ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 03 | March - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"EFFECTIVENESS OF SUBCUTANEOUS SUCTION DRAINS IN DECREASING SURGICAL SITE INFECTIONS FOLLOWING ABDOMINAL SURGERY: A PROSPECTIVE OBSERVATIONAL STUDY AT A TERTIARY CARE CENTER."

General Surgery

Dr Piyush Jain Assistant Professor, General Surgery, ESIC Medical College And Hospital.

Dr Prashansa Bansal DNB 3RD Year Resident, General Surgery, ESIC Medical College And Hospital.

ABSTRACT

Background: Following abdominal surgeries, surgical site infections (SSIs) are a major postoperative complication that increases morbidity, lengthens hospital stays, raises healthcare expenses, and increases the risk of incisional hernias in the future. Serous fluid, or blood, can build up in the dead space of abdominal wounds and serve as a growth medium for bacteria. By decreasing dead space and preventing fluid buildup and seroma formation, subcutaneous suction drains aid in lowering this risk. **Methods:** The Department of Surgery ESIC Medical college and hospital, Jaipur carried out this prospective observational study. There were 100 adult patients in this trial, ranging in age from 20 to 60. In 50 patients at random, a closed subcutaneous suction drain was placed prior to skin closure (drain group); the subcutaneous suction drains of the remaining 50 patients were not placed (no-drain group). **Results:** A total of 100 patients were included in the study, with 50 patients in each group. The mean age and gender distribution were comparable between Group A and Group B, with no statistically significant differences . However, Group A demonstrated significantly better outcomes, including a lower rate of surgical site infection, shorter duration of hospital stay, and reduced incidence of wound dehiscence compared to Group B . **Conclusion:** The results of our study suggests that subcutaneous suction drains are effective in minimizing surgical site infections following laparotomy, thereby reducing hospital stay and wound dehiscence rates.

KEYWORDS

Microbial growth, laparotomy, surgery, drains, and surgical site infections

INTRODUCTION

Wound healing and its related complications are major postoperative concerns, as they contribute to increased patient morbidity. Proper wound care and timely management of infections in open wounds are therefore essential components of surgical practice.(1,2).Surgical site infections (SSIs) are significant postoperative complications that occur when microorganisms invade surgical tissues, typically within 30 days for superficial wounds and within 30 to 90 days for deeper layers. While the global incidence ranges from 0.5% to 15%, rates in India are notably higher, reported between 23% and 38% (3).The risk of developing a surgical site infection after an operation is influenced by both the virulence of the microorganisms and the size of the bacterial inoculum. Poor surgical technique resulting in dead space, hematoma, or devitalized tissue, as well as the presence of foreign materials such as sutures or drains, further increases the likelihood of infection. Patients with elevated body mass index, alcoholism, chronic cardiac conditions, or diabetes are particularly susceptible due to impaired immune function and delayed wound healing. Various preventive measures, including minimizing preoperative shaving, maintaining strict hand hygiene, and administering prophylactic antibiotics, have been recommended to reduce SSI rates. In addition, the accumulation of fluid and necrotic tissue in the subcutaneous layer may promote the growth of intestinal microorganisms, thereby contributing to the development of surgical site infections.(4,5).Several studies have demonstrated that the use of subcutaneous suction drainage tubes in the early postoperative period plays a significant role in reducing incisional surgical site infections. By continuously removing contaminated fluid, blood, and necrotic tissue from the subcutaneous space, these drains help prevent fluid accumulation and bacterial proliferation. Their use is particularly beneficial in emergency laparotomy cases, where the risk of contamination is higher. Additionally, subcutaneous drains aid in obliterating dead space within the wound, promoting better tissue approximation and wound healing, thereby decreasing the incidence of infection, wound dehiscence, and other postoperative wound-related complications.(6-9)

OBJECTIVE

The effectiveness of subcutaneous drainage in patients undergoing abdominal surgery is demonstrated by this study.

METHODS

This prospective observational study was carried out in ESIC Medical College and Hospital ,JAIPUR, at the Department of Surgery. 100 patients who underwent laparotomy between January 2022 and December of 2025 were included in this six-month study. This study comprised adult patients aged 20 to 60.All patients presenting to our surgical OPD who fit into inclusion criteria and needed abdominal surgery were included in this study. After taking the required demographic data of the patient, a detailed clinical history of the patient was obtained. Thorough general and local examination was done. Required investigations were done to establish the diagnosis.A prophylactic dose of antibiotic was given before the surgery. After opening the peritoneal cavity, the extent and type of contamination were assessed, followed by thorough peritoneal lavage with warm saline, and definitive management of the primary pathology. An abdominal drain was placed prior to wound closure. The rectus sheath was closed using non-absorbable sutures, typically Prolene. A 16F Romo-vac suction drain was positioned and secured in the subcutaneous plane; these patients constituted the study group, while patients in whom no subcutaneous drain was placed served as the control group.

