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Vivano® Spectrum

Convincing case examples of negative-pressure wound therapy.

Abdominal · Traumatic · Chronic · Burns · Special Indication

Editorial details

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Editorial

Dear Colleagues,

It is my great pleasure to introduce the third edition of the "Vivano® Spectrum" series.

Since the first edition we have had many contributions highlighting several topics of NPWT. The last edition was dedicated to the complex treatment options of the open abdomen. We proposed to share knowledge particularly in less common, complex clinical situations.

To follow this line we selected new descriptions on NPWT use in cranio-maxillofacial surgery and in implant-related infections where proactive NPWT utilisation is intended to further reduce complications.

Two papers illustrate endoluminal NPWT applications. Clinical experience in 31 patients is shared by Laukötter et al. using endoscopic vacuum therapy in the upper gastrointestinal tract. These findings are further confirmed by Lock et al. describing their positive results in this special indication spectrum. This is an exciting new field where the reduction of post-operative complications is intended.

This "Vivano® Spectrum" illustrates that the full extent of potential NPWT applications is still growing. Considering that NPWT was first introduced in the 90's, this is an encouraging sign for prospective clinical research.

Please join me in sharing this edition with your colleagues – shared knowledge is the basis for disseminating best practice.

Kind regards,

Prof. Dr. med. Hans Smola

Content

In- and outpatient application of NPWT for an open abdomen with suture dehiscence

Medicus outpatient care partner
Northeim, Germany

63-year-old man with disturbed abdominal healing arising from suture dehiscence.

Patient anamnesis

The patient had undergone surgical construction of a bladder conduit. The patient was obese, with type II diabetes mellitus and arterial hypertension; his general condition was in keeping with his age.

Wound anamnesis

Suture dehiscence had disrupted abdominal wound healing, resulting in hospitalisation (day 0). Following removal of the suture clips, recurrent adipose tissue necrosis was found in the wound bed and the exposed muscle fascia. After debridement, there was a cavity measuring 3 cm at the 12 o'clock position. There was no sign of infection at the wound edge or in the vicinity, 200 mL exudate being produced per day. The wound measured 21 cm x 6 cm x 4 cm (day 9).

Aim of the treatment

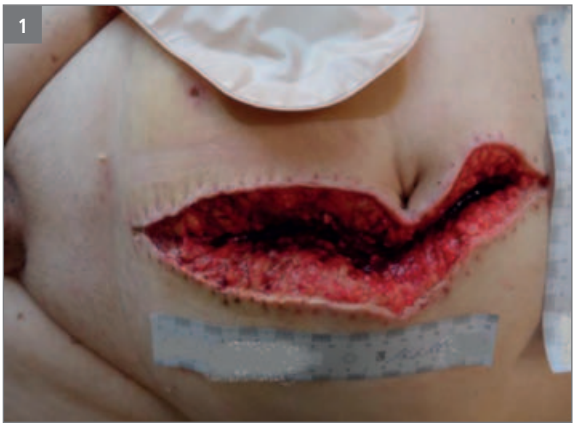
Application of negative pressure wound therapy (NPWT) using Vivano® to stimulate healing of an open abdominal wound arising from suture dehiscence.

Wound treatment

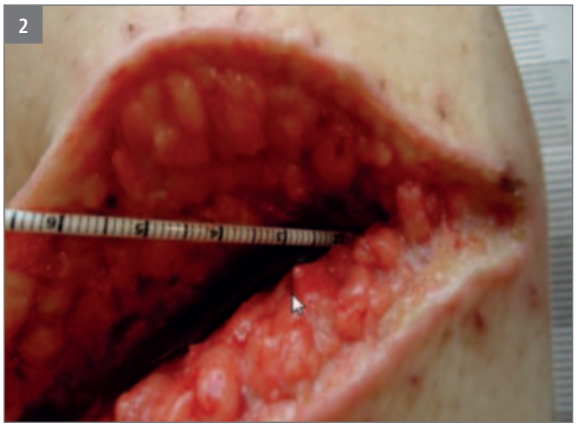
NPWT was initiated on day 2. At day 6, recurrent adipose tissue necrosis was observed, and wound debridement was repeated. By day 9, granulation tissue formation had begun at the wound edge. On day 10, the patient was transferred to the outpatient department. By day 20 granulation tissue formation had progressed to skin level. NPWT was discontinued on day 24 and treatment was continued using the interactive wound dressing, TenderWet Plus. Epithelialisation of the wound bed had begun by day 28.

