ORIGINAL ARTICLE

Infective Organisms and their Changing Antibiotic Sensitivity Trends in Surgical Site Infection after Orthopedic Implant Surgeries

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ABSTRACT

Background: In orthopedic surgeries, surgical site infection (SSI) has been reduced in recent decades with the help of several antibiotics and development of surgical techniques. But still SSI is a common finding of orthopedic surgery. There is lack of evidence regarding most common pathogen and its sensitivity pattern after orthopedic surgery.
Aim: To assess the frequency of Infective organisms and their changing antibiotic sensitivity trends in surgical site infection after orthopedic implant surgeries
Methods: 140 consecutive patients with surgical site infection after elective surgeries were included in the study from June to December 2017. Patients' demographics were recorded. Type of most common pathogen and its sensitivity pattern were recorded. Data was a recorded on proforma and analyzed through SPSS v. 21.0.
Results: The mean age of patients was 45.93±10.58years. There were 51(53.1%) males and 45 (46.9%) females. Out of 140, Staph Aureus was found in 23 (23.96%) cases, MRSA was found in 18 (18.75%) cases, E. Coli was found in 15 (15.63%) cases. Ceftriaxone was sensitive in 88 (91.7%) cultures, Ampicillin was sensitive in 62 (64.6%) cultures, Metronidazole was sensitive in 58 (61.4%) cultures.
Conclusion: The frequency of Staph aureus was found to be most common pathogen in SSI and ceftriaxone was most sensitive antibiotic for SSI management.
Keywords: bone fracture, orthopedic surgery, surgical site infection, pathogen, antibiotic sensitivity

INTRODUCTION

The increasing rates of orthopedic surgery across many countries emphasize the importance of implementing strategies to minimize the risk of surgical site infection[1,2]. Orthopaedic and trauma device-related infection remains a major complication in modern trauma and orthopaedic surgery[3].

The SSI was reported 3.8%, which is below the reported worldwide incidence of 2.6% to 41.9%[4,5]. Despite best practice in medical and surgical management, neither prophylaxis nor treatment of orthopedic device–related infection is effective in all cases, and can lead to infections that negatively impact clinical outcome and significantly increase healthcare expenditure[6]. Infections caused by antibiotic-resistant pathogens are a major public health concern, and their treatment can be challenging[7].

MATERIALS AND METHODS

This cross sectional study was done from June to December 2017 at Department of Orthopedic Surgery, jinnah Hospital, Lahore. Sample size of 96 patients of surgical site ifnection were included with 95% confidence interval and 4.5% margin of error and obtaining frequency of SSI i.e. 5.3% after orthopedic surgery. Non probability consecutive sampling technique was used to enroll the patients. Patients of age 16-80years, of either gender underwent surgery for bony fractures and developed SSI were included. Patients with diabetes, osteomalacia, patients presented received antibiotics for infection were excluded from the study. Written informed consent was taken from each case. Demographic details, like name, age, sex, duration of surgery and site involved were obtained. Then patients were evaluated for infection and pus sample was obtained under aseptic measures and sent to the laboratory of the hospital. Reports were assessed and type of bacterium found in culture was noted and its antibiotics sensitivity was noted. Data was collected through proforma. All the collected data was then analyzed through SPSS version 21.0. Mean±SD were computed for quantitative variables like age and duration of surgery. Qualitative variables like gender, site of fracture, pathogen involved and its sensitivity pattern were presented as frequency and percentage.

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RESULTS

The mean age of patients was 45.93±10.58years. There were 51 (53.1%) males and 45 (46.9%) females. The mean duration of surgery was 23.84±11.35days. In the sample, 44 had femur fracture, 23 had humerus fracture, 17 tibial fracture, 9 had radial fracture and 3 had fibula fracture (Table 1).

Out of 140, Staph Aureus was found in 23(23.96%) cases, MRSA was found in 18(18.75%) cases, E. Coli was found in 15 (15.63%) cases, Pseudomonas A was found in 12 (12.5%) cases, BHS group A in 10(10.4%) cases, Enterococcus in 9 (94%) and salmonella in 9 (9.4%) cases (Table 2).

Different antibiotics were applied on pus culture Ceftriaxone was sensitive in 88 (91.7%) cultures, Ampicillin was sensitive in 62 (64.6%) cultures, Metronidazole was sensitive in 58 (61.4%) cultures, gentamicin was sensitive in 29(30.2%) cultures while cefoxitin was sensitive in 13(13.5%) cultures (Table 3).

