

TO STUDY THE OUTCOME OF EMERGENCY LAPAROTOMY WOUND WITH SUBCUTANEOUS NEGATIVE PRESSURE SUCTION DRAIN

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Abstract-

BACKGROUND: Surgical site infection is one of the most common post-operative wound complication associated with open abdominal surgery and is related to increased morbidity, mortality and health care cost of the patients. Mainly Surgical wound infection occurs within first week of surgery. Compared to Elective laparotomy, emergency laparotomies have a disproportionately high risk of Surgical site infections. The aim of present study was to study the outcome of surgical wound using negative pressure suction drain placed in subcutaneous plane during emergency laparotomy.

METHODS: This prospective observational study was carried out in Dr. BRAM Hospital, Raipur over a period of one year. This study was conducted in 111 patients who underwent emergency laparotomy procedures and having subcutaneous negative pressure suction drain and fulfilling the inclusion criteria were included. Appropriate antibiotics was given to each patient. Patients were followed up on 3, 5,7,10 post-operative days and wound was examined and graded according to Southampton wound grading system. Suction drain was removed when the output was less than 10 ml for two consecutive days. All patients were studied in terms of surgical site infection and duration of hospital stay.

RESULT: 23 patients out of 111 patients developed surgical site infection. Out of which 2 patients had grade-1 infection, 5 patients had grade-2, 13 patients had grade-3, 3 patients had grade-4 infection. No patients developed grade-5 infection. In this study, it was observed that patients with raised BMI, having diabetes and in patients whom surgery was completed in 4 hours had more infection.

- Out of 19 overweight patients (BMI 25-29), 15 patients (78.9%) developed surgical site infection.
- out of diabetic 10 patients, 7 patient (70%) developed surgical site infection.
- Out of 11 patients in whom surgery was completed in 4 hours, 7 patients (63.6%) developed surgical site infections.

Mean duration of post – operative stay was 8.4+/- 2 days. Out of 111 patients, 98 patients stayed for 6-10 days.

CONCLUSION: Subcutaneous negative suction drain prevents post-operative surgical site infection significantly and also reduces post-operative hospital stay. So, it is highly recommended in all patients undergoing laparotomy surgeries.

Keywords: Subcutaneous suction drain, Surgical site infection, Emergency laparotomy.

INTRODUCTION

Wound healing is a major concern after Surgical procedures because of its association with quality of life and morbidity of patients. In normal healthy individuals, the surgical wound heals by an orderly sequence of physiological events that includes Inflammation, Epithelisation, Fibroplasia and maturation. Any failure of wound healing at the surgical site can lead to disruption of the closure leading to Surgical site infections, wound seroma, wound hematoma and wound dehiscence.(1)

Surgical site infection previously termed as post-operative wound infection is defined as infection presenting upto 30 days after a surgical procedure if no prosthesis is placed and upto 1 year if a prosthesis is implanted in the patient.

Increase in prevalence of Surgical site infections is partially due to the emergence of antibiotic resistant micro-organism and also due to the nutrition, Immune status and associated Co- morbidities of the patients.(2)

As per various studies, use of subcutaneous negative pressure suction drain is one of the methods used in reducing post-operative SSI.(3)

1. Negative pressure suction drain in subcutaneous plane decreases infections by removal of Seroma or debris and Elimination of dead space in subcutaneous plane.(3)
2. Negative suction improves the healing capacity of the wound by reducing its bacterial load.(3)
3. Negative pressure providing a moist and protected environment, reducing peripheral edema around the wound, Stimulating blood circulation to the wound bed, decreasing bacterial colonization, increasing the rate of granulation tissue formation and Epithelization.(3)

OBJECTIVES

- 1] To measure incidence of Surgical site infections in patients given subcutaneous Negative Pressure Suction Drain following emergency laparotomy.

2] To evaluate whether Negative pressure suction drain is effective in reducing length of hospital stay.

