

# Role of Subcutaneous Negative Suction versus Simple Subcutaneous Drain Closure in Contaminated Abdominal Surgeries in Pediatric Age Group

IMTIAZ AHMED<sup>1</sup>, IQRA ASLAM<sup>2</sup>, GHASHIA KHAN<sup>3</sup>, MUHAMMAD AKBAR<sup>4</sup>, ALI HASHAM<sup>5</sup>, MUHAMMAD ANWAR MEMON<sup>6</sup>

<sup>1</sup>Assistant Professor Pediatric Surgery, Liaquat University of Medical Health Sciences, Jamshoro Sindh

<sup>2</sup>Resident Pediatric Surgery, Liaquat University of Medical Health Sciences, Jamshoro

<sup>3</sup>Senior Registrar Department of Surgery Ibne sina University Mirpurkhas

<sup>4</sup>Assistant Professor Department of Surgery, Liaquat University of Medical Health Sciences, Jamshoro

<sup>5</sup>Resident Pediatric Surgery, Liaquat University of Medical Health Sciences, Jamshoro

<sup>6</sup>Senior Registrar Department of Surgery, Liaquat University of Medical Health Sciences, Jamshoro

Correspondence to: [Imtiaz Ahmed, Email: driq00@gmail.com](mailto:ImtiazAhmed@gmail.com)

## ABSTRACT

**Introduction:** Contaminated abdominal surgical laparotomy incisions and their care are basic principles in the field of surgery. In emergency or trauma laparotomy, the primary surgeon's pivotal role is to optimize the untoward incision wound response, excise or debride viable/nonviable tissues, and alleviate the process of wound healing near to normal function. In contaminated abdominal surgeries, wound contamination is unavoidable that occurs at the time of surgery, and several methods are used to prevent wound complications.

**Material and Methods:** To assess the impact of subcutaneous negative suction versus simple subcutaneous drains on the outcome of surgical wound infection, we conducted an observational study involving patients with contaminated abdominal surgical laparotomy wounds. The study was conducted in the Department of Pediatric Surgery at Liaquat University Hospital Hyderabad. Over five years from January 2015 to December 2020 about 300 patients underwent emergency or trauma laparotomy. Patients were divided into two groups A and B 150 each group by random sampling.

**Results:** In our study, negative suction drain versus simple subcutaneous drain without suction during the closure of the contaminated abdominal surgical wound in emergency or trauma laparotomy, the negative suction drain is highly suggestive to decrease postoperative wound infection, seroma formation, and wound disruption. Compared to a simple subcutaneous drain, the utilization of a subcutaneous suction drain following the closure of the abdominal sheath result in effective wound drainage, reducing the risk of wound infection and disruption.

**Conclusion:** Subcutaneous suction drain has a better outcome as compared with simple subcutaneous without suction in the management of contaminated surgical laparotomy wounds.

**Keywords:** Negative suction drain, simple drain, seroma, wound disruption.

## INTRODUCTION

Contaminated abdominal surgical laparotomy incision and their care are basic principles in the field of surgery. In emergency or trauma laparotomy, the primary surgeon's pivotal role is to optimize the untoward incision wound response, excise or debride viable/nonviable tissues, and alleviate the process of wound healing near to normal function. During contaminated abdominal surgeries, wound contamination is inevitable and occurs during the surgical procedure. To prevent wound complications, various techniques are employed.

Contaminated abdominal surgical laparotomy wounds and their care are basic principles in the field of surgery. Wound complications not only lead to higher morbidity but also significantly increase mortality rates as they involve the violation of mechanical or anatomic defense mechanism violation<sup>1</sup>. Wound infection within the first week of contaminated abdominal surgery is the most common response in the postoperative period<sup>2</sup>. Infections wound seroma and wound dehiscence are commonly seen in infected wounds postoperatively. Wound dehiscence is primarily caused by wound infection and seroma formation in contaminated abdominal surgeries. Surgical site infection by hospital-acquired infection in postoperative patients accounts for 38% of all such infections<sup>3</sup>. Infectious morbidity in surgical patients postoperatively caused by a wound infection. Infectious Wound has an immense role in Mortality and morbidity, patient anxiety, patient dissatisfaction, and health care burden<sup>4,5</sup>. In contaminated abdominal surgeries the unavoidable contamination of the wound at the time of surgery, makes surgeons use a different method for the prevention of wound infection. One of the most known complications of moderate to severe contaminated laparotomy wound<sup>6</sup> is wound infection of the surgical site. Hospital-acquired surgical site infections are the third most commonly reported infection that harms the hospital environment as well as the patient<sup>7</sup>. Preoperative antibiotics cover to decrease the prevalence of surgical site infection cases<sup>8-10</sup>. Infected wound complication

causes a notable increase in tenderness in patients, longer hospital stay, burst abdomen, and later on incisional hernia

