Original Article

Incidence of Infection after Surgical Management of Open Tibial Shaft Fractures

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ABSTRACT

Objective: To study the incidence of infection after using different methods for fixation of open tibial shaft fractures.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Department of Orthopedic Surgery, Sheikh Khalifa Bin Zayed Al Nahyan Hospital/CMH Rawalakot Azad Kashmir from 5th January 2016 to 5th July 2016.

Materials and Methods: Study was carried out on 62 patients. Patients were included through Non-probability, purposive sampling. Detailed medical history was taken from all the patients and they were examined clinically. Gustilo and Andreson classification was applied on these open factures. All the wounds were swabbed or clinical material from them was collected and sent to laboratory for studying microbiological status. Antibiotics were administered empirically which were revised on the report of culture and sensitivity. Wounds were inspected for signs of infection after 72 hours. In cases of unproven infections, the antibiotics were stopped after three days. The patients were discharged from the hospital after three days depending upon the general condition of the patients and the wounds. All the patients were followed up on 3rd, 7th, 15th, and 30th days, then monthly for six months. The patients were evaluated for the development of infection. Data was collected on a structured questionnaire and analyzed in SPSS software version 16.

Results: The mean age of the patients were recorded as 33.25±14.89years. There were 51 (82.3%) male patients while 11 (17.7%) were female .Open type I was observed in 4 (6.5%) patients ,Type II was noted in 7 (11.3%) cases, IIIA was observed in 43 (69.35%) patients and IIIB was noted in 8(12.9%) cases. In our study, 37 (59.68%) patients were managed with external fixation (EF), while 25 (40.32%) had internal fixation (IF).The cases in which internal fixation was done , DCP was applied in 13 (52%) patients while in 12 (48%) patients ILN was done. Post-debridement wound was left open in 19 (31%) patients and it was closed in 43 (69%) patients primarily. Incidence of infection was more with EF while it was low with IF. In cases of internal fixation ,incidence of infection was more with DCP while it was low with ILN. Infection rate was lower when post-debridement wounds were left open as compared to closing them after debridement.

Conclusion: The rate of post-operative infection was higher in this study with EF as compared to IF (DCP and ILN). Closing the wound after debridement and fixation was associated with higher rate of infection as compared to leaving it open after debridement.

Key Words: Open fracture, post-operative infection, external fixation, internal fixation, open reduction and internal fixation.

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INTRODUCTION

Open fractures generally result from high energy trauma. Severity of soft tissue injury and comminution depend upon the severity of the injury.[1](Koval et al., 2006). Road traffic accidents, industrial accidents, falls and fie arm injuries are the usual causes of open fractures.[2] (Cornwell, 2003).

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Injury severity and direction of force affects the type of fracture(Close or open).[3]. (Johnson and Christie, 2008). In cases of open fractures, contamination of wound increases the risk of infection and nonunion[4].(Lima et al., 2004).

During the last two decades, there are many changes in management of open fractures. Such fractures are challenges for orthopaedic surgeons because of complications like osteomyelitis, delayed union and nonunion[5]. (Quinn and Macias, 2006).Infection is directly related with the extent of soft tissue devitalisation in open fractures[3]. (Johnson and Christie, 2008).

The most serious complication of open fracture is infection.[6](Ostermann et al., 1995). Positive effects of early administration of antibiotics have been proved by many of the studies in treating open fractures.[7] (Giannoudis et al., 2006)

As per recent advances, antibiotics should be administered for three days.[3](Johnson and Christie, 2008).Suitable antibiotic is usually decided according to bacterial culture report[8].(Solomon et al., 2005). Nosocomial infection increase the chance of infection in open fractures [9].(Seekamp et al., 2000).Infection can be primary or secondary.[10] (Walter, 1996).Permanent osteomyelitis may result from failure of contaminated bacterias eradication[9]. Seekamp et al., 2000).Bacterial multiplication is increased by dead tissue or presence of foreign material[11](Bowler et al., 2001).Outcome is dependent uponthe number of inoculated microorganisms[12].(Sen et al., 2000) The presence of specific pathogens is of primary importance[13]. (D'Souza et al., 2008)

In our study, we adopted various methods for fixation of fractures to see the results in terms of infection so that we can adopt a treatment modality that have less chances of infection.

