Review

Negative-pressure wound therapy for prevention and treatment of surgical-site infections after vascular surgery

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Background: **Indications for negative-pressure wound therapy (NPWT) in vascular surgical patients are expanding. The aim of this review was to outline the evidence for NPWT on open and closed wounds.**

Methods: **A PubMed, EMBASE and Cochrane Library search from 2007 to June 2016 was performed combining the medical subject headings terms 'wound infection', 'abdominal aortic aneurysm (AAA)', 'fasciotomy', 'vascular surgery' and 'NPWT' or 'VAC'.**

Results: **NPWT of open infected groin wounds was associated with shorter duration of wound healing by 47 days, and was more cost-effective than alginate dressings in one RCT. In one RCT and six observational studies, NPWT-related major bleeding and graft preservation rates were 0–10 and 83–100 per cent respectively. One retrospective comparative study showed greater wound size reduction per day, fewer dressing changes, quicker wound closure and shorter hospital stay with NPWT compared with gauze dressings for lower leg fasciotomy. NPWT and mesh-mediated fascial traction after AAA repair and open abdomen was associated with high primary fascial closure rates (96–100 per cent) and low risk of graft infection (0–7 per cent). One retrospective comparative study showed a significant reduction in surgical-site infection, from 30 per cent with standard wound care to 6 per cent with closed incisional NPWT.**

Conclusion: **NPWT has a central role in open and infected wounds after vascular surgery; the results of prophylactic care of closed incisions are promising.**

VIDEO AVAILABLE ONLINE

Paper accepted 8 September 2016

Published online 15 November 2016 in Wiley Online Library (www.bjs.co.uk). **DOI:** 10.1002/bjs.10403

Introduction

Surgical-site infection (SSI) is a common cause of healthcare-associated infection[1]. SSI complicates up to 5 per cent of clean procedures and 30 per cent of clean-contaminated procedures, and is the most common nosocomial infection among surgical patients[2]. SSI leads to a significant increase in hospital stay, ICU admission, long-term surgical-site complications, patient suffering, readmission, cost and death[3]. It is estimated that 40–60 per cent of SSIs are preventable[4,5].

As a result of the severe consequences of SSI after vascular surgery, including leg amputation and death, every possible effort should be made to prevent SSI. Postoperative wound care to prevent SSI received little attention until recently, when incisional negative-pressure wound therapy (NPWT) emerged as a promising wound dressing.

NPWT is an established mode of therapy after vascular procedures, and in many centres is the method of choice when dealing with infected open groin wounds[6–12], lower limb fasciotomies[13,14] and open abdomen after repair of (predominantly ruptured) abdominal aortic aneurysm (AAA)[15–18].

The aim of this review was to outline the causes of SSI after vascular surgery, the potential implications of NPWT on closed incisions for primary prevention of SSI, and how further complications may be prevented by the use of NPWT in infected open groin wounds, leg fasciotomies and open abdomen.

Methods

A systematic literature search was performed in PubMed, Embase and the Cochrane Library from 2007 to 24 June 2016, combining the medical subject headings (MeSH) terms 'wound infection', 'abdominal aortic aneurysm', 'fasciotomy', 'vascular surgery' and 'NPWT' or 'vacuum assisted closure (VAC)'. The review was performed according to the PRISMA statement[19]. Selection of studies and data abstraction were performed independently by two authors.

Click on the video link below to see an overview of this review by the lead author. [Correction added on 20 January 2017, after first online publication: the video link has been added].

Results

After exclusion of duplicates from the three database sources, titles and abstracts were screened. Reviews, editorials, commentaries, abstracts without full-text articles, case series of fewer than five patients, irrelevant articles, articles not on NPWT, articles not in English or Spanish, and duplicates involving the same population were excluded. Twenty-one full-text articles remained for assessment of eligibility, of which ten were included in the review (*Fig. 1*): one RCT[6] and six observational studies[7–12] of patients receiving NPWT for open groin wound infections after vascular surgery, and three observational studies[16–18] of patients receiving NPWT for open abdomen after repair of aortic aneurysm. There was no basis for performing a meta-analysis.

No RCT exists on NPWT for fasciotomy wounds after vascular surgery, and there is only one retrospective comparative study[14]. No comparative studies employing the ‘EndoVAC’ method have been published. There is no published RCT[20,21] and only one retrospective comparative observational study[22] on NPWT for closed incisions after vascular surgery. A PRISMA flow diagram was therefore not performed for these three studies.

