ORIGINAL RESEARCH PAPER
Volume-8 | Issue-9 | September - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF SUBCUTANEOUS NEGATIVE PRESSURE DRAINAGE IN EMERGENCY LAPAROTOMY- IS IT USEFUL?

Surgery

Vipin Gupta Department Of Surgery, UP University of Medical Sciences, Saifai, Etawah, UP, India

Shailendra Pal Singh* Department Of Surgery, UP University of Medical Sciences, Saifai, Etawah, UP, India *Corresponding Author

RamKinker Pandey Department Of Surgery, UP University of Medical Sciences, Saifai, Etawah, UP, India

Anand Pandey Department of Pediatric Surgery, King George's Medical University, Lucknow UP, India

Meena Kumari Department Of Surgery, UP University of Medical Sciences, Saifai, Etawah, UP, India

ABSTRACT

Introduction- Emergency laparotomy is a common surgical procedure. Postoperative wound infection and burst abdomen are important wound related complications. In the present study, we have attempted to evaluate role of negative pressure using closed suction drain in minimizing such wound complications.

Material and Methods- A total of 212 consecutive patients undergoing emergency laparotomy included in the study were divided into two groups. In Group A in addition to simple closure a subcutaneous negative pressure suction drain was placed, whereas in Group B, only simple closure was performed. All patients were evaluated for presence of wound complications including skin changes, wound discharge, wound infection, wound dehiscence and the duration of hospital stay.

Results- The duration of this study was one and half years. One hundred and six patients were placed in both Group A and B. On Day 7, abnormal skin discoloration was found in 15 patients in Group A and 47 in Group B ($p<0.001$. The difference in surgical site infection and discharge from the wound was significantly increased in Group B. it was also significant as related to occurrence of burst abdomen and hospital stay.

Conclusion- The present study suggests that subcutaneous drain placement in emergency laparotomy decreases the possibility of SSI and abdominal wound dehiscence. The procedure is simple and results appear to be gratifying

KEYWORDS

burst abdomen; emergency laparotomy; wound dehiscence; negative suction drain; closed suction drain

INTRODUCTION:

Emergency laparotomy is one of the common surgical procedures accounting for all abdominal surgeries being performed by general surgeons and supervised surgical residents [1] Postoperative pyrexia, wound discharge, wound infection, minor gaping and burst abdomen areimportant wound related complications [2]. In most cases, such complications prolong hospitalization, with a substantial increase in cost of care [3, 4].

Acute wound failure, wound dehiscence or burst abdomen refers to post-operative separation of the abdominal musculoaponeurotic layers. It is among the most dreaded complications faced by surgeons and of greatest concern because of the risk of evisceration, the need for immediate intervention and the possibility of repeat dehiscence and incisional hernia formation. [5]

There are various patient and surgical factors affecting the outcome of laparotomy wound. The factors which can be controlled are surgical, which include the type of incisions, suture material and the method of closure. It is in this area that the surgeon must concentrate his efforts to minimize wound complications [6].Negative pressure wound therapy (NPWT) is a significant, clinically proven advancement in wound care that promotes active wound healing by removing secretions from the wound and at the cellular level through negative pressure [7,8]. In the present study, we evaluated the role of negative pressure using simple closed suction drain in preventing wound complications in laparotomy patients.

MATERIALS AND METHOD:

Study design: The present study was a prospective randomized study conducted in the Department of Surgery of a medical university from January 2016 to June 2017. It was approved by the university's ethical committee (reference no EC.NO: 2017/95).

Patient Selection: A total of 212 consecutive patients undergoing emergency laparotomy for peritonitis, intestinal obstruction, blunt injury abdomen, penetrating injury and firearm injury were included in the study. Patients which were significantly imunocompromised, having connective tissue disorder, expired during the course of follow up, and notgiving consent were excluded. The patients were allotted into two groups (Group A and B) using randomization technique by table of random numbers. Patients in Group A were those allotted even numbers while that of Group B were those allotted odd numbers.

