

Comparative study of subcutaneous single closed suction drain versus simple closure in emergency midline laparotomy wounds

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Abstract

Background: Wound healing post-surgery significantly affects patient morbidity and quality of life. The term "surgical site infections" (SSIs) is predominantly employed to denote infections occurring in the surgical wound after an invasive operation. Wound infections remain a critical concern due to their potential influence on surgical outcomes and prolonged hospital stays. Patients undergoing emergency laparotomy procedures are at a heightened risk for surgical site infections and delayed wound healing.

Materials & Methods: This research was conducted at a private medical college and hospital over 12 months, from December 2022 to November 2023. It constitutes a prospective comparative analysis. Data were gathered from patients admitted to the General Surgery department who underwent emergency laparotomy procedures at the hospital. A total of 100 patients were included in two groups, 50 in each group. In one group, the wound was closed with a subcutaneous drain, and in the other group, a simple skin closure technique was used.

Results: The mean age of the study participants was 39.5 ± 3.5 years. The majority of the participants belonged to the age group of 31-40 years, and there exists a male gender preponderance. The occurrence of wound complications, seromas, surgical site infections, and the need for surgical interventions was significantly less among those cases with subcutaneous drain than among those patients with simple skin closure. The mean days of hospital stay were comparatively less with the subcutaneous drain.

Conclusion: Subcutaneous single closed suction drains significantly mitigate surgical site infections compared to patients without such drains, which reduces the need for surgical intervention, which in turn helps in shorter hospital stay.

Keywords: Subcutaneous single closed, Suction drain, Simple closure, Emergency midline laparotomy wounds.

Introduction

Surgical site infections (SSIs) are prevalent complications following surgical interventions, especially major abdominal surgeries such as emergency laparotomies.[1] SSIs have the potential to result in increased morbidity, longer hospital stays, and rising costs associated with medical care. Methods that are effective in lowering the risk of surgical site infections (SSIs) are of utmost importance in developing countries, where healthcare resources are frequently limited.[2] The use of subcutaneous suction drains and simple skin closure techniques, both of which are frequently employed in postoperative wound management, are two of the strategies that are utilized to diminish the likelihood of these infections occurring. To improve patient outcomes, it is essential to have a thorough understanding of the relative

effectiveness of these methods, particularly in high-risk surgeries such as emergency and laparoscopic procedures.[3]

Emergency laparotomies, which involve immediate surgical intervention for patients in life-threatening unstable conditions, are included in the category of procedures that contribute to the increased risk of infection. [4] As a result, the postoperative care of these patients needs to implement a wound closure technique that is both effective and minimizes the risk of surgical site infections (SSIs). The decision between subcutaneous suction drains and simple skin closure in abdominal conditions significantly influences infection and complication rates. Abdominal conditions generally exhibit a greater risk of surgical site infections (SSIs) compared to elective surgeries.[5] It is important to note that the urgency and complexity of these procedures, in conjunction with the frequently unstable condition of patients, contribute to the greater likelihood of infection. Therefore, it is essential to implement a wound closure technique that is both effective and minimizes the risk of surgical site infections (SSIs) in the care that these patients receive after their surgeries. The decision between using subcutaneous suction drains or simply closing the skin can have a significant impact on the rates of infection and other complications. [6,7]

By actively removing fluid and debris from the wound site, subcutaneous suction drains can perform their function. This can potentially help prevent the accumulation of bacteria and reduce the likelihood of infection. By maintaining a dry environment around the wound and reducing the number of bacteria present, this technique is believed to hasten the healing process. Simple skin closure, on the other hand, involves suturing the wound without any additional drainage. [8,9] Although this method is simpler, it may allow fluid to accumulate, which could potentially increase the risk of infection. Despite this, both methods are widely utilized, and the extent to which they are successful in lowering the number of SSIs is still a matter of debate. [10,11] The primary objective of this research was to ascertain the effect of a subcutaneous closed suction drain on the incidence of surgical site infection post-emergency laparotomy. An examination was conducted to address this inquiry. The secondary objective is to evaluate the duration of hospitalization for patients utilizing a closed suction drain compared to a standard closure.

