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ORIGINAL ARTICLE

Role of Subcutaneous Suction Drain in Prevention of Wound Complications After Elective Abdominal Surgery

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Abstract

Background: **Any surgical procedure that disrupts the anterior abdominal wall in order to get access to the peritoneal cavity might result in an abdominal wound.**

Aim and objectives: **The aim and objective of this study was to assess the effectiveness of subcutaneous vacuum suction drains in reducing abdominal wound complications after elective abdominal operations.**

Patients and methods: **This research were performed on 200 patients undergoing exploratory laparotomy for elective indications in Al-Azhar University Hospitals (Al−Hussein and Bab−Elshaaria University Hospitals).**

Result: **In both groups, midline laparotomies were the most frequently applied incision. The other incisions made were on the grid iron and the right subcostal. The kind of incisions made between the two groups did not statistically vary substantially.**

Conclusion: **When compared with traditional primary skin closure, the use of a subcutaneous suction drainage tube for abdominal wall closure in the instances of peritonitis effectively lowers the frequency of wound infection, dehiscence, wound secondary suturing, and length of hospital stay in surgical site infection (SSI).**

Keywords: Abdominal surgery, Peritonitis, Subcutaneous suction drain, Wound

1. Introduction

An abdominal wound may develop when the anterior abdominal wall is damaged as a result of trauma or any surgical procedure intended to reach the peritoneal cavity. The most typical laparotomy incision is a vertical midline incision.[1]

Both early and late wound complications might result from emergency laparotomies. Hemostasis, seroma development, wound infection, ruptured abdomen (evisceration of bowel/abdominal contents), and wound dehiscence are some of the early wound problems (fascial disruption without evisceration). Chronic wound discomfort, suture sinus, and incisional (ventral) hernia are examples of late consequences.[2]

One of the recognized after-abdominal surgical consequences is hematoma development. Wounds that develop hematomas are more susceptible to subsequent infection.[3]

Another issue that may arise following abdominal surgery is seroma development; this condition can result in wound infection, wound dehiscence, seroma calcification, poor aesthetic outcomes, and an unattractive surgical scar.[4]

One of the most frequent postoperative consequences is surgical site infection (SSI), which affects at least 5% of all surgical patients and 30%−40% of patients having abdominal surgery, depending on the proportion between the fifth and tenth postoperative days.[5]

Additionally, problems after abdominal surgery include abdominal rupture and abdominal wound

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dehiscence. Burst abdominal organs necessitate prompt reoperation, have a high mortality risk of 15–20%, and occur in 1.03% of operations.[6]

Additionally, negative pressure creates a moist, safe environment that promotes wound healing and lessens complications by reducing peripheral edema around the wound, boosting blood flow to the area, limiting bacterial colonization, and speeding up the formation of granulation tissue and epithelization.[7]

The objective of this study was to assess the effectiveness of subcutaneous vacuum suction drains in reducing abdominal wound complications after elective abdominal operations.

2. Patients and methods

This research were performed on 200 patients undergoing exploratory laparotomy for elective indications in Al-Azhar University Hospitals (Al – Hussein and Bab – Elshaaria University Hospitals). Patients of different ages and both sexes were included, through history, routine investigations, and specific investigations for laparotomy was done. Two groups of patients were created; drain group: included 100 patients and in this group subcutaneous suction drain were inserted. Without drain group: included 100 patients and in this group no subcutaneous drain was inserted.

2.1. Inclusion criteria

All patients undergoing exploratory laparotomy by midline incisions, subcostal incisions and transverse exploratory incisions elective for elective indications, age above 14 years and conversion of laparoscopic surgery into open surgery.

2.2. Exclusion criteria

Laparotomies were performed on patients for gynecological reasons, the unintentional removal of a subcutaneous vacuum suction drain, patient requiring re-exploration after first surgery, age below 14 years, Coagulopathy, hypoalbuminemia, abdominoplasty, any mesh repair, peritonitis, and any gross abdominal contamination.

Full history taking which includs patient's demographics: age, sex, and BMI. Medical history: comorbidities e.g.: diabetes mellitus (DM), hypertension (HTN), ischemic heart disorders (IHD), allergies, medications, substance abuse (smoking, alcohol, and drugs). History of predisposing and precipitating factors causing strains such as: benign prostatic hyperplasia (BPH), chronic constipation, pulmonary diseases, or any medical problems and surgical history.

2.3. Through clinical examination

General examination, abdominal examination and Local examination of the Abdominal complains submitted to elective explorations.

2.4. Investigations

That included: testing for liver function (AST, ALT, prothrombin time, total bilirubin, direct bilirubin, albumin level, and bilirubin levels), complete blood picture, serum urea and creatinine, fasting and postprandial blood sugar and hepatic viral profile.

