Original Article

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Antibiotic Prophylaxis and Surgical Site Infection

S. Karthikeyan*, Priya, Vimal Raj**, Sivaprasanna***, Akash*****

*Professor **Assistant Professor ***Resident, Dept. of General Surgery, PSG Hospitals, Coimbatore.

Abstract

Background: Surgical Site Infection rate is an important health care index. Prophylactic antibiotics have been used to prevent surgical site infections. A continuous surveillance is called for to keep a check on the resistance pattern of microbes to the prophylactic antibiotic.

Objectives:

1. To estimate the Rate of Surgical Site Infections in the years 2014 and 2015 with reference to CDC guidelines at a tertiary care hospital (PSGIMS&R) located in Tamil Nadu, Southern India
2. To estimate the frequency of various organisms causing Surgical Site Infections
3. To study the antibiotic resistance pattern to the prophylactic antibiotic used.

Type of Study: Retrospective Observational study

Period of Study: January 2014 – December 2015

Methodology: The present study was conducted in PSG Institute of Medical Sciences & Research, Coimbatore. We did a thorough retrospective analysis of case files of 467patients reported to have culture positive SSI. SSI was established using clinical and Standard microbiological testing.

Results: The outcome of this study is that the SSI rate of 4.9% reported in our hospital is consistent with or less than the rates reported in other parts of the country. Diabetes is a very important comorbidity which makes the person significantly vulnerable to SSI. In culture positive cases 24.4% of SSI showed resistance to the prophylactic antibiotic used.

Conclusion: There is a significant rise in incidence of organisms exhibiting resistance to the prophylactic antibiotic and a constant surveillance with feedback to the surgeons and strict adherence to antibiotic policies is essential.

Keywords: Surgical Site Infection Rate; Prophylactic Antibiotics; Diabetes Mellitus; Surveillance.

Introduction

Surgical Site Infections (SSI) are those which occur in the wound created by invasive surgical procedures. Historically they were called 'Irritative Fevers' [1] before the era of antisepsis brought about by Joseph Lister. These 'fevers' were uniformly lethal and so dreaded by all surgeons. They are an important cause of Healthcare associated infections. They continue to be an important health hazard even in hospitals with standard protocols of preoperative preparation and prophylactic antibiotic usage. Their prevalence is usually underestimated [2] owing to the occurrence of many of these infections after the patient has been discharged from the hospital. The spectrum of SSI can range from a simple wound discharge to life threatening sepsis. The incidence of SSI in India is estimated [3] to be around 11% at tertiary care centers.

The present study was aimed at obtaining theincidence of surgical site infections and determining the role of Diabetes Mellitus as an

Corresponding Author: S. Karthikeyan, Medical Superintendent, Professor & unit chief, Dept. of General & GI Surgery, PSG Hospitals, Peelamedu Coimbatore – 641004 Tamilnadu, India.
E-mail: drkarthi1@hotmail.com

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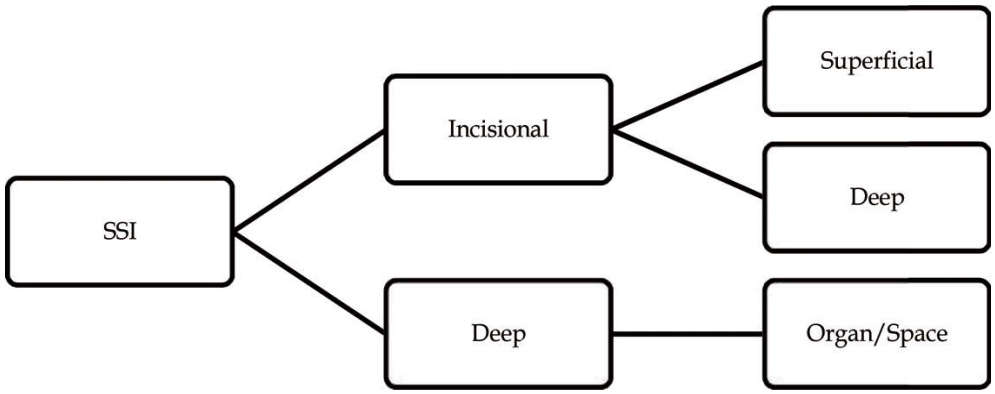
important risk factor for the development of SSI. The Study also aims at determining the percentage of SSI that were resistant to the prophylactic antibiotic

Defining a SSI should involve : 1. Demonstration of signs & symptoms of Inflammation 2. Microbiological evidence of infection. The skin is colonized by a wide range of microbes and clinical evidence of inflammation is mandatory to establish a diagnosis if SSI.



