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To evaluate the role of bacterial culture and prophylactic antibiotics in management of open fracture wound

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Abstract
Aim: To evaluate the role of bacterial culture and prophylactic antibiotics in management of open fracture wound.
Materials and Methods: This is prospective study of minimum 30 patients admitted to East point College of Medical Sciences and Research Centre. Thorough local examination of injured limb was done and fracture graded according to Gustilos grading of fracture. Post debridement grading and radiological evaluation of fracture was recorded. Wound management was decided as per the condition of the patient and wound contamination-acute (<1 week), subacute (1-6 weeks), chronic (>6 weeks).
Results: Majority of the patients were found in age group between 21-30 years and least was in the age group of below 10 years. It was observed that majority of patients in our study were male (86.66%). RTA was the main mode of injury with 27 cases (90%). Culture before starting prophylactic antibiotic was gram positive in 18 patients (60%) with S.aureus and gram negative in 12 patients (40%). Majority of the patients the antibiotics used prophylactically was inj crystalline penicillin+ inj.Gentamicin+inj. Metronidazole. Growth found in culture was pseudomonas in 6 cases (20%), *E.coli* in 3 cases (10%), Proteus in 2 cases (6.66%) and S.aureus in case (3.33%).
Conclusion: Early administration of antibiotics is important, with coverage targeted at the anticipated pathogenic organisms based on the grade of injury.

Keywords: Culture, tibia fracture, soft tissue reconstruction

Introduction
The location of the tibia and the fact that its anteromedial border is subcutaneous renders the bone susceptible to injury. The diaphysis becomes thinner distally, which means that it is particularly at risk from twisting injuries. Incidence of open tibia fracture is 23.5%. Out of this 59.8% fall into type III and 27.4%, 60.3%, 8.2% into IIIA, IIIB, IIIC respectively.
Infection, as a major complication pursuing these fractures, may lead to limb loss, sepsis, and death. Despite advances in the treatment of open fractures, delayed infection ensues in 2 - 25% of such fractures. The treatment of these fractures poses a tremendous challenge to surgeons.[1,2]
Positive effects of antibiotics have been well documented in patients with open fractures.[2] According to a study by Gustilo and Anderson, open fractures require emergency treatment like adequate debridement and irrigation of the wound. Also, antibiotics should be administered before and during surgery. If the wound is primarily closed, the administration of antibiotics is halted on the third day after surgery, but if the wound is secondarily closed, the administration continues for another three days after the procedure [1].
In the past, primary wound culture in open fractures was a common way of identifying infection-causing organism in the early stages thus selecting a suitable antibiotic treatment. Treatment with broad-spectrum antibiotics after injury and invasive surgical debridement reduces the incidence of infection in open fractures of the limbs, with significant improvement in functional results of open fractures [3].

Materials and methods
This is prospective study of minimum 30 patients admitted to East point College of Medical Sciences and Research Centre, satisfying both the inclusion and exclusion criteria as stated below, after obtaining ethical committee approval.

Inclusion Criteria
- All patients below 60yrs of age
- All patients who have sustained tibial fractures falling into IIIB Gustilo's Classification of open fractures.

Exclusion Criteria
- Open tibia fractures in patients above 60yrs of age
- Soft tissue loss secondary to pathological fractures of tibia: osteomyelitis and tumours

Patients who have
- Peripheral Vascular Disease
- Comorbidities-Diabetes mellitus
- Carcinomatous condition with cachexia
- Generalised atherosclerosis
- Serious medical illness

Method of collecting data

Once the patient was received in casualty after resuscitation measures the details of the cases regarding name, age, sex, occupation and address were recorded. Patients and the accompanying attendees were interviewed to determine mode of injury, time elapsed since injury. Thorough local examination of injured limb was done and fracture graded according to Gustilos grading of fracture. Patient was then posted for debridement of the wound. Post debridement grading and radiological evaluation of fracture was recorded. Wound management was decided as per the condition of the patient and wound contamination-acute (<1 week), subacute (1-6 weeks), chronic (>6 weeks). Fracture management included external fixation, IM fixation, plate fixation (Internal fixation), limited internal fixation-pin/K-wire/Screws, pin plaster. Type of coverage was planned-Split thickness skin grafting; fasciocutaneous flap, Muscle flap and SSG.

Post-operatively antibiotics were instituted as per wound culture and sensitivity.

