Research Paper

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Evaluation of Bacteriological Profile of Chronic Osteomyelitis in A Tertiary Care Hospital

Medical Science

KEYWORDS : Osteomyelitis, bacteriological profile,sensitivity pattern.

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ABSTRACT

Osteomyelitis is primarily caused by bacteria . It can also be due to mycobacterial and fungal and even viral infections. Usually occurs in paediatric age group and in immune deficient individuals.This study conducted to detect the bacteriological profile of chronic osteomyelitis & to determine the antimicrobial susceptibility of the bacterial isolates & thus to provide guidelines for empirical antibiotic treatment.Total of 50 samples were collected,only 45(90%) showed the growth.In that 40(89%) were monomicrobial & 5(11%) were polymicrobials .Out 40 single isolation,most common isolate was Staph.aureus (62%),next is CoNS(17.5%). As polymicrobials, 2 S.aureus were in combination with Pseudomonas (40%), 1with E.coli& Proteus (20%).For Cocci 100% sensitivity was seen to Vancomycin & for Bacilli 100% sensitivity to Imepenam.

INTRODUCTION

The first description of chronic osteomyelitis date back to early Sumerian carvings, the fossil was 250 million years old. At that time the mode of treatment was irrigation, immobilisation and bandaging. [1] Only in the 19th century, osteomyelitis was understood as bone marrow infection. Chronic osteomyelitis is identified radiologically by the presence of dead necrotic bone and new bone formation and surgically by persisting discharging sinus. The fragment of dead bone is called sequestrum. The overall prevalence of osteomyelitis is 5 to 6%.. Tibia is the most common site of open fracture and infection. In a retrospective cohort study, open tibial fracture reported 56% of infection rate. [2] Spinal implants act as source of infection and the infection rate is 6 to 8%. [3,4]

REVIEW OF LITERATURE

The commonest causative organisms of chronic osteomyelitis are Staphylococcus aureus ,Coagulase negative staphylococci, Pseudomonas, Proteus, Escherichia coli and Enterococci . Staphylococcus aureus constitutes 50% – 75% cases of chronic osteomyelitis **[5]** With the use of antibiotics the incidence of osteomyelitis has decreased significantly. Removal of dead bone is the gold standard of treatment. **[6]** The relapse of osteomyelitis even after 80 years has been documented. Most common causes of treatment failure is due to inadequate bone

debridement,presence of prosthetic materials,bacteria hiding in the host endothelial cells and existing as dormant form in the biofilm.

In 2008, Alok.C.Agrawal et al, in India found, Staphylococcus aureus-21, Streptococcus -7, Klebsiella-9, Proteus-7, E.coli-38 and Pseudomonas-29 out of 111 cases of chronic osteomyelitis**[7].** In 2010, Dr.Mita D. Wadekar et al, observed Staphylococcus aureus - 43%, Pseudomonas aeruginosa- 10%, Proteus species - 6%, E.coli - 5%, Klebsiella species - 5%, Staphylococcus epidermidis - 4%, Enterobacter species - 3%, Streptococcus pyogenes - 2% and Enterococcus species - 2%. **[8]**

Pathogenesis of chronic Osteomyelitis:

Normally adults are resistant to bone infection. Yet there are chances for infections due to presence of devitalised bone and soft tissue, presence of foreign body & the microorganisms which reach the bone or the adjacent muscle via blood are from adjacent source of infection or open wound contamination.**[9,10].** According to Elek and Conan, **[11]** the presence of foreign elements greatly reduces the amount of innoculum required to initiate an infection. Haematogenous spread is an important mode of spread of staphylococcus aureus infection. The rapid growth of bacteria leads to abscess and sinus tract formation, a key diagnostic factor for Chronic Osteomyelitis. Soft tissue loss is a key element in pathogenesis of diabetic osteomyelitis following foot ulceration **.**

According to Gustilo and Anderson cultures from open fractures give positive results in 70% of cases **[12].** Staphylococcus aureus is the predominant organism in children contributing more than 90%. In adults, staphylococcus aureus contribute 50% to 75% cases of Chronic

osteomyelitis. Coagulase negative staphylococcus (staphylococcus epidermidis) and gram negative bacilli contribute to 1/3 of infection. Removal of dead bone is the gold standard of treatment. According to Tsai et al,**[13]** Osteomyelitis is rarely controlled without the combination of careful, complete, surgical debridement and prolonged 4 to 6 weeks parenteral antibiotic therapy at high dose. **[14]** The antimicrobial agent of choice depends on the type of organism isolated, their anti microbial susceptibility, pharmaco kinetic factors like bone penetration vascularity of the affected area presence of any prosthetic material and the patient tolerance to the first line antibiotic.