The CDC definition [4] describes three levels of SSI:

superficial incisional, involves the skin and subcutaneous tissue. These infections may be indicated by Celsian signs of localized inflammation such as redness, pain, heat or swelling at the site of the incision or by the drainage of pus.

Deep Incisional involves the fascial and muscle layers. These infections may be indicated by the presence of pus or an abscess, fever with tenderness of the wound, or a separation of the edges of the incision exposing the deeper tissues.

Organ or Space Infection involves any part of the anatomy other than the incision that is opened or manipulated during the surgical procedure, for example joint or peritoneum. These infections may be indicated by the drainage of pus or the formation of an abscess detected by histopathological or radiological examination or during re-operation

Time period: The majority of SSIs become apparent within 30 days of an operative procedure and most often between the 5th and 10th postoperative days. However, where a prosthetic implant is used, SSIs affecting the deeper tissues may occur several months after the operation

Superficial Incisional SSI Infection occurs within 30 days after the operation and infection involves only skin or subcutaneous tissue of the incision and at least one of the following:

1. Purulent drainage, with or without laboratory confirmation, from the superficial incision.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative.
4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.

Deep Incisional SSI Infection occurs within 30 days after the operation if no implant† is left in place or within 1 year if implant is in place and the infection appears to be related to the operation and infection involves deep soft tissues (e.g., fascial and muscle layers) of the incision and at least one of the following:

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs orsymptoms: fever (>38°C), localized pain, or tenderness, unless site is culture-negative.
3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of a deep incisional SSI by a surgeon or attending physician.

Organ/Space SSI Infection occurs within 30 days after the operation if no implant† is left in place or within 1 year if implant is in place and the infection appears to be related to the operation and infection involves any part of the anatomy (e.g.,

organs or spaces), other than the incision, which was opened or manipulated during an operation and at least one of the following:

1. Purulent drainage from a drain that is placed through a stab wound‡ into the organ/space.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.
3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of an organ/space SSI by a surgeon or physician

Objectives

1. To estimate the rate of Surgical Site Infections in our hospital separately for the years 2014 & 2015.
2. To estimate the frequency of various organisms causing SSI.
3. To study the antibiotic resistance pattern to the prophylactic antibiotic used.

Type of Study

Retrospective Observational Study

Period of Study

January 2014 – December 2015

Inclusion Criteria

1. Patient admitted in PSG Hospitals who have undergone surgeries here in and reported to have SSI. The definitions were based on CDC guidelines.
2. The patients should have microbial growth on wound swab culture.
3. Prophylactic Antibiotic should have been used in all cases.
4. The SSI should have been reported within 30 days of the Surgery.

Exclusion Criteria

1. Patients operated in other hospitals but presenting with SSI.
2. Swab cultures from other centers.
3. Preop antibiotics not used or not tested for sensitivity in microbiology.

Methodology

The study was conducted in PSG IMS&R a tertiary care center in southern India. There have been 9470 surgeries performed in the two year period considered for this study. These include surgeries performed in the departments of General surgery, Urology, Pediatric surgery, Cardiothoracic and Vascular surgery, Neuro surgery, HepatoPancreaticobiliary, Plastic surgery, Obstetrics & Gynecology and Orthopedics.

Among this the total number of cases that had SSI was 467. These cases met the CDC definition and fit into the inclusion and exclusion criteria. They were diagnosed using wound swabs that were processed using standard microbiological methods

The data was analyzed using Microsoft Excel

Results

Our SSI rate is estimated to be 4.92% for the year 2014 and 4.95% for the year 2015

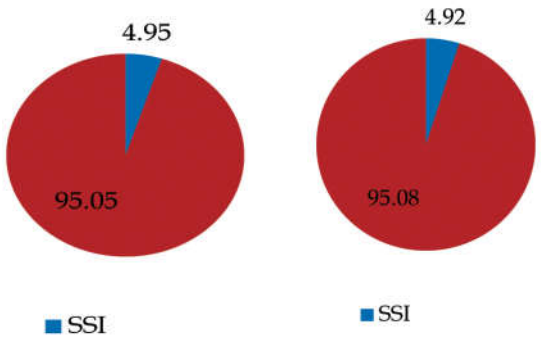


Fig. 2: SSI 2014

The most common antibiotic used preoperatively was IV Cefazolin and this was in accordace with our institution antibiotic policy

