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SURGICAL SITE INFECTION IN A TERTIARY CARE CENTRE-AN OVERVIEW -A CROSS SECTIONAL STUDY

General Surgery

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ABSTRACT

Background: Surgical Site Infections (SSIs) are the third most frequently reported nosocomial infection, accounting for 14 to 16 percent of all nosocomial infections among hospitalized patients according to National Nosocomial Infections Surveillance. SSIs are responsible for the increased morbidity and mortality related to surgery. Surgical wounds are classified as clean, clean contaminated, contaminated and dirty wounds as per CDC criteria. Better understanding of the causal factors of SSIs and prevention will reduce the cost of the surgery.

Materials And Methods: 150 patients who underwent surgery in the dept. of General surgery in a tertiary care hospital were taken for the study. Out of which 100 patients underwent elective surgical procedures and 50 underwent emergency procedures. An elaborate study of these cases with regard to date of admission, history, clinical features, type of surgery, emergency or elective, preoperative preparation, type of incision, contamination, procedure done, intraoperative findings, drain used and its type and duration of operation and postoperative management and signs of wound infection were done and the findings are tabulated.

Results: 37 cases out of 150 surgeries had surgical site infections. The overall post-operative SSI rate in elective clean and clean contaminated cases is 17% and emergency cases is40 %. The study showed that the superficial surgical site infections are the commonest type and accounted for about 52.94% in elective and 60% in emergency of all the SSI's and deep surgical site infection accounted for about 23% in elective and 30.55% in emergency cases. E. Coli is the commonest organism isolated from the surgical wounds that is 30.23% in elective cases. In emergency cases Proteus mirabilis is the most common organism involved in SSI followed by E. Coli.

Conclusion: E. coli is the commonest organism isolated from elective surgical wounds and Proteus mirabilis is the commonest organism isolated from emergency surgical wounds. A change in the pre operative antibiotics may reduce the incidence even lower. A preexisting medical illness like diabetes mellitus and duration of operating time, class of the wound, emergency surgeries and wound contamination had strong effect on the development of surgical site infection.

KEYWORDS

Calcium phosphates, dental materials, fluorides, shape memory alloys, smart materials, zirconium

INTRODUCTION

Hundreds of Millions of People around the world undergo surgery each year. Infection of the surgical site (formerly referred to as "wound infection", terminology that is no longer used owing to confusion between infections of surgical incisions and those of traumatic wounds) is a consequence of surgery, but it is not inevitable. Surgical site infections are the commonest nosocomial infections and are responsible for the morbidity, mortality and significantly prolong the duration of hospitalization, thus adding the economic burden. Surgical infections are those that occur as a result of a surgical procedure or those that require surgical intervention as part of their treatment. They are characterized by a breach of mechanical/ anatomic defense mechanisms (barriers) and are associated with greater morbidity, significant mortality, and increased cost of care. Despite the advances in surgical sciences post-operative wound infection remains one of the common complication which surgeons encounter. This problem if not evaluated and treated in a timely manner can have significant sequel. Based on NNIS(National Nosocomial Infections Surveillance) system reports, Surgical Site Infections (SSIs) are the third most frequently reported nosocomial infection, accounting for 14 to 16 percent of all nosocomial infections among hospitalized patients. Among surgical patients, surgical site infections were the most common nosocomial infection, accounting for 38 percent of all such infections. Of these surgical site infections 2/3rd were confined to the incision, and one third involved organs or spaces accessed during surgery.

MATERIALS AND METHODS

This study was conducted in DEPARTMENT OF GENERAL SURGERY , in a tertiary care hospital. Elective and emergency general surgical cases were taken up for study. Surgeries on severely immunocompromised patients , patients with Incomplete primary closure of the wounds and Relook surgeries were excluded from the study. A total number of 150 patients admitted in general surgical wards for elective and emergency surgery in the study period, out of which 100 were elective cases and 50 were emergency cases, fulfilling our study criteria. Surgeries were classified as clean, clean contaminated, contaminated and dirty wounds. The elective surgeries fall under first two categories while emergency procedures came under contaminated and dirty wounds. Clean Wound was defined as an uninfected operative wound in which no inflammation is encountered ad the respiratory, alimentary, genital or uninfected urinary tract scare not entered. In addition, clean wounds are primarily closed and if necessary, drained with closed drainage. Operative incision wound that follows non penetrating (blunt) trauma should be included in this category if they meet the criteria. Clean contaminated wounds were defined as operative wounds in which respiratory, alimentary, genital or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina and oropharynx are included in this category provided no evidence of infection or major breaks in technique is encountered. All patients received preoperative antibiotic injection of an aminoglycoside along with metronidazole one hour before surgery. Totally 37 cases had surgical site infections which had been taken up for this study. An elaborate study of these cases with regard to date of admission, history, clinical features, type of surgery, emergency or elective, preoperative preparation, type of incision, contamination, procedure done, intraoperative findings, drain used and its type and duration of operation and postoperative management and postoperative findings which included day of 1st dressing and frequency of change of dressing, day of wound infection, signs of wound infection were noted which included fever, erythema, discharge, type and color of the exudates till patient is discharged from hospital, and then followed up the patient for 6 weeks on OPD basis for any signs of wound infection. All patients with discharge of the wound, culture and sensitivity of the discharge was done and treated accordingly. Symptomatic treatment was given depending upon the combination and severity of various symptoms due to SSI.SSI are defined as incisional (either superficial or deep) infection or organ space infection according to CDC criteria[1]. Superficial incisional SSI involve skin and subcutaneous tissues only, common stitch mini-abscesses; deep incisional infections involve fascia and muscle; and organ space infections involve any organ or space other than the incised layer of body wall that was opened or manipulated during surgery[2].

