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General Surgery

NON SURGICAL FACTORS AFFECTING SURGICAL SITE INFECTIONS IN ELECTIVE AND EMERGENCY LAPAROTOMIES

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ABSTRACT

AIM: to compare incidence of superficial surgical site infections in elective and emergency laparotomies and to study the significance of factors like age and ASA score in its incidence

MATERIALS AND METHODS: 200 patients who underwent midline laparotomy(100 patients each in elective and emergency laparotomy groups) were followed up for a period of one month for the incidence of surgical site infections and effect of non surgical risk factors were analysed

RESULTS: the incidence of superficial surgical site infections was 20.7% with a higher incidence in those who underwent emergency laparotomy. Elderly age groups were more susceptible to SSI in both groups. Increased ASA score also proved to have a significant effect on incidence of surgical site infections across both groups

KEYWORDS : superficial surgical site infections,elective and emergency laparotomy,age ,ASA

INTRODUCTION

post operative infections increases both surgical morbidity and mortality and increases the duration of hospital stay and overall medical expense..we studied effect of factors like Age and ASA causing surgical site infections. Better understanding of which can help us in reducing surgical site infections

OBJECTIVE

To study the non surgical factors predicting the incidence of surgical site infections after elective and emergency laparotomy

Specific objectives

- To compare the incidence of superficial surgical site infections following elective and emergency laparotomy
- To study the statistical significance of non surgical factors like age and ASA in predicting incidence of superficial surgical site infections

MATERIALS AND METHODS

This was a prospective observational study conducted at a tertiary care hospital after obtaining permission from institutional ethics committee. 200 patients who underwent laparotomy through a midline incision in the age group 18-70 years during the study period of four months were incorporated into the study.Patients not willing to participate and those who developed deep incisional and organ space infections and those who expired before completion of study period were excluded from the study. Of the 200 subjects, 100 underwent laparotomy as an emergency procedure and the other 100 underwent laparotomy on an elective basis. The patients were examined postoperatively on day 1, day8,day 15 and day30 for the presence of superficial surgical site infections.

Surgical site infection was diagnosed based on criteria laid down by Centre for disease control(CDC). Data was recorded in a questionnaire and was analysed using SPSS software.the data was analysed for effect of increasing age and ASA score.Variables were compared using statistical tests including chi-square analysis and relative risk calculation

RESULTS

The subjects were divided into two groups based on whether laparotomy was done as an emergency or elective procedure. The two groups were age and sex matched. The mean age was 49.44±16 in those who underwent emergency procedure and 51.88±10 in those who underwent elective procedures.

The incidence of superficial surgical site infections in the study group was 20.5 %. Among the patients who underwent laparotomy as an emergency procedure 27 patients(27%) developed surgical site infections where as 14 patients(14%) among those who underwent laparotomy on an elective basis developed surgical site infection(P value 0.023)We found a significant increase in incidence of surgical site infections in the group with emergency laparotomy with a relative risk of 1.929(1.077-3.455)

The mean age was higher in those with surgical site infections (56.05 ±15.84) as compared to those without SSI (49.33 ±13.36),this finding was statistically significant (p value=0.006).

Within the elective laparotomy group the mean age was 58.21±7.34 in those who contracted SSI as compared to 50.97±10.76 in those who had no SSI,this finding was statistically significant (p value 0.023).Analysing the role of age in patients who contracted SSI within entire study group (n=41),the mean age of those in emergency laparotomy group was 54.93±18.85 while it was 58.21±7.34 in elective laparotomy group ,this difference in mean age was statistically significant (p value .003).

Table 1 - incidence of SSI among age groups in emergency and elective cases and in entire study group

	Emergency laparotomy		Elective laparotomy		All cases	
	Age upto 59	60 and above	Age upto 59	60 and above	Age upto 59	60 and above
SSI -	55 (82.1%)	18 (54.5%)	61 (87.1%)	25 (83.3%)	116 (84.7%)	43 (68.3%)
SSI+	12 (17.9%)	15 (45.5%)	9 (12.9%)	5 (16.7%)	21 (15.3%)	20 (31.7%)
P value	0.004		0.615		0.008	
Relative risk	2.538(4.784-1.345)		1.297(3.54-0.473)		2.07(3.53- 1.21)	

Table 2 SSI incidence across ASA scores 1-4

ASA	SSI-	SSI+	total
1	58(87.9%)	8(12.1%)	66
2	86(82.7%)	18(17.3%)	104
3	13(54.2%)	11(45.8%)	24
4	2(33.3%)	4(66.6%)	6
total	159(79.5%)	41(20.1%)	200

P value =0.001

In Order to analyse relative risk ASA 1 and 2 were grouped together and and 3 and 4 were grouped together and analysed

Table 4: SSI incidence in low ASI and high ASI score patients across elective and emergency laparotomy groups

