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Negative Pressure Wound Treatment In Complicated Abdominal Wall Wounds, A Comparative Study.

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ABSTRACT

Complicated wounds passively affects the quality of patients life as well as the insult on the health care budget, negative pressure wound therapy (NPWT), an example of technological application in wound therapy improves the quality of patient life by decreasing pain, frequency of dressing and wound debridement sessions, and hastens wound cleanliness. This is a comparative clinical trial between two groups of patients with complicated abdominal wall wounds; group A (18 patients) treated using (NPWT), and group B (19 patients) treated by conventional methods, demographic criteria, operative and follow up data till wounds become clean collected and analyzed using the proper tests. Analysis of the study data revealed that the use of (NPWT) is significantly better than the conventional methods regarding number of debridement sessions, total dressings number, severity of pain 24 hours post debridement and later on, patient mobilization and total time taken for wounds to be ready for definitive closure. When applicable, (NPWT) can be the ideal method for treating complicated abdominal wall wounds.

Keywords; negative pressure, wound management, complicated wounds

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INTRODUCTION

Complicated woundsis a worldwide problem, it forms large burden on the financials of healthcare providers as well as the quality of patients life, it has a wide incidence range, in some studies it ranges between 12 to 22 % [1,2], and may reach 44% especially in closure of contaminated or potentially contaminated surgical sites [2,3].

Throughout the surgical practice, trials for getting benefit of the new technologies led to the implication of negative pressure devices in the management of complicated wounds that was first introduced in the early 90's of the last century, in what was named negative pressure wound treatment (NPWT) [3-6].

(NPWT) helps wound healing and improves the outcome of complicated wounds as it drains the oozing fluids away from wound, helps increasing blood supply, improves granulation tissue formation and wound edges approximation.[7]

(NPWT) system was widely used in management of varieties of acute and chronic wounds this includes infected wounds, necrotizing fasciitis wounds, burst abdomen either partial or complete with or without intestinal fistula, infected prosthesis, infected flaps, diabetic foot infections, donor sites of grafts, the recipient sites of meshed grafts, and infected burns [8-10].

In the current study we are evaluating the use of (NPWT) system in management of complicated abdominal wall wounds without fecal fistula in comparison to the conventional methods of wound management.

PATIENT AND METHODS

This comparative prospective clinical trial was carried out in zagazig university hospitals, emergency unit, in the period between August 2017 and July 2019 on 37 patients with complicated abdominal wall wounds, either postoperative wound dehiscence, abdominal wall gangrene, and massive abdominal wall infections, patients were randomly allocated into two groups according to method of wound management; group A managed using (NPWT) system and group B managed using conventional methods of wound dressing and debridement.

Patients were informed and consented, the study was approved by institutional review board (IRB) and the research ethical committee of our university.

Patients with intestinal fistula andthose with proved abdominal malignancy were excluded from the study.

General technique for NPWT is as follows: Wounds were debrided, cleaned with saline and antiseptic solution then covered with non-adherent dressing, foam dressings or weave cotton gauze are used to fill the open cavity of wounds and can be cut to fit wound's size and may be fixed to wound margin, a flat drain is sandwiched in gauze or dressing and placed into the wound. Then a transparent adhesive film drape is applied over the top to create a seal around the dressing, the drain comes out through an opening in the sealant sheet, then the drain is connected to the pump via the tubing. Once the dressing is sealed the vacuum pump can be set to deliver continuous or intermittent negative pressures, with levels of pressure, varying between −125 and −75 mm Hg. As shown in figure 1

The dressing type used depends on the type of wound and clinical objectives. For pain sensitive patients with shallow or irregular wounds, wounds with undermining or explored tracts or tunnels, gauze may be used, while foam may be cut easily to fit a patient's wound that has a regular contour and perform better when aggressive granulation formation and wound contraction is the desired goal, which was achieved when patient is ready for wound closure by any surgery. As shown in figures 2,3 and 4.

