

INFECTION IN ORTHOPEDIC IMPLANT SURGERY, ITS RISK FACTORS AND OUTCOME

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Background: Infection in orthopedic surgery is a disaster both for the patient and surgeon. Although its incidence has been reduced due to modern theatre facilities and aseptic measures but in developing countries its prevalence is still high. It is better to prevent infection rather than to treat it. The objective of this study is to know the frequency of infection in orthopedic implant surgery in a public hospital and to evaluate the risk factors, causative organism, complications and treatment. **Methods:** This prospective study was conducted in orthopedic unit-B Ayub Teaching Hospital, Abbottabad, from 1st April 2007 to 30th October 2007. Close fracture cases admitted for internal fixation devices were included. The exclusion criteria were soft tissue surgery, wounds and open fractures needing external fixation devices. The follow up was done for six months. **Results:** Infection developed in 6 patients (5.76%), out of which superficial and deep infections were 2 (1.92%) and 4 (3.84%) respectively. There were 2 infection cases in each stage of the infection i.e. early, delayed and late. The staphylococcus aureus was the commonest organism, i.e., 3 (50%) out of 6. The age of the patients was more than 60 years in 3 (2.88%) patients, 30 to 60 years in 2 (1.92%) patients and below 30 year in 1 (0.96%) patient. The smoking history was in 2 (1.92%) patients. **Conclusion:** Infection rate in our study was quite high and needs proper measures to control it because it had great financial burden on patient and on hospital resources and could lead to morbidity and mortality in patients. We could not find significant risk factors in our small sample size study although the infection was relatively more common in patients with advanced age, prolonged surgery time, smoking and skin abrasion at fracture site. Commonest organism was Staphylococcus aureus.

KEY WORDS: Orthopedic infection, Implant surgery, clean cases.

INTRODUCTION

In orthopedics, 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 These infections are classified in to three stages, i.e., early (less than two weeks), delayed (2 to 10 weeks) and late (more than 10 weeks) infection.² In 1896, Brewer³ reported the infection rates of 39% in postoperative patients that was reduced to 0.2% with proper aseptic measures in recent times. At the beginning of 19th century, the rate of infection was reduced due to basic aseptic measures and antibiotic use. The most common infecting organism in orthopedic infection is Staphylococcus aureus.⁴

The diagnosis of deep implant infection can be done by clinical examination, laboratory investigation, histopathology, microbiology and imaging studies, i.e., ultrasonography, three phase technetium⁹⁹ indium¹¹¹ and gallium⁶⁷ bone scan, magnetic resonance imaging (MRI) and computerized axial tomography (CT).^{2,5} Positron emission tomography or PET-CT is a new imaging

diagnostic tool regarding implant related deep infection². Biopsy can also be done for undiagnosed infection but it is rarely done.⁶

For fine and delicate instruments used in arthroscopy, Gluteraldehyde is the most effective chemical agent for sterilization.⁷ In public hospitals of developing countries, the infection rate is still high and needs attention to take proper measures.⁸

The objective of this study was to know the frequency of infection in orthopedic implant surgery in a public hospital and to evaluate the risk factors, causative organism, complications and treatment.

MATERIAL AND METHODS

This prospective study was conducted in Orthopedics B unit Ayub Teaching Hospital Abbottabad from 1st April 2007 to 30th October 2007. The inclusion criteria were close fracture cases of each gender in all age groups admitted for implant surgery. Exclusion criteria were soft tissue surgery, wounds and open fractures needing external fixation devices.

The patients' particular were recorded on a prescribed proforma which included name, age, sex, diagnosis, co-morbidity, smoking history, nutritional status, type of implant, skin at risk, duration of procedure, category of surgeon (consultant, junior consultant or trainee medical officer), as variables.

