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Severe Osteoarticular Trauma of the Knee: an Unusual Injury Assessment

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Abstract

We report the case of a 34-year-old man, who was involved in a traffic accident resulting in a type III open knee fracture. A large spectrum antibiotic therapy was administered (penicillin+gentamicin) with early surgical debridement. Bone stabilization was achieved with an external fixator bridging the knee and skin closure was possible. Postoperatively we did not observe any clinical infection. Consolidation was obtained after 6 months of surgery. After 12 months, the patient regained his autonomy but retained a frank stiffness of the knee.

Keywords: Osteoarticular; Open fracture; Infection; Antibiotics; Stabilization

Introduction

An open fracture is defined by the presence of a communication between a fracture site and the external environment. The skin opening may vary from a simple perforation to complete exposure of the bone. These fractures are the cause of significant morbidity because the risk of infection remains high due to the breakdown of all protective barriers [1]. Osteoarticular trauma of the knee exposes the patient to primary and secondary complications, which makes their management difficult. The esthetic and functional damage can be deleterious [2]. Hence the importance of a rapid and compliant management allowing the prevention of infection, bone consolidation and an improvement of the functional prognosis.

Visual case discussion

A 34 year old patient, victim of a road accident (pedestrian hit by a heavy vehicle), which resulted in a damaged knee. The clinical examination revealed a conscious patient (GCS 15/15); without signs of hemorrhagic shock. A skin opening of more than 30 cm, medial to the knee with exposure of the joint and all bone segments (Figure 1). The opening was classified as Gustilo III. Pelvic examination was normal; the rest of the musculoskeletal examination was unremarkable. The popliteal and posterior tibial pulses were perceived; the pedal pulse was abolished. Paralysis in the deep and superficial fibular territory was noted, without paralysis in the tibial nerve territory.

Radiological examination (Figure 1) revealed a simple line fracture of the lateral condyle, a comminuted fracture of the patella, and a comminuted fracture of the tibial plateau extended to the upper third of the shaft. A CT angiography was performed showing respect for the popliteal pedicle; the anterior tibial artery was sectioned with respect for the posterior tibial and fibular arteries. A large spectrum antibiotic therapy was introduced 4 hours after the trauma (penicillin and gentamicin) and the patient was taken to the operating room for surgical management. First, abundant irrigation (12L of saline) was performed with debridement and excision of all necrotic and necrotic tissue. An exploration of the knee found (Figure 2):

i. -A ruptured and frayed extensor apparatus.

ii. -Comminuted fracture of the patella.

iii. -Patellar fins were broken and shredded.

iv. -Rupture of the lateral and medial collateral ligaments, with respect to the central pivot.

v. -There was a bilateral meniscus tear.

vi. -A simple fracture of the lateral condyle.

vii. -A comminuted fracture of the tibial plateau with proximal extension on the tibial diaphysis.

viii. -The superficial and deep fibular nerves were transected with an average of 5 cm loss of substance.

ix. -The anterior tibial artery was ruptured and thrombosed. The posterior tibial and fibular axes were intact.

The patient underwent primary stabilization with an external fixator and tension-free skin closure (Figure 3).

Antibiotic therapy was maintained for 8 days with discontinuation of gentamicin after 5 days. Thromboprophylaxis was prescribed for 14 days. Partial weight-bearing was allowed only after 2 months of surgery and full weight-bearing after 3 months. Consolidation was achieved at 6 months. After 12 months, the patient regained his autonomy but with severe knee stiffness (30° flexion). In addition, no skin or infectious complications were observed (Figure 4).