MATERIALS AND METHODS

The study was approved by the ethical committee of Thanjavur Medical College. The informed consent was obtained from all patient .Samples were collected from department of Orthopaedics Surgery,from April 2011 to April 2012.

DESIGN OF STUDY: Observational Study.

SAMPLE COLLECTION:

The specimen included were bone aspirate and bone curretings collected in the ortho ward or in ortho operation theatre& transported immediately to the Lab.Gram's stainingwais done & the specimen was plated in Nutrient agar, Macconkey agar and Blood agar and incubated for 24 hrs at 37 deg C. The organisms isolated were identified by colony morphology, gram staining, & by routine biochemical reactions.

Anti-bacterial susceptibility test procedure

The antimicrobial sensitivity pattern for all the isolates were done in Muller Hinton Agar by modified Kirby – Bauer disc diffusion method as per CLSI guidelines using antibiotic discs**[15].** For Gram positive organisms antimicrobial disc like Amoxicillin, Ampicillin, Erythromycin, Gentamicin, Amikacin, Doxycycline, Cotrimoxazole, Ciprofloxacin, Cephalexin, Ceftriaxone, Cefotaxime, Cefuroxime , Oxacillin, Cefoxitin, Vancomycin and Linezolid was used. For Gram negative organisms antibiotic disc like Ampicillin, Gentamicin, Amikacin, Doxycycline, Cotrimoxazole, Ciprofloxacin, Cephalexin, Ceftriaxone, Cefotaxime, Cefuroxime

, Ceftazidime, Ceftazidime +Clavulanic acid and Imipenem were tested.

RESULTS

In this study, the total number of cases Chronic Osteomyelitis considered was 50.The involvement of long bones in Chronic Osteomyelitis given in **Table:I**

Femur bone is mostly involved 23 cases & acetabulum is involved only in one case.

Bacterial culture results

The Bacterial culture results is given below

1. Number of samples with positive cultures – 45 cases
   a. Monomicrobial growth – 40 cases
   b. Polymicrobial growth – 5 cases
2. No growth was obtained – 5 cases

Monomicrobial growth: Fig -I

For Monomicrobial growth (40 isolates), organisms isolated is as follows

1. Staphylococcus aureus – 25 isolates
2. CoNS – 7 isolates
3. Escherichia coli – 2 isolates
4. Klebsiella pnemoniae – 2 isolates
5. Pseudomonas aeruginosa – 2 isolates
6. Proteus vulgaris – 1 isolate
7. Enterococci faecalis – 1 isolate

Polymicrobial growth:Fig -2

For Polymicrobial growth (5 isolates), organisms isolated is as follows

1. Staphylococcus aureus +pseudomonas – 2 isolates
2. Staphylococcus aureus + E.coli – 1 isolates
3. Staphylococcus aureus + Proteus – 1 isolate
4. Klebsiella + Pseudomonas – 1 isolate

Sensitivity of Gram positive Bacteria are given in Table No:II

The sensitivity of Enterococci is studied with 1 case**.** And it is found to be resistant to all drugs

except vancomycin.Antimicrobial susceptibility pattern of Gram negative bacilli are given in Table :III

DISCUSSION

In this study, incidence of Osteomyelitis in males is 84% and females 16% , male female ratio is 5.25:1 , where as it is 1.9:1 according to Haider Abdul-Lateef Mousa et al. [16]

According to Mita D. Wadekar (2010) et al. **[8]** observed, Staphylococcus aureus in 43% followed by Pseudomonas 10%, Proteus species 6%, Klebsiella 5%, E.coli 5%, Staphylococcus epidermidis 4%, Enterobacter 3% and Enterococci 2% . In this study occurrence of Staphylococcus aureus is 58% and Coagulase negative Staphylococci is 14%. Enterococci is 2% , E.coli 6%, Klebsiella 6%, Pseudomonas 10%, Proteus 4%.In this study, 5 out of 50 cases showed no growth. The absence of growth may be due to anaerobic organism.According to Haider Abdul-Lateef Mousa et al, incidence of osteomyelitis due to anaerobic bacteria is significant, because anaerobes multiply easily in dead tissue due to low oxygen tension.

Of the 29 isolates of Staphylococcus aureus, MSSA - 58%, MRSA 42%. According to Viudes A et al, MRSA is 42.85%. All MSSA were susceptible to vancomycin, gentamicin, teicoplanin, ciprofloxacin and linezolid. 90% were erythromycin susceptible. All the MRSA were susceptible to vancomycin and linezolid, 92% to gentamicin**. [17]** In this study sensitivity of vancomycin is 100, Linezolid 72%, cotrimoxazole 76%, Cephalosporin highly resistant, least sensitive include - Ciprofloxacin, Amikacin, Gentamicin.