METHODOLOGY

- This is prospective Observational study conducted from January 2022 to November 2022 in admitted patients of department of general surgery Dr. B.R.A.M. Hospital Raipur and PT JNM Medical college Raipur.
- The study was approved by the institutional ethic committee of the college.
- Patient who underwent emergency laparotomy procedure and having subcutaneous negative pressure suction drain was enrolled in the study. The choice of using a subcutaneous drain was taken by the operating surgeon.
- Appropriate antibiotics were started as per departmental protocol.

SAMPLE SIZE FOR ONE SAMPLE PROPORTION:

$$N = \frac{(Z_{1-\alpha/2})^2 P(1-P)}{d^2}$$

$$= \frac{(1.64)^2 \times (0.12)(0.86)}{(0.05)^2}$$

$$= 111.02$$

Where $Z_{1-\alpha} = 1.64$ at 90% confidence interval.

P = Proportion of surgical site infection with drain.

= 12.50%

d = margin error rate = 0.05

INCLUSION CRITERIA

- Patient age >18 yrs to 75 yrs
- Patient giving Consent
- Patient Underwent Emergency laparotomy Surgery

EXCLUSION CRITERIA

- Patients suffering from Malignancy.
- Immunocompromised patients [HIV , Steroid therapy, chemotherapy]
- Accidental removal of drain.
- Informed and written Consent taken from patients and patient's attenders for the study.
- A detailed case history was taken as per Proforma. General physical examination, Systemic examination and clinical examination will be done and findings were noted in a pre – designed proforma.
- Demographic and clinical variables are entered in proforma. Variables include age ,gender ,duration of illness, date of admission, date of surgery, duration of surgery, diagnosis, co-morbidities.
- Baseline blood Investigations [C B C , R F T , L F T] and Radiological investigation like X-ray, USG findings are noted in the proforma. BMI will be calculated by measuring height and weight.
- Quantity and character of content in suction drain container and surgical site wound will be examined .
- Suction drain is removed when the output is <10 ml for 2 consecutive days.
- Patients are followed up on post operative day 3,5,7,10 and Surgical wound was Examined for any evidence of Surgical site infections. Wounds were graded according to Southampton Grading System .Pus sent for culture and sensitivity and Antibiotics were given according to sensitivity report.
- All patients were studied in terms of Surgical site infections and duration of hospital stay.

closed suction drain.⁽²⁵⁾

SOUTHAMPTON WOUND GRADING SYSTEM

Grade	Appearance
0	Normal healing
I	Mild bruising or erythema
Ia	Some bruising
Ib	Considerable bruising
Ic	Mild erythema
II	Erythema plus other signs of inflammation
IIa	At one point
IIb	Along wound
IIc	Around wound
III	Clear or serosanguinous discharge
IIIa	At one point
IIIb	Along wound
IIIc	Large volume
IV	Pus
Iva	At one point
IVb	Along the wound
V	Deep or severe wound infection

RESULT

Table 1: Association between Age and surgical site infection:-

Age in years	Infection		Total	P value
	No	Yes		
18-25	38(43.2%)	5(21.7%)	43 (38.7%)	0.033
26-35	14(15.9%)	4(17.4%)	18 (16.2%)	
36-45	15(17.0%)	4(17.4%)	19 (17.1%)	
46-55	10 (11.4%)	5 (21.7%)	15 (13.5%)	
56-65	4 (4.5%)	5 (21.7%)	9 (8.1%)	
>66	7 (8.0%)	0	7 (6.3%)	
Total	88 (100.0%)	23 (100.0%)	111(100.0%)	

Table 1 shows the association between the age groups and wound infection. In age group 18-25 years, 5 patients developed wound infection (21.7%), in age group 26-35 years, 4 patients developed wound infection (17.4%), in age group 36-45 years, 4 patients developed wound infection (17.4%), in age group 46-55 years, 5 patients developed wound infection (21.7%), in age group 56-65 years, 5 patients developed infection (21.7%), in age group >66 years none of the patients developed wound infection. Association was tested using chi-square test and it was found statistically significant ($p=0.033$)

Table 2: Association between Gender and grade of infection:

Sex	Infection		Total	P value
	No	Yes		
Female	10 11.4%	5 21.7%	15 13.5%	0.195
Male	78 88.6%	18 78.3%	96 86.5%	
Total	88 100.0%	23 100.0%	111 100.0%	

Table 2: shows the association between gender and grade of infection. Out of 15 female patients, 5 patients developed infection (33.3%), out of 96 male patients 18 patients (18.7%) developed wound infection. Association was tested using chi-square test and it was statistically not significant ($p=0.195$).