2.5. Preoperative preparation

Treatment of any skin fungal or bacterial infection before surgery and skin disinfection using povidone-iodine 10% solution the night of surgery. Prophylactic low molecular weight heparin 12 h prior to the procedure and use of below-knee elastic stocking in those at risk to develop deep venous thrombosis (DVT).

2.6. Postoperative care

Patients were transferred to the ward, and no one required intensive care admission. Following three additional days of antibiotic injections, patients were released on oral amoxicillin-clavulanic acid 1 gm every 12 h for 5 days. Those at risk of developing deep venous thrombosis received prophylactic low molecular weight heparin subcutaneously once daily for a week. Unless resection anastomosis was performed, in which case oral intake commenced after peristalsis, patients were given oral liquids after 4 h and began a light diet after 24 h. After fully recovering after anesthesia, the patient was given the go-ahead to move, and the first POD morning saw the beginning of the patient's physiotherapy program for mobility and chest exercises. From the day of surgery up to two weeks were abdominal binders. On the third POD, the site was examined for seroma, infection, and dehiscence. Patients who were on a normal oral intake schedule with no complications that required hospitalization were released. Once a Drain once daily discharge were less than 30 ml for two days in a row without any indication that it was blocked, it was removed. Patients were checked on every week for the first month, then every three and six months for the

appearance of seroma, wound infection, or recurrence. They get clinical and US examinations. The duration of the procedure, blood loss, and the need for blood transfusions will all be noted.

2.7. Follow-up

For the purpose of identifying any difficulties, the patients will be invited to our surgical clinic after the first, fourth, and sixth weeks. After 10–12 days, skin sutures will be removed. Additionally, the amount and substance of the drains were daily observed. Drain eliminated when output is zero or less than 20 ml in a 24 h period. The information will be statistically examined.

2.8. Methods of analysis

With the aid of the IBM SPSS software package version 20.0, data were fed into the computer and evaluated. The number and percent were utilized to describe the qualitative data. The normality of the distribution was examined utilizing the Kolmogorov-Smirnov test. The range (minimum and maximum), mean, SD, and median were employed to characterize quantitative data. The acquired findings' significance was determined at the 5% level (Figs. 1–3).

3. Results

In the institutions affiliated with Al-Azhar University, 200 adult patients had exploratory laparotomies for elective reasons between August 2020 and October 2021. (AL-Hussein and Bab-Elshaaria hospitals) Utilizing the closed envelope approach, patients enrolled in this research were randomly

Fig. 1. Steps of Suction Drain insertion in partial gastrectomy.

Fig. 2. Suction drainage in total colectomy.

Fig. 3. Rt nephrectomy and adrenalectomy suction drain insertion.

Table 1. Patient's demographics (Age).

Age	Group A	Group B	*P* value	Statistical test of significance
Range	25 – 60	22 – 65	**0.647**	χ^2test
Mean + SD	(49.63 + 5.3)	(52.36 + 6.8)		

assigned to one of the following two groups. Group A: included 100 patients, whom subcutaneous drain would be inserted. Group B: included 100 patients, whom no subcutaneous drain would be inserted.

Age ranged from 25 to 60 years and mean value (49.63 ± 5.36) where in group B, 50 male patients (50%) and 50 females (50%) with age ranged from 22 to 64 years and mean value (52.36 ± 6.8) (Table 1, Figs. 4 and 5).

Patients were admitted to the hospitals by different complains and presentations of diseases such as abdominal pain, bleeding, diarrhea, nausea, vomiting, weight loss, constipation, yellowish discoloration, itching, and dark urine. This table shows the incidence of every one (Fig. 6).

The variations in the surgical indications between the two groups were statistically insubstantial, i.e., they were comparable in both groups (Table 2).

In both groups, midline laparotomies were done more often. The other incisions were right subcostal and grid iron. The kind of incisions made did not vary statistically substantially between the two groups. This table demonstrates that there was no statistically substantial variation between the two groups in any of the demographic factors, including

