ORIGINAL ARTICLE

Surgical Site Infection In Elective Surgery

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ABSTRACT

Objective — *To determine the causes and rate of surgical site infection (SSI).*

Study design — *Descriptive study.*

Place & Duration of study — *Surgical Unit II, Peoples Medical College and Hospital Nawabshah, from August 2009 to July 2010.*

Methodology — *Patients of different wound categories were included in this study and followed up for 30 days postoperatively. The wound infection which occurred within 30 days of operation was considered as surgical site infection. The diagnosis of infection was made on clinical rather than on bacteriological basis.*

Results — *Total number of patients was 300. Out of 212 patients from 12-50 years of age 14 (6.6%) developed SSI, whereas among 88 patients above 50 years, 14 (15.9%) developed wound infection. Most patients had body mass index between 20-28 kg/m^2. Obesity was more common in females and BMI more than 35 kg/m^2 appeared to be a risk factor for SSI. Most common organisms were staphylococcus aureus (50%), E. coli (14.3%), Klebsiella (14.3%) and other organisms found in 5-7% cases.*

Conclusions — *Wound infection occured in 28 (9.3%) patients. The achievable preventive measures should be taken to save the economic burden on patient, hospital and community as a whole.*

Key words — *Surgical Site Infection, Elective Surgery, Clean Wounds, Clean contaminated wounds.*

INTRODUCTION:

Infection in a wound like infection elsewhere in the body, is a manifestation of disturbed host-bacteria equilibrium in favor of bacteria. Wound infection is the commonest and most troublesome disorder of wound healing.[1] Wound infection whether in an operative incision, an acute traumatic laceration or a chronic pressure ulcer, results when bacteria indigenous to the patient or exogenous to the wound, achieve dominance over the systemic and local factors of host resistance. Since 1964 wound have been classified into four categories according to theoretical number of bacteria that contaminate wound intraoperatively.[2] These categories are clean, clean contaminated, contaminated and dirty wounds. Nowadays contaminated and dirty wounds are considered as one category as contaminated wounds. Surgical site infection is increasingly recognized as a measure of the quality of patient care by surgeons, infection control practitioners, health planners and public.[3]

Despite modern surgical techniques and the use of antibiotic prophylaxis SSI remained a major contributory factor of morbidity and mortality.[1] The surgical site is the second most common nosocomial infection. Absolute prevention of SSI seems to be an impossible goal.[4] Wound infection is continuing source of postoperative morbidity causing patient discomfort, prolonged hospital stay, more days off from work and increased cost of therapy.[5] Success in surgery depends on prevention and proper

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management of the wound. To adapt the policies that decrease the incidence of postoperative wound infection, the most important requirement is to collect data, perform surgical audit and wound surveillance. Unfortunately this important aspect of surgery is the least discussed topic in local literature and we refer to the Western literature for incidence of SSI. A study of SSI is conducted at surgical unit II of Peoples Medical College for elective surgery, to find out the probable source of infection and causative organisms of wound infection.

METHODOLOGY:

This descriptive study was conducted in Surgical Unit II of Peoples Medical College & Hospital Nawabshah from August 2009 to July 2010. Total of 1142 patients were admitted, 518 through emergency department of which 312 underwent emergency surgery, while 624 patients were admitted through outpatient department as elective cases. Of these 392 patients underwent elective surgical procedures. Out of this 336 were selected for the study. Thirty six patients were excluded due to different reasons thus 300 patients of different wound categories were included in this study and followed up for 30 days postoperatively (table I).

The diagnosis of infection was made on clinical rather than bacteriological basis. A wound was considered infected if definite pus was formed and discharged or if there were signs of advancing inflammation and controlled only by adequate antibiotics. The wound infection that occurred within 30 days from the day of operation was considered as surgical site infection.

The patients were assessed for preoperative risk factors through history of generalized illness, recent weight loss, medication, hospitalization and blood transfusion. Thorough clinical examination was conducted and anemia, jaundice, weight, height, nutritional status and other infective focus were noted. The site of incision was shaved with razor a night before operation. Prophylactic antibiotics were used in all patients and a single dose of 2nd generation cephalosporin at the time of induction of anaesthesia was given. The data was collected and assessed by SPSS version 10.1.

RESULTS:

Out of 212 patients from 12-50 years of age 14 (6.6%) developed SSI, whereas among 88 patients above 50 years 14 (15.9%) developed wound infection. Most patients had BMI between 20-28. Obesity was more common in females and BMI more than 35 kg/m^2 was identified as a risk factor for SSI (table II). Anemia was the relative risk factor, and out of 47 patients with hemoglobin less than 9.9 gm/dl, 8 patients (17%) developed SSI. In 206 patients with hemoglobin between 10 -12.9, 18 (8.7%) developed SSI, whereas in 47 patients with hemoglobin more than 13 gm/dl only 2 (4.2%) suffered from wound infection. Fifteen patients were diabetics and four of them (27.7%) developed SSI, while 24 (8.42%) out of 285 non-diabetic patients suffered from wound infection. Hence diabetes appears to be an important risk factor for wound infection. SSI was less when the patients were operated as first case on particular operation room (OR) table. Of 118 patients operated as first case, five (4.2%) developed SSI, whereas in 88 patients second on OR table 10 (8.8%) had SSI. Fifty six patients who were operated as third case, 7 (12.5%) developed SSI, and 38 patients who were fourth on table 6, (15.8%) had SSI.