Risk factors for vascular surgical-site infection

There is a complex interaction between patient-related, procedure-related and environmental factors that determines the risk of SSI, summarized in *Table 1*[23–26]. Incisions at the neck for carotid procedures, laparotomy for AAA repair, and transverse groin incisions for access for endovascular aortic repair should be considered clean procedures, whereas vertical groin incisions for lower limb revascularization should be considered clean-contaminated procedures[27].

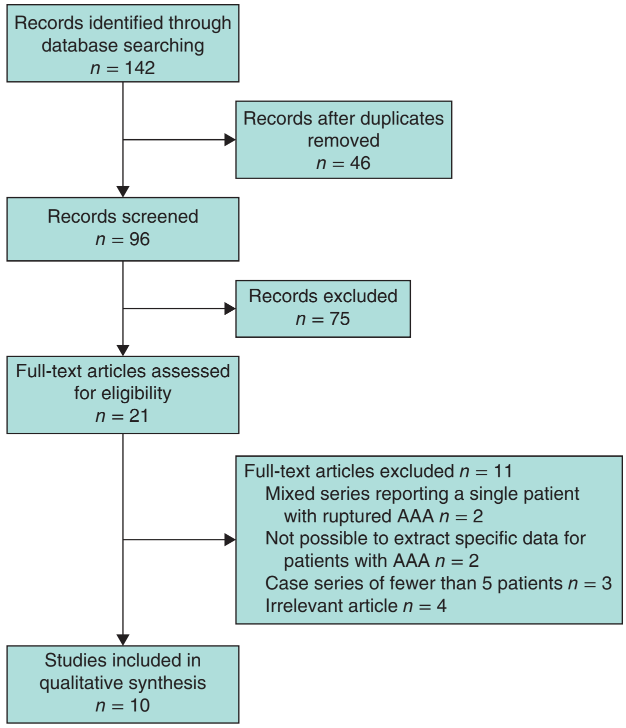

Fig. 1 PRISMA flow chart for the review of negative-pressure wound therapy after vascular surgery. AAA, abdominal aortic aneurysm

Incidence of surgical-site infection after vascular surgery

Determinations of SSI rates should be interpreted cautiously. Local surveillance programmes[28] and prospective RCTs[27] aiming to reduce SSI rates probably yield the most accurate values, whereas registry-based and retrospective studies seldom have the aim of studying SSI rates after operative procedures, and are consequently unreliable.

Published rates of SSI after vascular procedures are shown in *Table 2*. The percentages of superficial SSI, deep SSI and infection with graft exposure are 76, 24 and 6·1 per cent respectively[29]. The majority of vascular SSIs, 78 per cent in one study[25], develop after hospital discharge.

Definition of vascular surgical-site infection

The severity of SSI is defined as superficial, deep and organ/space according to the US Centers for Disease Control and Prevention (CDC)[31]: deep incisional or organ/space SSIs occur within 30 days of AAA surgery or carotid endarterectomy, and within 90 days after peripheral vascular bypass surgery. Organ/space SSI occurs when the infection spreads beneath the muscle or fascial layer,

Table 1 Risk factors for vascular surgical-site infection[23–26]

Patient-related	Procedure-related	Environmental deficiencies
Prolonged preoperative hospital stay	Groin incision	Operating suite ventilation
Obesity	Short time interval between multiple groin incisions	Environmental surface cleaning
Female sex	Vein harvest incision	Instrument and vascular implant sterility
Malnutrition	Biomaterial implant	Sterile operative technique
Smoking	Reoperation	
Diabetes mellitus	Prolonged duration of surgery	
Critical leg ischaemia with foot ulcer/gangrene	Hypothermia	
End-stage renal disease	Hyperglycaemia	
Vitamin K antagonist therapy		
Previous irradiation at incision site		
High dose of corticosteroids		
Chemotherapy for malignant disease		
Nasal carriage of *Staphylococcus aureus*		

often after opening or manipulation of the fascial layer during the operative procedure. The CDC expert group recommends that the diagnosis of organ/space SSI is made only by the surgeon. The most commonly used pragmatic grading system in vascular SSI is the Szilagyi[32] grade I–III system.