Table 3: Association between Duration of surgery and Surgical site Infection:

DURATION OF SURGERY in hrs	Infection		Total	P value
	No	Yes		
2	63 71.6%	7 30.4%	70 63.1%	p<0.01
3	21 23.9%	9 39.1%	30 27.0%	
4	4 4.5%	7 30.4%	11 9.9%	
Total	88 100.0%	23 100.0%	111 100.0%	

Table 3: shows the association between the duration of surgery and wound infection. Out of 70 patients in whom surgery was completed in 2 hours, 7 patients (10%) developed wound infection, out of 30 patients in whom surgery was completed within 3 hours, 9 patients (30%) developed wound infection, out of 11 patients in whom surgery was completed within 4 hours, 7 patients (63.6%) developed wound infection. Association was tested using chi-square test and it was statistically significant ($p < .01$)

Table 4: Association between Indication for emergency laparotomy and wound infection:

Indication for Emergency Laparotomy	Infection		Total	P value
	No	Yes		
Blunt trauma Abdomen	9 10.2%	2 8.7%	11 9.9%	0.986
hollow viscous perforation	38 43.2%	10 43.5%	48 43.2%	
intestinal obstruction	17 19.3%	4 17.4%	21 18.9%	
penetrating Injury to Abdomen	24 27.3%	7 30.4%	31 27.9%	
Total	88 100.0%	23 100.0%	111 100.0%	

Table 4 shows the association between indication for emergency laparotomy and wound infection. Out of 11 patients of blunt trauma abdomen, 2 patients (18%) developed wound infection, out of 48 patients of hollow viscous perforation, 10 patients (20.8%) developed wound infection, out of 21 patients of intestinal obstruction, 4 patients (19%) developed wound infection, out of 31 patients of penetrating injury to abdomen, 7 patients (22.5%) developed wound infection. Association was tested using chi-square test and it was statistically not significant ($p=0.986$).

Table 5: surgical site infection with drain according to Southampton wound grading:

Grade	Freq.	Percent (%)
Normal healing-0	88	79.28
Normal healing with mild brushing or erythema-I	2	1.8
Erythema plus other sign of inflammation-II	5	4.5
Clear or haemoserous discharge-III	13	11.71
Pus/purulent discharge-IV	3	2.7
Total	111	100

Among study subjects the Southampton wound grading was done and 88 patients(79.28%) had normal healing and 13 patients(11.71%) had Clear or haemoserous discharge, 5 patients(4.5%) had Erythema plus other sign of inflammation and 3 patients(2.7%) had purulent discharge.

