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A Comparative Study on the Effectiveness of Placing Subcutaneous Suction Drains in Emergency Midline Laparotomy Incisions

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Abstract

Background

Surgical site infection (SSI) is a common complication following emergency midline laparotomy and is associated with increased morbidity, prolonged hospitalisation, and higher healthcare costs. Subcutaneous suction drainage has been proposed as an adjunct to postoperative wound management by facilitating fluid removal from the subcutaneous space. This study aimed to compare SSI incidence, postoperative wound findings, and length of hospital stay between patients undergoing emergency midline laparotomy with and without subcutaneous suction drainage.

Methods

This prospective comparative study was conducted in the Department of General Surgery at Kempegowda Institute of Medical Sciences, Bengaluru, over 18 months. A total of 60 consecutive adult patients undergoing emergency midline laparotomy were included, with 30 patients in the subcutaneous suction drain group (Group A) and 30 in the no-drain group (Group B). Group allocation was nonrandomised and based on the treating surgical team's clinical decision. Postoperative wound findings, including pain, redness, discharge, seroma formation, and wound dehiscence, were assessed on postoperative days 2, 3, 5, 7, 15, and 29. SSI incidence was compared using Fisher's exact test. Continuous outcomes were analysed using appropriate statistical tests, and multiple day-specific comparisons of wound findings were adjusted using the Holm procedure.

Results

The overall incidence of SSI was 26.7% (8/30) in Group A and 50.0% (15/30) in Group B; however, the difference was not statistically significant (p = 0.110). Wound-related findings were generally less frequent in the drain group at several follow-up assessments, but none of the day-specific comparisons remained statistically significant after Holm correction. The mean length of hospital stay was significantly shorter in Group A than in Group B (10.13 ± 3.22 vs. 12.00 ± 3.07 days; mean difference, -1.87 days; 95% CI, -3.49 to -0.25; p = 0.025).

Conclusions

Subcutaneous suction drainage was associated with a shorter hospital stay and a lower observed incidence of SSI following emergency midline laparotomy. However, the difference in SSI incidence was not statistically significant, and the day-specific wound-related findings were not statistically significant after adjustment for multiple comparisons. Larger multicentre studies are needed to clarify the effectiveness of subcutaneous suction drainage in preventing postoperative wound complications and to identify patients most likely to benefit.

Categories: General Surgery, Emergency Medicine, Gastroenterology
Keywords: emergency laparotomy, postoperative complications, subcutaneous suction drain, surgical site infection, wound dehiscence

Introduction

Emergency laparotomy is an essential surgical procedure for managing acute abdominal conditions such as perforated peritonitis, intestinal obstruction, traumatic abdominal injury, and intestinal ischemia. Despite advances in perioperative care and surgical techniques, emergency laparotomy remains associated with substantial postoperative morbidity and mortality. Surgical site infection (SSI) is one of the important postoperative complications, contributing to prolonged hospitalisation, increased healthcare costs, delayed

recovery, and reduced quality of life [1].

SSIs account for a substantial proportion of healthcare-associated infections and remain an important indicator of the quality of surgical care [2]. The Centers for Disease Control and Prevention (CDC) provides standardised criteria for the identification and classification of SSIs following surgery [3]. Patients undergoing emergency abdominal surgery may be particularly susceptible to SSI because of contaminated operative fields, prolonged operative duration, underlying sepsis, physiological instability, and the urgent nature of surgical intervention. The burden of SSI is also influenced by differences in healthcare resources, infection prevention practices, and perioperative care across healthcare settings [4,5].

The development of SSI is influenced by patient-related and procedure-related factors. Patient-related factors include advanced age, obesity, malnutrition, diabetes mellitus, immunosuppression, malignancy, and smoking. Procedure-related factors include wound contamination, prolonged operative duration, tissue ischemia, hypothermia, and higher American Society of Anesthesiologists (ASA) classification [6]. Effective SSI prevention therefore requires a comprehensive perioperative approach incorporating appropriate antimicrobial prophylaxis, meticulous surgical technique, adequate source control, maintenance of physiological stability, and standardised postoperative wound care [7,8].