RESULTS

In our study, the overall postoperative SSI rate in elective clean and clean contaminated cases is 17% and emergency cases is 40%. Its

showed that the superficial surgical site infections are the commonest type and accounted for about 52.94% in elective and 60% in emergency of all the SSI's and deep surgical site infection accounted for about 23% in elective and 30.55% in emergency cases.

Age Wise Disrtribution Of Elective And Emergency Surgries

	Elective surgeries	Emergency surgeries
<20	26	12
21-40	29	16
41-60	23	12
>61	22	10
Total	100	150

Age Distribution In SSI

Age (in years)	No.ssi in elective surgeries	Percentage	No.ssi in emergency surgeries	Percentage
<20	3	11.53	4	33.33
20-40	4	13.79	6	37.3
40-60	4	17.39	5	41.4
>61	6	27.28	5	50

Elective Cases

TYPE	NO.OF CASES	PRRCENTAGE
SUPERFICIAL SSI	9	52.94
DEEP SSI	5	29.41
INTRA ABDOMINAL ABSCESS	3	17.65

Emergency Cases

TYPE	NO.CASES	PERCENTAGE
SUPERFICIAL SSI	12	60
DEEP SSI	6	30
INTRA ABDOMINAL ABSCESS	2	10

From the above observation, it shows that the superficial surgical site infections in the commonest type and accounted for about 52.94% in elective and 60% in emergency of all the SSI's and deep surgical site infection accounted for about 29.41% in elective and 30% in emergency cases.

Drain And Infection Rate

TYPE	NO.OF CASES	PERCENTAGE
WOUND WITHOUT DRAIN	16	43.25
WOUND WITH DRAIN	21	56.75

Surgical site infection is more common in surgeries when a drain is used.

Co Morbidity And Infection

CO-MORBIDITY	NO.OF SSI CASES IN ELECTIVE SURGERIES	NO.OF SSI CASES IN EMERGENCY SURGERIES
DIABETES	5	13
OBESITY	3	5
ANEMIA	1	3
HYPERTENSION	1	2
OTHER	2	2

Diabetes is the foremost comorbid condition associated with SSI. In our study, % of elective clean cases, % of elective clean contaminated cases and % of emergency cases developed SSI.

Organism Isolate From Wound

ORGANISM	NO.OF CASES IN ELECTIVE SURGERY	NO.OF CASES IN EMERGENCY SURGERY
E.COLI	7	9
PROTEUS	2	4
KLIEBSELA	1	4
NO GROWTH	1	3
OTHER	1	3

E.coli is the commonest organism isolated from the surgical wounds that is 30.23% in elective cases. In emergency cases Proteusmirabilis is the most common and E.coli is second most common organism isolated from the wound.

Secondary suturing wasd one in 34.8% of cases and the remaining 65.2% of cases healed by secondary intension. Method used for wound healing was preferred based on the site, size and intensity of the infection. Smaller wounds with less and superficial infections were allowed to heal by secondary intension.

Antibiotic Sensitivity

The less than 50% cultured aerobes demonstrated sensitivity to the cephalosporin's tested(Ceftazidime,Cefuroxime and Ceftriaxone) in infected patients.The proportion of bacteria resistant to all antibiotics for which tested was as high as 33.93%. Proteus was mostly sensitive to Amikacin, Gentamycin, Vancomycin, clindamycin and Imipenam. And E.Coli was commonly sensitive to piperacillin, clavulanicacid, Imipenam and ceftazidime.

DISCUSSION

In the present study, the postoperative SSI rate in elective clean and cleancontaminated casesis 4.34% and emergency casesis 12.41%, accounting for an overall SSI rate of 7.32%.Reports of SSI from different workers gave different infection rates. Number of studies carried out in India indicate overall infection rate of 4.04 e 30% for clean surgical cases. In a prospective study conducted in Ethiopia,out of 105 patients who undergone surgical procedure,20 patients developed SSIs which give over all incidence rate of 19.1% [15]. The finding was similar to studies done in India 20.09%[3], Nigeria20.3%[4], India21.66%[5] and Egypt22.6%[6]. But, lower rate compared to studies done in Tanzania26%[7], India 33.5%[8] and Mekele, Ethiopia75%[9]. The finding was higher compared with studiesd one in USA7.2%[10], France2.5%[8], Egypt9.2%[11] and Sudan9%[12]. Studies done in Egypt and Sudan included only elective surgery but in our study both elective and emergency surgeries were included. Our results were comparable with US study.

