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PREVALENCE OF INFECTIONS AMONG COMPOUND FRACTURES IN ORTHOPAEDIC WARD OF A TERTIARY HEALTHCARE HOSPITAL IN SOUTH INDIA

Orthopaedics

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ABSTRACT

Road traffic accidents which is the leading cause for compound fracture cases and a growing problem worldwide. In developing countries like India, the topic is of great importance since most of the cases of these fractures end up in fracture site infection because of many risk factors like gross contamination, delayed intervention etc. One fifty six swabs/ pus specimens from various compound fracture sites suspected to be infected were collected during July 2017 to May 2018 and processed, by standard methods. Antibiotic susceptibility testing of all the isolates was done. 64% of patients developed infection at the fracture site. Klebsiella species was the commonest organism isolated 30% followed by others . Unlike previous studies, Klebsiella constituted majority of the cases instead of Staphylococcus. There is an urgent need to adopt basic principles of asepsis and sterilisation and to make judicious use antibiotics.

KEYWORDS

Infection, Open fracture, Klebsiella , Orthopaedics.

INTRODUCTION

A fracture in which broken bone fragments lacerate the soft tissue and protrude through a wound in the skin is called compound fracture. It has some unique risks beyond those encountered with closed fractures that may occur with similar amounts of force.

The greatest problems with these fractures are the risk of infection and delayed healing. In open fractures, hematoma offer contact with the external milieu, making it particularly susceptible to infection[1,2]. Many investigators have shown that between 60-70% of open fracture injuries will have positive wound cultures before treatment commences in the hospital and the later microbial proliferation is time dependent. It has been demonstrated that sepsis occurs in 2-25% of all open fractures, which often leads to significant morbidity[3].

The classification that is most widely used for open fractures is the Gustilo and Anderson classification which groups open fractures into three major grades in order of increasing severity by taking into consideration the energy of the fracture, extent of contamination, and the degree of soft-tissue damage[4]. Type I infections have 0%–2% risk of infection, Type II infections have a 2%–12% risk, and Type III infections have the highest risk of 10%–50%[5,6].

Late infection remains a significant complication of the treatment of open fracture wounds with reports suggesting that Gram-positive cocci and Gram-negative enteric pathogens being mainly implicated[9]. Understanding the bacterial flora is important in order to administer a rational and effective antibiotic treatment for these fractures. Two principal factors seem to operate to produce infection—namely, the dose and virulence of the organism. Wound debridement and irrigation are the mainstay in reducing the incidence of infection.

Road traffic accidents are responsible for a substantial proportion of compound fracture cases and are a growing problem worldwide accounting for around 50 million injuries annually[3].In developing countries like India, the topic is of great importance since most of the cases of compound fractures end up in fracture site infection because of many risk factors like gross contamination, delayed intervention, multiple surgeries etc. A few studies have been reported in India, though none is comprehensive regarding the bacteriology of open fracture wounds[7-9].This project was aimed at determining the trend of causative micro-organisms of fracture site infection in the orthopedic ward of Coimbatore Medical College Hospital.

MATERIALS AND METHODS

A retrospective study was conducted inInstitute of Orthopaedic surgery and Traumatology, at Coimbatore Medical College Hospital, Coimbatore, India by collecting details of the patients with compound fractures admitted in orthopedic ward.

156 cases of compound fracture with age between 20 and 60, who were admitted in orthopedic ward during the period of July 2017 to May 2018 were included except those who are with associated HIV infection or on immunosuppression therapy. Details collected included patient's basic demographic data, data on underlying disease status, surgical procedures, preoperative preparation and antibiotic prophylaxis.