Conclusion

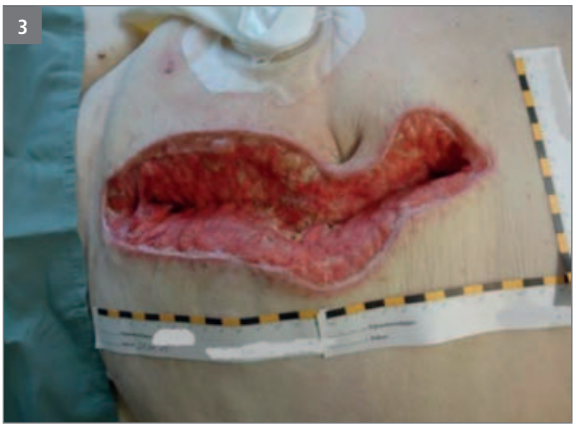
NPWT stimulated comprehensive granulation tissue formation, allowing for subsequent initiation of epithelialisation.



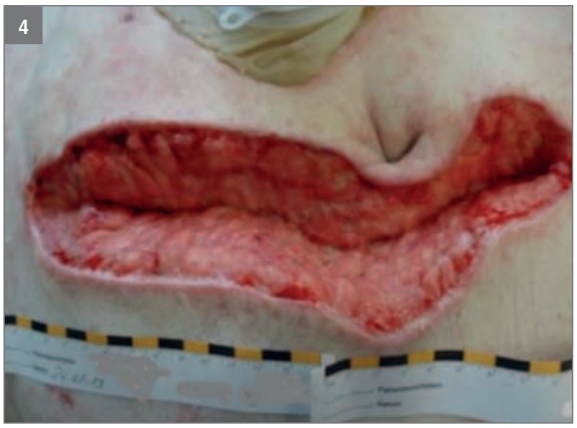
Day 0: Suture dehiscence and adipose tissue necrosis.



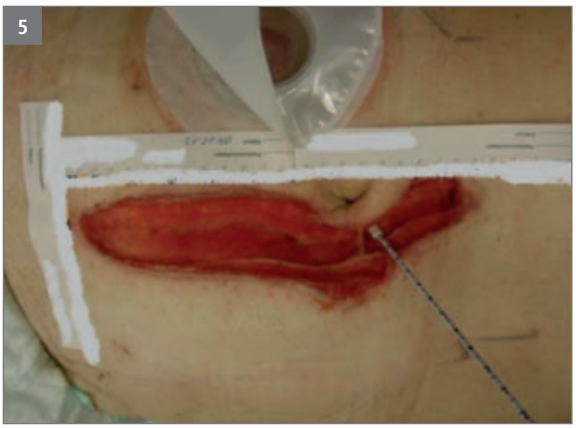
Day 0: Following debridement. Cavity measuring 3 cm at 12 o'clock position.



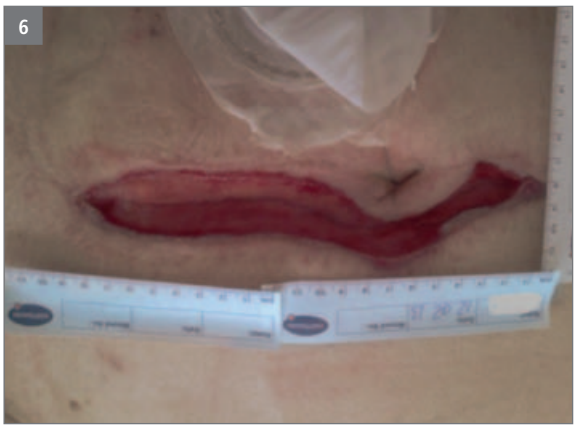
Day 6; day 4 of NPWT: Recurrent adipose tissue necrosis requiring debridement.



Day 9; day 7 of NPWT: Granulation tissue formation had started at the wound edge.



Day 20; day 18 of NPWT: Complete granulation almost to skin level. NPWT was discontinued 4 days later.



Day 28: Epithelialisation has started in the wound bed under TenderWet Plus.

NPWT application to a wound with abdominal-wall dehiscence and delayed healing following perforated sigma diverticulitis

Karolin Sobczyk
employee of PAUL HARTMANN AG, Germany

60-year-old woman with postoperative abdominal-wall dehiscence and delayed healing following perforated sigma diverticulitis and secondary ileocaecal perforation with four-quadrant peritonitis.

Patient anamnesis

The patient was in reasonably good health, despite suffering from diabetes mellitus.

Wound anamnesis

Abdominal-wall dehiscence of the medial lower abdomen 4 months after the original operation for colon perforation. The wound measured 6 cm x 3.5 cm x 4 cm with an annular cavity measuring 1.5 cm in depth (day 21). Extensive fibrinous slough, initiation of granulation and exposed fascia were found in the wound bed. The wound was macerated and was producing exudate, although the wound edge was dry.