CONCLUSION:

Common causative agent for chronic osteomyelitis is S.aureus both as single bacteria and as combination with other bacterias.It may be from blood stream infection or as nosocomial origin. So proper screening & treatment of health care workers is mandatory one. In suspected

cases of O.M esp in diabetic wound , earlier diagnosis like X-ray & bacterial cultures are needed. It will prevent unnecessary morbility & mortality . During treatment , proper care of wound , debridement of dead tissues,earlier treatment with combination of parenteral & oral antibiotics will reduce the development of resistants among the organisms. If any foreignbody or bone implants are present , it should be removed before starting the treatment . Parallely the co-morbid conditions like diabetes ,anaemia , vascular insufficiency & tuberculosis are also to be treated properly. Though S.aureus is commonly isolated bacteria , anaerobic bacterias are also playing important role in chronic O.M , which should also be included in antimicrobial coverage. Amputation is indicated only as life saving measure . To prevent Hospital acquired infection, prolonged hospital stay may be restricted in orho ward.

Table 1: Percentage of Bones Involved in Chronic Osteomyletis

S.No	Bones Involved	Number of cases
1	Femur	23(46%)
2	Tibia	15(30%)
3	Femur + Tibia	2(4%)
4	Tibia + Fibula	3(6%)
5	Radius + Ulna	4(8%)
6	Humerus	2(4%)
7	Acetabulum	1(2%)
		50

Table II:Sensitivity of Gram positive Bacteria

Drug	MSSA	MRSA	CONS
amoxycillin	0	0	29
ampicillin	0	0	43
cotrimoxale	76	83	57
doxycycline	88	50	71
erythromycin	76	58	57
amikacin	88	25	71
gentamicin	76	17	57
ciprofloxacin	65	0	43
cephalexin	59	0	57
oxacillin	100	0	100
cefotaxime	59	0	86
cefuroxime	76	8	71
ceftriaxone	76	17	86

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vancomycin	100	100	75
Linezolid	100	75	96

Table:III Antimicrobial susceptibility pattern of Gram negative bacilli

Drug	Pseudomonas n-5	E.coli n-3	Klebsiella n-3	Proteus n-2
ampicillin	0%(0)	0%(0)	0%(0)	0%(0)
Cotrimoxazole	0%(0)	33%(1)	33%(1)	0%(0)
Doxycycline	0%(0)	67%(2)	33%(1)	0%(0)
amikacin	40%(2)	67%(2)	67%(2)	100%(2)
gentamicin	20%(1)	67%(2)	33%(1)	100%(2)
ciprofloxacin	40%(2)	67%(2)	67%(2)	100%(2)
cephalexin	20%(1)	33%(1)	33%(1)	100%(2)
cefotaxime	20%(1)	67%(2)	67%(2)	100%(2)
cefuroxime	20%(1)	33%(1)	33%(1)	50%(1)
ceftriaxone	40%(2)	67%(5)	67%(2)	100%(2)
ceftazidime	60%(3)	67%(2)	67%(2)	100%(2)
ceftazidime - clavulanic acid	80%(4)	67%(2)	100%(3)	100%(2)
imipenem	100%(5)	100%(3)	100%(3)	100%(2)

Fig-I : Monomicrobial Growth (PIE DONUT 3D View)

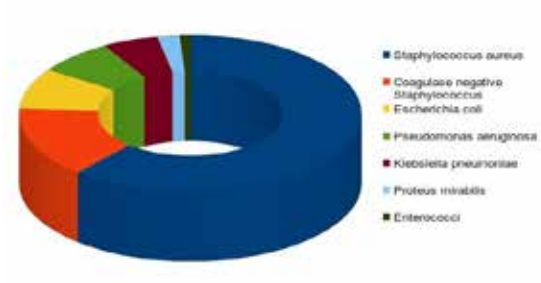
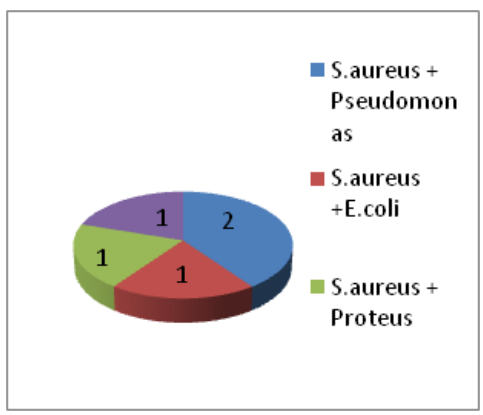


Fig-2 : Polymicrobial Growth (PIE 3D View)



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