

## Original Research

# The Association Of Intra Abdominal Drain With Surgical Site Infection – A Prospective Observational Study

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Received: 06 December, 2023

Accepted: 29 December, 2023

### ABSTRACT

**Background:** Surgical site infection is one of the most common types of nosocomial infection encountered in surgical patients and a potential cause of mortality and morbidity adding to the economic burden of patients and hence it draws all the possible efforts for its prevention. Surgical site drains of various types are used at the end of various abdominal surgeries considering its therapeutic as well as diagnostic use. Drain can be a cause of surgical site infection too since it acts as a conduit for transporting outside infection to surgical site and being a foreign body causes inflammatory response in the body.

**Materials And Methods:** This prospective observational study was conducted in a tertiary care medical college at Ludhiana, Punjab. Patients undergoing intra-abdominal surgeries were taken for this study. Patients with and without intra-abdominal drains were observed during post operative period on day 3, day 7, after one month and after three months for surgical site infections and detailed structured proforma was filled.

**Results:** In this study we found that intra-abdominal drains are risk factor for surgical site infections in patients undergoing abdominal surgeries. In this study we observed the risk of surgical site infection to be 31.4%.

**Conclusion:** The use of intra-abdominal drain is associated with surgical site infection. Drains kept in situ for longer duration, and a greater number of intra-abdominal drains increases the risk of SSI.

**Keywords:** Surgical site infection, Intra-abdominal drain, Abdominal surgery

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### INTRODUCTION

“When in doubt, drain”- Lawson Tait gave this dictum in 19<sup>th</sup> century. Drains are appliances or implants that acts as a deliberate channel through which established or potential collection of pus, blood or other body fluids egress to allow a gradual collapse and apposition of tissue.<sup>1</sup>Use of drain in surgical practice dates to ancient Greece around 400 BC during Hippocrates age. Hippocrates performed surgical drainage of pus with a tin pipe placed into the abscess cavity.<sup>1,2</sup> Use of oxen bones and aortas, catgut, glass, and brass tubes have been described to be used as drain during ancient time. Horsehair, linens, and silk were often placed within the drainage tube to assist with capillary drainage.<sup>3</sup>The principle of using a drain in surgery is an age-old practice and even today this practice continues considering early detection of complications, such as postoperative

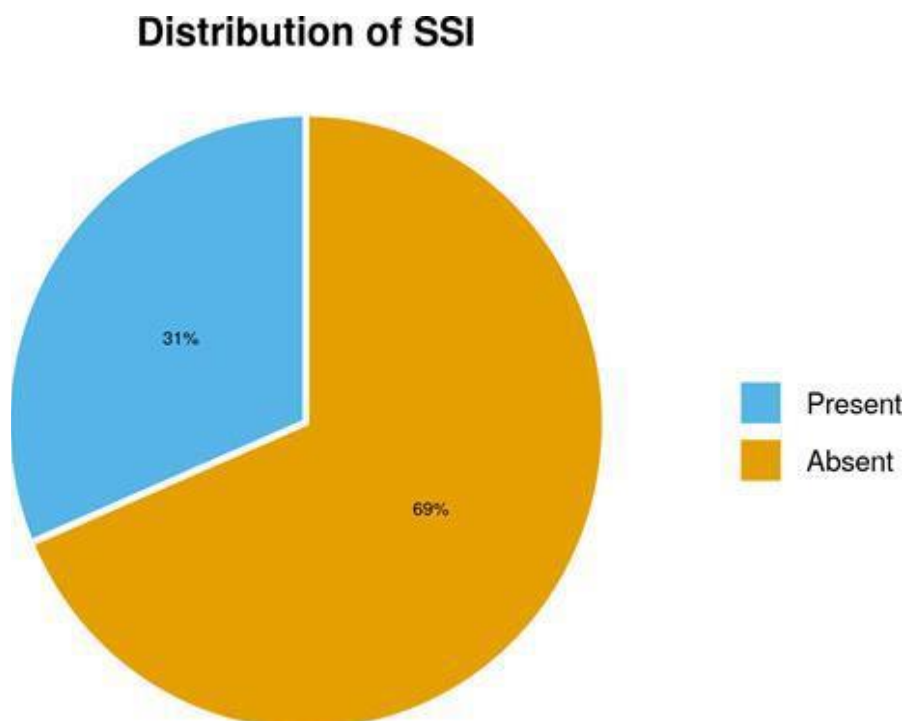
hemorrhage and anastomotic leakage although we know the potential complications of using a drain.Surgical site drains of various types are used at the end of various abdominal surgeries considering its therapeutic as well as diagnostic use. Surgical site drains of various types are used at the end of various abdominal surgeries to prevent the post operative collection and to drain the infective collection in a pre-existing dirty wound. Drains are also used at surgical site as a standard practice that aids in the reduction of dead space and removal of blood and tissue secretions, thereby helping to prevent hematoma and seroma.<sup>4</sup> In a pre-existing infection and dirty surgical sites use of drain helps in draining the infected fluid collection and thus reducing the infection load and hence early recovery of patient with fewer complications. Intra-abdominal drains also act as an indicator for anastomotic leak in

