ORIGINAL RESEARCH PAPER

General Surgery

EFFICACY OF SUBCUTANEOUS CLOSED SUCTION DRAIN IN REDUCTION OF POSTOPERATIVE SURGICAL SITE INFECTION: DESCRIPTIVE STUDY

KEY WORDS: Subcutaneous Closed Suction Drain, Surgical site infection; Efficacy

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ABSTRACT

Background: Up to 15% of all nosocomial infections are caused by postoperative surgical site infections (SSI), a severe health concern. The use of subcutaneous drains after surgery, particularly in emergency laparotomies, has appeared to be highly promising. With this background, we conducted this study to understand the efficacy of subcutaneous drain in prevention of SSI. **Materials and methods:** 100 patients who underwent midline exploratory laparotomies and were hospitalised to the surgical department of the Dr. Pujabrao Deshmukh Memorial Medical College in Amravati, Maharashtra, between November 2021 and July 2022 comprise this case-control research. After obtaining written informed consent, all hospitalised patients underwent clinical examinations and pertinent investigations. Of these, 50 patients were randomly chosen and had a closed subcutaneous suction drain implanted before the skin was closed; the remaining 50 patients did not receive this treatment. In contrast to the other set of patients, the patients for whom a subcutaneous drain was inserted were referred to as cases. The drains in the cases were left in place for seven to fifteen days (average 5.2 days). **Results:** The mean duration of hospital stay was significantly higher among the cases without drain when compared to the cases with drain. [11.22 days Vs 8.33 days]. The proportion of SSI among patients with drain was 16% and among without drain was 44%. This difference was statistically significant ($p<0.05$). The most common organism isolated among both the groups was E. Coli. **Conclusions:** Many people have found that subcutaneous suction drains lower SSI. In our study, the incidence of developing SSI was higher in co-morbid patients, emergency cases, and colorectal procedures. E. coli was the most typical organism isolated, followed by S. aureus. Therefore, the evaluation of these characteristics aids in the provision of a preventative therapy to lower mortality in the high-risk patients.

Introduction:

Up to 15% of all nosocomial infections are caused by postoperative surgical site infections (SSI), a severe health concern.[1] SSI rates range from 10% to more than 30% depending on the type of procedure and the degree of contamination, especially in abdominal surgery. There is plenty of proof that postoperative SSI leads to higher rates of morbidity and death as well as an average week-long hospital stay extension.[2] When added to the indirect costs like lost income and insurance costs, the direct costs that arise seriously damage the health care system. In addition, patient-related factors such as age, nutritional status, smoking, diabetes mellitus, and concurrent medication are risk factors for developing SSI. Therefore, many strategies have been put forth to lower the rate of SSI.[3]

Several strategies have been used to decrease them, including good hand hygiene, hair removal, and chlorhexidine wash with antibiotic treatment before to surgery. However, the use of subcutaneous drains after surgery, particularly in emergency laparotomies, has appeared to be highly promising. The idea behind it is to eliminate any accumulated fluid or debris and close any dead spaces in the subcutaneous plane, which will lessen the risk of infection and wound problems. The drain output is then properly monitored.[4–6]

One method to combat seroma may be to use these drains behind flaps. After that, it can be removed sterilely and covered with a pressure dressing. If the seroma gathers once more, the incision should be opened to remove it. Seroma should be emptied by opening the incision and packing the wound with saline gauze if it recurs after two aspirations in order to allow for secondary healing. By fixing the issues with the clotting factors, hemostasis can be avoided. Interrupted sutures or synthetic mesh are the most secure options for high-risk patients. This has shown to be quite helpful coupled with wet surgical gauze, an iodophor dressing, and continual suctioning.[7,8] In 7 to 10 days, the wound can be stitched up. If the wound cannot be stitched shut, it is instead allowed to granulate before being stitched shut with a skin graft. According to certain research, subcutaneous catheter use with an antibiotic cover and saline irrigation is only useful for filthy wounds. With this background, we conducted this study to understand the efficacy of subcutaneous drain in prevention of SSI.

Materials and methods:

Study design and settings:

100 patients who underwent midline exploratory laparotomies and were hospitalised to the surgical department of the Dr. Pujabrao Deshmukh Memorial Medical College in Amravati, Maharashtra, between November 2021 and July 2022 comprise this case-control research.

Sample size:

A case control study conducted by Harish R et al9 reported that cases with subcutaneous drain had the rate of SSI to be 14% and controls without the drain the rate was 42%. Using this, with 95% confidence interval and 80% power, we found the sample size to be 46 in each group. For our convenience, we have considered 100 patients in the present study.

After obtaining written informed consent, all hospitalised patients underwent clinical examinations and pertinent investigations. Of these, 50 patients were randomly chosen and had a closed subcutaneous suction drain implanted before the skin was closed; the remaining 50 patients did not receive this treatment. In contrast to the other set of patients, the patients for whom a subcutaneous drain was inserted were referred to as cases. The drains in the cases were left in place for seven to fifteen days (average 5.2 days).

The current study included individuals who were older than

18 and were having either emergency or elective surgery. Exclusion criteria for the study included patients with extreme ages (18 years and >80 years), immunocompromised state (such as HIV), radiation, chemotherapy, and re-exploration instances.

Ethical considerations: All the study participants were provided informed written consent forms before the start of the study. Strict confidentiality about their particulars was maintained throughout the study. The study was approved by Institutional Ethics committee before the start of the study.