	Emergency laparotomy		Elective laparotomy		Total	
	SSI -	SSI +	SSI -	SSI +	SSI -	SSI +
ASA 1 and 2	64 (80%)	16 (20%)	80 (88.9%)	10 (11.1%)	144 (84.7%)	26 (15.3%)
ASA 3 and 4	9 (45%)	11 (55%)	6 (60%)	4 (40%)	15 (50%)	15 (50%)
P value	0.002		0.044		0.000	
Relative risk	2.747(4.975-1.522)		3.597(9.345-1.381)		3.26(5.405-1.976)	

DISCUSSION

Surgical site infections (SSIs) are the most prevalent surgical wound complications, comprising approximately 15% of all health care–associated infections [1]. This leads to increasing morbidity and mortality. Surgical site infections have been defined by Center for Disease Control [2] which divided them into superficial incisional , deep incisional and organ space infections. Our study covers only superficial incisional surgical site infections which are defined as Infection occurring within 30 days after the operation and infection involving only skin and 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, localised swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative
4. Diagnosis of superficial incisional SSI made by a surgeon or attending physician

While the global estimates of surgical site infection (SSI) have varied from 0.5% to 15%, studies in India have consistently shown higher rates ranging from 23% to 38%[3] . Our study showed an incidence of SSI in 20.5% of total study group. SSI incidence was 27% in group which underwent emergency laparotomy and 14% in those who underwent elective laparotomy.

Study by Kumar A et al [4] showed that SSI was associated with 17.7% of emergency surgeries as compared to 12.5% of elective surgeries.

In a study by Kamat US et al [5] a higher SSI rate of 30.7% was found.

The overall incidence of surgical site infection (SSI) has been estimated to be 2.8% in the United States, according to the U.S. Centers for Disease Control and Prevention [6]. This sharp contrast points to the need for stricter surveillance for the development of SSI .

In our study we found that mean age of those SSI was higher than those did not develop SSI. In the group who underwent emergency laparotomy even the younger patients developed SSI as evidenced by the lesser mean age in those who developed SSI in those who underwent emergency laparotomy. We found that those aged 60 and above had a 2.7 times risk of developing SSI compared to those younger.

Study by Keith s et al [7] inferred that increasing age independently predicted an increased risk of SSI until age 65 years.Study by utsumi M [8] et al reported an overall incidence of 12.2%. of SSI and found that patient age is a significant predictor for SSIs in some gastrointestinal procedures, although risk factors for SSIs in laparoscopic procedures appear quite different from those in open procedures.

The American Society of Anesthesiologists (ASA) physical status classification system (ASAPS) as approved by the ASA House of Delegates on October 15, 2014 classifies patients into six groups.

- **ASA 1**: A normal healthy patient.
- **ASA 2**: A patient with a mild systemic disease.
- **ASA 3**: A patient with a severe systemic disease that is not life-threatening.
- **ASA 4**: A patient with a severe systemic disease that is a constant threat to life
- **ASA 5**: A moribund patient who is not expected to survive without the operation. The patient is not expected to survive beyond the next 24 hours without surgery.
- **ASA 6**: A brain-dead patient whose organs are being removed with the intention of transplanting them into another patient.

Our study has patients with ASA 1 to ASA 4 since patients who didn't survive the one month observation period were excluded from the study.

In our study we found that in the group which underwent emergency laparotomy those with ASA score 3 and above had a 2.747 times chance of developing SSI as compared to those with ASA score 1 and 2. In the group which underwent elective laparotomy the relative risk for developing SSI for ASA 3 and above was 3.597.

Study by Khan et al [9] concluded that American Society of Anaesthesiologists (ASA) score has strong influence on SSI rates in clean and clean contaminated cases. Patients' with comorbidities undergoing clean and clean contaminated general surgical procedures have greater SSI rates than those without any comorbidity.

Study by Kaye K S et al [10] reported a statistically significantly higher SSI incidence for those with an ASA score of 3 or greater compared with those with an ASA score of 1 or 2 (Odds Ratio 3.0, 95% Confidence interval I ,2.6 to 3.2).

Study by Neumayer L et al [11] reported that compared with an ASA score of 1, a score of 3 and a score of 4 or 5 were found to be statistically significantly associated with SSI (Odds Ratio 1.97, 95% CI 1.53 to 2.54 and Odds Ratio 1.77, 95% CI 1.34 to 2.32, respectively). These were similar to findings in our study.

CONCLUSION

Emergency laparotomy procedures has an increased incidence and double the risk for surgical site infections as compared to elective laparotomy procedures which undermines the significance of optimisation of the physiology of the patient before surgery.

Age has a detrimental effect on the outcome in the surgery regarding surgical site infections,but in the emergency laparotomy patients even the younger patients were susceptible to surgical site infections as indicated by reduced mean age of patients who contracted SSI in emergency laparotomy group

ASA 3 and above patients are more susceptible to surgical site infections

All these points further undermines the significance of proper resuscitation and better optimisation of patients prior to surgery

The lack of proper antibiotic policy and stricter surveillance should be pointed out as the reason for increased surgical site infections in developing nations and their introduction can contribute to the reduction of surgical site infections

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