

Role of Closed Suction Drain in the Prevention of SSI in Elective Surgery

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ABSTRACT

Background: Presence of haematoma, serous fluid, and dead space in a wound increase the risk of infection as they act as a culture media. Multiple options had been mentioned to reduce these risks. We tried to assess the incidence of SSI following placement of closed suction drains following elective surgeries. **Methods:** A prospective observational study was conducted in the Department of General Surgery, IPGMER & SSKM Hospital, Kolkata from January 2016 to June 2017. Patients who were given a subcutaneous suction drain after an elective general surgical procedure were included in the study. Patients unwilling to take part in the study, patients from paediatric age group, on steroids, with Class 4 wounds and those underwent Laparoscopic Surgery were excluded. Outcome was measured in the form of presence or absence of SSI and data was analysed. **Results:** No statistically significant decrease of incidence of SSI was found in terms of different age, sex, socio-economic status, duration of hospital stays, smoking or alcoholism. Increased incidence of SSI was detected among Diabetics even after using closed suction drainage. **Conclusion:** Placement of closed suction drain did not significantly reduce incidence of SSI following elective general surgical procedures.

Keywords: Suction drain, SSI.

INTRODUCTION

Surgical site infection (SSI) has been defined as that infection presenting up to 30 days after a surgical procedure if no prosthetic is placed and up to 1 year if a prosthetic is implanted in the patients. SSI responsible for significant discomfort for patients, excess morbidity and mortality, as well as increased financial burden on the health system. Surgical site infections have been shown to compose up to 20% of all healthcare-associated infections. At least 5% of patients undergoing a surgical procedure develop a surgical site infection.^[1]

The risk of developing SSI is multifactorial and include the degree of microbial contamination of the operation site indicated by wound class, patient age, length of surgery, preoperative shaving of the operative site, hypothermia and co morbidities e.g. diabetes and obesity.^[2] Infection can weaken an abdominal closure and result in wound dehiscence and incisional hernia. Despite amazing advances in

medical sciences, post-operative wound infection lingers as a potential killer. Control of infection is a major consideration before, during and after operation; which can be achieved by reducing the microbial inoculums and treating established infection.^[3]

Presence of haematoma, serous fluid, and dead space in surgical incisional wounds increase the risk of infection as this acts as a culture medium³. Subcutaneous drains have been used to reduce the risk of infection.^[4] However, the use of postoperative subcutaneous wound drainage is not universally accepted. Drains may not be efficacious, cause discomfort, increase infection rate and increased hospital stay on their own.^[5] The objective of closed suction drainage of an established surgical site wound collection is to facilitate sucking out such collection with the aim of increasing patient's comfort, decreasing patient morbidity and decreasing the length of hospitalization.

The use of closed suction drains in medicine dates back to the third century BC when Hippocrates utilized hollow tubes to treat empyema.^[6] Closed suction irrigation method is a modification of the VAC technique. Vacuum assisted closure (VAC) is a well-described technology with applications in a variety of "difficult to manage" acute and chronic

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wounds. Since Cruse et al. published their prospective study of 23,659 surgical wounds in 1973, which showed a lower wound infection rate (1.8% vs 2.4%) with a closed suction drain system than a Penrose wound drain closed suction drain systems have been preferred to open systems. Thereafter, in almost all studies, subcutaneous wound drain refers to a closed suction drain system.^[7] The Mini-VAC Drainage System has two characteristics: pressure is a maximum of 60 mmHg so that the drainage is not excessive, and obstruction of the drainage tube is improbable because the Silicon Drain is designed with 4 slits, so that if one slit is obstructed, suction can continue from the other openings. Compared to the VAC technique, there is no need to use a special foam dressing.

The aim of our study was to assess the incidence of SSI after applying closed suction drain after elective general surgery in our institute.

MATERIALS AND METHODS

We conducted a prospective observational study from January 2016 to June 2017 in the Department of General Surgery, IPGMER & SSKM Hospital, Kolkata. On approval from Institutional Ethical Committee, all patients who were given a subcutaneous suction drain after an elective general surgical procedure were included in the study. Patients unwilling to take part in the study, patients from paediatric age group, on steroids, with Class 4 wounds and those underwent Laparoscopic Surgery were excluded from the study.

Outcome was measured in the form of presence or absence of surgical site infection as per CDC definition. Data was collected in a preformed data sheet, analysed in Microsoft Excel 365 and was appropriate statistical tools were used for analysis of the cumulated data.

RESULTS

A total 200 consecutive patients were included (109 males, 91 females) in our study after application of relevant exclusion criteria. Among them 22 (11%) patients had SSI despite giving a suction drain.