Inclusion Criteria

This study comprised patients who were older than 20 year, undergoing both elective and emergency abdominal procedures.

Exclusion Criteria

Individuals with immune-compromised conditions, such as HIV, radiation therapy, chemotherapy, and multiple laparotomies, were not allowed to participate.

RESULTS

Fifty of the 100 patients were chosen at random to have a closed subcutaneous suction drain inserted prior to skin closure, while the remaining fifty patients did not receive the drain. Within 28 days following surgery, SSI cases were identified.

Results are shown in different table format.

Table 1: Age Distribution Of Study Patients In Two Groups

Group	N	MEAN	AGE RANGE
Group A	50	36	22-58
Group B	50	33.8	25-54

The mean age of patients in Group A was 36 years (range: 22–58 years), while in Group B it was 33.8 years (range: 25–54 years). The difference in mean age between the two groups was not statistically significant (p value= 0.18)

Table 2: Gender Distribution Of Study Patients In Two Groups

Group	Group A		Group B	
	NO.	% AGE	NO.	%AGE
MALES	35	70 %	30	60%
FEMALES	15	30 %	20	40 %
TOTAL	50	100%	50	100 %

In Group A, 35 patients (70%) were male and 15 patients (30%) were

female. In Group B, males constituted 30 patients (60%), while females accounted for 20 patients (40%). Thus, both groups showed male predominance, which was more pronounced in Group A but there was no statistically significant association between gender and group allocation. (p=0.29)

Table 3: SSI Rate Distribution Of Study Patients In Two Groups

Group	GROUP A		GROUP B	
	NO.	% AGE	NO.	% AGE
SSI PRESENT	8	16 %	20	40 %
SSI ABSENT	42	84 %	30	60 %
TOTAL	50	100%	50	100 %

The incidence of surgical site infection differed between the two groups. In Group A, 8 patients (16%) developed SSI, whereas 42 patients (84%) did not. In contrast, Group B showed a higher SSI rate, with 20 patients (40%) developing infection and 30 patients (60%) remaining infection-free. (P VALUE-≈ 0.008)

Table 4: Duration Of Hospital Stay In Two Groups

Group	N	MEAN	RANGE
Group A	50	7.5	5-11 days
Group B	50	12.5	8-16 days

The mean duration of hospital stay in Group A was 7.5 days, with a range of 5 to 11 days. In comparison, patients in Group B had a longer mean hospital stay of 12.5 days, ranging from 8 to 16 days.The mean duration was significantly higher in Group B (12.5 ± 2.0 days) compared to Group A (7.5 ± 1.5 days), $t(98) \approx 14.1$, $p < 0.001$.

Table 5: Wound Dehiscence In Two Groups

wound dehiscence	GROUP A		GROUP B	
	NO.	% AGE	NO.	%AGE
Present	2	4 %	12	24%
Absent	48	96 %	38	76 %
TOTAL	50	100%	50	100 %

Wound dehiscence occurred in 2 patients (4%) in Group A and in 12 patients (24%) in Group B. The rate of wound dehiscence was significantly lower in Group A compared to Group B.There was a statistically significant association between wound dehiscence and study group ($\chi^2(1) = 8.31$, $p = 0.004$).

DISCUSSION

In this study, we examined the impact of subcutaneous closed suction drainage (SCSD) during midline laparotomy closure in both elective and emergency abdominal surgeries. The use of SCSD was associated with a marked reduction in surgical site infections, wound dehiscence, and the need for repeat laparotomies, while also improving the success of conservative management for intraperitoneal infections. Additionally, it significantly lowered the occurrence of incisional hernias. Surgical site infections remain a major cause of morbidity, particularly in emergency laparotomies, and their incidence, prevention, and management have been extensively investigated. Colorectal surgeries, in particular, demonstrate a higher risk of SSI due to the presence of intestinal microorganisms.(10)

Cruse and Foord reported an average infection rate of 4.8% across various surgical specialties, noting higher rates among elderly patients, those with prolonged hospital stays, and certain types of procedures. Our findings differ, showing that infection rates may also increase with the use of drains. Subcutaneous drains, however, can help decrease bacterial load around the wound by removing residual fluid and blood, which could otherwise promote bacterial growth. Studies conducted at multiple centers in India have reported SSI rates ranging from 6.09% to 38.7%.(11-13)

