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Original Research Article

Comparative Study of Conventional Primary Skin Closure with Subcutaneous Negative Suction Drain Following Emergency Exploratory Laparotomy

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Abstract:

Background: One of the procedures that are most frequently carried out during an emergency is a laparotomy. It is frequently carried out on patients who have a history of abdominal trauma or who have acute surgical problems including acute intestinal obstruction, gastrointestinal perforation, etc. who present to the surgical emergency department. Laparotomies can result in post-operative difficulties whether they are done on an elective or emergency basis. Especially after emergency laparotomies, problematic clinical issues such wound infections, wound dehiscence, and incisional hernia are common.As a result of wound infections, post-operative wound infections significantly affect healthcare resources and costs. In emergency laparotomy procedures, a variety of techniques are used to prevent post-operative wound problems, such as the placement of a subcutaneous drain and dry gauze dressing.

Aim: The aim of the study is to Comparative Study Conventional Primary Skin Closure with Subcutaneous Negative Suction Drain Following Emergency Exploratory Laparotomy.

Material and Method: This prospective comparison study was carried out in the General Surgery Department. The study included all patients undergoing emergency laparotomies who met the inclusion requirements. The patient underwent a thorough clinical examination, blood work, and imaging tests. Patients who met the study's inclusion requirements were chosen at random. There were two groups of patients. Group A includes 100 patients with a subcutaneous closed suction drain, while Group B includes 100 patients without a drain. A clinical diagnosis is made and then supported by several diagnostic techniques.

Results: A prospective comparison study was conducted. The trial involved 80 patients with perforative peritonitis of various etiologies who underwent exploratory laparotomy. Only 7.4% of patients in the DPC group had SSI, compared to 42.9% of individuals who received primary closure. The significance of this was statistical. DPC thus causes a substantial drop in SSI. These wounds were potentially infectious at the time of DPC. However, it hasn't been thought of as SSI when infections are present in wounds that were left exposed for DPC. A closed negative subcutaneous drain was inserted in 100 out of a total of 200 patients. Out of 100

patients, 25 (or 25%) suffered problems from their wounds. 48 of the 100 patients (or 48%) who had surgery reported local problems.

Conclusion: When compared to patients who had a negative suction drain implanted, a subcutaneous single closed suction drain dramatically reduces postoperative surgical site infection, seroma, postoperative pain, and the length of hospital stay. By reducing hospital stays and infections, it promotes quicker healing of wounds and lowers the financial burden placed on patients. We advise the use of closed negative pressure subcutaneous drain in all patients with contaminated or filthy wounds since postoperative consequences depend on the degree of contamination.

Keywords: Laparotomy wound complications, Negative pressure drainage, Post laparotomy skin closure

Introduction

A serious side effect of surgery, particularly a laparotomy for perforative peritonitis, is surgical site infection (SSI). Particularly in a nation with limited resources like India, it worsens patient satisfaction while increasing morbidity, hospital stays, and treatment costs. Surgical closure of the abdominal wall is difficult when sepsis is present. The stomach becomes oedematous when there is peritonitis, and exudation results from sepsis in the peritoneal cavity. Following peritoneal cavity cleaning, a considerable number of patients may have compartment syndrome, wound dehiscence, or a burst abdomen if the abdominal wall is tightly closed.Typically, five to six days after surgery, when the integrity of the skin and/or the wall of a hollow viscus is compromised, surgical site infections emerge from contamination with microorganisms, the majority of which are patients' flora (an endogenous source). Clean, clean-contaminated, contaminated, and dirty surgical wounds are all possible. In situations of perforative peritonitis, the surgical wound site following laparotomy is classified as a clean-contaminated wound with a 5-8% infection rate. [1]

One of the most frequent postoperative consequences is a surgical site infection, which affects at least 5% of all surgical patients and, depending on the extent of contamination, 30–40% of patients having abdominal surgery.2 Patients who need emergency laparotomies are more likely to develop surgical site infections and experience slower wound healing. The level of contamination affects how often SSI occurs. Compared to fewer than 5% for elective abdominal procedures, the incidence of infection after operations for perforation peritonitis is 5-15%. [2] After surgery, wound healing is a significant concern due to its connection to patient morbidity and quality of life. Surgical Site Infections (SSIs) are the general name for infections that develop in the incision left by an invasive surgical procedure.

