

ORIGINAL RESEARCH

A case-control study on the use of negative pressure wound treatment for managing abdominal wound dehiscence

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Received Date: 15 November, 2023

Acceptance Date: 18 December, 2023

ABSTRACT

Aim: Negative pressure wound therapy in management of abdominal wound dehiscence: a case control study. **Material and methods:** This research included a total of 100 patients. Among the total of 100 participants, 50 were selected as the experimental group, where intervention was performed using VAC Therapy. The remaining 50 participants were assigned to the control group, where just NS dressing was applied. The main intervention was the use of NPWT, which could be administered by several methods such as vacuum-assisted closure (VAC system) or simple closed-system suction drainage. Alternatively, the AB thera system may be used constantly or intermittently for a certain duration. The comparison was conducted using a basic Normal saline dressing. **Results:** The majority of patients in this research were between the age range of 45-65 years. The youngest patient was 9 months old, while the oldest patient was 78 years old. The average age affected is 45.77 ± 5.45 years. In our research, the occurrence of abdominal wound dehiscence was more prevalent among men, with 70 cases (70%), compared to females, with 30 cases (30%). The male to female ratio was 2.33 to 1. The most prevalent form of abdominal wound dehiscence was partial thickness wound dehiscence, accounting for 65 cases (65%), whereas full thickness wound dehiscence accounted for 35 cases (35%). In the current investigation, 45 out of the 50 cases had positive abdominal wound culture and sensitivity (c/s) results before the administration of Vacuum-Assisted Closure (VAC). After the application of VAC, 14 patients had positive c/s reports. The p-value of 0.001 indicates a high level of statistical significance. Secondary intention resulted in a healing rate of 50%, while the control group had a healing rate of 82%. The mortality rates in the cases group were much lower at 0% compared to the control group, which had a mortality rate of 2%. **Conclusion:** Our findings indicate that negative pressure wound treatment is a much superior method for controlling abdominal wound dehiscence and should be used in all feasible instances of abdominal wound dehiscence.

Keywords: Negative pressure wound therapy, abdominal wound dehiscence, VAC, Normal saline dressing

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INTRODUCTION

The technique of negative pressure wound treatment (NPWT) was first established by Morykwas et colleagues [1,2] as a method of vacuum-assisted closure (VAC). During the late 1990s, this technique emerged as a means of managing wounds in several domains, including the treatment of soft tissue abnormalities, fixation of transplanted skin, and the management of burn wounds. The use of NPWT on surgical abdominal wounds was first introduced in the 2000s as a way to reduce damage in trauma patients or to temporarily close wounds before a second look procedure [3,4]. NPWT has been used as a necessary technique for decompressive laparotomy in patients

diagnosed with abdominal compartment syndrome [5,6]. Wound dehiscence refers to the complete or partial separation of the layers of a wound. Abdominal wound dehiscence refers to the partial or total separation of the closure of an abdominal wound, with or without the protrusion of abdominal contents. The incidence of laparotomy wound dehiscence ranges from 0.25% to 3% in patients [7,8]. The majority of patients will need a return to the operating theater for the purpose of re-suturing. For some individuals, it may be suitable to keep the wound uncovered and manage it using dressings or vacuum-assisted closure (VAC) pumps. NPWT, sometimes referred to as vacuum dressing or VAC dressing, is a therapeutic

