The THAI Journal of SURGERY 2013;34:115-118.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Risk Factors for Surgical Site Infections at Vietduc Hospital During a 4-Month Period

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Abstract

Objective: **Surgical site infection (SSI) is a common complication associated with serious morbidity, mortality, and high cost. The aim of the present study was to estimate the incidence of SSI among surgical patients at Viet Duc Hospital and to identify risk factors for SSI .**

Materials and Methods: **A prospective cross-sectional study of surgical patients treated at the Viet Duc Hospital from February 2009 to April 2009 was done. Patients in all specialties of surgery were included. Information was collected using a form created by the Japanese International Cooperation Agency (JICA).**

Results: **Of 1,004 operations, 85 developed SSIs (8.5%), of which 64.7 % were superficial SSIs, and 35.3 % deep SSIs. SSI incidence was 9.3% for emergency operations, and 16.8% for diabetic patients. SSIs for patients with wound classes III and IV were higher than for those with classes I and II. Most common organisms isolated included *E.coli* (27.7%) and *K. pneumoniae* (16.7%). Prophylactic antibiotics was given in 19% of patients. Combinations of a betalactam or a cephalosporin with metronidazole were the most commonly used antibiotic regimens.**

Conclusions: **The overall incidence of SSI at Viet Duc Hospital was 8.5%. The correlation between SSIs and risk factors such as ASA score, associated pathologies, surgical wound classification, and antibiotic prophylaxis was not clearly established. In order to reduce SSIs in our hospital, the study suggested that SSI surveillance and guidelines for antibiotic prophylaxis are required.**

Keywords: **Surgical Site Infection, risk factor, Vietnam**

INTRODUCTION

Surgical Site Infections (SSIs) are still common and can be associated with serious morbidity, mortality, longer hospital stay and high costs. According to the Centers for Disease Control and Prevention (CDC) in the United States, these infections number approximately 500,000 per year, among an estimated 27 milion operations, and account for approximately one quarter of the estimated 2 million nosocomial infections. Despite improvements in operating room

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practices, instrument sterilization methods, better surgical techniques and the best efforts of infection prevention practitioners, SSI remains a major cause of nosocomial infection and rates are increasing globally[1,2,3].

As for almost all developing countries, SSI in Vietnam is also a major issue. With the assistance from the Japanese International Cooperation Agency (JICA), we conducted a cross-sectional study at Viet Duc Hospital, one of the biggest centers of surgery in Vietnam, to estimate the incidence of SSI and identify risk factors or interventions associated with SSIs, and thus make recommendations for the prevention of SSI and improve the quality of care for surgical patients in Vietnam.

Materials and Methods

A prospective cross-sectional study of the incidence of SSI was conducted between February 2009 and April 2009 at Viet Duc Hospital. All surgical specialties were included. Patients with pre-existing SSI were excluded from the study. The survey form was designed and created by JICA. The information collected included gender, age, medical history, previous surgery, surgical procedure performed, emergent status of the operation, antibiotic prophylaxis regimen, associated comorbidities such as obesity, diabetes, cancer, and infection at other sites, immunocompromised status, surgical wound classification, drains used, and implants used. Signs and symptoms of SSI as well as the bacteriological examination results were also collected. Patients with SSI were identified with the use of ICD10 diagnostic codes, or positive microbiological cultures of specimens from the wound. SSI was defined as wound infections developing within 30 days after an operation, and classified as superficial (skin and subcutaneous tissue), deep (deep soft tissue-muscle and fascia) and organ-space infections[4]. Data were collected by head nurses responsible for SSI surveillance.

Results

The study included 1,004 operations. There were 370 female patients (37%), 620 (62%) were aged above 50 years, 114 patients (11%) had cancer, 143 (14%) had diabetes, and 260 (26%) were trauma patients. Nineteen patients had previous operations in other hospitals. Pre-operative antibiotics was used in 406 operations (40%), however, prophylaxis antibiotics was used in only 191 operations (19%).

The most common antibiotic used was a beta-lactam in 234 operations, a cephalosporin in 183 operations and Metronidazole in 87 operations. There were 713 elective operations (71%), and 291 emergency operations (29%). Wounds were classified as contaminated or dirty in 143 operations (14%), patients were classified as American Anesthesiologist Association (ASA) classes III to V in 225 patients (22%). Drains were used in 728 operations (73%) and implants were used in 227 operations (23%).

Of the 1,004 operations included in the study, 85 operations, or 8.5%, developed SSI. Superficial SSI was seen in 55 or 65% of all SSI, the rest (35%) was deep SSI. In Table 1 the incidence of SSI for various subgroups of patients are listed. The highest incidence of SSI was seen in patients with diabetes.

While we did not test for any significant correlation between ASA score, sex, age and SSIs, the preparation for surgery could be important.The

Table 1 Incidence of SSI for various subgroups (risk groups) of patients

Risk factor	Incidence of SSI		
	Total	Number	Incidence (%)
Age > 50 years	620	23	3.7
Female	370	15	4.1
ASA score ≥ 3	225	15	6.6
Trauma patients	260	14	5.4
Diabetic	143	24	16.8
Cancer	114	9	7.9
Emergency operations	291	27	9.3

incidence of SSI in emergency operations was as high as 9.3%. The incidence of SSI for wound classes III and IV was higher compared with that for wound classes I and II. It was twice as high for diabetic patients.

