Surgical Site Infections in Laparotomy: A Bacteriological Study

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Abstract
A surgical site infection is defined as infection at surgical site within 30 days of procedure or infection within 1 year in patients with an implant or prosthesis. It may be defined clinically as presence of pain of a surgically created wound, which is accompanied by erythema, in duration and local tenderness. Pus swabs obtained from surgical wound of infected patients operated for exploratory laparotomy were included in the present study. The specimens were inoculated on Blood agar and MacConkey agar plates, and then incubated at 37°C for 18-24 hours. The isolated organisms were identified by their morphological and biochemical characteristics using standard microbiological methods.

Keywords: SSI’s, E.coli, S.aureus, nosocomial.

Introduction
Surgical site infections are the most common nosocomial Infections and account for approximately 38% of all infections in surgical patients. It is the third most common cause of nosocomial infection. Hospital sepsis and wound infection is a complex and multifaceted problem. Since time immemorial, hospital infection has been a horror for the surgeon and the patient alike[1]. Wound sepsis not only tolls the death in its trail but much many are made morbid. The mortality and morbidity directly concerns surgeons and sisters, while changing patterns of infection and drug resistance intrigues the bacteriologists mind and as the cross infection has come into picture, the epidemiologist has to step in to prevent it.

Surgical site infections have a significant impact on patients, increasing length of stay, contributing to overuse of antibiotics and increased associated costs and contribution to increased mortalities. Abdominal surgical site infections are among the most common complications of inpatient admissions and have serious consequences for outcomes and costs. Different risk factors may be involved including age, sex, nutrition, immunity, prophylactic antibiotics, operation type and duration and secondary infections.

This study is aimed to determine the risk factors affecting abdominal surgical site infections and their incidence in our institution.
Aim
To determine the incidence of surgical site infections in laparotomy wounds and to find out the most common organism causing it.

Material and Methods
A prospective observational study of a total of 494 patients, operated for exploratory laparotomy was conducted in the present study. The approximate time period for the study was from November 2008 to November 2010. The dependent variable in this study was abdominal surgical site infection, defined as redness, swelling, pain and body temperature above 38°C, during the 30 days after operation. The stages for data collection and information completion were as follows- identification of patients, preoperative interview, postoperative interview, record completion, pre-discharge examination, weekly examination and follow-ups for 30 days following operation.

Surgical site infection was defined as, “an infection related to the operative procedures that occurred at or near the surgical incision within 30 days of the operative procedures.”

Clinical criteria for the diagnosis of SSI included any of the following:

a. A purulent exudate draining from the surgical site
b. A fluid culture positive for organisms obtained from surgical site that was closed primarily or delayed primary suturing done
c. The surgeon’s diagnosis of infection
d. A surgical site that required reopening.

Material for study consisted of pus swabs obtained from surgical wound of infected patients aseptically. The specimens were inoculated on Blood agar and MacConkey agar plates, which were then incubated at 37°C for 18-24 hours. The isolated organisms were identified by their morphological, cultural and biochemical characteristics using standard microbiological methods. Anaerobic cultures could not be done for this study.

Results
Out of 494 patients included in the study 81 developed SSI at the rate of 16.39%. The mean age of the patients was 37.66 years. Age group 51-60 years showed the maximum number of patients. The rate of SSI was maximum in this age group.

349 patients i.e. 70.64% of the study population were males.

145 patients i.e. 29.35% of the study population were females. The rate of SSI was higher i.e. 22.45% in males compared to 13.38% in females.

30.86% of laparotomy wounds were infected by Escherechia Coli.

23.45% of laparotomy wounds were infected by Staphylococcus Aureus.

Table no.1 – Type of microorganism

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherechia Coli</td>
<td>25</td>
</tr>
<tr>
<td>Staphylococcus Aureus</td>
<td>19</td>
</tr>
<tr>
<td>Escherechia Coli +Staphylococcus</td>
<td>12</td>
</tr>
<tr>
<td>Klebsiella Pneumonella</td>
<td>08</td>
</tr>
<tr>
<td>Proteus Mirabilis</td>
<td>03</td>
</tr>
<tr>
<td>Pseudomonas Aeroginosa</td>
<td>02</td>
</tr>
<tr>
<td>Polymicrobial</td>
<td>12</td>
</tr>
</tbody>
</table>
Discussion
Association of age with surgical site infection is statistically significant with rate of SSI being 25.2% for population above 65 years in the study\(^2\). Incidence of SSI is higher in subjects above 45 years of age and the relation of age with SSI is statistically significant, with \(p=0.012\)\(^3\).
In our study as well, we observe that the relation of age with SSI is statistically significant with \(p=0.0001\). The incidence of post-operative wound infection increases with increasing age, due to probably defective wound healing mechanisms and natural weakening of host defences with age.
In our study, the rate of SSI was higher i.e. 22.45% in males compared to 13.38% in females. But one study reported that incidence of SSI and age did not correlate statistically\(^3\). Similarly many other previous studies reported that the relation of SSI with sex was statistically insignificant\(^{14,5,6,7}\). In our study as well the relationship of sex with incidence of SSI is statistically insignificant with \(p=0.094\) (\(p>0.05\)).
In this study, 81 bacterial culture positive patients were found to have SSI.
In 25 patients the organism was Escherichia coli and in 19 patients, the organism was Staphylococcus aureus. 12 patients showed culture positive for both Staphylococcus aureus as well as E.coli and 8 patients had bacterial culture positive for Klebsiellaspns. 3 patients bacterial cultures were positive for Proteus mirabilis. Rest cultures were polymicrobial. In one study, Bacteroids Fragilis was the most common anaerobic organism causing SSI\(^8\).
Amongst the aerobic organisms Pseudomonas aeruginosa followed by enterobacter species and proteusmirabilis were common organisms causing abdominal SSI. The study showed that virtually all the pathogens were resistant to the most commonly prescribed antibiotics such as ampicillin, cotrimoxazole, streptomycin and tetracycline. The cultured aerobes also demonstrated less than 50% sensitivity to the cephalosporins tested. (ceftazidime, cefuroxime and ceftiraxone) in over 80% of the infected patients. In one study, E.coli was the causative organism in 60.7% of cases followed next in frequency by Klebsiella (20%)\(^9\). The other isolates were Staphylococcus aureus, Pseudomonas, Enterobacter, Proteus and Staphylococcus epidermis. In yet another study, endogenous organisms like E.coli, Klebsiella and proteus species were reported as the common organisms causing abdominal SSI, following surgery for typhoid perforations\(^10\).

Conclusions
Escherechia Coli was the most common pathogen causing laparotomy wound infection in our study. The rate of SSI in our institution is higher (16.39%) and this underlines the association of surgeons and microbiologists, in a collective effort to minimize the rate of SSI in hospitals.

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References
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