D:/Biomedica Vol.25, Jul. – Dec. 2009/Bio-22.Doc P. 180 – 183 (WC)

BACTERIAL AETIOLOGY OF BONE LESIONS, IN A TERTIARY CARE HOSPITAL

MAJDA QURESHI, SADIA CHUADRY AND SHALA HAROON
Department of Pathology, Lahore Medical & Dental College, Lahore – Pakistan

ABSTRACT

This study was planned to observe the bacteriological pattern of causative organisms of osteomyelitis reporting to orthopedic unit at Ghurki Trust Teaching Hospitals, (GTTH) Lahore. The objective of this study was to know the type / frequency of infection in orthopaedic surgery in a public hospital and its treatment. It is a retrospective study carried out between Dec 2006 and Jan 2008. A total of one hundred and sixty five (165) patient samples were received at Lahore Medical and Dental College Lahore (LM&DC) during this period. They included 113 males and 52 females with age range of 01 to 80 years. All the patients were investigated in outpatient departments and Orthopaedic wards. Among the 165 patient investigated only 89 were found infected (63 males and 26 females). The commonest infecting organism isolated was Staphylococcus (54%) followed by enterobacteriaceae (23%) that included (proteus spp (12.5%), E.coli (8%), Klebseilla (2.5%) Pseudomonas aeruginosa (18%), anaerobes (2.5%) and miscellaneous (2.5%). Two (2.5%) anerobic bacteria were isolated, anaerobic bacteria were peptostreptococci and bacteroides either alone or as a mixed infection. The different kind of bacterial isolation shows no relation with age and gender. This increase in Pseudomonas aeruginosa as a significant bone pathogen is related to the increasing nosocomial nature of osteomyelitis.

INTRODUCTION

Infections of the bone have been known for a long time. Post-traumatic osteomyelitis is one of the most serious complications after fracture treatment. In orthopaedics, the surgical site infection after implant surgery is a disaster both for the patient and surgeon. This may lead to increased antibiotic use, prolonged hospital stay, repeated debridements, prolong rehabilitation, morbidity and mortality.[1]

The pathogenesis of infection in fractures, fixation devices is related to micro-organisms, which grow in biofilm, and therefore its eradication is difficult.[2] In human the most common route by which bacteria reach the bone is blood stream[3,4]. However, traumatic modes as penetrating injury[5], fractures and intramedullary nailing[6,] implants and post-surgical complications[7] have been identified. Intravenous drug users[8,9] and the presence of foreign body[10] also predispose to bone infection. The initial diagnosis of osteomyelitis is usually made on physical signs[11] and by sonography for early soft tissue changes.[12,13] Magnetic resonance imaging[14] and bone scans[15] are most sensitive and specific. Conclusive diagnosis requires isolation of pathogen in aspirate from bone lesion, bone debridement and blood culture.[15]

The present study was undertaken to evaluate the microbiological pattern of cases of bone lesions at GTTH, Lahore.

MATERIAL AND METHODS

The study was conducted at the Microbiology Department of Lahore Medical and Dental College, Lahore. Specimens of pus from bone, blood and bone debridement were received from GTTH.

All samples were inoculated onto two blood agar and one MacConkey agar plates. One blood agar plate was incubated aerobically for 48 hours and the other two plates aerobically for 24 hours. Smears were made from samples and stained by the Gram's and Zeil Neelson staining. The colonies obtained were processed according to the standard technique of practical text book Mackie and MacCartney.

RESULTS

One hundred and sixty five patient samples were received from outpatient departments and Orthopaedic wards of GTTH Lahore. The patients included were from both sexes and all age groups. The age of the patients ranged from 1–80 years with a mean age (± SD) of 28.73 ± 16.64 years. There were 113 males and 52 females.

There were 70 specimens showing granulation tissue, two specimens of blood, eleven specimen of fluid (knee aspirates) and 82 specimens of pus. Among the 165 specimens 89 isolates were identified.

The commonest isolate is Staphylococcus aureus 48 out of 89 (54%), followed by Enterobacteriaceae 20

Table 1: *Shows number of samples revealing positive culture both in males and females and their relative percentage in each group;*

Total No. of samples	Samples showing growth	Staph aureus	Enterobacteriacae	Pseudomonas	Streptococci	Mix growth
165	89	48 (54%)	20 (23%)	16 (18%)	2 (2.5%)	2 (2.5%)
M / f 113/52	M/ f 63/23	M/ f 35/13	M/ f 9/11	M/ f 12/4	M/ f 1/1	M/ f 1/1

Table 2: *Distribution of isolates in various age groups of osteomyelitis patients.*