A single microbial agent was identified and isolated in all cases of SSIs. The most common agents were *E. coli* in 28% of operations, *K. peumoniae* in 17%, and *A. baumannii* in 11%. The proportion of of ESBL-producing *E. coli* was 45%. Combinations of betalactam or cephalosporin and metronidazole were the most commonly used antibiotic regimens.

Discussion

Surgical site infection is a heavy burden on patients and the social health care system. SSIs are among the most common hospital acquired infections, comprising 14% to 16 % of inpatient infections[5,6]. In the United States, the incidence of SSI varies from zero to 15% depending on types of surgical procedure, surgical site, surgical instruments used, as well as antibiotic prophylaxis. For example, SSI incidence in spinal surgery in various hospitals in the US was from 1.3% to 2.1%, while the SSI incidence in abdominal surgery was 15%, compared with 7.3% in Nepal[5,6,7].

In Vietnam, studies have shown that SSI incidence varied from 3% to 20%, according to different surgical procedures and hospitals. A recent investigation of SSIs in five central hopitals in Hanoi in 2008 conducted by the Ministry of Health, has noted that the incidence of nosocomial infection was 10% among inpatients, with SSIs ranking among the top of three nosocomial infections. At Viet Duc Hospital, Nguyen and Nguyen (unpublished, 2003), found the SSI incidence to be 20%, similar to the results of another study[8]. Risk factors for SSI included type of surgical procedures, emergency surgery, antibiotic prophylaxis, ASA class, and postoperative patient care. In the present study, out of 1,004 operations, 85 or 8.5% developed SSI, which was lower than the incidence found in previous studies.

In one study, risk factors associated with SSI included age above 45 years, female gender, underlying diabetes, and certain types of surgery such as gastrectomy, prostatectomy, hysterectomy, cholecystectomy and appendectomy[5]. Another study of orthopedic spinal surgery in a tertiary care hospital found an overall SSI incidence of 2% (46 of 2316)[9]. It was concluded that diabetes was associated with the highest incidence of spinal SSI, while elevated preoperative and postoperative serum glucose levels were also independently associated with an increased risk. At an Iranian teaching hospital, the overall SSI incidence was 17.4%.[6] The rate of wound infection in 15 to 24 year-old patients was only 10%, but increased significantly in those over 65 years of age. Finally, in another study, risk factors for SSI included ASA classes III or IV, presence of diabetes, and clean-contaminated wound[10].

In the present study, SSI was relatively frequent among diabetic patients, and the incidence of SSI in the group with wound classes III and IV were higher compared with the group with wound classes I and II. SSI incidence in the group of emergency operations was higher than that in the elective operation group. However, ocurrence of SSI in the group with ASA class III or higher was not different compared with that of other ASA classes.

Regarding microbial profile of SSIs, one study found that *Staphylococcus aureus* (33%) and *Enterococcus* spp. (33%) were the commonest agents associated with SSIs[5]. The study suggested that third-generation cephalosporins, cefoperazone and cefotaxime, were effective against all these strains. Likewise, gentamycin and amikacin were also effective. In another study, *E. coli* was the most common organism isolated[11]. Combinations of ampicillin and cloxacillin were the most commonly used antibiotic regimen followed by combinations of ampicillin, cloxacillin and metronidazole[7,11,12].

In the present study, *E. coli* was the predominant isolate, followed by *K. peumoniae* and *A. baumannii*, respectively. Betalactams and cephalosporins were commonly given. Combinations of betalactam or hird generation cephalosporin and metronidazole were the most common antibiotic regimen.

Some authors suggested the use of antibiotic prophylaxis to help reduce SSIs[1,10]. One study found that patients who did not receive a timely prophylactic antibiotic had a SSI incidence of 5.8%, compared with 4.6% in those who received a timely prophylaxis[10]. According to another study, suboptimal timing of prophylaxis, defined as the administration of an antibiotic more than 60 minutes before the incision, or administration immediately after the incision, was associated with an increased risk of SSI. Other operative

variables associated with an increased risk of SSI included irrigation of the surgical wound, and the use of a drain for three days or more after operation[9,13].

In the present study, the incidence of SSIs in the group receiving prophylactic antibiotics was lower than that in the group which did not receive it. However, there were only 191 (19%) operations with antibiotic prophylaxis. In addition, guidelines for antibiotic use was not available.

Conclusion

The incidence of SSI at Viet Duc Hospital was relatively high at 8.5%. The SSIs were mostly superficial (65%). We did not find clear correlation between SSIs and risk factors such as ASA score, surgical wound classification as well as surgical procedures, except perhaps a correlation with diabetes. In order to reduce the incidence of SSI, surveillance systems for SSI and hospital guidelines for antibiotic prophylaxis are required.

Acknowledgements

Grateful thanks are due to the surgeons and nurses of the departments of VietDucHospital involved in this study for their great assistance and cooperation. We should also express our gratitude to Dr. Akiyama, expert of JICA in Hanoi for his help and direction in implementing the study.

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