Prevention of SSI with negative-pressure wound therapy for closed vascular incisions

There are two dominating, commercially available, closed NPWT systems: the PICO™ system (Smith & Nephew, St Petersburg, Florida, USA) and the Prevena™ Incision Management System (Acelity/KCI Medical, San Antonio, Texas, USA) (*Fig. 2*).

The PICO™ system consists of a battery-driven, single-use, lightweight pump, without a canister, which delivers NPWT at a single preset pressure of 80 mmHg and is disposable after 7 days of continuous use. The device incorporates leak detection and a low-battery indicator. The pump is connected to a four-layer absorbent dressing, which has a total fluid management capacity of up to 200 ml (20 × 15-cm dressing pad) and works predominantly by evaporative loss (20 per cent absorption and 80 per cent evaporation)[33].

The Prevena™ system has a similar battery-driven unit that delivers 7 days of continuous NPWT at 125 mmHg through the two-layer dressing to the incision site. The inner layer consists of a thin polyurethane-coated, silver-impregnated layer, and the outer layer is of polyurethane foam with pore sizes of 400–600 μm. In contrast to the PICO™ system, the Prevena™ system has a canister that can collect 45 ml of exudate. If handling of larger fluid volumes is required, this small canister can either be exchanged or the pump device unit can

Table 2 Reported surgical-site infection rates after vascular procedures

Vascular surgical procedure	Reference	SSI rate (%)
Vascular surgery (lower limb revascularization and open aortic surgery)	Turtiainen *et al.*[29]	26·6
Lower limb revascularization	Turtiainen *et al.*[30]	21·9
Groin infection after vascular surgery	Hasselmann *et al.*[28] – proportion of EVAR : open vascular surgery, 64% : 36%	19·0
	Matatov *et al.*[22] – proportion of EVAR : open vascular surgery, 24% : 76%	30·2 (of groins)
EVAR	Hasselmann *et al.*[27]	4·4 (of groins)

SSI, surgical-site infection; EVAR, endovascular aneurysm repair.

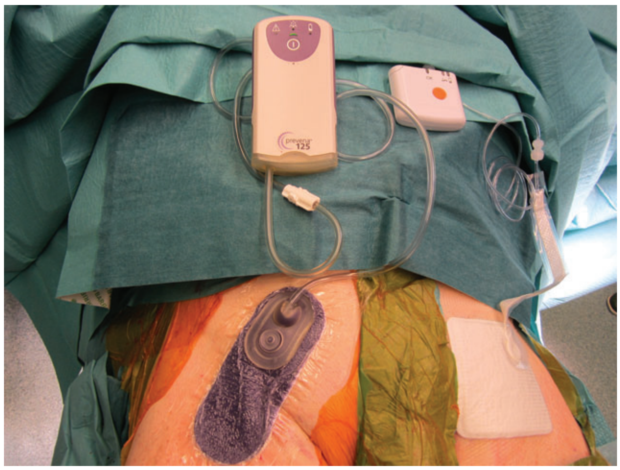

Fig. 2 Negative-pressure wound therapy applied over closed inguinal incisions after vascular surgery. The Prevena™ Incision Management System was applied on the right groin and the PICO™ system on the left

be replaced by a larger pump device (ActiV.A.C.®; KCI Medical) with a canister capacity of 300 ml.

Two recent systematic reviews[20,21] on NPWT over closed surgical incisions suggest that it may be able to reduce SSI rates. Compared with control groups, NPWT was found to reduce the rate of SSI: relative reduction 29·4 per cent (from 9·36 to 6·61 per cent), with lower wound dehiscence rates (relative reduction 50·2 per cent)[20]. NPWT was associated with lower SSI (relative risk 0·54, 95 per cent c.i. 0·33 to 0·89) and seroma formation (relative risk 0·48, 0·27 to 0·84) rates[21]. The reduction in SSI is attributed to the combined effect of the tight dressing minimizing the risk of contamination of the wound from bacteria in the perineal and groin area, reduction of dead space, leaving the closed incision dry, counteraction of the lateral retraction forces at the wound edges[34], and clearance of haematoma and/or seroma and oedema through the lymphatic drainage system[35]. There is one retrospective study[22] of SSI in the groin after vascular surgery with a comparative historical control group suggesting incisional NPWT is superior to standard dressing. The reduction in SSI rate was from 30 per cent with standard wound care to 6 per cent with incisional NPWT, with a reduction in severity of wound infections from 47 per cent to zero.

