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Effectiveness of Subcutaneous Drains in Preventing Surgical Site Infections in Laparotomy Patients

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Abstract **Original Research Article**

Introduction: Surgical site infection (SSI) is a significant postoperative wound complication associated with open abdominal surgery. It is linked to increased morbidity, mortality, and healthcare costs. The use of a subcutaneous suction drain helps reduce dead space in the subcutaneous tissue plane, thereby preventing the accumulation of fluid and the formation of seroma. ***Objective:*** This prospective study aims to observe the efficacy of subcutaneous drains in preventing Surgical Site Infections in emergency laparotomy in patients. ***Methodology:*** A prospective randomised comparative study was conducted with 216 patients who met specific inclusion and exclusion criteria. 108 patients were classified as cases and had subcutaneous suction drains placed, while 108 patients were classified as controls and did not have drains placed. All patients received antibiotic prophylaxis. Surgical site infections (SSIs) were diagnosed and graded using the Southampton wound grading system. ***Results:*** Among 108 patients in each group, the mean age was 48.22±9.09 in the control group and 46.36±9.12 in the subcutaneous group. 24% in the subcutaneous group and 46% in the control group developed SSI. 33% of patients in the control group and 9% of patients in the subcutaneous group developed wound dehiscence and the mean duration of hospital stay was 6 days in cases and 10 days in controls. All the above parameters were statistically significant with $p<0.05$. ***Conclusion:*** Subcutaneous suction drainage is effective in reducing surgical site infections (SSI), wound dehiscence, and the mean duration of hospital stay in emergency laparotomies.

Keywords: Subcutaneous suction drain, Surgical site infection, SSI, Emergency laparotomy.

INTRODUCTION

Surgical site infection (SSI), previously known as postoperative wound infection, is defined as a wound infection that occurs within 30 days after an operative procedure, or within a year if an implant was inserted during the operation. These infections are mostly due to the surgical procedure [1]. SSIs are known to be responsible for up to 20% of hospital-acquired infections, with an incidence of 5% across all invasive surgical procedures and up to 30-40% in major abdominal surgeries, depending on the level of contamination [2]. They lead to increased morbidity, mortality, patient discomfort, dissatisfaction, higher healthcare costs, and wound-related complications [3]. Several risk factors for SSI have been identified, including smoking, obesity, diabetes, malnutrition, high levels of contamination, and inappropriate antibiotic prophylaxis. There are three types of SSI: superficial incisional infections involving the skin and subcutaneous tissue, deep incisional infections involving the fascial and muscle layers, and organ/space infections occurring in any part handled during the operative procedure [4]. Standard measures such as hand washing, minimizing shaving, skin preparation, and antibiotic prophylaxis are known to reduce the risk of SSI [5]. The presence of serous fluids, hematoma, or any dead space in the incisional wounds acts as a good culture medium and increases the risk of SSI. Therefore, negative suction in the subcutaneous area has been found to reduce the risk of infection by removing infectious content and draining the seroma [6]. This study aims to evaluate the effectiveness of subcutaneous drains in preventing surgical site infections in laparotomy patients. Written

consent and ethical clearance were obtained before the study.

Objectives

- *General objective:* The objective of this research is to find the management of surgical site infections in laparotomy patients.
- *Specific objective:* This study aims to find the effectiveness of subcutaneous drains in terms of surgical site infections in laparotomy patients.

METHODOLOGY

This prospective randomised comparative study was conducted at the Department of Surgery at Holy Family Red Crescent Medical College Hospital, Dhaka, Bangladesh. The study included 216 adult patients aged 18–80 years who underwent emergency surgery for emergency appendectomies for complicated appendicitis, obstructed inguinal hernia, perforation of gas containing hollow viscros etc. between December 2021 and December 2023 in the hospital.

- *Inclusion criteria:* Patients over 18 years of age and less than 80 years old with class III and class IV surgical wounds were included.
- *Exclusion criteria:* Patients who did not match the age limit, had class I and class II surgical wounds, accidental removal of drain, patients who died in the immediate postoperative period and immune-compromised state were excluded from the study.

The demographic data of the patient and a detailed clinical history were collected. Patients were followed up for 30 days after the surgery, and their wounds were inspected for any signs of surgical site infections. The severity of any infections was assessed using the Southampton Wound Grading Score. The data was organised and analysed using MS Excel Office 365, GraphPad Prism 8.4.2, and Statistical Package for Social Sciences (SPSS) version 25. For comparing proportions (categorical variables), Fisher's Exact test/Chi-square test was employed. The Mann-Whitney test/Student's t-test (for independent group/unpaired data) and Wilcoxon sign rank test/Paired t-test (for paired data) were used to analyse continuous variables based on the normality of the data. A significance level of $p<0.05$ was utilised. The study received ethical approval from the hospital's ethical committee. Furthermore, all study participants provided voluntary informed consent after receiving a comprehensive explanation of the study's objectives.