treatment that utilizes a suction dressing to eliminate excessive exudation and facilitate the healing process in both acute and chronic wounds. This treatment involves the deliberate administration of sub-atmospheric pressure to the specific wound area, achieved by utilizing a sealed wound dressing coupled to a vacuum pump [9-12]. The use of this method in wound care had a significant surge throughout the 1990s and 2000s [13]. NPWT has shown use in the treatment of the open abdomen after laparotomy[14].The general approach for Negative Pressure Wound Therapy (NPWT) is as follows: Shield the area around the wound by administering a skin barrier[15]. A dressing or filler material is applied to the shape of a wound (which is covered with a non-sticky dressing film) and the foam on top is then coated with a clear film to keep it in place. A drainage tube is attached to the dressing via an aperture in the transparent sheet. A vacuum tube is linked to a canister on the side of a vacuum pump by means of an aperture in the film drape.[10] A vacuum source is used to convert an open wound into a regulated and closed wound, while simultaneously extracting surplus fluid from the wound bed to improve circulation and eliminate wound fluids. This promotes a humid healing environment and decreases swelling. An air tight seal is necessary for the effective implementation of this treatment [15,16]. Abdominal wound dehiscence (AWD) is a persistent challenge that no surgical unit has successfully addressed with a 100% effective strategy. In other words, no surgical institution globally has reported a 0% failure rate in managing AWD. Nevertheless, some institutions worldwide have been effectively striving to attain and maintain failure rates that are far lower than 1%. Nevertheless, these figures do not deter ongoing research aimed at eradicating the disease. A plethora of publications have been conducted in the previous decade, aiming to elucidate strategies for overcoming this issue. Given the rising occurrence of abdominal wound dehiscence, we have decided to examine the instances of this condition in our hospital and evaluate the efficacy of negative pressure wound therapy in treating abdominal wound dehiscence compared to other traditional methods of wound management.

MATERIAL AND METHODS

The research was carried out at the Department of General Surgery. Prior to performing this investigation, we received ethical permission from the relevant institution. This research examined all instances of post laparotomy full thickness or partial thickness abdominal wound dehiscence, including all

age categories. Patients failing to provide informed consent The research excluded patients with Enterocutaneous fistula. This research included a total of 100 patients. Among a total of 100 individuals, 50 were selected as the experimental group, where intervention was performed using VAC Therapy. The remaining 50 individuals were chosen as the control group, where simply NS dressing was administered.

METHODOLOGY

The primary intervention was by NPWT delivered by any mode (for example vacuum-assisted closure (VAC system) or simple closed-system suction drainage) or AB thera system delivered continuously or intermittently over a specified time period. The comparison was done with simple Normal saline dressing.

STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 24.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages and means. Test applied for the analysis was t-test and chi square test. The confidence interval and level of significance were set at 95% and 0.05.

RESULTS

The research included a significant proportion of patients aged between 45 and 65 years. The youngest patient was 9 months old, while the oldest patient was 78 years old. The average age affected is 45.77 ± 5.45 years. In our research, the occurrence of abdominal wound dehiscence was more prevalent among men, with 70 cases (70%), compared to females, with 30 cases (30%). The male to female ratio was 2.33 to 1. The most prevalent form of abdominal wound dehiscence was partial thickness wound dehiscence, accounting for 65 cases (65%), whereas full thickness wound dehiscence accounted for 35 cases (35%). In the current research, 45 out of 50 patients had positive abdominal wound culture and sensitivity (c/s) results before the administration of Vacuum Assisted Closure (VAC). After the application of VAC, 14 patients still had positive c/s reports. The p value of 0.001 indicates a high level of statistical significance. Secondary intention healing was seen in 50% of patients, as opposed to 82% in the control group. The mortality rates in the cases group were much lower at 0% compared to the control group, which had a mortality rate of 2%.

Table 1: Basic profile of the participants

	Number	Percentage	P value
Gender			0.14
Male	70	70	
Female	30	30	
Age			0.11

Below 25	10	10	
25-45	40	40	
45-65	42	42	
Above 65	8	8	
Type of wound dehiscence			0.16
Full thickness	35	35	
Partial thickness	65	65	

Table 2: Distribution of patients with abdominal wound dehiscence according to underlying intra-abdominal pathology

Diagnosis	Number	Percentage
Perforation peritonitis	50	50
Incisional hernia	15	15
Malignancy	5	5
Blunt trauma abdomen with perforation peritonitis	4	4
SMV/SMA Thrombosis	4	4
Psoas abscess	3	3
Post LSCS	4	4
Intestinal obstruction	13	13
Other(acute appendicitis, obstructed incisional hernia)	2	2

Table 3: Organism cultured from wound before and after application of vac.