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Figure 1: Applied vacuum system

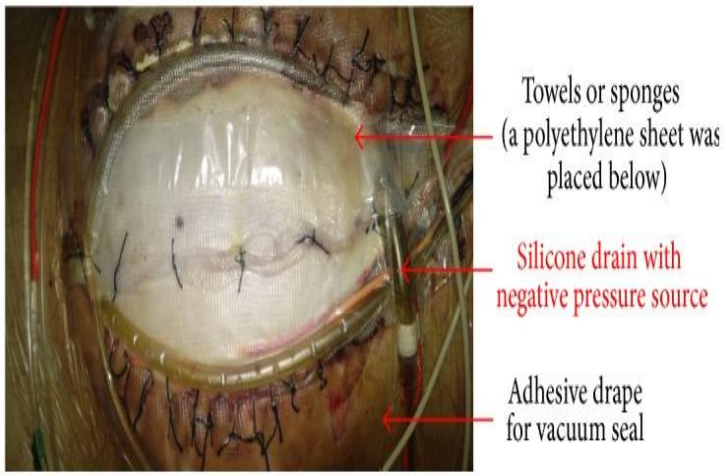

Figure 2: Abdominal wall necrotizing fasciitis after debridement

Figure 3: The same patient in fig 2 during vacuum application

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Figure 4: Patient in fig 2,3 after VAC removal (13 days)

Technique of the conventional method

Careful wound cleaning, drainage, and debridement of necrotic tissue was done; sterile dressing with topical agents was performed twice daily.

In group A (vacuum group), dressing was changed every 48 hours except if there was any bleeding or failure of the sealing system.

In group B (conventional group) dressings were done twice daily (or according to need) using saline wash, antiseptic solutions and wound debridement when needed.

We collected data on patient age, gender, history of diabetes mellitus, cause of the complicated abdominal wall wound, wound area, duration of use of VAC, the total number of dressings, visual analogue scale for pain (VAS), the duration of mobilization per day, number of surgical debridement andtime from initial surgical debridement to full cleanliness of wounds. Statistical analysis done using Z test, paired t test in SPSS 18 program.

RESULTS

The 37 patients recruited in this study were randomly allocated into two groups; group A (18patients) underwent (NPWT) and group B(19) underwent conventional wound treatment. In group A, male patients were 5 (27.2%) and female patients were 13 (72.2%) while in group B, male patients were 8 (42%) and female patients were 11(58%) the difference between gender presentation between the two groups was non-significant. Age ranged between 48years and 70 years (mean age 57.5 years) in group A while age ranged between 49 years and 70 years (mean age 58.6 years).

In group A the most common cause of the abdominal wall wound was necrotizing fasciitis 7 cases (38.9%) followed by burst abdomen (incomplete burst) in 6 cases (33.3%), then mesh infection after hernioplasty in 3 cases (16.7%) lastly surgical site infection (SSI) in two cases (11.1%) in group B the most common cause was necrotizing fasciitis in 7 cases (36.8%) and burst abdomen with the same incidence 2 cases complete burst abdomen and five cases partial burst, then mesh infection in 3 cases(15.9%) and lastly SSI in 2 cases(10.5%). Diabetes was present in 14 cases of group A and 16 cases of group B. The demographic and etiological data presented in table 1

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Table 1: Etiology and demographic data

		Group A	Group B	P value
Age		57.5 years (48-70)	58.6 years (49-70)	> 0.05
Gender	Male	5 (27.8%)	8 (42%)	> 0.05
	Female	13 (72.2%)	11 (58%)	> 0.05
Etiology	Burst abdomen	7 (38.9%)	7 (36.8%)	> 0.05
	Necrotizing fasciitis	6 (33.3%)	7 (36.8%)	> 0.05
	Mesh infection	3 (16.7%)	3 (15.9%)	> 0.05
	SSI	2 (11.1%)	2 (10.5%)	> 0.05
DM		14 (77.8%)	16 (84.2%)	>0.05

