

The Outcome Of Surgical Fixation Of Multiple Long Bone Fractures in A 26-Year Male: A Case Report.

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Abstract

Introduction – Multiple bilateral long bone fractures are relatively rare injuries. This study aims to present a case of a patient, a known smoker who sustained ipsilateral humerus and patella and bilateral shaft of femur, tibia and fibula fractures, the functional and clinical outcomes of fixation with a two-year follow-up. **Presentation of case:** A 26-year-old man presented to the emergency department after a motor vehicle accident. Radiographs and clinical examination determined a right shaft of humerus fracture, Bilateral shaft of femur fractures and right Patella fracture, right bimalleolar ankle fracture, and left segmental tibia fracture with a grade 3b compound injury. Right Humerus and Right Bimalleolar ankle fractures are treated with open reduction and plating. Tension Band Wiring is done for the right Patella fracture. The bilateral shaft of femur fractures are treated with closed reduction and intramedullary interlocking nailing. For left segmental tibia fracture, external fixator applied elsewhere was removed, and Ilizarov fixation was done, and the compound wound over the left leg was managed with debridement, Vacuum-Assisted Closure therapy and split skin Grafting. At two-year follow-up, he can do his daily activities with minimal limitation. **Discussion:** Multiple Bilateral long bone fractures occur mostly due to high energy traumas. A meticulously planned staged surgery should be performed to minimize the complications. All the fractures in this patient were fixed in three sessions, which prevented deterioration of the patient's status and made rehabilitation easy. Revision surgery was done for non-union right humerus. We attribute the non-union to his smoking habits and the increased load on the arm due to weight-bearing with a walker as part of the rehabilitation program for lower extremity fractures. **Conclusion:** Careful evaluation of all systems should be performed in multi-trauma patients to find out concomitant injuries. A Well planned, staged surgical treatment with proper wound care management may decrease morbidities. Discontinuation of smoking is to be advised, at least during the healing phase.

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I. Introduction

High energy traumas are the leading cause of multiple fractures and compound injuries in the young population. This article aims to report a patient who sustained simultaneous bilateral shaft of femur fractures, ipsilateral humerus, patella, and bimalleolar fractures with left segmental tibia fracture with grade 3 open injury and his two-year follow-up after fixation. The impact of smoking on fracture healing is also studied. Several non-randomized and uncontrolled studies have suggested a harmful effect of tobacco, resulting in delayed healing and increased rates of non-union. Hypothetically we attribute the nonunion of fracture humerus treated with plating in this patient to his chronic smoking habits.

II. Case Report

A 26-year-old male presented to the emergency department after a road traffic accident (collision between two lorries). He was initially taken to a local hospital where external fixation was done to left leg fracture with an open wound and referred to our hospital for further management. The patient was complaining of pain and swelling of the right arm, and bilateral lower extremities with an inability to weight bear since the accident. He is a known smoker and smokes 20 cigarettes per day.

On physical examination, swellings and tenderness were present over the right arm, bilateral thigh, right knee and ankle, and a degloving injury over the left leg with an external fixator. Vitals were 110/60 mmHg blood pressure, and his pulse rate was 90/min. The hemoglobin level was 10.2 g/dl.

Radiographic examination showed fractures of the right humeral shaft, bilateral femoral shafts, left tibia, right patella, and right bimalleolar ankle fracture-dislocation. (Fig.1)

Fig.1. Radiographs showing multiple long bone fractures of right humerus (fig.1.1,1.2), right patella (fig.1.3), right ankle (fig.1.4), right femur (fig.1.5), left femur (fig.1.6), right segmental tibia fracture (fig.1.7,1.8)



Fig.2.Immediate post op radiographs after both external and internal fixation of tibia(Fig.2.1,fig.2.2
 Fig .3.post op radiographs taken one year after removal of Ilizarov ring fixator
 Fig .4.1.Implant failure of right humerus fracture , Fig .4.2,4.3 .post op xrays after 1 year follow up after revision plating



Fig.5. post op x-rays after a follow up of one year.Right patella (fig.5.1.),right ankle fracture(fig.5.2) , right femur shaft fracture (fig.5.3, 5.4) ,left shaft of femur fracture(fig.5.5)

The grade 3 compound injury over the left leg was thoroughly debrided, followed by the application of Vacuum-Assisted Closure(VAC) dressing. Antibiotic prophylaxis was started.Swab for culture sensitivity was sent from the degloved wound before debridement.Onthe third day, VAC Dressing was removed,andthe wound condition was found to be satisfactory with decreased discharge.

Informed consent was taken from the patient and his attendants regarding operative Intervention.He was operated on the third day of admission. Proximal tibial skeletal traction was applied on the right side until surgery. Fixation was done in three sessions with a three-day gap in between the sessions. In the first session,right-sided fractures are fixed. Open reduction with plating was done to the right humerus and right bimalleolar fracture, Tension band wiring to the patella,closed reduction with intramedullary nailing to the right femur. After a three day gap, closed reduction and interlocking nailing was done to left femur fracture.In the third session, the uni-planar external fixator was removed because of inadequate reduction and the segmental tibia fracture is fixed withinterfragmentary screws and locking compression plate and for better therapeutic effect, Ilizarov ring fixator was also applied.