To date, there are no RCTs on vascular surgical patients. The great interest in this novel technique is demonstrated by the fact that 46 RCTs had been registered at ClinicalTrials.gov (http://clinicaltrials.gov), either recruiting or completed, at 16 May 2016, of which seven include patients undergoing lower limb vascular surgery.

Conservative approach with NPWT for open groin wounds in vascular SSI

The options available in deep vascular infections range from a conservative[7] to an aggressive surgical approach[36]. NPWT is the conservative option for open wound management in groin or fasciotomy wounds, and is commenced after debridement of necrotic tissue, and when there is adequate control of haemostasis. The polyurethane sponges fill the wound cavity, and are covered by a plastic sheet; a circumferential hole is cut in the plastic sheet and the suction catheter is pasted above the hole. The other end of the catheter is connected to the vacuum machine. The pressure is often set to 125 mmHg[6,12], but some centres use 50 mmHg[10], in continuous mode. Dressing changes are usually performed two or three times per week on the ward. After the suction has been switched off, local anaesthesia may be applied by injection through the sponges, or the suction catheter, before removal. If a haematoma or blood clot has developed after the debridement procedure beneath the sponges, before suction has been applied, drainage of blood and wound fluid through the sponges will be insufficient and the NPWT system will automatically be discontinued.

A number of series have described the safety and efficacy of NPWT for deep perivascular groin infection after vascular surgery[6–12]. NPWT-related major bleeding was reported in 0 per cent[8,10] to 10 per cent[6] of groin wounds in these series. Graft preservation rates ranged from 83 per cent[12] to 100 per cent[10]. NPWT of open infected groin wounds was associated with shorter wound healing of 47 days, and was more cost-effective than alginate dressings in the only RCT available[6]. NPWT is considered cost-effective owing to superior clinical outcome, fewer dressing changes, less resource use and similar costs, compared with standard dressings[37]. It is suggested that NPWT generates greater wound granulation, wound contraction, wound bed vascularization, reduced oedema and more effective control of fluid leakage than standard dressings; clearance of bacteria from the wound was similar[6].

NPWT over exposed vessels remains off-label, according to the manufacturers. To reduce the risk of ingrowth and adherence of the wound filler material with bleeding from vessels, a non-adhesive silicone-based dressing may be applied to cover the vessels first, with foam applied on top[6,12]. One centre advocates a two-layer combination of sponges: first an inner white polyvinyl alcohol sponge and then an outer black polyurethane sponge[10]. Patients with visible graft material are treated in hospital until granulation tissue has covered the vessels completely. Serious in-hospital bleeding events from the groin have been reported during NPWT[6,7,9,11,12], but as the majority of wounds heal with no serious complications, NPWT remains an option instead of surgery in these elderly and often frail patients.

Negative-pressure wound therapy for lower leg fasciotomy

NPWT has become commonly used for treatment of fasciotomy wounds after ischaemia–reperfusion syndrome in vascular surgical patients (*Fig. 3*). One retrospective comparative study[14] showed greater daily wound size reduction, fewer dressing changes, shorter wound closure time and shorter hospital stay with NPWT compared with gauze dressings. In this small study[14], three wound infections were found in the gauze group compared with none in the NPWT group, but this difference was not

a Bilateral medial and lateral fasciotomy

b Negative-pressure wound therapy

c Primary closure and skin grafting

Fig. 3 **a** Bilateral medial and lateral compartment fasciotomy due to lower leg compartment syndrome. **b** Negative-pressure wound therapy with continuous pressure of 125 mmHg was applied to the fasciotomy wounds. **c** Primary closure was possible in three of the four fasciotomy wounds; split-thickness skin grafting was necessary in the fourth

statistically significant. NPWT requires fewer dressing changes and less resource use than standard dressings[38]. If split-thickness skin grafting of the fasciotomy is necessary, it may be preferable to use the less adherent polyvinyl alcohol dressing (white foam) as a wound filler on top of the split-thickness skin graft[39].

