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RESEARCH ON THE DISTRIBUTION OF BACTERIAL ISOLATES IN OPEN FRACTURES.

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ABSTRACT

Fractures are common in underdeveloped countries. An open fracture may result from an accident, a fall, a gunshot, an assault, or a machine injury. It is common for open fractures to develop infections. Osteomyelitis, nonunion, function loss, and limb amputation can be caused by deep fracture site infections. The early debridement of open fractures, wound irrigation, and broad-spectrum antibiotics are followed by fracture stabilization. In this study, we are trying to identify patterns of isolated bacteria in open fractures in order to develop a sensible antibiotic treatment plan. There were 50 patients of different ages and sexes with open fractures studied. Initially, the wound was evaluated and described. After debriding the first dressing, a second culture swab was taken. We collected reports on the culture and sensitivity of bacterial isolates. It is useless to take cultures before debridement. Antibiotic formulation requires post-debridement cultures. Most infections are caused by Gram-negative bacteria. Among the most sensitive antibiotics for gram-positive and gram-negative bacteria are aminoglycosides. Cephalosporin, quinolones, and aminoglycosides should be used to treat open fractures in our area. The most common pathogen in each organization and hospital should be determined, and an antibiotic policy should be developed.

Key words: Open fractures, bacterial culture, debridement

INTRODUCTION

Since ancient times, doctors have been aware of the potentially life-threatening nature of fractures that have open end [1]. Open fractures, also known as complex fractures, are fractures that allow for communication with the outside environment through a wound [2]. This is what gives open fractures its name. In most cases, a high-energy trauma was the culprit [3]. There are still many gaps and fissures in the world's infrastructure. Infections at the sites of traumatic wounds are a common side effect that can arise from open fractures [4]. It is estimated that between 60 and 70 percent of the contamination that can occur in open fractures takes place at the moment of the injury [5]. It is essential to keep in mind that germs can originate from the skin as well as the environment outside the body [6]. There are also instances in which the microorganism isn't really present at the moment of the injury; yet, the wound still develops an infection after the injury has taken place [7]. Over the course of time, the dynamics of microbial pathogens in tissue wounds as well as in bone might vary greatly from one instance to the next [8]. When handled correctly, an open fracture should have as its major focus the prevention of infection of the soft tissues and bone that result from the fracture. Early treatment dissection, irrigation of open sores, antimicrobials, fracture stabilization, and early surgical dissection are some of the treatment protocols that are designed to assist to achieve this goal [9]. Other commonly accepted treatment protocols include fracture stabilization and early treatment debridement. In this study, the distribution of bacteria that were isolated from open fractures of the extremities that were submitted to our department was investigated.

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Materials and Methods

As part of the current descriptive ongoing study, seventy patients underwent among all age ranges, both genders, with open fractures, of any and all grade levels of Gustilo-Anderson classification, who attended the Outpatient Clinics of the Orthopedic Department and Emergency Department of the Orthopedics of Medical Sciences were selected. These patients had all presented themselves at the Outpatient Clinic of the Orthopedic Department and Emergency Department of the Orthopedics of Medical Sciences.

Individuals with open fractures who had undergone definitive treatment before to coming to our hospital were also determined to be excluded from the study. Individuals with diabetes mellitus were also decided to be excluded from the study.

Before choosing patients for the trial due to germs in open fractures and antibiotic sensitivity, the institution's Ethics Committee and each patient who met inclusion criteria were consulted. As soon as the patient came at the urgent care, the wound was evaluated, and three consecutive swabs were collected to verify bacterial culture and sensitivity.

1. At the time of admission, the wound was examined for the first time.
2. After debridement, the initial dressing should be applied to the wound.

The first inspection yielded a culture. The patient was transported for emergency debridement since wounds had been washed and coated with antimicrobial solution before debridement. Cultures were not collected at that time. If the wound was mostly healed at the time of debridement, a culture must be obtained before antibacterial solution or saline cleaning. On-site lockers were used.

All of the cultures & susceptibility reports have been compiled in order to gain a better understanding of the patterns for isolated bacteria and the antibiotics that are effective against them.

Following the initial wound management, all patients were treated with antibiotics according to their body mass. Depending on culture and sensitivity reports, antibiotics were changed later. Orthopedics used the same medications in the past to avoid using different antibiotics based on bacterial sensitivity.

Results

In a year, 50 cases of upper and lower extremity open fractures were treated. 43(90% male) of the 70 patients and 7(10%) were female. Patients were 5 to 70 years old. Most clients (30, 40.56%) were between the ages of 20 and 45. In our area, 50 (70.43%) open fractures were from car accidents. The lower limb had 50 (71%) open fractures. The tibia accounted for 30 (61.65%) of such 50 (70%) fractures. 42 (60.8%) of the injured patients were hospitalized within five hours. After 5 h, bacterial isolates grew most in patients. [Table:1]

30 of 50 predebridement cultures (50.42%) showed bacterial growth [Table 2]. 20 (60.66%) of 30 patients had Gram-positive bacteria on their skin. Most Gram-positive isolates were coagulase-negative *Staphylococcus aureus*. 12 of 30 cases (33.33%) had Gram-negative bacteria, with different isolates in each case.

