

# Role of Prophylactic Subcutaneous Drain in Reducing Surgical Site Infections in Patients Undergoing Elective Abdominal Surgery

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**Abstract:** ***Introduction:** We are concerned about the wound healing in post operative patients, since wound complications will increase the morbidity of patient. Wound management is a basic practice in surgery, especially after an elective abdominal surgery. Our task after surgery is to avoid and thereby to reduce the adverse effects of wound complications such as hematoma, seroma and surgical site infection. The rationale for the use of subcutaneous drain is based on the principle that removal of the collecting serum or debris and elimination of dead space in subcutaneous plane will result in lower rate of infection and wound complications. Only a few studies are available in the literature regarding the role of subcutaneous drain in the prevention of local wound complications and majority of these studies were done in female patients who undergoes gynaecological or breast surgeries, with controversial results. Many elective abdominal surgeries are routinely performed in general surgical units of our institution and a subcutaneous collection in such patients increases the morbidity. **Objectives:** The main objective of our study is to determine whether subcutaneous drain can reduce the post operative wound complications in patients undergoing elective abdominal surgery. **Discussion:** Any surgery in obese individuals will have complications whether done electively or emergency. These include seroma, hematoma, wound dehiscence and surgical site infections. These complications will prolong the hospital stay of the patient and cause economic burden to the patient. These collections in the wound act as a nidus for infection. These complications will lead to wound failure or dehiscence. **Conclusion:** In our study it is concluded that placement of a subcutaneous drain in individuals with increased subcutaneous fat thickness helps in reducing the local wound complications and reducing the hospital stay of the patients and also aids in faster recovery.*

**Keywords:** Surgery, subcutaneous drain, surgical site infections, hematoma, seroma

## 1. Introduction

Infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections (SSIs). SSIs are one of the most important causes of healthcare-associated infections (HCAIs). A prevalence survey undertaken in 2006 suggested that approximately 8% of patients in hospital in the UK have an HCAI. SSIs accounted for 14% of these infections and nearly 5% of patients who had undergone a surgical procedure were found to have developed an SSI. However, prevalence studies tend to underestimate SSI because many of these infections occur after the patient has been discharged from hospitals.

SSIs are associated with considerable morbidity and it has been reported that over one-third of postoperative deaths are related, at least in part, to SSI. However, it is important to recognise that SSIs can range from a relatively trivial wound discharge with no other complications to a life-threatening condition. Other clinical outcomes of SSIs include poor scars that are cosmetically unacceptable, such as those that are spreading, hypertrophic or keloid, persistent pain and itching, restriction of movement, particularly when over joints, and a significant impact on emotional wellbeing.

SSI can double the length of time a patient stays in hospital

and thereby increase the costs of health care. Additional costs attributable to SSI of depending on the type of surgery and the severity of the infection. The main additional costs are related to re-operation, extra nursing care and interventions, and drug treatment costs. The indirect costs, due to loss of productivity, patient dissatisfaction and litigation, and reduced quality of life, have been studied less.

### Objective of the Study

The objective of this study was to compare the incidence of incisional surgical site infections in abdominal surgical wounds with subcutaneous suction drains versus those in who subcutaneous drains are not used.

## 2. Materials and Methods

This is a prospective study which was done in DEPARTMENT OF GENERAL SURGERY, at GOVERNMENT ROYAPETTAH HOSPITAL from JULY 2021 to DECEMBER 2021. A total of 106 patients who underwent elective abdominal surgeries for various causes were included in the study.

The aim of the study was to evaluate the outcome of surgical

site infection in elective abdominal surgeries with and without a subcutaneous drain and to evaluate different causal factors for SSI in elective abdominal surgeries in our hospital setup.

#### Inclusion criteria:

- 1) All patients between the age group of 20 years to 50 years who underwent elective abdominal surgeries for various causes.
- 2) Patients with maximum subcutaneous fat thickness.

#### Exclusion criteria:

- 1) Patients with preexisting skin infections.
- 2) Patients undergoing revision or laparoscopic surgeries.
- 3) Patients with comorbidities like steroid intake, radiotherapy, diabetes mellitus, renal and hepatic insufficiency.
- 4) Patients with sepsis and spillage.

#### Patient selection:

All patients between the age group of 20 years and 50 years who were admitted for elective abdominal surgeries for various causes were included in the study. Patient were explained about the pathology, the need for surgery and the complications associated with it in their own understandable language; informed consent was taken, ethical committee clearance was obtained.

