MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.1.517.521

Subcutaneous Negative Pressure Versus Simple Closure of Skin Incision Following Surgery for Hollow Viscus Perforation: A Comparative Study

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Abstract

An important issue with open abdominal surgery is surgical site infection (SSI), which raises treatment costs, morbidity and death. One of the most frequent post-operative consequences is surgical site infection, which affects at least 5% of all patients having surgery and, depending on the degree of contamination, 30- 40% of patients having abdominal surgery. The subcutaneous single closed suction drain and the straightforward conventional closure of the skin incision during an emergency laparotomy for a hollow viscus perforation are contrasted in this research. The study's objective is to ascertain if, in emergency laparotomies performed for hollow viscus perforations, the insertion of a subcutaneous closed suction drain at the incisional site lowers the risk of surgical site infection after surgery. The research included seventy patients who were admitted to the Department of General Surgery. The diagnosis was established by clinical means and validated by suitable diagnostic techniques. Intravenous fluid was used to revive the patients and antibiotics were administered first. Intravenous metronidazole 500 mg and piperacillin tazobactum 4.5 gm were given to each patient. Individuals who were clinically and radiologically diagnosed with acute abdomen were scheduled for an emergency exploratory laparotomy. Thirty-five of the 70 patients who had emergency laparotomies had closed subcutaneous drains implanted. An additional 35 individuals had their skin incisions closed in the primary manner. The age group of 31-40 years old saw the second-highest number of patients, followed by that of 41-50 years old. In this research, the average age was 44.2 years. According to our research, subcutaneous negative pressure drainage greatly shortens the length of hospital stay after hollow viscus perforation surgery and lowers the risk of surgical site infection. By reducing hospital stays and infections, this promotes quicker healing from injuries and lessens the financial strain on patients. We advise using a closed negative pressure subcutaneous drain in all patients with contaminated or unclean wounds since the degree of contamination affects the potential for post-operative problems.

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Key Words

Laparotomy wound complications, hollow viscus perforation, negative pressure drainage, post laparotomy skin closure

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Received: 20 January 2024
Accepted: 23 February 2024
Published: 25 February 2024

Citation: A. Kalaiventhan, S. Deepak and S.K. Sreethar, 2024. Subcutaneous Negative Pressure Versus Simple Closure of Skin Incision Following Surgery for Hollow Viscus Perforation: A Comparative Study. Res. J. Med. Sci., 18: 517-521, doi: 10.36478/makrjms.2024.1.517.521

INTRODUCTION

Individuals who need an emergency laparotomy surgery run the risk of wound healing more slowly and developing an infection at the surgical site. The degree of contamination affects the incidence of SSI. Infection rates after perforation peritonitis procedures range from 5-15%, whereas rates following elective abdominal surgery are less than 5%[1].

There are several risk factors that have been linked to SSIs. Obesity and Body Mass Index have been associated with a higher incidence of SSIsobesity raises the risk of wound complications from 7%-23%[2]. Numerous additional variables that have been linked to SSI include diabetes mellitus, starvation, smoking, ASA class, operating time, contaminated procedures the rise of bacteria resistant to antibiotics[3]. A number of strategies have been put forward to lower SSIs. A few of these are used in daily practice. It has been shown that reducing shaving, hand washing, skin preparation preoperative antibiotics reduce the risk of post-operative wound problems[4]. In surgical wounds, the presence of dead space, serous fluid hematoma serves as a culture medium and raises the possibility of surgical site infection. Incisional SSIs are decreased when a subcutaneous drain is inserted because it clears the subcutaneous layer of fluids and debris and removes dead space early in the healing process, preventing infection. Infections at the surgical site result in longer hospital stays, higher rates of morbidity needless suffering for patients.

The subcutaneous single closed suction drain and the straightforward conventional closure of the skin incision during an emergency laparotomy for a hollow viscus perforation are contrasted in this research.