Patients			Staphy looccus aureus m/f	Entero bacteriace m/f	Pseudo-monas m/f			
Age group (years)	No.	No. of Microbes				strept m.f	Miscell Aneous M,f	% age
< 15	17	07	7/2	0/1	0/0	0.0	-	3,8
15-30	54	30	13/.6	¾	2/0	0.1	- / 1	12.320.0
31-50	52	32	22/3	5/4	3/2	1.p	1/-	8.35
51-70	34	18	05/3	½	5/1	0.0	-	2.0
>70	08	02	02/0	-	0/0	0.0	-	-
Total	**165**	**89**	**35/13**	**8/11**	**12/4**	**1.1**	**1/1**	**25.75**

out of 89 (23%) Pseudomonas aeruginosa 16 out of 89 (18%), anaerobes 2 out of 89 (2.5%) and miscellaneous (2.3%). The distribution of isolates according to various age groups is shown in Table 2. Two (2.5%) anaerobic bacteria were isolated. Anaerobic bacteria were peptostreptococci, peptococci and bacteroides either alone or as a mixed infection. The miscellaneous group comprised of streptococci, staphylococcus epidermidis, diptheroids, micrococci and bacilli.

DISCUSSION

In this study, bacterial organisms responsible for infection are mainly single while in one fourth cases the aetiology was polymicrobial. Other studies, from Pakistan and some international studies,[17,22,23] also report the predominance of monomicrobial aetiology. Recent studies[20,24,25] all report an increasing incidence of polymicrobial infection than the other reported in the past[26,27] was mainly monomicrobial infection in bone lesions.

Staphylococcus aureus remains the most frequent pathogen isolated in bone, the distribution varies from two third Staphylococcus aureus to one third Enteriobacteriaceae and Pseudomonas aeruginosa. This significant increase in Pseudomonas aeruginosa as a bone pathogen is related to the increasing nosocomial nature of osteomyelitis.[29]

A slight predominance in the isolation rate of Enteriobacteriaceae is reported by Mousa[23]. Even in this study there was a difference of only 3.24% between Staphylococcus aureus and Enterobacteriaceae group. Enterobacteriaceae are increasingly nosocomial pathogens[29]. The third major group in our study was Pseudomonas aeruginosa, that remains a severe complication of hospitalisation[30]. Mixed infections included two isolates belonging to aerobes as Staphylococci, Enterobacteriaceae, and Pseudomonas or with anaerobe. Enterbacteriaeiae alone as single organism were isolated in twenty cases. Proteus was the commonest Enterbacteriaeiae to be isolated (n = 11) in single pattern.

The reports from different cities have shown different bacteriological patterns. In a study at Karachi[16]. Among the 125 cases, 68.6% were reported to be infected with Staphylococci. From Rawalpindi Karamat *et al*[17] have also reported a high frequency (79%) of Staphylococci, whereas Farooq and Ahmad[18] On the other hand have reported a very low (37.5%) frequency of Staphylococci. The predominant role of Staphylococci in bone infection is also supported in some international studies by Karwo-

wska *et al*[19], Alonge *et al*[20] and Lobati *et a1*.[10] This proves the impor-tance of culturing pus from osteomyelitis cases for aerobes, as well as anaerobes for appropriate management and cure of chronic illness.

It is **concluded** that the present study highlights the importance of microbiological examination of bone in cases of osteomyelitis. Microorganisms could not be detected in only 76 cases and one third of cases had polymicrobial aetiology. Any bacterium, Gram positive or negative, aerobe or anaerobe, either alone or as a mixed infection, could be responsible for osteomyelitis. The modern era with high speed travel, warfare, use of implants and prosthetics will add to the load of osteomyelitis. The clinicians should first obtain a microbiological investigation and then treat their patients to halt the chronic relentless course of this crippling disease.

ACKNOWLEDGEMENT

Authors are grateful to Prof Dr. Aamir Aziz of orthopaedic department and Prof Dr. Sabiha Hamid head of pathology department at Lahore Medical & Dental College, Lahore and Microbiology section staff for their support and cooperation.

