International Surgery Journal
Manoharan GV et al. Int Surg J. 2018 Apr;5(4):1368-1372
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20181112

Original Research Article

Evaluation of the use of subcutaneous drains to prevent wound complications in abdominal surgeries

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Received: 21 January 2018
Accepted: 28 February 2018

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ABSTRACT

Background: Wound complications like surgical site infections (SSI) and wound dehiscence are common following abdominal surgery for peritonitis. Drains have been used to remove collections from the early days of surgery. The use of drains to remove subcutaneous collections to prevent wound complications needs to be studied.
Methods: Sixty patients who underwent surgery for peritonitis were selected for the study. 30 patients underwent conventional abdominal wall closure while the other 30 had suction drains inserted in the subcutaneous tissue. Wounds were observed for complications and time for healing.
Results: The incidence of SSI was significantly less in Group A (23%) than in Group B (60%). Similarly, wound dehiscence occurred in 43% of SSI cases in Group A as against 89% of SSI cases in Group B, the difference of which was statistically significant. The mean duration of hospital stay was significantly less when subcutaneous suction drain was placed (9 days).
Conclusions: Subcutaneous suction drainage tube is an effective method of abdominal wall closure in cases of peritonitis when compared to conventional primary skin closure as it significantly reduces the incidence of SSI, wound dehiscence, wound secondary suturing and duration of hospital stay.

Keywords: SSI, Suction drain, Wound dehiscence, Wound infection

INTRODUCTION

Surgical Site Infection and delayed wound failure are reported more commonly in abdominal surgeries performed in cases of peritonitis than in other gastrointestinal surgeries.[1] Post-operative Surgical Site Infection (SSI) is a significant cause of morbidity in terms of prolonged hospital stay and increased expenses. Though pre-operative antibiotic prophylaxis and per operative thorough peritoneal lavage play a major role in preventing SSI, an effective method of closure of wound is also important. Burst abdomen following wound dehiscence in SSI is a major concern for surgeons as it can cause compromise of respiratory functions if reclosure is done, whereas, nosocomial infection can occur if the wound is left open.[2] Subcutaneous negative suction drainage has been shown to reduce the incidence of SSI and wound dehiscence by causing drainage of the infective material and promoting wound healing.[3] This study was done to compare the effectiveness of sub-cutaneous negative suction drainage tube and conventional abdominal wall closure in cases of peritonitis with regard to SSI, wound dehiscence, wound secondary suturing and duration of hospital stay.

METHODS

Patients presenting at the emergency department who meet the inclusion criteria were recruited into the study. After obtaining a detailed history, all patients presenting

with acute abdominal pain were isolated in the emergency ward.

Diagnostic criteria for peritonitis

Clinically

- Acute pain abdomen, nausea, vomiting
- Fever, Tachycardia
- Guarding, rigidity
- Absent or decreased bowel sounds

On investigations

- Leukocytosis
- X-ray abdomen erect-free air under diaphragm, distended bowel loops.
- USG Abdomen-Free fluid in peritoneal cavity

Laparotomy findings

Whether pus fluid is present or abdominal cavity is contaminated with bowel contents.

Patients who met the above mentioned diagnostic criteria for peritonitis were included in the study.

Consent for participation in the study was obtained from the patients after pre-consent counselling. The consent for participation in the study was obtained simultaneously with the consent for surgery.

30 cases underwent abdominal wall closure with subcutaneous suction drain and were assigned to Group A. 30 other cases underwent conventional primary skin closure and were assigned to Group B.

Type of drainage tube-closed wound suction system.

Redon drain (perforated catheter tube) was placed subcutaneously and connected to a container which had the negative suction pressure capacity.

Follow up

DOS: On table pus c/s was sent. Empirical antibiotic therapy was started

POD 2/3/4: If wound discharge/sero-purulent discharge in bellow container was present, pus c/s was sent.

POD 3: Antibiotic changed according to on table pus c/s result

POD 4/5/6: Comparison of on table pus c/s with wound/bellow container discharge pus c/s was done to identify whether infection is due to abdominal cavity infection or hospital acquired cross infection.

The collection in the bellow container was emptied and measured every post-operative day. If the collection in the drain was negligible for two consecutive days and wound apposition was good, the suction drain was removed. Average period of suction drain placement was analyzed.

Wound infection: superficial incisional SSI was assessed based on the CDC criteria for surgical site infection as follows:

Infection involving only skin or sub-cutaneous tissue of the incision and at least any one of the following:

- Purulent drainage with or without laboratory confirmation from the superficial incision
- Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
- At least one of the following signs or symptoms of infection-pain or tenderness, localized swelling, redness, or heat.

Wound dehiscence was identified as per the definition, i.e. postoperative separation of musculoaponeurotic layers of the abdominal wall. Post-operative follow up was for 30 days. The patients were reviewed at two and four weeks from the date of discharge.