	Before VAC		After VAC		P value
	Number	Percentage	Number	Percentage	
Staphylococcus	16	32	5	10	0.001
Pseudomonas	12	24	5	10	
Klebsiella	7	14	2	4	
Escherichia coli	10	20	2	4	
No growth	5	10	36	72	

Table 4: Post vac and post normal saline wound contraction Wound Contraction

	Case	Control	P value
Wound Contraction	0.88±0.04	0.15±0.02	0.01

Table 5: plan at end of treatment

	Case	Control	P value
Healing by secondary intension	15	5	0.03
Secondary resuturing	25	41	
Tension suturing	10	3	
Expired	0	1	

DISCUSSION

This research examines the comparative effectiveness of two methods for controlling abdominal wound dehiscence: standard normal saline dressing and the more recent negative pressure wound care. The primary factor leading to abdominal wound dehiscence is infection occurring during or after surgery. Wound dehiscence is often treated with saline dressings, which need to be changed numerous times a day. However, this frequent dressing change might raise the risk of further wound infection and cause significant discomfort for the patient. Conversely, negative pressure wound therapy enhances blood flow to the skin and stimulates the growth of new tissue, thereby expediting wound healing and reducing the presence of bacteria. This is achieved by reducing swelling and fluid buildup in the tissues, as well as facilitating wound contraction and promoting the

closure of the wound. The dressing is changed every 2-3 weeks, providing psychological benefits for the patient and preventing the entry of environmental infections into the wound. Several studies in literature have compared VAC therapy with Bagota bag and saline dressing. However, none of these studies have considered all four parameters of wound culture and sensitivity, wound contraction, and mortality. By examining these specific parameters, the effectiveness of VAC therapy can be demonstrated in comparison to other conventional dressing methods. All parameters in the current investigation were taken into account [17,18]. In addition, the reverse tissue expansion effect of negative pressure helps to approximate skin and fascia. The efficacy of NPWT has already been proven, and currently, it is used to treat trauma-induced soft tissue defects, necrotizing fasciitis, suppurative and extravasation injuries and burn

wounds, and to promote skin graft fixation [19,20]. Recently, NPWT has been applied in the abdominal surgery field for temporary closure in cases of trauma and bowel strangulation, and to manage abdominal compartment syndrome when the abdomen is open [21,22]. In this study major number of patients belonged to the age group between 45-65 years, youngest age was 9 months and oldest patient was 78 years. The mean age affected is 45.77 ± 5.45 yrs. In study of Subramonia et al [23] and Batacchi et al [24] the mean age was 60 year and 68.3 year respectively. In our study the abdominal wound dehiscence was more common in males 70 cases (70%) than females 30 cases (30%). Male to female ratio was 2.33:1. The type abdominal wound dehiscence was most commonly partial thickness wound dehiscence 65 case (65%) and full thickness wound dehiscence were 35 (35%). Subramonia et al [23] 33 male and 18 female and Batacchi et al [24] 50 male and 16 female were studied. In present study abdominal wound c/s positive before application of VAC was in 45 patients out of the 50 cases and after application of VAC c/s positive reports came out in 14 patients. The p value is 0.001 which is highly significant. In study done by Jang et al p value is not significant. In present study 26 out of 50 cases wound closure by VAC which was either healed by secondary intension or was resutured as the wound got contracted so much that simple suturing could be possible, in 8 cases there was no wound contraction so tension suturing had to be done [25] In study of Subramonia et al 31 patients had successful wound closure by VAC and in study of Jang et al out of 50, 39 patients had successful wound closure [23,24] The hospital stay was found to be only 22 days for patients with VAC dressing, when compared to the conventional dressings, who have an average hospital stay of 31 days In study of Batacchi et al the mean hospital stay was 28.5 days with p value of 0.019 which is significant [24]. In study of Jang et al and Subramonia et al mean hospital stay was 42 and 39 days respectively [23,25]. Patients with VAC dressing have more healing by secondary intension before discharge and nil rate of patient being expired when compared to the control group. 50% of cases were healed by secondary intension when compared to 82 % in control group. The death rates in cases were only 0% when compared to 2% in control group. In study conducted by Subramonia et al out of 51 patients' 27 patients wound was closed by secondary intension [23] in study of Jang et al mostly secondary suturing was done [25].

CONCLUSION

Our findings indicate that negative pressure wound treatment is a much superior method for controlling abdominal wound dehiscence and should be used in all feasible instances of abdominal wound dehiscence.

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