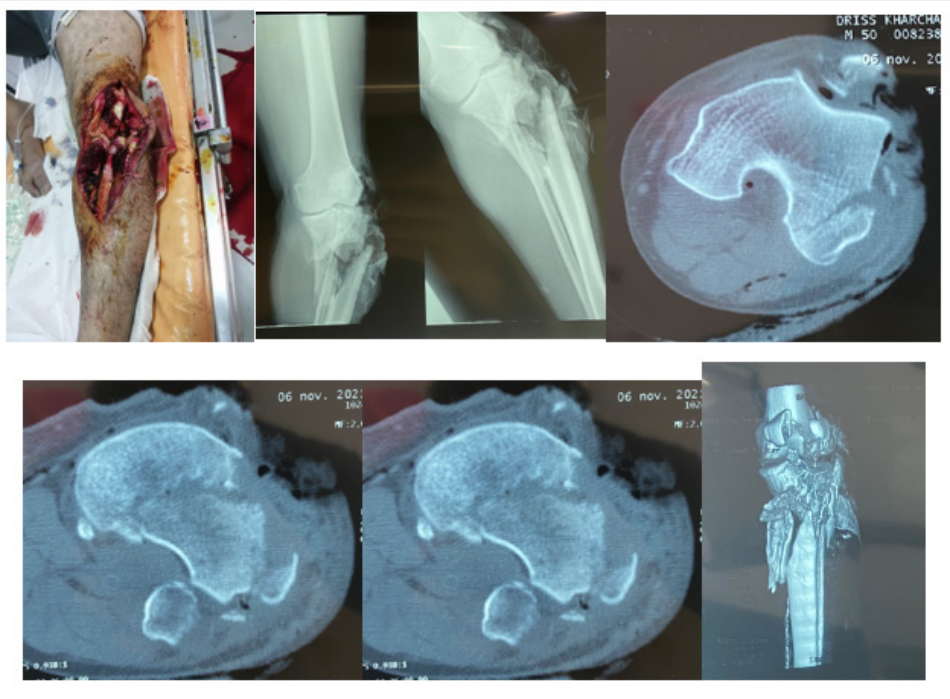

Figure 1: Clinical image and radiological assessment of the wound.

Figure 2: Intraoperative image of the lesion assessment during the debridement.

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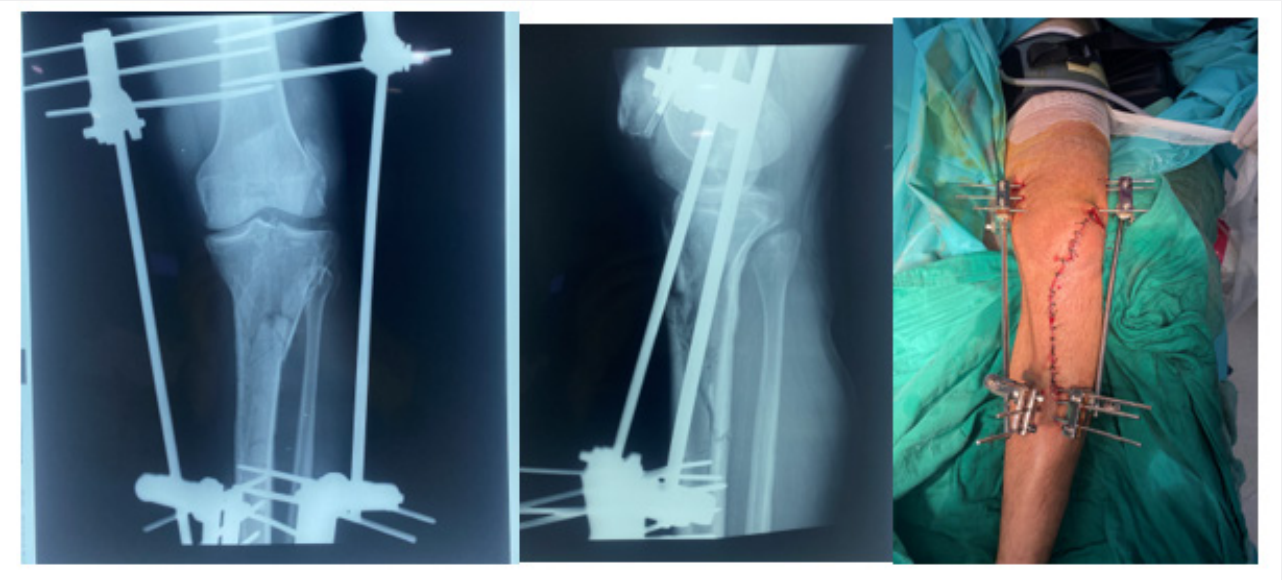