A useful growth medium for bacterial organisms to proliferate and infect wounds is hematoma and seroma[5,6]. The bacterial pathogens may originate nosocomially or from intra-abdominal sepsis. When there is a hollow viscus rupture, the gut contents including microorganisms leak into the peritoneal cavity, producing localised or widespread peritonitis. This irritation of the gut wall over time leads to gut oedema. Increased fluid extravasation into the intra-abdominal cavity due to an oedematous gut might lead to subcutaneous space leakage of the abdominal wound during the postoperative phase, potentially resulting in sepsis. Localised redness, swelling, soreness, warmth, purulent discharge, or poor wound healing are all signs of sepsis. Therefore, in order to avoid wound dehiscence or severe complications including ruptured abdomen, delayed sepsis, or patient mortality, early detection and therapy are essential. A number of interventions have been suggested with the goal of lowering SSIs. Numerous socially acceptable practices are utilised in normal practice, including as hand washing, avoiding shaving in favour of hair trimming using pre-operative antibiotics. In addition to guided aspiration and physical inspection of the wound using an alternate-day dressing, radiographic studies such as computed tomography and ultrasound are used to identify fluid accumulation post-operatively. It has also been shown that removing the fluid accumulation by placing a drain intraoperatively in the subcutaneous area lowers the risk of SIS. Dead space may be efficiently managed by using a drain. A dead space is an irregularity that arises from tissue rupture or the dissection of face planes after surgery. Dead space offers an opportunity for the development of germs that may infect wounds. By removing the "dead space" in the incision and draining the seroma or hematoma collection, a drain inserted into the subcutaneous area lowers the risk of SIS. Using a drain may help remove exudative fluid, insufficient tissue perfusion, absence of granulation tissue bacterial burden-all of which are obstacles to wound healing. There are two kinds of drains: open and closed. Closed drains may also be classified as passive or non-suction and active or suction. Open drains provide a route between the body and the outside world, which helps with the passive drainage of a cavity based on gravity. such as corrugated drains, penrose drains, etc. Negative pressure is maintained in suction drains and active drains to actively suck out fluid, eliminate dead space avoid fluid collection. For example, the Redon drain and other non-suction/passive drains employ gravity and capillary action to remove liquids. such as nasogastric tubes, Robinsons drainsurine catheters.

MATERIALS AND METHODS

The research included seventy patients who were admitted to the Department of General Surgery. The diagnosis was established by clinical means and validated by suitable diagnostic techniques.

Intravenous fluid was used to revive the patients antibiotics were administered first. Intravenous metronidazole 500 mg and piperacillin tazobactum 4.5 gm were given to each patient. Individuals who were clinically and radiologically diagnosed with acute abdomen were scheduled for an emergency exploratory laparotomy. They were then divided into two groups, Group I (which had a subcutaneous closed suction drain) and Group II (which did not). The surgical site was cleansed in the operating room using alcohol and povidone iodine. A midline incision was made to access the abdomen. Following surgery, a thorough peritoneal wash was administered. Continuous non-absorbable monofilament suture material was used to seal the Rectus sheath. In Group I, a 16F Romovac subcutaneous suction drain was positioned and secured using 2-0 Mersilk suture material. In every case, skin staplers were used to mimic the skin. Every

24 hours, the Group I patients' drainage quantity was recorded. For each patient, sterile dressing using Gamzee pads was applied daily. If there is redness, swelling, or discomfort along with a serous or purulent discharge, SSI has been diagnosed. Antibiotics were adjusted in accordance with the results of the microbiological assessment of every wound collection. Drainage was eliminated when the production was less than 5 millilitres in a 24-hour periodthe amount was recorded every day. Only once the drain was removed were patients released from care.

The statistical software SPSS was used to analyse the data. Student's t-test was used to compare group means the Chi-square test was used to compute frequencies and percentages for categorical variables. An alpha value of <0.05 was deemed statistically significant.

RESULTS AND DISCUSSIONS

Thirty-five of the 70 patients who had emergency laparotomies had closed subcutaneous drains implanted. An additional 35 individuals had their skin incisions closed in the primary manner. The age group of 31-40 years old saw the second-highest number of patients, followed by that of 41-50 years old. In this research, the average age was 44.2 years (Table-1).

Gender wise distribution of patients in our study is shown in Table-2. Total male patients were 46 (65.7%) and female patients were 24 (34.2%) Male to female ratio in our study was 3.5:1 (Table-2).

35 out of the 70 patients had closed negative subcutaneous drains inserted. Out of 35 patients, 11 (31.4%) had a wound-related complication. 19 individuals (54.2%) suffered a local problem at the surgical site out of 35 patients who had primary skin closure (Table 3). With a P value of 0.02 the complication rate in patients with subcutaneous drains was considerably lower.

The most frequent problem that was found was surgical site infection. The current research also included other postoperative complications, such as chest problems, wound infection (25.7%), wound dehiscence (5.7%)ruptured abdomen (5.7%) (Table 4). One patient in Group II had intestinal evisceration due to an abdominal rupture. Tension suturing was needed to close the abdominal wall in this patient and perform a new examination. Antibiotics and frequent dressing changes were used to treat the remaining patients conservatively.

The relationship between the drain status (with or without) and the length of stay after surgery is seen in Table 5. According to our research, patients with negative pressure drains had shorter postoperative stays than those without drains.

Patients who had subcutaneous negative pressure drains spent an average of 10.11 days in the hospital. 13.4 days was the average length of stay for patients without drains. Patients who have subcutaneous drains have a statistically significant decrease in length of hospital stay (Table 6).