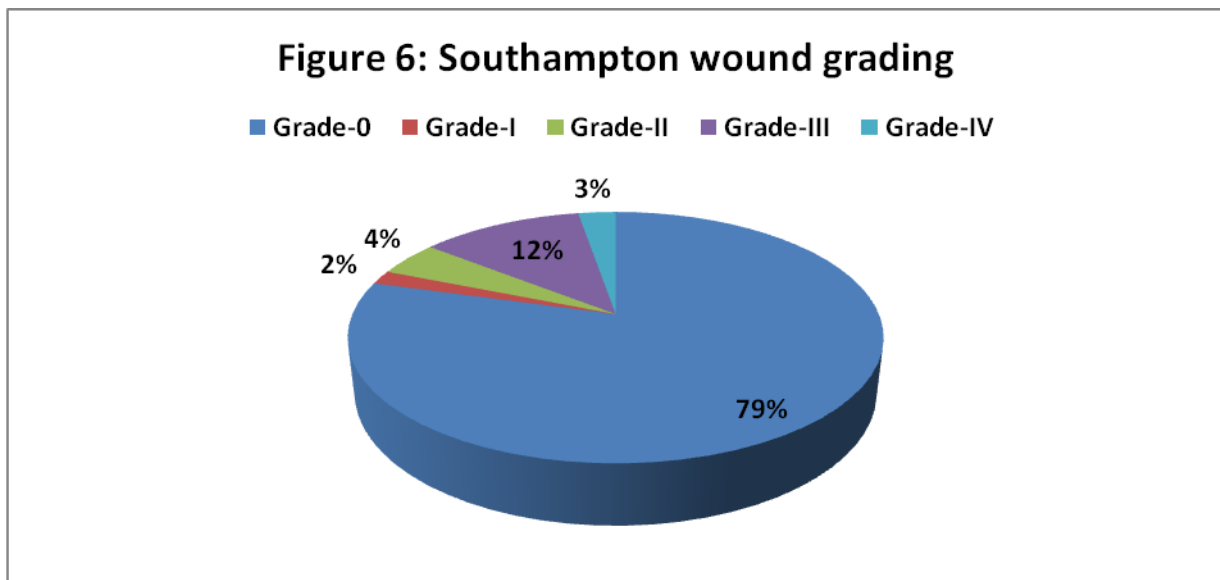


Table 6: Mean duration of post-operative stay among study subjects:

Duration of Post OP stay	Freq.	Percent
6-10 days	98	88.29
10-15 days	12	10.81
>15 days	1	0.90
Total	111	100

The mean duration of post-operative stay was 8.40 ± 0.206 days. Maximum 98 patients (88.29%) stayed for 6-10 days, 12 patients (10.81%) stayed for 10-15 days and one case stayed for 22 days.

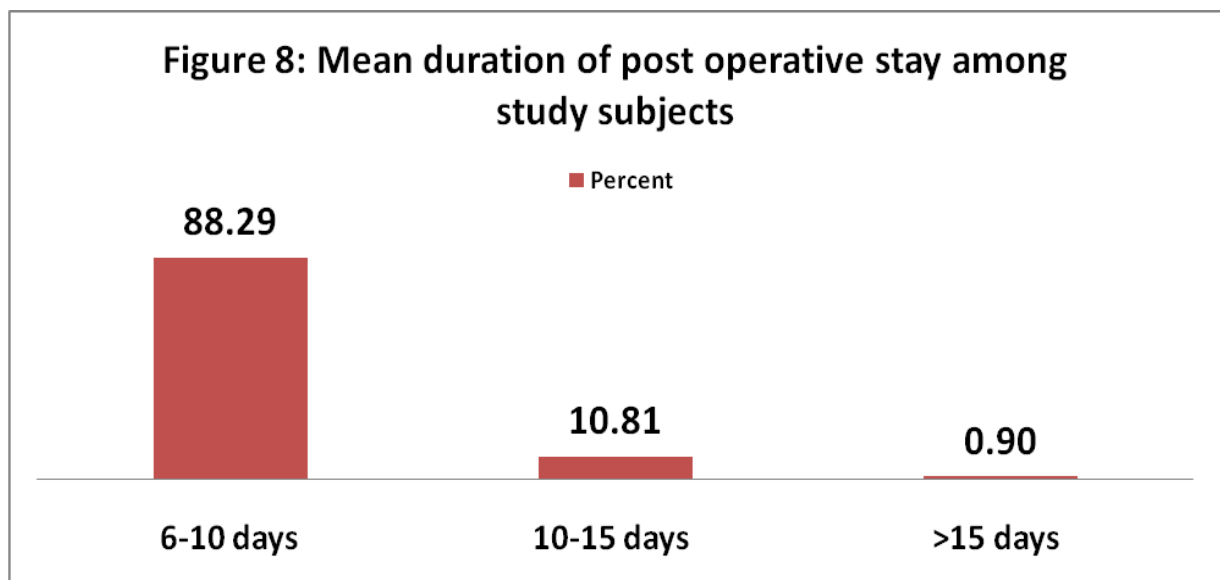


Table 7: Association between BMI and grade of infection among study subjects :

