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PREVALENCE OF SURGICAL SITE INFECTION ASSOCIATED RISK FACTORS IN A TERTIARY CARE HOSPITAL OF VEDANTA INSTITUTE OF MEDICAL SCIENCES

Dr. Amit Ramesh Churi
Assistant Professor Dept. of General Surgery Vedanta Institute of Medical Sciences Dahanu, Palghar, Maharashtra

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Corresponding author: Dr. Amit Ramesh Churi
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Abstract:
Introduction: Skin is generally colonised by a wide range of microorganisms that could cause infection. Surgical site infection (SSI) requires evidence of clinical signs and symptoms of infection rather than microbiological evidence alone. SSIs generally affect the superficial tissues, but some more serious infections affect the deeper tissues or other parts of the body manipulated during the surgical procedure.About 5% of patients posted for surgery develop surgical site infections (SSIs), which may cause much morbidity and may sometimes mortality. Treatment of SSIs imposes a substantial financial burden on the health care system. Patients who develop SSI are more likely to spend 60% more time in an Intensive care unit (ICU), they are 5 times as likely to be readmitted and their mortality rate is twice of non-infected patient. But to great surprise 40-60% of these infections are preventable.
Material and Methods: A total of 500 patients who had undergone surgical procedure at the teaching hospitalwere studied prospectively. A total of 464(92.8%) elective surgical patients and 36(7.2%) emergency surgical patients were included in the study.Patient information gathered from the data chart, treatment chart and from ward rounds in the hospital. All patients were followed up from the time of admission until the time of discharge and 30 days postoperatively to inspect the incidence of SSI. Wound infection was diagnosed. SSI diagnosed was divided into three categories: Superficial incision SSI, Deep incision SSI and Organ/space SSI. SSI is considered if an infection occurred within 30 days after the operation, if no implant is left in place SSI was considered.
Results: In the present study 500 patients were included of which 464(92.8%) were elective surgical patients and 36(7.2%) were emergency surgical patients. Total SSI cases were 41 (8.2%) of which 29 (70.7%) were identified in elective surgery cases and 12 (29.3%) were observed in emergency surgery superficial incision SSI was most prevalent 25 (61%) followed by deep incisional SSI 11(26.8%) and then by organ/space SSI 5(12.2%).Mean age in elective surgery group was 52.4±7.48 and in emergency surgery group was 56.2± 6.78. In elective surgery group there were 296 (63.8%) male and 168 (36.2%) female. In emergency group there were 29 (80.6%) male and 7 (19.4%) female. Prophylactic antibiotics were given to 404 (87.1%) in elective surgery group and 30 (83.3%) in emergency surgery group. SSI rate observed in elective surgery group was 29/464 (6.25%) while in emergency surgery group was 12/36 (33.33%).BMI (Body mass index) in elective surgery group was 28.7 ±2.45and in emergency surgery group was 27.6 ± 2.89.
Conclusion: higher incidence of SSI with increasing age of the patient.it was observed that to prevent SSI prophylactic antibiotics should be initiated within one hour before surgical incision.
Keywords: SSI, Surgery, Superficial incision SSI, Deep incision SSI, Organ/space SSI

Introduction

Skin is generally colonised by a wide range of microorganisms that could cause infection. Surgical site infection (SSI) requires evidence of clinical signs and symptoms of infection rather than microbiological evidence alone. SSIs generally affect the superficial tissues, but some more serious infections affect the deeper tissues or other parts of the body manipulated during the surgical procedure.

The majority of SSIs become evident within 30 days of an operative procedure and most often between the 5th and 10th postoperative days. If a prosthetic implant is used, SSIs of the deeper tissues may occur several months after the surgical procedure[i]. About 5% of patients posted for surgery develop surgical site infections (SSIs), which may cause much morbidity and may sometimes mortality. Treatment of SSIs imposes a substantial financial burden on the health care system[ii]. There are advances in infection control practices which includes improved operating

room ventilation, sterilization methods, barriers, surgical techniques, and availability of antimicrobial prophylaxis[iii],[iv]. Education regarding these prevention strategies of SSI must be interdisciplinary and is essential for the implementation and adoption into day to day practice. For this guidance from physicians, nurses, and senior leadership is required to affect SSI rates positively. Senior leadership should also place emphasis on the value and benefits of SSI reduction, including the patient positive outcomes[v].