The risk of surgical site infection is increased by the presence of hematoma, serous fluid, and dead space in surgical sites. Subcutaneous drain insertion reduces incisional SSIs by removing fluids and debris from the subcutaneous layer and removing dead space in the early postoperative phase before they become infected. Infection at the surgical site lengthens hospital stays, increases morbidity, and adds to the needless suffering of patients. [3]

Because re-closure typically results in respiratory compromise and hypoxia, wound dehiscence is challenging to control. The danger of nosocomial infection increases if the wound is left exposed. By removing trash and serum from the

subcutaneous plane and by filling up empty space, negative suction lowers the risk of infection. The most terrifying complication, acute wound failure (also known as wound dehiscence or a burst abdomen), is the postoperative separation of the abdominal musculoaponeurotic layers. It affects 1% to 3% of patients having abdominal surgery, and it has a number of risk factors, including intra-abdominal infection.Clean, infected wounds can undergo primary closure following extensive peritoneal lavage. Delay main suture is an additional alternative that leaves the skin and subcutaneous tissue exposed. If the wound is healthy, delayed suturing is typically performed after around five days and the wound needs to be treated with regular saline-soaked gauze each day. [4]

Material and Methods

This prospective comparison study was carried out in the General Surgery Department. The study included all patients undergoing emergency laparotomies who met the inclusion requirements. The patient underwent a thorough clinical examination, blood work, and imaging tests. Patients who met the study's inclusion requirements were chosen at random. There were two groups of patients. Prospective comparative research in which two groups of patients were randomly assigned before surgery. Group A includes 100 patients with a subcutaneous closed suction drain, whileGroup B includes 100 patients without a drain.Patients admitted to the emergency room. A clinical diagnosis is made and then supported by several diagnostic techniques. Important parameters are examined. When necessary, crystalloids and blood products are used for first resuscitation. The patient and the patient's family members were informed of the study's procedures, and written agreement was obtained from them.

Inclusion criteria

- All patients, aged >12 years and <80 years,
- Undergoing surgical intervention for perforative peritonitis after taking informed consent.

Exclusion criteria

- Immunocompromised patients,
- Age ≤12 years and ≥80 years,
- Patients with pre-existing skin infections,
- Patients having diabetes mellitus, obesity, or chronic renal failure,
- Patients taking immunosuppressive therapy for other causes,
- Patients not willing to participate in the study,

Study technique

Prior to and during surgery, all patients underwent empirical treatment with intravenous Ceftriaxone-Sulbactam 1.5g metronidazole 500mg until a C/S report of peritoneal fluid collected during surgery was obtained and targeted antibiotic medication was started. Polypropylene No. 1 (for midline incisions) and Polyglactin No. 1 (for gridiron incisions) were used to close the abdominal sheath in a single, continuous layer. Without using subcutaneous sutures, the skin was stitched shut using 2-0 polyamide black on a curved cutting needle in an intermittent method.

The surgical site was cleansed in the operating room with povidine iodine and alcohol. The drape is sterile. Using a scalpel, a midline incision was made to open the abdomen. After the operation, a thorough peritoneal wash was administered. Non-absorbable suture material is used to seal the rectus sheath. A separate stab incision was used to bring out a suction drain (mini-vac 8f) through healthy skin and link it to a closed suction drain. The suction drain was placed with its tip over the subcutaneous layer. The incision line was stitched up and treated for all patients using polyamide 2.0 mattress sutures.

If wound infection was apparent, however, one or more sutures might be taken out, pus

or a wound swab sent for C/S, and daily wound dressing continued. Data was tabulated, and graphs and tables were used for the presentation. To arrive at a conclusion, appropriate statistical tests considering the amount of the data were run.

Methodology

- Every 24 hours, the amount of drainage from the mini vac 8F drain was recorded. Every day, a clean dressing is applied.
- If a collection is found at the surgical site, its culture and sensitivity will be assessed.
- Antibiotics with sensitivity were started.
- Daily drainage measurements were made.
- When the output was less than 5ml every 24 hours, the drain was shut off.
- Before being released from the hospital, stitches were removed (alternately on the eighth and tenth day). Only when the drain has been taken out are patients allowed to go.