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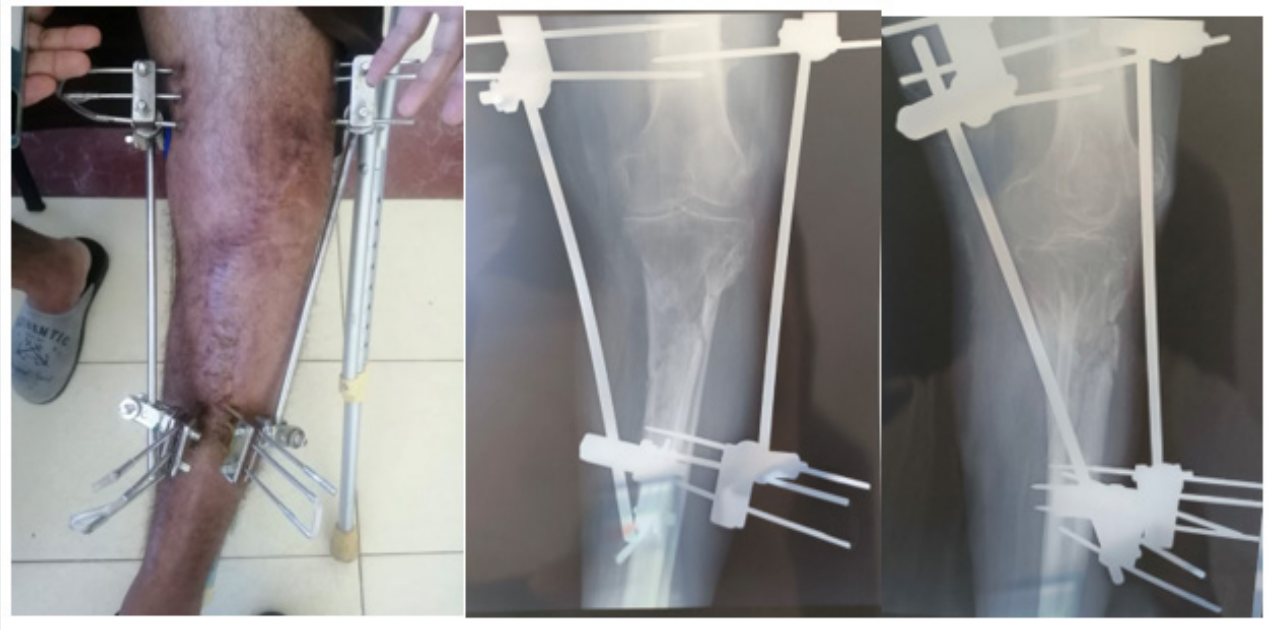

Figure 4: Clinical control showing a clean wound without infection, and radiological consolidation.

Discussion

Open osteoarticular trauma represents a major problem in terms of both management and prognosis. Orthopaedic surgeons are constantly challenged by these injuries which, despite the development of surgical techniques, remain at high risk of infection and pseudarthrosis. The Gustilo classification is the most widely used system for classifying open fractures. It takes into account the energy of the fracture, the degree of soft tissue damage and contamination [3,4]. A second classification system is used to guide the surgeon in determining the indication for amputation in the context of major trauma to the limbs: the MESS score [5]. A score greater than or equal to 7 is predictive of amputation with an accuracy close to 100% [5-8].

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All open fractures are contaminated by definition, with an infectious risk that differs according to the type of fracture. It is 0 to 2% for type I fractures, 2 to 10% for type II fractures and 10 to 50% for type III fractures [4,9]. Antibiotics should be administered systematically and early, ideally within 3 hours of the trauma [10]. This will reduce the risk of infection [11,12]. The duration of antimicrobial coverage remains debated and requires a multicenter randomized trial to determine the optimal duration that reduces the risk of infection without increasing the risk of antibiotic resistance [13]. Usually, surgical debridement is performed within 6 hours in an attempt to reduce the rate of infection and pseudarthrosis [14]. However, this approach remains controversial with respect to the risk of infection [15-20], and there is no consensus. Skeletal stabilization protects soft tissue from further damage that may be caused by mobile fragments. Restoration of length and stabilization reduces dead space and allows for easier access to soft tissue while reducing the rate of infection [21-23]. Therapeutic means include external fixator, intramedullary nail, or plates depending on the type of injury and the risk of infection [24-29].

Conclusion

Open fractures are a challenging condition for orthopedic surgeons. Management is based on early administration of antibiotics, surgical debridement and effective stabilization of the bone, which decreases the risk of infection and allows for bone healing with an improved functional prognosis.

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