Several preventive strategies have been proposed to reduce SSIs following abdominal surgery [9]. These include appropriate skin antisepsis, timely administration of antimicrobial prophylaxis, maintenance of aseptic technique, and careful postoperative wound management [10,11]. Negative-pressure wound therapy has also been investigated as an adjunctive intervention for selected high-risk surgical wounds, with the aim of managing wound exudate and reducing certain postoperative wound complications [12]. However, negative-pressure wound therapy and subcutaneous closed-suction drainage are distinct interventions and should not be considered interchangeable.

Subcutaneous closed-suction drains have been proposed as a relatively simple method of evacuating blood and serous fluid from the subcutaneous space following wound closure. By facilitating fluid removal, these drains may reduce subcutaneous fluid accumulation and seroma formation and potentially support wound healing. Nevertheless, their effectiveness in preventing SSI, wound dehiscence, and other postoperative wound complications remains uncertain, and the benefits may vary according to patient characteristics, operative conditions, and the degree of wound contamination. Although subcutaneous drainage has been investigated in abdominal surgery, evidence specifically addressing its role following emergency midline laparotomy remains limited.

Given the high risk of postoperative wound complications in patients undergoing emergency laparotomy and the uncertainty surrounding the effectiveness of prophylactic subcutaneous suction drainage in this setting, further clinical evaluation is warranted. The present study aimed to compare postoperative outcomes between patients undergoing emergency midline laparotomy with and without subcutaneous suction drain placement, focusing on SSI, postoperative wound-related findings, and length of hospital stay.

Materials And Methods

Study design and setting

This prospective comparative study was conducted in the Department of General Surgery at Kempegowda Institute of Medical Sciences (KIMS), Bengaluru, India, over an 18-month period. The study compared postoperative wound outcomes, surgical site infection (SSI), and length of hospital stay between patients who underwent emergency midline laparotomy with subcutaneous suction drain placement and those who underwent conventional wound closure without a drain. Institutional Ethics Committee approval was obtained under reference number KIMS/IEC/D177/M/2023, and written informed consent was obtained from all participants before enrolment.

Study population

The study included 60 consecutive adult patients undergoing emergency midline laparotomy during the 18-month study period, with 30 patients in each group. Group A comprised patients who underwent subcutaneous suction drain placement, whereas Group B comprised patients who underwent conventional wound closure without a subcutaneous drain.

Patients aged 18 years or older undergoing emergency midline laparotomy were eligible for inclusion. Patients undergoing redo laparotomy, those requiring delayed abdominal closure or planned relaparotomy, and those unwilling or unable to provide informed consent were excluded. Accidental postoperative drain removal was also recorded as an exclusion criterion in the study protocol.

Group allocation and surgical procedure

Patients were allocated to two groups according to the treating surgical team's decision regarding subcutaneous drain placement, based on the patient's clinical condition, degree of wound contamination,

and intraoperative assessment. Group A underwent placement of a subcutaneous closed-suction drain, whereas Group B underwent conventional wound closure without a subcutaneous drain. The study used a prospective comparative design with nonrandomised group allocation.

Following closure of the abdominal fascia, a single Romo Vac No. 16 closed-suction drain (Romsons Group Private Limited, Agra, India) was placed in the lower subcutaneous plane in Group A. The drain was exteriorised through a separate stab incision lateral to the main surgical wound and connected to its closed-suction collection reservoir to facilitate evacuation of accumulated blood and serous fluid from the subcutaneous space. The skin was subsequently closed using the operative technique employed for the wound. In Group B, the incision was closed without placement of a subcutaneous drain.

Drain output was recorded daily, and the drain was removed when the output was less than 25 mL for two consecutive days. Perioperative antimicrobial prophylaxis, fascial closure, operative management, and postoperative wound care were provided in accordance with institutional protocols in both groups.

Data sources and variables

Demographic, clinical, and operative data were collected prospectively using a structured case record proforma. The variables included age, sex, diabetes mellitus, obesity, malnutrition, smoking status, sepsis at presentation, American Society of Anesthesiologists (ASA) physical status, operative indication, wound contamination classification, bowel resection or stoma formation, and operative duration.