gastrointestinal surgeries and also one of the obvious indicator for hemorrhage. Therefore, keeping all this into consideration and based on the personal experience of the individual surgeon and/or institutional tradition, drain is used for monitoring possible anastomotic leak and bleeding as well as for draining and preventing intra-abdominal collection.<sup>5</sup> Like other invasive devices, the presence of a drain in situ may predispose to biofilm formation and bacterial invasion of the wound. Bacterial invasion of the wound occurs due to colonization of the outer surface of the drain at the exit site from the body. Alternatively, contamination at the lower end of the drain when it is disconnected for emptying may cause intraluminal colonization and subsequent wound infection.<sup>6</sup> Apart from SSIs drain has many other complications that includes tissue reactions, hemorrhages, bowel hernia, delayed healing time, drain entrapment, fluid and electrolyte loss, dislodgement of drain, and damage to viscera by erosion.<sup>7</sup> Surgical site infections are wound infection that occurs after any surgical procedure. Surgical site infection is defined as an infection occurring within 30 days after an operation and involves either a discharge of pus (purulent discharge), with or without laboratory confirmation; an organism isolated from an aseptically obtained culture; or signs and symptoms of infection, such as localized swelling, redness, or tenderness.<sup>8</sup>

## MATERIALS AND METHODS

This prospective observational study was conducted in Department of General Surgery in a tertiary care teaching hospital in North India. This study was done from December 2018 to May 2020 for a total period of 18 months. Only those individuals who fulfilled the predefined inclusion criteria were included in this study. Individuals included in the study were observed and analyzed on account of American Society of Anesthesiologists physical status classification system, wound class, duration of surgery, type of drain, and number of drain and duration of drain in situ. Individuals included in the study were also assessed for presence of co-morbidities which can lead to surgical site infections. Following operation of the patient, both groups i.e. with drain and without drain were observed on post operative day 3, day 7, after one month, and after 3 months for signs and symptoms of surgical site infection. Minimum sample size for this study was taken to be 100 cases. Patients were evaluated for signs and symptoms of surgical site infections as defined by CDC. Symptoms and signs like tenderness, swelling, erythema, discharge, wound dehiscence, local temperature at wound site, and raised body temperature. Interventions done for surgical site infection by the surgeons were also observed.

