Practice of negative pressure wound therapy (NPWT) in Togo

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Key words: Negative pressure, wound therapy, wound healing, skin graft, flap, Africa

Abstract

Background: Negative pressure wound therapy (NPWT) is considered as an innovative technique in wound management. The commercial VAC[R] Therapy system is not available in Togo. We established NPWT using local materials. We present our technique and results.

Methods: We conducted a retrospective cross-sectional study based on 15 patients whose wounds were treated with NPWT in the wound care department of Sylvanus Olympio Teaching Hospital between March 2014 and March 2015. We analysed the materials used for the NPWT and the wound outcomes.

Results: 15 patients were included, with an average age of 22.5 years, ranging between 16 and 60 years, and a sex ratio of 1.5 for men. Traumatic wounds and complications of orthopaedic surgery were the most encountered lesions, followed by leg ulcers. Gauze was used as an interface for all patients and the main source of the vacuum was an electric surgical suction machine (9 of 15). The average duration of treatment was 10 days, with a range between six days and 18 days. Ten skin grafts, a fasciocutaneous flap, and two muscle flaps were performed after the NPWT. None of our patients had spontaneous wound healing under NPWT. The patients expressed moderate pain at baseline, which subsided after a few hours with or without step one analgesics. Patients, including those in whom the procedure was aborted, were all very satisfied. They referred to the absence of pain and avoidance of discomfort and pain from daily dressing.

Conclusion: NPWT has been successfully used in the treatment of wounds using local materials. The results obtained are comparable to those in the literature using the same devices or VAC[R] Therapy devices.

Wound Healing Southern Africa 2016;9(2):15-17

Introduction

Negative pressure wound therapy (NPWT) is a dressing of wounds by applying to them a lower pressure than ambient atmospheric pressure in order to achieve rapid healing. The pressure under the dressing is supposed to be lower than atmospheric pressure. Kairinos et al. have proven that the pressure on the wounds may increase instead of getting lower. The real mechanism of this dressing is still a subject of research.[1]

The system is marketed under trade names, including V.A.C.[R] Therapy (KCl), by several manufacturing companies. The commercial kit usually uses sterile polyurethane foam, special tubing, transparent adhesive bandages, and a portable suction machine with a container.[2] Considered to be one of the latest technical innovations in the management of wounds, NPWT has proven to be effective in the treatment of chronic wounds, diabetic foot, acute traumatic wounds and post-surgical infectious complications. It reduces healing time by accelerating granulation, preparing the wound bed for a skin graft or a flap, or sometimes achieving complete wound healing.[3-10] The commercial V.A.C.[R] Therapy used for NPWT is not accessible in low-income countries such as Togo. Local materials (gauze, various pipes such as nasogastric tubes, wall vacuum) have therefore been used in other countries for the realization of the NPWT.[5,11,12] The aim of our study was to describe the practice of NPWT in our conditions of work, and present our results.

Method

We conducted a prospective cross-sectional study based on 15 patients whose wounds were treated with NPWT in the wound care department in the Sylvanus Olympio Teaching Hospital in Lomé between March 2014 and March 2015.

The operative technique

A clinical examination of the wound and the legs was done prior to the procedure. A vascular evaluation of leg ulcers was done clinically by pulses palpation and search for clinical signs of ischemia on the legs. No patient had an ankle-brachial pressure index (ABPI) determination.

After debridement of the wound under local, loco-regional or general anaesthesia, gauze is cut to the size of the wound. An adhesive transparent dressing film is used to hold the gauze and create

a seal. A small hole is made through the transparent dressing to allow a CH20 nasogastric tube to be inserted, in contact with the gauze. Additional transparent dressings are then utilised to seal the hole made for the nasogastric tube. The nasogastric tube is then connected to a vacuum source (surgical suction machine or wall vacuum). The vacuum is turned on with a pressure between -75 and -175 mmHg, either continuously when using the wall vacuum or intermittently with a surgical suction machine (Figure 1). The pressure has been determined empirically according to the size of the wounds and measured by the manometer of the suction machine or the wall vacuum.

A lack of air movement heard on auscultation with a stethoscope of the dressing demonstrated that a perfect seal have been achieved. The system should be shut down one or two hours before the dressings are changed, which should occur every three to five days. The patients should remain hospitalised and bed-bound throughout the procedure.

