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Original Research Article

Comparative study of use of 32-F, multi-perforated tube drainage of subcutaneous plane versus no drainage, in laparotomy

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ABSTRACT

Background: We are concerned about the wound management and wound healing amongst post-operative patients, as wound complications increase the morbidity of patients post-surgery. Most common wound complications post-surgery are wound seromas, hematomas and surgical site infections (SSIs). SSIs lead to increased hospital stay and increased morbidity alongside increasing unnecessary patient suffering and a decreased quality of life. The underlying principle for the use of subcutaneous drains is based on the belief that removal of serum or debris and eradication of dead space in subcutaneous plane will bring down the rate of infection and wound complications.
Methods: A randomized control study was conducted at the General Surgery Department at SGT Medical College, Gurgoan, Haryana. In total, 60 patients were selected (after taking informed written consent) among those admitted to the Surgery Department for laparotomy procedure. Patients were divided randomly into two groups i.e., group-A (study group) and group-B (control group). In group-A patients, subcutaneous wounds were closed over a drain (32-F multi-perforated drain), while in group-B patients no drain was used. Intra-operative and post-operative findings were recorded and analysed to draw study conclusions.
Results: SSIs were observed significantly higher among patients without subcutaneous drain (group-B). Patients of group-B had significantly higher incidence of seroma and pus as compared to group-A patients. Experience of pain was reported higher among the patients without subcutaneous drain (group-B).
Conclusions: Subcutaneous drains play an important role in reducing the incidence of SSIs, wound complications, wound pain; thereby lead to better healing of the surgical wound.

Keywords: Subcutaneous drains, Surgical site infections, Seroma, Pus, Hematoma, Wound complications, Wound pain

INTRODUCTION

We are concerned about the wound management and wound healing amongst post-operative patients, as wound complications increase the morbidity of patients post-surgery. One of the prime tasks post-surgery is to avoid or reduce the adverse effects of wound complications. Most common wound complications post-surgery are wound seromas, hematomas and surgical site infections. SSIs have been observed to contribute upto 20% of nosocomial infections with an overall incidence of around 5% among all invasive surgical procedures. Laparotomies carry a higher risk of wound infection, a combined rate of 15% has been reported in upper, and lower gastrointestinal surgery, over three times the average risk.[1]

SSIs lead to increased hospital stay and increased morbidity alongside increasing unnecessary patient suffering and a decreased quality of life (QoL).[2,3]

Johann Scultetus of Amsterdam (1595–1645) in the early part of the seventeenth century was the first person to recommend the principle of capillary drainage by inserting a wick into a drainage tube to increase its efficiency.[4] This principle was given further impetus by another German surgeon, Lorenz Heister of Nuremberg (1683–1758), in the latter part of the century and was the forerunner of the much used Penrose drain (Figure 1).[5]

A number of techniques and approaches have been used from time to time for reducing post-operative wound complications and the use of subcutaneous drain is one of them. The underlying principle for the use of subcutaneous drains is based on the belief that the removal of serum or debris and eradication of the dead space in subcutaneous plane will bring down the rate of infection and wound complications. There are very few studies available in the literature about the role of subcutaneous drain in prevention of wound complications.

Aim of this study is to compare the use of 32-F, multi-perforated tube drainage of subcutaneous plane versus no drainage, in laparotomy in terms of given parameters of wound complications: (a) postoperative pain, (b) seroma formation, (c) wound infection and (d) wound dehiscence.

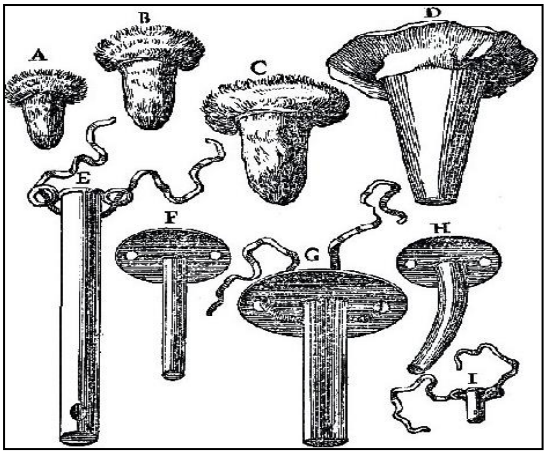

Figure 1 (A-I): Laurenz Heister-drains and plugs.