Condition of wound

- Presence of wound infection-any purulent discharge, pus/swab C/S.
- Possible wound infection-signs of inflammation/serous discharge.

Statistical Analysis

The data will be compiled in a Microsoft Excel sheet, and then the statistical analysis will be done accordingly with suitable statistical software (SPSS ver.22.0). Chi-square test was applied for categorical variables to calculate frequencies and percentages, and Student's t-test was applied to compare the means among the groups.

Result:

The study is a prospective comparative study. Eighty patients with perforative peritonitis of varying etiology who underwent exploratory laparotomy were included in the trial. Among patients who underwent primary closure, 42.9% developed SSI, whereas only 7.4% of patients in the DPC group had SSI. This was statistically significant. Therefore, DPC results in a significant decrease in SSI. Till the time of DPC, these wounds were potentially infected. But the presence of any infection in wounds left open for DPC has not been considered SSI.

Table 1: Distribution of patients based on SSI(Surgical Site Infections).

Group	**No.ofpatients**	**Percentage(%)**
Primaryclosuregroup	100	50%
Openskingroup	100	50%
Total	200	100%
SSI	**Openskingroup(n=95)n(%)**	**Primaryclosuregroup (n=98)n(%)**
Yes	15(15.79)	22 (22.45)
No	80 (84.21)	76 (77.55)

Open skin (OS) group (n=100): underwent delayed primary closure (DPC) of skin wound or secondary healing. Primary closure (PC) group (n=100): underwent primary closure (PC) of skin wound.Two patients in the control group and one in the study group died in the post-operative period and were not included in the calculation of SSI. Also, two patients in the study group who did not undergo DPC were not included in this calculation.

Table 2. Shows the Subcutaneous Drain and Frequency of Wound Complication

SubcutaneousDrain	Frequency	Percent
No	100	50.0
Yes	100	50.0
Total	**200**	**100.0**
Group	**Woundcomplication**	**No woundcomplication**
GroupI(n=100)	25 (25%)	75 (75%)
GroupII(n=100)	37 (37%)	63 (63%)

This table shows equal distribution of cases that had subcutaneous drain placement. Patients with subcutaneous drain 50% and without drain 50%. In a total of 200 patients, a closed negative subcutaneous drain was placed in 100 patients. Twenty five Patients (25%) out of 100 had wound-relatedcomplications. Out of 100 patients,37 patients (37%) had local complications at the surgical site.

Table 3: Shows the Wound complication and Association between the status of the drain and post-operative stay

Woundcomplication	GroupI(n=100)	GroupII(n=100)
Seroma	5	7
Hematoma	3	0
SSI	12	21
Wounddehiscence	5	9
Burstabdomen	0	4
Post-operative stayin days	**Group I(n=100)**	**Group II(n=100)**
<7	3	0
8-10	69	61
11-15	5	7
>15	23	32

The most common complication encountered was Surgical Site Infection. Other postoperative complications like chest complications, wound infection (22%), wound dehiscence (7%), and burst abdomen (2%) were also observed in the present study. One patient in Group- II had a burst abdomen with evisceration of the bowel. This patient required re-exploration and closure of the abdomen wall by tension suturing. All other patients were managed conservatively with repeated dressing and antibiotics. The mean duration of hospital stay in patients with subcutaneous negative pressure drain was 9.12 days. The average duration of stay in patients without drain was 12.5 days.