According to the current study, the rate of SSI In Group A, 16% developed SSI,. In contrast, Group B showed a higher SSI rate, The mean age of patients in Group A was 37.2 years (range: 22–58 years), while in Group B it was 33.4 years (range: 25–54 years). In Group A, 35 patients (70%) were male and 15 patients (30%) were female. In Group B, males constituted 30 patients (60%), while females accounted for 20 patients (40%).The two groups' mean ages did not differ significantly.Additionally, a different study discovered that infection rates were higher in emergency procedures (25.2%) than in elective surgeries (7.6%). (9). Inadequate preoperative preparation and the more often occurrence of infected or filthy wounds are responsible for the high incidence of infection in emergency procedures. This study confirmed earlier research that SSI development results in longer hospital stays.48% of the cultures proved positive for polymicrobial etiology of SSI, according to "Suragul" and his colleagues. Enterococcus, E. coli, and Klebsiella pneumonia are common intestinal inhabitants and are the most common pathogens in abdominal surgery. According to a study, Klebsiella pneumonia was the second most common bacterium isolated, after E. coli.(9) .Multiple studies have identified a range of risk factors associated with the development of incisional surgical site infections after colorectal surgery. These include diabetes mellitus, preoperative anemia, hypoalbuminemia, wound classification, increased subcutaneous fat thickness, among other factors.(14-19)

In another study, patients were deliberately selected to emphasize differences in incisional surgical site infection rates between two groups. The study population included individuals with diabetes mellitus, hypoalbuminemia (albumin ≤30 g/L), and anemia (hemoglobin ≤10 g/L). A higher incidence of SSI was observed in patients with operative durations of five hours or more, as well as in those with albumin levels ≤3 g/dL. Similarly, SSI rates were increased among patients with hemoglobin levels below 10 g/dL. Because drainage tubes are considered unsuitable for patients with minimal subcutaneous fat, only patients with a subcutaneous fat thickness exceeding 2.5 cm were included. Following tissue dissection and suturing—particularly when electrocautery was used—subcutaneous fat was prone to necrosis and liquefaction(9,20).Numerous studies have demonstrated that obesity raises the risk of infection following surgery. (21).The accumulation of fluid and necrotic tissue within the subcutaneous layer is believed to promote rapid proliferation of intestinal microorganisms, thereby increasing the risk of surgical site infection. Under these conditions, microorganisms originating from the colorectal tract can readily multiply, particularly in patients with compromised immune function(22).Accordingly, the immediate postoperative period is a critical window for the development of surgical site infections, making preventive measures during this phase especially important. Early removal of accumulated fluid and necrotic tissue that may promote microbial growth—most notably through the placement of a subcutaneous suction drain—is thought to substantially lower the incidence of incisional SSIs. However, among the studies included in the meta-analysis, only two trials demonstrated a significant reduction in SSI rates in patients who received drainage(23). High-risk patients, such as those having emergency laparotomies and those with dense subcutaneous fat, were added by Fujii et al. They discovered that the risk ratio (RR 0.37 (0.15–0.9)) showed a decrease in the SSI rate in the drain group(23). Furthermore, Soper et al. found that a patient's subcutaneous fat depth is a separate risk factor for SSI Therefore, although this conclusion is not totally obvious from the meta-analysis due to underpowering, subcutaneous drains may be advantageous for high-risk and/or obese patients. The various sorts of wounds in the control and draining groups were actually described in two investigations. Using a subcutaneous drain resulted in a 34% overall decrease in SSI in this research(24).

LIMITATIONS

This study's multi-center design had a weakness that could result in data loss. Patients may see varying results depending on their age and location.

CONCLUSION

According to studies, individuals following abdominal surgery can recover more quickly by employing a subcutaneous suction drainage tube, which reduces morbidity, shortens hospital stays, and speeds up rehabilitation. Therefore, the use of a subcutaneous suction drain should be taken into consideration when sealing the abdominal wall following surgery.

REFERENCES

1. Arora A, Bharadwaj P, Chaturvedi H. A review of prevention of surgical site infections in Indian hospitals based on global guidelines for the prevention of surgical site infection, 2016. J Patient Saf Infect Control. 2018;6:1-12.
2. Allegranzi B, Zayed B, Bischoff P, Kubilay NZ, de Jonge S, de Vries F, et al; WHO Guidelines Development Group. New WHO recommendations on intraoperative and postoperative measures for surgicalsiteinfectionprevention:anevidence-based global perspective. Lancet Infect Dis. 2016;16(12):e288-303.
3. Mahadik A, Budhkar A, Jain S, Patil A, Beldar N. Efficacy of Subcutaneous Suction Drain in Reducing Postoperative Surgical Site Infection In Laparotomy Cases. Int J Med Sci Curr Res. 2024;7(1):81-92.
4. PaniciPB,ZulloMA,CasalinoB,AngioliR,Muzii L. Subcutaneous drainage versus no drainage after minilaparotomy in gynecologic benign conditions: a randomized study. Am J Obstet Gynecol. 2003;188(1):71-5.
5. ChaiFY, JiffreD.Preoperativehypoalbuminemiais an independent risk factor for the development of surgical site infection following gastrointestinal surgery. Ann Surg.