Wound grade	BMI category			Total	P value
	Healthy Weight (18.5 - 24.9)	Overweight (25.0 - 29.9)	Underweight (<18.5)		
0	83 92.2%	4 21.1%	1 50.0%	88 79.3%	P<0.01
I	2 2.2%	0 0.0%	0 0.0%	2 1.8%	
II	1 1.1%	3 15.8%	1 50.0%	5 4.5%	
III	1 1.1%	12 63.2%	0 0.0%	13 11.7%	
IV	3 3.3%	0 0.0%	0 0.0%	3 2.7%	
Total	90 100.0%	19 100.0%	2 100.0%	111 100.0%	

Among study subjects the association between BMI and grade of infection shows that out of 90 patients with healthy weight 92.2% (83patients) had no infection and out of 19 overweight patients, 3 patients(15.8%) had grade-2 infection, 12 patients(63.2%) had grade-3 infection and of 2 underweight patients, both 1 case had no infection and one case had grade-2 infection. Association was tested using chi-square test and it was statistically significant ($p<0.01$).

Table 8: Association between Co-morbidities and wound infection:

Co- morbidities	Infection		Total	P value
	No	Yes		
DM	3 3.4%	7 30.4%	10 9.0%	p<0.01
HTN	12 13.6%	3 13.0%	15 13.5%	
No	73 83.0%	13 56.5%	86 77.5%	
Total	88 100.0%	23 100.0%	111 100.0%	

Table 8 shows the association between co-morbidities and wound infection. Out of 10 diabetic patients, 7 patients (70%) developed wound infection and out of 15 hypertensive patients, 3 patients (20%) developed wound infection. Association was tested using chi-square test and it was statistically significant ($p<.01$).

DISCUSSION

1). AGE AND SURGICAL SITE INFECTION:

In the present study, In age group 18-25 years, 5 patients developed SSI (21.7%), in age group 26-35 years, 4 patients developed SSI (17.4%), in age group 36-45 years, 4 patients developed SSI(17.4%), in age group 46-55 years, 5 patients developed SSI (21.7%),in age group 56-65 years, 5 patients developed SSI (21.7%), in age group >66 years none of the patients developed SSI. Association was tested using chi- square test and it was found statistically significant ($p=.033$).

Patel PR et al(2019)reported age wise distribution of patients in drain group. In age group 21-30 years, 1 patient developed SSI. In 31-40 years, 1patient developed SSI. In 41-50 years, 1 patient developed SSI.In 51-60 years, 3 patients developed SSI. In >60 years , 2 patients developed SSI.

2).ASSOCIATION BETWEEN GENDER AND SURGICAL SITEINFECTION(SSI):

In the present study, Out of 15 female patients, 5 patients (33.3%)developed SSI, out of 96 male patients 18 patients (18.7%) developed SSI. Association was tested using chi- square test and it was statistically not significant ($p=.195$).

Gupta P et al (2017) reported that out of 50 patients in the drain group , 12 patients(24%) developed SSI (9 were malesand 3 were females.) and out of 50 patients in control group,25 patients(50%) developed SSI(21 were males and 4 were females).

Patel PR et al(2019) reported out of 50 patients in the drain group, 8 patients developed SSI (7 were males and 1 were female) and out of 50 patients in control group, 20 patients (40%) developed SSI (18 males and 2 females).

3). SOUTHAMPTON WOUND GRADING

In the present study, Among study subjects the Southampton wound grading was done and 88 patients (79.28%) had normal healing and 13 patients (11.71%) had Clear or haemoserous discharge, 5 patients (4.5%) had Erythema plus other sign of inflammation and 3 patients (2.7%) had purulent discharge.