## MATERIAL AND METHODS

Our observational study was conducted on patients with contaminated abdominal surgical laparotomy wounds to evaluate the outcome of subcutaneous negative suction versus simple subcutaneous drains in the outcome of surgical wound infection. The study was conducted in the Department of Pediatric Surgery at Liaquat University Hospital Hyderabad. Over five years from January 2015 to December 2020 about 300 patients underwent emergency or trauma laparotomy with age groups from 1 year to 12 years. Patients were divided into two groups A and B with 150 patients in each group by random sampling. Upon admission, all patients underwent a baseline investigation and were administered prophylactic antibiotics. Patients with moderate to severe contamination were then evenly divided into two groups, regardless of their pathology. In both groups, a subcutaneous drain was placed along the entire length of the wound via a separate incision with or without suction. The patients with less than 1 year and more than 12 years, sepsis, liver insufficiency or renal failure, patients requiring ileostomy, or patients who expired postoperatively due to systemic illness were not included in the study. Incidentally drain out was also not included in the study. In all patients, the wound closure was simply interrupted by vicryl. Suction and a simple subcutaneous drain were placed through a separate and dependent incision and were removed on the fifth postoperative day. We monitored all patient's incisional wounds postoperatively to identify any wound collection, surgical site infection, and wound disruption. Additionally, we regularly followed up with all patients in the outpatient department for a month to detect any signs or symptoms of wound infection. The infected incision wound was drained by the primary surgeon. Surgical wound infections were treated with culture-positive antibiotics regular dressings if necessary then debridement.

Statistical analysis of data by SPSS (Version 21.0). Continuous variables were summarized as Mean  $\pm$  SD and categorical variables as percentages. A p-value of less than 0.05 was considered statistically significant. There was a significant statistical difference between suction versus simple subcutaneous drains. The occurrence of surgical wound infection was significantly lower in the subcutaneous suction drain group (15.3%) as compared to the simple drain group (30%), with a statistically significant difference observed with a p-value less than 0.002. In the suction drain group, 14.7% of cases developed seroma, whereas in the simple drain group, the number was higher at 50%, and the difference was statistically significantly observed with a p-value of less than 0.001. Similarly, wound disruption was lower in the suction drain group at 12%, as compared to 45.3% in the simple drain group. There was a statistically significant difference observed, with a p-value of less than 0.001.

Table 1: Surgical wound infection, seroma formation, and wound disruption

Surgical site infection	Subcutaneous Suction Drain % (no.) A	Subcutaneous Simple drain % (no.) B	P value
Present	15.3% (23)	30% (45)	0.002
Absent	84.7 % (127)	70% (105)	
Total	100 (150)	100 (150)	
Seroma	Subcutaneous Suction Drain % (no.)	Subcutaneous Simple drain % (no.)	P value
Present	14.7 % (22)	50 % (75)	0.001
Absent	85.3% (128)	50 % (75)	
Total	100 (150)	100 (150)	
Wound Dehiscence	Subcutaneous Suction Drain % (no.)	Subcutaneous Simple drain % (no.)	P value
Present	12 % (18)	45.3 % (68)	0.001
Absent	88 % (132)	54.7 % (82)	
Total	100 (150)	100 (150)	

\*Statistically significant difference (p-value < 0.05)

## DISCUSSION

Surgical wound infection, localized collection or seroma formation, and wound dehiscence are the most frequent complications resulting from contaminated abdominal surgeries. Infectious complications due to contaminated abdominal surgeries are one of the main sources of postoperative morbidity. Surgical site infection is one of the commonest complications in the first week of surgery. The role of a subcutaneous negative suction drain versus simple subcutaneous without suction has decreased dramatically the prevalence of surgical wound infection, localized collection, and wound disruption; however, limited data is accessible for subcutaneous suction drain and their role in contaminated abdominal surgeries.

We did not use any irrigation through the drain or topical application of antibiotics but was done in one of the previous studies<sup>11</sup>. Although Wound complication in some of the cases in our study shows blockage of a drain by clot or debris is one of the reasons for not using irrigation technique Farnell et al.<sup>11</sup>. Takaaki et al.<sup>12</sup> conducted a study at the Department of General Surgical Sciences, Graduate School of Medicine, and Gunma University of Japan,<sup>13</sup> which found that the rate of surgical site infection was 14.3% in the study group and 38% in the control group. Similarly, Khan et al.<sup>14</sup> reported that the infection rate in the study group was 12%, compared to 30% in the control group. In a retrospective review of 47 patients undergoing emergency surgery for colorectal perforation, Yasuo et al.<sup>15</sup> found that the overall rate of surgical site infection was 36.2%, but the rate of wound infection in cases with the JVAC™ drainage system was lower at 16.7% compared to 56.5% in cases without the drainage system. These results suggest that a subcutaneously sealed suction tube is effective in preventing surgical site infection in high-risk patients undergoing emergency surgery for colorectal perforation.