RESULTS

Indications of surgery

The following were the indications for surgery in all peritonitis cases (on table finding - pyoperitoneum / fecal peritonitis) in the order of decreasing frequency:

- Appendicular perforation/mass (most common)
- Small bowel perforation: duodenal/ileal, obstruction with pyo peritoneum
- Cholecystitis
- Large bowel perforation: colon/recto sigmoid
- Gastric-antro pyloric
- Liver abscess
- Parietal wall abscess with pyo-peritoneum, post appendicectomy fecal peritonitis, obstructive umbilical hernia with pyo peritoneum

The difference in the indications of the surgery in both the groups was not statistically significant, i.e. the indications were similar in both the groups.

Type of incision

The most common incision performed was midline laparotomy in both the groups. Grid iron and right subcostal were the other incisions performed. There was no statistically significant difference in the type of incisions performed between the two groups.

Table 1: Statistical significance of difference in indications for surgery.

Demography indications of surgery	Group A (n = 30)	Group B (n = 30)	P value	Statistical test of significance
Appendicular	16	15	0.8	Chi square test
Small bowel	8	8		
Gall bladder	2	3		
Large bowel	0	2		
Gastric	2	0		
Liver	0	1		
Others	2	1		

Table 2: Statistical significance of difference in the type of incisions performed.

Demography type of incision	Group A (n = 30)	Group B (n = 30)	P value	Statistical test of significance
Midline laparotomy	26	25	0.9	Chi square test
Grid iron	2	3		
Right subcostal	2	2		

Hence, there was no statistical difference in all the demographic parameters like age, sex, indication for surgery and type of incision between both groups.

Surgical site infection, wound dehiscence and wound secondary suturing

Overall superficial incisional surgical site infection rate was 42% (25 out of 60 cases were infected), 23% in Group A and 60% in Group B.

Dehiscence occurred in 76% of SSI cases (19 out of 25 overall cases), 43% of SSI cases (3 out of 7) in group A and 89% of SSI cases in group B (16 out of 18). The wound healed without dehiscence in 4 out of 7 patients in group A and 2 out of 18 patients in group B. All patients with wound dehiscence were taken for secondary suturing.

Table 3: Statistical significance of difference in the incidence of SSI, wound dehiscence, secondary suturing.

Outcome	Group A (n = 30)	Group B (n = 30)	P value	Statistical test of significance
SSI	7 (23%)	18 (60%)	0.003	Chi square test
Wound dehiscence and secondary suturing	3	16	0.015	Chi square test

The incidence of SSI was significantly less in group A than in group B. Similarly, among the SSI cases the incidence of wound dehiscence was also significantly less in group A than in group B.

Role of drain in early identification of SSI

Sero purulent collection from the drain was picked up and sent for C/S as early as POD-2 in 86% of SSI cases in group A. Whereas, in group B, 56% of the SSI cases were detected on POD 4 by the presence of wound discharge.

Table 4: Significance of early detection of SSI.

SSI cases- POD of detection	Group A (n = 7)	Group B (n = 18)	P value	Statistical test of significance
POD 2	6	-	0.0001	Chi square test
POD 3	1	6		
POD 4	-	10		
POD 5	-	2		

There was statistically significant early detection of SSI due to the presence of drain in group A when compared to conventional closure in group B.

Duration of stay

The mean duration of hospital stay was significantly less when subcutaneous suction drain was placed.

Table 5: Mean duration of hospital stay.

Outcome measure	Group A (n = 30)	Group B (n = 30)	P value	Statistical test of significance
Mean duration of hospital stay (days)	9.17	14.17	0.00001	Student unpaired t test

DISCUSSION

The indications for surgery were similar in both the groups (p value 0.8). Appendicular causes topping the list in both the groups. The most common incision performed was midline laparotomy in both the groups. Similar to this a recent study was done at D. Y. Patil Medical Hospital, Pune from 2013 to 2015 in 100 patients who were taken up for elective laparotomy, in which cholecystectomy was the most common surgery and right subcostal was the most common incision performed.

The incidence of SSI was significantly less in group A (23%) than in group B (60%), with a p value of 0.003. Among the SSI cases the incidence of wound dehiscence

and secondary suturing was also significantly less in group A (43%) than in group B (89%) with a p value 0.015. Whatever be the cause for peritonitis, whatever be the type of incision, subcutaneous negative suction drains are effective in reducing the incidence of SSI, wound dehiscence, wound secondary suturing rate when compared to primary conventional abdominal wall closure. There are a lot of studies on open vs closed technique/ primary vs delayed abdominal wall closure in sepsis/peritonitis cases. Similarly, studies for and against the placement of subcutaneous drains in various scenarios like elective laparotomy wounds, colorectal surgeries are also available.