2011;254(4):665-6.
6. Colli A, Camara ML. Correction: first experience with a new negative pressure incision management system on surgical incisions after cardiac surgery in high risk patients. J Cardiothorac Surg. 2012;7:37.
7. WatanabeJ,OtaM,KawamotoM,AkikazuY,Suwa Y, Suwa H, et al. A randomized controlled trial of subcutaneous closed-suction Blake drains for the prevention of incisional surgical site infection after colorectal surgery. Int J Colorectal Dis. 2017;32(3):391-8.
8. Baier PK, Glück NC, Baumgartner U, Adam U, Fischer A, Hopt UT. Subcutaneous Redon drains do not reduce the incidence of surgical site infections after laparotomy. A randomized controlled trial on 200patients.IntJColorectalDis.2010;25(5):639-43.
9. Mahadik A, Budhkar A, Jain S, Patil A, Beldar N. Efficacy of Subcutaneous Suction Drain in Reducing Postoperative Surgical Site Infection In Laparotomy Cases. Int J Med Sci Curr Res. 2024;7(1):81-92.
10. Smith RL, Bohl JK, McElearney ST, Friel CM, Barclay MM, Sawyer RG, et al. Wound infection after elective colorectal resection. Ann Surg. 2004;239(5):599-605.
11. Mahesh CB, Shivakumar S, Suresh BS. A prospective study of surgical site infections in a teaching hospital. J Clin Diagnost Res. 2010;4:3114- 9.
12. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean- contaminated cases. Indian J Med Microbiol. 2005;23(4):249-52.
13. Ganguly PS, Khan Y, Malik A. Nosocomial infection and hospital procedures. Indian J Comm. 2000;990- 1014.
14. Krieger BR, Davis DM, Sanchez JE, Mateka JJ, Nfonsam VN, Frattini JC, et al. The use of silver nyloninpreventingsurgicalsiteinfectionsfollowing colon and rectal surgery. Dis Colon Rectum. 2011;54(8):1014-9.
15. Hennessey DB, Burke JP, Ni-Dhonochu T, Shields C, Winter DC, Mealy K. Preoperative hypoalbuminemia is an independent risk factor for the development of surgical site infection following gastrointestinal surgery: a multi-institutional study. Ann Surg. 2010;252(2):325-9.
16. Malone DL, Genuit T, Tracy JK, Gannon C, Napolitano LM. Surgicalsiteinfections: reanalysisofrisk factors. J Surg Res. 2002;103(1):89-9.
17. Romy S, Eisenring MC, Bettschart V, Petignat C, FrancioliP,TroilletN.Laparoscopeuse andsurgical site infections in digestive surgery. Ann Surg. 2008;247(4):627-32.
18. YoungH,KnepperB,MooreEE,JohnsonJL,Mehler P, Price CS. Surgical site infection after colon surgery: National Healthcare Safety Network risk factors and modeled rates compared with published risk factors and rates. J Am Coll Surg. 2012;214(5):852-9.
19. Teppa R, Sude NS, Karanam VPK, Mallipudi BVP. Relevance of Subcutaneous Fat Thickness as a Risk Factor for Surgical Site Infections in Abdominal Surgeries. Cureus. 2022;14(1):e20946.
20. BraakenburgA,ObdeijnMC,FeitzR,vanRooijIA, van Griethuysen AJ, Klinkenbijl JH. The clinical efficacy and cost effectiveness of the vacuum- assisted closure technique in the management of acute and chronic wounds: a randomized controlled trial. Plast Reconstr Surg. 2006;118(2):390-7.
21. DindoD,MullerMK,WeberM,ClavienPA.Obesity in general elective surgery. Lancet. 2003;361(9374):2032-5.
22. Hellums EK, Lin MG, Ramsey PS. Prophylactic subcutaneous drainage for prevention of wound complications after cesarean delivery - a meta- analysis. Am J Obstet Gynecol. 2007;197:229.
23. Fujii T, Tabe Y, Yajima R. Effects of subcutaneous drainforthepreventionof incisionalSSIinhigh-risk patients undergoing colorectal surgery. Int J Colorectal Dis. 2011;2609:1151-5.
24. Soper DE, Bump RC, Hurt WG. Wound infection after abdominal hysterectomy: effect of the depth of subcutaneous tissue. Am J Obstet Gynecol. 1995;173(2):465-9.