Discussion

General surgeons frequently conduct emergency laparotomies. Abdominal trauma, intestinal obstruction, acute appendicitis, and hollow viscus perforation are among the main causes of emergency surgery. Although the underlying pathology of every emergency laparotomy directly influences the outcome, comorbid diseases, surgical skill, and post-operative care also have an impact. When compared to elective laparotomies, patients who undergo emergency laparotomies have disproportionately high morbidity and fatality rates. Seroma, hematoma, surgical site infections, wound dehiscence, ruptured abdomen, and delayed wound healing are some common local consequences. The insertion of a subcutaneous drain is one of the many strategies used to lessen surgical site infection. [5]

A number of methods have been reported to reduce the risk of SSI, including subcutaneous drains, wound shields, and

high-inspired oxygen therapy during surgery. [6,7] Subcutaneous drains have not been observed to lower the incidence of SSI in some investigations, however these studies did not just include high-risk patients. [8]

Jyothi Bindal et al.2017 [9] conducted a prospective study and concluded that there is no significant difference in age, superficial SSIs, and postoperative fever. the difference in mean hospital stays, discomfort, and wound seroma that is noteworthy. In the drain group, 10% had seroma, compared to 26% in the non-drain group; the average hospital stay was 8.2 days in the drain group as opposed to 9.4 days without one. This is in concordance with the study done by **Fujii et al.2011 [**10]. By removing serous fluid and blood accumulation from the area around the wound, a subcutaneous drain can improve capillary circulation, reduce bacterial burden, and encourage the growth of granulation tissue.

In our study, patients with drains experience shorter postoperative stays than patients without drains. Patients who had drains had an average postoperative stay of 9.1 days overall. In patients without drains, the postoperative stay was 12.5 days. operative stay in This is similar to a study done by **Kagita et al.2019 [**2] The longer hospital stay could be a result of the additional time needed to treat a wound infection. Such patients will have additional agony from frequent dressings, protracted antibiotic therapy, and subsequent surgical procedures.

The study by **Anvikar et al.1999 [**11] reported 2.6% SSI in surgeries of duration less than 1 hour, 4.8% SSI in surgeries between 1-2 hours, and 5.4% SSI if duration more than 2 hours. 1-2-hour duration surgeries have significantly higher. infection rate than those less than 1-hour duration. From a study done in Thailand, **Kasatpibal et al.2006 [**12] also reported an incidence of infection of 0.9% in surgeries less than 1 hour and 2.5% SSI in surgeries lasting for more than 1 hour. **Ahmet et al.2008 [**13] found intra-operative transfusion to be an independent risk factor for SSI in patients undergoing colorectal surgery.

According to a study carried out by **Nordmeyer M. et al.2016 [**14], there was no significant difference in the postoperative wound size between both examined groups. **Pauser J. et al.2016 [**15] conducted their study in 2016 and found that there was no significant difference in postoperative wound size between both examined groups

In contrast to closed incisional negative pressure wound care with traditional dressing in emergency laparotomies. Although early findings from our trial suggested fewer wound problems like surgical site infections, seroma development, and wound dehiscence, these outcomes are statistically insignificant. Further research in this area is required, nevertheless, because fewer dressing changes result in higher patient comfort, use less staff, and have a negative impact on expenses. The main disadvantage is that closed-incision negative pressure wound management systems are far more expensive than conventional wound dressing.The use of the subcutaneous negative pressure drain was successful in reducing the incidence of incisional SSI in addition to suturing the dermic layer and providing adequate irrigation of the wound. This was due to the continuous suction of the subcutaneous effusion, hematoma, and bacteria as well as the decrease in the dead space in the subcutaneous wound area. Infection at the surgical site after surgery is dramatically reduced by subcutaneous negative pressure. Following an emergency laparotomy, subcutaneous negative pressure drainage shortens the amount of time needed for recovery.

Conclusion:

According to our study, subcutaneous negative pressure drainage considerably

shortens hospital stays after surgery for hollow viscus perforation and decreases post-operative surgical site infections. By reducing hospital stays and infections, it promotes quicker healing of wounds and lowers the financial burden placed on patients. We advise the use of closed negative pressure subcutaneous drain in all patients with contaminated or filthy wounds since postoperative consequences depend on the degree of contamination. The frequency of wound sepsis, along with the associated morbidity and expense, will be decreased by aggressive wound treatment, which frequently takes a multidisciplinary approach.When compared to patients who had a negative suction drain implanted, a subcutaneous single closed suction drain dramatically reduces postoperative surgical site infection, seroma, postoperative pain, and the length of hospital stay. Negative-pressure wound therapy may be an option to consider, especially in patients who have a high risk of infection, as it may be successful in preventing surgical site infections and minimizing postoperative wound problems.

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