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Comparison of Elective Versus Emergency Abdominal Surgery in Terms of Surgical Site Infection

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Abstract

Objective: To compare elective versus emergency abdominal surgery in terms of surgical site infection.

Study Design: Randomized Controlled Trial.

Setting: Department of General Surgery, Khyber Teaching Hospital, Peshawar.

Duration of Study: This study was conducted from 1st October 2021 to 1st April 2022.

Subjects and Methods: A total of 282 patients of both genders underwent elective abdominal surgeries and emergency abdominal surgeries were included in the study. Any surgical site infection found till the 30th postoperative day was noticed. The total hospital stay was noted.

Results: Age range in this study was 18 to 60 years with mean age of 34.035 ± 6.18 years, mean time required for operative procedure 110.865 ± 24.10 minutes and mean hospital stay was 4.085 ± 1.13 days in Group A and mean age of 36.205 ± 6.54 years, mean time required for operative procedure 112.198 ± 21.30 minutes and mean hospital stay was 4.992 ± 1.09 days in Group B. Surgical site infection was observed in 10 (7.1%) patients in elective group A as compare to 38 (27%) patients in emergency group B ($P=0.000$).

Conclusion: Our study has concluded that emergency abdominal surgery is associated with surgical site infection.

Keywords: Abdominal Surgery, Emergency, Surgical Site Infection

Introduction

Any negative sequelae of surgery noticed by the patient and the surgeon after surgery is termed as a post operative complication^[1] and surgical site infections is the recognized risk factor for post operative morbidity and mortality specifically in abdominal procedures. Despite modern recovery programs emphasizing the need for early rehabilitation of surgical patients, hospital stay hasn't shown much improvement and the main reason cited for this observation is the presence of surgical site infections. Surgical site infections have been broadly classified depending upon the type of surgeries^[2, 3].

The center for disease control and prevention has simplified the definition: any infection that occurs in the 30 days period following surgery is termed as a surgical site infection, regarded as the most common health care related pathology seen in surgical patients. The ratio of SSIs is much higher following abdominal surgeries as compared to other type of surgeries with an annual incidence of 15% to 25% depending upon the level of contamination^[4, 5]. Numerous risk factors may contribute to the development of SSI, one of which is mode of surgery i.e., emergency abdominal surgery, but very little is known in research literature regarding the comparative risk of SSI in emergency versus elective abdominal surgeries^[6].

A retrospective analysis was done at the department of general surgery and gynecology and obstetrics in India over a period of 18 months. The results demonstrated 25.2% rate of surgical site infections in emergency settings and 7.6% rate of SSIs in elective abdominal surgeries^[7].

In a prospective study 150 patients were enrolled (75 in elective abdominal surgery group and 75 in emergency abdominal surgery group), 23 patients (incidence of 15.33 %) developed an SSI, 7 (9.33%) in elective cases and 16 (21.33%) in emergency cases, whereas 127 did not^[2].

Literature review show that till date no researcher has compared surgical site infection in elective abdominal surgeries with emergency abdominal surgeries in our population. Even the results given by other studies done in other regions of the globe are different from one another. So, this study will be the first research of such kind in our country. It will help in the better management of laparotomy patients.

Objective:

To compare elective versus emergency abdominal surgery in terms of surgical site infection.

Operational Definitions:

Surgical Site Infection: It was defined as an infection of the surgical wound that occur till 30 days of a. It was diagnosed by physical examination of the surgical site by the presence of redness, pus discharge or gap in incision scar.

Elective Abdominal Surgeries: It was an abdominal surgery performed for any abdominal pathology without the need for emergency surgery.

Emergency Abdominal Surgeries: It was surgical exploration of the abdominal cavity in the emergency operation theater for the treatment of emergency surgical causes including; intestinal obstruction (air-fluid levels on x-ray erect abdomen) or blunt trauma abdomen.

Hypothesis: Elective abdominal surgeries have less chances of surgical site infection as compared to emergency abdominal surgeries.

Material and Methods**Setting:**

Department of General Surgery, Khyber Teaching Hospital, Peshawar

Study design:

Randomized Control Trial.

Duration of study:

This study was conducted from 1st October 2021 to 1st April 2022.

Sample size:

Sample size was 282 patients (141 in each group), taking rate of SSI in elective abdominal surgeries group as $P1=9.33\%$ & in emergency abdominal surgeries group as $P2=21.33\%$,^[2] using power of 80% & significance 5%.

Sampling technique:

Consecutive nonprobability sampling

Inclusion Criteria

1. Patients underwent elective abdominal surgeries and emergency abdominal surgeries for clean and clean-contaminated wounds.
2. Age 18 to 60 years
3. Both genders.