Procedure: The laparotomy was performed in both groups under general anesthesia (GA). The midline closure of rectus sheath was performed by simple continuous polypropelene no 1 suture in all the patients. In Group A, in addition to simple closure, a subcutaneous negative pressure suction drain (16 Fr) was placed before skin closure whereas in Group B, simple closure was performed without placing negative suction drain. A similar antibiotic protocol of our institute was followed for patients of both groups i.einj Ceftriaxone 1gm intra venous(IV)twelve hourly, injMetronidazole 100ml IV eight hourly, and inj Amikacin 500mg IV twelve hourly for seven days. Amikacin was omitted in patients with deranged renal functions.

Evaluation of outcome: All patients were evaluated in postoperative period from Day1 onwards for presence of wound complications including skin changes, wound discharge, wound infection, wound dehiscence, and need to have re-intervention until skin sutures were removed. The findings were made on day 1, 3, 7, 14 21 and 28. The closed suction drain in group A was removed after satisfactory healing of incision was appreciated after varying period of time. The postoperative hospital stay was noted in all patients. After discharge, patients were called at seven day and one monthafter discharge. They were advised to return in case of any further complaint especially as regard to local wound site.

Statistical Analysis: All quantitative data were estimated through mean, medium and standard deviation. All categorical data were analyzed by the chi square test; continuous data were analyzed by Student's t test. A p value of less than 0.05 was considered significant. The statistical analysis was done using SPSS (Statistical package of Social Sciences) version 17.0 (Chicago, IL: SPSS Inc.) statistical analysis software.

RESULTS:

The duration of this study was one and half years. Of total 212

patients,106 (50.0%) patients were placed in Group A, while remaining 106 (50.0%) patients were placed in Group B.The age of patientsranged from 13 to 86 years. Mean age of patients of Group A (41.48 years) was found to be slightly higher than that of Group B (39.56years), which was not statistically significant (p>0.05).

The skin discoloration in the wound was serially noted in all patients from Day1 onwards, which was not significantly different on Day1 and Day 3 (p>0.05). On Day 7, abnormalskin discoloration was found in 15 patients in Group A and 47 in Group B. this difference was statistically significant(p<0.001, Table 1). The surgical site infection and discharge from the wound was observed in 16 patients in Group A and 47 in Group B. This difference was statistically significant (p<0.001, Table 2). There was no problem in patients in the follow up period of one month or thereafter.

The occurrence of burst abdomen was noted in 37 patients (16.0%) in group B as compared to 14 (44.3%) in group A. The difference was statistically significant (p < 0.001, Table 3). The mean duration of hospitalization of Group B (11.36±3.52 days) was significantly higher as compared to that of Group A (9.87±2.39 days, Table 4). This difference was also highly significant (p<0.001).

DISCUSSION:

The success of laparotomy procedures is dependent not only in the successful culmination of the operative procedure but also on the successful closure of the incisions as closure of laparotomy incisions continues to be followed by complications such as infection, granuloma and fistula formation, burst abdomen, and incisional hernia [9]. The ideal abdominal closure should be efficient, provide strength, and serve as a barrier to infection. It should have low rates of fascial dehiscence, infection, hernia formation, suture sinus formation, and incisional pain [10].Thus, a great focus during laparotomy is on wound closure and management. So the wound care and its management remains to be one of the most important aspects of total patient care and advancement from time to time have been made in order to facilitate wound healing and protection from infection at the earliest possible.

Though the causes of wound infection might be systemic as well as local, yet topical wound management is compulsory in view of the exposure of wound to environment and per se exposure of wound to newer risks [11]. While managing the wounds, a major focus is on the appropriate skin closure. Negative pressure wound therapy (NPWT) has played a major role as a bridge to reconstruction. It is a significant, clinically proven advancement in wound care that promotes active wound healing at the cellular level through negative pressure [12, 13]. Some of the clinical trials evaluating role of NPWT in various types of wounds have shown a promising response. Considering these positive responses for NPWT in these studies, the present study was carried out with an aim to evaluate the role of negative pressure drainage in midline laparotomy wound closure [14]. Besides the effect of negative pressure in clearing of seroma fluid from the wound due to negative suction was also believed to play a role in healing and prevention of wound dehiscence in our study.