## RESULTS



**Figure 1: Distribution of the Participants in Terms of SSI (n = 102)**

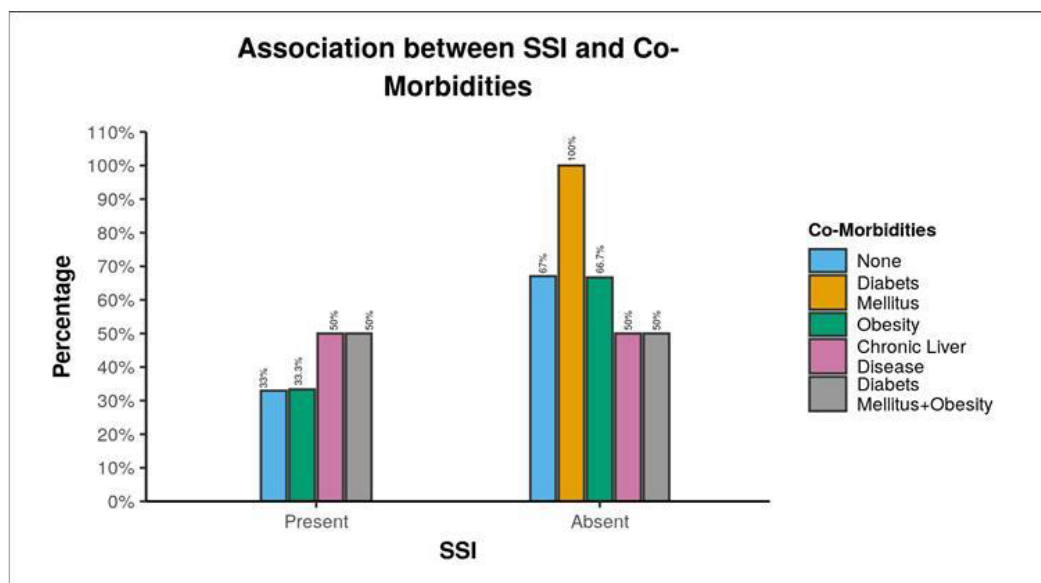


Figure 2: Association Between SSI and Co-Morbidities (n = 102)

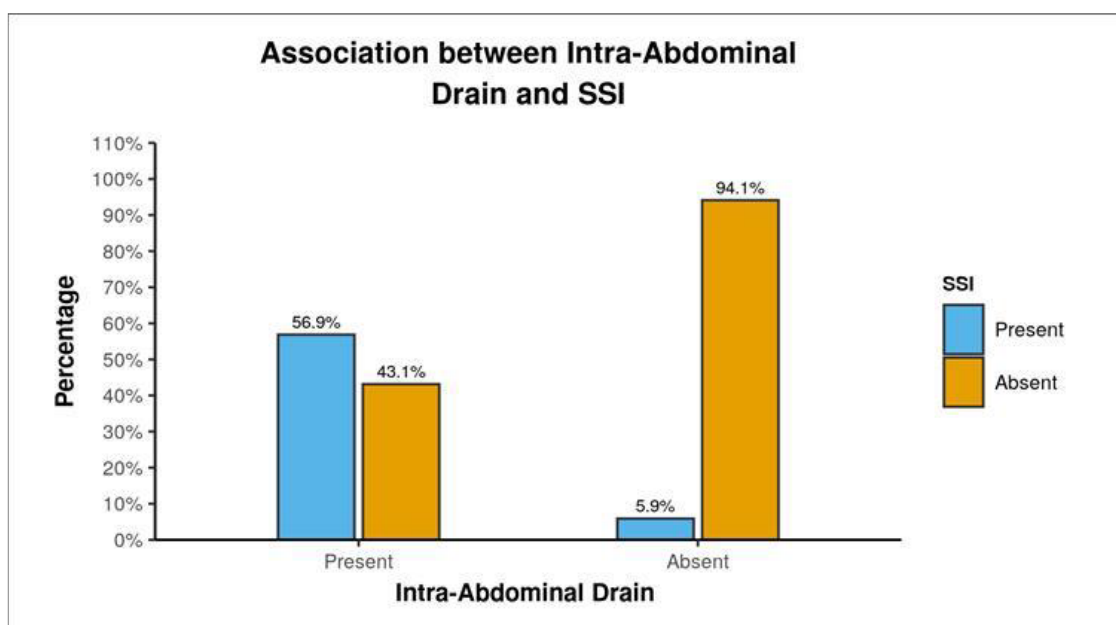


Figure 3: Association Between Intra-Abdominal Drain and SSI (n = 102)

In this study we found that intra-abdominal drains are risk factor for surgical site infections in patients undergoing abdominal surgeries. In this study we observed the risk of surgical site infection to be 31.4%. In our study 1.0% of the total participants were underweight, 73.5% of the participants had normal BMI, 20.6% of the participants were Overweight and 4.9% of the participants were obese. In our study the incidence of SSI among individuals with normal BMI was 29.3%, and in overweight group it was 33.3% and in obese it was 40.0%. In our study in drain group patients with normal BMI has a SSI incidence of 57.95, in overweight group SSI incidence was 44.4%, in obese group SSI incidence was 66.7%. In without drain group the individual with normal BMI has a SSI incidence of 0%, overweight has 0%, obese had 25%. More use of drain was observed in obese individuals.

