

Original Research Article

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Bacteriological Profile of Post Traumatic Osteomyelitis in a Tertiary Care Centre

Naseel Salim and J. Lancy*

Pulikkalakath House Chettuva, Kundaliyur PO Thrissur District Kerala, India

*Corresponding author:

ABSTRACT

Keywords

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Osteomyelitis is an infection of the bone caused by bacteria. Osteomyelitis is one of the most severe complications that can arise following trauma or surgical treatment of bone. The present study was conducted in the Department of Microbiology, Government Medical College, Thrissur from April 2010 to March 2011 and the objective of this study was to determine the prevalence of different aerobic bacteria causing post-traumatic osteomyelitis and the antibiotic susceptibility pattern of the isolates. A total of 78 samples were received out of which, 53 were positive by culture, while 25 were sterile. Out of the 55 positive samples 7 were polymicrobial and 48 had only single isolate, *Staphylococcus aureus* was the most commonly isolated pathogen. 33(65.4%) and 39.4% of *Staphylococcus aureus* were MRSA. Other important organisms isolated included *Pseudomonas aeruginosa*, *E.coli*, *Klebsiella pneumoniae* and *Proteus mirabilis*. All the isolates of *Staphylococcus aureus* were resistant to Penicillin. However, Vancomycin resistance was not detected in any of the patient with MRSA. All Gram negative bacilli were sensitive to Piperacillin-Tazobactam and Imipenem. *Staphylococcus aureus* was the most commonly isolated organism. Other important organisms isolated include *Pseudomonas aeruginosa*, *E.coli*, *Klebsiella pneumoniae* and *Proteus mirabilis*. All the isolates of *Staphylococcus aureus* were resistant to Penicillin. However, Vancomycin resistance was not detected in any of the patient with MRSA. All Gram negative bacilli were sensitive to Piperacillin-Tazobactam and Imipenem.

Introduction

Osteomyelitis is defined as infection in bone. The root words 'Osteon'(bones) and 'myelo' (marrow) are combined with 'itis' (inflammation) to define the clinical state in which bone is infected with microorganisms.

Osteomyelitis is usually caused by bacteria. Osteomyelitis is one of the most severe complications that can arise following trauma or after operative treatment of bone. Bones, which usually are well protected from infection, can become infected through three

Routes Blood stream, direct invasion and infections in adjacent bone or soft tissues

Bacteria may infect the bone directly through open fractures, during bone surgery, or from contaminated objects that pierce the bone. Osteomyelitis may also occur where a piece of metal has been surgically attached to a bone, as is done to repair hip or other fractures. Osteomyelitis may also result from an infection in an adjacent soft tissue. The infection spreads to the bone after several

days or weeks. This type of spread is particularly likely to occur in older people.

This study was conducted to determine the prevalence of different bacteria in osteomyelitis and their relevance to treatment and cure.

The main objectives of this study Includes to determine the prevalence of different aerobic bacteria causing post traumatic osteomyelitis. And to describe the antibiotic susceptibility pattern of the clinical isolates.

Material and Methods

Patient and study design

Patients in all age groups and both sexes were included in the study. All patients with post-traumatic osteomyelitis admitted in the orthopaedics wards of Government Medical College, Thrissur, Kerala, India were included. The study period was one year from 1st April 2011 to 31st March 2012

Study design- cross-sectional study
Study size -all patients in that period

Collection of sample

The specimens were collected under aseptic precautions. Specimens were (1) aspirates from bone abscesses (2) bone cuttings during surgery (3) swabs collected from sinus discharges in case of chronic osteomyelitis (4) Sinus tract aspirates. Gram staining was done and smear examined under oil immersion objective.

Aerobic culture

Bone curettings were first homogenized using a sterile pestle and mortar. Bone curettings, aspirates and swabs were inoculated on Blood agar, MacConkey agar, Chocolate Agar Brain heart infusion broth.

Readings were taken after 24 hours and 48 hours of incubation and the plates were discarded if there is no growth after 48 hours.

In case of acute osteomyelitis two blood samples were collected and inoculated in blood culture bottles containing Brain heart infusion broth and sub cultured on Blood agar and MacConkey agar on alternate days up to 7 days. Antibiotic sensitivity testing of the isolates was done on Mueller Hinton agar by Kirby Bauer method.

The identification of bacterial pathogens was done based on microscopic morphology, staining characteristics, cultural and biochemical properties using standard laboratory procedures

Results and Discussion

Out of the 78 cases studied (Table 1), 53 cases (67.9%) were positive on culture while 25 (32.1%) were sterile. Grams staining of all these samples showed pus cells along with organisms.

