

Original Article

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Negative Pressure Wound Therapy in the Management of Postoperative Abdominal Wound Dehiscence

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Abstract:

Background: Abdominal wound dehiscence (AWD) is one of the dreadful complications of abdominal surgery. Conventionally it is treated with regular dressing. Negative pressure wound therapy (NPWT) is newest concept for management of AWD.

Objective: To find out the effectiveness of NPWT in management of AWD.

Material & methods: This prospective study was conducted in the Department of Plastic and Reconstructive Surgery, Sir Salimullah Medical College (SSMC) and Mitford Hospital, Dhaka, Bangladesh from July 2018 to June 2020. Total 30 patients were fulfilled the enrollment criteria.

Result: Age range of our patient was 15-60 and mean (SD) was 36.5 (\pm 12.204) years. Male to female ratio was 1.5:1. AWD commonly (60.66%) occurred after emergency procedure. The mean (SD) wound size was changed from 60.21 (\pm 31.418) cm³ to 12.19 (\pm 7.453) cm³ at the end of treatment that was statistically significant. The average duration of NPWT was 8.26 days.

Conclusion: The wound healing process is aided by NPWT, which makes the wound bed more favorable to early covering and reduces the mental stress and financial burden of the patient.

Key Words: Abdominal Wound dehiscence, Negative Pressure Wound Therapy.

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Introduction:

Abdominal wound dehiscence (AWD) is the disruption of any or all the layers in a wound before it has healed completely.

It might be a partial or full rupture of the abdominal wound, with or without abdominal contents protrusion.¹ Dehiscence of wound occurs before cutaneous healing.² Because of the risk of evisceration, the necessity for prompt intervention, and the probability of recurring dehiscence, surgical wound infection, and incisional hernia formation, it is one of the most feared consequences faced by surgeons. It is a serious surgical complication with mortality rates as high as 20%. The incidence ranges from 0.4 percent to 3.5 percent.³ Complications like infection and lack of adequate hospital facilities contribute to high mortality rates in many developing countries.^{4,5} Wound dehiscence varies in severity from hospital to hospital around the world. Several studies have identified various combinations of elements as risk factors. As a result, early identification of these factors and simple regular laboratory examinations may aid in wound dehiscence prevention.^{4,6} Patients undergoing emergency surgery are more at risk to develop abdominal wound dehiscence as compared to the patient undergoing elective surgery.^{4,7,8}

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Morykwas et al. Introduced NPWT in the late 1990s, and it is now utilized for wound

management in a variety of fields, including soft tissue defects, grafted skin fixation, and burn wound treatment.⁹ In the 2000s, NPWT was first used to treat surgical abdominal wounds as a sort of damage control surgery in trauma patients or as a temporary wound closure before a second look operation.⁹⁻¹¹ The majority of past research in this area has focused on utilizing NPWT to effectively closure of open abdominal wounds, with only a few findings on using NPWT to treat postoperative wound issues.¹⁰ Patients experience discomfort and anxiety as a result of traditional wound dressing changes and wound debridement. There is a need for an alternative method of soft tissue care to improve the wound healing process, so that faster wound covering can be achieved, ensuring patient comfort and reducing anxiety. The use of NPWT has been demonstrated to be beneficial in enhancing the rate of granulation tissue production, tissue perfusion, and soft tissue defect healing. The aim and objective of the study were to study the effect of NPWT in:

- Reducing wound size and healthy wound bed preparation
- Time required for wound closure
- Mode of wound closure
- Complications associated with NPWT

Here, we describe our experiences of the use of NPWT to treat for postoperative partial AWD.

Material and Methods:

This prospective study was conducted from July 2018 to June 2020, in the Department of Burn, Plastic and Reconstructive Surgery, Sir Salimullah Medical College (SSMC) and Mitford Hospital, Dhaka, Bangladesh. Total 30 patients were included in the study who have developed partial AWD after initial surgery.

Inclusion criteria: 1. Age between 15 to 60 years, 2. Both sexes, 3. Patients who have undergone either emergency or elective abdominal operations and developed partial wound dehiscence, 4. Patients with partial abdominal wound dehiscence who are willing for investigation and treatment.

Exclusion criteria: 1. Patients with incisional Hernia, 2. Patients with wound dehiscence on sites other than the abdomen, 3. Patients who have developed wound dehiscence after second surgery, 4. Patients who refuse investigations

and treatment, 5. Patients with complete wound dehiscence and revealed incomplete type of wound dehiscence. An elaborative history was taken. Details history regarding the clinical diagnosis, type of operation, wound volume, duration of NPWT was noted. Postoperatively AWD was diagnosed when superficial layers or a small amount of tissue layers being reopened.