Exclusion Criteria

1. Patients with perforated peritonitis.
2. Patients having skin infection at the site of incision.
3. Patients having diabetes mellitus and smokers
4. Patients with immune compromised status
5. Patients having severe comorbidities, i.e., shock, septicemia, failure of other organ systems.
6. Laparoscopic abdominal surgeries

Data Collection Procedure:

All the patients presenting to Department of General Surgery (both OPD and ER), Khyber Teaching Hospital, Peshawar with any abdominal pathology were included in the study according to the given criteria. A written informed consent (attached) was taken from them both for inclusion in the study and surgical procedure. Group A included patients for elective abdominal surgeries & group B included patients for emergency abdominal surgeries. A detailed

history & physical examination & relevant investigations for surgical fitness, of each patient was done. Patients in each group received one dose of pre-operative parenteral antibiotics 1 hour before the skin incision & proper disinfection at the time of incision. Name, age, sex, anemia, BMI and address was noted. After surgery, the skin incision in both groups was closed with non-absorbable 2-0 proline. For both groups time required for operative procedure was recorded. Same antibiotics was used for both groups postoperatively. The patients were discharged on 3rd postoperative day if no postoperative complication is noted. Sutures removal was done on the 7-8th day for both groups. In case of any infection or discharge, in any group, the patient was retained for further treatment. Patients were advised to contact in case of any fever, wound discharge or notice of redness in the wound. Any surgical site infection found till the 30th postoperative day was noticed. The total hospital stay was noted. All the data obtained will recorded on a proforma (attached).

Statistical Analysis:

All the analysis was done in SPSS 21. Mean and standard deviation was calculated for numeric variables like age, hospital stay & time required for operative procedure in both groups. Frequencies were calculated for categorical variable like gender, anemia & surgical site infection in both groups. Surgical site infection in both groups was stratified among age, anemia, time required for operative procedure & gender. Post-stratification Chi-square Test was applied to compare outcome in both groups, keeping p-value ≤ 0.05 was as significant. All the results were presented as tables and graphs.

Results

Age range in this study was 18 to 60 years with mean age of 34.035 ± 6.18 years, mean time required for operative procedure 110.865 ± 24.10 minutes and mean hospital stay was 4.085 ± 1.13 days in Group A and mean age of 36.205 ± 6.54 years, mean time required for operative procedure 112.198 ± 21.30 minutes and mean hospital stay was 4.992 ± 1.09 days in Group B as shown in Table 1.

Male gender was dominant in both groups as shown in Table 2. Frequency and percentage of anemia in both groups are shown in Table 3.

Surgical site infection was observed in 10 (7.1%) patients in elective group A as compare to 38 (27%) patients in emergency group B ($P= 0.000$) as shown in Table 4.

Stratification of surgical site infection in both groups with regard to age, gender, anemia and time required for operative procedure are shown in Table 5, 6, 7 and 8 respectively.

Table 1: Mean \pm SD of patients according to age, time required for operative procedure and hospital stay n=282

Demographics	Group A n=141 Mean \pm SD	Group B n=141 Mean \pm SD
Age (years)	34.035 \pm 6.18	36.205 \pm 6.54
Time required for operative procedure (mins)	110.865 \pm 24.10	112.198 \pm 21.30
Hospital Stay (days)	4.085 \pm 1.13	4.992 \pm 1.09

Table 2: Frequency and percentage of gender in both groups

	Gender	n=141	n=141
		Group A	Group B
1	Male	92 (65.2%)	109 (77.3%)
2	Female	49 (34.8%)	32 (22.7%)
	Total	141 (100%)	141 (100%)

Table 3: Frequency and percentage of anemia in both groups

	Anemia	n=141	n=141
		Group A	Group B
1	Yes	35 (24.8%)	29 (20.6%)
2	No	106 (75.2%)	112 (79.4%)
	Total	141 (100%)	141 (100%)

Table 4: Comparison of Surgical Site Infection in both groups

	Surgical Site Infection	n=141	n=141	P Value
		Group A	Group B	
1	Yes	10 (7.1%)	38 (27%)	0.000
2	No	131 (92.9%)	103 (73%)	
	Total	141 (100%)	141 (100%)	

Table 5: Stratification of Surgical Site Infection with respect to age in both groups

For Age 18-40 years

Group	Surgical Site Infection		P value
	Yes	No	
A	9(7.4%)	112(92.6%)	0.000
B	32(28.6%)	80(71.4%)	

For Age 41-60 years

Group	Surgical Site Infection		P value
	Yes	No	
A	1(5%)	19(95%)	0.123
B	6(20.7%)	23(79.3%)	

Table 6: Stratification of Surgical Site Infection with respect to gender in both groups

For Male

Group	Surgical Site Infection		P value
	Yes	No	
A	8(8.7%)	84(91.3%)	0.033
B	21(19.3%)	88(80.7%)	

For Female

Group	Surgical Site Infection		P value
	Yes	No	
A	2(4.1%)	47(95.9%)	0.000
B	17(53.1%)	15(46.9%)	

Table 7: Stratification of Surgical Site Infection with respect to anemia in both groups

For Yes

Group	Surgical Site Infection		P value
	Yes	No	
A	2(5.7%)	33(94.3%)	0.000
B	19(65.5%)	10(34.5%)	

