

The patient remained weightbearing with crutches for 2 weeks. He was initiated on physical therapy consisting of muscle stimulation and whirlpools three times weekly for 1 month. Active and passive range of motion and strengthening exercises for the anterior and posterior muscle groups were also performed. The patient was placed in a Reebok Air Pump Shoe[15] to enclose the entire ankle and help reduce edema. He was started on weightbearing with crutches for 2 weeks. Physical therapy was continued with an increase in activities to tolerance. Four months postoperatively the patient ambulated in the Reebok Air Pump Shoe with a slight antalgic gait. The follow up x-rays show no sign of avascular necrosis. The patient was allowed to return to work on light duty. One year postoperatively he began to develop mild subtalar joint pain. No treatment was given at that time. However, the patient was to continue with physical therapy to increase range of motion and strength.

### Discussion

A case of an unusual fracture to the body of the talus was presented from diagnosis, radiographic examination, surgical procedure, and postoperative therapy. The patient is 1 year postsurgical intervention. Early complications associated with open reduction of talar fractures include skin necrosis, and sepsis. Other complications that may occur include nonunion, malunion, avascular necrosis and post-traumatic arthritis (7–11). The patient presented in this case report progressed well for 10 months. He then developed pain in the region of the subtalar joint. This is the sequella of post-traumatic arthritis to the subtalar joint (7), since this was a sagittal plane fracture of the talus into the subtalar joint. Aggressive physical therapy has accomplished adequate range of motion to the rearfoot. No signs of degeneration, nor avascular necrosis, of the talus were

[6] The Purdue Frederick Company, 1100 Connecticut Avenue, Norwalk, Connecticut 06856.
[7] Davis & Geck, Inc., American Cynamid Company, Danbury, Connecticut 06810.
[8] LOOK, Inc., 45 Charles Park Road, Boston, Massachusetts 02132.
[9] Davol Rubber Company, P.O. Box 8500, Cranston, Rhode Island.
[10] Winthrop Pharmaceutical Division of Sterling Drug Inc., New York, New York 10016.
[11] Organon Inc., 375 Mt. Pleasant Ave., West Orange, New Jersey 07052.
[12] Johnson & Johnson, New Brunswick, New Jersey 08903.
[13] Kendall Co., Hospital Products, Boston, Massachusetts 02101.
[14] McNeil Pharmaceutical, McNeil Lab, Inc., Spring House, Pennsylvania 19477.
[15] Reebok Air Pump Shoe-International Limited, Drawer CS 100280, Atlanta, Georgia 30384–0280.

noted during the postoperative period. Recent reports show a majority of satisfactory results with open reduction and internal fixation, even with more severe injuries (8).

Mann (12) discusses in detail classification of talar bone fractures (Table 1). He further subdivides Group II shearing fractures of the talar body as shown in Table 2. Mann suggests open reduction with a medial malleolar osteotomy, and internal fixation with compression screw. Even after 1 year, avascular necrosis or severe degeneration of the subtalar or ankle joint may occur and fusion may be necessary.

The diagnosis of avascular necrosis is difficult with plain radiography. "Hawkins Sign," defined as atrophy in the dome of the talus on an anterior posterior radiograph of the ankle, should exclude the diagnosis of an avascular necrosis (6). However, it may not be present at 6 to 8 weeks and does not ensure total vascularization. Six months' delay in union may occur in 15% of the talar fractures and nonunion is rare (6). The incidence of difficulty with union is significantly lowered with open reduction and internal fixation (6). Pennal (13) suggests, in cases of comminuted fractures of the talus with marked displacement, or with severe post-traumatic arthrosis, tibiocalcaneal fusions may be performed.

TABLE 1. **Talar body fractures**[a]

| Classification | Description |
|---|---|
| Group I | Transchondral or compression fractures of the talar dome; includes so-called osteochondritis dissecans of the talus |
| Group II | Coronal, sagittal, or horizontal shearing fractures involving the entire talar body |
| Group III | Fractures of the posterior tubercle of the talus |
| Group IV | Fracture of the lateral process of the talus |
| Group V | Crush fractures of the talar body |

[a] Reprinted with permission from Mann, R., Surgery of the Foot: Fractures and Dislocations of the Foot, Chapter 24, pp 665–719, CV Mosby Company, St. Louis, 1986.

TABLE 2. **Shearing fractures of the talar body**[a]

| Classification | Description |
|---|---|
| Type I | Coronal or sagittal fractures |
| Type I-A | Nondisplaced |
| Type I-B | Fractures with displacement only at the trochlear articular surface |
| Type I-C | Fractures with displacement of the trochlear articular surface with associated subtalar dislocation |
| Type I-D | Fractures with total dislocation of the talar body |
| Type II | Horizontal fractures |
| Type II-A | Nondisplaced |
| Type II-B | Displaced |

[a] Reprinted with permission from Mann, R., Surgery of the Foot: Fractures and Dislocations of the Foot, Chapter 24, pp 665–719, CV Mosby Company, St. Louis, 1986.

TABLE 3. **Associated injuries with ankle sprains**[a]

| |
|---|
| Base 5th/Jones fracture |
| Anterior process of calcaneus |
| Peroneal subluxation |
| Osteochondral dome lesions |
| Avulsion fractures of calcaneus |
| Shepherds fracture |
| Masonneuve |
| Tibial fracture |
| Fibular fracture |
| Peroneal rupture |
| Talar fracture |
| Ligamentous damage |
| Sinus tarsi |
| Cuboid fracture |

[a] Personal Communication: Jared Frankel, DPM, Lincoln West Hospital Resident Lecture Series, "Ankle Fractures," Lincoln West Hospital, Chicago, IL. September 1990.

## Conclusion

This manuscript is intended to provide a case presentation of an occult fracture of the talus associated with an acute ankle sprain. In treating ankle sprains, one must not only be aware of direct injuries that are involved with acute ankle sprains, but also those of the indirect injury. Those injuries directly related to ankle sprain includes fractures of the tibia and fibula, and the medial deltoid and lateral collateral ligaments. Those injuries not occurring in the ankle, but caused by the forces that pass through the ankle, are considered indirect injuries. These injuries are listed in Table 3. The podiatric physician should be aware of possible associated fractures with ankle sprains. Exuberant edema and pain may be the indication of an occult fracture. Follow-up radiographs, including computerized tomographic scans, magnetic resonance imaging, or triphasic bone scans are then indicated.

Once the pathologic area is identified, in this case a sagittal plane fracture of the body of the talus, accurate evaluation of its extent and location allow for better understanding and management. Open reduction with internal fixation reduces the possibility of arthritis to the subtalar and ankle joints. It decreases the chance of avascular necrosis, delayed and/or nonunion. Good anatomical alignment of the fragments, with early mobilization, will provide the best results.

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