



Case report

Successful treatment of an open tibial fracture in a 102-year-old woman: a case report

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Abstract

Introduction: As the average life expectancy is increasing, the number of patients aged >100 years who have fragility fractures will increase in the future. In female patients, the incidence of open fractures increases with age.

Case Presentation: We present the case of a 102-year-old woman with open tibial and fibular diaphyseal fractures (Gustilo-Anderson classification type IIIb) treated with temporary external fixation, advancement flap, and negative pressure wound therapy in the first-stage surgery and treatment, and open reduction and internal fixation with skin grafting in the second-stage surgery. Open wound and bone healing were attained.

Conclusion: Surgery should not be denied on the basis of age alone. Medical evaluation should focus on identifying risk factors, assessing risk in detail, optimizing status, predicting complications, and making the appropriate surgical plan for the patient status. Moreover, in the present case, meticulous postoperative management was the main reason for the successful surgical treatment.

Key words: open fractures, open tibial fractures, Gustilo–Anderson classification type III, skin graft, advanced-age patients

(J Rural Med 2020; 15(4): 221–224)

Introduction

As the average life expectancy is increasing, the number of patients aged >100 years who have fragility fractures will increase in the future¹. In female patients, the incidence of open fractures increases with age. Owing to the thinner skin of geriatric women, the incidence of open fractures in this population is higher than that in the younger population². The most common open fractures among women aged ≥80 years are distal radial and ulnar, phalangeal, tibial and/or fibular diaphyseal, and ankle fractures (in this order of frequency). The annual incidence of open tibial and/or fibular diaphyseal fractures in women aged ≥80 years is 56.7 cases in 10⁶ women. The prevalence of Gustilo–Anderson classification type III fractures in open tibial and/or fibular diaphyseal fractures in women aged ≥80 years is 46.7%².

Here, we present the case of a 102-year-old woman with open tibial and fibular diaphyseal fractures treated with temporary external fixation, advancement flap, and negative pressure wound therapy (NPWT) in the first-stage surgery and treatment, and open reduction and internal fixation (ORIF) with skin grafting in the second-stage surgery. The patient attained bone healing and is living at home. This case report conforms to the principles stipulated in the Declaration of Helsinki. Written informed consent was obtained from the patient for the publication of this case report.

Case Presentation

A 102-year-old woman (height, 1.30 m; weight, 30 kg) lived in her house with her children. Before the injury, she had been walking short distances in the house by herself. One night, she fell down the stairs. This led to her hospital admission for open tibial and fibular diaphyseal fractures. Radiography revealed a fracture at the right tibia and fibula (AO Foundation and Orthopaedic Trauma Association classification of 42B2b and 4F2Bc; Figure 1). She had a history of hypertension and paroxysmal atrial fibrillation. Echocardiography revealed moderate tricuspid and mild aortic regurgitations. She had no diabetes and smoking habit. The American Society of Anesthesiologists physical status classification was III. The Charlson Comorbidity Index score

Received: April 22, 2020

Accepted: May 7, 2020

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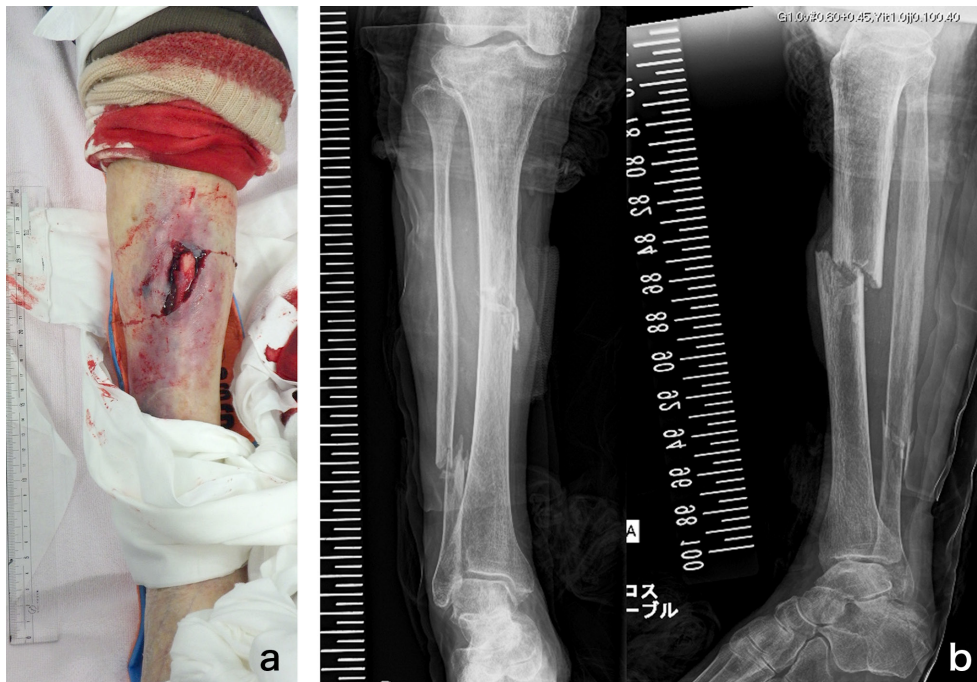


Figure 1 a. Traumatic wound in the right leg found upon admission at the emergency department. b. Preoperative radiograph of the right lower leg.

was 1. Antibiotic (cefazolin) was promptly administered upon arrival at the emergency department.