#### Pre-operative preparation:

- 1) Shaving of the operative area was done the night before surgery.
- 2) All patients were advised to take shower on the day of surgery with soap.
- 3) Body hair should be removed
- 4) Before incision, antibiotics should be given
- 5) scalpel used for making skin incision
- 6) Electrocautery used for subcutaneous dissection, later it is closed with vicryl
- 7) Along subcutaneoustissue, drain is placed
- 8) Suction drain is used
- 9) Drain exit is kept away from main wound
- 10) Drain is measured daily
- 11) Drain emptied daily
- 12) Post operatively sterile dressing done
- 13) Discharge the patient after removal of subcutaneous drain
- 14) Outcome measured by
  - Seroma: clear fluid from the wound
  - Hematoma: dark red colored fluid from wound
  - SSI: frank pus from wound.

### 3. Results

- Age distributions were 24.5% is 21-30 years, 31.1% is 31-40 years, 44.3% is 41-50 years. The average age distribution is  $38 \pm 8$  years.
- Gender distributions were 50.9% are Female, 49.1% are Male.

- Age with Groups by Pearson's chi-squared test were  $\chi^2=0.205$ ,  $p=0.902>0.05$  which shows no statistical significant association between Age and Groups.
- Gender with Groups by Pearson's chi-squared test were  $\chi^2=0.151$ ,  $p=0.698>0.05$  which shows no statistical significant association between Gender and Groups.
- Hematoma with Groups by Pearson's chi-squared test were  $\chi^2=0.121$ ,  $p=1.000>0.05$  which shows no statistical significant association between Hematoma and Groups.
- Seroma with Groups by Pearson's chi-squared test were  $\chi^2=9.127$ ,  $p=0.003<0.01$  which shows highly statistical significant association between Seroma and Groups.
- SSI with Groups by Pearson's chi-squared test were  $\chi^2=1.504$ ,  $p=0.359>0.05$  which shows no statistical significant association between SSI and Groups.
- Complications with Groups by Pearson's chi-squared test were  $\chi^2=13.940$ ,  $p=0.0005<0.01$  which shows highly statistical significant association between Complications and Groups.
- Sub cutaneous with Groups by Unpaired t-test were t-value=0.035, p-value=0.972>0.05 which shows no statistical significant difference at  $p > 0.05$  level.
- Duration of Hospital with Groups by Unpaired t-test were t-value=3.157, p-value=0.002<0.01 which shows highly statistical significant difference at  $p < 0.01$  level.

### 4. Discussion

Surgical site infections are one of the most serious infective complications of surgery. Study consideration is to remove the blood and serous fluids from the wound by drains before fluids can get infected. This concept is frequently implemented in clinics. However, a meta-analysis showed that prophylactic subcutaneous drainage to prevent wound complications is not efficient in gynecology. Laprotomies carry a higher risk of wound infection and a combined rate of 15% has been reported in upper and lower gastrointestinal surgery, over three times the average risk. On the other hand, there have so far been few reports on the efficacy of prophylactic subcutaneous drain for the prevention of SSI following elective surgery. It is generally thought that the incidence of SSI is related to amount of bacterium of the wound, formation of hematoma, pool of effusion, potential subcutaneous dead space, disturbance of the local circulation, and the amount of bacterium in the surgical organ.

A subcutaneous drain might reduce the amount of bacterium around the wound and remove residual effusion and blood from the wound that could serve as a medium for bacterial growth. Numerous risk factors for developing a SSI have been identified. Current smokers are at a 30% increased risk of SSI after major surgical procedures and smoking cessation reduces SSI. Body Mass Index and obesity have also been linked to increased risk of SSI with studies showing wound complication rates in some procedures rising from 7% up to 23% due to obesity. More specifically, depth of subcutaneous fat has been shown to be a strong risk factor for SSI and has been shown to be a useful predictor for SSI risk. Many other factors including nutrition and diabetes control, certain comorbidities, ASA

class, and operation time have been identified as important factors affecting SSI.