Aim of the treatment

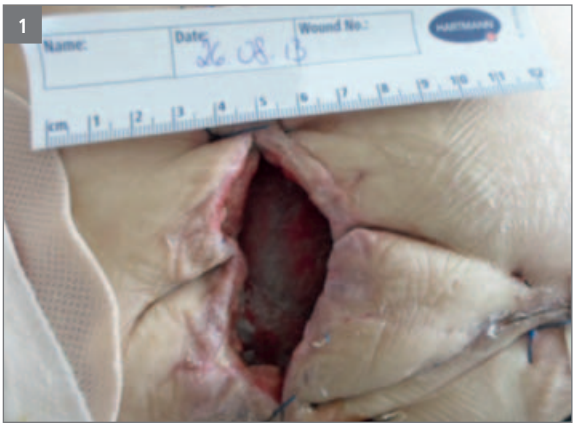
Application of negative pressure wound therapy (NPWT) using Vivano® for wound conditioning and cleansing, removal of toxins and reduction of bacterial burden prevention of cross-infection, optimisation of exudate management, stimulation of tissue formation and granulation, and to bring the wound edges together.

Wound treatment

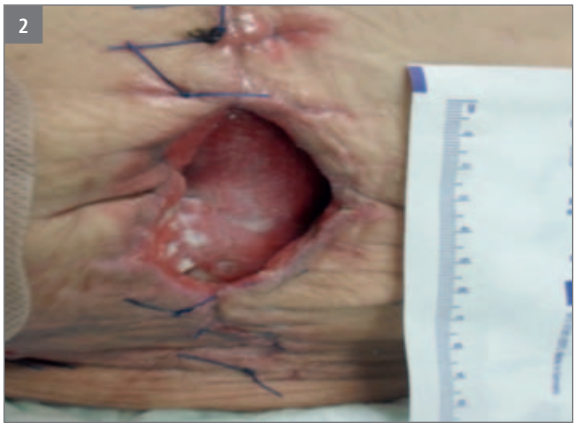
The patient was admitted for relaparatomy and adhesiolysis, leading to ileostomy, and accordingly, descendostomy, descendorectostomy (end-to-end anastomosis) as well as ileoascendostomy (with side-to-side technique) and the creation of a protective ileal stoma. On day 6, median laparotomy, fascia resection, wound debridement and abdominal wall closure were performed. Wound debridement and secondary abdominal wall closure followed on day 16, along with NPWT initiation with a continuous negative pressure of –50 mmHg. The wound was debrided again on day 18, with continuing NPWT treatment. On day 23, the patient received outpatient treatment with NPWT, applying a continuous negative pressure of –100 mmHg. The patient was readmitted on day 35 due to prerenal kidney failure with dehydration and electrolyte derailment, together with acute urinary tract infection. Continuous NPWT of –100 mmHg was applied to the wound. On day 43, the patient was discharged for outpatient treatment, continuing with the same NPWT treatment conditions until discontinuation on day 56 (day 40 of NPWT). A subsequent increased flow of exudate was observed, the wound being treated locally with Sorbalgon and sterile compresses (changed twice weekly) as outpatient. On day 133, local wound treatment was changed to HydroTac pads cut to wound size and fixed in place with foil strips. Treatment was completed on day 172, with 100 % epithelialisation.

Conclusion

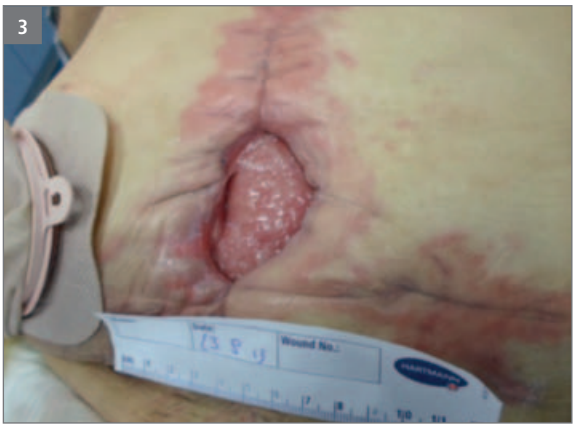
NPWT stimulated the replacement of fibrinous slough with granulation tissue, decreased bacterial contamination and reduced the wound size.