Most of the operations were completed between 35 to 75 minutes. The rate of wound infection was more in operation lasting more than 80 minutes. Most common organisms were staphylococcus aureus (50%), E. coli (14.3%) and Klebsiella (14.3%). First dressing was changed on 4th postoperative day or earlier if the patient developed severe pain in wound, fever and soakage of dressing. Seventeen (66%) patients presented with wound infection between 3rd to 7th postoperative day, and four (14.2%) between 8th to 15th postoperative day. Three (10.7%) patients presented between 16th to 24th day and only one (3.5%) in 4th week. No patients developed septicemia or other life threatening condition. Rate of infection was directly proportional to wound contamination (table III).

Duration of hospital stay was increased due to development of SSI. In case of localized cellulitis surgical intervention was not required and patients were discharged on oral antibiotics. When wound abscess developed surgical intervention was needed and patient remained in the ward for 5 to 15 days, more than expected duration. Conservative measures were taken with minor SSI as 12 out of 16 recovered without changing initial medication, and in cases of suppuration wounds were drained. In 12 patients stitches were removed and wounds were opened. Culture was sent and dressings with pyodine soaked gauze packs done. Antibiotics were selected according to culture and sensitivity reports. Most of the wounds healed without any further surgical intervention except two patients who required secondary suturing. There was no mortality in this study.

Table I: Surgical Procedures with Wound Classification.	
Clean operations	
Inguinal herniotomy / herniorraphy	45
Umbilical / Paraumbilical / Epigastric hernia repair	28
Hydrocele operations	23
Orchidopexy	10
Lymph node biopsies	15
Thyroidectomy	08
Breast lump excision	18
Total	147
Clean Contaminated Operations	
Cholecystectomy / Choledochotomy	20
Pyelolithotomy & Ureterolithotomy	27
Cystolithotomy	25
Transvesical prostatectomy	18
Elective appendicectomy	15
Hysterectomy/ oophorectomy	08
Gastrojejunostomy	07
Splenectomy	03
Hepatic hydatid cyst excision	05
Total	123
Contaminated Operations	
Skin graftings	06
Haemorrhoidectomy, fissure / fistula surgery	16
Liver abscess surgery	08
Total	30
Grand Total	300

Table II: Obesity and Surgical Site Infection (CI=95%)			
Quitlet index	No. of Patients	Surgical Site Infection	Percentage
<10 (kg/m^2) 5-10	30	02	6.5%
11-20 (kg/m^2) 9-13	35	02	5.7%
21-30 (kg/m^2) 10-15	40	03	7.5%
31-40 (kg/m^2) 16-20	46	03	6.5% (p 0.05)
41-50 (kg/m^2) 20-23	27	04	11.2%
51-60 (kg/m^2) 24-29	48	05	10.2%
61-70 (kg/m^2) 30-36	56	05	10.7%
>70 (kg/m^2) 32-38	18	04	22.3%

DISCUSSION:

The rate of SSI varies in different countries. It occurs in up to 40% of all elective surgical procedures and can delay the recovery from 15 days to some weeks and can increase the cost and morbidity.[6] The overall SSI in this study was 9.3%, which is lower as compared to 20-50% found by Holtz and Wenzel.[7] However, significantly lower rate is documented in

Table III: Wound Class and Surgical Site Infection

Wound Class	No. of patients	Surgical Site Infection	Percentage
Clean	147	08	5.4 %
Clean Contaminated	123	14	11.4 %
Contaminated	30	06	20 %

Eastern countries like 9.4% in Saudi Arabia.[8] In clean wounds the SSI occurred in 5.4% cases (table III), which is little higher as the usually reported figures vary between 1-4%. The acceptable rate in clean contaminated wounds is 5-15%.[9] It is comparable with our study as we observed a rate of 11.4%. In contaminated cases SSI varies from 10-40% and most studies reports to rate of 15-25%.[10] Same is noted in this study where it was 20%.

Patients with age more than 50 years had a higher rate of SSI and were 16% in our study as compared to 6.6% in patients with age less than 50 years. Several studies document higher rate in elderly patients.[11] Obesity is known to be a well established risk factor for SSI. In this study BMI of more than 35kg/m^2 was associated with higher rate of SSI. Anaemia itself is not an established factor for SSI. Higher rate was observed (18%) in patients with haemoglobin less than 10gm/dl. It is comparable with studies which showed haemoglobin more than 10gm/dl corrected by transfusions, with SSI between 7-12%.[12] The increased susceptibility to infection in diabetics is an established risk factor. The rate of SSI in diabetic patients was 27.2% in our study which is fairly high.

We also made an interesting observation that infection rate was significantly low when the patients were operated as first case on a particular table. No study in this respect was found for comparison. Regarding the duration of operation prolonged time is a significant risk factor for SSI.[13] In this study higher rate was observed when duration of operation was more than 80 minutes.

Simple wound abscess was the common presentation. A positive culture is not necessary for diagnosis of wound infection.[14] The culture of wound pus was reported as positive in 24 (86%) cases, while 4 (14%) cases were reported sterile. In a study by Arora and colleagues 87% positive cultures were obtained.[15] The most common organisms involved in SSI was staphylococcus which is comparable to most of the studies.[16] The average postoperative stay was three days in uncomplicated cases, and most of them were day cases. In infected wounds average stay was 15 days, so the patients with surgical site infection remained in hospital on average 12 days longer than non infected group. The range was 8-25 days. Surgical site infection delayed the recovery of the patient by about one week and in some cases markedly prolonged the duration of hospital stay as reported in literature.[17]

CONCLUSIONS:

Despite modern surgical and sterilization techniques and prophylactic use of antibiotics the surgical site infection of 9.3% occurred which is higher. The achievable preventive measures should be taken to save the economic burden on patient, hospital and community as a whole.

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