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Management of Compound Fracture Tibia

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Abstract

Tibial fractures are common due to high energy injuries. The principles of treatment include the respect of the soft tissues and reduction of fracture fragments. There are various surgical fixation methods that can achieve these principles of treatment. Recognition of the particular fracture is important, as these guides the surgical approaches required in order to adequately stabilize the fracture. Three cases of compound fracture tibia are treated depending upon Gustilo types, are discussed here.

Keywords: Compound Fracture; Tibialfracture; AO External Fixation; Limb Reconstruction System (LRS); Gustilo Types.

Introduction

Tibiafractures are usually high energy injuries presenting with significant compound, comminuted/ segmental fractures and soft tissue damage in a major weight bearing extremity. The restoration of fracture fragments, the soft tissue damage associated with the severity of injury, only adds to the the challenge of optimizing outcomes for these injuries [1]. The original approaches to these injuries werean open reduction of the fracture fragments with internal fixation using plates and screws /internal locking nails. The advantage of anatomic reduction with stable fixation that allows early mobilization, however frequently overshadowed by soft tissue complication [4]. The effect of surgical trauma on compromised soft tissue leads to wound infection - a devastating complication associated with an increased re-operation rate with poor outcomes. To address these concerns,the use of a closed reduction with external fixation has been advocated [2-5]. The purpose of these prospective cases is to evaluate the radiological and clinical outcomes after treatment of compound tibial fractures with use of fixators depending upon type of compound fractures. Following are the cases of different types of compound fractures attended to our hospital which were treated successfully without any significant complications.

Materials and Methods

Studied 100 cases of compound fractures of tibiae in KLE's Dr. Prabhakar Kore Hopsital & MRC, Belagavi in last two years, treated by the different modality of management depending upon Gustilo & Anderson types. In our series, we set age criterion between 20 years and 50 years as road traffic accidents are more common at this age group. Out of 100 cases 75 were males and 25 were females. 40 cases were type I, 30 cases were type II & 30 were type III in which 15 were type IIIA, 12 were type IIIB, 3 were type IIIC. Results analysed,

discussed and concluded. Following are the interesting cases of compound fractures of tibiae.

Case 1

A 55 years old male patient came to Accident and Emergency Department following Road Traffic Accident & patient was in hypovolemic shock for which he was resuscitated and X rays were taken and diagnosed as compound type 3B, communited, segmental fracture tibia shaft. As an emergency under regional anaesthesia (SAB), Debridement and surgical toilet done. Reduction followed by AO external fixator with limb reconstruction system (LRS) was applied and raw area was covered with skin graft. Regular dressingswere done to avoid pin tract infections and patient followed for 6 months on OPD basis. After 6 months all 3 cortices union seen, Patellar Tendon weight Bearingcast applied for 2 months, advising partial weight bearing on affected extremity. After complete union, full weight bearing on affected extremity encouraged. Radiological union with full functional movements of neighboring joints (knee and ankle) observed only then patient resumed his duty.

Case 1:

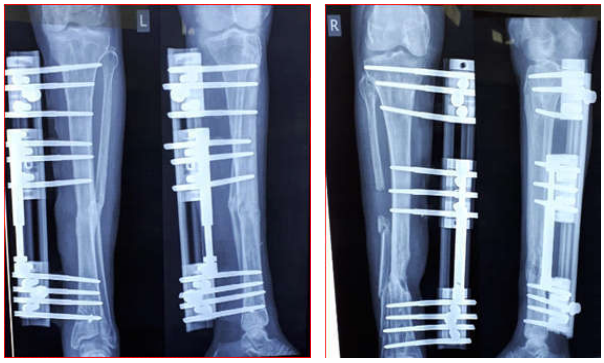
Case 2

A 55 years old female patient came to Accident and Emergency Department following Road Traffic Accident with complaints of wound, pain and swelling in the left knee joint and leg and was diagnosed with type 1 compound fracture of tibial condyle with shaft (segmental) and was operated after general work up. In supine position under combined spinal and epidural (regional) anaesthesia and under all aseptic precautions debridement of the wound is done and thorough wash given. Fractures were fixed with precontoured proximal tibial locking plate (for tibial condyle fracture) and intramedullary interlocking nail (for tibia shaft fracture). Wound and incisions were closed in layers and regular sterile dressings were done. Patient was adviced partial weight bearing walking with walker support after suture removal and full weight bearing after 4 weeks of surgery. Patient adviced follow up at 1, 6, 9 and 12th month after surgery and serial x rays were taken for radiological assessment. Functional and radiological results were excellent at one year follow up without any significant complications.

Case 2:

Case 3

A 56 years old male came to Out Patient Department of our hospital with bilateral non union of fracture tibiae treated outside for compound type 2 fracture with plate and screws. We treated by removal of plate and screws, debridement and bilateral application of Limb Reconstructive System (LRS) in compression mode. Regular follow up were adviced at 1, 6, 9 & 12th month after surgery for radiological assessment. At one year follow up, functional and radiological results were excellent without any significant complications. After one year, fracture union was satisfactory and Limb Reconstruction System (LRS) was removed bilaterally and bilateral Patellar Tendon weight Bearing cast was applied for 6 weeks and adviced full weight bearing walking and casts were removed after 6 weeks.