Abdominal trauma, acute appendicitis, intestinal blockage hollow viscus perforation are among the main causes of emergency surgery. The underlying disease directly affects the prognosis of every emergency laparotomy, although coexisting disorders, surgical skillpost-operative care all play a role. When compared to patients having elective laparotomies, those receiving emergency laparotomies have a disproportionately high morbidity and fatality rate[7]. Local problems that are often observed include seroma, hematoma, wound dehiscence, ruptured abdomen delayed wound healing. Subcutaneous drain implantation is one of the strategies being used to decrease surgical site infection.

Sixty-eight percent of the patients in our research were in the 31-50 age range. This result is consistent with a research by Kapoor[8], where 69% of participants were between the ages of 21 and 50. In our research, the male to female ratio was 2.6:1. Due to increased rates of smoking and misuse of analgesics, young guys are more likely to get perforation peritonitis. This age group is also more vulnerable to intra-abdominal injuries and perforations from highway accidents.

Within our investigation, 20 individuals (about 40%) had wound problems. Wound problems occurred in six individuals (24%) in the subcutaneous drain group and in fourteen patients (56%) in the primary closure group. In our investigation, the probability value (P = 0.02) is statistically significant. The most frequent side effect is an infection at the surgery site. The current research also included other surgical problems such as ruptured abdomen (2%) and wound infection (22%), dehiscence (6%)chest issues. This is consistent with the research conducted by Fujii[9] By removing serous fluid and blood collection from the area immediately around the wound, a subcutaneous drain helps to improve capillary circulation, lower the bacterial loadencourage the creation of granulation tissue.

In our research, postoperative stays for individuals with drains were shorter than those without drains. In patients with drains, the average length of stay after surgery was 9.1 days. Patients without a drain had a postoperative stay of 12.5 days (P<0.01). This study and one by Kagita *et al*. are comparable. The longer hospital stay might be brought on by the additional time needed to treat wound infections. These patients' miseries will be exacerbated by the need for frequent dressing changes, protracted antibiotic medication subsequent surgery. Furthermore, an SSI often results in a five-day increase in hospital stay[10]. The patient's financial burden will increase as a result of this. The intermittent negative pressure cycle offered by a VAC

Table 1: Age distribution

Age group	Frequency (n=70)	Percentage
21-30	13	18.5%
31-40	17	24.2%
41-50	27	38.5%
51-60	10	14.2%
61-70	3	4.2%
Total	70	100

Table 2: Gender distribution

Sex	Frequency	Percentage
Male	46	65.7%
Female	24	34.2%
Total	70	100

Table 3: Association between status of drain and SSI

Group	Wound complication	No wound complication	Chi Square
Group I (n=35)	11(31.4%)	24(68.5%)	= 6.31 P =0.03
Group II (n=35)	19(54.2%)	16(45.7%)	

Table 4: Wound complication

Wound complication	Group I (n=35)	Group II (n=35)	p-value
Seroma	2	4	0.30
Hematoma	2	0	0.79
SSI	4	9	0.08
Wound dehiscence	2	3	0.48
Burst abdomen	0	2	0.79

Table 5: Association between status of drain and Post-operative stay

Post-operative stay in days	Group I (n=35)	Group II (n=35)	
<7	2	0	Chi Square =4.94 P =0.29
8-10	25	16	
11-15	3	5	
>15	5	14	

Table 6: Mean duration of hospital stay

Group	Mean	S.D	p-value
Group 1(n=25)	10.11	2.4465	T test= 6.71
Group 2(n=25)	13.4	3.570	P=< 0.01

apparatus offers a higher suction force than that given by the spring-loaded device, which is one of the advantages of NPWT versus SSDs. An SSD cannot operate again unless the suction force is manually applied after it has dropped. It no longer serves the purpose of expelling extracellular fluid when it is released. Due to the VAC apparatus's constant maintenance of the suction pressure within the intended negative range and its electric power operation, this drawback is not present. In severely exuding abdominal wounds, pressures may be increased to-100 mmHg, which is not possible with SSDs. In addition to keeping fluid from building up, NPWT promotes wound healing, which is especially helpful for immunocompromised and sepsis patients. As shown by the current investigation, SSIs considerably lengthen hospital stays and raise the cost burden on impacted patients[11-13]. The two drawbacks of DPC are a somewhat longer hospital stay (about five to seven days) and the need for a repeat surgical treatment in instances with unremarkable post-operative courses. Still, the advantages of a markedly reduced SSI incidence outweigh the disadvantages. This research's limited sample population-just 70 subjects-is one of its limitations. Larger trials and multicentric investigations are needed to improve the validity of this method.

CONCLUSION

According to our research, subcutaneous negative pressure drainage greatly shortens the length of hospital stay after hollow viscus perforation surgery and lowers the risk of surgical site infection. By reducing hospital stays and infections, this promotes quicker healing from injuries and lessens the financial strain on patients. We advise using a closed negative pressure subcutaneous drain in all patients with contaminated or unclean wounds since the degree of contamination affects the potential for post-operative problems.

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