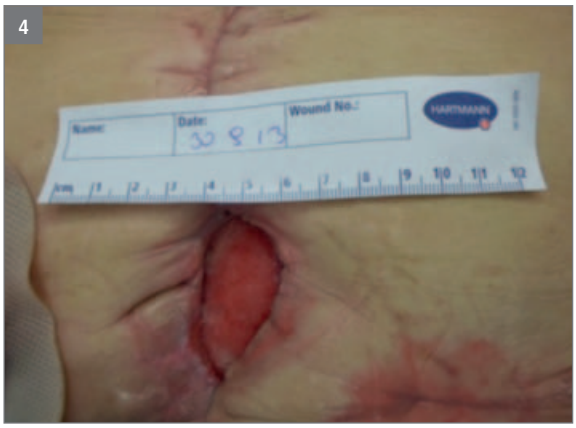
Day 21; day 5 of NPWT: Wound measuring 6 cm x 3.5 cm x 4 cm with annular cavity measuring 1.5 cm in depth. Wound bed with 50 % granulation and 50 % fibrin.



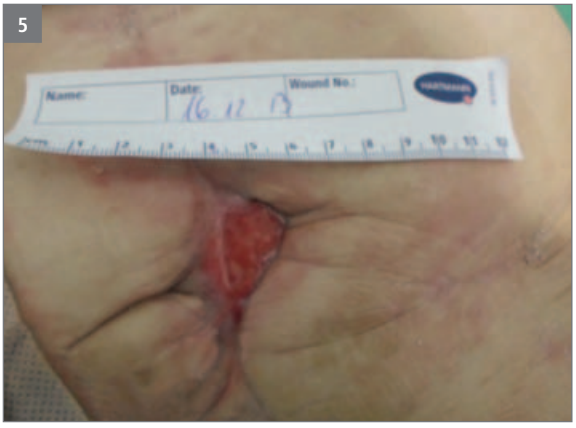
Day 31; day 15 of NPWT: Wound measuring 6 cm x 3.5 cm x 3 cm with cavity at 3 o'clock position measuring 1.5 cm in depth. Wound bed with 75 % granulation and 25 % fibrin.



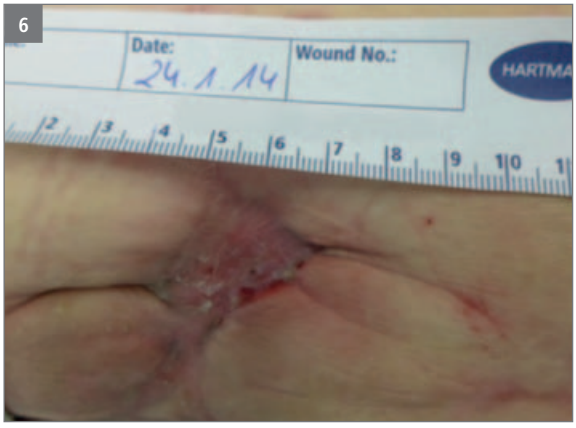
Day 49; day 33 of NPWT: Wound measuring 5 cm x 3 cm x 1 cm, predominantly with granulation tissue. Moderate levels of MRSA and Escherichia coli.



Day 56; day 40 of NPWT: Wound measuring 4 cm x 2 cm with complete surface granulation. NPWT discontinued, treatment continued with Sorbalgon with dressing changes twice a week.



Day 133: Wound measuring 2 cm x 1.5 cm with 75 % surface granulation and 25 % epithelialisation. Wound edge smooth and intact.



Day 172: Treatment completed with 100 % epithelialisation achieved.

NPWT treatment of deep sternal wound infection following cardiac surgery: Vivano® as the first line of therapy

Pavel Zacek
Charles University Hospital, Hradec Kralove, Czech Republic

Patients with deep sternal wound infection have a high mortality risk and suffer from extreme morbidity, and thus have a major impact on the healthcare team despite a low infection rate of 1.5% in our patients. The majority of procedures used to treat this complication are complex, and have given rise to resistant microbes.
Infection in the sternotomy starts in the superficial layer, but can then go deeper, leading to a split of the sternal hull and mediastinitis with the associated risks due to close vicinity to the heart and bypass surgery.

Aim of NPWT

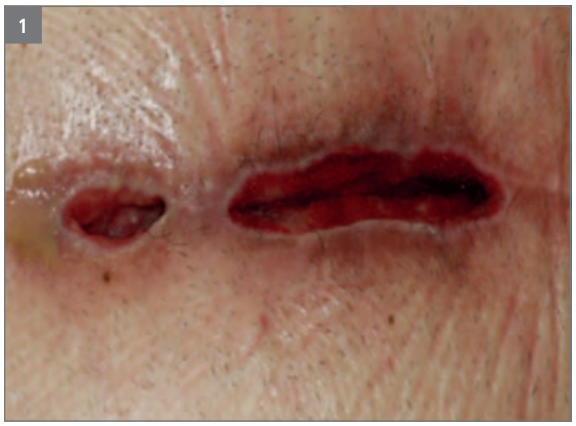
To maximise treatment success by aggressive use of modern modalities within a conceptual systemic approach. The wishes of the patient must be considered while the task of the healthcare team is to prevent the development of complications and death, shorten the treatment time, prevent failure of the reconstruction and balance or even decrease costs.

