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## Study on compound fractures and their outcome at BRD medical college: A descriptive study

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### Abstract

The open fractures management challenges for the orthopedic surgeon. Despite the improve in technology and surgical techniques, infection and nonunion are still troublesome. Compound fractures with different modality of fixation and antibiotic bone cement and there outcome in this study. Early antibiotic administration is of paramount importance in these cases, and when coupled with early and meticulous irrigation and debridement, the rates of infection can be dramatically decreased.

**Keywords:** Compound fractures, BRD, descriptive, debridement

### 1. Introduction

Open fractures, multiple factors beyond fracture pattern influence prognosis. Local injury variables, such as the presence of copious foreign debris with highly contaminated material, and substantial soft tissue also important factors.

The main goal in managing such injuries include infection prevention, fracture union, functional enhancement, long-term skin and soft-tissue coverage and adjacent joint mobility.

Such injuries are typically classified using the system proposed by Gustilo and Anderson <sup>[1]</sup> and later modified by Gustilo and colleagues in 1984 <sup>[2]</sup>.

Type	Description
I	Skin wound less than 1 cm Clean Simple fracture pattern
II	Skin wound more than 1 cm Soft-tissue damage not extensive No flaps or avulsions Simple fracture pattern
III	High-energy injury involving extensive soft-tissue damage Or multifragmentary fracture, segmental fractures, or bone loss irrespective of the size of skin wound Or severe crush injuries Or vascular injury requiring repair Or severe contamination including farmyard injuries
Gustilo and Anderson classification of open fractures	

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### 1.1 Current protocols for treating open fractures include

Early administration of antibiotics [3], timely surgical debridement [4], skeletal stabilization, sterile dressing, systemic support, and Establishment of soft-tissue coverage in a wound environment that is clean. A thorough debridement, washout and skeletal stabilization are the mainstays of initial treatment of wound along with intravenous antibiotics. The purpose of study to evaluate outcome with these measures.

## 2. Material and methods

### 2.1 Source of data

This study is done on patients with compound open fractures



Wound before debridement



Wound after debridement and application of external fixator

After initial evaluation the open wound is sealed with sterile dressings.

Antibiotics given as soon as possible. Antibiotic ceftriaxone 1.5 gm i.v. 12 hourly and amikacin 500 mg i.v. 12 hourly started from the emergency room along with Tetanus toxoid 1 ml.

Debridement and primary closure of wound is done in many cases. A second wound debridement carried out if wound does not improve. Damaged limb. A photograph of wound is taken. After initial evaluation the open wound is sealed with sterile dressings. Antibiotics given as soon as possible. Antibiotic ceftriaxone 1.5 gm i.v. 12 hourly and amikacin 500

based on Gustilo and Anderson classification coming to BRD medical College, Gorakhpur. In OPD as well as in emergency department.

Random cases of compound fractures admitted under department of Orthopedics in Nehru Hospital, a teaching hospital of Baba Raghav Das Medical College, Gorakhpur, will be included in the study cases 15 September 2014 to 14 September 2015 1year month follow up with a sample size of about 50 cases.

It is a cross-sectional study. Classification system used for this study is Gustilo and Anderson's classification.

### 2.1.1 Inclusion Criteria

1. Patients with open fracture Gustilo & Anderson type I type II & type III 2. Patients who are medically fit for the surgery.

### 2.1.2 Exclusion Criteria

Simple fracture. Patients medically unfit for the surgery. Old open Fractures of any grade. I.e. more than 3 weeks old fractures. All the cases undergoing the procedure and included in the study will be evaluated using pro-forma type of fracture, intraoperative observation, post-operative clinical and radiographic findings will be recorded. This study was approved by the institutional ethics committee of B.R.D. medical college Gorakhpur. All the patients provided written informed consents. All surgical procedures were performed by the same surgical Team. The initial evaluation of a patient with an open fracture of a limb was done following the principles and guidelines of the Advanced Trauma Life Support System.

After initial adequate resuscitation and stabilisation of the patient, The neurovascular status of the limb was carefully evaluated. The distal arterial pulses, capillary refill and overall colour of the limb, and the presence of active bleeding from the wound recorded.