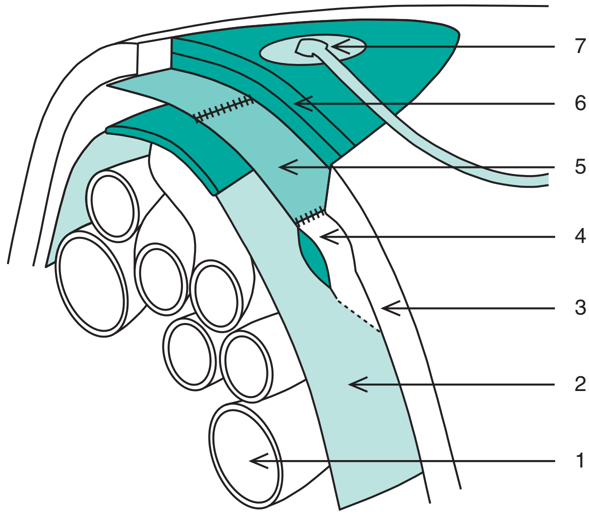

Fig. 4 Vacuum-assisted wound closure and mesh-mediated fascial traction technique: 1, bowel; 2, visceral protective layer; 3, abdominal wall; 4, abdominal wall fascia; 5, polypropylene mesh; 6, two pieces of polyurethane foam placed on top of the mesh and subcutaneously between the wound edges; 7, tubing set with an interface pad attached to an opening in the self-adhesive drapes and connected to the vacuum source

Negative-pressure wound therapy of open abdomen after aortic surgery

Open abdominal treatment is necessary to save lives in both trauma and non-trauma surgical conditions[40]. The strongest indication for initiation of open abdomen therapy is abdominal compartment syndrome (ACS). Around 20–30 per cent of patients develop ACS after open (and endovascular) aneurysm repair of ruptured AAA[41,42]. When ACS is identified late and intra-abdominal pressure reaches 30 mmHg, urgent decompression laparotomy is necessary to save life[43]. Prolonged duration of open abdomen may occur due to co-existing co-morbidities and compromised physiological function[44]. Temporary abdominal closure dressings are used to cover the intra-abdominal contents and facilitate subsequent abdominal closure. In a recent systematic review[45], the most effective temporary abdominal closure was the vacuum-assisted wound closure and mesh-mediated fascial traction (VACM)[18].

Vacuum-assisted wound closure and mesh-mediated fascial traction

The VACM technique (Fig. 4)

The visceral protective layer is placed above the entire viscera (V.A.C.® abdominal dressing or ABThera™ dressing, Acelity/KCI Medical; or RENASYS™ AB abdominal

