A Study of Incidence of Post-operative Wound Infection in Orthopaedics Surgery at a Tertiary Care Centre

ABSTRACT
Background: Surgical site infections are one of the most common nosocomial infections globally resulting in high morbidity and mortality.
Aim: To determine the incidence and causing factors of surgical site infections at a tertiary care centre.
Materials and Methods: This is a prospective study, which was conducted in the Department of Orthopaedics, Dr. D.Y. Patil Medical College, Pimpri, Pune, Maharashtra from October 2014 to October 2015. A total of 100 patients who underwent elective orthopaedic surgeries were included in this study. The aim of the study was to study the incidence of post-operative wound infections and its effect on orthopaedic surgeries by evaluating the effectiveness of usage of pre-operative and post-operative intravenous antibiotics, the role of sterile measures such as gowns, scrub, masks, sterile gloves, drapes and operation theatre environments, in reducing the surgical site infection and in assessing the efficacy of surgical asepsis (that is surgeons hand scrub, antibiotics used prior to surgery, shaving prior to surgery and use of antibiotics prior to surgery) in orthopaedic surgeries.
Results: Out of 100 patients in this study, the overall incidence of infection was 4%. Sex incidence, marginal though, but statistically significantly higher in female sex. Significant correlation was noted between antibiotic administration and timing of surgery. Correlation between duration of surgery and incidence of infection in major surgeries was found to be statistically significant with p value 0.028.
Conclusion: This study did not show any statistically significant correlation between age, scrub time, spirit used with respect to incidence of infection. The incidence of infection by gram –ve bacteria was higher than that of gram +ve bacteria. Pathogens isolated are often resistant to commonly used antimicrobials.
KEYWORDS: Wound infections, antibiotics, orthopedic surgeries

INTRODUCTION
Surgical site infection is one of the most common post-operative complications and causes significant post-operative morbidity, mortality, prolonged hospital stay and increase hospital costs also. Surgical site infection is categorized under a broad term nosocomial infection (NI). Nosocomial infections are the infections acquired during hospital stay. They are important contributors to morbidity and mortality. These infections concern 2 million cases annually worldwide.
WHO described hospital-acquired infections as one of the major infectious diseases having huge economic impact.
A wound infection is the commonest and the most troublesome disorder of wound healing. Post-operative wound infections have been a problem since surgery was started as a treatment modality. The advancement in medicine has resulted in the prevention and the control of this infection. The discovery of anti-microbial agents also enables us to perform surgeries in many conditions that were previously thought to be impossible in the pre-antibiotic era, due to the risk of infections. US National Research Council group in 1964 developed a system of classification for operative wounds, which was based on the degree of microbial contamination.
Four wound classes with an increasing risk of SSIs were described: clean, clean-contaminated, contaminated and dirty. This study was carried out to determine the incidence of surgical site infections (SSIs) and to study other factors that can affect the infection.
AIMS AND OBJECTIVES

- To determine the incidence and determinants of surgical site infections at a tertiary care centre.
- The effectiveness of usage of pre-operative and post-operative systemic antibiotics.
- The role of sterile measures such as scrub suits, masks, sterile gloves, gowns, drapes and operation theatre environments, in reducing the surgical site infection.
- To assess the efficacy of surgical asepsis (surgeons hand scrub, alcohol based agents, antibiotics and shaving) in orthopaedic surgeries.

MATERIALS AND METHODS

This is a prospective study which was conducted in the Department of Orthopaedics, Dr. D.Y. Patil Medical College, Pimpri, Pune, Maharashtra from October 2014 to October 2015. A total of 100 patients underwent elective orthopaedic surgeries were included in the study. Institutional ethical committee permission was taken before starting the study. Informed and written consent was taken from all the subjects.

The aim was to study the incidence of post-operative wound infections and the toll it takes on orthopaedic surgeries by evaluating the effectiveness of usage of pre-operative and post-operative systemic antibiotics, the role of sterile measures such as scrub suits, masks, sterile gloves, gowns, drapes and operation theatre environments, in reducing the surgical site infection and in assessing the efficacy of surgical asepsis (that is surgeons hand scrub, antibiotics used prior to surgery, shaving prior to surgery and use of antibiotics prior to surgery) in orthopaedic surgeries.