**A photograph of wound is taken.**

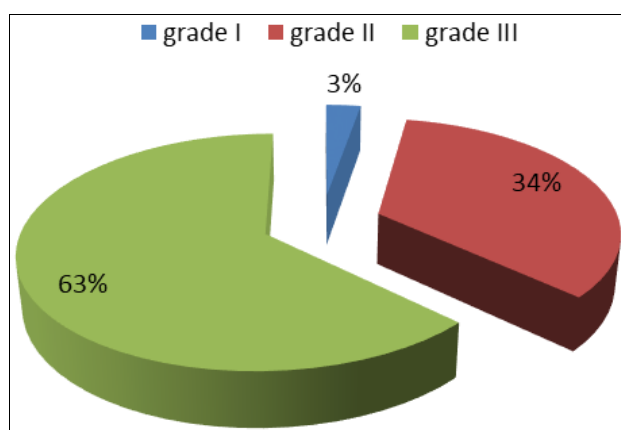
mg i.v. 12 hourly started from the emergency room along with Tetanus toxoid 1 ml. ideally within 3 h of injury. The risk of infection has been shown to decrease six-fold with this practice [5, 6, 7]. Some authors have advocated adding gram-negative coverage as well [5, 6, 8] Type III fractures often have contamination from gram-negative organisms, and in the case of soil-contaminated wounds (i.e., farm injuries), additional coverage should be added for anaerobic bacteria. Our institution uses a popular protocol that calls for 3 L for a Type I open fracture, 6 L for a Type II open fracture, and 9 L for a Type III open fracture [9].

Debridement and primary closure of wound is done in 38

patients with antibiotic beads with different means of external fixation. Local antibiotic delivery must be considered when extensive contamination is present. This is commonly done with an “antibiotic bead-pouch” construct formed with antibiotic powder and polymethyl methacrylate (PMMA) cement. These constructs are available commercially or can also be easily made in the operating room with readily available equipment. A recommended technique we follow includes forming beads over 24-gauge wire with 3.6 g of tobramycin mixed with 40 g of PMMA cement [10]. The beads are counted and then placed into the wound and covered with an impermeable dressing (i.e., Ioban, 3M, Minneapolis, MN). This simple technique when used in conjunction with systemic antibiotics has been shown to decrease infection rates from 12 to 3.7% in severe open fracture [11]. At our institution, this bead-pouch technique is occasionally used after preliminary debridement when surgical plans dictate a return to the operating room within 48 h for further debridement. A second wound debridement carried out if wound does not improve. A valuable adjunct to wound closure has been the wound vacuum-assisted closure device (VAC; KCI, San Antonio, TX) [12-16]. It has been shown that this device aids in wound healing by reducing edema, enhancing granulation tissue formation, and increasing local blood flow [17, 18]. We utilize this vacuum-assisted closure concept often when immediate closure is not possible although it is important to realize that this method does not necessarily reduce infection rates or allow a permissible delay in wound closure [16, 19]. Definite treatment is given when there is no discharge from wound and healthy granulation tissue is present or it is healed completely by primary intention.

### 3 Result

Total 50 patient were studied which were admitted in department of orthopaedic surgery, BRD Medical college, Gorakhpur with diagnosis of open fracture with grade, II and III. Mode of trauma RTA 38, Fall from height 7, crush injury 3, physical assault 1, gun shot 1. Average age of distribution 48.6 (20-65) year, 43 male and 7 female, 23 have compound grade III, 25 have compound grade II, 2 have compound grade I injury. According to (Gustilo Anderson classification),



In this study it was found that out of 50 patients 27 (54 %) patients were between age groups of 20 to 45 years and 12 (24 %) were between 45 to 65 years while 5 (10 %) patients were < 20 years and 6 (12 %) were >65 years the two extremes of age. Of 50 patients 43 patients (86 %) are male and 7 patients (14 %) are female. Injuries in female are lesser in incident and also it was found that age at the time of injury was higher in female patients. These findings correlate to study done by

These data are similar to a more recent study on the treatment of open tibia fractures [6], upper limb involve in 13 patients and lower limb involve in 47 patients, Out of various mode to stabilize the fracture site, stabilization by skeletal traction after debridement of wound, skeletal traction were applied in 10 out of 50 injuries (20%), Plaster of Paris slab were applied in 17 out of 50 injuries (34%), External fixator were applied in 19 out of 50 injuries (38%), Kirschner 's wire was applied in 4 out 50 injuries (8%). Average time for healing of wound or formation of healthy granulation tissue. Technique, average days, pop slab 16, external fixator 24, skeletal traction 18, kirschner wire 10 days after wound healing 35 patients manage with different operative modality in which 20 patients required flap rotation, 7 required skin grafting while 8 heal and unit on external fixator and 7 manage with pop cast. Patients were discharged from the hospital at a mean, of the 6.0<sup>th</sup> post-operative day. Patients were followed up at 6 week 3 months, 6 months and 12 months. A majority of the patients had a infection free well unit bone with a near full range of flexion, extension.

### 4. Discussion

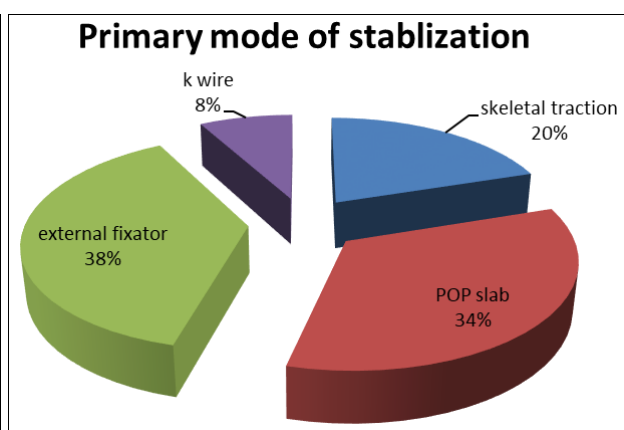
This study has been conducted over fifty patients with open fracture grade I, II and III injury classified as per Gustilo and Andersons classification of open fractures, at Department of orthopaedics, Nehru Hospital, B. R. D Medical College, between September 15, 2014 to September 14, 2015.