First Surgery: An emergency surgery was performed on the day of the injury. The cranial end of the distal bone fragment was exposed through the open wound (approximately 6 cm long). No foreign bodies were found in the open wound. We performed low pressure lavage (9,000-mL saline), extensive cleaning, and debridement of the open fracture (i.e., the cranial and dorsal margins of the distal bone fragment from which the periosteum had been removed was excised with a bone rongeur) and necrotic skin. The patient was treated with a temporary external fixator (Figure 2). The Gustilo–Anderson classification was type IIIb. We performed an advancement flap placement to prevent bone exposure, thereby exposing the tibialis anterior muscle. The NPWT device (RENASYS, Smith & Nephew, London, UK) was attached to the open wound where the tibialis anterior muscle was exposed. The intraoperative bleeding volume was 220 mL. For safety reasons, the patient was transferred to the intensive care unit for monitoring and received 480 mL of red blood cell transfusion. She resumed oral intake the day after the surgery.

Second Surgery: The patient received antibiotics (cefazolin) for 72 h. She underwent a second surgery 3 days after the injury. No impaired blood flow was observed in the skin that was sutured during the first surgery. No particular problems occurred with the open wounds. An intramedullary nail (diameter 11.5 - length 240 mm Trigen Meta-Nail,

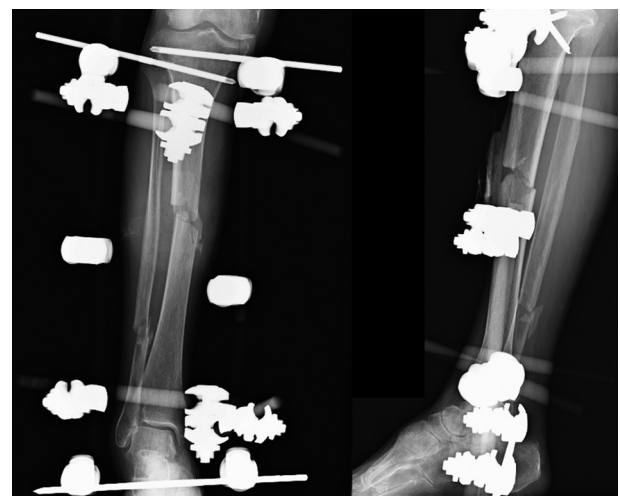


Figure 2 Radiograph after the first surgery (the cranial and dorsal margins of the distal bone fragment from which the periosteum had been removed).

Smith & Nephew, London, UK) was inserted in her tibia (Figure 3). She received a full-thickness skin graft (70 × 30 mm) from the ipsilateral front thigh. The NPWT device was attached to the same site for skin engraftment. NPWT was administered for 1 week after the second surgery. For safety reasons, the patient was transferred to the intensive care unit for monitoring and received 240 mL of red blood cell transfusion. After the operation, she developed a heart failure.



Figure 3 Radiograph after the second surgery.



Figure 4 Radiograph 6 months after the second surgery.

Oxygen via nasal cannula and diuretics (furosemide) were administered for treatment. She was discharged from the intensive care unit 5 days after the operation. She underwent rehabilitation at full weight bearing.

She was transferred to a rehabilitation hospital 2 weeks after her second surgery. She was discharged home 3 months after the second surgery. She could walk short distances at home with a walking support device while being watched by her family. Six months after the operation, both the tibial and fibular fractures achieved union (Figure 4). No problems occurred with the skin graft (Figure 5) and donor site.

Discussion

Patients aged >100 are not uncommon owing to the increasing life expectancy. The number of patients with advanced age is expected to increase in the future. Some operative risks are dependent on patient age. The medical evaluation for patients with advanced ages should focus on identifying risk factors, optimizing status, predicting complications, and providing appropriate information. Some studies have described cases of surgery in patients aged >100 years, for example, coronary bypass surgery in a 105-year-old patient³⁾, abdominal wall reconstruction in



Figure 5 Skin grafting site at 6 months after the second surgery (black arrows).

a 105-year-old patient⁴), and osteosynthesis for hip fracture in a 107-year-old patient⁵). They reported that in each case, detailed risk assessment, surgical planning, and meticulous postoperative management were the reasons for the successful surgical treatment³⁻⁵). In the case of a single injury in a young healthy patient, treatment is considered to be one-stage surgery with ORIF and flap placement for soft tissue reconstruction. However, this time, we considered the possibility of reducing surgical invasiveness (bleeding volume and operative time) using a skin graft in two-stage reconstruction instead of a flap for soft tissue reconstruction. We performed advancement flap placement and NPWT in the first surgery. In the second surgery, soft tissue reconstruction was possible only with skin grafting together with ORIF. Skin grafting was considered a less-invasive surgical procedure in terms of operative time and bleeding volume, and less burdensome to patients than the use of a skin flap.

The 1-year mortality rate of patients aged ≥ 80 years who have hip fractures is 15.6%⁶). Regarding fracture surgery for patients with advanced age, the mortality rate is low. Care

should be taken during treatment, including the possibility of death. Regarding death within 1 year after the osteoporotic fracture surgery, the mortality rate is significantly higher within than after 6 months after operation^{6, 7}). The cause of death at that period was cardiovascular events⁸). In the present case, the patient developed a postoperative congestive heart failure and required oxygen and intravenous diuretics. Careful postoperative management was required. A cardiologist participated in daily heart failure treatment and made drug adjustments. We believe that careful attention to perioperative complications was also important.

Conclusion

Surgery should not be denied on the basis of age alone. Medical evaluation should focus on identifying risk factors, assessing risk in detail, optimizing status, predicting complications, and making the appropriate surgical plan for the patient status. Moreover, meticulous postoperative management was the main reason for the successful surgical treatment in the present case.

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