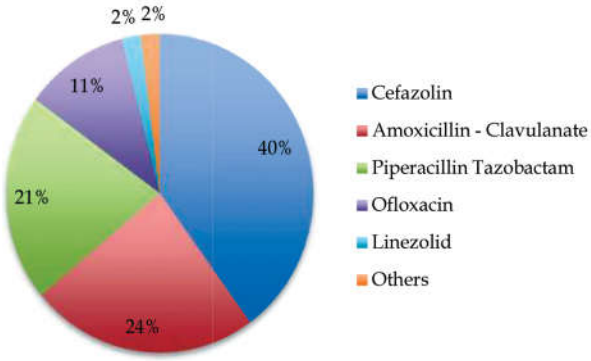


Fig. 3: Antibiotic usage

The commonest organism that showed up in wound swab culture was Escherichia Coli followed by Klebsiella pneumonia

Table 1: SSI rates for the years 2014 & 2015

Year	Total cases	SSI	SSI rate
2014	4719	232	4.92%
2015	4751	235	4.95%

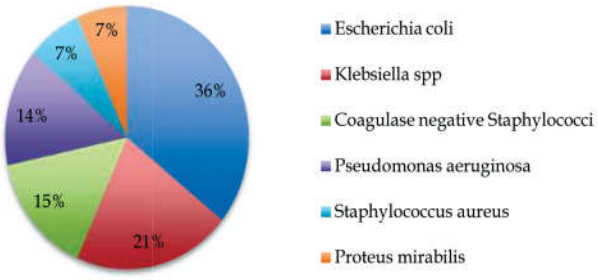


Fig. 4: Organisms grown in culture

Our study showed a predominance of SSI in Diabetics – 27.62%(n=129)

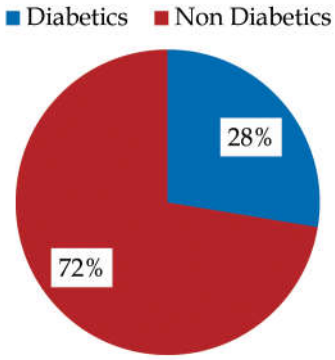


Fig. 5: Incidence of SSI in Diabetics

Resistance to the antibiotic used prophylactically was noticed in - 24.41%(n=114)

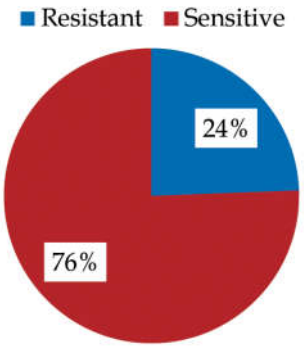


Fig. 6: Resistance to prophylactic antibiotic

Discussion

Surgical site infections are an important cause of Health Care Associated Infections (HCAI). They stand second only to Urinary Tract Infections as a significant cause of morbidity and occasional mortality in operated patients. This rate is widely variable among institutions. The rate of SSI is significantly higher in abdominal than extra abdominal procedures.

The rate of SSI varies greatly worldwide and from hospital to hospital. The rate of SSI varies from 2.5% to 41.9% as per different studies [13,14]. Thepresent study shows SSI rate 4.9% which isless than the rate of SSI reported by other authors in India.

National Academy of Science reported [15] higher rate of infection in patients with Diabetes Mellitus which is similar to our study Microbes that cause SSI are acquired either endogenously from the patient's own flora orexogenously from contact with the environment. However, theperiod of greatest risk remains the time betweenopening and closing the operating site [16].

Prophylactic antibiotics play a major role in the prevention of SSI. But a significant number of culture positive SSI show resistance to the prophylactic antibiotic.

Conclusion

All hospitals should aim at keeping a check on Surgical Site Infections. Special consideration should be given to Diabetics as this population is at a very great risk of developing SSI. Periodic surveillance and feedback to the surgeons is essential to monitor the rise of antibiotic resistant SSI.

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