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Differences In Post Surgical Wounds After Emergency Laparotomy Using Negative Pressure Subcutaneous Drainage and Without Subcutaneous Drainage in H.Adam Malik Hospital, Medan, Indonesia.

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ABSTRACT

The aim of the study was to assess the characteristic of the patients of emergency laparotomy in H.Adam Malik hospital, Medan, including gender, duration of surgery, amount of blood loss during surgery and thickness of subcutaneous layer and the application of negative pressure wound therapy (NPWT) related to condition of surgical wound. The number of subject involved in this study are 40 patients. Based on bivariate analysis if the result, there are significant association ($p < 0.05$) between condition of surgical wound with mean of age of the subject, thickness of subcutaneous layer and the use of negative pressure subcutaneous drainage. It can be concluded that application of NPWT in surgical wound of laparotomy significantly give positive effect in the wound healing of surgical wound.

Keywords: laparotomy, negative pressure wound therapy (NPWT), subcutaneous drainage, wound dehiscence

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INTRODUCTION

Surgical wound infection is one of the most common complication encountered after surgery, occur in at least 5% of all patients who undergo surgery and 30-40% on abdominal wound surgery, depending on the level of contamination. Infection complication is a major cause of post surgical morbidity in abdominal surgery. The most common form us a superficial wound infections that occur in the first week after surgery [1,2].

Abdominal wound dehiscence is one complication after abdominal surgery. Wound dehiscence is the opening of the surgical wound layer. The main cause is an infection and seroma formation [3]. The incidence of wound dehiscence or burst abdomen varies from one center to other centers around the world. A study in India reported the incidence of burst abdomen as 10-30%. Burts abdomen is associated with a mortality rate of 45% [4].

The use of negative pressure wound therapy (NPWT) improve the wound healing by reducing and inhibit the growth of bacteria. Negative pressure drainage makes the moist and protected environment, reducing the peripheral edema around the wound and stimulates circulation to the wound, increase the rate of granulation tissue formation and epithelialization [5]. The aim of the study was to determine the differences in post laparotomy emergency surgery wound with and without the use of NPWT

MATERIAL AND METHODS

Design Study

This study was an clinical trial experimental research about differences post surgery wound in patients who underwent emergency laparotomy using negative-pressure subcutaneous drainage and without subcutaneous drainage.

Location of Study

The study was conducted in emergency and hospitalization room in H.Adam Malik Hospital from June 2016 until August 2016

Population and Samples

The population were all the patients who underwent emergency laparotomy surgery that meet the inclusion criteria as many as 40 patients. The samples were randomly selected by systematic random sampling in accordance with the calculation of sample size to cohort test as follows :

$$n1=n2 = \left(\frac{(p0.q0 + p1.q1)(z\alpha + z\beta)^2}{(p1-p0)^2} \right)$$

with :

$z\alpha$ = standard value of normal deviation α = 1.96

$z\beta$ = standard value of normal deviation β = 0.84

$p0$ = exposure proporsion in control group = 0.57

$Q0$ = 1- $p0$ = 0.43

$p1$ = exposure proporsion in cases group = 0.16

$Q1$ = 1- $p1$ = 0.84

$p1-p0$ = differences in minimal proportion that considered significant in according to researchers

$n1=n2$ = all the subjects in control and cases group= 19

total samples =40 subject

Inclusion and Exclusion Criteria

Inclusion Criteria

The inclusion criteria were including all the patients who underwent the emergency laparotomy surgery in H.Adam Malik Hospital with range of age between 18-50 years old. The exclusion criteria including a condition if NPWT inadvertently pulled out before the specified time, the patients passed out before the time of study completed and patients with comorbid diabetes mellitus, HIV and tuberculosis.

Procedures

The samples will be selected based on the sequence number of medical record. The even numbered patients will underwent the installation of NPWT and the odd numbered patients without drainage. The surgical wound was irrigated with NaCl 0.9% 500 mL. the fascia layer or muscle was closed with absorbable thread multifilament polyglactin no.1. The installation of NPWT was conducted using nasogastric tube no 12 Fr. The tube was inserted at the end of surgery in subcutaneous then the subcutaneous was stitched using monofilament absorbable chromic catgut 2-0, the cutis then closed with non absorbable monofilament threads polypropylene 3-0 then drained in a connected vacuum using 20 cc syringe and removed on the 3rd day after surgery. Systemic antibiotic prophylaxis was given strictly to all cases 30 minutes before the surgery begins. The variables that will be assessed including age, sex, duration of surgery, intrasurgery blood loss, the thickness of the subcutaneous layer, duration of hospitalization.