The primary outcome was the incidence of SSI following surgery. Secondary outcomes included postoperative wound pain, wound redness, wound discharge, seroma formation, wound dehiscence, and length of hospital stay (LOS).

Postoperative wound findings were assessed on days 2, 3, 5, 7, 15, and 29. Wound pain was recorded when pain localised to the surgical incision was documented. Redness was recorded when visible peri-incisional erythema was observed, and wound discharge was recorded when fluid emerged from the incision. Seroma was defined as a clinically identified collection of serous fluid within the subcutaneous space. Wound dehiscence was defined as partial or complete separation of previously approximated wound edges.

SSI events were assessed by the treating surgical team during postoperative follow-up using clinical examination and available clinical records. SSI was classified anatomically as superficial incisional, deep incisional, or organ/space infection using the applicable Centers for Disease Control and Prevention/National Healthcare Safety Network (CDC/NHSN) framework [3]. Superficial incisional SSI involved the skin and subcutaneous tissue; deep incisional SSI involved the deeper soft tissues, including fascia and muscle; and organ/space SSI involved an organ or anatomical space opened or manipulated during surgery. Each recorded SSI was assigned to the deepest applicable anatomical category, and the categories were treated as mutually exclusive. Individual wound findings, including pain, redness, discharge, seroma, and dehiscence, were assessed separately because none independently establishes an SSI diagnosis. Postoperative antibiotic initiation or escalation was considered supportive clinical information but was not used as the sole criterion for diagnosing SSI. Length of hospital stay was calculated in days and compared between the two groups.

Sample size

The study included 60 eligible patients over the 18-month period, with 30 in each group. The final sample size was determined by the number of eligible patients included during the study period rather than by a formal power-based sample-size calculation. Consequently, the precision of the estimated treatment differences and the ability to detect differences in less frequent wound complications were limited.

Statistical analysis

Data were entered into Microsoft Excel (Microsoft Corp., Redmond, WA)and analysed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY). Continuous variables were summarised as means and standard deviations, while categorical variables were expressed as frequencies and percentages. Normality of continuous variables was assessed before selecting the appropriate statistical tests.

Between-group comparisons of continuous variables were performed using the independent-samples Student's t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data. Categorical variables were compared using Pearson's chi-square test or Fisher's exact test, as appropriate. Fisher's exact test was used for categorical comparisons involving small event counts.

The primary outcome, SSI, was expressed as the number and percentage of affected patients in each group. The absolute risk difference was calculated as the SSI proportion in Group A minus that in Group B, with a 95% confidence interval (CI) used to describe the precision of the estimate. SSI subtype frequencies were presented descriptively.

Wound findings recorded at each postoperative assessment were analysed using day-specific comparisons. These analyses were treated as exploratory because separate comparisons at multiple time points do not account for within-patient correlation. The Holm procedure was applied across the 27 estimable day-specific comparisons involving pain, redness, discharge, seroma, and wound dehiscence to account for multiple testing. Comparisons in which both groups had zero events were considered not estimable.

Length of hospital stay was summarised as mean ± standard deviation. The between-group mean difference was calculated as the mean in Group A minus the mean in Group B, with a 95% CI. The length-of-stay comparison was performed using Welch's independent-samples t-test. All statistical tests were two-sided, and a p-value of less than 0.05 was considered statistically significant.

Results

A total of 60 patients undergoing emergency midline laparotomy were included in the comparative analysis. Thirty patients underwent subcutaneous suction drain placement (Group A), while 30 underwent conventional wound closure without a subcutaneous drain (Group B). Postoperative wound findings were assessed on postoperative days 2, 3, 5, 7, 15, and 29. The results are presented according to baseline characteristics, surgical site infection (SSI), postoperative wound findings, and duration of hospital stay.

The baseline demographic and clinical characteristics of the two groups are summarized in Table *1*. The mean age was 51.97 ± 16.85 years in Group A and 54.83 ± 17.72 years in Group B. The sex distribution was comparable, with males accounting for 56.7% and 60.0% in the respective groups. The groups also had similar reported frequencies of diabetes mellitus, obesity, malnutrition, smoking, sepsis, higher American Society of Anesthesiologists (ASA) physical status, perforation or peritonitis, contaminated or dirty wounds, bowel resection or stoma formation, and prolonged operative duration.