Various interventions have been proposed with a view to reducing SSIs. A number of them are used in routine practice. Hand washing, minimising shaving, skin preparation, and preoperative antibiotics have all gained acceptance in the surgical community. Use of drains after surgery however has declined in recent times. It has been shown that drains provide no advantage after inguinal hernia repairs, and various other types of surgery. Use of drains, however, is still popular after abdominoperineal excision of rectum and repair of incisional hernias due to inconclusive evidence and surgeon preference. They are still used in some major plastic surgery procedures as they are thought to reduce collections in closed spaces. It has been postulated that the presence of hematoma, serous fluid, and dead space in surgical incisional wounds increases the risk of infection as this acts as a culture medium. Subcutaneous drains have been used to reduce the risk of infection. However, the use of postoperative subcutaneous wound drainage is not universally accepted. In addition, drains may not be efficacious and cause discomfort and increased hospital stay on their own.

In a transitional economy like India, even a small reduction in SSI by introduction of a simple cost-effective subcutaneous drain will go a long way in reducing the economic burden of SSI on healthcare. These drains are cheap, simple to insert, don't require any special skills or technique, are not known to cause any harm to the patient and easy to remove. Though their effectiveness in preventing SSI is still a matter of debate, their use may be propagated at least in emergency setting where degree of contamination is high. However more studies are required to study the role of subcutaneous drains in elective abdominal surgeries.

In this study hundred and six patients with above mentioned criteria were selected. Subcutaneous drains were kept in fifty three patients. The drain is removed when the output is less than 20 ml/day for 2 consecutive days. Another fifty three patients without subcutaneous drains were compared for the occurrence of local wound complications such as seroma, hematoma, and surgical site infections. The parameters such as length of hospital stay, number of patients requiring intervention studied. The results are compared among the two groups. All the patients are discharged only after drain removal. The study group consists of 106 patients. Total male patients in the study group are 52 and the female patients is 54. The mean age group of the patients included in the study is around 38 years. Subcutaneous drains used in 53 patients and not used in 53 patients. The patients are selected by systemic random sampling. Wound complications observed in 13 patients with subcutaneous drain which forms 24.5% of the total patients with subcutaneous drain. Wound complications observed in 32 patients without subcutaneous drain which forms 60.4% of the total patients without subcutaneous drain. Comparing these two, data was found to be statistically significant with P value < 0.01. Thus the incidence of wound complication is low in those with subcutaneous drain than those without drain. Wound complications such as seroma, hematoma, and

surgical site Infections were studied. In our study Seroma occurred in 12 patients in whom the subcutaneous drain was kept which represents 22.6% of those with subcutaneous drain. Seroma occurred in 27 patients in whom the subcutaneous drain was not kept which represents 50.9% of those without subcutaneous drain. Intervention was done in all 39 patients. Seroma evacuated by removing one or two sutures and applying pressure dressing over it. Seroma resolved in all the 14 patients. Thus the development of seroma is more with the patients without subcutaneous drain when compared to those with subcutaneous drain. In our study Hematoma occurred in 4 patients in whom the subcutaneous drain was kept, which represents 7.5% of those with subcutaneous drain. Hematoma occurred in 5 patients in whom the subcutaneous drain was not kept, which represents 9.4% of those without subcutaneous drain. Patients presented with localized swelling with bluish discoloration of overlying skin. Hematoma is evacuated under local anaesthesia with sterile aseptic precautions and daily dressing done. Thus the occurrence of hematoma is more in patients without subcutaneous drain than compared to those with subcutaneous drain. In our study 12 patients developed SSI. It is found to be superficial SSI in all. Surgical site infections occurred in 4 patients with subcutaneous drain which represents 7.5% of those with drain. And surgical site infections occurred in 8 patients without subcutaneous drain which represents 15.1% of those without drain. Intervention is done in all the 12 patients. Thus the incidence of SSI is more in those without subcutaneous drain than those with subcutaneous drain. Thus seroma and hematoma occurred only in patients without subcutaneous drain.

Surgical site infections occurred in less number of patients with subcutaneous drain. Also the group of patients with subcutaneous drain had mean stay in the hospital of 8.5 days. Mean stay of the patients with subcutaneous drain is low when compared with the mean stay of 10.1 days for the group of patients without subcutaneous drain. Thus subcutaneous drain when kept in patients who undergo elective abdominal surgeries had lesser incidence of local wound complications and lesser hospital stay when compared to those patients without subcutaneous drain.