Prophylactic antibiotics of first generation cephalosporins, i.e., cefazoline were used in all cases at the induction of anaesthesia and were continued for 72 hours. Sterilization of implants and equipment was done in autoclave by operation theatre attendant with limited knowledge of proper orthopedic sterilization. The diagnosis of infection was clinical and microbiology reports. Infection was graded superficial or deep and early, delayed or late. The infection was considered superficial when it did not penetrate the deep fascia while the deep infection was inside the deep fascia. All infections were treated with antibiotics, wound debridement and implant removal as needed.

The follow up was done up to six months according to a protocol i.e. first visit after two weeks and subsequent visits on monthly basis.

RESULTS

Out of 104 patients, 67 (64.42%) were male and 37 (35.58%) were female. Six (5.76%) patients developed infections. The superficial infection was in 2 (1.92%) patients, while deep infection was in 4 (3.84%) patients. There were 2 cases of infection each in early, delayed and late stages.

The age of the patients was more than 60 years in 3 (2.88%) patients with 01 patient having diabetes mellitus, 30 to 60 years in 2 (1.92%) patients and below 30 year in 1 (0.96%) patient. In 3 cases (2.88%) of infection, procedure times were more than 02 hours, and in 2 cases (1.92%) less than 2 hours, and in one case (0.96%) one hour.

In the case of 4 patients (3.84%) procedures were performed by junior consultant or trainee medical officers and in 2 (1.23%) patients the operations were performed by senior consultants. The risk factors are shown in Table-1. The microorganisms implicated are shown in Table-2. The infection rate in different type of implant is shown in Table-3.

Table-1: Probable risk factors in infected cases (n=6)

Risk factors	Infected cases	%
Smoking	2	1.92
Advance age (above 60years)	2	1.92
Co morbidity in elderly patient (diabetes)	1	0.96
Skin at risk	1	0.96
Total	6	5.76

Table-2: Microorganism involved in 6 infected cases

Organism	All infected cases(n=6)	%
Staphylococcus aureus	3	50.00
E.Coli & Proteus	2	33.33
Klebsella	1	16.66

Out of 6 infected cases, implant (Austin more prosthesis) was removed in one 80 years old female while the rest of the patients were treated with intravenous antibiotics and multiple debridements.

Table-3: Infection rate in different type of implants.

Type of procedure (n=104)	performed	infected cases	%
SIGN open interlocking Nails	18	3	2.9
Close SIGN interlocking Nails	6	0	0
Dynamic Hip Screw	14	1	0.96
Austin More prosthesis	8	1	0.96
Proximal femoral Nail	3	0	0
AO/Cannulated hip screws	8	0	0
Condylar Blade Plate	6	0	0
Dynamic Condylar Screw	2	0	0
Recon plate in Acetabulum fracture	2	0	0
Total Knee replacement	1	0	0
Plates (Humerus, radius, ulna)	18	1	0.96
K-wires	15	0	0
K-Nails	2	0	0
Fixator interneer in spine fracture	1	0	0
Total	104	6	5.78

DISCUSSION

The rate of infection in the present study is 5.76%, which is much higher than accepted standard for postoperative wound infection, which should be less than 1%. Our infection rate is comparable to another local study⁹ in which the infection rate was 5% and is much lower than another local study⁸ in which the infection rate was 7.8%.

Marston *et al*¹⁰ reported 5% superficial and 0.25% deep infection in 413 total hip replacements in ideal circumstances. According to some studies conducted in Pakistan, the overall superficial and deep infection rate is 7.8% and 10% respectively¹¹ while we reported 1.92% superficial and 3.84 % deep infection.