REFERENCES

1. Edwards C, Counsell C, Boulton C, Moran G. Early infection after hip fracture surgery, risk factors, costs and outcome. J. Bone joint Surg 2008; 90-B: 770–7.
2. Trampuz A, Zimmerli W. Diagnosis and treatment of infections associated with fracture fixation devices. Injury 2006; 37 (suppl 2): S59–66.
3. Glover SC, Padfield C, McKendrick MW, Geddes AM, Dwyer NJP. Acute osteomyelitis in a district general hospital. Lancet 1982; 1: 609-11.
4. Willis RB, Rozencwaig R. Pediatric osteomyelitis masquerading as skeletal neoplasia. Orthop Clin North Am 1996; 27 (3): 625-34.
5. Gale W, Scott R. Puncture wound of the foot? Persistent pain? Think of Pseudomonas aeroginosa osteomyelitis. Injury: the Br J Acci Surg 1991; 22 (5): 427-8.
6. Court-brown CM, Keating JF, McQueen MM. Infection after Intramedullary nailing of the tibia. J Bone Joint Surgery 1992; 74 B: 770-4.
7. Khan G, Hussain A, Rehman M. Infection of the sternum and costal cartilages following median sternotomy: Report of 4 cases. JPMI 1997; 11 (2): 224-9.
8. Boll KL, Jurik AG. Sternal osteomyelitis in drug addicts. J Bone Joint Surg 1990; 72B: 328-9.
9. Kak V, Chanderasekar PH. Bone and Joint infections in injection drug users. Infect Dis Clin North Am 2002; 16 (3): 681-95.
10. Lobati F, Herndon B, Bamberger D. Osteomyelitis: aetiology, diagnosis, treatment and outcome in a public versus a private institution. Infection 2001; 29 (6): 333-6.
11. Tuson CE, Hoffman EB, Mann MD. Isotope bone scanning for acute osteomyelitis and septic arthritis in children. J Bone Joint Surg 1994; 76B: 306-10.
12. Howard CB, Einhorn M, Dagan R, Nyska M. Ultrasound in diagnosis and management of acute haematogenous osteomyelitis in children. J Bone Joint Surg [Br] 1993; 75 B (1): 79-82.
13. Mah ET, LeQuesne GW, Gent RJ, Paterson DC. Ultrasonic features of acute osteomyelitis in children. J Bone Joint Surg 1994; 76 B (6): 969-74.
14. Onitsuka H. MRI of bones, joints, and soft tissue. Asian Med J 1995; 38 (9): 502-8.
15. Warner WC Jr. Osteomyelitis. In: Crenshaw AH, Daugherty K, Curro C. (eds) Campbell's Operative Orthopaedics. 8th Ed. St. Louis: Mosby Year Book; 1992: 131-50.
16. Alam SI, Khan KA, Ansari AM, Ahmed A. Etiological study of chronic osteomyelitis in Karachi [Letter]. J Pak Med Assoc 1991; 41: 24.
17. Karamat KA, Butt T, Abbas G. Osteomyelitis-prevalence and susceptibility pattern of causative microorganisms in Rawalpindi/Islamabad area. Pak J Pathol 1995; 6 (2): 61-6.
18. Farooq U, Ahmad IF, Bacteriological studies in osteomyelitis at Faisalabad. J Pak Med Assoc 1988; 38: 43-7.
19. Karwowska A, Davies HD, Jadavji T. Epidemiology and outcome of osteomyelitis in the era of sequential intravenous–oral therapy. Pediatr Infect Dis J 1998; 17 (11): 1021-6.
20. Alonge TO, Ogunlade SO, Fashina AN. Microbial isolates in chronic osteomyelitis—a guide to management. Afr J Med Sci 2002; 31 (2): 167-9.
21. Baird D. Staphylococcus: Cluster-forming Gram-Positive cocci. In: Colllee JG, Fraser AG, Marimion BP, Sinnons A (eds). Mackie and Mecartney Practical Medical Microbiology. 14th Ed. London: Churchill Livingstone; 1996: 45-61.
22. Iqbal MZ, Chima TA, Sabir MR. Rate of post operative infection clean orthopaedic cases. J Pak Orthop Assoc, 2001; 13: 121–4.
23. Mousa HAL. Evaluation of sinus-track cultures in chronic bone infection. J Bone Joint Surg 1997; 79B (4): 567-9.
24. McNally MA, Small JO, Tofighi HG, Mollan RAB. Two-stage management of chronic osteomyelitis of the long bones: The Belfast technique. J Bone Joint Surg [Br] 1993; 75B (3): 375-80.
25. Marsh DR, Shah S, Elliott J, Kurdy N. The Ilizarov method in nonunion, malunion and infection of fractures. J Bone Joint Surg [Br] 1997; 79B (2): 273-9.
26. West WF, Kelly PJ, Martin WJ. Chronic osteomyelitis: I. Factors affecting the results of treatment in 186 patients. JAMA 1970; 213 (11): 1837-42.
27. Kelly PJ, Martin WJ, Coventry MB. Chronic osteomyelitis. II. Treatment with closed irrigation and suction. JAMA 1970; 213: 1843-8.
28. Carek PJ, Dickerson LM, Sack JL, Diagnosis and management of osteomyelitis Am Fam Physician 2001; 63: 2413-20.

29. Tago IA, Asfhaq K, Gill P, Memon K, Kumar N Mahboob G. Post operative infection in clean cases with the use of implant and their management. J pak orthop assoc 2007; 19 (2): 46–56.
30. Ostermann PAW, Henry SL, Seligson D. The role of local antibiotic therapy in the management of compound fractures. Clin Orthop Related Res 1993; 295: 102-11.
31. Bukhari SAH, Skinner J, Bentley G. Management of delayed infection after total hip replacement (case report) Journal of Surgery Pakistan 2002; 7: 39–41.