RESULT

The conducted on 216 patients, divided into two groups, 108 patients in each. The mean age was 48.22±9.09 years in the control group while the mean age was 46.36±9.12 years old for the subcutaneous drain group which was not statistically significant [Table-1]. According to Table-2, the mean duration of hospital stay was 10.71±5.83 days for the control group while the subcutaneous drain group had a lower duration of stay for a mean of 6.90±3.11 days. There were 46.30% of patients who developed surgical site infection in the control group while 24.08% of patients had surgical site infection and the difference was statistically significant. The control group had wound dehiscence in 36 cases (33.33%) while the subcutaneous drain group had 10 cases (9.26%) and the difference was statistically significant. On the other hand, the control group had 66.67% negative wound dehiscence but 90.74% negative wound dehiscence in the subcutaneous drain group [Table-3].

Table-1: Demographic characteristics

Characteristics	Parameters	Control group	Sub Cut Drain +	P value
Age	Number of patients	108	108	
	Mean	48.22	48.36	0.674
	SD	9.09	9.12	
Gender	Female	32 (29.62%)	38 (35.18%)	0.539
	Male	76 (70.38%)	70 (64.82%)	

Table-2: Surgical data of the study patients

	Parameters	Control group (n=108)	Sub Cut Drain + (n=108)	P value
Duration of hospital stay	Mean duration	10.71	6.90	0.0001
	SD	5.83	3.11	T = - 4.063
	Minimum	5.00	4.00	
	Maximum	33.00	18.00	
Surgical site infection	Absent	58 (53.70%)	82 (75.92%)	0.0161
	Present	50 (46.30%)	26 (24.08%)	Chi Sq. – 5.791

Table-3: Wound dehiscence

Wound dehiscence	Control group (n=108)	Sub Cut Drain + (n=108)	P value
Yes	36 (33.33%)	10 (9.26%)	0.0024
No	72 (66.67%)	98 (90.74%)	Chi sq. – 9.247

DISCUSSION

Surgical site infections (SSI) remain a major concern in clinical practice, particularly in the context of emergency laparotomies. SSI has a significant impact on the morbidity and mortality rates associated with complications related to wound infections [17]. In the present research, the effectiveness of subcutaneous suction drains in reducing SSI in emergency laparotomies was examined.

In the present study, it was observed that 26 (24.08%) out of 108 patients and 50 (46.08%) of controls developed SSI, which was statistically significant with a p-value of 0.0161. Similar findings were shown in studies by Kagita *et al.*, where SSI was reported as 12.50% in cases and 69.44% in controls with a significant p-value of 0.0001 [7]. Patel *et al.*,'s study showed an incidence of SSI as 16% in patients with drains and 40% in patients without drains, which was statistically significant with a p-value of 0.01 [8]. A study by Wani JN *et al.*, also showed similar results, with the SSI rate in cases at 15.3% and 30% in controls, with a statistically significant p-value of 0.002 [9]. In contrast, studies by Nasta *et al.*, and Manzoor *et al.*, reported that the use of subcutaneous suction drains did not prevent surgical site infections [10, 11].

The present study found that the average hospital stay was 6.90 ± 3.11 days for cases and 10.71 ± 5.83 days for controls, with a statistically significant p-value of 0.0001. Similarly, Patel *et al.*,'s study showed an average hospital stay of 10.1 days for cases with a drain and 13.2 days for controls, with a significant p-value of 0.058. In a study by Zhuang J *et al.*, the inpatient stay was 9.64 ± 4.15 days for cases and 12.26 ± 5.55 days for the control group, with a statistically significant p-value of 0.004 [12]. Manoharan *et al.*,'s study revealed a mean hospital stay of 9.17 days for patients with a drain and 14.17 days for cases without a drain [13]. Additionally, Kagita *et al.*,'s study demonstrated that the postoperative hospital stay was not statistically significant, with a p-value of 0.3467.

In this study, 5 out of 108 cases (9.26%) and 36 out of 108 controls (33.33%) developed wound dehiscence, either as a wound gap or wound dehiscence. This was statistically significant with a p-value of 0.0024. Similar results were found in studies conducted by Wani *et al.*, where 12% of cases and 45.3% of controls developed wound dehiscence with a significant p-value of less than 0.001 [14, 17]. Khan *et al.*,'s study demonstrated that 14% of patients with drains and 42% of patients without drains reported wound dehiscence, with a significant p-value of 0.002 [15]. However, a study by Alsafrani *et al.*, contradicted these findings [16, 17].

LIMITATIONS

There are some potential limitations to this study. The main limitation is the relatively small sample size, which restricts the generalization of the study results. Additionally, it's important to note that the study was conducted at a single center and did not account for many other known risk factors contributing to SSI.

CONCLUSION

The findings of this study indicate that using a subcutaneous suction drain can be beneficial in lowering the occurrence of surgical site infections, wound dehiscence, and the average length of hospital stay. This ultimately leads to reduced healthcare costs in emergency laparotomies, particularly for class III and class IV surgical wounds.

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Conflicts of interest: N/A

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