MATERIALS AND METHODS

The study was conducted out at the Department Of Surgery/Orthopaedic Surgery Sheikh Khalifa Bin Zaid Al Nahyan Hospital (SKBZANH)/CMH Rawalakot Azad Kashmir that is teaching hospital affiliated of Poonch Medical College Rawlakot from 05th January 2016 to 05th July 2016. Many of the districts are cathment areas of SKBZANH/CMH Rawalakot. The hospital provides 24 hour emergency services and it has well equipped laboratory facilities as well.

Sample Technique: Non-probability, purposive sampling.

Inclusion criteria: All the patients between 18 to 60 years of age presenting within 06 hours of acute trauma having Open tibial shaft fractures (type I, II and III of Gustilo classification) were included in the study.

Exclusion Criteria: All the patients having old infected (neglected) fractures, with some other sites of infection in the body and patients who have received antibiotics at some other setup were excluded from the study.

Ethical Consideration: The study was carried out after formal approval by ethical committee of the hospital.

Data collection procedure: In this study, the variables included were age, type of open fracture (Gustilo classification), mode of fixation and post-operative infection. All the patients were clinically examined and their medical history was recorded. Their open fractures were classified based on Gustilo and Anderson classification. All wounds were swabbed and sent to laboratory for studying microbiological status. Request was made for Aerobic and Anaerobic cultures. Necessary stabilization of fractures was performed . Antibiotics were administered empirically. Wounds were inspected for signs of infection after 72 hours and a repeat culture was obtained and if infected, appropriate antibiotics according to sensitivity report were started. If there was no evidence of infection, the antibiotics were discontinued after third day. The patients were discharged from the hospital after three days depending upon the general condition of the patients and wound. All **the** patients were followed up on 3rd, 7th, 15th, and 30th days, then monthly for six months. The patients were evaluated for the development of infection. Data was collected on a structured questionnaire.

Data Analysis: Data was entered and analyzed in SPSS software version 16. Quantitative variables like age was presented in form of mean ± S.D. Qualitative variables like gender and infection was presented in form of frequency and percentage. Chi-square test was applied to compare the rate of infection with type of surgery performed, type of implant used and type of post-debridement wound.

RESULTS

We included total 62 patients presented during 6 months of study time in our department and who fulfilled the selection criteria with the mean age of 33.25±14.89years. The minimum and maximum age of patients was 18 and 60 years respectively.

Table No.1: Descriptive Statistics for age of patients

Age (years)	n	62
	Mean	33.25
	SD	14.89
	Minimum	18
	Maximum	60
	Range	60

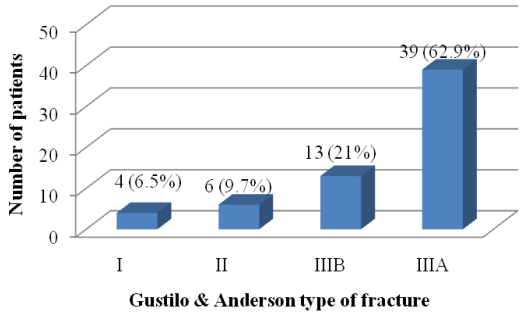

Figure No.1: Distribution of Gustillo and Anderson type of patients

Table No.2: Distribution of mode of fixation of the patients

		Frequency	Percentage
Mode of fixation	EF	37	59.7%
	IF	25	40.3%
	• DCP	• 13	• 52%
	• ILN	• 12	• 48%
	Total	62	100%

Patients were evaluated as per classification of Gustilo and Anderson. Type I was observed in 4 (6.5%) patients, Type II was noted in 6 (9.7%) cases, type IIIA was observed in 39 (62.9%) patients and type IIIB was noted in 13 (21%) cases.

