East African Medical Journal Vol. 90 No. 12 December 2013
NEGATIVE PRESSURE WOUND THERAPY (NPWT) FOR THE MANAGEMENT OF LAPAROSTOMY WOUNDS: CASE SERIES
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SUMMARY

Laparostomy or the open abdomen can be a lifesaving intervention in surgical emergencies for abdominal compartment syndrome, wound dehiscence, trauma and intra-abdominal sepsis. However, the open abdomen imposes a significant burden on nursing staff caring for these critically ill patients due to the large volume of exudate and fluid loss.To achieve mechanical containment of abdominal viscera and active removal of exudate, we used NPWT to manage five patients with complex intra-abdominal sepsis laparostomy wounds. It took between 12 to 28 days to achieve full granulation for secondary closure of the wounds. The series shows that in the management of laparostomy wounds, NPWT provides an easier way to manage the large volumes of exudates and reduces the frequency of dressings changes required with traditional wound dressings.

INTRODUCTION

Laparostomy or the open abdomen has developed as a life-saving intervention in surgical emergencies for abdominal compartment syndrome, wound dehiscence, trauma and intra-abdominal sepsis (1,2). These wounds are classified by severity as type I, II, III or IV by Swan *et al* (3). However, the open abdomen imposes a significant challenge due to marked fluid shifts, loss of protein and heat, increased exudate and contamination with exogenous bacteria (4, 5).

The main objectives in laparostomy wound management include mechanical containment of abdominal viscera, active removal of exudate, third space fluid loss estimation, infection control and prevention of intestinal fistulae (4,6). To achieve this, the ideal dressing for temporary abdominal closure (TAC) should not cause trauma or adherence to underlying bowel (3). Various materials have been used to dress the open abdomen including intravenous fluidbags, Goretex, Bogota bags and sandwiched gauze dressings (7).The ultimate aim is closure of the laparostomy, ideally by early surgical approximation of the fascia, or alternatively by secondary healing through granulation and delayed ventral hernia repair, as appropriate to the underlying cause and patient condition. Negative pressure wound therapy (NPWT) is one of the new additions to the armamentarium of laparostomy wound management to achieve the above (8).

NPWT applies an occlusive dressing over the wound with interface material of foam or gauze and tubing connected to a suction machine. This helps control and measure exudate, assist fascial closure or granulation (9, 10). The role of NPWT in the management laparostomy wounds has been reported in case series mainly in developed countries with encouraging results (11, 12, 13). This case series looked into the use of NPWT for laparostomy wound management with equipment available in a developing country hospital set up.

CASE SERIES

The different cases presented here were managed at Kenyatta national hospital surgical and gynaecological wards between March 2012 and January 2013. The laparostomy wounds were cleaned with normal saline and then a non- adhesive wound dressing (Bactigrass®) applied directly on the wound. The wound cavity was filled with continuous layering of a gauze sheet and a suction tube placed between the gauze sheets after the first two layers. This dressing was then secured by a transparent adhesive dressing (Opsiteflexigrid®).

The suction tube was connected to a suction machine and continuous negative pressure applied at -100mmHg with the exudate collected in a canister. Dressing change was done after every 72 hours or if the vacuum seal was broken. This was continued until there was significant wound contraction and granulation for secondary closure or for continued outpatient dressing for healing by secondary intention. Informed consent was obtained from the patients and institutional approval for publication. There were five patients managed in this series. They

are summarised in the table below.

Table 2
Summary of the patients managed.

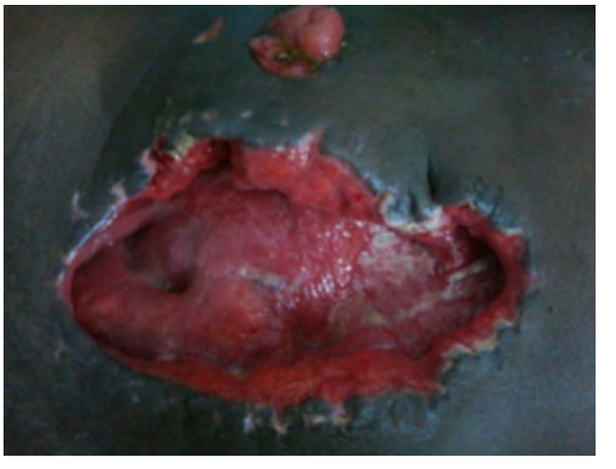
Case No.	Age	Sex	Wound class[3]	Cause	Duration of NPWT in days	Outcome
1	18	F	II	Post Caesarean section	12	Secondary closure.
2	30	F	II	Post Caesarean section	12	Secondary closure
3	35	F	III	Traumatic ileal perforation with ECF.	28	Secondary intention
4	46	F	III	Traumatic ileal perforation	21	Secondary intention.
5	35	M	III	Peritonitis 2o to strangulated hernia	14	Secondary closure.

Cases number 1 and 2: These two patients underwent emergency caesarean section due to obstructed labour but subsequently developed deep surgical site infection and a burst abdomen. They underwent two laparotomies with recurrent complete abdominal wound dehiscence. We managed them with NPWT for 12 days, achieved wound sepsis control and significant wound contraction. Secondary closure was successfully achieved in both cases.