### DISCUSSION

In individuals with no co-morbidities SSI was observed in 33% cases, in patients with chronic liver disease incidence of SSI was 50% and in patients with CLD and diabetes mellitus the incidence of SSI was 50%. In our study use of drain was more in contaminated and dirtier wounds. Among the drain group 33.3% cases were having dirty wounds. Incidence of SSI was observed to be highest in dirty wounds. In dirty wounds the incidence of SSI was 76.5%. In the drain group 60.8% of the participants had closed drain and 39.2% of the participants had Closed Suction drain. 28.4% of the participants had 1 drain, 19.6% of the participants had 2 drains and 2.0% of the participants had 3 drains. The day of drain removal was not normally distributed. The mean (SD) of post operative day of drain removal was 6.46

(7.17). The median (IQR) of post operative day of drain removal was 5.00 (3.25-6). In our study the duration of drain in situ ranged from 2 days to 45 days. During post operative follow up 23 (22.5%) of the participants were observed to be having discharge: Present from the wound, Dehiscence was present in 8 (7.8%) of the participants. 12 (11.8%) of the participants were found to have developed fever during post operative follow up and 18 (17.6%) of the participants had pain over surgical site. Erythema was present in 4 (3.9%) of the participants. In our study the incidence of SSI came out to be 31.4%. This incidence is comparatively higher than the average incidence of SSI as found in other similar studies conducted in India.<sup>86,87</sup> But rate of SSI in abdominal surgeries has been observed to be as high as 69% in some of the studies.<sup>58</sup> In our study we found a significant difference between the drain groups and no drain groups in terms of SSI. In this study 56.9% of the participants in the drain group had developed SSI in some form as compared to 5.9% of the participants developing SSI in the no drain group. In this study we have observed that a greater number of drains has higher association with SSI. Patients without drain has SSI rate of 5.9% in our study and patient with 1, 2, and 3 drains have SSI rate of 51.7%, 60.0% and 100.0% respectively. Study done by Mujagic E et al has also shown that a greater number of drains associated with higher incidence of SSI.<sup>88</sup> In our study we observed that in maximum number of cases SSI was first observed by 3rd post operative day.

## CONCLUSIONS

1. Use of intra-abdominal drains is a risk factor in causing surgical site infection in patient undergoing abdominal surgeries.
2. Various types of drain have different association with surgical site infection. Use of open drain carries higher risk of SSI as compared to closed suction drain.
3. Use of a greater number of drains is associated with more risk of developing SSI.
4. Duration of intra-abdominal drain in situ has a correlation with SSI. Use of intra-abdominal drain for longer duration of time increases the risk of SSI both at incision site and at drain site.
5. Use of intra-abdominal drain increases the duration of operation.
6. If patients are discharged with drain in-situ then risk of SSI increases even more.
7. Male gender has higher incidence of SSI as compared to females.
8. Longer duration of surgery is an independent risk factor in causing SSI.
9. Use of steroids and immunosuppressant makes the individual more susceptible to develop SSI.
10. Higher BMI is an independent risk factor for SSI.
11. Surgeries done in emergency settings are more prone to develop SSI.

12. Most of the SSI gets detected by post operative day 3.

So intra-abdominal drain should be used very judiciously after assessing the risk associated with drain and benefits of placing an intra-abdominal drain after abdominal surgeries. If use of drain is indicated in a particular surgery, then use of a closed suction drain system should be preferred over an open drain system so as to decrease the risk of SSI and also number of intra-abdominal drains should be kept to minimum to decrease the risk of SSI in patients undergoing abdominal surgeries. In clean surgeries use of intra-abdominal drain should be prevented. Early removal of intra-abdominal drain should be practiced preventing occurrence of SSI in patients undergoing abdominal surgeries. In case any intra-abdominal drains are placed then care must be taken to discharge the patients from hospital only after drain removal.

## BIBLIOGRAPHY

1. JG, Makama, Ameh EA. Surgical drains: what the resident needs to know. *Niger J Med.* 2008;17.
2. Murray CK. Infectious disease complications of combat-related injuries. *Crit Care Med.* 2008;36:S358-64.
3. Meyerson JM. A brief history of two common surgical drains. *Ann Plast Surg.* 2016;77:4-5.
4. Robinson JO. Surgical drainage: an historical perspective. *Br JSurg.* 1986;73:422-6.
5. Giovanazzo F, Butturini G, Salvia R, Mascetta G, Monsellato D, Marchegiani G, et al. Drain management after pancreatic resection: state of the art. *J Hepatobiliary Pancreat Sci.* 2011;18:779.
6. Felipe WA, Werneck GL, Santoro-Lopes G. Surgical site infection among women discharged with a drain in situ after breast cancer surgery. *World JSurg.* 2007;31:2293.
7. Memon MA, Memon MI, Donohue JH. Abdominal drains: A brief historical review. *Ir Med J.* 2001;94:164-6.
8. Webster J, Osborne S. Preoperative bathing or showering with skin antiseptics to prevent surgical site infection. *Cochrane Database Syst Rev.* 2015.