Procedure: Thorough wound evaluation was done. Wound debridement was performed under anesthesia, and NPWT was applied once haemostasis was achieved. The peri-wound areas were cleansed and dried completely. A sterile foam dressing was applied to the whole wound cavity. A vacuum pump with a fluid collection canister is attached to a fenestrated evacuation tube that is kept on foam. Adhesive tape was used to seal the wound as well as the foam. A negative pressure of -110 mm Hg to -125 mm Hg was applied intermittently. Every fourth day, the dressing was changed, and the wound was evaluated to track its development. NPWT was kept going until the wound was ready for secondary closure.¹² The collected data was analysed and statistics were made according to need.

Result: In 30 patients who were suffering from postoperative partial AWD, NPWT was used to augment the process of wound healing. The age of patients ranged from 15 to 60 years (mean age 36.5 ± 12.204). Male to female ratio was 1.5:1. AWD commonly (60.66%) occurred after emergency procedure (table 1).

Table 1: Distribution of study subjects according to age, gender and types of operation (n=30)

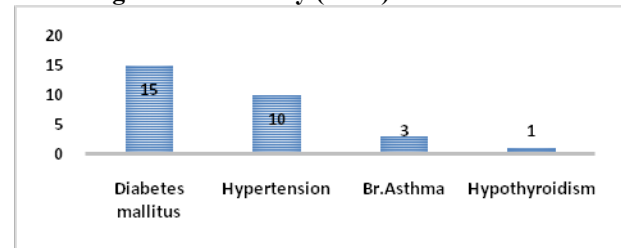
Factor	Cases	Percentages
Age (in years)		
15-30	19	63.33
31-45	13	43.33
46-60	8	26.66
Mean (SD) (15-60)	36.5 (± 12.204)	
Gender		
Male	18	60
Female	12	40
Ratio	1.5:1	
Types of operation		
Routine	10	33.33
Emergency	20	66.66

The mean (SD) wound size at start of treatment was 60.21(±31.41) cm³ which were changed to 12.19(±7.45) cm³ at the end of treatment. The largest one was 108 cm³ and smallest was 20cm³. Daily average wound size reduction was 5.83 cm³. Statistically significant (p<0.000000003) improvement in wound size was noted at the end of NPWT. The average duration of NPWT was 8.266 days and average numbers of dressings used was 2.066 (table 2).

Table 2: Wound size and NPWT of study population (n=30)

Case no	Wound size (cm ³)		No of dressing	Duration of NPWT (days)
	Before	After		
1	54	15.75	2	8
2	63	22	2	8
3	99	7	2	8
4	108	19.12	3	12
5	37.5	10.12	1	4
6	72	12	2	8
7	81	28	2	8
8	42	10	2	8
9	36	8	2	8
10	42	10	2	8
11	20	9	1	4
12	90	28	2	8
13	50	13.5	2	8
14	11.5	3	1	4
15	108	32	3	12
16	11.5	3	1	4
17	24	9	1	4
18	24	11.25	1	4
19	30	5	2	8
20	32	5	2	8
21	72	5	3	12
22	99	7	3	12
23	90	14.62	2	8
24	90	7	2	8
25	36	8	2	8
26	90	6	3	12
27	60	14	2	8
28	99	18	3	12
29	36	11.5	2	8
30	99	14	3	12
Mean (SD)	60.21(±31.41)	12.19(±7.45)	2.066	8.266

Chart 1: Distribution of study population according to co-morbidity (n=30)



The commonest (50%) co-morbidity associated with AWD was Diabetes Mellitus (chart 1) whereas laparotomy (33%) was the commonest procedure (chart 2) associated with AWD. All patients' wound improved at the end of NPWT and wound got covered with healthy granulations tissue. Wound was closed with secondary intention and no post-operative complication was found.