Follow up

The discharged patients were advised to report for follow up every month till adequate soft tissue coverage and the fracture union. At every visit patient was examined clinically for wound coverage, knee and ankle movements and the radiograph was obtained to see for fracture union. Any complications noted were recorded.

Results

Table 1: Age and Gender wise distribution of the study population

Age (Years)	Number	%age
0-10	Nil	0
11-20	3	10
21-30	10	33.33
31-40	8	26.66
41-50	4	13.33
51-60	5	16.66
Gender		
Male	26	86.66
Female	4	13.33

Table 2: Type of fracture and wound management

Type of fracture	Number	%age
Oblique	15	50%
Spiral	10	33.33%
Comminuted	5	16.66%
Wound Management		
Acute	9	30.0%
Sub-acute	9	30.0%

Table 3: Growth on culture before prophylactic antibiotic administration

Antibiotic	Number	%age
Gram positive growth	18	60%
Gram negative growth	12	40%

Table 4: Antibiotic used based on culture and sensitivity

Antibiotics	Number	%age
Inj. Pipercillin + tazobactum	5	16.66%
Inj. Linezolid	2	6.66%
Inj. Vancomycin	2	6.66%
Inj. Cefoperazone + Sulbactum	3	10%

Table 5: Type of growth on culture

Type of growth	Number	%age
Pseudomonas	6	20%
S. Aureus	1	3.33%
E. coli	3	10%
Proteus	2	6.66%

Discussion

Prevention of infection remains one of the critical goals in open fracture treatment, though the methods utilized to achieve this goal have evolved over time. High rates of positive bacterial culture from the initial wound can be obtained from open fractures [4, 5]. Prompt administration of antibiotics is a critical adjunct for decreasing infection after open fractures (in addition to surgical debridement of devitalized tissue and debris) and can be viewed more as treatment for presumptive infection or contamination, rather than simply prophylaxis [5].

Age of the patients is ranging from 18 years to 60 years with an average of 34.73 years and 48 patients are male (80%) and 12 patients female (20%).

Study	Average Age	Male	Female
Schandelmaier et al. (1997) [6]	36yrs (18-78)	85.36%	14.64%
Court-Brown et al. (1995) [7]	43.2yrs (18-70)	83%	17%
Keating et al. (1997) [8]	36yrs (16-88)	88%	12%
Edwards et al. (1988) [9]	37.3 (11-65)	89.4%	10.6%
Our study	34.73(18-60)	80%	20%

In our study Inj. Crystalline penicillin, inj. Gentamicin and inj. Metronidazole was instituted empirically to 40 patients (66.66%). Inj. Ceftriaxone, inj. Gentamicin and inj. Metronidazole was instituted empirically to 20 patients (33.33 %).

Study	Antibiotic used empirically	Percentage
Schandelmaier et al. (1997) [6]	Third generation cephalosporins+GM +/- Metronidazole	100%
Court-Brown et al. (1995) [7]	Third generation cephalosporins+GM +/- Metronidazole	100%
Keating et al. (1997) [8]	Third generation cephalosporins+GM +/- Metronidazole	100%
Edwards et al. (1988) [9]	Third generation cephalosporins+GM +/- Metronidazole	100%
Our study	Inj. CP + GM+Metronidazole	66.66%
	Third generation cephalosporins+GM +/- Metronidazole	33.33%

Based on culture and sensitivity antibiotic changeover was done to inj. Pipercillin and Tazobactum in 14 patients (46.66%), to inj. Linezolid in 8 patients (26.66%), to inj. Cefaperazone and Sulbactum in 5 patients (16.66%), to inj. Vancomycin in 3 patients (10 %). In our study predominant growth on culture was Pseudomonas in 30 patients (50%), E. coli in 14 patients (23.33 %), Proteus in 10 patients (16.66%) and S.aureus in 6 patients (10%).

Study	Culture Growth
Schandelmaier et al. (1997) [6]	Streptococcus
Court-Brown et al. (1995) [7]	Gram Negative Growth
Keating et al. (1997) [8]	Staphylococcus
Edwards et al. (1988) [9]	Gram Negative Growth
Our study	Pseudomonas

Conclusion

Early administration of antibiotics is important, with coverage targeted at the anticipated pathogenic organisms based on the grade of injury. Growing prevalence of resistant organisms necessitates reconsideration of general and local practices. Prolonged duration of antimicrobial administration is not supported.

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