Wound treatment

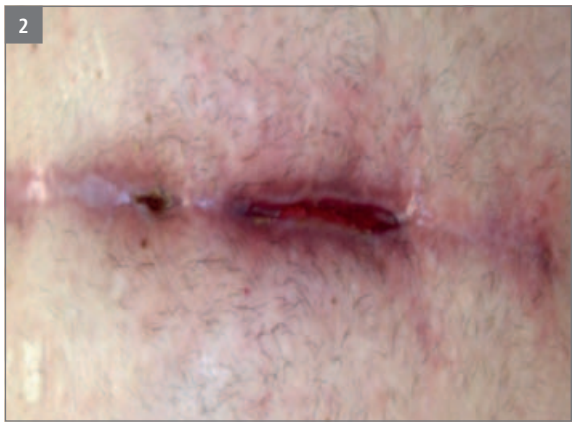
The classical strategy is suture and cerclage and the patient receives NPWT as an in-patient as first line treatment. When infection is evident, the wound is opened aggressively, together with wire removal, to discover whether the problem goes deeper, including a sternal hull split with some form of instability. Fluid material is removed completely to determine whether there is deeper infection. Surgical toilette is applied as aggressively as possible, disinfecting agents are used and a silver-containing mesh is applied to cover the entire surface. The sponge is shaped according to specific need. A deeper layer fills the gap between the sternum halves to prevent sternal-hull closure, followed by a superficial layer for the soft layer. A covering sheet is placed over the entire wound and the suction hub is applied. NPWT is initiated and the first dressing change is made after 4/5 days, and then normally twice weekly, depending on secretion and tissue appearance. When doing this, painkillers or injections are used rather than anaesthesia.
The application of NPWT using the Vivano® can act as a bridge for sternum reconstruction when it is impossible to suture the soft tissue. In reconstruction, surgical toilette is performed using an oscillatory saw for precise removal of bone edges. Refixation is episternal from outside the sternum to eliminate substernal dissection and potential trauma. In recent years, cable ties with zip fix, originally designed to go around the sternum, have been used, usually combined with plating. When everything is melted together, the ties are used only as superficial cortex fixation. Bone cement Kryptonite™ is applied to amplify fixation of the sternum for maximum stability.

Conclusion from our experiences

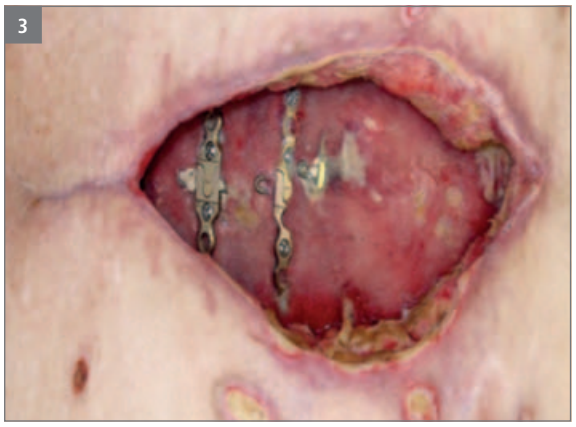
From 2011–2013, 52 cardiac surgery patients with 335 exchanges (median 5 per patient) obtained full reconstruction of skin integrity, and only six patients required rehospitalisation, without any patient mortality during this period. Only one patient has since been lost, possibly due to hesitation with regard to reopening. The Vivano® is easy to use and maintain, can be applied readily to the longitudinal defects of sternotomy and to variable defect sizes, and is comfortable for the patient. There should be no delay in wound opening and NPWT application to save the patient's time, together with an aggressive surgical necrectomy approach. This is combined with systemic therapy/topical chemotherapy, nutrition and psychological support while providing frank information, including the expected length of the hospital stay.