Despite these preventive measures, SSIs remain a substantial cause of morbidity and mortality among operated and hospitalized patients. This can be explained by the emergence of antimicrobial-resistant bugs and the increased numbers of surgical patients who are elderly and/or have a wide variety of chronic, debilitating, or immunocompromised or other underlying diseases. Also there is increased numbers of prosthetic implant and organ transplant operations performed in the surgery department[vi].

The incidence of SSI is a serious threat to the patient's health and life, and also imposes a substantial economic burden on the patient's family and society[vii]. Patients who develop SSI are more likely to spend 60% more time in an Intensive care unit (ICU), they are 5 times as likely to be readmitted and their mortality rate is twice of non-infected patient. But to great surprise 40-60% of these infections are preventable[viii]. The present study was carried out to study the prevalence of SSI in the Department of Surgery.

Material and Methods

This study was carried out prospectively at the Department of Surgery at Vedanta Institute of Medical Sciences Dahanu, Palghar, Maharashtra. The study was approved by the institutional ethics committee.

Study Population

A total of 500 patients who had undergone surgical procedure at the teaching hospital from 2016 to 2019, were studied prospectively. Patients admitted to the hospital for more than 1 day were included, while outpatients and those who had surgery elsewhere before referral to our hospital were excluded. A total of 464(92.8%) elective surgical patients and 36(7.2%) emergency surgical patients were included in the study.

The elective surgical procedures included hernioplasty, cholecystectomy, gastrectomy,mastectomy, resection anastomosis of bowel, hemorrhoidectomy, fistulectomy, parotidectomy and thyroidectomy. The commonly performed surgeries under emergency conditions were resection anastomosis of bowel and exploratory laparotomy.

Survey Method

Patient information gathered from the data chart, treatment chart and from ward rounds in the hospital. All patients were followed up from the time of admission until the time of discharge and 30 days postoperatively to inspect the incidence of SSI[ix]. Details that were recorded included the type of surgery by wound class, type and duration of operation, antimicrobial prophylaxis if given, drain used, preoperative and total hospital stay after surgical procedure.

Diagnostic Criteria

Wound infection was diagnosed if any of the following criteria were fulfilled:

- Serous or non-purulent discharge from the wound with signs of inflammation;
- Oedema, redness, warmth, raised local temperature, fever >38ºC, tenderness, induration;
- Serous or purulent wound deliberately opened up by the surgeon due to localized collection. Stitch abscesses were excluded from the study.

SSI diagnosed was divided into three categories[x]:

- Superficial incision SSI,
- Deep incision SSI and
- Organ/space SSI

SSI is considered if an infection occurred within 30 days after the operation, if no implant is left in place SSI was considered.

Statistical analysis

All of the data were checked and analysed with Statistical Package for the Social Sciences version (SPSS) 19.0 software. Descriptive statistics, including count and percentage, were used to describe the demographic characteristics of the subjects. Univariate analysis for association was performed using chi-square tests for discrete variables, and $P<0.05$ was accepted as statistically significant.

Results

In the present study 500 patients were included of which 464(92.8%) were elective surgical patients and 36(7.2%) were emergency surgical patients. Total SSI cases were 41 (8.2%) of which 29 (70.7%) were identified in elective surgery cases and 12 (29.3%) were observed in emergency surgery superficial incision SSI was most prevalent 25 (61%) followed by deep incisional SSI 11(26.8%) and then by organ/space SSI 5(12.2%).

