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Original Research Paper

General Surgery

SURGICAL SITE INFECTIONS AFTER EMERGENCY LAPAROTOMY: A HOSPITAL BASED STUDY FROM ASSAM

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ABSTRACT

Background: Surgical site infection (SSI) is a commonly encountered problem in the surgical departments, especially after emergency surgeries. The incidence of SSI after emergency laparotomy is still high, which increases the morbidity of the patient as well as the hospital expenses. Therefore, it is essential to attempt to reduce the frequency of SSI by applying our knowledge from evidence based studies.

Aim: The present study is done to evaluate the incidence of SSI after emergency laparotomy, to assess the risk factors and find the organisms involved and their susceptibility to antibiotics

Methods: A total of 270 cases of emergency laparotomy done over a period of one year were included in the study, out of which SSI were diagnosed in 64 cases on the basis of criteria by National Healthcare Safety Network. All the cases were treated and followed up for a period of 30 days with simultaneous record and analysis of data.

Results: Out of 270 cases,64 had SSI (23.7%).It was found to be common in 50-59 years.Anaemia was a common comorbid condition. SSI was more common in Class IV surgical wounds with duration of surgery more than 2 hours. Staphylococcus aureus was the most common isolated organism.

Conclusion: Surgical site infections, still a very common complication after emergency laparotomies can be reduced considerably with effective asepsis and antisepsis.

KEYWORDS : Surgical Site Infection (SSI), Emergency, Laparotomy

INTRODUCTION

Surgical site infections (SSI) may be defined as infections occurring upto 30 days after surgery (or one year after surgery in patients receiving implants) and affecting either the incision or deep tissue at the operation site[1]. SSI are of three different types—a)Superficial incisional that involves the skin and subcutaneous tissues, b)Deep incisional involving fascia and muscle and c) Organ space infections[2].Surgical site infection is one of the commonest complication that occurs in 1-3% of all surgical procedures[3]. Abdominal operations account for high rates of SSI, which not only increase morbidity and mortality but also add to expenses of the patient for prolonged hospitalization[4]. Further emergency surgeries increases the risk of SSI about five times than in elective cases[5]; this is probably due to the more incidence of contaminated and dirty surgeries (Table 1) in this group and inability to adequately optimize patient related risk factors like diabetes, obesity, malnutrition and hypoalbuminemia. The problem is made worse by the increase in the spectrum of microorganisms combined with the emergence of antibiotic resistance.

Table 1: Classification Of Surgical Wounds[6]

Clean — an incision in which no inflammation is encountered in a surgical procedure, without a break in sterile technique, and during which the respiratory, alimentary and genitourinary tracts are not entered.
Clean-contaminated — an incision through which the respiratory, alimentary or genitourinary tract is entered under controlled conditions but with no contamination encountered.
Contaminated — an incision undertaken during an operation in which there is a major break in sterile technique or gross spillage from the gastrointestinal tract, or an incision in which acute, non-purulent inflammation is encountered. Open traumatic wounds that are more than 12–24 hours old also fall into this category.
Dirty or infected — an incision undertaken during an operation in which the viscera are perforated or when acute inflammation with pus is encountered during the operation (for example, emergency surgery for faecal peritonitis), and for traumatic wounds where treatment is delayed, and there is faecal contamination or devitalised tissue present"

AIMS AND OBJECTIVES

The present study is an attempt to study the incidence of SSI after emergency laparotomy, to assess the risk factors associated with SSI in emergency surgeries and to know about the micro-organisms involved and their antibiotic susceptibility.