Materials and Methods

This study was conducted at Meenakshi Medical College Hospital and Research Institute situated in Kancheepuram, South India. This study was done over 12 months, from January 2023 to December 2023, as a prospective analysis. Data was gathered from patients admitted to the General Surgery department who underwent emergency laparotomy procedures. A total of 100 patients were included in the sample during this timeframe. The defined Inclusion Criteria to select the eligible participants are as follows: 1. Patients undergoing emergency laparotomy through a midline incision, 2. Patients aged 20 to 59 years, of both genders, 3. Patients with a BMI over 31, 4. Both male and female participants. With the following exclusion criteria, ineligible patients were not included. 1. Patients aged 60 and above, 2. Patients with a previous surgical history, 3. Patients who declined participation in the study, 4. Immunocompromised individuals, 5. Patients diagnosed with diabetes mellitus, 6. Patients showing symptoms of jaundice and 7. Patients with anemia

Ethical approval was obtained from the Institutional Ethical Committee before starting the study, and informed consent was collected from all participants. This prospective comparative study used systematic random selection to assign patients into two groups before surgery. In Group A, fifty patients received subcutaneous closed suction drains, while in Group B, fifty patients did not receive any drainage system.

Individuals admitted to the emergency department. Clinical diagnosis is corroborated by various diagnostic methodologies. Critical parameters are analyzed. The initial phase of resuscitation is conducted with crystalloids and blood products as needed. Written consent was acquired after the patient and their family members were informed of the study protocol. A study group was selected randomly. The gathered data was inputted into Microsoft Excel. The variables were coded.

Patients admitted to the emergency department underwent a clinical diagnosis, confirmed through various diagnostic methods. Key parameters were analyzed, and the initial resuscitation phase involved crystalloids and blood products as necessary. Written consent was obtained after informing the patient and their family about the study protocol. A study group was selected at random, and the collected data was entered into Microsoft Excel. Variables were coded, and analysis was performed using SPSS software (Version 27, IBM). Descriptive statistics were used, and correlations among categorical variables were assessed, with a p-value below 0.05 considered statistically significant.

Result

A total of 100 patients operated for midline laparotomy were included in the present study. The average age of the study participants was 39.5 ± 3.5 years.

Table 1: Distribution of patients in the study as per age (N=100)

Age in years	Frequency	Percent
20 – 30	11	11
31 – 40	32	32
41 – 50	28	28
51 – 60	29	29
Total	105	100%

The table above displays the frequency (number of individuals) and percentage of participants in each age group: 20–30 years (11%), 31–40 years (32%), 41–50 years (28%), and 51–60 years (29%). The total sample consists of 100 individuals.

Table 2: Distribution of the study subjects as per gender (N=100)

Gender	Frequency	Percent
Male	60	60%
Female	40	40 %
Total	100	100%

The above table displays the frequency (number of individuals) and percentage of males (60%) and females (40%) in the overall sample of 100 individuals.

Table 3: Proportion of wound complication among study subjects (N=100)

Wound Complication	Frequency	Percent
Absent	61	61%
Present	39	39%
Total	105	100%

The table above shows the number of cases with wound complications (39 cases) and without wound

complications (61 cases).

Table 4: Proportion of Seroma among the study subjects (N=100)

Presence of Seroma	Frequency	Percent
Absent	80	80%
Present	20	20%
Total	105	100%

The table above shows the number of cases in which seroma was observed (20 cases) and not observed (80 cases).

Table 5: Proportion of SSI among the study subjects (N=100)

SSI	Frequency	Percent
No	69	69%
Yes	31	31%
Total	105	100%

The table presented illustrates the distribution of cases with and without SSI. Out of the total, 31 instances exhibited SSI, while 69 did not. When examining the relative frequencies, cases lacking SSI constituted 69% of the overall sample, whereas those with SSI represented 31% of the total cases.

Table 6: Proportion of surgical intervention among study subjects (N=100)

Intervention	Frequency	Percentage
No	68	68%
Yes	32	32%
Total	100	100%

The data presented in the table shows that SSI was observed in 31 instances, while 69 instances were free from SSI. About the total number of cases, those without SSI represent 69% of the sample, whereas SSI-positive cases constitute 31%. This breakdown illustrates the distribution of cases across both categories.