The rehabilitation program was started immediately after surgery. The patient was advised to stop smoking, but he was not compliant. Assisted weight-bearing was allowed six weeks after surgery.

The ring fixator was removed two months after surgery to minimize the complications like pin tract infections, leaving the tibial plate and lag screw in situ. Three months after surgery, the patient presented with sudden pain and deformity of the right arm while weight-bearing with the support of a walker. Radiological examination revealed implant failure and nonunion at the fracture site for which bone grafting and revision plating was done, and the patient was counseled to stop smoking.

Imaging assessment with anteroposterior and lateral radiographs made in the immediate post-operative period, at six months, one year, and a final two-year follow-up. At two year follow up, radiographs showed progressive union and the patient is able to do his day to day activities without assistance and is leading a normal life.

III. Discussion

Multiple Bilateral long bone fractures occur mostly due to high energy traumas. It is of utmost importance in multiple trauma patients to mobilize early to enhance survival by preventing bed ridden complications. A meticulously planned staged surgery in a minimal number of sessions should be performed to minimize the complications and to avoid deterioration of the patient's status thus making the rehabilitation easy. Literature suggests that a stably fixed bone defends itself best against infection by rapidly restoring the microcirculation and building a protective barrier. Therefore the uniplanar external fixator with which the patient presented to us was removed because the reduction was traumatic. External fixation enhances the function of a limb by providing the advantage of early mobilization. Nevertheless, its application is accompanied by a series of problems in alignment and bone healing. Therefore limited internal fixation can be used along with external fixator to enhance the therapeutic effect. However, the procedure needs to be done after the infection subsides in compound wounds. Debridement, negative pressure wound therapy are effective ways to treat an open injury with discharge. There was marked reduction in purulent discharge and new granulation tissue formation over the wound on the left leg in our patient after one sitting of Vacuum-Assisted Closure therapy. Hence we continued the treatment for four sessions before proceeding to combined internal and external fixation and split skin grafting. After its removal, combined internal and external fixation of the tibia was done to enhance the stability and to answer the bone loss that occurred due to open injury. Whenever possible, external fixators should be used in combination with local interfragmentary compression fixation by lag screws whereby the external fixator takes over the function of a neutralization plate. Postoperatively, it is crucial to begin motion early with guided, supported mobilization and slowly progress to active movement.

Clinical and radiographic criteria were used to define bone union or nonunion. A nonunion was defined as a fracture that had failed to show continuity of three of four cortices, six or more months from the time of the fracture-related injury, or had failed to demonstrate any radiographic change (improvement) for three consecutive months, and was associated with clinical findings consistent with a nonunion (inability to bear weight on the affected extremity, pain on palpation, or motion at the fracture site for three to six months or more following the incident traumatic event)

Experimental studies have shown that tobacco has negative effects on fracture healing. Nicotine seems to affect the early revascularization of the fractured bone, probably through down-regulated gene transcription of fibroblast growth factor, vascular endothelial growth factor, and bone morphogenetic protein cytokines, which are known to be essential to angiogenesis and osteoblast function [10]. Clinically, the consequences of smoking on bone healing are less clear [11–17]. Several non-randomized and uncontrolled studies have suggested a harmful effect of tobacco, resulting in delayed healing and increased rates of nonunion [18–20]. Although it remains unknown if modifying tobacco use has an impact on fracture healing, it appears logical to advocate tobacco discontinuation in smokers, at least during the healing time of the bone. In our patient revision, plating with bone grafting done alongside abstinence from smoking achieved good functional and radiological outcomes of the non-union humerus.

IV. Summary

Careful evaluation of all systems should be performed in multi-trauma patients to find out concomitant injuries. Application of the four basic principles in internal fixation--anatomical reduction, stable internal fixation, preservation of maximum blood supply to the bone fragments and soft tissues, and early active pain-free mobilization of muscle and joints adjacent to the fracture--have proven their validity in a compound fracture and multiple fractures. A Well planned staged surgical treatment with proper wound care management may decrease morbidities. Negative pressure wound therapy is a cost-effective modality in treating infected compound wounds and enhances new granulation tissue formation. Discontinuation of smoking is to be advised, at least during the healing phase in diaphyseal fractures of humerus and tibia. Long-term results using early stable internal fixation in compound fractures have shown that deep bone infection can be overcome in practically every salvageable limb. Limited internal fixation along with external fixation can be done to enhance stability with good results.

Conflict of interest

The authors declare that there is no conflict of interest

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Ethical approval

Written informed consent is obtained from the patient for publication of this case report.

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