Table 2: Centres For Disease Control And Prevention Criteria For Defining Surgical Site Infection

Superficial Incisional Infection less than 30 days after surgery Involves skin and subcutaneous tissue only, *plus* one of the following: • Purulent drainage • Diagnosis of superficial SSI by a surgeon • Symptoms of erythema, pain, and local edema
Deep Incisional Less than 30 days after surgery with no implant and soft tissue involvement Infection less than 1 year after surgery with an implant; involves deep soft tissues (fascia and muscle), *plus* one of the following: • Purulent drainage from the deep space but no extension into the organ space • Abscess found in the deep space on direct or radiologic examination or on reoperation • Diagnosis of a deep space SSI by the surgeon • Symptoms of fever, pain, and tenderness leading to wound dehiscence or opening by a surgeon
Organ Space Infection less than 30 days after surgery with no implant Infection less than 1 year after surgery with an implant and infection; involves any part of the operation opened or manipulated, *plus* one of the following: • Purulent drainage from a drain placed in the organ space • Cultured organisms from material aspirated from the • organ space • Abscess found on direct or radiologic examination or during reoperation • Diagnosis of organ space infection by a surgeon

Adapted from Mangram AJ, Horan TC, Pearson ML, et al[72]

MATERIALS AND METHODS

The study was carried out in the Department of Surgery in Assam Medical College and Hospital over a period of one year.270 patients undergoing emergency laparotomy for various indications were included in the study.

All the patients received a dose of 1 gm Ceftriaxone injection after negative skin test preoperatively. Shaving was done just prior to surgery. The operations were carried out with all aseptic precautions. A detailed history, including the presence of any coexisting illnesses, the diagnosis of the presenting disease, the operative procedure performed and the duration of the procedure was recorded.

Postoperatively operative wound dressings along with the drain site were inspected for any soakage. Antiseptic dressings were done accordingly. The wounds were assessed for any features of inflammation like redness, swelling, pain or increase in temperature. If pus was present, swab taken and sent in sterile vials for culture and sensitivity examinations. The patients were followed up for a period of 30 days from the date of surgery.

Out of the total of 270 cases, SSI was confirmed in 64 cases using the criteria by CDC (Table 2). All these cases were studied systematically and the recorded data were analyzed.

RESULTS AND OBSERVATIONS

1. Incidence Of SSI After Emergency Laparotomy

Out of the total 270 cases of emergency laparotomy, 64 cases of SSI were observed; so the incidence is 23.7%.

2. Age And Sex Incidence

Table 3: Distribution Of SSI In Relation To Age And Sex

Age	Total no of cases with SSI (%)	Male	Female
10-19	6 (9.4%)	4	2
20-29	12 (18.8%)	7	5
30-39	14 (21.8%)	7	7
40-49	8 (12.5%)	5	3
50 and above	24 (37.5%)	13	11
Total	64 (100%)	36 (56.3%)	28 (43.7%)

In the present study, maximum number of cases was observed in 50 years and above age group (37.5%).Incidence in males (56.3%) was only slightly higher than in females (43.7%).

3. Comorbid Conditions

Table 4: Pre Existing Comorbid Conditions In Patients With SSI

Comorbid conditions	No of patients with SSI	Percentage (%)
Anaemia	10	15.6
Diabetes	9	14
Malnutrition	8	12.5
Hypertension	7	10.9
Obesity	3	0.04
TOTAL	37	57.8%

Out of total 64 patients of SSI, 37 (57.8%) had pre existing comorbid conditions. Anaemia (15.6%) was the commonest comorbid condition followed by diabetes (14%) in our study.

4. Class Of Surgical Wound And SSI

Table 5: Relation Of The Class Of Wounds With Frequency Of SSI

Class of wound	No of patients with SSI	Percentage (%)
Class I	5	7.8
Class II	13	20.3
Class III	16	25.0
Class IV	30	46.9

SSI was found to be predominant in Class IV wounds (46.9%).

5. Duration Of The Operative Procedure

Table 6: Relation Between Duration Of Procedure And SSI

Duration of Surgery	No of patients with SSI	Percentage (%)
Less than 1 hour	12	18.8
1 hour—2 hours	17	26.6
Greater than 2 hours	35	54.6

Maximum incidence of SSI (54.6%) was seen in the cases with operative time greater than 2 hours.

6. Common Causative Organisms

Table 7: Causative Organisms Isolated From The Cases Of SSI

Causative organism	No of cases with SSI	Percentage (%)
Staphylococcus aureus	38	59.3
Eschericia coli	14	21.8
Pseudomonas	8	12.6
Klebsiella	4	6.3

Staphylococcus aureus was the commonest organism (59.3%) isolated from culture of infected wound swabs, while E coli was the second common.