Blood culture was done for 10 patients with acute post traumatic osteomyelitis. All of them were sterile. Aspirates of these patients were also sterile.

Out of the 55 positive samples 7 were polymicrobial and 48 had only single isolate. *Staphylococcus aureus* was the organism most commonly isolated i.e 33 (65.4%). 13 (39.39%) of *S.aureus* were Methicillin resistant (MRSA). Other important organisms isolated include *Pseudomonas aeruginosa* (20%), *E.coli* (7.27%), *Klebsiella pneumoniae* (3.6%), and *Proteus mirabilis* (3.6%) (Table 5).

All the isolates of *Staphylococcus aureus* were resistant to Penicillin. However, Vancomycin resistance was not detected in

any of the patients with MRSA. All gram negative bacilli were sensitive to Piperacillin-Tazobactem and Imipenem. (Table 6)

In the current study the ratio of infected males to females is 6.8:1; this finding may be due to the more frequent exposure of males to accidents, missile injuries, trauma, and fractures. Patients with open fractures were usually young men in their teens or twenties. This may reflect the fact that young adults and adolescents who use motor vehicles are more prone to develop post traumatic osteomyelitis following accidents.

In this study, bones predominantly involved were that of lower limbs (85.8%). The most common bone affected was tibia (41%). This correlates with the study by Browner, Jupiter *et al.*, (Browner, 2003). They reported that post traumatic osteomyelitis of lower

extremity was more common than that of upper extremity. The tibia was the most frequent location of open fracture and accordingly was also the most frequently infected bone.

Staphylococcus aureus remains the most common pathogen isolated. Commonest gram negative isolated in the study was *Pseudomonas aeruginosa* followed by *E. coli*. This significant increase in *Pseudomonas aeruginosa* as a bone pathogen might be related to the increasing nosocomial infections.

Staphylococcus aureus was reported as the commonest isolate in all types of bone infections and is implicated in 50-75% of cases of chronic osteomyelitis (Zuluaga *et al.*, 2006; Elie *et al.*, 2005; Shanson, 1999).

Table.1 Distribution of cases in relation to sex of the patients

Sex	No. of Cases(%)
Male	68 (87.17%)
Female	10 (12.82%)
Total	78 (100%)

Table.2 Distribution of cases according to age

Age in Years	No. of cases (%)
< 19	4(5.12%)
20-29	14(17.9%)
30-39	19(24.3%)
40-49	13(16.7%)
50-59	13(16.7%)
60-69	9(11.5%)
70-79	6(7.7%)
Total	78(100%)

Table.3 Distribution of bones affected by post traumatic osteomyelitis

Bones involved	No. of cases (%)
Femur	25(32.02%)
Tibia	32(41.02%)
Fibula	2(02.56%)
Humerus	2(02.56%)
Ulna	1(01.28%)
Radius	3(03.84%)
Both bone - upper limb	4(05.12%)
Foot	6(07.67%)
others	3(03.84%)
Total	78(100%)

Table.4 Distribution of specimens collected

Type of Specimen	No. of specimens collected
Bone curetting	9
Aspirates from abscesses	30
Aspirates from Sinus tract	8
Sinus tract swabs	31
Total	78

Table.5 Analysis of isolates

Sl.NO	Organisms	Number		Total (%)
		Pure	Polymicrobial	
1	<i>Staphylococcus aureus</i>	33	3	36(65.45%)
2	<i>Pseudomonas aeruginosa</i>	8	3	11(20.00%)
3	<i>E.coli</i>	3	1	4(07.27%)
4	<i>Klebsiella pneumoniae</i>	2	0	2(03.63%)
5	<i>Proteus mirabilis</i>	2	0	2(03.63%)
Total		48	7	55(100%)