Characteristic	Group A: Drain (n = 30)	Group B: No drain (n = 30)	p-value
Age, years, mean ± SD	51.97 ± 16.85	54.83 ± 17.72	0.56
Age range, years	21-80	23-85	-
Male sex, n (%)	17 (56.7)	18 (60.0)	0.79
Female sex, n (%)	13 (43.3)	12 (40.0)	-
Diabetes mellitus, n (%)	7 (23.3)	8 (26.7)	-
Obesity, n (%)	8 (26.7)	9 (30.0)	-
Malnutrition, n (%)	9 (30.0)	10 (33.3)	-
Smoking, n (%)	5 (16.7)	6 (20.0)	-
Sepsis at presentation, n (%)	12 (40.0)	14 (46.7)	-
ASA physical status III-IV, n (%)	14 (46.7)	16 (53.3)	-
Perforation/peritonitis, n (%)	18 (60.0)	19 (63.3)	-
Contaminated or dirty wound, n (%)	21 (70.0)	22 (73.3)	-
Bowel resection or stoma formation, n (%)	10 (33.3)	12 (40.0)	-
Operative duration >120 minutes, n (%)	13 (43.3)	15 (50.0)	-

TABLE 1: Baseline demographic and clinical characteristics of the study population

Values are presented as number (percentage) unless otherwise indicated. ASA: American Society of Anesthesiologists; SD: standard deviation. Percentages are calculated using 30 patients per group.

The incidence and anatomical classification of SSI are presented in Table *2*. SSI occurred in 8 (26.7%) patients in Group A and 15 (50.0%) patients in Group B. The absolute difference in incidence was -23.3 percentage points for Group A compared with Group B (approximate 95% CI, -44.3 to 1.2 percentage points). However, the between-group comparison did not reach statistical significance (Fisher's exact test, p = 0.110). Superficial incisional SSI was the most frequently reported category in both groups.

SSI outcome	Group A: Drain (n = 30)	Group B: No drain (n = 30)
Any SSI, n (%)	8 (26.7)	15 (50.0)
No SSI, n (%)	22 (73.3)	15 (50.0)
Superficial incisional SSI, n (%)	6 (20.0)	10 (33.3)
Deep incisional SSI, n (%)	1 (3.3)	3 (10.0)
Organ/space SSI, n (%)	1 (3.3)	2 (6.7)
Overall comparison of any SSI	Fisher's exact p = 0.110	-

TABLE 2: Surgical site infection and classification

SSI: surgical site infection. Infection categories are classified according to the deepest anatomical level involved and are mutually exclusive. Percentages are calculated using 30 patients per group. The absolute difference is calculated as Group A minus Group B.

Postoperative pain, wound redness, and wound discharge were assessed at six time points (Table *3*). These findings were generally less frequent in Group A than in Group B. The largest differences included pain on postoperative day 7 (13.3% versus 43.3%) and wound discharge on postoperative day 5 (13.3% versus 50.0%). Several unadjusted comparisons had p-values below 0.05. However, because multiple related outcomes were assessed repeatedly, the results should be interpreted cautiously and in conjunction with the multiple-comparison analysis.

Outcome	Postoperative day	Group A: Drain, n (%)	Group B: No drain, n (%)	Fisher's exact p-value
Pain	2	1 (3.3)	3 (10.0)	0.612
Pain	3	6 (20.0)	14 (46.7)	0.054
Pain	5	5 (16.7)	13 (43.3)	0.047
Pain	7	4 (13.3)	13 (43.3)	0.020
Pain	15	1 (3.3)	7 (23.3)	0.052
Pain	29	0 (0.0)	5 (16.7)	0.052
Wound redness	2	1 (3.3)	4 (13.3)	0.353
Wound redness	3	4 (13.3)	11 (36.7)	0.072
Wound redness	5	5 (16.7)	14 (46.7)	0.025
Wound redness	7	4 (13.3)	14 (46.7)	0.010
Wound redness	15	0 (0.0)	5 (16.7)	0.052
Wound redness	29	0 (0.0)	4 (13.3)	0.112
Wound discharge	2	1 (3.3)	2 (6.7)	1.000
Wound discharge	3	3 (10.0)	9 (30.0)	0.104
Wound discharge	5	4 (13.3)	15 (50.0)	0.005
Wound discharge	7	4 (13.3)	13 (43.3)	0.020
Wound discharge	15	1 (3.3)	6 (20.0)	0.103
Wound discharge	29	0 (0.0)	4 (13.3)	0.112