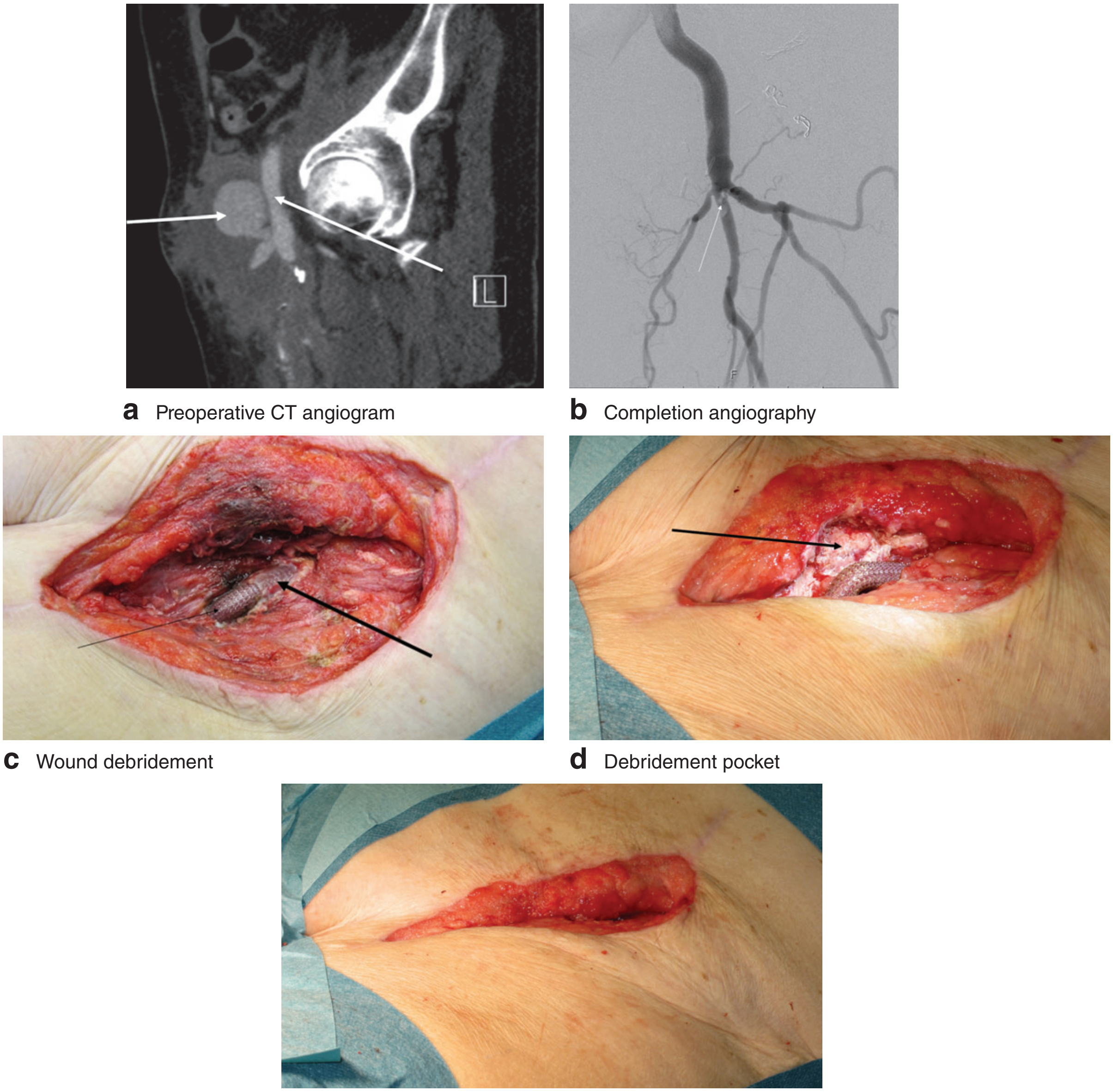

Fig. 5 The EndoVAC strategy, used in an 84-year-old woman with an infected bovine pericardial patch 3 months after thromboendarterectomy. **a** CT angiogram showing a large left femoral pseudoaneurysm. On sagittal view, the common femoral artery (long arrow) can be distinguished from the pseudoaneurysm (short arrow). Using a retrograde puncture of the right common femoral artery, microcoils were deployed to occlude two proximal minor small branches from the profunda artery, after which flexible stent-grafts (GORE® VIABAHN® Endoprosthesis; W. L. Gore, Livingston, UK) with diameters of 8 mm distally and 10 mm proximally were deployed. **b** Completion angiography showed a minor plaque/limited dissection (arrow), which not was flow-limiting, in the origin of one of three outflow arteries. **c** The wound underwent surgical debridement the next day. The lower part of the bovine pericardial patch (thick arrow) was missing, exposing the stent-graft (thin arrow). After debridement, negative-pressure wound therapy (NPWT) was applied. Wound cultures showed growth of *Staphylococcus lugdunensis*. **d** During subsequent wound dressings the whole pericardial patch disappeared and the stent-graft bulged outwards. A medial pocket in the wound (arrow) was created to place the bulging stent-graft after debridement. **e** Two sutures in the granulated subcutaneous tissue across the wound then covered the stent-graft and speeded up the healing process. NPWT continued for a further 3 weeks. In-hospital stay was 33 days and total duration of antibiotic therapy was 36 days. The wound had healed completely and epithelialized 51 days after initial debridement surgery. There was no sign of reinfection at 2-year follow-up

dressing and RENASYS™ EZ pump, Smith & Nephew). The outer layer of the polyurethane foam(s) is placed on top between the abdominal wall edges, after which the wound is sealed by occlusive self-adhesive polyethylene films. The suction device is connected to a calibrated negative-pressure source. Continuous negative pressure of 125–150 mmHg is the standard setting. At the second or third dressing change, or earlier if it is decided to leave the abdomen open for more than 5 days, a polypropylene mesh is inserted between the two layers. The mesh is divided in two halves and sutured with a 0 running polypropylene suture with narrow bites to the fascial edges on each side, keeping the viscera from protruding.

Dressing changes are usually performed every 3 days under general anaesthesia, although this can be done in the ICU[46]. At each dressing change, the mesh is opened in the midline and the visceral protective layer exchanged after inspection and/or exploration of the abdominal cavity. The mesh halves are resutured together with tightening of the mesh and reapproximation of the fascial edges. The outer polyurethane foam layer is then applied. As the intra-abdominal swelling decreases, the abdominal wall edges are gradually brought together with each dressing change. Finally, the temporary mesh is removed and the fascia closed using a standardized suturing technique.