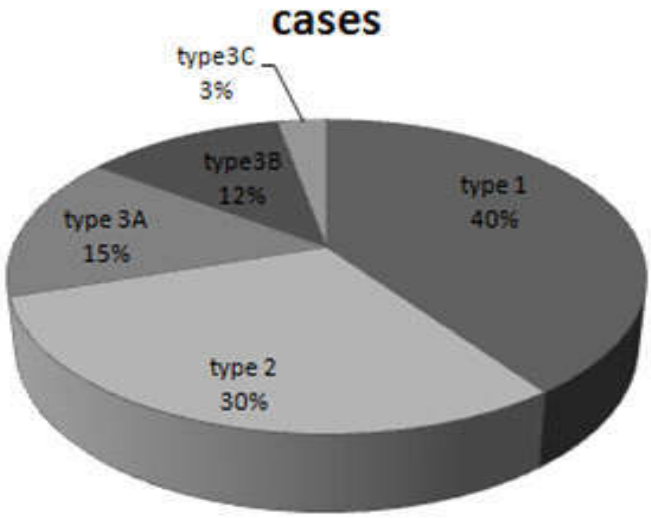
Case 3:

Case 3:

Result

Compound tibia fractures were treated with close reduction with External fixation or internal fixation depending upon the Gustilo type of injury. Union was defined as pain free weight bearing and radiographs showing callus in minimum 3 cortices was observed. No pin tract infection, no compartment syndromes or deep vein thrombosis were noticed in our cases. In our series 40 cases of type I treated with closed reduction and interlocking nail and all resulted in excellent functional and radiological union, 30 cases were type II & III each treated with debridement, surgical toilet and stabilized with LRS. 100% union achieved in type II & 3A and in type IIIB & IIIC 90% united and 10% (one type IIIB and two type IIIC) went for non union which again treated with ilizarov methods.

Graph 1:



Graph 2:

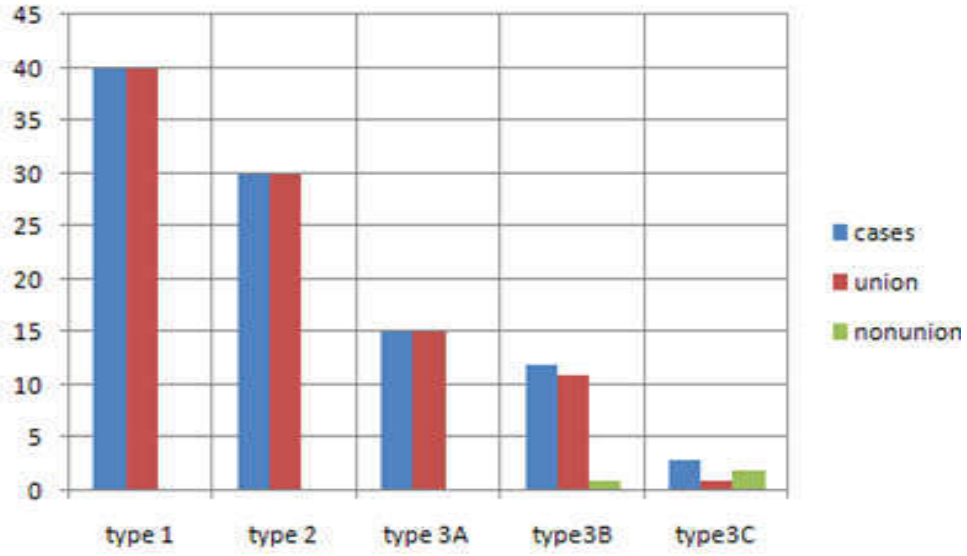


Table 1:

Gustilo Type	I	II	IIIA	IIIB	IIIC
Energy Wound Size	Low ≤ 1 cm	Moderate 1-10 cm	High usually >10 cm	High usually >10 cm	High usually >10 cm
Soft Tissue Damage	Minimal	Moderate	Extensive	Extensive	Extensive
Contamination	clean	Moderate contamination	Extensive	Extensive	Extensive
Fracture Pattern	Simple fx pattern with minimal comminution	Moderate comminution	Severe comminution or segmental fractures	Severe comminution or segmental fractures	Severe comminution or segmental fractures
Periosteal Stripping	No	No	Yes	Yes	Yes
Skin Coverage	Local coverage	Local coverage	Local coverage	Requires free tissue flap or rotational flap coverage	Typically requires flap coverage
Neurovascular Injury	Normal	Normal	Normal	Normal	Exposed fracture with arterial damage that requires repair

Discussion

The treatment of compound fractures of tibia was challenging till date, there is no clear consensus as to the ideal method treatment. Closed reduction with external fixation in compound fractures tibia (comminuted, segmental) is a safer equivalent to open reduction and internal fixation of closed fractures of tibia. The role of external fixators either half pin or ring or LRS has been evaluated in various studies of compound, comminuted segmental fractures of tibia with encouraging results have been emerged. Compound fractures were classified into types and subtypes for the surgical management of fractures and antibiotic coverage. Gustilo classification [6] and Tscherne classification [7] (for open soft tissue injuries) are widely used in the management of compound fractures.

Conclusion

The use ofExternal fixator for treatment of compound, comminuted, segmental fracture of tibia is safe with effective in terms of low rates of complication and good functional results. Attempts to restore the anatomical reduction should be made. Mal-alignment in the coronal plane should be less than 5 degrees as compared to the contra-lateral limb to improve short term functional outcomes.

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