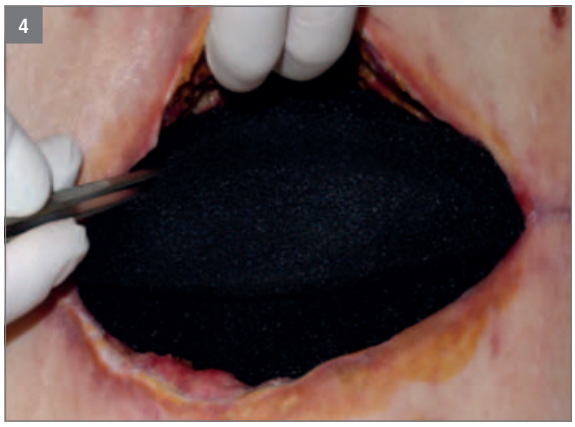
Small thoracic defect: Male patient, 49 years old, returned 3 months after successful mitral valve repair with purulent secretion. Patient required surgery, four wire loops were extracted and one application of the Vivano was made (right wound with a sponge and left with mesh alone). The right wound was good but the left wound still produced secretions.



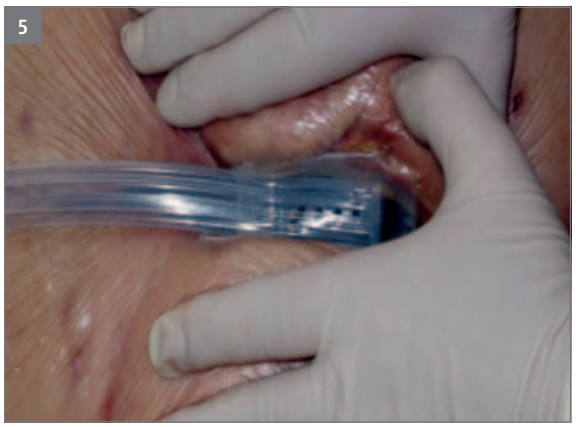
Wound healing: Two very small pieces of sponge were placed within the defects, covered with mesh and placed under a film to allow NPWT under a mutual suction hub. A good result was obtained after 1 week.



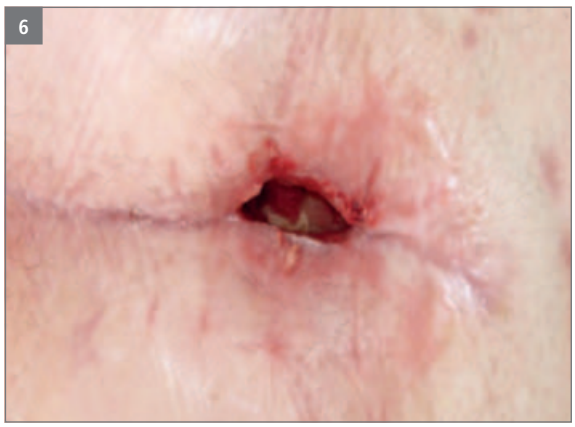
Major problematic wound: A 72-year-old female following mitral valve repair and coronary artery bypass graft surgery. Early sternal dehiscence. Plate re-osteosynthesis, bone cementing using Kryptonite and spongioplasty were performed. Repeated soft-tissue dehiscence was observed with poor tissue vitality and large overlying undermined tissue flaps.



Sponge insertion: A very specifically shaped piece of foam was inserted to go under the undermined flaps to maintain the shape of the sternum.



NPWT application: The breasts were pushed together to promote tissue mobilisation and pressure was applied at –125 mmHg.



Wound healing: Perfect healing was achieved.

NPWT combined with different modalities of reconstructive surgery

Csaba Halmy
Health Centre of the Hungarian Defence Force, Hungary

Combining negative pressure wound therapy (NPWT) with reconstructive surgery procedures of different complexity levels.

Patient anamnesis

Plastic surgeons have a guideline "reconstructive ladder" of options with increasing complexity which can be applied to cover a skin defect. This goes from non-intervention with healing by secondary intention, via simple procedures, including suturing and grafting, to complex methods using flaps. Eight cases were presented, of which the most complicated was a fracture of the left leg in a 41-year-old man, which required multiple methods.

Wound anamnesis

The patient had a third-degree open fracture. Following a change of the internal and external fixations by orthopaedic surgeons, the patient was transferred for coverage of the wound using viable tissue.

Aim of the treatment

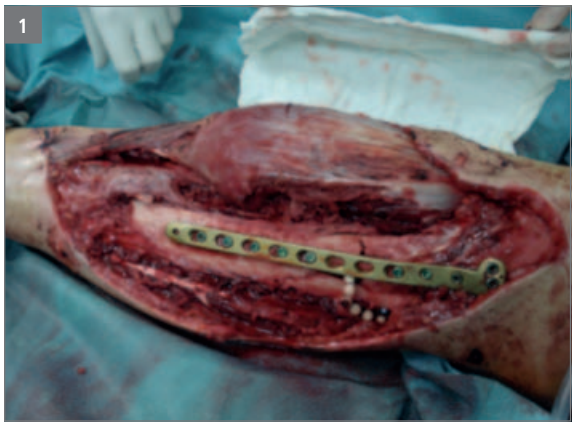
Combining NPWT with reconstructive surgery of varying degrees of complexity to close major skin and soft-tissue defects.