Pre-operative preparation

All patients received Injection Ceftriaxone 1.5 gm the day of the surgery.

Aseptic precautions in the operation theatre

All routine aseptic precautions were taken like using autoclaved gowns, drapes, sterile gloves and instruments. Standard surgical scrub was done for 5 minutes before performing the operation.

RESULTS

On analysis of incidence in relation to age for infection in this study, it was found that maximum incidence was in 51–60 age group (96%), the next largest group being 21–30 yrs (94%) and above 80 yrs (88.2%) had the least incidence (Tables 1, 2).

First described by Howes\textsuperscript{1} in 1946, the effective period of prophylactic antibiotic activity was quantified by Burke\textsuperscript{2} to be a narrow period of 1–3 hours.

Microorganisms

According to the NNIS, pathogens causing SSIs include the following:

\begin{enumerate}
  \item \textit{Staphylococcus aureus}
  \item \textit{Pseudomonas aeruginosa}
  \item \textit{Escherichia coli}
  \item \textit{Enterococcus species}
  \item \textit{Enterobacter species}
  \item Coagulase negative \textit{Staphylococci}
\end{enumerate}

### Table 1 Incidence of surgical site infections.

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>96</td>
</tr>
<tr>
<td>Present</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 2 Incidence of infection in relation to age of patient.

<table>
<thead>
<tr>
<th>Age of patient</th>
<th>Infection absent</th>
<th>Infection present</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 years and below</td>
<td>13</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>21–30 years</td>
<td>18</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>31–40 years</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>41–50 years</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>51–60 years</td>
<td>24</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>61–80 years</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Above 80 years</td>
<td>15</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>
DISCUSSION

Of the 100 patients in this study, the overall incidence of surgical site infection in the study is 4%, which compares favourably with studies of Marston et al. who reported 5% superficial and 0.25% deep infection in 413 replacements in ideal circumstances. The rate of post-operative wound infection without prophylactic antibiotic is high as compared to the use of prophylactic antibiotic. Recent international studies show further decline in the post-operative infection rate with prophylactic antibiotics which is 0.23%, 1.06%, 1.09% and 1.34%.

In my study, the advanced age [(41–50 age group (96%)] and prolonged surgery time were responsible for infections as reported in other studies. In terms of the incidence of infection in relation to sex (Table 3), there was marginal though statistically not significant higher incidence in females but no obvious or specific reason could be found to explain this. There was no correlation in terms of scrub time, chorhexidine used, spirit used and use of scrub brush. There was no significant correlation observed between the incidence of infection and type of anaesthesia used and thus not considered to be a major factor. There was no significant relationship noted between the incidence of infection and the length of hospital stay. There was significant correlation noted between antibiotic administration and timing of surgery similar to guidelines stipulated by Woods and Dellinger.

Study of the bacteriological profile shows most of the cases had single organism infection, the commonest organism isolated being *Acinetobacter* followed by *Escherichia coli* and *Staphylococcus* which is similar to organism profiles described in other studies. Correlation between duration of surgery and time of antibiotic administration (Table 4) in relation to incidence of infection was found to be statistically significant, 4% infection present when there was a delay of more than 60 minutes. Most of the wound infections fell in Class II of the classification of surgical site infections which was statistically not significant.

CONCLUSION

- This study shows that the incidence of infection is not very high in our hospital.
- This study did not show any statistically significant correlation between age, scrub time, spirit used with respect to incidence of infection.
- The incidence of infection by gram –ve bacteria was higher than that of gram +ve bacteria.
- Antimicrobial use is widespread and inconsistent with published guidelines.
- Pathogens isolated are often resistant to commonly used antimicrobials.
- The actual incidence of infection could be significantly higher than that showed by the study as the patients were only followed up at 3 months and then at 6 months, after being discharged from hospital and not in between.

REFERENCES