In our study, 37 (59.7%) patients were managed with external fixation (EF) while remaining 25 (40.3%) were managed with internal fixation. Out of 25 cases who underwent IF,DCP fixation was done in 13 (52%) patients and 12 (48%) patient had unreamed ILN fixation.

Table No.3: Distribution of type of open fractures (Gustilo-Anderson) in relation with mode of fixation

		Mode of fixation		Total
		EF	IF	
G & A type	I	0 (0%)	4 (100%)	4 (100%)
	II	1(14.29%)	6 (85.71%)	7 (100%)
	IIIA	30 (69.77%)	13 (30.23%)	43 (100%)
	IIIB	6 (75%)	2 (25%)	8 (100%)
	Total	37(59.7%)	25 (40.3%)	62 (100%)

In this study, all 4 cases of open type I were managed by IF. Majority of open type II fractures (6 cases) underwent IF while 1 patient was managed by EF. Out of 43 cases of open type IIIA, 30 underwent EF and 13 cases were managed by IF. In 8 cases of open type IIIB fractures, 6 underwent EF while in 2 cases IF was done.

DISCUSSION

When open fractures are treated by external fixators, it can lead to pin track infection. The remedy then is the removal of these fixators and their placement at distant sites if required. Internal fixation is another option in this case[14]. (Moroni et al., 2002). Advances in the principles of fracture management has significantly decreased the infection rate during the last century[15,16,17]. (Gustilo and Anderson, 1976, Robinson and Hofman, 1989,Rojczyk and Tscherne, 1982). Infection resulting in limb loss is a great risk where there is associated major vascular injury[18].(DeBakey and Simeone, 1946, Neubauer et al., 2006)

A total of 62 patients were treated during 06 months of our study period with mean age33.25+-14.89 years of and male-to-female ratio was 4.6:1 compared with one study reporting a male to female ratio of 1.7: 1 with the mean age of 38.7yrs[19].(Madu et al., 2012)

Fractures were classified on the basis of Gustilo & Anderson classification. Percentage for Type I,Type II, Type IIIA and Type III B was 6.45%,11.29%,69.35% and 12.9% respectively.

In our study, external fixation (EF) was done in almost 60% patients while internal fixation (IF) was done in about 40% of patients. Considering internal fixators, DCP was applied in 52% patients and unreamed ILN was implanted in 48% of the patients. After debridement wounds were left open in 31% patients. Post-operative wound infection was seen in 22.6% of patients after 6 months of procedure.

After 3rddays, infection rate was almost equal with both EF and IF while after 6 months it was higher with EF as compared to IF. The infection rate was almost equal with both DCP and ILN in the former case of procedure but in later case infection rate was higher with DCP as compared to ILN. The difference between the groups was insignificant showing that chances of infection are equal with all procudures. The reason behind seems the uneven distribution of surgical procedures. In cases of internal fixation 52% cases had DCP fixation while in 48% cases unreamed ILN was used. Literature has reported 50% rate of infection with EF, 4%-9% with ILN and 45%-50% with DCP[20,21,22,23].(McGraw and Lim, 1988b, Krettek et al., 1996, Clifford et al., 1988, Schreinlechner, 1982)

Wound infections are associated with the time interval between injury and surgery or wound debridement. Effects of early debridement(within 6 hours of injury) on bone healing and wound infections is not supported by literature[24,25,26,27,28]. (DeLong et al., 1999, Harley et al., 2002, Hertel et al., 1999, Khatod et al., 2003, Kindsfater and Jonassen, 1995) In our study, 80%of patients were managed within 6 hours time of injury.

CONCLUSION

In our study the rate of post-operative infection was higher with External Fixation as compared to Internal Fixation. In cases of Internal Fixation, DCPs were associated with a higher rate of infection as compared to ILN.

Author's Contribution:

Concept & Design of Study:	Abdul Karim
Drafting:	Malik Asrar Ahmed
Data Analysis:	Malik Asrar Ahmed, Abdul Karim
Revisiting Critically:	Zia-ur-Rehman
Final Approval of version:	Abdul Karim

Conflict of Interest: The study has no conflict of interest to declare by any author.

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