TABLE 3: Postoperative pain, wound redness, and wound discharge during follow-up

Values represent the number (percentage) of patients with the specified finding at each assessment. Percentages are calculated using 30 patients per group. P-values are from unadjusted, two-sided Fisher's exact tests.

The frequency of seroma and wound dehiscence at each postoperative assessment is shown in Table *4*. Seroma was recorded less frequently in Group A than in Group B at all assessments after postoperative day 2. The largest difference was observed on day 7, when seroma occurred in 2 (6.7%) patients in Group A and 10 (33.3%) in Group B (unadjusted p = 0.021). Wound dehiscence was uncommon in both groups, and none of the unadjusted comparisons was statistically significant.

Outcome	Postoperative day	Group A: Drain, n (%)	Group B: No drain, n (%)	Fisher's exact p-value
Seroma	2	0 (0.0)	0 (0.0)	Not estimable
Seroma	3	1 (3.3)	4 (13.3)	0.353
Seroma	5	3 (10.0)	9 (30.0)	0.104
Seroma	7	2 (6.7)	10 (33.3)	0.021
Seroma	15	0 (0.0)	4 (13.3)	0.112
Seroma	29	0 (0.0)	4 (13.3)	0.112
Wound dehiscence	2	0 (0.0)	0 (0.0)	Not estimable
Wound dehiscence	3	0 (0.0)	0 (0.0)	Not estimable
Wound dehiscence	5	1 (3.3)	3 (10.0)	0.612
Wound dehiscence	7	2 (6.7)	6 (20.0)	0.254
Wound dehiscence	15	0 (0.0)	4 (13.3)	0.112
Wound dehiscence	29	0 (0.0)	4 (13.3)	0.112

TABLE 4: Seroma and wound dehiscence during follow-up

Values represent the number (percentage) of patients with the specified finding at each assessment. Percentages are calculated using 30 patients per group. "Not estimable" indicates that no events occurred in either group at that time point, preventing estimation of a between-group difference using the specified test. P-values are unadjusted for multiple comparisons.

The duration of hospital stay was compared between the two groups (Table *5*). The mean hospital stay was 10.13 ± 3.22 days in Group A and 12.00 ± 3.07 days in Group B. The mean difference was -.87 days (95% CI, -3.49 to -0.25; p = 0.025), indicating a shorter mean hospital stay in the drain group in this unadjusted comparison. This finding should be interpreted cautiously because length of stay may also be influenced by baseline illness severity, operative findings, postoperative complications, and discharge practices.

Outcome	Group A: Drain (n = 30)	Group B: No drain (n = 30)	Mean difference (95% CI)	p-value
Hospital stay, days, mean ± SD	10.13 ± 3.22	12.00 ± 3.07	-1.87 (-3.49 to -0.25)	0.025

TABLE 5: Duration of hospital stay

CI: confidence interval; SD: standard deviation. The mean difference was calculated as Group A minus Group B. A p-value less than 0.05 is considered to be statistically significant.

Discussion

This prospective comparative study evaluated the association between subcutaneous suction drainage and postoperative wound outcomes following emergency midline laparotomy. The principal findings were a lower observed incidence of surgical site infection (SSI) and a shorter postoperative hospital stay in patients who received a subcutaneous suction drain. However, the difference in overall SSI incidence between the two groups was not statistically significant. Wound-related findings, including pain, redness, discharge, seroma, and dehiscence, were generally less frequent in the drain group at several follow-up assessments, although none of the day-specific comparisons remained statistically significant after adjustment for multiple testing. These findings suggest that subcutaneous suction drainage may have a role in postoperative wound management, but its effectiveness in preventing SSI and other wound complications requires further evaluation [13].