7. Antibiotic Susceptibility

On analysis of the culture sensitivity reports, Staphylococcus aureus was found to be sensitive to each of Linezolid, Vancomycin, Meropenem and Imipenem in all the 38 cases (100%).8 samples out of 38 positive strains (79%) were resistant to Piperacillin Tazobactum, whereas third generation Cephalosporins were found to be resistant in 14 out of 38 cases (36.8%).

All the other isolates of E.coli, Pseudomonas and Klebsiella were sensitive to Meropenem and Imipenem. All the 14 samples of E coli was found to be sensitive to Tigecycline (100%). 4 out of 14 E coli cases(28.5%) were resistant to Aztreonam.

DISCUSSION

Emergency surgeries by itself is a risk factor for the development of Surgical Site Infections (SSI).Various studies have reported comparatively higher rates of SSI in emergency surgeries.(Satyanarayana et al[8],Murtaza B et al[9],Srivastava P et al[10]). The present study from Assam done on 270 cases of emergency laparotomy has an incidence of 23.7% which is comparable with the findings of Abbey et al[11], Singh et al[12] who has reported 25.4% and 26.4% respectively.

The elderly are more prone to develop SSI with a greater incidence in males (Sachin et al[13], Abbey et al[11]). Majority of our cases (37.5%) were in ages of 50 years and above whereas incidence in males (56.3%) was only slightly higher than in females (43.7%). Studies from Razavi et al from Iran have reported no significant correlation between sex and SSI[14].

Risk of SSI is significantly increased by patient related risk factors like malnutrition, obesity, diabetes, anaemia and other pre-existing illnesses[10].In this study,15.6% of SSI patients were anaemic.This is comparable to study by Tabri S et al[15],Sattar et al[16].However most studies have reported diabetes as the commonest comorbidity associated with SSI (Abbey et al[11],Maheswari et al[17].Diabetes is the second common in the present study. The higher incidence of diabetes may be attributed to the studies being conducted in developed countries.

Almost all studies have reported that incidence of SSI increases with the increase in class of wound. We also observed maximum SSI cases (46.9%) in Class IV wounds. Satyanarayana et al has reported 56.7%[8] and Abbey et al

53%[11], which is comparable with the present study.

Prolonged surgery of greater than 3 hours duration is associated with four fold risk of SSI (Mawala B et al[18]) whereas incidence is reported to be as less as 10% for less than 2 hours (Srivastava et al[10]). Farhan Sattar from Pakistan reports 35.7% incidence of SSI following greater duration surgeries (>2 hours)[16]. 54.6% of the cases in the present study had greater than 2 hours duration of surgery while only 18.8% occurred with less than 1 hour operative time.

Culture swabs taken from the infected areas in the present study revealed Staphylococcus aureus in majority of the cases (59.3%). The second frequently isolated organism was E.coli (21.8%). High incidence of Staphylococcus aureus have been reported by various studies[11,17]. Singh et al has reported E-coli as the most frequent organism[12]. The high incidence of Staphylococcus aureus may be explained by the fact that it remains as normal skin flora and may contaminate wounds easily during emergency procedures.

All the organisms isolated were found to be susceptible to Meropenem and Imipenem(100%). Tigecycline and Aztreonam were tested and found to be equally effective against E-coli[12]. Third generation Cephalosporins exhibited resistance to most of the isolated organisms.

SUMMARY AND CONCLUSION

Surgical Site Infections are quite frequent after emergency laparotomies. Elderly individuals especially with associated comorbid conditions like anaemia, diabetes, hypertension are found to have increased risk of developing SSI.The contaminated and dirty group of wounds pose a greater risk of SSI.Increase in duration of the surgical procedure increases the chance of SSI.Staphylococcus aureus is a commonly involved organism, though E coli, Pseudomonas and Klebsiella are not uncommon. Meropenem and Imipenem were found to be good antibiotics with least resistance.

To conclude, SSI are still very high following emergency laparotomies. Proper asepsis, selection of antibiotics and shorter duration of surgeries with experienced surgeons can go a long way in reducing the incidence of Surgical site infections.

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