For No

Group	Surgical Site Infection		P value
	Yes	No	
A	8(7.5%)	98(92.5%)	0.035
B	19(17%)	93(83%)	

Table 8: Stratification of Surgical Site Infection with respect to duration of procedure in both groups

For ≤ 120 minutes

Group	Surgical Site Infection		P value
	Yes	No	
A	2(3.5%)	55(96.5%)	0.000
B	26(41.9%)	36(58.1%)	

For > 120 minutes

Group	Surgical Site Infection		P value
	Yes	No	
A	8(9.5%)	76(90.5%)	0.270
B	12(15.2%)	67(84.8%)	

Discussion

The etiology of surgical site infections is dependent on the location of the surgery, the bacterial load in the tissue or blood peri-operatively and the integrity of host defenses [8]. The overall infection rate is around 2-5% for extra abdominal surgeries and about 20% for intra-abdominal injuries but varies from surgeon to surgeon, hospital to hospital, one procedure to another and even from one patient to another patient [8]. In our study, Surgical site infection was observed in 10 (7.1%) patients in elective group A as compare to 38 (27%) patients in emergency group B (P=0.000).

Many studies at different places have shown the SSI rate to vary from 6.09% to 38.7% [9-12]. Lack of adequate data on some surgical procedures such as cholecystectomy and prostatectomy has resulted in publication of false statistics on the rate of SSIs. Compared to European countries (2-5%) and the USA (2.8%), the infection rate in Asian countries is much higher [9]. Some factors are attributed to this observation which mainly include poor infrastructure and minimal awareness about basic infection control measures. The rate of SSIs is heavily dependent upon the type of surgical wound whether its clean, dirty or contaminated as shown by results in multiple studies [13, 14]. Garibaldi *et al* [15] discovered that at least the presence of 30 or more colony forming units (CFU) are indicative of superficial infection irrespective of wound category. Furthermore, a prospective analysis on 190 colorectal patients demonstrated that a concentration of 5 CFU/milliliter or higher in the peritoneal fluid are predictive of wound infection [16].

As expected, complications related to infection are more common following emergency procedures as compared to elective procedures. This high percentage of SSIs is mainly related to improper pre-operative scrubbing and draping and the underlying pathologies that lead to emergency surgeries [9]. A positive correlation was seen between the ratio of SSIs and the order and duration of surgery. Some reasons given for this finding included fatigue among the operating room staff which led to a decline in the standard of aseptic techniques and an increase in the pollution in the operating room with the passage of time [10, 17]. Awan MS detected similar findings [18]. Anemia has not been documented as a significant risk factor for SSIs as observed by Raka L *et al* [19].

As risk index scores increased so did the chance of developing surgical site infections as shown by the positive correlation between the NNIS system and progression of SSIs. Platon E M *et al* [20] discovered that large gaps in the provision of antibiotic prophylaxis increased the rate of SSIs

in the future. Antibiotic prophylaxis significantly reduced the concentration of the microbes allowing the body's host defenses to respond properly to per-operative contamination. These measures will obviously decrease the patient load as well as the financial burden on hospital administration and related authorities [21]. The timing of antibiotic treatment is very important as mentioned in literature that it should be between 30 mins to 2 hours before giving surgical incision [22]. For major procedures requiring longer duration of surgery, it is advisable to give multiple doses at intervals as per the half-life of the drug [23].

The purpose behind this protocol is provision of proper serum levels of antibiotic throughout the tenure of surgery but it shouldn't exceed it. However, if there is a chance of severe sepsis such as in a trauma setting, the time period of empirical treatment can be prolonged. Though, current literature does not this practice [24]. Some drawbacks of this trend include increased expenses and the risk of developing drug resistant microbes.

The gastrointestinal tract contains the highest number of anaerobic microorganisms, increasing in number as we go further down the tract. Hence the choice of antibiotic is dependent upon the segment of bowel involvement. Compared to upper gastrointestinal tract viscera such as the stomach and duodenum, broader spectrum antibiotics are recommended for surgeries related to the lower gastrointestinal tract. Surprisingly, gastric acid has been theorized to decrease the bacterial load hence the chance of surgical site infection [25], therefore, previous usage of antacids warrants antibiotic prophylaxis in special circumstances. There are certain other situations where antibiotic prophylaxis is advised such as gastrointestinal bleeding, obstruction, ileus, morbid obesity and malignancy. The best empirical antibiotic chosen for such conditions is cefazolin. Colorectal surgeries have higher chances of leading to surgical site infections so proper prophylaxis is mandatory.

Conclusion

This post operative adverse event is given great consideration by surgeons, health care staff, hospital administration and other concerned authorities. Even though a complete eradication of these superficial infections is very difficult, their percentage can be minimized hence leading to improvement in post-surgery morbidity and mortality and decrease in the unnecessary usage of hospital resources. Factors such as co-morbid conditions, length of surgery, type of surgery and per operative contamination can lead to surgical site infections. Timely administration of antibiotic prophylaxis is an effective measure in preventing this complication in the long run.

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