The two groups had broadly comparable baseline demographic and clinical characteristics. There were no statistically significant differences in age or sex distribution, and the groups were also similar with respect to several clinical characteristics and operative factors. Nevertheless, the drain group and the no-drain group differed numerically in some risk factors, including sepsis, higher ASA class, contaminated or dirty wounds, bowel resection or stoma formation, and prolonged operative duration. These differences are

important because they may influence postoperative wound healing and infection risk. Although the overall baseline profile supports a descriptive comparison between the groups, the prospective comparative design does not eliminate the possibility of confounding. Similar baseline comparability between patients receiving subcutaneous suction drainage and those undergoing conventional closure has been described by Sivabalan et al. [14].

Postoperative wound complications remain an important concern following emergency laparotomy, particularly in patients with contaminated wounds, systemic infection, and other factors that impair tissue healing. In the present study, SSI occurred in 8 of 30 patients (26.7%) in the drain group compared with 15 of 30 patients (50.0%) in the no-drain group. Although this represented an absolute difference of 23.3 percentage points in favour of drainage, the difference did not reach statistical significance (Fisher's exact test, $p = 0.110$). The observed difference may be clinically relevant, but it should be interpreted cautiously because the relatively small sample size limits the precision of the estimate. The findings therefore do not establish that subcutaneous suction drainage significantly reduces SSI following emergency midline laparotomy.

A possible explanation for the lower observed frequency of wound complications is that continuous suction facilitates the removal of fluid from the subcutaneous space. By limiting fluid accumulation, drainage may reduce the formation of seromas and local tissue tension and may support the healing of the incision. However, the presence of a drain does not itself establish protection against bacterial contamination or infection. The effectiveness of drainage may depend on patient characteristics, the degree of wound contamination, the adequacy of surgical source control, drain management, and other perioperative practices. Previous studies by Naik et al. [13] and Goyal et al. [15] have examined the role of subcutaneous drainage in postoperative wound management. Their findings provide a basis for considering the potential value of drainage, although differences in study populations, operative settings, and outcome definitions should be considered when comparing their results with those of the present study.

The serial assessment of wound findings showed that pain, redness, and wound discharge were generally less frequent in the drain group at several postoperative time points. Some unadjusted comparisons showed nominal statistical significance, particularly for pain and redness on postoperative days 5 and 7 and discharge on postoperative day 5. Seroma was also less frequent in the drain group at some follow-up assessments. However, because multiple day-specific comparisons were conducted, Holm correction was applied to reduce the risk of false-positive findings. Following this adjustment, none of the estimable comparisons remained statistically significant. Consequently, these findings should be interpreted as descriptive patterns rather than conclusive evidence of a reduction in individual wound complications. Further studies with larger samples and prespecified outcome analyses are needed to establish whether these differences represent consistent treatment effects.

Wound dehiscence is a multifactorial complication influenced by infection, tissue oedema, nutritional status, comorbidities, the degree of wound contamination, and surgical technique. In this study, dehiscence events were relatively few in both groups, and the between-group comparisons did not demonstrate statistically significant differences after accounting for multiple testing. The lower observed frequencies of some wound complications in the drain group are broadly consistent with the clinical rationale for managing subcutaneous fluid accumulation, but the present findings do not establish that suction drainage prevents wound dehiscence. Previous work by Naik et al. [13] and Mallaiah et al. [16] has explored strategies to reduce postoperative wound complications, while the review by Sandy-Hodgetts et al. [17] highlights the broader importance of effective postoperative wound management. Differences in interventions and clinical settings, however, limit direct comparisons with the present study.

An important finding was the shorter postoperative hospital stay among patients who received subcutaneous suction drainage. The mean length of stay was 10.13 ± 3.22 days in the drain group and 12.00 ± 3.07 days in the no-drain group, corresponding to a mean difference of -1.87 days (95% CI: -3.49 to -0.25; $p = 0.025$). This statistically significant difference suggests that drainage was associated with a shorter hospital stay in this study. Improved management of wound-related problems could potentially contribute to earlier discharge, but the study did not establish that reduced wound complications directly caused the shorter stay. Length of hospitalisation may also be influenced by the severity of the initial illness, recovery from the underlying abdominal condition, additional procedures, and local discharge practices. Previous studies by Naik et al. [13] and Zhuang et al. [18] provide relevant context for considering the relationship between wound management and postoperative recovery. Nevertheless, the observed difference in length of stay should be interpreted as an association rather than definitive evidence of a causal effect of drainage.