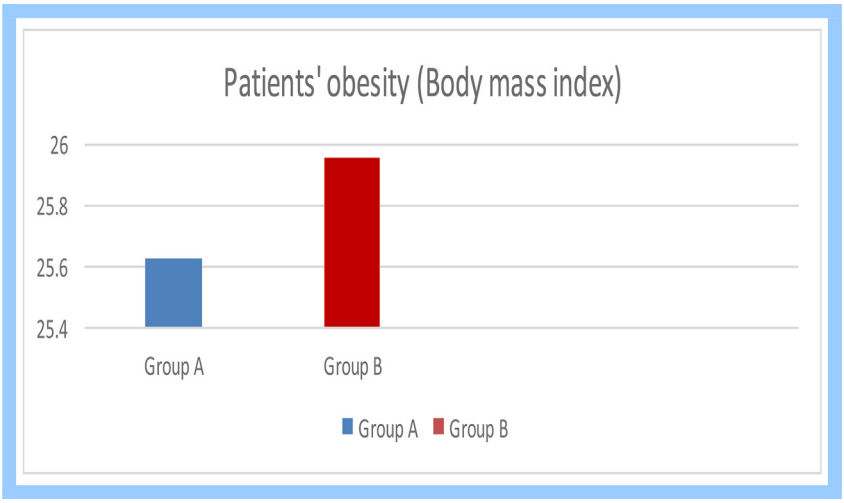

Fig. 4. Patients' obesity (Body mass index).

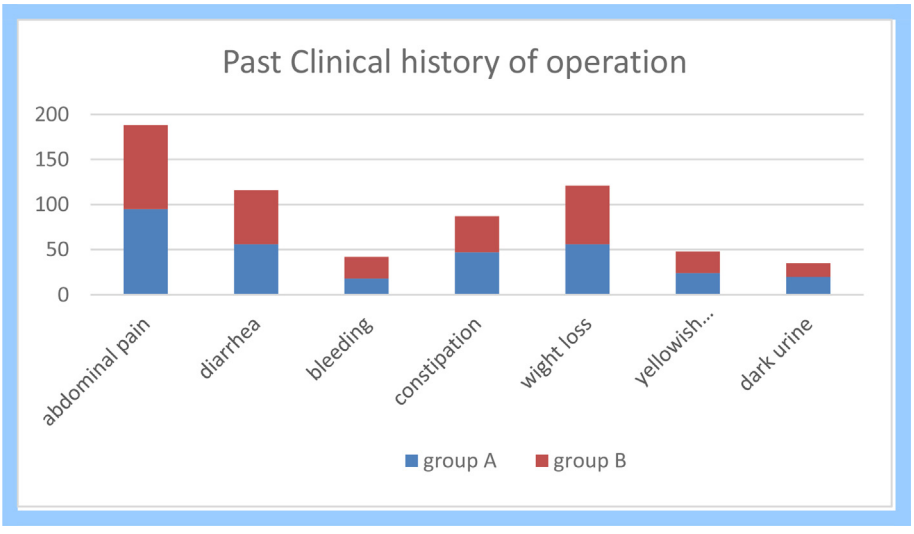

Fig. 5. Past clinical history of operation.

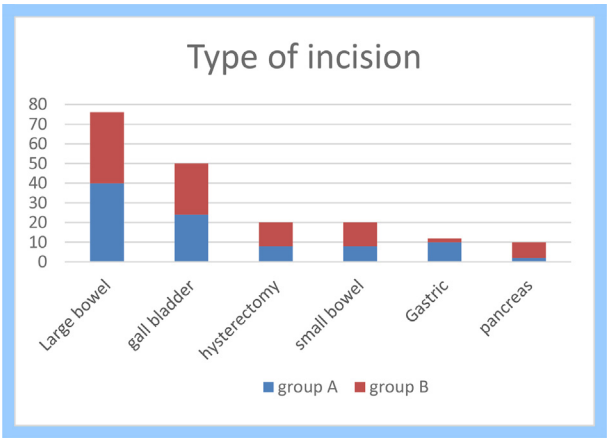

Fig. 6. Type of incision.

Table 2. The statistical importance of the kind of incisions made being different.

Demography type of incision	Group A ($n = 100$)	Group B ($n = 100$)	P value	Statistical significance test
Midline laparotomy	88	82		χ^2test
Paramedian	6	10	0.9	
Right subcostal	6	8		

Table 5. Drain's function in SSI early detection.

SSI cases- POD of detection	Group A ($n = 12$)	Group B ($n = 30$)	P value	Statistical significance test
POD 2	10	–	0.0001	χ^2 test
POD 3	2	10		
POD 4	–	17		
POD 5	–	3		

Table 6. Seroma formation after drain removal.

Seroma formation	Group A1 (No = 50)	Group 2 (No = 50)	P value	Statistical significance test
Yes	3	8	**0.010**	χ^2**test**
No	47	42		

Table 7. Length of stay.

Outcome measure	Group A ($n = 100$)	Group B ($n = 100$)	P value	Statistical significance test
Average length of hospitalization (days)	9.17	14.17	0.00001	Student unpaired t-test

age, sex, surgical indication, and kind of incision (Table 3).

This table shows that in group A, the amount of blood loss ranged from 50 to 100 cc (74.2 + 12.36) where in group B, the amount of blood loss ranged from 50 to 120 cc (77.95 + 15.6). There is no substantial variation between both groups regarding amount of blood loss (Table 4).

