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Study of Organisms Causing Surgical Site Infections in abdominal surgeries and their Antimicrobial Susceptibility Pattern in Tertiary Hospital

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Abstract
Background: *Surgical site infection (SSI) is an important postoperative complication. Even after improving the operating room practices, sterilization methods for instruments, better surgical technique and the best efforts of infection prevention practitioners, surgical site infections (SSIs) remain a major cause of nosocomial infections and their rates are increasing globally. E.coli, Staph. aureus, Pseudomonas are some of the common microbes causing SSI.*
Objectives: *To identify the common pathogens that causes SSI in emergency abdominal surgeries.*
Materials and Methods: *This prospective study involves following up the patients in general surgery department from December 2018 to December 2019 undergoing emergency abdominal surgeries. Patients are followed up for 30 days from the date of surgery. The wound is observed during dressing for any purulent discharge and aspectic swab culture done and processed by gram staining, cultured in agar to isolate the infective organism. Antimicrobial susceptibility also done by disc diffusion method.*
Results: *Over one half of the isolates were gram positive cocci and rest were gram negative bacilli. Staph. aureus was the commonest pathogen followed by E.coli and Enterococci. Staphylococcus isolated was found to be penicillin resistant, susceptibility to tetracyclin is 55.5%, that of clindamycin is 66.66%.*
Conclusion: *SSI is more common in contaminated abdominal surgeries than clean abdominal surgeries. The rate increases with increase in degree of contamination. To control the SSI, reducing the preoperative hospital stay, prophylactic antibiotic usage and reducing the duration of surgery are necessary.*
Keywords: *Surgical site infections, Nosocomial infection, contaminated abdominal surgeries.*

Introduction

Surgical site infection is one of the most common cause of hospital acquired infection which is associated with 14% of healthcare infections. This increases the duration of hospital stay double the times and also increases the cost of care.[1] In recent times surgical field has greatly advanced, still this SSI remains one of the most common complication faced by surgeons globally.[2] Furthermore, the multidrug resistance

development of bacteria in hospital is becoming a challenge for the surgeons.[3]

SSI is defined as the infection occurring at the incision site or deeper tissues at the site of operation. These infections occur within 30 days at the operation site without any implant and in case of with implant SSIs occur within 1 year. It can be classified anatomically as Superficial SSI if only skin and subcutaneous tissues are involved. Deep SSI, if deeper structures like fascia and muscle are involved and Organ space infections involving any organs that is manipulated during surgery.[1-4]

Local factors like hematoma, seroma, poor surgical technique, suture materials, degree of contamination and also some of the patient related factors like age, nutrition, hygiene, other comorbidities plays an important role in etiology of post operative wound infections.[2]

The rate of SSI varies based on the type of procedure and wound classification from 15% to 20%. Staphylococcus aureus, Pseudomonas aeruginosa, Enterobacter, and Acinetobacter spp are some of the common organisms causing SSI.[4]

Aims and Objectives

- To identify the incidence of surgical wound infections in surgery department, RMMCH
- To determine the bacterial profile and its antimicrobial susceptibility from the isolate.

Materials and Methods

This is a prospective study conducted in Surgery department along with department of Microbiology RMMCH, Annamalai University, Chidambaram, Tamilnadu. The study period is from December 2018 to December 2019. Institutional Ethical committee clearance was obtained before starting the study.

Sample Size

Total 50patients undergone emergency abdominal surgeries in the department of Surgery were included in this study. The details of the patient were recorded as per the proforma. Each patient was followed till discharge from the hospital from the time of surgery.

Inclusion Criteria

1. Age more than 18 years
2. Contaminated abdominal wounds as per wound classification.

Exclusion Criteria

1. Clean abdominal surgeries as per surgical wound classification.

Sample Collection

A wound is considered to be infected if any of the following criteria are fulfilled:

1. Serous or non-purulent discharge from the wound
2. Pus discharge from the wound
3. Wound with signs of inflammation.

Sample Collection and Transport

Swabs were obtained from the wound avoiding touching the skin and taking all aseptic precautions. The surgical wound was inspected at the time of first dressing and weekly thereafter till discharge.[5,6]

Smear Examination

A smear was prepared and stained by Gram staining method. Culture was done by inoculation on blood agar and MacConkey agar. Identification of isolate was made by colony characteristics and biochemical tests according to standard bacteriological criteria.[5] Antimicrobial susceptibility test was done using disk diffusion method as per CLSI guidelines.[7]

