



Case report

Salvage of both feet after complete resection of large carcinomas and local infection using a new negative pressure wound dressing in combination with intermittent instillation therapy



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1. Introduction

Despite great progress in the field of local and microsurgical reconstructive techniques in the past decades, there are cases where surgery is not applicable or surgery alone is not expedient. Negative pressure wound therapy (NPWT) has proven to be effective in the treatment of many kinds of wound healing issues and shows a significant positive effect in the healing of chronic wounds, including complex diabetic foot ulcerations, wound healing disorders, burns and wound infections [1–10]. In combination with intermittent instillation, it is a valid alternative or additional therapy to surgery for complex wounds [5,6,9,11–14]. However, there are still cases where wound conditioning remains complicated and insufficient, for example in situations with non- or low-vascularized wound beds. A novel NPWT-dressing was recently described on 21 patients and seems to be promising in these situations [15]. We used this new NPWT-dressing with intermittent instillation in a patient with complex wounds on both feet after complete resection of extensive verrucous squamous cell carcinomas.

2. Case report

A 35-year-old male patient from Egypt presented with exophytic verrucous tumors at the plantar side of both forefeet. After an initial

resection, the histology revealed verrucous squamous cell carcinomas on each side. Pre-existing conditions were, beside disseminated warts on both feet, amputated halluces on both feet due to a long history of untreated diabetes mellitus type 1, accompanied by a polyneuropathia, chronic renal insufficiency, arterial hypertension and advanced arteriosclerosis with a stenosis of the right external iliac artery (Table .1).

In advance the perfusion of the right lower limb was improved by a percutaneous transluminal angioplasty of the right external iliac artery. Leaving an R2 situation (Fig. 1) after the first resection, a further surgical resection was necessary. After R0 resection of the carcinomas and an initial approach with standard NPWT, wounds were covered with split skin grafting in combination with NPWT. A free-flap transfer was not a viable option, as recurrences of the carcinomas in this special case were highly anticipated and harder to detect beneath the thickness of a free tissue transplant. Furthermore, the patient showed an advanced arteriosclerosis and a one-vessel-perfusion situation on both shanks. After 5 days the NPWT dressings were removed, whereas the transplants showed a success rate of about 20% with infected wounds on both sides (Fig. 2). Intraoperative swabs showed *pseudomonas putida* and *proteus mirabilis* in the wounds. The patient underwent further surgical debridements, jet-lavage and the wounds were treated with a recently introduced novel NPWT-dressing (V.A.C. Cleanse Choice Dressing™) in combination with intermittent instillation. As described by Téot et al., the dressing comes with two kind of foam (in layers): the

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Table 1

Shows an overview of the patient's characteristics.

Gender	Male
Age	35 years
Weight	110 kg
Height	185 cm
Diagnosis	Verrucous squamous cell carcinomas on both feet (5 × 5cm)
Comorbidities	<ul style="list-style-type: none"> - Diabetes mellitus type 1 - Polyneuropathia - Glaucoma on both eyes - Chronic renal insufficiency - Arterial hypertension - High grade stenosis of the right external iliac artery - Arteriosclerosis - Amputation of both halluces



Fig. 1. Initial finding on the left foot.



Fig. 2. Finding after first trial of split skin transfer on the left foot.



Fig. 3. a: Different layers (foams) of the new NPWT-system. c: Both feet covered with the new NPWT-system.

first, which should be directly applied to the wound, has perforations with a diameter of 1cm spaced 0,5cm from each other. The cover layer (without holes) should be placed over the perforated foam to cover the

wound contact layer as well as to fill the undermined areas around the wound [15]. (Fig. 3a–c). The perforated foam is supposed to achieve more granulation tissue and having the ability to debride the wound to a certain extent. Initially the chosen instillation solution was Lavanid® (polyhexanid solution), followed by Granudacyn® (hypochlorous acid), known to be effective in case of an infection with pseudomas spp [16,17]. Additionally, the patient received a dual intravenous antibiotic therapy with meropenem and piperaciline/tazobactam according to the resistogram. Three days after the initial application of the new dressing, a large amount of well perfused tissue was found. As the defects were quite deep, therapy was continued and dressing changes were performed every 2–7 days after surgical debridement. After a series of four operations and an infection-free wound base, enough well vascularized granulation tissue was present (Fig. 4a and b). Due to the delicate location of the defects Matriderm® (2mm, bovine collagen) in combination with standard NPWT was applied prior to split skin grafting



Fig. 4. New NPWT-system fixed on the wound before vacuum-coverage (left foot).



Fig. 5. Application of Matriderm® on the left foot.

(Fig. 5). After the removal of the NPWT dressing (Fig. 6a and b), the wounds were finally covered with split skin grafts, fixed with NPWT-system. Five days later, NPWT-system was removed and we found 100% adherent and vital split skin grafts (Fig. 7a and b). Therapy



Fig. 6. 7 days after Matriderm® application and regular NPWT (left foot).



summary is listed in Table 2.

3. Discussion

Growth of granulation tissue was extraordinary vigorous even on low-vascularized tissue such as tendons. After a series of only four surgical debridements in combination with the new NPWT-system, both deep wounds were completely covered with granulation tissue and perfectly conditioned for a split skin transfer. The chosen therapy was successful, though alternative therapies must also be considered. Free-flap transfer was not first choice, as recurrences of the carcinomas were highly suspected in this patient due to the widespread warts on the feet which are hard to discover beneath the thickness of a free tissue transplant. But in the special case of a low- or non-vascularized wound ground, especially on highly burdened regions as the bottom of the feet, a certain thickness of well-vascularized tissue is required and advocates a free-flap transplant. This caused a therapeutic dilemma. As the patient showed a one-vessel-perfusion on both shanks it was decided that the final reconstruction with split skin grafts would be the best option for the patient.

Regular negative pressure vacuum-systems entail the risk of germ cultivation [13]. In some studies a decrease of aerobic bacteria could be demonstrated, although anaerobic bacteria are more likely to increase



Fig. 7. 13 days after split skin transfer on both feet.

Table 2

Overview of therapy.

Total number of days of hospitalization	69 days
Total number of days of NPWT for wound conditioning	23 days
Total number of days with “Cleanse Choice Dressing” VAC therapy	16 days
Instillation solution used	Lavanid® (polyhexanid) (9 days) Granudacyn® (HOCl) (7 days)
Germs on wound ground	- Pseudomonas putida - Proteus mirabilis
Cover technique	- Matriderm® - Mashed skin transfer from right tight - Graft thickness: 0,3mm - Mash: 1:1,5
Results	- RO resection of the carcinoma - Asepsis - 100% survival of the mashed skin transfer

under regular vacuum-assisted therapy [18,19]. After the first split skin transfer and five days of vacuum coverage, pseudomonas putida and proteus mirabilis were found in both wounds. We changed our initial

instillation regime from a polyhexanide solution (Lavanid®) to a hypochlorous acid solution (HOCl) (Granudacyn®) and started a dual antibiotic therapy. Only seven days later we achieved an infection-free wound base. One cannot say if just the change of instillation solution in combination with NPWT would have been sufficient to eradicate wound contamination.

In sum, this new NPWT-system combined with instillation seems to be a promising tool in complex wound conditioning especially in low-vascularized tissue and should be tested in a prospective controlled study with a larger number of patients.

Disclosure

Dr. Taeger is a consultant for Kinetic Concepts, Inc. The other authors have no financial interest to declare in relation to the content of the article.

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