The rate of postoperative wound infection without prophylactic antibiotic is high as compared to the use of prophylactic antibiotic.¹² Our infection rate with prophylactic antibiotic is 5.7% that is comparable to another local study¹¹ in which it is 6% but is higher as compared to another local study,¹³ i.e., 3.97%. Recent international studies show further decline in the postoperative infection rate with prophylactic antibiotics which is 0.23%, 1.06%, 1.09% and 1.34%.¹⁴

In our study the advanced age and prolonged surgery time were responsible for infections as reported in other studies as well^{9,15} apart from other predisposing factors like smoking and skin abrasion at incision site. In another study,¹⁶ it was revealed that the rate of infection is directly proportional to the length of the procedure where cases lasting one hour or less had a wound infection rate of 1.3% while that lasting for 3 hours or more it was 4 %. This is comparable to our study, i.e., 3 cases (2.9%) got infected when procedures lasted more than 2 hours. The open interlocking Surgical Implant Generation Network (SIGN) Nails had infection in 3 cases

(2.9%) while no infection was detected in closed interlocking SIGN nails.

Staphylococcus aureus was the most common organism detected in our study, i.e., 50% comparable to another study⁹ where it was 67.30%. The gram-negative organisms were found in patients with prolonged postoperative stay in ward, may be due to cross infection. In one 80 years old female patient with co-morbidities and prolonged warfarin history, implant (Austin-Moore Prosthesis) was removed after developing deep and late infection.. This patient was admitted for 3 weeks and had a lot of investigations and had used costly antibiotics.

In the other 5 cases the infection was subsided with intravenous antibiotics and repeated debridements with hospital stay of 2 to 4 weeks, which resulted burden on the hospital resources and patients as well.

CONCLUSION

Our infection rate was quite high and needs proper measures to control it because it had great financial burden on patient and on hospital resources and could lead to increased morbidity and mortality in patients. We could not find significant risk factors in our small sample size study although the infection was relatively more common in patients with advanced age, prolonged surgery time, smoking and skin abrasion at fracture site. Commonest organism was *Staphylococcus aureus*.

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. Brewer GE. Operative surgery at city hospital with a preliminary report on the study of wound infection. *Surgery of musculoskeletal system*. Everts M, 1990;5:4316.
4. Esterhai J, Gelb I. Orthopaedic infection. *Ortho. Clin. North Am*, 1991;22:503-10.
5. Tuson CE, Hottman EB, Mann MD. Isotope bone scanning for acute osteomyelitis and septic arthritis in children. *J. Bone Joint Surg*, 1994;76:306-10.
6. Howard CB, Einhorn M, Dagon R, Yaoupski P, Porat S. Fine-needle bone biopsy to diagnose osteomyelitis. *J. Bone Joint Surg*, 1994;76:311-4.
7. Shoji H, Guttierrez M M, Aldridge K E. The use of 2% glutaraldehyde as a disinfectant for arthroscopies used in septic arthritis: *Orthopaedic* 1984;7:241-4.
8. Iqbal MZ, Chima TA, Sabir MR. Rate of post operative infection in clean orthopaedic cases. *J Pak Orthop Assoc*, 2001;13:121-4.
9. 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.
10. Martson RA, Cobb AG, Bantley G. Stammor compare with Charnely total hip replacement. *J Bone J Surg* 1996;78:178-84.
11. Tayyab S, Hussain N, Sharaf T. Low dose cephradine prophylaxis in caesarean section. *Med Channel* 1999;5(3):13-5.
12. Williams DN, Gustilo RB. The use of preventive antibiotic in orthopaedic surgery. *Clin Orthop Relat Res* 1984;190:83-8.
13. Jamali AR, Mehboob G, Majid A, Bhatti A, Minhas S, Akhtar R, *et al*. Postoperative wound infections in Orthopaedic surgery. *J Coll Physicians Surg Pak* 2001;11:746-9.
14. Weick JA, Jackson JK, O'Brien TJ, Lurate RB, Rusell JM, Dorchak JD. Efficacy of prophylactic antibiotic in arthroscopic surgery. *Orthopaedic* 1997;20:133-4.
15. Burnett JW, Gustilo RB, Williams DN, Kind AC. Prophylactic antibiotic in hip fractures: a double-blind prospective study. *J Bone Joint Surg Am* 1980;62:457-62.
16. Sawyer RG, Pruett TL. Wound infections. *Surg Clin North Am* 1994;74:519-36.

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