We divided the patients into younger age group (<45 years of age) and older age group (>45 years of age). On analysis, 9.6% of patients in younger age group and 12.2% of patients of older age group developed SSI despite giving a suction drain (p value = 0.544, not significant).

Despite use of suction drain, eleven (10%) out of total 109 males developed SSI, whereas 12% of females (11 out of 91) developed SSI (p-value = 0.653, not significant). When compared among patients from different socio-economic strata, 7.1% (6 out of 78) patients from lower class, 13.2% (9 out of 59) from lower middle class and 14.58% (7 out of

41) patients from middle class in socioeconomic strata developed SSI (P value = 0.749, not significant).

Among 39 patients with history of alcohol intake, 4 (9.3%) developed SSI; whereas 18 out of 139 patients (11.4%) developed SSI in spite of giving a suction drain (p-value = 0.688, not significant). Similarly, 8.77% (5 out of 52) smokers and 11.88% (17 of 126) non-smokers developed SSI despite giving a suction drain (p=0.525, non-significant).

None of the 2 patients with BMI <18 developed SSI, 9.63% (16 of 150) patients with BMI 18-25 developed SSI despite giving suction drain, whereas, 18.75% (6 of 26) patients with BMI >25 developed SSI despite suction drain (p=0.316, not significant).

When compared among diabetics and non-diabetics, 21.7% (10 of 36) of diabetic patients and 7.7% (12 of 142) of non-diabetic patients developed SSI even after placement of closed suction drain (P value = 0.008, significant as <0.05).

Nine patients out of 83 (9.7%) of patients with preoperative hospital stay <1 week developed SSI as compared to 12% (13 out of 95) patients with pre-operative hospital stay > 1 week, developed SSI even with closed suction drain placement (P=0.612).

When compared considering length of surgery, 10.13% (15 of 133) patients with duration of surgery ≤ 2 hours developed SSI as opposed to 13.46% (7 of 45) of those underwent surgery for >2 hours duration (p=0.510, not significant).

DISCUSSION

For wound healing to progress methodically, the local environment of the wound should be healthy. Evidence indicates that if a wound is not allowed to drain freely, blood, body fluids, pus and necrotic material will collect in the wound, providing a growth medium for microorganism. Surgical wound drainage is recognized as a key element in facilitating the healing process.

Our study showed no statistically significant improvement in decreasing SSI with the use of subcutaneous closed suction drain. However, multiple studies have showed significant role of closed suction drain in wound drainage. In a study by Shah et al., placement of closed suction drains significantly prevented suture line infection in Elective Laparotomy wounds among patients aged from 18 to 65 years. Extremes of age had higher incidence of wound infections, perhaps owing to decreased immunocompetence.^[7]

Our study showed no significant difference in occurrence of SSI among different sexes despite using closed suction drain. Sohn et al., in their report of 280 cases, showed a higher incidence of infection in males (47%) as compared with females (31%).^[8] Another study conducted in a Peruvian Hospital in 2005 by Hernandez et al. supported the same. In our

study there was no significant association between gender predisposition of SSI.

Among the risk factors for SSI, obesity is the most well-known and widely studied. Shah et al. showed no significant difference between patients with and without closed suction drain in terms of BMI. This was in contrast with a study conducted in 1976 by Pitkin et al, where he observed a 29% wound complication rate in obese patients in comparison to 4% in non-obese patients⁹. Our study showed an increased percentage of SSI among obese patients though p value was not significant.

In a study conducted by Ukwenya Y et al, prolong operating time was found to be a significant risk factor for SSI.^[9] They found out that insertion of subcutaneous suction drains provided effective drainage of the collection without the need of open drainage. In our study, 10.13% patients with short duration operating time developed SSI as opposed to 13.46% of those who had prolonged operating time. Length of OT does not appear to have a significant effect on causation of SSI despite giving suction drain.

Gallup et al. in their prospective study on 197 patients concluded that use of subcutaneous drains plus prophylactic antibiotics may decrease wound related complication rate when operating on obese gynaecologic patients (20% in study group vs 31% in control group).^[10]

In our study, patients with longer hospital stay, developed higher SSI even with closed suction drain placement though data was statistically insignificant. Placement of suction drain did not change incidence of SSI among smokers and habit of alcohol intake and different socio-economic status.

In our study, 21.7% of diabetic patients and 7.7 % of non-diabetic patients developed SSI even after placement of closed suction drain (P value = 0.008). This shows using closed suction drain did not decrease SSI among diabetics, rather increased it, probably because of increased susceptibility to infection and least of a closed suction drain in controlling infection in them.

CONCLUSION

Placement of closed suction drain did not significantly reduce incidence of SSI following elective general surgical procedures.

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