METHODS

A randomized control study, after obtaining approval from the institutional Ethical committee, were conducted at the Department of General Surgery at SGT Medical College Hospital and Research Institute, Gurgoan, Haryana. In total, 60 patients (of age >18 years) were selected for the study among those admitted to the Surgery Department for laparotomy procedure. Patients below 18 years of age or with incision length <6 cm were excluded from this study. Study lasted for 18 months i.e., from December 2019 to March 2021, and prior written informed consent was obtained from each patient.

Sample size

Based on the number of patients admitted for laparotomy in the previous year, it was decided to study 60 patients in a period of 18 months, whereby 30 patients were taken in each group for this comparative study. Sample was divided into two study groups i.e. group-A (study group) and group-B (control group). Selection of patients for each group was done on random basis, using envelope method.

Prior to the surgery

Meticulous clinical examinations and routine investigations such as CBC-complete blood count, PT(INR), LFT, KFT, ECG, chest X-ray, blood sugar (random), HBsAg, Anti HCV, ELISA HIV, and urine examination were carried out.

Radiological investigations were carried out, such as USG abdomen or CT abdomen according to the requirement on case to case basis. Any other specific investigations were done as and when required.

Patient preparation for surgery

For routine laparotomy, PAC (pre anesthesia checkup) cleared patients, with written consent for surgery were slotted for operation. Body parts prepared the night before, and overnight fasted patient was transported to the operation theatre next morning, intravenous antibiotic was given half an hour before the surgery.

In emergency laparotomy, the above mentioned pre-surgical preparation was fast-tracked along with fluid and electrotype resuscitation. Patients shifted to operation theatre on pre-decided time for emergency laparotomy.

Laparotomy procedure

Laparotomy procedures included in this study comprised of surgeries related to bowel perforations, intestinal obstructions, intussusception, diverticulitis, appendicitis, cholecystitis, hernia of any kind (epigastric/ incisional/ umbilical/ inguinal), abdominal trauma management.

Patients were I/V (intravenous) life lined, placed supine on the OT table, under general, spinal or epidural anesthesia, as required by particular surgical procedure. Parts cleaning, painting and draping was done. I/V antibiotics fired at incision (which were midline, Kocher's, Mc Burney's or groin incisions). Incision to closing time recorded in each case

Group-A patients' subcutaneous wounds were closed over a drain i.e. 32-F multi-perforated drain (Figure 2).

Group-B patients' subcutaneous wounds were closed without a drain.

Observations were made regarding intra-operative complications, bowel breach, wound hemorrhage, wound contamination, incision to closing time, drained closure, or non-drained closure of wound, types of skin closure, hardware used (stapler, silk, nylon and glue) and type of wound dressing given (sealed dressing, ventilated dressing, or "air dressing" i.e. no dressing) from OT table onwards to postoperative period.

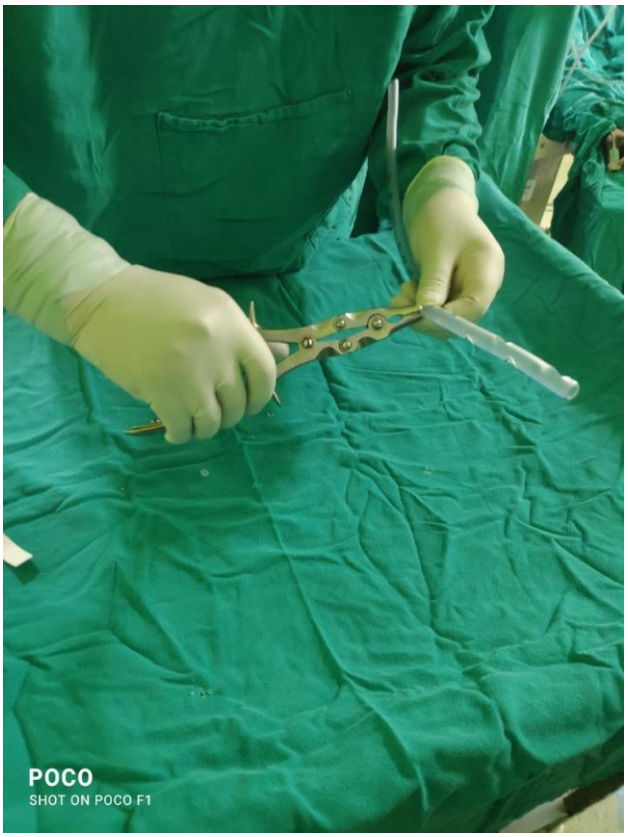

Figure 1: Double action bone nibbler is being used to convert 32 F drain into multi perforated drain.