Studies on closed suction drain date back 1973. Cruse et al in their prospective study on 23,659 surgical wounds showed a lesser SSI rate of 1.8% in closed suction drain as against 2.4% in a Penrose wound drain and hence, closed suction drains were preferred to open drains since then.[4]

A randomized clinical trial which was done in 2001 concluded that primary closure should be done in clean contaminated and contaminated laparotomy wounds whenever possible. This study compared the rates of complication in clean-contaminated and contaminated laparotomy wounds between those primarily closed and those left open. There was a statistically significant difference (p = 0.002) in wound infection rate between those wounds left open (30.2%) and those closed primarily (2.1%). There was no significant difference in the incidence of wound dehiscence between the two groups as p value was >0.05.

Another study in 2006-2007 was conducted to evaluate the outcome of wound healing in laparotomy wounds in terms of delayed vs primary skin closure. Sixty patients were enrolled into this study. Thirty patients (group A) underwent delayed closure. Thirty other patients (group B) underwent primary closure. Wound infection leading to wound dehiscence occurred in 10 out of 60 patients (16.66%). The incidence was less in group A (4 cases - 13.33%) than in group B (6 cases - 20 %). This difference was statistically significant (p <0.05). The infection rate was significantly high in advanced age (p <0.01). The mean duration of stay was 7.7 days in group A as against 10.3 days in group B. Open abdomen technique of dirty wounds was found to reduce SSI.

A prospective study in 154 patients was done at the Department of Surgery in Gazi University Medical School at Turkey aimed to evaluate the effectiveness of subcutaneous suction drains. All patients had undergone laparotomy for peritonitis. After the closure of the musculo fascial layers, a subcutaneous negative suction drain was placed. The average period of placement of drains in patients was 5.3 (4-15) days. 13.1% patients developed SSI, detected by drainage of pus from the drain. One patient who developed evisceration was reoperated. In two patients the wounds were left open. In 90.4% patients with surgical site infection, the drains were placed for a day and the wound had remained healthy until and thereafter. It was substantiated that subcutaneous closed suction drainage of the surgical incision in colorectal surgery results in significant reduction in surgical site infections.

A prospective study to investigate the effectiveness of negative suction in abdominal wall closure in cases of sepsis was done in 2013. A total of 100 cases of perforation peritonitis were taken into the study. They had studied 100 cases of perforation peritonitis. Patients were divided into two groups A and B. Patients who had abdominal wall closure with negative suction drain were assigned to group A and patients who had abdominal wall closure without drain were assigned to group B. Patients in group A had low incidence of SSI and wound dehiscence than patients in group B. Average time for wound healing was 10 days in group A and 14 days in group B.

A study from Japan's Gunma University showed that subcutaneous drains help in reducing the incidence of SSI in colorectal surgery in obese patients. Obese patients are at increased risk of SSI due to increased thickness of the subcutaneous fat. The incidence of SSI in obese patients with drain was 14.3% and without drain was 38.6%.

Chowdri et al in their study, had shown 8% SSI in cases without drain versus no SSI in cases with subcutaneous drain.[5]

In a similar study by Kim et al, 2.8% infection rate was shown in the group with drain versus 7.8% in the group with conventional closure.[6]

A recent study was done at D. Y. Patil Medical Hospital, Pune from 2013 to 2015 in 100 patients of elective laparotomy. The SSI rate with drain was 6% and without drain was 20%.

In contrast to these, Gallup et al in a study showed no statistically significant difference in wound complication rate, between the groups with and without subcutaneous drain: 20% versus 31% with a p value of 0.09.[7]

Cardosi et al in a randomized control trial studied the use of subcutaneous suction drain in which no significant difference in infection rate was noted between the control group and the study group: 17.9% versus 15.6% with a p value of 0.70.[8]

There was statistically significant early detection of SSI due to the presence of drain in group A when compared to conventional closure in group B (POD 2 in group A versus POD 4 in group B, p value 0.0001). Subcutaneous negative suction drains not only help in reducing the incidence of SSI, but also help in early identification of SSI, and thus allowing us to ensure early treatment and prevention of wound dehiscence. The mean duration of

hospital stay was significantly less when subcutaneous suction drain was placed (9 days versus 14 days, p value 0.00001). This parameter has been studied by others.

Kim et al in a study evaluated the hospital stay period in patients with and without wound drain. It was found to be 8 days in the group with drain and 11 days in the group without drain. A similar study was done by Zhen et al. It was found that the closed suction group had lesser period of stay (9 days) than the group without drain (20 days).[9]

CONCLUSION

Surgical site infection is commonly due to abdominal cavity infection rather than hospital acquired cross infection.

Subcutaneous suction drainage tube is an effective method of abdominal wall closure in cases of peritonitis when compared to conventional primary skin closure as it significantly reduces the incidence of wound infection, dehiscence, wound secondary suturing and duration of hospital stay in SSI.

Subcutaneous suction drainage tube enables improved rate of recovery and finally decreased morbidity and early rehabilitation. Hence, subcutaneous suction drainage tube should be considered in abdominal wall closure in patients who undergo surgery for peritonitis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Manoharan GV, Sivakumar T, Kumar MA. Evaluation of the use of subcutaneous drains to prevent wound complications in abdominal surgeries. Int Surg J 2018;5:1368-72.