Table 7: Association between SSI and Subcutaneous drain

Variables		Subcutaneous drain		P value
		Yes (50)	No (50)	
Wound Complication	No (61)	42 (68.8%)	19(31.2%)	<0.01
	Yes (39)	8(20.5%)	31(79.5%)	
Seroma	No (80)	45(56.2%)	35(43.8%)	<0.01
	Yes (20)	5(25%)	15(75%)	
SSI	No (69)	45(65.2%)	24(34.8%)	<0.01
	Yes (31)	5 (16.1%)	26(83.9%)	
Intervention	No 68	44(64.7%)	24(35.3%)	<0.01
	Yes 32	6(16%)	26(84%)	

The data presented in the aforementioned table indicate that patients who received subcutaneous drains experienced significantly lower rates of wound complications, seroma formation, and surgical site infections compared to those who underwent simple closure. Furthermore, the need for additional surgical intervention was substantially reduced in cases where subcutaneous drains were employed, as opposed to instances where simple closure techniques were utilized.

Table 8: Duration of hospital stay between two study groups(N=100)

S.No	Study group	Mean	Standard deviation	P value
1	Simple closure	11.45	3.53	<0.05
2	Subcutaneous drain	8.94	2.76	

With regards to the number of days of hospital stay, the patients in the simple closure group had higher mean duration than the patients in the subcutaneous drain group and this finding was statistically significant as shown in the above table.

Discussion

The current study was conducted to compare the effectiveness of the usage of a subcutaneous drain versus the simple closure among patients with midline laparotomy wounds. The study participants had an average age of 39.5 ± 3.5 years. The largest proportion of subjects (31%) fell within the 31- 40 year age range. This finding, which showed middle-aged individuals as the primary contributors, was corroborated by research conducted by Khan RM et al. Their study similarly identified subjects aged 31- 40 years as comprising the majority of their sample.[12] In the present study, there was a male gender preponderance with almost $2/3^{\text{rd}}$ of the subjects being male. This inference is by a study conducted by Junaid F et al which also showed that 70% of their study participants as male subjects [13]. Thus, midline laparotomies are most commonly performed among middle-aged male patients.

In our study, it was found that the proportions of wound complications were significantly less among the cases with a subcutaneous drain in comparison with those cases with simple skin closure of the wound after midline laparotomy. This finding is supported by the randomized control conducted by Shunmugam D et al. [14] The main aim of our study is to the incidence of surgical site infection with subcutaneous drain. The effectiveness of subcutaneous suction drains is evidenced by the substantially reduced infection rate in patients who received them (16%) compared to those who underwent simple skin closure (84%). These results align with other research indicating that drain usage decreases the likelihood of surgical site infections (SSIs), especially in high-risk procedures like emergency laparotomies. [15] Furthermore, our observations regarding SSIs corroborate global research findings.

Numerous studies worldwide have shown that subcutaneous suction drains effectively minimize wound fluid accumulation, thereby reducing bacterial presence and helping to prevent infections. According to the findings of other studies, the high rate of surgical site infections (SSIs) in the group that underwent simple skin closure, which affected 84% percent of patients, is a reflection of the difficulties associated with managing wound closure without drainage in high-risk surgeries. On the other hand, the subcutaneous suction drain group had a significantly lower infection rate of 16%, which is consistent with the findings of other prospective studies that highlight the benefits of drains in providing relief from postoperative complications. [11,16]

The length of time that patients in the simple closure group remained in the hospital was significantly higher than those in the subcutaneous drain group. The group that received subcutaneous suction drains had an average stay that was 8.94 days shorter than the group that received a simple skin group focused on closure (11.45 days). This study's finding is similar to the findings of other studies, which have demonstrated that the utilization of suction drains can lessen the likelihood of fluid accumulation and infection, thereby resulting in a more expedient recovery and a shorter duration of hospitalization. Our research demonstrates that there is a statistically significant difference ($p = 0.004$), which provides additional evidence that subcutaneous suction drains are beneficial in terms of enhancing recovery.[17]

Conclusion

In conclusion, the observed findings of our study provide strong support for the utilization of subcutaneous suction drains in emergency laparotomies in India. This is done to reduce surgical site infections (SSIs), shorten hospital stays, and improve results for patients. The findings of this investigation contribute to the increasing amount of proof that supports the utilization of suction drains in high-risk situations that operations on the abdominal region and provide valuable insights for the improvement of surgical practices in countries with limited resources.

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