The primary fascial closure rate varied from 96 to 100 per cent in three studies[16–18]. The median time to closure of the open abdomen in these three studies ranged from 10·5[17] and 17[16] to 36[18] days. No patient with long-term open abdomen therapy with the technique was left with a planned ventral hernia.

The graft infection rate was zero in two of the three studies; in one prospective study[16], two (7 per cent) of 30 patients treated with open abdomen after aortic repair developed suspected graft infections.

The VACM seems a good alternative for the treatment of a clean, grade 1A, open abdomen after AAA repair[47]. High fascial closure rates have been achieved with this technique in general surgery patients[48–52]. If intestinal and/or infectious complications develop, the risks of delayed fascial closure, intestinal fistula and graft infection increase[53]. The duration of open abdomen treatment seems to be a crucial factor, as severe complications usually develop after 2 weeks[54].

The EndoVAC technique

A novel hybrid approach using NPWT has been described for infected vascular reconstructions, termed EndoVAC[55,56] (*Fig. 5*). The components include: relining of the infected reconstruction with a stent-graft; surgical revision without clamping the reconstruction; and NPWT to permit granulation and secondary healing.

The main advantages of the EndoVAC technique are that only limited dissection is required in a usually scarred area, no fragile anastomosis is left in the infected area, and no clamping of the circulation is necessary. The EndoVAC method has been used to treat patients with an infected carotid patch, infected extra-anatomical bypasses in the neck region, and infected vascular reconstructions in the groin. It has been reported to be technically successful in all 16 patients in one series[56], with no reinfection during a 5-year follow-up.

Discussion

NPWT has become an important tool in wound management after vascular surgery. Vascular surgeons often use NPWT for open groin wound and fasciotomy wound management, to such an extent that it may be difficult to enrol patients in any proposed RCT[6]. There are several potential advantages of NPWT for open wounds, including active treatment without fluid leakage, possible cost-effectiveness owing to faster wound healing, fewer dressing changes, less resource use and shorter hospital stay[14,37,38]. The low risk of NPWT-related bleeding from underlying vessels and the high rate of graft preservation[57] make this an attractive alternative. The possibility of adding the EndoVAC hybrid repair method[56] in wounds considered to be at high risk of bleeding strengthens the potential of NPWT as a first strategy in treating perivascular graft infections.

There are no formal comparative studies between NPWT and other treatment options for open abdomen management after repair of ruptured AAA. The synergistic effect of adding a mesh-mediated fascial traction may avoid subsequent ventral hernia[16–18]. Other fascial traction methods in combination with NPWT have shown similar high fascial closure rates[51,52].

The evidence base for different methods of managing open abdomen after AAA repair could be improved by performing multicentre RCTs. The results of the currently registered RCTs on incisional NPWT in patients undergoing vascular surgery are awaited eagerly. Despite the lack of hard evidence, recommendations have already been issued to use incisional NPWT in high-risk procedures[58]. Groin incision for arterial reconstructions with, or without synthetic graft insertion might be considered as high-risk procedures in this category.

Test your understanding of indications for NPWT by reviewing the key learning points in Appendix 1. [Correction added on 20 January 2017, after first online publication: Appendix 1 has been added to the article].

Disclosure

The authors declare no conflict of interest.

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Appendix 1: Key learning points

1. What is the surgical site infection rate after lower limb vascular surgery?
2. What is the rate of major bleeding from the groin in patients receiving NPWT for perivascular groin infection after vascular surgery?
3. What is the graft preservation rate in patients receiving NPWT for perivascular groin infection after vascular surgery?
4. When should the NPWT and mesh-mediated fascial traction technique for open abdomen be considered?
5. Where is the mesh placed in the NPWT and mesh-mediated fascial traction technique for open abdomen?
6. What is the fascial closure rate (per protocol) in patients treated with open abdomen after AAA repair with NPWT and mesh-mediated fascial traction?
7. What is the graft infection rate in patients treated with open abdomen after AAA repair with NPWT and mesh-mediated fascial traction?
8. Which three procedures are performed in a sequential manner in patients treated with the EndoVac technique?

Answers:

1, 20 – 30%; 2, 0 – 10%; 3, 83 – 100%; 4, When it is decided to leave the abdomen open for more than five days; 5, The mesh is sutured to the fascial edges, and lies above the innermost plastic sheet that covers the visceral contents and below the thick polyurethane sponges that lies subcutaneously; 6, 96 – 100%; 7, 0 – 7%; 8 (i) Relining of the reconstruction with a stentgraft, (ii) surgical revision, (iii) NPWT.

