ORIGINAL RESEARCH

Analysis of Incidence and Risk Factors of Surgical Site Infections at a Tertiary Care Hospital

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ABSTRACT

Background: The present study was conducted for assessing incidence and risk factors surgical site infections. **Materials & Methods:** A total of 200 patients were enrolled. Incidence of SSI was evaluated. We defined infection using a simplified Southampton wound scoring system. Wounds were graded into four categories: Normal healing; grades 0–1, Minor complications; grades 2–3, Wound infection (SSI); grade 4–5, Major hematoma; wound or scrotal hematomas requiring aspiration or evacuation. Wound infection, which includes grade 4 and 5, are considered as SSI in present study. Risk factors of SSI were evaluated. **Results:** SSI was found to be present in 25.5 percent of the patients. 64.7 percent of the patients with surgical site infection were of more than 45 years of age. 62.75 percent of the patients with SSI were diabetic. 56.86 percent of the patients with SSI underwent emergency surgery. 54.9 percent of the patients with SSI underwent multilayer closure. Wound was contaminated type in 66.67 percent of the patients with SSI. Higher age, presence of diabetes, emergency surgery, multilayer closure and contaminated wound were found to be risk factors for SSI. **Conclusion:** SSI presents a major surgical problem. Identification of risk factors and adequate prophylactic antibiotic therapy could decrease the risk factors of SSI.

Key words: Surgical Site Infection, Risk Factors

INTRODUCTION

The term ‘surgical site infection’ (SSI) was introduced in 1992 to replace the previous term ‘surgical wound infection’. SSIs are defined as infections occurring within 30 days after a surgical operation (or within one year if an implant is left in place after the procedure) and affecting either the incision or deep tissue at the operation site.[1, 2] These infections may be superficial or deep incisional infections, or infections involving organs or body spaces. SSIs remain a major cause of morbidity and mortality, despite improvements in infection control techniques and surgical practice, and impose substantial demands on healthcare resources. Continuing vigilance is therefore required to minimize the incidence of such infections.[3] It is important to recognize that much of this burden of morbidity and mortality associated with SSIs is preventable. There is good evidence that attention to multiple patient-related and procedure-related risk factors leads to a decrease in SSI risk in diverse clinical settings.[4]

Reported rates of SSI range from 2% to 3%, but these figures probably underestimate the true rate. Infections may total three-fourths of a million annually, two-thirds of which are limited to the incision. The Department of Veterans Affairs has monitored surgical infections over the past two decades, and the continuity of care and close follow-

up add legitimacy to their figure of 5.1%. For comparison, the rates of pneumonia, urinary tract infection, and systemic sepsis are 3.6%, 3.5%, and 2.1%, respectively.[4, 5] Hence; the present study was conducted for assessing incidence and risk factors surgical site infections.

MATERIAL AND METHODS

The present study was conducted for assessing incidence and risk factors surgical site infections. A total of 200 patients were enrolled. Complete demographic and clinical details of all the patients was obtained. The inclusion criteria were postoperative patients in the general surgical ward or surgical ICU. Assessment of all the patients was done. Incidence of SSI was evaluated. We defined infection using a simplified Southampton wound scoring system. Wounds were graded into four categories: Normal healing; grades 0–1, Minor complications; grades 2–3, Wound infection (SSI); grade 4–5, Major hematoma; wound or scrotal hematomas requiring aspiration or evacuation. Wound infection, which includes grade 4 and 5, are considered as SSI in present study. Risk factors of SSI were evaluated.[6] All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

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RESULTS

A total of 200 patients were analyzed. Mean age of the patients was 49.3 years. SSI was found to be present in 25.5 percent of the patients. 64.7 percent of the patients with surgical site infection were of more than 45 years of age. 62.75 percent of the patients with SSI were diabetic. 56.86 percent of the patients with SSI underwent emergency surgery. 54.9 percent of the patients with SSI underwent multilayer closure. Wound was contaminated type in 66.67 percent of the patients with SSI. Higher age, presence of diabetes, emergency surgery, multilayer closure and contaminated wound were found to be risk factors for SSI.