Wound treatment

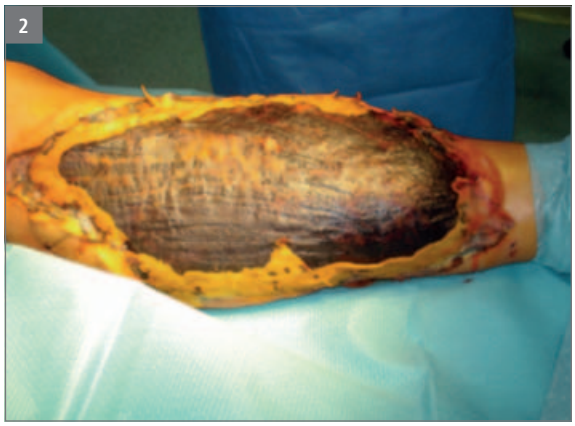
As standard for such a wound, a free latissimus flap was initially attempted. However, this was unsuccessful, and NPWT was applied using Vivano®. Subsequently, the proximal region of the tibia was covered using a muscular flap from the medial side, while for the middle of the bone a fasciocutaneous flap from the lateral side was used. The remainder of the wound was covered with a skin graft. NPWT was reapplied, during which the graft took. After completion of NPWT treatment, the wound healed and the patient was discharged from hospital.

Conclusion

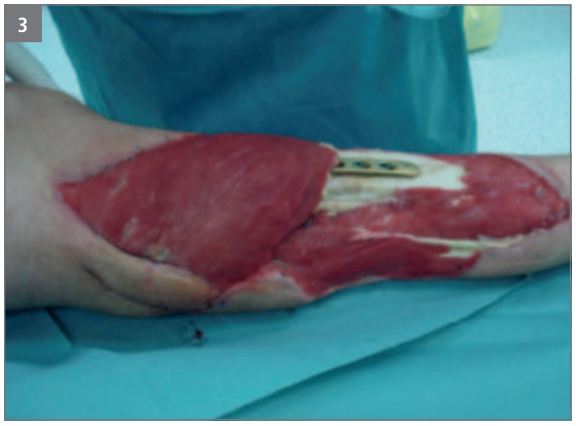
NPWT can be successfully combined with different modalities of reconstructive surgery to close major skin and soft-tissue defects, which in some cases represents a salvage procedure.



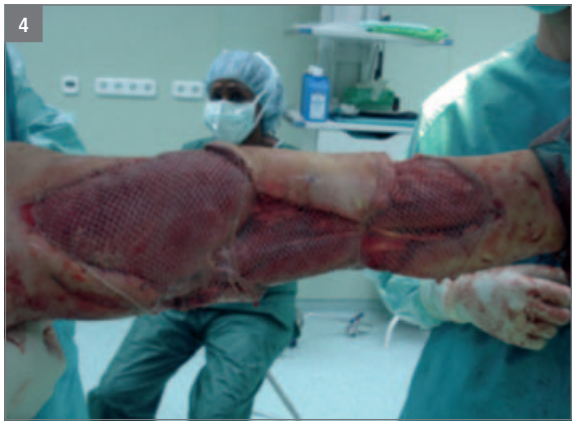
Wound: Third-degree open fracture.



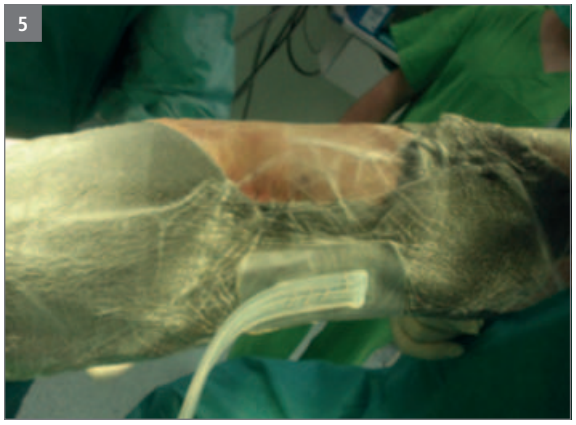
First NPWT: Application of NPWT following a failed latissimus flap.