European Colorectal Congress

28 November – 1 December 2022, St.Gallen, Switzerland

Monday, 28 November 2022

09.50
Opening and welcome
Jochen Lange, St.Gallen, CH

10.00
It is leaking! Approaches to salvaging an anastomosis
Willem Bemelman, Amsterdam, NL

10.30
Predictive and diagnostic markers of anastomotic leak
Andre D'Hoore, Leuven, BE

11.00
SATELLITE SYMPOSIUM
ETHICON
PART OF THE Johnson & Johnson FAMILY OF COMPANIES

11.45
Of microbes and men – the unspoken story of anastomotic leakage
James Kinross, London, UK

12.15
LUNCH

13.45
Operative techniques to reduce anastomotic recurrence in Crohn's disease
Laura Hancock, Manchester, UK

14.15
Innovative approaches in the treatment of complex Crohn Diseases perianal fistula
Christianne Buskens, Amsterdam, NL

14.45
To divert or not to divert in Crohn surgery – technical aspects and patient factors
Pär Myrelid, Linköping, SE

15.15
COFFEE BREAK

15.45
Appendiceal neoplasia – when to opt for a minimal approach, when and how to go for a maximal treatment
Tom Cecil, Basingstoke, Hampshire, UK

16.15
SATELLITE SYMPOSIUM
Medtronic
Further, Together

17.00
Outcomes of modern induction therapies and Wait and Watch strategies, Hope or Hype
Antonino Spinelli, Milano, IT

17.30
EAES Presidential Lecture - Use of ICG in colorectal surgery: beyond bowel perfusion
Salvador Morales-Conde, Sevilla, ES

18.00
Get-Together with your colleagues
Industrial Exhibition

Tuesday, 29 November 2022

9.00
CONSULTANT'S CORNER
Michel Adamina, Winterthur, CH

10.30
COFFEE BREAK

11.00
SATELLITE SYMPOSIUM
INTUITIVE

11.45
Trends in colorectal oncology and clinical insights for the near future
Rob Glynne-Jones, London, UK

12.15
LUNCH

13.45
VIDEO SESSION

14.15
SATELLITE SYMPOSIUM
BD

15.00
COFFEE BREAK

15.30
The unsolved issue of TME: open, robotic, transanal, or laparoscopic – shining light on evidence and practice
Des Winter, Dublin, IE
Jim Khan, London, UK
Brendan Moran, Basingstoke, UK

16.30
SATELLITE SYMPOSIUM
Takeda

17.15
Lars Pahlman lecture
Søren Laurberg, Aarhus, DK

Thursday, 1 December 2022
Masterclass in Colorectal Surgery
Proctology Day

Wednesday, 30 November 2022

9.00
Advanced risk stratification in colorectal cancer – choosing wisely surgery and adjuvant therapy
Philip Quirke, Leeds, UK

09.30
Predictors for Postoperative Complications and Mortality
Ronan O'Connell, Dublin, IE

10.00
Segmental colectomy versus extended colectomy for complex cancer
Quentin Denost, Bordeaux, FR

10.30
COFFEE BREAK

11.00
Incidental cancer in polyp - completion surgery or endoscopy treatment alone?
Laura Beyer-Berjot, Marseille, FR

11.30
SATELLITE SYMPOSIUM

12.00
Less is more – pushing the boundaries of full-thickness rectal resection
Xavier Serra-Aracil, Barcelona, ES

12.30
LUNCH

14.00
Management of intestinal neuroendocrine neoplasia
Frédéric Ris, Geneva, CH

14.30
Poster Presentation & Best Poster Award
Michel Adamina, Winterthur, CH

15.00
SATELLITE SYMPOSIUM
OLYMPUS

15.45
COFFEE BREAK

16.15
Reoperative pelvic floor surgery – dealing with perineal hernia, reoperations, and complex reconstructions
Guillaume Meurette, Nantes, FR

16.45
Salvage strategies for rectal neoplasia
Roel Hompes, Amsterdam, NL

17.15
Beyond TME – technique and results of pelvic exenteration and sacrectomy
Paris Tekkis, London, UK

19.30
FESTIVE EVENING

Information & Registration **www.colorectalsurgery.eu**