When a subcutaneous negative suction drain was used, there was a significant reduction in the amount of discharge, and the conversion from purulent to serous was rapid. This is because negative suction drains prevent the formation of seromas and the subsequent growth within the subcutaneous space. Additionally, patients who received the subcutaneous negative suction drain had a significantly lower incidence of wound infection compared to those who received a simple drain without suction. Wound infection is a major source of morbidity and can result in prolonged hospital stays, increased costs, secondary suturing, and long-term complications such as an incisional hernia. Antibiotic prophylaxis has been shown to reduce wound infection rates, but the subcutaneous negative suction drain is also an effective measure for decreasing morbidity. This can lead to a reduction in overall hospital stay and allow patients to resume normal activities sooner. Wound dehiscence, which is a disruption in any or all of the layers of a wound, can occur in 3% of patients with abdominal wounds and is commonly seen between 5 to 8 days after surgery. The use of a subcutaneous negative suction drain can decrease wound infection and wound dehiscence, which in turn reduces the risk of incisional hernias.

Three categories of surgical site infection exist superficial incisional infection that affects the skin and subcutaneous tissue, deep incisional infection that involve the fascial and muscle layers, and organ/space infections that occur in any part of the body that was handled during the surgical procedure.<sup>16</sup>

Kagita et al conducted studies that yielded similar results, where superficial site infection was reported to be 12.50% in cases and 69.44% in control, with a significant p-value of 0.0001.<sup>17</sup> The finding mentioned earlier have been contraindicated by the study conducted by Alsafrani et al.<sup>18</sup>

## CONCLUSION

Based on our observational study, the use of subcutaneous negative suction drains is an effective way to decrease the incidence of surgical site infections, wound dehiscence, and average hospital stay in emergency laparotomies, especially for surgical wounds with moderate to severe contamination. This method is technically feasible and simple, making it a practical option for contaminated emergency surgical procedures that can also reduce healthcare costs.

## REFERENCES

1. Leaper DJ. 2004. Surgical infection. Bailey & Love's short practice of surgery, 27th edition.
2. Kujath P et al. 2010. Complicated skin, skin structure and soft tissue infections - are we threatened by multi-resistant pathogens? European Journal of Medical Research 15:544-553.
3. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR (1999) Guideline for Prevention of Surgical Site Infection. Am J Infect Control 27; 97-132.
4. Wilson AP, Gibbons C, Reeves BC, Hodgson B, Liu M, et al. (2004) surgical wound infection as a performance indicator: agreement of common definitions of wound infection in 4773 patients. BMJ 25; 329:720.
5. Scott RD II (2009) the direct medical costs of healthcare-associated infections in US. hospitals and the benefits of prevention.
6. Williams N, O'Connell PR. Bailey & Love's short practice of surgery. 26th Edition. CRC Press; 2013.
7. Shahane V, Bhawal S, Lele U. Surgical site infections: A one year prospective study in a tertiary care center. Int J Health Sci (Qassim). 2012;6(1):79-84.
8. Wong ES. Surgical site infections. In: Mayhall CG, editor. Hospital epidemiology and infection control. 1st ed. USA: Williams and Wilkins; 1996: 154-74.
9. Anvikar AR, Deshmukh AB, Karyakarte RP, Damle AS, Patwardhan NS, Malik AK, et al. A one year prospective study of 3280 surgical wounds. Indian J Medical Microbiol. 1999;17(3):129-32.
10. Berard F, Gandon J. Factors influencing the incidence of wound infection. Ann Surg. 1964;160:32-81.
11. Farnell MB, Worthington S, Peter M, Duane M, McIlrath DC (1986) Closure of abdominal incisions with subcutaneous catheters: A Prospective Randomized Trial. Arch Surg 121:641-648.

12. Muneiah SN, Roopesh Kumar NM, Sabitha P, Prakash GV (2015) Abdominal wound dehiscence- A look into the risk factors. IOSR- J Dental Med Sci 14:47-54.
13. Fujii T, Tabe Y, Yajima R, Yamaguchi S, Tsutsumi S, et al. (2011) Effect of subcutaneous drain for prevention of incisional SSI in high risk patients undergoing colorectal surgery. Int J Colorectal Surg 26:1151-1155.
14. Khan AQ, Kodalkar M (2016) Role of negative suction drain in subcutaneous plane in reducing laprotomy wound infection. Int J Scientific Res 5: 692-694.
15. Sumi Y, Yamashita K, Kanemitsu K (2014) Effects of subcutaneous closed suction drain for the prevention of incisional SSI in patients with colorectal perforation. Surg Sci 5:122-127.
16. Townsend C M, Beauchamp R D, Evers B M, Mattox K L. Surgical infections and antibiotic use: Sabiston textbook of Surgery: The biological basis of modern surgical practice. 21st ed. Amsterdam: Elsevier. 2021;224-5.
17. Kagita R, Mulla SA, Pai BS, Desai M. Subcutaneous negative pressure versus simple closure of skin incision following an emergency laparotomy: a randomized control study. Int Surg J. 2019;6:1230-7.
18. Alsafrani TA, Alabbasi AA, Dabroom AA, Alhothali MM, Alresini KA, Aboalsamh GA, et al. The Effectiveness of Superficial Drain to Reduce Surgical Site Infection in Colorectal Surgery. Cureus. 2021;13(8):e17232.