In the operating room, samples were taken after debridement was done using the standard procedure under strict aseptic conditions and were immediately transported to the microbiology department for culture and antibiotic sensitivity testing. Antibiotic therapy was modified based on the sensitivity reports. Repeat cultures were done where signs of clinical infection were noted and patients were switched to appropriate antibiotics based on the culture and sensitivity reports. The microbial flora cultured in the post-debridement samples and the samples sent after infection signs were noted and included in the study. The swabs were assayed for the predominant organisms found in culture and the microbial sensitivity/resistance patterns. The pathogens were identified by standard laboratory procedures including Grams staining, motility, colony characters and biochemical reactions. Antibiotic susceptibility testing was done by Disc diffusion method and measuring diameter of zone of inhibition as described by Bauer-Kirby method on Mueller Hinton Agar (MHA).

Clinical infection was defined according to the Centers for Disease Control and Prevention criteria[8] which divides infections into superficial and deep based on the extent of skin and tissue involvement. The factors considered for the diagnosis of infection include the presence of local or systemic signs of inflammatory response including fever, local erythema, warmth, purulent discharge, or the invasion of sterile host tissue, leading to necrosis irrespective of whether the bacterial cultures were positive or negative.

Analysis was done on the collected data to determine the incidence of infections in compound fracture cases in orthopedic ward,Prevalence of various microbes at the infected fracture site, and pattern of their drug sensitivity.

RESULTS

During the 1 year of study period, out of 156 compound fracture patients admitted in the orthopaedic ward of Coimbatore Medical College Hospital, 98 patients (63%) developed fracture site infections. Among the infection majority were caused by gram negative organisms (85%) table 1 and figure 1 and the type of culture has been tabulated in table 2 and figure 2.

Table 1

Type of organism	n	%
Gram positive	14	14.3
Gram negative	84	85.7

Table 2

Type of microbial culture	n	%
Polymicrobial culture	13	13
Monomicrobial culture	85	87

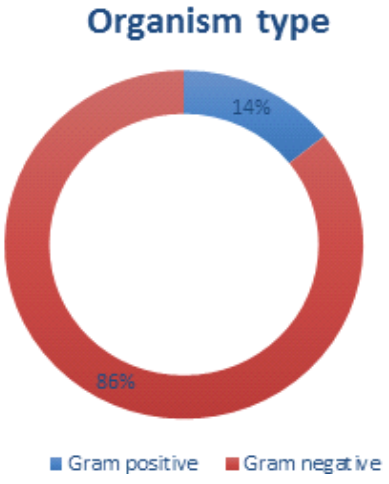

Fig-1

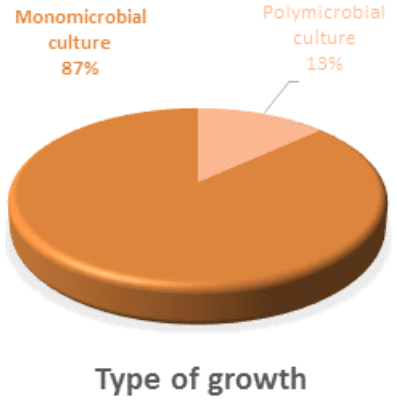

Fig-2

Among them infection caused by Klebsiella species ranks first (39 patients, 39.8%), Proteus infection accounts for another 23 cases(23.47%). 17 patients (17.34%) developed infection by pseudomonas species and 14 patients (14.28%) developed infection by staphylococcus species. Escheria coli caused infection among 3 patients(3.06%) and actinobacter, candidia, and citrobactor species caused infection among 1 patient each (1.02%) (Table 3 and figure 3)

Table 3

Cultured organism	n	%
Klebsiella pneumoniae	39	39.8
Proteus mirabilis	23	23.47
Pseudomonas aeruginosa	17	17.34
Staphylococcus aureus	14	14.28
Escherichia coli	3	3.06
Acinobacter	1	1.02
Candida	1	1.02
Citrobacter	1	1.02
Enterococci	1	1.02

