

OPEN FRACTURES - CONSIDERATIONS IN PEDAL INJURIES

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INTRODUCTION

Open fractures of the lower extremity represent some of the most unpredictable and challenging scenarios that podiatric physicians must face. Although trauma-trained podiatrist will deal with a greater number and variety of open fractures, all office based physicians will see these injuries as well. An open fracture is simply defined as a fracture that has penetrated the surrounding soft tissues and made contact with the external environment. With this definition in mind, nail bed injuries with associated tuft fractures would be classified and treated as open fractures. We will look at this particular injury and other examples of lower extremity open fractures and present the accepted treatment principles that should be applied. As these principles are described, you will notice that the same recommendations used to treat a severe open fracture of the tibia also apply to the open tuft fracture of the hallux. After looking at the traditional classification of open fractures, we will investigate some very unique scenarios that occur in the human foot.

CLASSIFICATION

The classification scheme forwarded by Gustilo in 1951 remains the gold standard by which open fractures are categorized.¹ In this system, open fractures are broken down into three types according to the mechanism of injury, the degree of soft tissue damage, the fracture configuration, and the degree of contamination.

A Type I fracture involves a defect of less than 1 cm, little soft tissue damage, and minimal

contamination. The fracture pattern is relatively stable, usually consisting of a short oblique or transverse configuration (Fig. 1).

A Type II open fracture includes those with a soft tissue defect greater than 1 cm in length. There is an increased degree of soft tissue damage and moderate wound contamination. Although the soft tissue damage is increased in this group, there are no flaps or avulsions created. The fracture is more unstable than the previous group and typically involves a degree of comminution (Fig. 2).

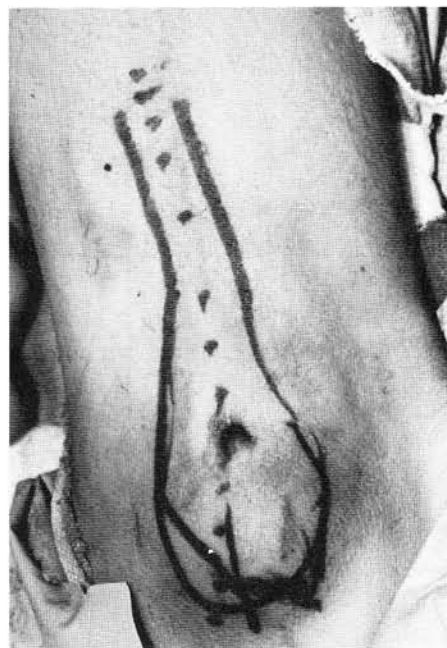


Fig. 1. Typical Type I open fracture. Small soft tissue defect with little contamination.



Fig. 2. Increased soft tissue defect and wound contamination with Type II injury.

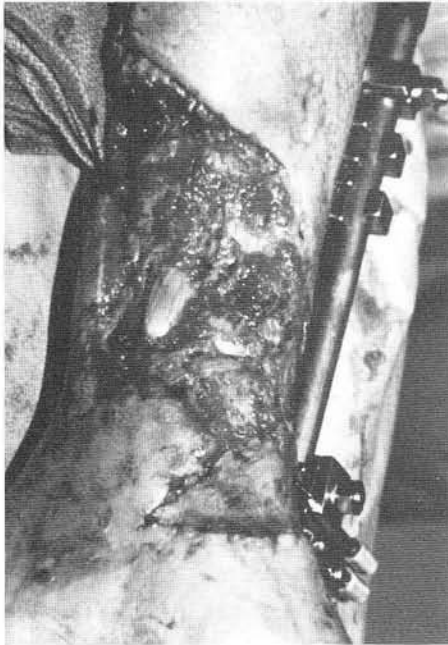


Fig. 3A. Type III injury with extensive soft tissue damage and highly comminuted fracture.

Type III open fractures represent the most severe type of injury. These are typically high velocity type injuries with extensive soft tissue damage. The destruction often extends beyond the skin and subcutaneous layer and involves the muscle and neurovascular structures. Wound contamination is also extensive with this type of

fracture. The fracture itself is extremely unstable and highly comminuted (Fig. 3A, 3B). Due to the wide variety of fracture scenarios that can fall under this description, Type III injuries are further divided into three sub - categories; Type III A, Type III B, and Type III C. The degree of soft tissue damage and extent of wound contamination increase as the levels progress.

This scheme has served as the standard for classifying open fractures for over 40 years. It is an extremely versatile system, that can be applied to virtually all upper and lower extremity fractures. However, there are several unique fracture scenarios occurring in the human foot that do not conveniently fit into the above scheme. As the treatment principles are discussed, the typical open fracture scenario will be presented initially and subsequently some of the unique pedal injuries that occur will be addressed.



Fig. 3B. Type III injury.

TREATMENT

The treatment of open fractures should be aimed at achieving three goals: preventing bone and soft tissue infection; obtaining fracture healing; and restoring function to the injured extremity. The ease with which these goals can be accomplished is directly related to the severity of injury.

Gustilo¹ emphasizes eight essential principles required to address open fractures (Table 1). These principles need to be applied in chronological order. Before any local treatment is carried out on the fracture itself, the patient must be evaluated for life threatening injuries. Approximately 30% of all trauma cases involve multi-trauma events. Once life threatening events have been ruled out or addressed, the remaining principles can be executed in order. The specific treatment principles will be described in detail during the lecture.

Although a majority of open pedal fractures can be classified according to Gustilo's classic breakdown, there are several unique scenarios that exist and require a slightly different treatment approach. These atypical open fracture types include such injuries as crush injuries with associated nail damage, puncture wounds with osseous

involvement, gun shot injuries and traumatic avulsions. Each of these examples will be illustrated in the course of the lecture.

COMPLICATIONS

Complications are to be expected with these types of injuries. They can occur as a result of the injury itself or as a consequence of the treatment or lack of treatment instituted. The primary complication seen in these injuries is infection. If infection can be eliminated or controlled, there is a much greater chance of preventing the other complications from occurring. Some of the other complications that can be seen include delayed or non-union of the fracture, skin and soft tissue complications, osteomyelitis, gangrene, and amputation. Early, aggressive treatment is mandatory to minimize these obstacles.

SUMMARY

Open fractures of the lower extremity represent one of the most challenging fracture scenarios the podiatric physician must face. Whether it be a severe fracture - dislocation of the ankle, or a tuft fracture of the hallux with an associated nail bed laceration, treatment principles remain constant. Early, aggressive therapy is the standard of care for all of these injuries.

REFERENCE

1. Gustilo RB: *Fracture Classification Manual* Chicago, MosbyYearbook, 1991.

TABLE 1

EIGHT ESSENTIAL PRINCIPLES WHEN ADDRESSING OPEN FRACTURES

1. Treat all open fractures as an emergency
 2. Evaluate other life threatening injuries
 3. Appropriate and adequate antibiotic therapy
 4. Aggressive debridement and irrigation
 5. Stabilization of fracture
 6. Appropriate wound coverage
 7. Early bone grafting if required
 8. Rehabilitation
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