

# Infective Organisms With Their Changing Antibiotics Sensitivity Trends In Orthopedics Implant Surgery Infections

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## **ABSTRACT**

**Objective:** To know about the various pathogens causing infection in orthopaedic implant surgeries and their antibiotic sensitivities.

**Methods:** This prospective study was conducted jointly in Departments of Orthopaedics and Trauma of Kausar Hospital, Afghan Hospital and Emergency Hospital, Kabul, from April 2019 to April 2020. All patients having close fractures of long bones including humerus, radius/ulna, femur and tibia requiring open reduction and internal fixation (ORIF) were included. Patients data was noted on a preformed proforma. Patients were followed up to 6 months.

**Results:** 30 patients out of 650 developed Surgical site infection were selected. 23 were male and 7 were female patients. Age range was from 5-75 years. Staphylococcus Aureus including Methicillin resistant Staphylococcus Aureus MRSA was most common cultured organism, followed by E Coli and pseudomonas. 23 cases yielded single organism, 5 cases yielded 2 organisms, 1 case yielded 3 organisms. There was no organism growth in one case.

**Conclusion:** Staphylococcus Aureus including MRSA is the main cause of surgical site infection in orthopedics implant surgery. Other bacteria like E.Coli may cause surgical site infection. Antibiotics should be prescribed according to culture and sensitivity reports.

**Key Words:** Surgical site infection, MRSA, Beta Hemolytic Staphylococci Group A, Open reduction and internal fixation, Culture and sensitivity.

## **1. INTRODUCTION**

Surgical site infection (SSI) is defined as contamination of operative wound by microbes within 30 days of operation or 1 year if an implant is placed in [1,2]. It is considered as a major problem for the patient, surgeon and surgical procedure [3]. It increases the stay of patient in hospital, need of multiple surgical procedures, increases morbidity and mortality [4], and causes drainage of hospital and patient economic resources [5].

In orthopedics implant surgery, the microorganism develops a biofilm, which caused difficulty in its eradication [1,6,7]. Cornelius Celsius (14-37AD) described the four cardinal signs inflammation [1], those are redness, pain, warmth and swelling. Surgical site infections are classified as early (<2 weeks), delayed (2-10 weeks) and late (>10 weeks). Staphylococcus Aureus, E. Coli and Proteus are the main causes of infections [3,7]. With the use of modern antiseptic techniques, use of adequate antibiotics, the rate of Surgical site infection has decreased significantly [3,8,9].

Many bacteria have developed resistant to various drugs, and its frequency is increasing day by day. These bacteria are difficult to eradicate. The frequency of infections caused by MRSA has increased from 2.4% in 1974 to 29% in 1991, in various hospitals of US [10]. In large tertiary care hospitals, the infection caused by MRSA has increased up to 40%, due to infections caused by Staphylococcus Aureus [11].

The aim of this study is to know the infective bacteria in orthopedics implant surgery and their sensitivity to antibiotics according to culture and sensitivity reports in patients operated in our departments.

## 2. METHODS

This study was conducted in Orthopedics and Trauma departments of Kausar, Afghan and Emergency Hospital jointly in Kabul, from April 2019 to April 2020. All closed fractures of long bones including humerus, radius/ulna, femur and tibia, requiring internal fixation with plates, interlocking nails and Austin Moore prosthesis were included in the study. Open fractures, fractures with soft tissue injury, fracture requiring external fixators and pathological fractures were excluded.

Patient data like name, age, gender, diagnosis, comorbidities, type of surgery and implant used were noted on a preformed proforma. Written and informed consent were taken from the patients. All patients received prophylactic antibiotic ( 3<sup>rd</sup> generation of cephalosporin ) at the induction of anesthesia which were continued for 24 hours postoperatively. Patients were properly prepared and draped before surgery. Strict antiseptic precautionary measures were taken. Patients were discharged on 1<sup>st</sup> or 2<sup>nd</sup> postoperative day. Follow up was done on 2<sup>nd</sup> week and then monthly for 6 months.

Patients, who developed SSI, were admitted. Wounds were debrided, tissues were sent for culture and sensitivity. Implants were removed where necessary. Patients were continued on antibiotics according to culture and sensitivity reports. SPSS version 18 was used for statistical analysis.

## 3. RESULTS

A total of 650 patients were enrolled, out of which 30 patients developed surgical site infection. 23 patients were male and 7 patients were female. Mean age of patients was 31.03 (5-75 years). Major pathogenic organism was Staphylococcus Aureus including MRSA. E.coli was the second most common organism. Table 1. Shows the various pathogens which were cultured. 23 (76.7%) culture reports yielded single organism growth, 5(16.7%) had two organisms growths. One (3.3%) tissue yielded the growth of 3 organisms, while in one (3.3%) report there was no growth.