## 5. Conclusion

The study was done with aim of reducing the surgical site infections and thereby reducing morbidity, cost, duration of hospital stay and psychological stress the patient experience. Many novel techniques are implemented in decreasing the incidence of surgical site infection like preparing the patient for surgery, administration of antibiotics prophylactically when necessary, the use of subcutaneous drain before closing the skin incision followed by post operative administration of broad spectrum antibiotics, maintenance of adequate nutrition and removal of drain at appropriate time, regular dressing and follow up. The drain placed subcutaneously act as a channel to drain out secretion that are likely to collect in the subcutaneous tissue following closure of the incision in the immediate post-operative period. There by reducing the chance of hemotoma formation, seroma formation that might get infected in due

course of time to cause wound dehiscence increasing the morbidity, duration of hospital stay, cost.

Thus by keeping the drain in the subcutaneous tissue we facilitate the drainage of subcutaneous collection, early detection of infection and faster management of surgical site infection there by reducing the cost, hospital stay and morbidity.

## References

- [1] Ferroz EM, Bacelar TS, Aguiar JLA, Ferraz AAB, Pognossin G, Batista JEM. Wound infection rates in clean Surgery. *Inf contr. Hosp. Epidem*, 1992; 13: 457-462
- [2] McLaws HM, Irwing L, Moch P, Berry G, Gold J. Predictors of surgical wound infection in Australia. *Med. J. Austr.*1988; 149: 591-595
- [3] Haley RW, Culver DH, Morgan WM, White JW, Emori TG; Hooton TM. Identifying patients at risk of surgical wound infection. *Am J. Epidemiol.*1985; 121: 206-215
- [4] Centres for Disease Control and Prevention. National centre for health statistics. Vital and health statistics, detailed diagnosis and procedures. National hospital discharges survey; 1994.127
- [5] Emori TG, Gaynes RP. An overview of nosocomial infections, including the role of the microbiology laboratory. *ClinMicrobiol Rev* 1993; 6 (4): 428-42
- [6] Garth Dixon. Sources of surgical site infection. *Surgery International.*2000; 58: 179-185.
- [7] Sobayo ES. Surgical wound infection in Hospital University College. *Proceedings Surgical infections in Africa.* Merck, Sharp and Dohme.1983; 2: 89-97.
- [8] Ad Hoc committee of the committee on trauma, Post operative wound infections, the influence of ultraviolet irradiation on the operating room. *Ann Surg.*1964; 160; 2 (Supplement).
- [9] Geubbels EL, Mintjes-de Groot AJ. An operation surveillance system of surgical site infections in the Netherlands; Results of the PREZIES National Surveillance Network. *Infect control hospital epidemiol.*2000; 21: 311-318.
- [10] Thompson BR, Julian TB, Stremple JF, Guidelines for prevention of SSIs. *Am. J. Infect. Control.*1999; 27 (2): 48-55.
- [11] Ponce-de-Leon S. The needs of developing countries and the resources required. *J. Hosp. Infect.*1991; 18 (supplement A): 376 – 381.
- [12] Breasted D: *The Edwin Smith Surgical Papyrus.* University of Chicago: University of Chicago press; 1930. (as quoted by SinghalH: wound infection. E-medicine).
- [13] Bryan PW: *The Papyrus Ebers.* London/Washington DC: Government Printing Office; 1883. (as quoted by SinghalH: wound infection. Emedicine)
- [14] Cohen IK: *A brief history of wound healing* 1st ed. Yardley, Pa: Oxford clinical communications Inc; 1998
- [15] Lister J. On a new method of treating compound fractures. *Lancet.*1867; 1: 326-329, 387-389, 507-509.
- [16] Qvist G: Hunterian Oration, 1979. Some controversial aspects of John Hunter's life and work. *Ann R CollSurgEngl* 1979 Jul; 61 (4): 309-11
- [17] Helling TS, Daon E: In Flanders fields: the Great War, Antoine Depage, and the resurgence of debridement. *Ann Surg* 1998 Aug; 228 (2): 173-81.
- [18] Emori TG, Gaynes RP: An overview of nosocomial infections, including the role of the microbiology laboratory. *ClinMicrobiol Rev* 1993 Oct; 6 (4): 428-42.
- [19] Martone W, Jarvis W, Edwards J, Culver D, Haley R. Incidence and nature of endemic and epidemic nosocomial infections. In: Bennett JV, Brachman PS, Eds. *Hospital Infections.* Philadelphia: Lippincott-Raven; 1998; 461-76.
- [20] Mayon-White RT, Duce G, Kereselidze T: An international survey of the prevalence of hospital-acquired infection. *J Hosp Infect* 1988 Feb; 11 Suppl A: 43-8