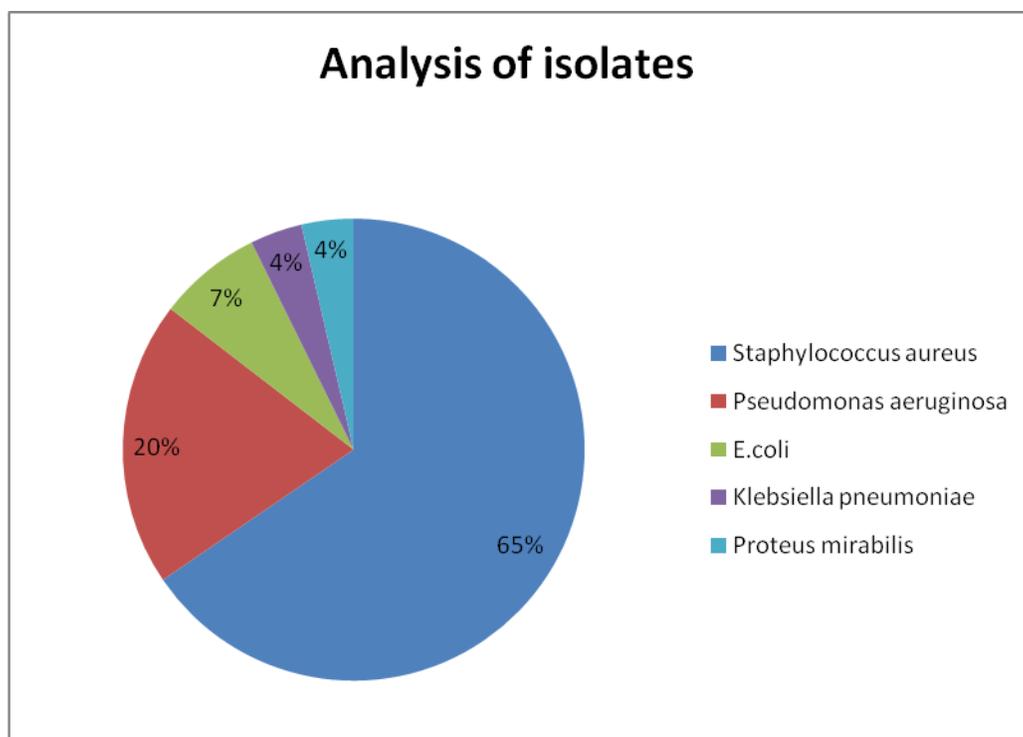


Table.6 Antibiotic susceptibility pattern of isolates (%sensitivity)

Organism (No.)	P	G	E	CEP	CXT	VA	A	CN	AK	CF	CE	CO	PIPER + TAZO	IMI
<i>S aureus</i> (22)	0	40	50	100	100	100								
MRSA (14)	0	7.7	23	0	0	100								
<i>P aeruginosa</i> (11)		18					NT	NT	72	27	45	NT	100	100
<i>E. coli</i> (4)		50					0	0	100	75	0	50	100	100
<i>Klebsiella pneumoniae</i> (2)		0					0	0	100	100	0	50	100	100
<i>P.mirabilis</i> (2)		100					100	100	100	100	100	100	100	100

P-PENICILLIN,G-GENTAMICIN,CEP-CEPHALEXIN,E-ERYTHROMYCIN,CXT-CEFOXITIN, VA – VANCOMYCIN, A – AMPICILLIN,CN- CEPHALEXIN AK – AMIKACIN, CF – CIPROFLOXACIN, CE – CEFOTAXIME, CO – COTRIMOXOZOLE,PIPER + TAZO-PIPERACILLIN-TAZOBACTUM,IMI –IMIPENEM.

Blood culture was done for 10 patients with acute post traumatic osteomyelitis. All of them were sterile. Aspirates of these patients were also sterile. Sample for blood cultures was collected prior to initiation of antimicrobial therapy in all patients, in whom there was suspicion of bacteraemia, fever and leukocytosis or leucopenia. Circumstances in which blood cultures are especially important

include acute osteomyelitis and acute arthritis Culture of bone specimens is considered to be the gold standard for conclusive microbiological diagnosis. In the present study, only 11.5% of the specimens were bone curetting 48.7% were aspirates and 39.7% were swabs from sinus tract. There were very few bone curettings since there is some reluctance in taking bone biopsy among

the orthopaedicians. In this study, bacterial pathogens responsible for infection were mainly monomicrobial(87.3%). Majda Qureshi et al from Pakistan also had more monomicrobial infections in osteomyelitis (Daniel, 1997; Majda *et al.*, 2009).

In conclusion, *staphylococcus aureus* was the most commonly isolated organism and 25.4% of all isolates was MRSA. Other important organisms isolated include *Pseudomonas aeruginosa*, *E.coli*, *Klebsiella pneumoniae* and *Proteus mirabilis* All the isolates of *Staphylococcus aureus* were resistant to Penicillin. However, Vancomycin resistance was not detected in any of the patient with MRSA. All Gram negative bacilli were sensitive to Piperacillin-Tazobactam and Imipenem.

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