We Analysed:

- The socioeconomic parameters of patients
- The type of wound
- The vacuum source
- The granulating period (time between the beginning of treatment and obtaining a granulated surface ready for a skin graft or a flap)
- Complications resulting in a failure of the treatment
- Patient satisfaction (very satisfied, satisfied, not satisfied).

Results

Fifteen patients were included in the study, with an average age of 22.5 years, ranging between 16 and 60 years, and a sex ratio of 1.5 for men. The most common lesions were traumatic wounds and complications of orthopaedic surgery, followed by leg ulcers mostly of infectious aetiology post necrotising fasciitis. Gauze was used in all patients and the vacuum source was most often an electric surgical suction machine (9 of 15) (Table I).

Overall, 13 patients had favourable results (procedure carried to term), whilst for two patients the procedure was stopped early. Both patients had diabetic foot ulcers, with the second one requiring amputation for ischaemic supra infected gangrene. In this patient, clinical vascular evaluation before the procedure did not revealed any concern. The second patient had an infectious diabetic foot with clinical normal vascular status prior to NPWT. There were some necrotic deep cavities found at surgery after NPWT was stopped. The duration of treatment was 10 days on average, with a range of six days to 18 days. Ten skin grafts, a fasciocutaneous flap, and two muscle flaps were performed after the NPWT. None of our patients had spontaneous wound healing under NPWT. No patient presented a complication such as bleeding during the procedure. All patients expressed moderate pain at baseline, which subsided after a few hours with or without step one analgesics. Patients, including those in whom the procedure was aborted, were all very satisfied. They referred to the absence of pain and avoidance of discomfort and pain due to daily dressing.

Table I: Wounds and source of negative pressure

	Item	n
Type of wound	Post-traumatic soft tissue wound necrosis without bone exposure	7
	Infectious leg ulcer (diabetic and non-diabetic)	4
	Venous leg ulcer	1
	Post traumatic wound with bone or tendon exposure	2
	Osteosynthesis material exposition	1
Source of negative Pressure	Surgical electrical suction machine on intermittent suction	9
	Wall vacuum on continuous suction	6

Figure 1

Discussions

Our study had a small sample size (only 15 patients) that prevented us from using statistical tests or drawing strong conclusions. However it did allow us to demonstrate the feasibility of undertaking NPWT with local materials. The study population had a relatively young age. This reflects the type of treated wounds (traumatic wounds). A similar age profile can be seen in other studies which have assessed traumatic wounds.[4,6,11,13] NPWT is part of the therapeutic arsenal for the treatment of wounds with a fairly high level of evidence.[3-5,7,8] Long before our study, other authors had used material other than commercial devices for the realization of the NPWT.[5,11,12] Our study is replicating these and providing further evidence to support the results of these authors.

The polyurethane foam utilized by the commercially available VAC^{R}, was substituted with gauze. Nasogastric tubes were used in place of the TRAC pad suction tubes used with the VAC^{R} dressing. In the absence of VAC^{R} Therapy machines, we used vacuum wall or surgical electric suction motors. We were able to get wounds ready for a skin graft or for a flap within an average of 10 days, results comparable to what was found by Odiendki et al. and other authors.[8,11]

Odienki et al. and Webster et al. did not find a significant difference between the use of polyurethane foam or gauze.[5,11] Studies have found a reduction in the cost of wound treatment through the use of NPWT with the non-commercial device, either directly or indirectly. For Webster et al. and other authors, the use of local materials for NPWT produced results that were as good as those for commercial

materials, and led to a decrease in the cost of the procedure.[3,5,13,14] Two patients in our study could not go through with the procedure because of non-improvement. The failure in both patients was related to diabetic foot ulcers; although this is an indication for NPWT, failure may have occurred because an on-going ischaemic insult made amputation unavoidable. Our patients were all very satisfied with the procedure in spite of the fact that the system required them to stay in bed. This may be because of a reduction in pain, greater spacing between dressings (that would normally be replaced daily) and the good outcomes experienced for the majority of the study participants.

Conclusion

NPWT has been successfully achieved in the treatment of wounds using local materials. Gauze, surgical suction machine and wall vacuum have been used effectively. The results obtained were comparable to those in studies that used commercially available systems. Efforts to popularize the practice of NPWT using local materials are to be encouraged and supported in Togo and other low-income countries which have populations for whom health insurance is not always available.

Using local materials may be less easy and more time consuming than commercial devices however, not only for staff but also for patients. These factors have not been taken into account when considering the time (operation/cost), the quality of life or the possible complications. Future studies should include a focus on these considerations and application of the procedure to various types of well described wounds.

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