Figure 2: Wound closure with drain.

Post operation observations

After surgery, all patients were shifted to their respective wards (SICU i.e. surgical ICU, postoperative or general wards). All patients were examined on daily basis on below parameters: a) clinical examination (look of patient, pain, fever, tachycardia, tachypnea and wound tenderness), b) post-operative fever, c) pain score (using VAS scale), d) status of the wound (healthy, inflamed, serous or pus discharge), e) subcutaneous drain output (amount) (in group-A) (volume, color and nature), f) subcutaneous discharge nature (in group-B) (Volume, color and nature), g) any wound complications: seroma, hematoma, sinus and dehiscence and h) surgical site infections (Figure 3).

Figure 3: Highly contaminated wound.

In case of Group-A, the subcutaneous drain was removed when the discharge was less than 25 ml/day and the nature of discharge was serosanguineous or serous.

Stable patients in each group, with no wound complications were DTH (discharged to home) between 3rd to 5th postoperative days. Patients with wound complications (seroma, hematoma) were either aspirated or evacuated by removing few sutures. Wound discharge sent for culture and antibiotic sensitivity. Culture sensitivity specific antibiotics were started wherever indicated.

Periodic follow up of each patient was done 5 times i.e. on 7th day, 15th day, 1st month, 2nd month and 3rd month.

In case of wound complication (inflammation, serous/pus discharge, partial or total wound dehiscence), appropriate corrective surgical measures were undertaken and recorded in both group-A and group-B patients.

The corrective surgical measures undertaken were aspiration of seroma, evacuation of hematoma or pus and secondary suturing of partial or total wound failure / breakdown.

Statistical analysis

Data collected in predesigned proforma was coded electronically into computer and was analyzed using Microsoft Excel and IBM Statistical Package for Social Sciences (IBM SPSS v26).

The continuous variables were presented as average/mean; while for categorical variables frequencies and percentages were presented. For this, cross-tabulations were made using IBM SPSS (v26) and Fisher's exact test of independence was performed to observe and evaluate the significance of the differences observed between the study groups (p value of <0.05 was taken as statistically significant).

Pain score was analysed using two tests i.e., analysis of variance (ANOVA) test as well as by comparing the mean pain score between the study groups using Bonferroni correction. In both the tests, p value of <0.05 was considered to be statistically significant.

RESULTS

Profile of the patients in both the study groups was similar. Mean age of the patients in this study was around 40 years and representation of male patients was higher (57%) than female patients (43%).

Type of surgery was majorly elective one (82%) across both the study groups and the duration of surgery was mostly between 1-2 hours with mean duration around 98 minutes.

Table 1: Duration of Surgery.

Duration	Group A (n=30)	Group B (n=30)	Total (n=60)
< 1 hour	5	4	9
1-2 hours	17	21	38
> 2 hours	8	5	13
Mean (mins)	100	97	98

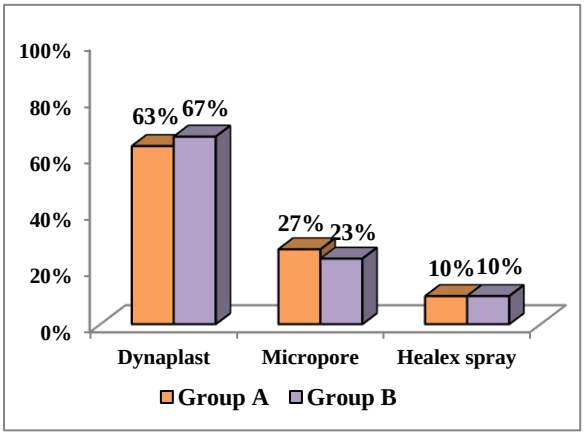

Figure 4: Wound dressing (%).

Skin closure was primarily done by nylon suture (67%), followed by stapler (20%) across both the study groups. Similar wound dressings were used for both the study groups with dynaplast (65%) as the most used dressings followed by micropore (25%) and healex spray (10%).

Almost every surgery, except 3 surgeries, was carried out without any intra-operative complications.