20 (40.24%) of the post-debridement cultures grew, while 46 did not [Table 2]. In 20 patients, 50% had Gram-positive bacteria and 50% had Gram-negative bacteria. Coagulase-negative *Acinetobacter calcoaceticus baumannii* complex was the most common Gram-negative bacterium.

In our study, 14 discharged patients had a third culture taken. 10 (71.42%) patients showed skin organisms [Table 2]. Nine of ten patients (90%) had Gram negative bacteria, and one had Gram positive bacteria. *A. calcoaceticus baumannii* was a common Gram-negative bacterium.

After conducting an investigation into all of the pre- and post-debridement cultures, we came to the conclusion that pre-debridement cultures continuously did grow a higher number of isolates, whereas post-debridement cultures had a tendency to grow a lower number of isolates. In addition, we discovered that open fractures of Grade II and accessible fractures of Grade IIIB were more likely to become infected.

Table: 1 Assessment of bacterial growth based on the time elapsed between injury and hospitalisation

Time in hrs	Cases	Predebridement	Postdebridement	Third culture
Before 5	**20**	**5**	**7**	**4**
After 5	**30**	**25**	**13**	**6**

Table: 2 Bacterial growth patterns overall in various culture samples

Sample Culture	Absence of growth	Presence of growth	Gram-positive bacteria (%)	Gram-negative bacteria (%)
Predebridement n=50	20 patients (n=50)	30 patients (n=50)	20 patients (60.66%) (n=30)	10 patients (40.24%) (n=30)
Postdebridement n=50	30 patients (n=50)	20 patients (n=50)	10 patients (50%) (n=20)	10 patients (50%) (n=20)

3rd culture n=14	4 patients (n=14)	10 patients (n=14)	1 patients (10%) (n=10)	9 patients (90%) (n=10)

Discussion

Antibiotics ought to be effective against both Gram-negative rods as well as Gram-positive staphylococci, as these two types of bacteria are responsible for the majority of open fracture infections [10]. Recent research has shown that methicillin-resistant *S. aureus* is linked to fractures of the lower limbs. This association was discovered as a result of some studies that were carried out. There is no established antibiotic treatment plan for reducing infection rates associated with open fractures [11].

An open fracture shouldn't receive prophylactic antibiotics. Infections in open fractures not treated by antibiotics are common. Researchers recommend treating all open fractures with first-generation cephalosporins and aminoglycosides.

In a sizeable portion of cases of late infections brought on by hospital-acquired organisms, inoculation of the patient with pathogens takes place after the initial injury has taken place [12].

Because of changes in wound closure ecology and sampling, orthopaedic authors have proposed different ideas. Many open fracture wound infections are nosocomial, according to studies. A few authors have proposed this based on infection-causing organisms and early wound cultures [13]. The anti - microbial regimen should be effective both against Gram-positive and Gram-negative microorganisms [14].

Predebridement cultures had more Gram-positive bacteria. Most postdebridement cultures contained multiple organisms. After debridement, cultures grew nothing or a different microbe. 30% of patients with a positive predebridement culture had bacterial growth. Two places grew. Even negative predebridement cultures often indicate later infection.

Postdebridement cultures were much more reflective. Gram-negative bacteria grew more than Gram-positive bacteria in our postdebridement culture. In 80% of patients who had bacterial growth in their third culture or showed some signs of continued infection, post-debridement cultures showed bacterial growth. Based on the study's results, postdebridement cultures are indeed the best method for developing a proper antibacterial drugs regimen for all patients with open fractures [15].

Ninety percent of Gram-negative bacteria isolated from post debridement cultures grew, including *Acinetobacter, Pseudomonas, Enterobacter, and E coli*. It is clear from the findings of Lee and Merritt that infectious disease in open fractures is nosocomial since the causative microorganism differs from that present in initial smears to cause the disease. The majority of open fracture infections occur in developed countries. *Pseudomonas* and *Enterobacter species* infections acquired in hospitals, not in the field. Since it survives in dry conditions and is drug-resistant, *Acinetobacter spp*. is the most important nosocomial pathogen. Common environmental sources of *Acinetobacter* are hands, garments, contaminated surgical instruments, and HVAC systems.

Conclusion

Open fractures don't require pre debridement cultures. Patients with fractures should have post-debridement cultures and antibiotic therapy started as soon as possible to formulate an antibiotic policy. Gram-negative organisms cause most open fracture infections. Our antibiotic policy should cover Gram positive and Gram negative organisms with 2 different antibiotic regimens, if possible. Aminoglycosides are sensitive to Gram-positive as well as Gram-negative bacteria. Our area should treat open fractures with quinolones or cephalosporin. The study's results changed our department's antibiotic choice and regimen. Every institution and health center should ascertain a most common pathogen in their surroundings and establish an antibiotic policy around it.

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