This study is a descriptive study on various techniques to manage open fractures of grade I, II and grade III in B. R. D Medical College focusing on different modalities to provide primary stabilization to broken bone.

Initially all 50 patients were classified on the basis of Gustilo and Anderson's classification. Based on size of wound, soft tissue coverage, contamination of wound, bone comminution, neurovascular status etc.

X ray were taken before application of any stabilization to bone to know the exact extent of injuries.

In this study out of 50, 2 (4%) patients were compound grade I and 25 injuries (50%) were of compound grade II and 23 (46 %) were of compound grade III.



*Court-Brown et al.* [4]

The fractures in upper limb were less in number as compared to lower limb. Total fractures in upper limb were 13 (14.94 %) while in lower limb they were 37 (85.05 %). upper limb involve in 13 patients and lower limb involve in 47 patients, mode of primary stabilization skeletal traction on Thomas splint and Bohlar's brown splint 10 out of 50 injuries (20%), Plaster of Paris slab were applied in 17 out of 50 injuries

(34%), External fixator were applied in 19 out of 50 injuries (38%), Kirschner's wire was applied in 4 out 50 injuries (8%) This restoration of length also helps decrease soft tissue dead spaces and has been shown in studies to decrease the rates of infection in open fractures [20, 21, 22]. Lastly, early fixation allows improved access to soft tissues surrounding the injury and facilitates the patient's early return to normal function [23]. 30 patients manage with antibiotic bead. Average time for healing of wound or formation of healthy granulation tissue. Technique, average days, pop slab16, external fixator 24, skeletal traction 18, kirschner wire 10 days after wound healing 35 patients manage with different operative modality in which 20 patients required flap rotation, 7 required skin grafting while 8 heal and unit on hybrid fixator and 7 manage with pop cast.

In this study most common mode of trauma was road traffic accidents which were 38 in 50 patients (76 %), rest were fall from height 7 in numbers (14 %), crush injury by machines were 3 in numbers (6 %), physical assault and gunshot wound were 1 case each (12 %). These figures correlate with the study done by *Sushil H Mankar* (24).

Most common bone involved in compound fractures was Tibia 24 (48%) which can be attributed to its major surface being subcutaneous, followed by fibula 23 (46 %) involved individually or collectively as both bone leg fracture or Bimalleolar fracture. Followed by Femur which was found to be third common bone involved in compound injuries. Total 10 fractures of Femur were found (20 %). These were followed by Metatarsals and Phalanx 7 (14%), Patella 6 (12 %), Hand (metacarpals and phalanx) 4(8 %), Humerus 4 (8 %), Radius 4 (8%), Ulna 4 (4 %), Calcaneum 3 (6 %), Talus 1 (2 %), Pelvis 1 (2%).

Complications which occurred in this study group were infection of the wounds (12), pin tract infection (10), flap necrosis after primary closure (12), skin damage with splints (2), bed sore in elderly patients (2), pulmonary infection (1), UTI (1), Lateral popliteal nerve palsy (1). These can be attributed to prolonged decubency and improper bed care, fragile body due to severe trauma or old age. Incidence of infection was more in compound grade III injuries.

Maximum time for wound improvement was taken by external fixator which does not correlate to any previous study as all wound were not comparable and external fixators were usually applied to compound grade III injuries. These being more extensive injuries required more time to heal other factors apart from fracture stabilization which affected the wound healing were Nutritional status of patient, Hospital environment, other medical comorbidities like diabetic mellitus, Grade of wound at the time of injury.

## 5. Conclusion

Early stabilization is important to restore alignment of the limb, limit the extent of soft tissue damage and reduce gross movement at the site of the fracture. This will enable better blood flow, and reduce postoperative pain and stiffness. It is important that external fixation is applied despite a more stable form of definitive stabilization being substituted at a later date.

Open fractures (Gustilo I-III) continues to be a common injury with a high risk of complications such as wound infection and problems with healing of bone and soft tissues. The basic objectives in the management of open fractures are to prevent infection, reconstruct soft tissue defects and achieve bony union. Improvement in nutritional status of patients by high protein diet, blood transfusions etc. play important role in

healing of wound. With the availability of broad-spectrum antibiotics, antibiotic impregnated polymethyl methacrylate beads, pulse lavage and a choice of improved fracture stabilization and proficiency in plastic surgery procedures, the outcome of these injuries has improved.

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