Data Analysis

The basic data collected including age, sex, duration of surgery, intra surgery blood loss, comorbid diseases, thickness of subcutaneous layer, condition of surgical wound, and the use of NPWT. The data will processed statistically using Statistical Package for Social Science (SPSS) by T Test analysis.

RESULT AND DISCUSSION

Characteristic of Subjects

The total number of subjects were 40 subjects. 20 subjects using subcutaneous drainage and 20 subject without subcutaneous drainage. The characteristic of subjects were described in following table.

Table 1: Characteristic of subject

Characteristic	N	%
Age (Mean±SD)	34.52±10.7	
Gender		
Male	21	52.5
Female	19	47.5
Installation of subcutaneous drainage		
Installed	20	50
no installed	20	50
Surgical wound condition		
Good condition	28	70
Surgical site infection	12	30
Duration of surgery (Mean±SD) (minutes)	141.55±56.6	
Blood loss (Mean ±SD) (cc)	182±38.6	
Thickness of subcutaneous layer (Mean±SD) (mm)	14.58±5.5	

Table 1 showed that the number of male were more than female with percentage 70%. The similar result was reported by Hirose et al [6] which reported that male was more susceptible to wound dehiscence than woman. The similar report also reported by Muneiah et al [7] which conducted a study about risk factors of abdominal wound dehiscence in Sri Venkateswara Ramnarain Ruia Government General Hospital. It reported that the incidence of abdominal wound dehiscence is more common in male patients around the age group of 45 years old with percentage up to 75%.

Bivariate Analysis Based On Characteristic of Subject

Characteristics of the subject that were assessed in present study includes five variables : gender, duration of surgery, amount of blood loss during surgery and thickness of subcutaneous layer. Bivariate analysis will correlate each characteristic of the variables and surgical wound. The analysis of surgical wound by gender using chi square analysis showed in **Table.2**

Table 2: Correlation between gender and surgical wound

Gender	Normal wound	Wound with dehiscence	Total	p*
Male	15	6	21	0.554
Female	13	6	19	
Total	28	12	40	

*Chi square analysis

Table 2 showed that the number of female subject compared to male who underwent the emergency laparotomy surgery was almost the same namely 19 ; 21. The result of the bivariate analysis using chi-square test was $p = 0.554(p>0.05)$. the p value implies that there is no correlation between gender and the surgical wound. The different result was reported by Cohen et al [8] which reported that surgical site infections were significantly lower for women than for men after controlling for present on admission patients characteristics and events during the hospital stay [odds ratios (95% confidence intervals) were 0.85 (0.77-0.93), 0.82 (0.74-0.91), and 0.78 (0.68-0.91), respectively]. This difference is probably due to the number of subjects involved in the study is more less

The correlation between age and condition of surgical wound are described in table 3.

Table 3 showed that good condition of surgical wound obtained at the age 32.93 ± 12.05 . The bivariate analysis using independent T-test ($p=0.013$ ($p<0.05$)) implies that there is significant correlation between age and surgical wound. The similar result was reported by Kaye et al [9] which reported that there are significant relationship between age and risk of wound dehiscence ($p=0.006$). Risk of wound dehiscence increased by 1.1% /year between ages 17 and 65 years ($p=0.002$). So it could be concluded that increasing age independently predicted an increased risk of wound dehiscence until age 65 years old.

Table 3: Mean of age and surgical wound in emergency laparotomy

	Good condition	Wound with dehiscence	p*
Age (mean±SD)	32.93±12.05	38.35±5.8	0.013

*Independent T-Test

The correlation duration of surgery and condition of surgical wound are described in table 4.