Table 1: Characteristics of patients (n=96)

Age	45.93±10.58years
Gender (Male / Female**)**	51 (53.1%) / 45 (46.9%)
Duration of surgery	23.84±11.35days
Site of fracture	
Femur	44
Humerus	23
Tibial	17
Radial	9
Fibula	3

Table 2: Pathogens found in culture

Bacteria	**f (%)**
Staph Aureus	23(23.96%)
MRSA	18(18.75%)
E. Coli	15(15.63%)
Pseudomonas A	12(12.5%)
BHS Group A	10(10.4%)
Enterococcus	9(9.4%)
Salmonella	9(9.4%)

Table 3: Antibiotic sensitivity of pathogens

Antibiotic	**Sensitive**
Ceftriaxone	88(91.7%)
Ampicillin	62(64.6%)
Metronidazole	58(61.4%)
Gentamicin	29(30.2%)
Cefoxitin	13(13.5%)

DISCUSSION

The most prevalent species in orthopaedic device-related infection are Staphylococci[8-12]. Staphylococcus (S.) aureus accounts for between 20% and 30% of cases of infection after fracture fixation and prosthetic joint infections (PJI), with coagulase-negative staphylococci (CoNS) accounting for 20%–40% of cases, including small colony variants[13].

The most common isolated infective organism was *Staphylococcus species* including Methicillin Resistant *Staphylococcus aurous* (MRSA) in 32 patients (43.8%), *Staph epidermidis* in 17(23.2%), *Acinetobacter species* in 11(15%), *Pseudomonas species* in 7(9.6%), *Enterococcus species* in 3(4.1%), *Escherichia coli* in 2(2.7%) and *Klebsiella species* in 1(1.4%). There were 53 patients (72.6%) infected by a single organism, (21.9%) by two infecting organisms, and 4 (5.5%) patients infected by more than two organisms[14]. In all patients who had two or more organisms, Staph epidermidis was the common organism. The following prophylactic antibiotics were used: ampicillin, gentamicin, cefoxitin, metronidazole and ceftriaxone[15,5].

Other Gram-positive cocci including Streptococci (1%–10%) and Enterococci (3%–7%) are less frequently encountered. Infections caused by Gram-negative bacilli, including Pseudomonas aeruginosa and Enterobacteriaceae account for approximately 6%–17% and anaerobes (including Propionibacteria and Peptostreptococci) are comparatively rare at approximately 4%–5%[8-12]. Shoulder orthopedic device–related infections, however, may have higher Propionibacterium (P) acnes prevalence, at up to 38%.[16] Recently, more attention has been focussed upon polymicrobial infections, which may account for 10%-20% of cases.[8, 9, 12] Furthermore, studies using molecular diagnostic techniques indicate that, in addition, there is a significant proportion (5%-34%) of culture-negative infections[17,18].

Others are anaerobes, gram-negative bacilli such as *Pseudomonas* species or *E. coli,* and, especially in hematogenous infections, streptococci[19,20]. Tunney et al., isolated *Propionibacterium* species in 60% of orthopedic device–related infections by using strict anaerobic bacteriologic practices during the processing of samples considered associated with orthopedic device–related infections[21]. *Propionibacterium* species are the second most frequent contaminant observed in joint aspiration[22].

Hidayatullah et al., fond that Staph Aureus (13 cases) including MRSA (5 cases) was the most common infecting organism in our study, involving 18 (50%) patients.[23] Other studies show the frequency of Staph Aureus to be 25-29%[24,25]. The frequency of MRSA among Staph Aureus was 27.8% (5 out of 18). Staph Aureus was most sensitive to fusidic acid, vancomycin linezolid, clindamycin and erythromycin. There was a mixed sensitivity pattern to gentamycin, cotrimxazole and oxacillin. In majority of cases Staph Aureus was resistant to pencillin, levofloxacin and tetracyclin[23].

CONCLUSION

The frequency of Staph aureus and MRSA were most common pathogens in SSI and ceftriaxone, ampicillin and metronidazole were most sensitive antibiotic for SSI management. Now in future, we can implement the use of ceftriaxone, ampicillin and metronidazole for management of SSI keeping in mind most common pathogens.

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