The evidence concerning prophylactic subcutaneous drains remains heterogeneous. Studies by Baier et al. [19] and Kaya et al. [20] did not demonstrate a significant reduction in SSI with drain placement in elective abdominal surgery. Differences between these studies and the present investigation may relate to the operative setting, patient risk profile, wound contamination, and perioperative practices. Emergency laparotomy frequently involves patients with acute intra-abdominal pathology and potentially contaminated wounds, making postoperative wound management particularly challenging. However, differences in clinical setting alone cannot explain the variation in outcomes, and the present study's nonsignificant SSI result should not be interpreted as proof of benefit. Taken together, the available

findings support continued evaluation of subcutaneous suction drainage in selected high-risk surgical patients rather than routine use in every patient undergoing emergency laparotomy.

The findings have practical implications for postoperative care following emergency midline laparotomy. Subcutaneous suction drainage was associated with a lower observed SSI frequency and a significantly shorter hospital stay, while several wound-related findings were numerically less frequent during follow-up. These results may justify further investigation of drainage as an adjunct to standard wound care, particularly in patients with substantial wound-related risk factors. However, decisions about drain placement should also consider the individual patient's clinical condition, operative findings, and the potential disadvantages of drain use. Larger, preferably randomised multicentre studies are required to determine whether the observed differences persist in broader patient populations and whether drainage provides a reproducible benefit in preventing SSI and other clinically important complications.

Strengths and limitations

The strengths of this study include its prospective comparative design, evaluation of patients undergoing emergency midline laparotomy, and serial assessment of wound-related outcomes at predefined postoperative intervals. The study also evaluated several clinically relevant outcomes, including SSI, pain, redness, discharge, seroma, wound dehiscence, and length of hospital stay. The inclusion of both early and later postoperative assessments provided a broader description of wound recovery than a single postoperative assessment would have allowed.

Several limitations should be acknowledged. First, this was a single-centre study with a relatively small sample of 60 patients, limiting the precision and generalizability of the findings. Second, the comparative design was nonrandomized, and potential confounding from patient characteristics, disease severity, wound contamination, and operative factors cannot be excluded. Third, the study may have been underpowered to detect differences in individual wound complications and SSI. Fourth, the multiple day-specific comparisons of wound findings required adjustment for multiple testing; none remained statistically significant after Holm correction. Finally, follow-up was limited to the postoperative period assessed in this study, and longer-term outcomes such as incisional hernia, scar quality, and other drain-related complications were not established. Larger multicentre studies with appropriate allocation methods, prespecified outcomes, and longer follow-up are needed to clarify the effectiveness and safety of subcutaneous suction drainage following emergency abdominal surgery.

Conclusions

In this prospective comparative study of patients undergoing emergency midline laparotomy, subcutaneous suction drainage was associated with a lower observed incidence of SSI and a significantly shorter postoperative hospital stay. However, the difference in overall SSI incidence was not statistically significant, and none of the day-specific comparisons of wound findings remained statistically significant after adjustment for multiple testing. The results therefore suggest a possible benefit of subcutaneous suction drainage but do not establish that it prevents postoperative wound complications. The shorter hospital stay is a notable finding, although a causal relationship with drain placement cannot be confirmed by this study design. Subcutaneous suction drainage may be considered as an adjunct to postoperative wound management in appropriately selected patients, but routine use cannot be recommended on the basis of these findings alone. Larger, preferably randomised multicentre studies are required to establish its effectiveness, identify patients most likely to benefit, and evaluate longer-term outcomes and potential drain-related complications.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Acquisition, analysis, or interpretation of data: Piyush Bhagat, Sharanya Vijay, Madhushankar Lingegowda, S Jayasurya , Sneha Zakkir

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Kempegowda Institute of Medical Sciences issued approval KIMS/IEC/D177/M/2023. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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