The dominance of males as compared to females in different studies could be owing to gender based difference in health services utilization pattern. Moreover, the fact that owing to difference in social roles, the extent of exposure to outdoor activities is higher in males as compared to females, thus making males more vulnerable to laparotomies as a result of traumatic injuries [1].

During the course of our study, the incidence of abnormal wound coloration (14.2% vs 44.3%), surgical site infection (15.1% vs 44.3%) and burst abdomen (13.2% vs 34.9%) was significantly lower in negative suction group as compared to simple closure group (Table 3,4,5). The prevention of wound infection and burst abdomen appears to be major advantage of placement of subcutaneous negative suction drain in laparotomy wounds. The better performance of negative pressure closure was explained by Voinchet and Magalon (1996) who were of the view that negative pressure wound therapy helps to accelerate the healing process and induces an increased peripheral blood flow, improved local oxygenation and promotes angiogenesis and proliferation of good quality granulation tissue. The findings of present study also support this view point [15].Besides this reason, negative suction also mitigates the possibility of seroma formation. [16] It is a known fact that postoperative formation of a seroma or hematoma and subsequent infection could lead to abdominal wall dehiscence [17]

Compared to our study, Shen *et al.* did not find a significant difference in any of the outcomes (seroma, hematoma, wound dehiscence) between standard therapy and negative pressure groups. However, it must be noted that in their study all the laparotomies were conducted among patients having surface malignancies as compared to present study where perforation was the major indication for laparotomy [18]. There are reports in the literature suggesting that placement of drains predisposes the area to infection and prolongs hospital stay. This may be true in clean surgeries having relatively shorter periods of hospital stay [19]. However, it was not found to be true for laparotomy procedures conducted in present study with "perforation" as the major indication.

The concept of placement of subcutaneous drain to decrease the possibility of abdominal wall dehiscence has not been evaluated in great details. There are sporadic reports of such use in emergency laparotomy. Most of the studies in which subcutaneous drain placement has been undertaken are in elective surgeries [19, 20]. The studies undertaken in the emergency surgery had documented the role of negative suction drain in preventing surgical site infection only. [21, 22] In current study however detailed evaluation of surgical site infection, along with wound dehiscence, has been conducted with an emphasis on follow up.

To conclude, the present study suggests that subcutaneous drain placement in emergency laparotomy decreases the possibility of SSI and abdominal wound dehiscence. The procedure is simple and results appear to be gratifying. Further studies in this group of patients may substantiate our efforts.

Table 1: Comparison of Abnormal Wound Color at different time intervals

Time interval	Total (N=212)	Group A (n=106)		Group B (n=106)		Significance of difference	
		No.	%	No.	%	χ^2	P
Day 1	0	0	0.0	0	0.0	–	–
Day 3	1	1	0.9	0	0.0	1.005	0.316
Day 7	62	15	14.2	47	44.3	23.343	<0.001

Table 2: Comparison of Surgical Site Infection at different time intervals

Total (N=212)	Group A (n=106)		Group B (n=106)		Significance of difference	
	No.	%	No.	%	χ^2	p
63	16	15.1	47	44.3	21.704	<0.001

Table 3: Comparison of incidence of Burst Abdomen in both groups

Total (N=212)		Group A (n=106)		Group B (n=106)		Significance of difference	
No.	%	No.	%	No.	%	χ^2	p
51	24.05	14	13.20	37	34.90	20.144	<0.001

Table 4: Comparison of Duration of Hospitalization

Group	No.	Min.	Max.	Median	Mean	S.D.
Group A	106	4	20	9.0	9.87	2.39
Group B	106	8	23	9.0	11.36	3.52
Total	212	4	23	9.0	10.61	3.09

('t'=3.607; p<0.001)

Figure1: Post-operative appearance of patients with two abdominal drains and a suction drain places subcutaneously.

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