Table 1: Types of SSI

Types of SSI	Elective surgery		Emergency surgery	%	Total	%
Superficial incision SSI	17	41.5%	8	19.5%	25	61.0%
Deep incisional SSI	8	19.5%	3	7.3%	11	26.8%
Organ/space SSI	4	9.8%	1	2.4%	5	12.2%
Total	29	70.7%	12	29.3%	41	

Table 2: Baseline characteristics of the patients

Parameters	Elective surgery	Emergency surgery
Age years (Mean± SD)	52.4±7.48	56.2± 6.78
Male (%)	296 (63.8%)	29 (80.6%)
Female (%)	168 (36.2%)	7 (19.4%)
BMI (Body mass index) (Mean± SD)	28.7 ±2.45	27.6 ± 2.89
Prophylactic antibiotics	404 (87.1%)	30 (83.3%)
SSI rate	29/464 (6.25%)	12/36 (33.33%)

Mean age in elective surgery group was 52.4±7.48 and in emergencysurgery group was 56.2± 6.78. In elective surgery group there were 296 (63.8%) male and 168 (36.2%) female. In emergency group there were 29 (80.6%)male and 7 (19.4%)female. Prophylactic antibiotics were given to 404 (87.1%) in elective surgery group and 30 (83.3%) in emergency surgery group. SSI rate observed in elective surgery group was 29/464 (6.25%) while in emergency surgery group was 12/36 (33.33%).BMI (Body mass index)in elective surgery group was 28.7 ±2.45and in emergency surgery group was 27.6 ± 2.89.

Table 3: Comparison of various risk factors for SSI.

Variable	No of SSI	P value
Age		
<60 years	16/231 (7.4%)	P = 0.2736
>60 years	25/269 (10.2%)	
Diabetes		P < 0.0001
Yes	31/156 (19.9%)	
No	10/344 (2.9%)	
Total hospital stay		P = 0.0585
< 5 days	18/289 (6.2%)	
> 5 days	23/211 (10.9%)	
Antibiotic prophylaxis given		P = 0.0003
Yes	27/198 (13.6%)	
No	14/302 (4.6%)	

Discussion

SSIs are the second most common type of adverse events occurring in hospitalized patients after surgery and are one of the most common surgical complications[xi].The incidence of SSI differs widely from hospital to hospital and from one geographic location to another[xii].Total SSI cases were 41 (8.2%) in our study. In a study by Devjani de et al. SSI was identified in 121 (24.2%) out of 500 patients which was higher than our study[xiii].

In this study 29 (5.8%) SSI were identified in elective surgery cases and 12 (2.4%) were observed in emergency surgery superficial incision SSI was most prevalent 25 (61%) followed by deep incisional SSI 11(26.8%) and then by organ/space SSI 5(12.2%). In a study by et al showed the SSI rate of 12.5% for elective surgeries and 17.7% for emergency surgeries. Among the 3 types, superficial incision SSI was most prevalent (215 cases) followed by deep incisional SSI (169 cases) and finally by organ/space SSI (111 cases)[6]. The rate of SSI in elective surgery of this study was comparable to other studies done in developing countries[xiv].

The present study showed higher incidence of SSI with increasing age of the patient, SSI in patients less than 60 years was 16/231 (7.4%) as compared to >60 years age 25/269 (10.2%). Increased age is associated with various predisposing factors like diabetes, anemia, immunosupression which could be attributed to this trend of increasing incidence of SSI with increasing age[6]. In this study there was a significant correlation between existing diabetes and incidence if SSI. Similar results were observed in a study by Cheng K et al[xv] they also observed an association was found between the age of surgical

patients and SSI, they suggested that patients aged over 75 years (5.6%) were more likely to develop SSI than those under the age of 75 years (3.0%). In the present study incidence of SSI was higher when antibiotic prophylaxis was not given. 27/198 (13.6%) when antibiotic prophylaxis and 14/302 (4.6%) without antibiotic prophylaxis. To prevent SSI use of prophylactic antibiotics should be initiatedwithin one hour before surgical incision. Prophylactic antibiotics should be discontinued within 24 hours of surgery completion[xvi].

Financial burden for patients with surgical site infections is about 3 times higher than that for surgical patients without the infections during the first eight weeks after hospital discharge. These infections reduce patients' quality of life and account for 3.7 million excess hospital days and more than 1.6 billion dollars in excess costs annually in United State of America[xvii].

Conclusion

SSI is the index of the health care system. Present study showed higher incidence of SSI with increasing age of the patient.it was observed that to prevent SSI prophylactic antibiotics should be initiated within one hour before surgical incision.Proper assessment of risk factors that predispose to SSI and their modification may help in reduction of SSI rates.

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