This table demonstrates that group A had a much lower incidence of SSI than did group B. The frequency of wound dehiscence among SSI patients was similarly considerably lower in group A than in group B (Table 5).

This table shows that when compared with traditional closure in group B, there was statistically substantial early diagnosis of SSI in group A because of the existence of the drain (Table 6).

3 patients (6%) of group a developed wound seroma after removal of the drain, but 8 patient (16%) of group B developed wound seroma after removal of the drain. They were treated by repeated aspiration of the seroma under complete aseptic condition. Mean value of seroma formation is substantially greater among group B than group A (Table 7).

When a subcutaneous suction drain was used, the average length of hospital stay was dramatically reduced.

Table 3. Amount of blood loss (in cc).

Amount of blood loss (in cc)	Group A	Group B	P value	Statistical significance test
Range	50 – 100	50 – 120	**0.735**	χ^2 test
Mean + SD	(74.2 + 12.3)	(77.96 + 15.7)		

Table 4. Variations in the frequency of SSI, wound dehiscence, and secondary suturing are statistically substantial.

Outcome	Group A ($n = 100$)	Group B ($n = 100$)	P value	Statistical significance test
SSI	24 (23%)	60 (60%)	0.003	χ^2 test
Dehiscence of the wound and secondary suturing	10	58	0.015	χ^2 test

4. Discussion

In this study 200 patients undergoing exploratory laparotomy for elective indications in Al-Azhar University Hospitals (Al – Hussein and Bab – Elshaaria University Hospitals). Patients of different ages and both sexes were included, through history, routine investigations and specific investigations for laparotomy will be done. Two groups of patients were created:

Those patients followed up at surgical clinic at the up to 6 months for detection of any complications.

Skin sutures removed after 7–21 days. Additionally, the amount and substance of the drains were observed daily. Drain is stopped when the output is zero or less than 20 ml in a day.

We are trying to investigate the possibility, safety, and benefits of inserting a subcutaneous drain versus no insertion of a drain by compering safety and effectiveness of procedure for subcutaneous decompression in the case of open exploration for variable causes.

As regarding the mean age of all patients on both groups was 48 year as the age of group I was 49 years while for group II was 52 years with no statistical significance difference for increasing incidence to encounter post-operative seroma formation the same results published by Papadakis and Rahmanian-Schwarz,[8] that concluded for a large population undergoing investigation for post-operative incidence of sermon formation, advanced age was not associated with more incidence of seroma formation.

Despite that the previous surgical history purse is not risk factor to proceed for a new surgery except for adhesiolysis for postoperative adhesive intestinal obstruction in current study the large bowel disease, then gallbladder, then hysterectomy, then small bowel diseases then gastric and pancreatic disease was representing majority of cases submitted to our study this is different from results of Bozola et al.,[9] who implicated similar study but most of his cases was for abdomonoplasty and ventral hernias repair.

In both groups, midline laparotomies were done more often. Other incisions included right subcostal and grid iron. There was no statistically substantial variation in the kind of incisions made between the two groups according to the statistical analysis of the data from both groups. So we can conclude that seroma formation is not directly related to the type of incision used to perform specific procedure, this conclusion was also reached via Garcia and Marder.[10] In his study to assess the usage of electrocautarization as monopolar diathermy device versus scalpel in the incidence of formation of postoperative seroma.

Discussing the effect of drain insertion in the overall incidence of postoperative wound complications was the most important issue regarding this pilot study as the power of the statistical analysis revealed that the frequency of SSI and wound dehiscence was significantly reduced as a direct result of drain placement. This results agreed with results published by Vashist M et al.,[11] while investigating the role of negative suction in abdominal closure.

Despite that drain insertion isn't attached to prolonged hospital stay as patients were allowed to discharge home with active subcutaneous drain but monitoring the time of drain removal was essential follow up job in our study as drain is always annoying for most of patient, when the drain is discharging less than 20 cc plasma fluid it should be removed with mean time of removal between 4 and 6 days however we encountered 10% of cases with seroma formation after drain removal especially in those group with early drain removal less than 4 days which further submitted for US guided aspiration of the seroma which is considered as additional procedure, the finding regarding recollection of seroma was similar to results by Fujii T et al.,[12] while investigating impact of subcutaneous drain on high-risk patients having colorectal operation to avoid incisional SSI.

4.1. Conclusion

When compared with traditional primary skin closure, the use of a subcutaneous suction drainage tube for abdominal wall closure in instances of peritonitis considerably lowers the frequency of wound infection, dehiscence, wound secondary suturing, and length of hospitalization in SSI.

Conflicts of interest

Authors declare that there is no conflict of interest, no financial issues to be declared.

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