The mean wound area in group A was 34.17 cm^2 range (18-56 cm^2), and 34.74 cm^2 rang (19-50cm^2) in group B. The mean debridement times in group A was 1.22 and 1.89 in group B. total times of dressings done for each patient, in group A ranged between 5 and 10 with mean 7.4 times and in group B ranged between 17 and 47 with mean 39 times. The average mobilization minutes was 45.8 min in group A, and 37.1 min in group B. total time taken for being ready to wound closure was14.4 days in group A and 22.3 days in group B. as presented in table 2 there is non-significant difference regarding wound area but highly significant difference regarding all other parameters. One of the most important parameters in comparison between both groups was pain, visual analogue scale used for pain assessment revealed non-significant difference between both groups in the first 12 hours after debridement and revealed significant difference after 24, 48 hours and after 1 week. As presented in table 2.

Table 2: frequency of debridement, dressing and follow up data

		Group A	Group B	P value
Wound area		34.17 cm^2	34.74 cm^2	0.43
Debridement times		1.22	1.89	<0.001
Dressing times		7.4	39	< 0.001
VAS measurement	12 hours	5.11	5.47	0.58
	24 hours	3.06	3.74	< 0.05
	48 hours	2.44	3.21	0.001
	1 week	0.89	2.05	< 0.001
Mobilization time		45.8 min	37.1 min	< 0.05
Total time to be ready for closure		14.4 days	22.3 days	< 0.001

DISCUSSION

The vacuum assisted closure (VAC) or negative pressure wound treatment (NPWT) was widely used successfully in complicated wounds of the head and neck, perineum and Fournier's gangrene, the use of negative pressure exerted within foam like dressings, through a completely sealed environment helps drain tissue fluids away from wound vicinity, decreasing tissue edema, increases blood flow and increases granulation tissue formation. In most of the studies (NPWT) has a better rate of cleaning wounds off the necrotic tissues, fewer debridement and dressings time and shorter hospital stay time, thus decreasing the total financial costs.[11, 12].

In the present study the demographic data are more or less as that in the other studies even if there was any difference between our study and the others it will not affects the outcome, the etiologies of the abdominal wall condition, in both groups were burst abdomen, necrotizing fasciitis, infected mesh and surgical site infections with non-significant difference in between both groups, most of the previous studies were

carried out on individual factors which is better to judge the treatment of concern but in our study as the number of the individual causes is not large enough we thought it's better to test the (NPWT) on the different causes of complicated abdominal wall wounds.

The wound area was 34.17 cm2 in group A and 34.74 cm2 in group B with non-significant difference between both groups, the previous studies reported different wound areas with varying outcomes according to the size of the wounds as the larger the size of the wound the more the time it takes to heal, here we are aiming to wound preparation for closure not wound healing, this might not be affected by wound area, the use of (NPWT) made the wound preparation faster than the conventional methods, the total number of dressings needed for wounds to be clean is much more less in group A the total number of debridement is significantly less in group A, as the (NPWT) transforms the complicated wounds into a closed wounds with good drainage it facilitates patient movement and patient mobilization is significantly better in group A. pain assessment using VAS revealed non-significant difference between both groups in the first 12 hours as both groups underwent debridement.By time the pain was significantly higher in group B as patients were subjected to daily dressing. The total time needed for the wounds to be clean was significantly longer in group B, Yanaral et al [11], Tucci et al [13],Czymek [14] reported that vacuum didn't shorten the time of healing in Fournier's gangrene but makes the wounds clean in shorter time with better pain score and fewer dressings and debridement times, but Tsuji et al [15], Mir et al [16], reported that the use of vacuum therapy hasten the healing of infected neck wounds even in the presence of hypoalbuminemia and skin loss.

CONCLUSION

(NPWT) is better than the conventional method in treating complicated abdominal wall wounds as it offer a fewer number of dressing and debridement times with less pain and a lower need for analgesia and faster preparation of the wounds for closure.

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