Statistical analysis plan:
The data was collected, compiled, and analyzed using EPI info (version 7.2). The qualitative variables were expressed in terms of percentages. The quantitative variables were categorized and expressed in percentages or terms of mean and standard deviations percentages. The difference between the two proportions was analyzed using the chi-square or Fisher exact test. All analysis was two-tailed, and the significance level was set at 0.05.

Results:
We have included 100 patients in the present study. They were divided into two groups by random selection (With and without drain).

Table 1: Demographic particulars of the sample

Demographic particulars	Group with Drain (n=50)	Group without Drain (n=50)	P value
Age (Mean ± SD)	42.34 ± 5.56	43.55 ± 6.73	0.3211
Gender			
Male	28 (56)	27 (54)	0.7732
Female	22 (44)	23 (46)	
Associated diseases			
Diabetes meliteus	7 (14)	5 (10)	0.6723
Hypertension	9 (18)	7 (14)	0.5623
Type of surgery			
Elective	26 (52)	25 (50.00)	0.7821
Emergency	24 (48)	25 (50.00)	

SD-Standard deviation; ()-Percentage

The mean age of the cases was 42.34 years with drain and 43.55 years without drain. The cases were comparable in terms of gender, associated diseases and type of surgery. (p>0.05)

Table 2: Mean duration of stay

Duration of stay (Mean ± SD)	Group with Drain (n=50)	Group without Drain (n=50)	P value
	8.33 ± 3.56	11.22 ± 4.13	<0.001

The mean duration of hospital stay was significantly higher among the cases without drain when compared to the cases with drain. [11.22 days Vs 8.33 days].

Table 3: Distribution of the surgical site infection based on the groups

Surgical site infection	Group with Drain (n=50)	Group without Drain (n=50)	P value
Present	8 (16.00)	22 (44.00)	<0.001
Absent	42 (84.00)	28 (56.00)	

()-Percentage
The proportion of SSI among patients with drain was 16% and among without drain was 44%. This difference was statistically significant (p<0.05).

Table 4: Distribution of the organisms causing surgical site infection based on the groups

Organisms causing surgical site infection	Group with Drain (n=8)	Group without Drain (n=22)
Acinetobacter Boumani	1 (12.50)	2 (9.09)
Enterococcus Faecalis	0	5 (22.72)
Escherichia coli	5 (62.50)	8 (36.36)
Pseudomonas aeruginosa	0	4 (18.18)
Staphylococcus aureus	2 (25.00)	3 (13.05)

The most common organism isolated among both the groups was E. Coli.

Discussion:
One of the main reasons for morbidity following emergency laparotomy is SSI. There has been a lot of study done on the incidence, treatment, and prevention of SSIs. Due to the organisms that live in the intestines, colorectal procedures have been demonstrated to have a significant incidence of surgical site infections (SSI).—4,10 In an effort to identify the factors that increase the risk of SSI, Cruse and Foord demonstrated that the average infection rate in the various surgical specialties was 4.8%, with an increase in infections among the elderly, prolonged hospital stays, and procedures.11 However, contrary to our findings, their studies indicated that the use of drains also enhanced the rate of infection.

According to our study, SSI rates reached 16% in patients with subcutaneous drains and 44% in those without drains. Similar results were found by Harish R et al9 in another investigation. There have been conflicting findings on the relationship between SSI and subcutaneous drains in the past. Fujii et al.12 discovered a marked decrease in SSI with subcutaneous drains, however Baier disagreed.13 After conducting study on patients who had their ileostomies reversed, Pan concurred with Fujii et al 12. He discovered that patients without drains had a rate of 12.5% SSI development whereas those with drains had a rate of 1.2%. Similar findings were obtained in our investigation. According to a research by Sumi Y et all4., the incidence of incisional SSI in these cases with and without the J-VAC™ Drainage System was 16.7% and 56.5%, respectively. According to a different study by Goyal A. et al.15, patients with closed suction drains have considerably more primary intentions/closures than patients in the control group who did not have closed suction drains.

Additionally, earlier research has shown that SSI development results in a lengthier hospital stay—[13,15]. This was confirmed by the current investigation, which we conducted. The average length of stay for patients who experienced surgical site infections (SSI) was 11.22 days, compared to 8.33 days for patients who did not. This is mostly because managing SSIs requires constant observation, frequent dressing changes, and antibiotic administration.

According to Suragul and his associates, 48% of the cultures had positive results, making polymicrobial organisms the aetiology of SSI16. The most frequent pathogens that cause SSI following abdominal surgery are Enterococcus, E. coli, and Klebsiella pneumonia, which are common occupants of the intestines. Our investigation revealed that E. coli was the most often isolated organism in the study, followed by S. aureus and pseudomonad in thyroid operations and S. aureus in orthopaedic procedures. In their research, Mundhada A et all7, Hassan Ra et al18, and Cooper et all0 found that S. aureus was the most prevalent organism.

There are several restrictions on this study. It was a study with a modest sample size. The outcomes of the present investigation would have been more exact in randomised

controlled trials. However, this study is one of the first ones of its kind to be done in this area.

Conclusions:

Many people have found that subcutaneous suction drains lower SSI. In our study, the incidence of developing SSI was higher in co-morbid patients, emergency cases, and colorectal procedures. E. coli was the most typical organism isolated, followed by S. aureus. Therefore, the evaluation of these characteristics aids in the provision of a preventative therapy to lower mortality in the high-risk patients.

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