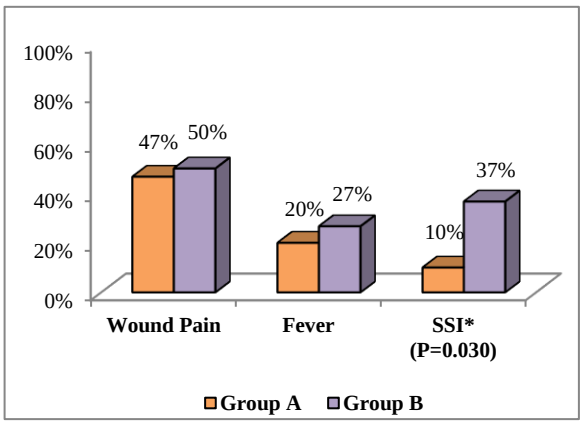

Figure 5: Postoperative clinical observations.

There was no significant difference in wound pain and fever on day-0 between the study groups. Surgical site infections were observed significantly higher among patients without subcutaneous drain (group B).

Postoperative wound complications were significantly lower among patients with subcutaneous drain (group A). Patients without subcutaneous drain (group B) had significantly higher incidence of seroma and pus as compared to patients who had subcutaneous drain (group A).

Table 2: Types of postoperative wound complications.

Complication	Group A (n=30)	Group B (n=30)	Total (n=60)
Seroma	5*	13*	18
Hematoma	3	6	9
Pus	3**	11**	13
Sinus	2	5	7
Partial wound dehiscence	0	0	0
Total wound dehiscence	0	1	1

* Difference significant (p=0.047).
** Difference significant (p=0.030).

Experience of pain was reported higher among the patients without subcutaneous drain (group B). Pain scores after 72 hours to 1 month were significantly lower among patients who had subcutaneous drains (group A).

Table 3: Comparison of mean pain scores using bonferroni correction method.

Study group	Group A	Group B
	Mean	Mean
Pain score after 6 hours	4	5
Pain score after 12 hours	4	5
Pain score after 24 hours	3	4
Pain score after 48 hours	3	3
Pain score after 72 hours	2	3 A
Pain score after 7 days	1	3 A
Pain score after 15 days	1	3 A
Pain score after 1 month	1	2 A
Pain score after 2 months	0	1
Pain score after 3 months	0	0

Results are based on two-sided tests assuming equal variances. For each significant pair, the key of the smaller category appears in the category with the larger mean. Significance level for upper case letters (A, B, C): 0.05*.
*Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

Re-exploration within 30 days was done only in 1 patient (group B) who had complete wound dehiscence.

DISCUSSION

Wound management, though a basic practice after surgery, plays vital role to minimize wound complications, which may increase the chances of morbidity of the patient. Surgical site infections, post-operative pain, seroma formation are common wound complications which patients tend to develop post operatively.

Our study shows that the patients with subcutaneous drain (group-A: SSI=10%) were less likely to have SSI compared to the patients without subcutaneous drain (group-B: SSI=37%). A study by Kagita et al, conducted among 76 patients (40 with drain, and 36 without drain) who underwent emergency abdominal surgical procedure, showed similar conclusions that subcutaneous negative pressure prevents SSI significantly.[6]

Like the case of SSI, it was observed that postoperative wound complications were less likely to occur in case of patients with subcutaneous drain (group-A) in comparison with the patients without subcutaneous drains (group-B). A similar study by Panici et al, conducted among 72 patients (divided in 2 groups of 36 each, one group with subcutaneous drain, while other with no drain) who had surgery for benign gynecologic disease, also concluded that subcutaneous drains significantly prevented wound complications and reduced hospital stay.[7]

Study findings reveal that patients with subcutaneous drain (group-A) were less likely to experience higher pain than the patients without subcutaneous drains (group-B). In a study conducted by Bindal and Munda among 100 pregnant patients (50 with drains, and 50 without drain) who had cesarean section for their delivery, it was concluded that patients with subcutaneous drain have reduced rates of wound seroma, postoperative pain and shorter hospital stay.[8]

However, there is one limitation to the study findings, i.e. a smaller sample size that was primarily due to the time constraints and due to single researcher working on it. The study findings cannot be generalized with given sample size. Hence, I shall like to recommend further study on this subject with a fairly larger sample size to strengthen these findings.

CONCLUSION

Hence, from the findings of this study, it can be concluded that the subcutaneous drains play an important role in reducing the incidence of surgical site infections, wound complications, wound pain; thereby lead to better healing of the surgical wound. Surgeons can certainly adopt the use of subcutaneous drains while closing the surgical wounds to bring down the wound infection and wound complications, thereby decreasing unnecessary patient suffering and eventually improving the quality of life of the patients.

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