Incidence of Surgical site infections in IPD Orthopedics patients undergoing implant surgery

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ABSTRACT

Background: Prevalence of Surgical site infections (SSI) in orthopedic implant surgery is ranges from 1 to 22%. It leads to increase case cost, prolong antibiotic use/abuse, increases morbidity and rehabilitation.

Methods: This prospective study was conducted on 130 patients with closed fracture cases undergoing clean and elective orthopedic implant surgeries admitted in the department of Orthopedics at Govt. Medical College, Nagpur, India between October-2016 to March-2017. Results: The surgical site infection was diagnosed in 11 (4.35%) patients within 3 months after surgery. Staphylococcus aureus was most common infective organism isolated in 54.54% cases. On data analysis SSI was significantly associated with increasing age, diabetes mellitus, smoking and anemia. Conclusions: Incidence of SSI in implants surgeries are quite high, proper measure are needed to control it.

Key Words: Surgical site infection, orthopaedic surgery, risk factors

INTRODUCTION

Surgical site infection (SSI) is defined as microbial contamination of the surgical wound within 30 days of an operation or within 1 year after surgery if an implant is placed in a patient.[1] In orthopedics, the surgical site infection after implant surgery is a disaster both for the patient and surgeon.[1] SSI’s are one of the most common nosocomial infections besides pneumonia, urinary tract infections, and bloodstream infections.[2] SSI is the second or third most frequent infection among surgical patients. It is responsible for approximately 17% of all healthcare-related infections.[3] Surgical site infections cause increased morbidity, mortality, extended hospital in-patient stays, and economic burden to the hospital resources.[4] SSI’s related to orthopedic procedures represents a severe and catastrophic complication for patients, surgeons and hospital institutions, as an infection can extend the patient’s hospitalization time by up to two weeks, double re-hospitalization rates, increase care costs by more than 300%, besides causing important physical limitations that significantly reduce patients quality of life after the surger.[5] Incidence levels of orthopedic SSI’s can range between 0.8 and 71%.[5-9] The pathogenesis of infection in fractures fixation devices is related to microorganisms, which grow in biofilm and therefore its eradication is difficult.[10] 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.[11] In 1896, Brewer 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.[12] Hence the present study designed to estimate the rate of infection in orthopedic implant surgery in a public hospital and also to identify causative organisms and risk factors associated with surgical site infections.

METHODS

This prospective study was conducted in department of Orthopedics at Govt. Medical College, Nagpur. The inclusion criteria were closed fracture cases of either gender in all age groups admitted for elective implant surgery. Exclusion criteria were soft tissue surgery, open fractures needing external fixation devices, pathological fractures or patient with pre-existing cardiac/pulmonary/renal disease. 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 as variables. All patients were given first generation Cephalosporins as a standard practice prophylactic intravenous antibiotic on call to the operating room. Based on the criteria, patients were included in the study after taking informed written consent during postoperative period. Patients were observed for postoperative wound infection till discharge. The follow up will be done up to three months according to a protocol, first visit after two weeks and subsequent visits on monthly basis. The diagnosis of infection was based clinical observations and microbiology reports which was done as routine investigations. If the aerobic cultures are negative, anaerobic culture will be considered. Infection will be graded superficial or deep and early, delayed or late. The infection will be considered superficial when it did not penetrate the deep fascia while the deep infection was inside the deep fascia. At least 3 swab samples from the most inflamed areas will be sent for culture to improve yield and minimize diagnostic error in a sterile culture tube. The risk factors assessed includes age, sex, duration of hospital stay, nutrition status, presence of diabetes mellitus, smoking habits, hypertension, anemia, whether drainage was performed, duration of drainage, Open/closed reduction of fracture.

RESULTS

Out of 130 patients enrolled in our study, 91 (70%) were male and 39 (30%) were female. Out of 130, only Eight (6.15%) patients developed infections out of which 6 were male and 2 were female. The superficial infection was in 1 (12.50%) patients, while deep infection was in 7 (87.5%) patients. There were 6 (75.0%) cases of early infection and 1 (12.50%) each in delayed and late stages. The age of the patients was more than 60 years in 1 (12.50%) patient. The risk factors are shown in Table-1. The microorganisms isolated are shown in Table-2. The infection rate in different type of implant is shown in Table-3. Out of 8 infected cases, implant was removed in 2 patients one with ORIF of peri-articular fracture and one operated with PFN, while the rest of the patients were treated with intravenous antibiotics and multiple debridement.