Results

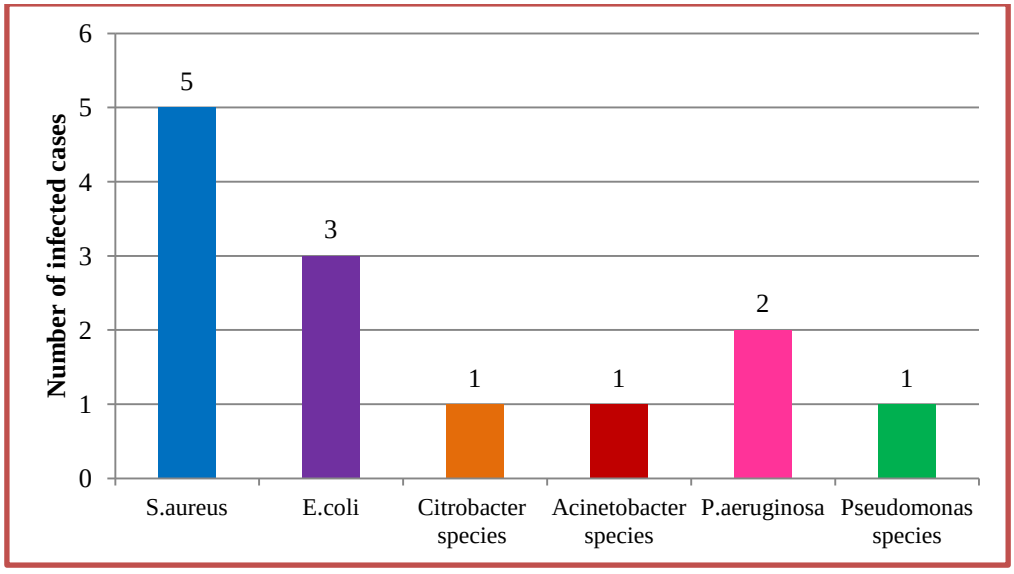
Total 50 patients who underwent emergency abdominal surgeries were followed, out of which 13 patients developed SSI. Risk factors like Obesity, Smoking, Diabetes mellitus, Malnutrition play an equal role in increasing the incidence of SSI. Incidence of SSI is higher in patients with obesity. This shows that Abdominal subcutaneous fat is an independent predictor of superficial incisional SSI after midline laparotomy. Among the 13 patients who developed SSI, 10 patients developed superficial SSI, and 3 patients

developed deep SSI. *S.aureus* was the most common pathogen isolated followed by *E.coli*, *Citrobacter* species, *P. aeruginosa*, and *Acinetobacter* species. *S. aureus* was 100% resistant to penicillin, 22.22% sensitive to cefoxitin, 55.55% sensitive to tetracycline, 44.44% sensitive to gentamicin, and 66.66% sensitive to clindamycin. *P. aeruginosa* isolate was susceptible to aztreonam, piperacillin + taxobactam, piperacillin, and ceftazidime. *Citrobacter* species isolated was susceptible to meropenem, gentamicin, ciprofloxacin, and cefepime. *E. coli* and *Acinetobacter* were resistant to all tested antibiotics.

Table -1: Organisms causing SSI

Organism isolated	Number of infected cases
S.aureus	5
E.coli	3
Citrobacter species	1
Acinetobacter species	1
P.aeruginosa	2
Pseudomonas species	1

Graph – 1: Pathogens causing SSI



Discussion

The post-operative wound infection remains a problem in both developed and developing countries, despite the introduction of meticulous antiseptic regime in clinical practice. The source can be either endogenous or exogenous.

Because of pre-operative antibiotic prophylaxis for all the patients in our study, comparison of rate of SSI with and without antibiotic prophylaxis may not be found. But many studies reported that pre-operative antibiotic prophylaxis reduces the SSI incidence.

Bacterial contamination increases with increase in duration of surgery, also the cells are increasingly damaged by exposure to air or trauma due to surgical instruments, or because longer procedures are more likely to be associated with blood loss thereby reducing the patient's general resistance. SSI is more in contaminated surgeries as compared to clean surgeries due to increase in the degree of contamination with microbes. This result is consistent with other studies.[2,4,8]

S.aureus is the predominant organism that involves in SSI which is similar with other study result.[2-4,8-11]

Resistance to multiple antibiotics among *Staphylococcus* isolate is the major challenge in hospital infection control. Early detection of

methicillin-resistant *S.aureus* and formulation of effective antibiotic policy plays a vital role.[12]
Reducing pre-operative stay, use of pre-operative antibiotics, and proper control of comorbidities can reduce the incidence of SSI.

Conclusion

S.aureus is the most common organism leading to SSI. Surveillance of SSI with appropriate feedback to surgeons is needed to reduce SSI. CDC guidelines on the importance of good patient preparation, aseptic practice, attention to surgical techniques, and antimicrobial prophylaxis must be followed for prevention of SSI.[13]

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