Table 1: Incidence of SSI

Surgical site of infection	Number	Percentage
Present	51	25.5
Absent	149	74.5
Total	200	100

Table 2: Risk factors of SSI

Risk factors		Patients with infection	Patients without infection	p-value
Age (years)	**More than 45**	64.71	50.34	0.001*
	Less than 45	33.33	49.66	
Gender	**Males**	49.02	46.98	0.775
	Females	50.98	53.02	
Diabetes	**Present**	62.75	40.27	0.000*
	Absent	37.25	59.73	
Type of surgery	**Emergency**	56.86	31.54	0.000*
	Elective	43.14	68.46	
Type of closure	**Monolayer**	45.10	65.77	0.003*
	Multilayer	54.90	34.23	
Type of wound	**Clean**	33.33	72.48	0.002*
	Contaminated	66.67	27.52	

***: Significant**

DISCUSSION

SSIs run the gamut from small suture abscesses that are easily managed to massive and persistent infections that may alter a patient's life, perhaps permanently. The duration of the surgical scrub and the skin antiseptic preparation influence the risk of SSI. The length of the operation also is important; procedures longer than 3–4 h increase the risk. Body hair at the site of the incision was long considered to increase risk because of exposure of the surgical site to bacteria on the hair. In recent years, however, hair entering the wound has not been considered a major source of contamination by most surgeons, and efforts to remove body hair are considered only when it is excessive.[7-9]

A total of 200 patients were analyzed. Mean age of the patients was 49.3 years. SSI was found to be present in 25.5 percent of the patients. 64.7 percent of the patients with surgical site infection were of more than 45 years of age. 62.75 percent of the patients with SSI were diabetic. 56.86 percent of the patients with SSI underwent emergency surgery. 54.9 percent of the patients with SSI underwent multilayer closure. Alkaaki A et al described the incidence, bacteriology and risk factors associated with SSI in patients undergoing abdominal surgery. A total of 337 patients were included. The overall incidence of SSI was

16.3% (55/337); 5 patients (9%) had deep infections, and 25 (45%) had combined superficial and deep infections. The incidence of SSI in open versus laparoscopic operations was 35% versus 4% ($p < 0.001$). The bacteria most commonly isolated were extended-spectrumβ-lactamase-producing Escherichia coli, followed by Enterococcus species. Only 23% of cultured bacteria were sensitive to the prophylactic antibiotic given preoperatively. The independent predictors of SSI were open surgical approach, emergency operation, longed operation duration and male sex.[10] Mekhla et al determined the incidence of and associated risk factors for superficial SSIs in abdominal surgery cases at a central Indian rural teaching hospital. The cumulative incidence rate of superficial SSI was 39% with 95% CI. The analysis defined 12 variables significantly associated with superficial SSI: middle or elderly age, male gender, diabetes mellitus, preoperative anemia, preoperative hypoalbuminemia, tobacco smoking, higher ASA score, perioperative blood transfusion, drain placement, surgery duration >2 h, contaminated/dirty wound class and emergency surgery.[11]

Wound was contaminated type in 66.67 percent of the patients with SSI. Higher age, presence of diabetes, emergency surgery, multilayer closure and contaminated wound were found to be risk factors for SSI. Akhter MS et al showed a SSI rate of 11%. Risk factors associated with a higher incidence of SSI were found to be age (>55 years), diabetes mellitus (especially uncontrolled sugar in the perioperative period), immunocompromised patients (mainly HIV and immunosuppressive therapy patients), surgeon skill (higher in senior professors compared with junior residents), nature of the cases, (emergency surgeries), placement of drains, wound class (highest in dirty wounds), type of closure (multilayer closure), prolonged duration of hospital stay, longer duration of surgery (>2 hours), type of surgery (highest in cholecystectomy). The highest rates of causative organisms for SSIs found were Staphylococcus aureus, Escherichia coli and Klebsiella ssp.[6] Shahane V et al assessed the incidence of SSI in their hospital. Prolonged surgery (>2hours) and insertion of drain were found to be significantly associated with occurrence of SSI and the clean surgeries showed minimum risk of infection. Escherichia coli (31.25%) was the commonest pathogen, followed by Pseudomonas aeruginosa (25 %) and Staphylococcus aureus 22%. The incidence of SSI in our set up is 6%.[12] Several risk factors are known in the literature as predisposing to SSI and make up the surgical infection risk index of the National Nosocomial Infection Surveillance System (NNIS), such as the American Society of Anesthesiologists (ASA) index, which classifies patients according to their clinical condition; the Wound class, which represents the classification of the surgical wound by the surgical team in terms of the potential presence of microorganisms and; the Duration of Surgery. Other risk factors such as: Body Mass Index (BMI), smoking, video-assisted procedures, blood transfusion, non-performance of preoperative bath 9 and pre-existing chronic diseases, are also mentioned in the literature and were identified as associated with SSI, in studies on the subject.[13- 15]

CONCLUSION

SSI presents a major surgical problem. Identification of risk factors and adequate prophylactic antibiotic therapy could decrease the risk factors of SSI.

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