Table 1: Frequencies of various bacteria

S.No	Bacteria	Number
1	Staph Aureus	13(36.1%)
2	MRSA	5 (13.9%)
3	E. Coli	8 (22.2%)
4	Pseudomonas A	2 (5.5%)
5	BHS Group A	2 (5.5%)
6	M Morgagni	1 (2.8%)
7	Enterococcus	1 (2.8%)
8	Salmonella	1 (2.8%)
9	Proteus Vulgaris	1 (2.8%)
10	Staph Epidermidis	1 (2.8%)
11	Acinetobacter BAU	1 (2.8%)

## 4. DISCUSSION

Surgical site infection is a major cause of postoperative morbidity and mortality in surgical patients. It is the third most common cause of nosocomial infection [12,13,14]. In Orthopedic Surgery, it is a difficult problem, because the organism usually develops a biofilm and the

implants used in orthopedic surgery are avascular [1,6,7]. Eradication of infection associated with orthopedic implants is very difficult because antibiotics do not reach there, often necessitating implant removal.

Staphylococcus Aureus (13 Cases) including MRSA (5 Cases) was the most common infecting organism in our study, involving 18 (50%) patients. The frequency is similar to another local study (7) but the frequency is less to another study previously done in neighboring country [3]. Other studies show the frequency of Staphylococcus Aureus to be 25-29% (5 out of 18). Staphylococcus Aureus was most sensitive to fusidic acid, vancomycin, linezolid, clindamycin and erythromycin. There was a mixed sensitivity pattern to gentamycin, cotrimoxazole and oxacillin. In majority of cases Staphylococcus Aureus was methicillin resistant to penicillin, levofloxacin and tetracyclin.

All MRSA cases were resistant to penicillin, oxacillin and cotrimoxazole but it was sensitive to vancomycin, fusidic acid and linezolid.

E. coli was the second most common organism involving 8(22.2%) cases. The frequency is increased as compared to other studies. [1,3]. It was sensitive to imipenem but was resistant to ceftriaxone, cotrimoxazole, cefixime and ciprofloxacin.

It showed mixed sensitivity to augmentin, amikacin, piperacillin/tazobactam and gentamycin. We had one culture report of E. Coli which was resistant to all tested antibiotics.

Pseudomonas and BHS GA were cultured in two cases each. The frequency of Pseudomonas is decreased as compared to other studies [1]. Pseudomonas was sensitive to amikacin, aztreonam, ceftazidime, imipenem, piperacillin/tazobactam, gentamycin and ciprofloxacin. One case was resistant to cefepime and one was sensitive to it. BHS GA was resistant to clindamycin and gentamycin and sensitive to ceftriaxone, chloramphenicol, ofloxacin, penicillin and vancomycin.

Enterococcus was cultured in one case, it was sensitive to augmentin, gentamycin and vancomycin. It was resistant to erythromycin, tetracyclin and chloramphenicol. One culture report was positive for salmonella, which was sensitive to all tested antibiotics (ampicillin, ceftriaxone, cotrimoxazole, ciprofloxacin and cefixime). Proteus Vulgaris was cultured in one report which showed sensitivity to amikacin, imipenem and piperacillin/tazobactam. It was resistant to ceftriaxone, ciprofloxacin, augmentin, gentamycin, cotrimoxazole and tetracyclin.

Staphylococcus epidermidis was cultured in single report which showed sensitivity to amikacin, clindamycin, gentamycin and tetracycline. It was resistant to penicillin, ciprofloxacin and cotrimoxazole. It was also resistant to fusidic acid. Acinetobacter was cultured in one report. It was sensitive to colistin, imipenem, tobramycin and polymixin. It was resistant to amikacin, cefepime, ceftazidime, piperacillin/tazobactam, ciprofloxacin and cotrimoxazole. M Morgagni was cultured in one report. It was sensitive to amikacin, piperacillin/tazobactam and meropenem. It was resistant to aztreonam, gentamycin, ceftriaxone, cotrimoxazole, cefixime and ciprofloxacin. It was intermediately sensitive to augmentin.

## 5. CONCLUSION

Staphylococcus Aureus including MRSA is the main cause of surgical site infection in orthopedic implant surgery. Other bacteria like E.Coli may cause surgical site infection. Antibiotics should be prescribed according to the culture and sensitivity reports. Antibiotics should not be used haphazardly, in order to prevent resistance to antibiotics.

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