Table 4 showed that the good condition of surgical wound occurs in duration of surgery 130 ± 55.22 minutes which is faster than wound with dehiscence, 167 ± 42.48 minutes. The result of the bivariate analysis using independent T-Test namely $p=0.054$ ($p>0.05$) implies that there is no significant correlation between duration of surgery and the surgical wound. Beldi et al [10] reported that duration of surgery greater than 3 hours (median duration of all operations) was associated with a 7.5 fold increased risk of wound dehiscence. Previous study also reported that a duration above the 75th percentile was an independent risk factor for wound dehiscence in major operations [11].

Table 4: Average duration of surgery and condition of surgical wound on emergency laparotomy

	Good condition	Wound with dehiscence	p*
Duration of surgery (min) (Mean±SD)	130±55.22	167±42.48	0.054

*Independent T-Test

The correlation between the amount of bleeding in surgical wound with condition of surgical wound in emergency laparotomy was shown in **Table 5**.

Table 5: Average value amount of bleeding and surgical wound in emergency laparotomy

	Good condition surgical wound	Wound with dehiscence	p*
Amount of bleeding (cc)	89.29 ± 38.45	99.58 ± 39.74	0.45

*independent T-Test

The result of the bivariate analysis using T-test independent resulted p value =0.45 (p>0.05) implies that there is no significant correlation between the amount of bleeding and surgical wound. Cheng et al [12] reported that the result of logistic regression analysis showed that wound dehiscence was related with volume of blood loss. The relationship between blood products and wound dehiscence has been a matter of debate for more than 2 decades. It has been established that the incidence of wound dehiscence will increased the volume of blood. Table 6 describe the correlation between the average thickness of cutaneous layer and wound surgical of laparotomy emergency.

Table 6 showed that in good condition of surgical wound, the average thickness of subcutaneous layer were 12.21 ± 3.1mm which is thinner than the wound with dehiscence. The result of bivariate analysis using T test are p= 0.01 (p<0.05). The p value implies that there is a relationship between the thickness of subcutaneous layer and the surgical wound. Tongyoo [13] reported that the comparison of abdominal wall thickness between patients with and without infection was significantly different (20±8.4m and 16.0±7.2mm) respectively. The univariate analysis revealed that abdominal wall thickness ≥20 mm, body weight ≥60kg were the important factors related to wound dehiscence after the abdominal operation. The thickness of subcutaneous layer had an effect on increasing post operative wound dehiscence rate especially in contaminated operations.

Table 6: Average thickness of subcutaneous layer and wound surgical of laparotomy emergency

	good condition surgical wound	Wound with dehiscence	*p
Average thickness of subcutaneous layer in mm (mean ±SD)	12.21 ± 3.1	20.08 ±6.0	0.01

*Independent T test

The correlation between subcutaneous drainage and surgical wound were described in **Table.7**

Based on table 7, from 20 patients who underwent NPWT, 17 of them have a good condition surgical wound, and only 3 of patients have surgical wound with dehiscence, and from 20 patients who do not use subcutaneous drainage, there were 11 patients have good condition of surgical wound and 9 have dehiscence in their surgical wound. The result of bivariate analysis using chi-square, the p value was 0.041 (p<0.05). It means that there are relationship between the usage of NPWT and surgical wound. The principle of NPWT in wound healing is applying sub atmospheric pressure on the wound to reduce edema, increase the formation of granulation tissue and overcome exudates. NPWT is the most important mechanism to make the atmosphere humid or moist in the wound area, removing fluids and infectious material, reducing in bacterial colonization and increased formation of granulation tissue. The advantage of NPWT is forming cells rapidly, increasing local vascularization, reduction of bacteria and the evacuation of protease enzyme which could be dangerous. NPWT produces processes of angiogenesis and growth of healthy tissue (64% granulation tissue), whereas in the group of patients with standard wound care, 81% experiences inflammation and the formation of fibrotic tissue [14].

Table 7: Relationship between subcutaneous drainage with surgical wound

	Good condition surgical wound	wound with dehiscence	Total	*p
Subcutaneous drainage (+)	17	3	20	0.041
Subcutaneous drainage (-)	11	9	20	
Total	28	12	40	

*chi square analysis

CONCLUSION

Based on the result it can be concluded that application of NPWT in surgical wound of laparotomy significantly give positive effect in the wound healing of surgical wound.

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