### Table 1: Risk factors

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advancing age (&gt;60 yrs)</td>
<td>5 (62.50%)</td>
</tr>
<tr>
<td>Comorbidities in elderly patients</td>
<td>2 (25%)</td>
</tr>
<tr>
<td>(Diabetes, anemia)</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>4 (50%)</td>
</tr>
<tr>
<td>Skin at risk</td>
<td>1 (12.50%)</td>
</tr>
</tbody>
</table>

### Table 2: Micro-organisms isolated

<table>
<thead>
<tr>
<th>Micro-organisms</th>
<th>Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staph aureus</td>
<td>6 (54.54%)</td>
</tr>
<tr>
<td>E-coli and proteus</td>
<td>2 (18.18%)</td>
</tr>
<tr>
<td>Klebsiella</td>
<td>2 (18.18%)</td>
</tr>
<tr>
<td>Polymicrobial</td>
<td>1 (9.09%)</td>
</tr>
</tbody>
</table>

### Table 3: Micro-organisms isolated

<table>
<thead>
<tr>
<th>Surgeries</th>
<th>Performed</th>
<th>Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHS/PFN</td>
<td>28</td>
<td>3 (27.27%)</td>
</tr>
<tr>
<td>AMP/Bipolar Prosthesis</td>
<td>12</td>
<td>1 (9.09%)</td>
</tr>
<tr>
<td>Plating of long bone shaft fractures</td>
<td>14</td>
<td>1 (9.09%)</td>
</tr>
<tr>
<td>Nailing of long bones</td>
<td>12</td>
<td>1 (9.09%)</td>
</tr>
<tr>
<td>ORIF of peri-articular fractures</td>
<td>36</td>
<td>3 (27.27%)</td>
</tr>
<tr>
<td>CRIF/ORIF with cannulated screw</td>
<td>13</td>
<td>1 (9.09%)</td>
</tr>
<tr>
<td>ORIF of tarsal bones</td>
<td>15</td>
<td>1 (9.09%)</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td>11 (100%)</td>
</tr>
</tbody>
</table>

DISCUSSION

The incidence rate of surgical site infections found in the present study is 6.15% which is much higher than accepted standard for postoperative wound infection, which should be less than 1%. Our infection rate is comparable to another study in which the infection rate was around 5%[13] and this is also in accordance with the study conducted by K. S. Dhillon et al [14] where infection rate was found to be 6.8% whereas our findings were lower than I. Onche et al [15] found 7.5 % and N. E. Ngim et al [16] found 9.38% infection rate. Marston et al [17] reported 5% superficial and 0.25% deep infection in 413 total hip replacements in ideal circumstances. The rate of postoperative wound infection without prophylactic antibiotic is high as compared to the use of prophylactic antibiotic.[18] Our infection rate with prophylactic antibiotic is 6.15% which is higher as compared to another study i.e., 3.97%.[19] The difference in incidence rate of SSI in different studies may be related to different inclusion criteria, different surgical set ups and facilities available. In our study, we
found that SSIs are more common in patients above 60 years of age. It may because of low immunity, increasing catabolism, increasing co-morbidities and low wound healing rates in old age patients. [20] Stephen Apanga et al., [21] Aikaterini Masagala et al., [22] Ibtesam K Afifi et al., [23] A.L. Akinyoola et al. [24] and Khan MS et al. [25] also reported that SSI is common in old aged patient.

We found Significant association of diabetes mellitus with SSI. Sachin et al. [26] Yang K et al. [27] Ibtesam K Afifi et al., [23] Aikaterini Masagala et al.[22] and Guo-qing et a [28] found that diabetes mellitus as independent risk factor with significant increase in the development of SSI. Delayed wound healing and neutrophil dysfunction may be the cause of increasing SSI among diabetics. [23] Anemia is also an important risk factor in development of SSI. Similar results were observed by Awan MS. [29] The timing of administration of antibiotics prophylaxis is also critical factor in development of SSI. The administration of antibiotics 2 hours or more before surgery or post-operatively was definitely associated with a higher SSI rate. The antibiotics should be administered ideally within 30 minutes and certainly within two hours of the time of incision. [30] So the selection of proper antibiotics and time of its administration can reduce the incidence of SSI to the great extent. Staphylococcus aureus was predominant causative organism in this study which is 54.54%. Jadranka Maksimovic [8] Ibtesam K Afifi [23], Khan et al. [25] and Wassef MA et al. [31] also found same organism. About 10-30% of healthy people carry this organism in their nares. Infections by these organisms can also be caused by patients themselves. Although eradication of Staphylococcus aureus nasal carriage with mupirocin was found to be effective, this measure reduced the surgical site infections rates only in some studies. [32] Bed sheets, instruments and dressing have also been found to act as reservoirs of S. aureus. Rajiv Singh et al. [33] recorded gram-negative infections as major threat and isolated gram-negative organisms in 75.6% cases.

CONCLUSION

Surgical site infections are a considerable problem in orthopedic patients. 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.

REFERENCES