Case 3: The patient underwent uterine curettage for an incomplete abortion at another facility but sustained uterine perforation during the procedure. A laparotomy was performed and the uterus repaired. However, second day post operatively she developed a high output entero-cutaneous fistula and subsequently peritonitis with severe sepsis. She was referred to our facility and underwent laparotomy after adequate resuscitation. Intra-op findings were two ileal perforations with severe peritonitis. A double barrel ileostomy was fashioned and the patient admitted to the critical care unit.

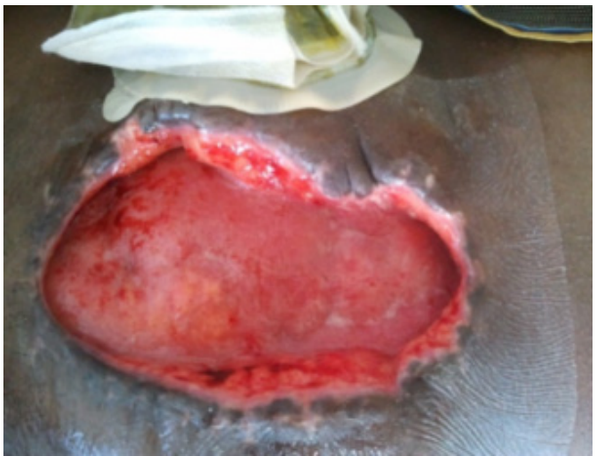
She developed complete wound dehiscence and deep surgical site infection. The open abdomen was managed with NPWT for four weeks with good exudate control and achieved marked wound contraction. She was discharged home after five weeks and the residual wound managed as an outpatient. This completely healed by the 7th week and the ileostomy was reversed on the 12th week with the ventral hernia awaiting repair later. The different stages of the wound management are show in the figures below.

a. Laparostomy wound

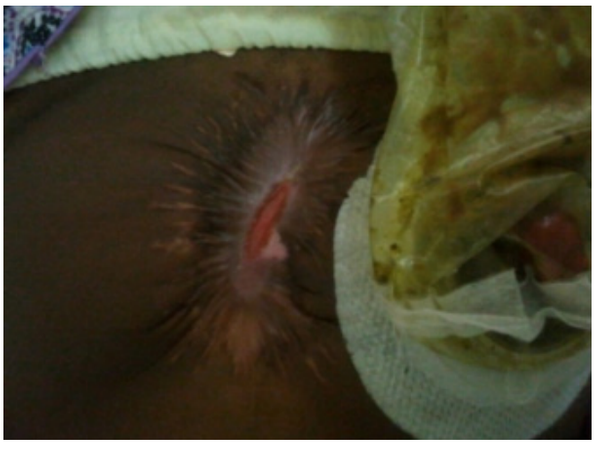


b. Wound dressed and NPWT active

c. Wound after two sessions of NPWT.



d. Wound after 5 weeks



e. Wound after ileostomy closure.

Cases number 4 and 5: These two patients developed complete abdominal wound dehiscence secondary to deep surgical site infection and intra-abdominal sepsis. They were managed with NPWT until the infection was controlled and there was significant wound contraction to allow for outpatient management in one case and secondary closure in the other. The resultant ventral hernia in case number 4 will be closed later.

DISCUSSION

Laparostomy wounds provide a significant challenge to the clinicians and nursing staff both due to the poor patient general condition and the significant exudate. Various methods have been applied to manage them with varying success and NPWT is one of the new additions in the past 20 years.

The cases presented above illustrate that NPWT can be adopted even in a developing country set up for the management of laparostomywounds with comparable results to other reported series. Miller et al reported the use of VAC® dressings in a prospective, single centre comparative study of 53 mostly young patients with type IIA post trauma abdominal wounds. They reported a rate of successful primary fascial closure (88%) with a delay time of up to 21 days which was significantly shorter compared to historic controls (14). In our series the longest delay time of 28 days was comparable to the above.

A randomised trial comparing different types of TAC by Bee et al. involving 51 patients randomised to receive vacuum packing or VAC® dressings or polyglactin-910 mesh temporary abdominal repair did not demonstrate significant differences in primary fascial repair rates, fistula and abscess formation, or mortality. However, the NPWT improved exudate control and made nursing care easier (15).

The current case series shows comparable wound closure and no major complication such as intestinal fistulae as reported in other studies. Existing level III evidence at least supports the hypothesis that NPWT for laparostomy wounds increases the likelihood of successful delayed primary fascial closure and thereby may reduce the late presentation of ventral hernias (16).

NPWT also increases subcutaneous blood flow significantly increasing formation of granulation tissue by enhancing capillary circulation and oxygenation through removal of interstitial fluid (17), reduction in local bacterial loads (18), and mechanical tissue stress promoting angiogenesis and new tissue growth (19). This has been shown to translate into clinical and economic benefits with a significantly reduced nursing staff time (20), and overall medical costs (21). Whether the same applies in laparostomy wounds remains to be determined by randomised studies.

Some studies have reported on the possibility that NPWT in the open abdomen may potentially increase the risk of entero-cutaneous fistula formation but published literature has not proved this association (22, 23). In our current case series, none developed an entero-cutaneous fistula.

CONCLUSION

In the management of laparostomy wounds, NPWT provides an easier way to manage the large volumes of exudates and reduces the frequency of dressings changes required with traditional wound dressings. This may translate into reduced cost of hospital care although more randomised studies are required to demonstrate any benefits conclusively.

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