Chart 2: Distribution of study population according to type of operation (n=30)

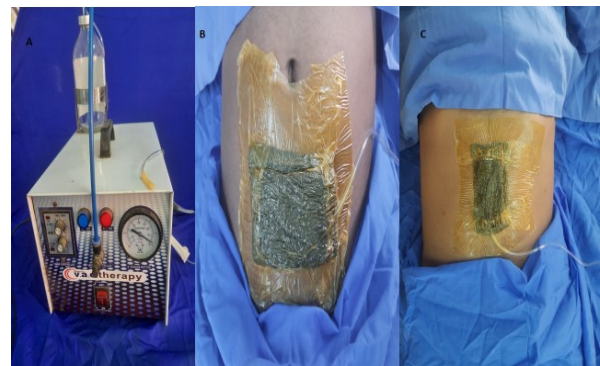
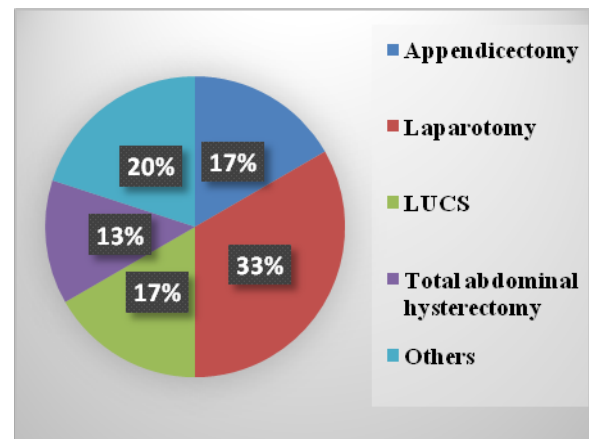


Fig 1: A: NPWT machine, Collection Container. B,C: Application of dressing.

Discussion:

Abdominal wound dehiscence is one of the most deadly life-threatening complications owing to the associated quick onset of often irreversible pathological sequelae. Post-operative wound infection is the prime cause of abdominal wound dehiscence. When a wound dehisces, the most common treatment is a saline dressing, which must be changed several times each day, increasing the risk of infection and making it difficult for the patient to tolerate the discomfort during dressing. Because NPWT minimizes tissue edema and interstitial tissue fluid, the administration of it to a wound promotes dermal perfusion and induces the creation of granulation tissue, which speeds wound healing and reduces bacterial colonization. Negative pressure's reverse tissue expansion effect also aids in the approximate of skin and fascia.



Fig 2: AWD after emergency LUCS. A-before NPWT, B-4th day of NPWT, C- on 8th day of NPWT, D-after secondary closure.



Fig 3: A- AWD after emergency Appendicectomy. B- on 4th day of NPWT

Tirpude B et al. carried a hospital based non randomized comparative prospective interventional study between July 2017 to November 2019, In his study majority of patients belonged to 51-75 years age group, The mean age affected is 43.3 yrs. Male to female ratio was 3.2:1.¹ Teklewold B et al. carried out a hospital-based retrospective review over a period of three years. A total of 41 individuals (0.99%) developed AWD and underwent abdominal surgery out of 4137 patients at the SPHMMC, Department of Surgery. The mean (SD) age of the patients was 29.8 (\pm 1.21) years. The majority of the patients (51.2%) were between the ages of 41 and 50.⁴

In our study mostly AWD occurs after emergency procedure. Muneiah S N et al. conducted a clinical study of post-operative abdominal wound dehiscence in Tirupati's several hospitals. A total of 32 cases (88.88%) were operated on as emergency surgery.³ Jang J Y et al. also found that AWD commonly (60%) occurred after emergency procedure.¹⁰

We found that the mean (SD) wound volume at start of treatment was 60.21(\pm 31.418) cm³ which were changed to 12.19(\pm 7.453) cm³ at the end of treatment. The largest wound was 108 cm³ and smallest was 20 cm³. Statistically significant ($p < 0.000000003$) improvement in wound size was noted at the end of NPWT. In this study, daily average wound size reduction was 5.83 cm³. The average duration of NPWT was 8.266 days and average numbers of dressings used was 2.06. Jang JY et al. performed a retrospective study on 50 patients from November 2009 to May 2012, with an average NPWT of 17.9 days (2 to 96 days).¹⁰ Leon D JM et al. conducted a retrospective chart review and discovered that the average wound volume was 286.4 cm³ and the average NPWT duration was 24.3 days. The average daily wound volume reduction was 5.02 (\pm 13.32).¹³ Jensen R O et al. cohort study found that average Duration of VAC treatment was 5.2 (0–15) days with median 1.6 (0–6) dressing changes.¹⁴ Findings were nearly similar to our study.

Conclusion:

The wound healing process is aided by NPWT, which makes the wound bed more favorable to

early covering. The most significant advantages were a reduction in the number of unpleasant dressing changes required, as well as a reduction in wound size. This reduces the mental anxiety and financial burden to the patients and their families. Our findings imply that NPWT can be utilized safely in incomplete abdominal wound dehiscence when performed under the supervision of an experienced observer who follows proper protocol.

Conflict of Interest: None.

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