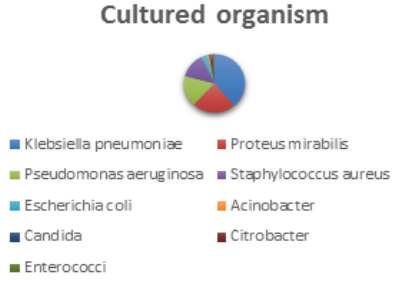

Fig - 3

DISCUSSION

Infection in orthopaedic trauma patients is a common problem associated with significant financial and psychosocial costs, and increased morbidity. The incidence of infection is high, ranging from 5% to 10% depending on the location and severity of the injury, and the type of fracture. Despite improvements in management, infection still remains a significant problem[4,10].This topic is of great importance as the incidence of compound fracture cases is increasing due to the increasing number of road traffic accidents and due to risk factors like development of antibiotic resistance. Not much studies have been done in this topic in India.

The common microbes found in orthopedics open fractures in our study are Klebsiella, Proteus, Pseudomonas species, Staphylococcus aureus and Eschericia coli in the same sequence. S. aureus used to be the most common strain in the 1950s and 1960's. Harvey Bernard (1962) opines that in the last several decades the pattern of infection has been changing and gram negative bacteria are becoming more and more common. E.Jack Benner (1967) reports the incidence of gram negative bacteria to be 59% but Surange and Rai (1971-73) report it as 35.25% S. aureus, 22.55% E. coli and 18.5% B. pyocyancs.

In a prospective study, Das, Mishra et al[13], done at IMS and SUM Hospital, Odisha, India, a total of 621 orthopaedic wound samples were collected among which 468 samples showed bacterial growth. Staphylococcus aureus (26.89%) was the most commonly isolated organism in that study followed by Pseudomonas aeruginosa (11.35%), Klebsiella Species, (10.76%), Acinetobacter Species, (8.76%), Citrobacter Species (4.98%), Proteus Species, (3.39%) and E. coli (1.79%).

Shiraz Bhattyet al[12]concluded that most of bacterial infections in open fracture wounds are nosocomial and the isolated bacteria would depend upon the microbiologic environment of the institution**.** In their study, the commonest site of injury was the leg (55.5%) and Acinetobacter, Staphylococcus aureus were the predominant organisms isolated in these open fractures.

Lingarajet al[7]. demonstrated that organisms grown in pre-debridement cultures did not correlate with postoperative wound infection. Lee showed that post-debridement cultures could predict infection in only 42% of the cases. However, another study by D'Souza et al. showed that both preand postdebridement cultures play a role in predicting postoperative infection.

In Jadranka Maksimovićet al[11], on assessing 277 patients after operation, it revealed surgical site infection in 63 patients. The overall incidence rate of surgical site infections was 22.7%. The incidence increased from 13.2% in clean wounds to 70.0% in dirty wounds.

Patzakiset al[2]. in his landmark study demonstrated a significant reduction in the incidence of infection with the use of prophylactic parenteral antibiotics in open wound fractures. He suggested that the choice of antibiotic must depend on the severity of fracture: Type I and II injuries most commonly grow Staphylococcus aureus, hence a second generation cephalosporin is recommended and more severe Type III injuries predominantly grow Gram negative aerobes, for which Gentamycin is to be added.

CONCLUSION

Infections in compound fracture patients are prevalent and showing an increasing incidence pattern. Amidst varied results regarding the pathogenic organism, in recent period there is a changing trend from gram positive like , Staphyloccocus aureus towards gram negative organisms like Klebsiella, Proteus, Pseudomonas.

There is an urgent need to adopt basic principles of asepsis and sterilization and to make judicious use antibiotics in these patients to reduce the incidence of fracture site infections

LIMITATIONS

The sample size of our study was relatively small to derive strong associations. The lack of standardized empiric antibiotic protocol is also a potential limitation of this study. Further research, including randomized clinical trials, should be done to study the usefulness of both pre and post debridement cultures to establish firm guidelines.

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CONFLICT OF INTEREST: None declared.
ETHICAL APPROVAL: Obtained .

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