Kagita R et al(2019) reported that only 5 patients (12.5%) out of 40 patients in drain group developed SSI. Out of them, 1 patient (2.50%) had grade 1 infection, 2 patients (5%) had grade 2 infection, 2 patients (5%) had grade 3 infection. No patient had grade 4 or 5 infection.

Pai V et al(2014) reported that only 3 patients (11%) out of 27 patients in drain group developed SSI. Out of them 2 patients (7.40%) had grade 1 infection, 1 patient (3.70%) had grade 2 infection. No patients in drain group had grade 3, 4 and 5 infections. 15 patients (48%) out of 29 patients in control group developed SSI. Out of them 1 patient (3.4%) had grade 1 infection, 1 patient (3.4%) had grade 2 infection, 8 patients (27.5%) had grade 3 infection and 4 patients (13.7%) had grade 4 infection. No patient in control group had grade 5 infection.

4). INCIDENCE OF SURGICAL SITE INFECTION:

In the present study 23 patients (20.7%) out of 111 patients developed surgical site infection.

Nirupam et al(2020) reported that SSI occurred in 9 patients (16.4%) in drain group and 32 patients (58.2%) in control group with p-value of <0.001.

Kumar S. et al(2017) reported that 32 patients (16%) developed SSI in drain group and 116 patients (58%) developed SSI in control group with p-value <0.001.

Kagita R. et al (2019) reported that 5 patients (12.5%) developed SSI in drain group and 25 patients (69.4%) developed SSI in control group with p-value <0.05. Gupta P et al (2017) reported that 12 patients (12.5%) developed SSI in drain group and 25 patients (50%) developed SSI in control group.

Vigneshwaran P et al (2020) reported that 4 patients (16%) developed SSI in drain group and 9 patients (36%) developed SSI in control group.

Vaghani Y L et al(2014) reported that 8 patients (25%) developed SSI in drain group and 15 patients (57.7%) developed SSI in control group.

Pai V et al (2019) reported that 3 patients (11%) developed SSI in drain group and 14 patients (48%) developed SSI in control group. Naik AK et al(2022) reported that 13 patients (24.08%) developed SSI in drain group and 25 patients (46.30%) developed SSI in control group with p-value of 0.0161.

Goyal A. et al(2019) reported that 9 patients (30%) developed SSI in drain group and 18 patients (60%) developed SSI in control group with p-value 0.0195.

Patel PR et al(2019) reported that 8 patients (16%) developed SSI in drain group and 20 patients (40%) developed SSI in control group.

Y. Sumi et al(2014) reported that 4 patients (16.7%) developed SSI in drain group and 13 patients (56.5%) developed SSI in control group.

5). MEAN DURATION OF POST OPERATIVE STAY AMONG STUDY SUBJECTS In the present study the mean duration of post operative stay was 8.40±0.206 days. Maximum 88.29% stayed for 6-10 days and 10.81% stayed for 10-15 days and one case stayed for 22 days.

Nirupam et al(2020) reported that the mean duration of hospital stay was 13.65±1.39 days in drain group and 14.2±1.75 days in control group with p-value of 0.071.

Kagita R et al (2019) reported that the average post-operative stay with drain was 5 to 15 days. And without drain was 5 to 20 days. Vaghani Y L et al(2014) reported that the mean duration of hospital stay was 12±1.5 days in drain group and 18±1.5 days in control group.

6). CO-MORBIDITIES AND WOUND INFECTION:

In the present study, Out of 10 diabetic patients, 7 patients (70%) developed wound infection and out of 15 hypertensive patients, 3 patients (20%) developed wound infection. Association was tested using chi-square test and it was statistically significant (p<.01).

Mathews MZ et al (2019) reported that 37 patients who were included in the study were diabetic, out of which 25 patients (67.6%) developed SSI compared to 10 patients (15.4%) who developed SSI in the non-diabetic group. This was statistically significant (p value <0.001).

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