Age

In our study, almost 69.7% and 77.7% of the cases with SSI were in the age group between 20 and 60 years in elective and emergency cases respectively. The study conducted at Ethiopia revealed that patients with age greater than 40 years were 7.72 times more likely to develop SSIs compared with patients in the age range of 19e 40 years with A OR ¼7.72 (95%CI[1.461e40.810,p¼0.016]). There sult was in agreement with other studies[13,14] confirming that as age increases the risk occurrence of SSIs increases[15].

Co-morbidity And Infection Rate

Sixteen total studies were available to assess the association between hyperglycemia and SSI with ten papers(n¼27,844pro-cedures) including pre-orintra-operative assessments of blood glucose levels and eleven papers (n¼32,625procedures) including postoperative assessments of blood glucose levels. The overall estimate for the association between elevated blood glucose in the postoperative period and SSI was 1.45 (95%Predictive Interval0.77,3.04).History of diabetes remained a significant risk factor in metaanalyses of studies that controlled for hyperglycemia [16]. In our study also,34.9% of elective clean and clean contaminated cases and 26.4% of emergency cases with SSI had diabetes mellitus, stating Diabetes as a strong risk factor for the development of SSI irrespective of the type of surgery.

Drain And Prosthesis

Infections are more in drained wounds and in the procedure involving implanting prosthesis like mesh. This increased incidence may be due to the effect of the drain itself by acting as a microbial pathway. Implants carry higher risk of infections acting as a foreign body if in case there is breach in the strict aseptic protocols. UmeshS. Kamatetal,in2007 studied that patients with postoperative drain were5.8(2.33e14.66)timesmorelikelytodevelopSSIcomparedtothose withoutthedrain.Inourstudy,whilethepro-portion of those with postoperative drain acquiring SSI was 2times higher than those without drain. Further, the infection rate increases with the increasing duration of the drain. Hence, we can avoid keeping the drain, unless other wise very much indicated. In indicated cases also, use of a closed drain for a minimum period of time as short as 48 h will reduce the incidence of postoperative SSI.

Organisms

Giacometti et al. studied 676 surgery patients with signs and symptoms indicative of wound infections, who presented over the course of 6 years. Bacterial pathogens were isolated from 614 individuals. A high preponderance of aerobic bacteria was observed. Among the common

pathogens were Staphylococcus aureus (28.2%), Pseudomonas aeruginosa (25.2%), Escherichia coli (7.8%), Staphylococcus epidermidis (7.1%), and Enterococcus faecalis (5.6%) [17]. Pseudomonas was most common isolate in other studies like Mofikoya Bo et al. But in our study, E. Coli is the commonest organism isolated fromthesurgicalwoundsthatis30.23%inelectivecases.The second most common was Proteus mirabilis (19.64) followed by K. Pneumoniae (16.27%). In emergency cases Proteus mirabilis is the most common organism involved in SSI followed by E.Coli which is a second most common organism isolated from the wound.

Antibiotic Sensitivity

The introduction of routine surgical antimicrobial prophylaxis (SAP) was a breakthrough in the prevention of SSI. Current guidelines, however, suggest that single-shot administration of a first-or second-generation cephalosporin is sufficient for optimal prevention of SSI in the absence of high rates of resistant bacteria. Due to a limited anaerobic activity of most cephalosporin, treatment is supplemented with metronidazole where indicated. Importantly, two large prospective studies observed the lowest risk of SSI when SAP was given within 30 min prior to incision, and the National Surgical Infection Prevention Project simply recommends administering SAP as close to the incision time as possible. Similar statements are made in European guidelines. The translocation of skin microorganisms into the wound during incision is the first vulnerable phase of surgery, and administering SAP only a few minutes before incision might not be optimal to achieve the tissue levels required to prevent SSI [18]. In our study, the proportion of bacteria resistant to all antibiotics for which tested was as high as 33.93%. Proteus demonstrated sensitivity to the aminoglycosides and cephalosporin. E. Coli was mostly sensitive to ePiperacillin, clavulanic acid and cephalosporin. Hence, we have to change the prophylactic antibiotics used prior to the surgical procedure accordingly.

CONCLUSION

E.coli is the commonest organism isolated from elective surgical wounds and Proteus mirabilis is the commonest organism isolated from emergency surgical wounds. Overall Amikacin, Gentamycin, Ciprofloxacin, Imipenam and Ceftazidime with Clavulinic acid are the sensitive drugs for SSI's developed in our hospital. Hence, change in the pre operative antibiotics may reduce the incidence even lower. A preexisting medical illness like diabetes mellitus, prolonged operating time, class IV wounds (dirty wounds), emergency surgeries and wound contamination strongly predispose to surgical site infection which has to be taken care of.

Limitations Of The Study

High risk factors for SSI like smoking and increased BMI were not taken into account. Regarding the bacteria, anaerobic bacteria was not cultured. Hence, SSI with negative cultures (17.1%) may be positive for anaerobic bacteria.

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Conflict Of Interest Statement

No conflict of Interest.

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