



Vacuum drainage in the management of complicated abdominal wound dehiscence in children[☆]

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VAC therapy;
Complex;
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Abstract

Purpose: The aim of the study was to report the outcomes of the vacuum dressing method (vacuum-assisted closure [VAC]) in the management of “complicated” abdominal wounds in a selected group of children including neonates.

Methods: All children with vacuum (VAC) dressing-assisted closure of a *complex abdominal wound* (defined as complete/partial wound dehiscence combined with at least one of stoma, anastomosis, tube enterostomy, or infected patch abdominoplasty) were included in a 2-year study that took place in a single tertiary referral hospital. Retrospective case note analysis was used to determine pre-morbid diagnosis, management, illness severity markers, morbidity, and outcome.

Results: Nine children (neonate to 16 years) required 11 continuous episodes of VAC therapy. Abdominal wall dehiscence was complete in 7 and partial in 4 episodes. These were complicated by stomas (8), anastomoses (3), enterocutaneous fistulae (3), tube enterostomy (1), and infected patch abdominoplasty (2). Illness severity was assessed by the following proxy physiologic markers: American Society of Anesthesiologists status 3 or more (10), intensive care unit (ICU) (7), inotropes (4), ventilation (7), septic (C-reactive protein >100 and blood culture-positive) (3), liver impairment (aspartate transaminase >58 and alanine transaminase >36) (4), coagulopathy (international normalized ratio >1.3) (4), proinflammatory state (platelet count >450) (5), and nutritional impairment (albumin <37) (9). The median VAC treatment time was 32 days (range, 9–101 days). Of the changes, 70% required a general anesthetic or sedation on ICU. Control of 10 of 11 complex abdominal wounds (including 3 established enterocutaneous fistulae) was achieved using VAC therapy. Complications included nonreduction of laparostomy (1), failure of anastomosis (1), and failure of tube enterostomy diversion (1). Four children died of unrelated causes, 2 of them more than 3 months after VAC therapy.

Conclusions: In our experience with a small series of patients, VAC therapy is both safe and effective in complex pediatric abdominal wounds in severely ill children. It appears to promote wound closure, control local sepsis, and can be used to manage established fistulae. However, our results suggest that recent bowel anastomoses may be compromised using VAC, which in this circumstance, should be used with caution.
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Vacuum-assisted closure (VAC) therapy is the intermittent or continuous controlled application of subatmospheric pressure to a wound, achieved by placing open cell polyurethane foam into the cavity, securing an overlying drain, sealing the area with an adhesive drape, and applying vacuum pressure via the drain [1]. In complex dehiscence

abdominal wounds, exposed bowel must be protected with one or more layers of a fine-meshed nonadherent material interposed between the foam dressing and the underlying bowel. Dressings are usually changed every 48 hours. The VAC therapy helps to promote wound healing by removing exudate, approximating the wound margins, reducing edema, promoting granulation tissue formation, and increasing perfusion [1].

VAC therapy is now an accepted treatment modality for acute and chronic wounds in adults, where there is a sizeable literature describing its effectiveness in chronic open wounds, pressure ulcers, partial thickness burns, grafts, flaps, and dehisced wounds [2-4]. The VAC therapy should not be applied over necrotic tissue; malignant tissue; untreated osteomyelitis; or directly over vital structures such as tendons, ligaments, nerves, and large blood vessels. Its use in abdominal compartment syndrome and severe abdominal sepsis has been described [5].

The decision to apply VAC to a complex dehisced abdominal wound often arises in the setting of previous failure of surgical control, where the relative risks posed by a recent anastomosis or fistula are subordinate to the risk of worsening the situation at further laparotomy. There is some experimental evidence that intermittent rather than continuous vacuum therapy promotes more active granulation tissue formation [6]; however, given the exposure of many of these wounds to enteric content, we decided to use the continuous vacuum modality.

The application of VAC in the setting of recent anastomoses and enterocutaneous fistulae remains controversial. Anastomotic failure was not observed in a report of 5 patients in whom VAC therapy was used to manage the open abdomen at the time of surgical closure of an established high-output enteric fistula [7]. A large series comparing VAC and primary anastomosis with other management strategies for bowel injury after abdominal trauma found no difference in the subsequent (10.5%) anastomotic leak rate [8]. However, a 20% enteric fistula rate for VAC therapy in conjunction with laparostomy has been reported in 29 adult patients [9].

VAC therapy has been described as an effective treatment of established enterocutaneous fistulae [9-11]. One series reported control of all fistulae with VAC therapy in 13 adult patients, albeit with spontaneous closure in only a single case [9]. The usefulness of VAC as a “bridging therapy” to formal operative closure of high-output enterocutaneous fistulae when nutritional status had sufficiently improved has been emphasized in adults [11]. However, reported instances of new enteric fistula formation during VAC therapy raise concern about this approach [12].

There are few reports of the use of VAC for abdominal wounds [13-16] in children and limited information concerning neonatal application [17,18]. This report summarizes our clinical experience of VAC therapy for “complex” dehisced abdominal wounds in children and neonates. Our definition of *complex* includes the presence of

Table 1 Clinical summaries

Case	Age	Diagnosis	VAC time (d)	Dehiscence—partial/complete	Complicating factor	Complication of VAC	Mortality
1	15 d (term)	NEC	11	Partial	s	No	Progressive neuromuscular disorder
2	37 wk	NEC	14	Complete	s, f	No	
3a	7 wk	Gastroschisis	32	Complete	s, a	Yes, anastomotic failure distal to diverting stoma	
3b	28 wk		101	Partial	s, a, p	No	Liver failure
4	11 wk	Hirschsprung’s (enterocolitis)	9	Complete	s	No	
5	2.8 y	Peritonitis (ileal perforation)	80	Complete	t	Yes, failure of tube enterostomy diversion	
5b	3 y		61	Complete	s, f	No	
6	5.1 y	Hirschsprung’s (colocutaneous fistula)	29	Complete	f	No	
7	14.1 y	Abdominal compartment syndrome (vascular injury after cardiac surgery)	9	Complete	p	Yes, failure to close midline laparostomy	Mediastinitis
8	14.7 y	Peritonitis (shunt-related abdominal abscess)	40	Partial	s, a	No	Died of sepsis
9	16 y	Wound infection (bladder/bowel neuropathy)	49	Partial	s	No	

NEC indicates necrotizing enterocolitis. For complicating factor, a indicates anastomosis; s, stoma; f, enterocutaneous fistula; t, tube enterostomy; p, infected patch abdominoplasty.

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