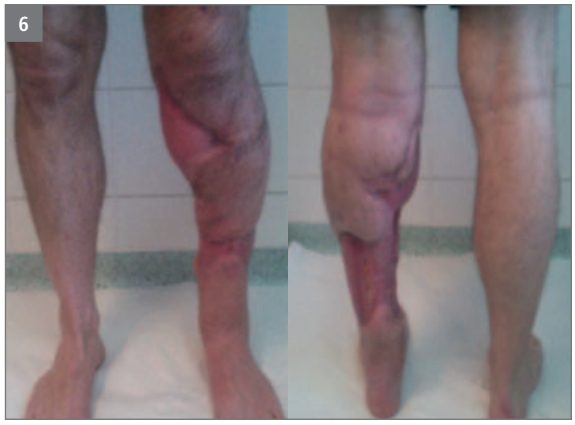
Wound post-NPWT: A muscular flap from the medial side was used to cover the proximal tibial region.



Reconstructive surgery: In addition to the muscular flap, the middle of the bone was covered using a fasciocutaneous flap from the lateral side, and the remainder of the wound was covered with a skin graft.



Second NPWT: Application of NPWT.



Healed wound: Patient was mobile and could be discharged.

Complex trauma with tibial open fracture

G. Noditi, S. Dragusanu, Timisoara, Rumania

A 29-year-old man was transferred to the clinic with a complex trauma and open fracture 7 days after a work-related accident.

Patient anamnesis

The man from a rural area had suffered a complex trauma with open fracture (Gustillo Anderson IIIB) of the left tibial pillar, which had been fixed using a K-wire. The patient was transferred to our clinic 7 days after the incident.

Wound anamnesis

Contamination at the fracture site was found together with bone necrosis. The patient received antibiotic therapy for 1 week on arrival. Contamination and necrotic tissue were removed together with the primary osteosynthesis material.

Aim of the treatment

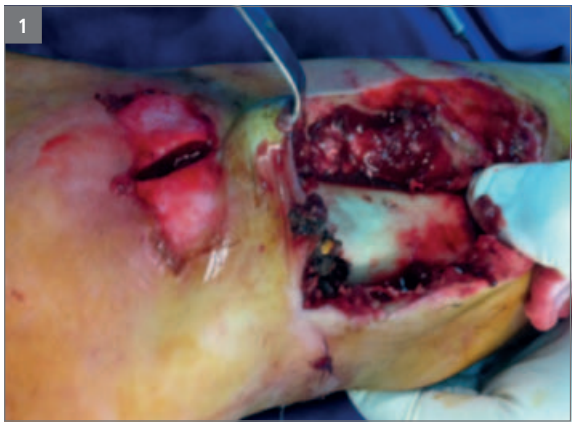
Negative pressure wound therapy (NPWT) with Vivano® was applied to eliminate infection and support granulation formation, allowing subsequent skin grafting and autologous bone grafting.

Wound treatment

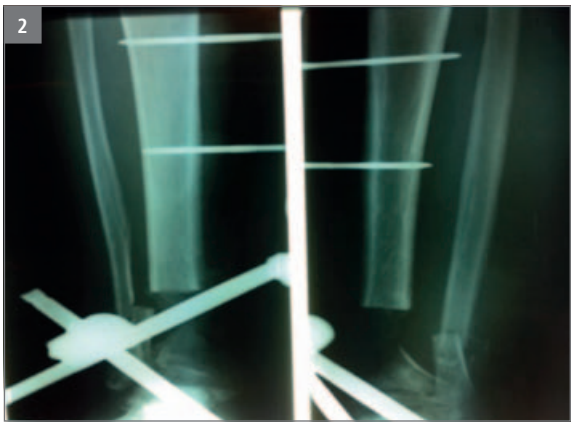
The tibia was stabilised using external fixation. Following debridement, a negative pressure of –125 mmHg was applied for 3 days. After 3 days, very good granulation was observed in the internal defect and re-epithelialisation was observed at the margin of the skin defect. Further negative pressure was applied after 3 and 5 days, depending on the volume of the aspirate. By day 14, good progression and good quality of the granulation tissue was observed. After 4 weeks, negative pressure was applied at intervals of 3 and 5 days, again depending on the aspirate volume. Granulation tissue covered the defect and re-epithelialisation of the margin was very good. After 6 weeks, the defect was covered with granulation tissue and there was no microbial contamination. The defect was closed using skin grafts and a spacer was introduced to protect the bone segments for 3–4 months. Subsequently, an autologous bone graft was performed. Finally, bone reconstruction by free-transfer fibular autology ous bone grafting was planned.

Conclusion

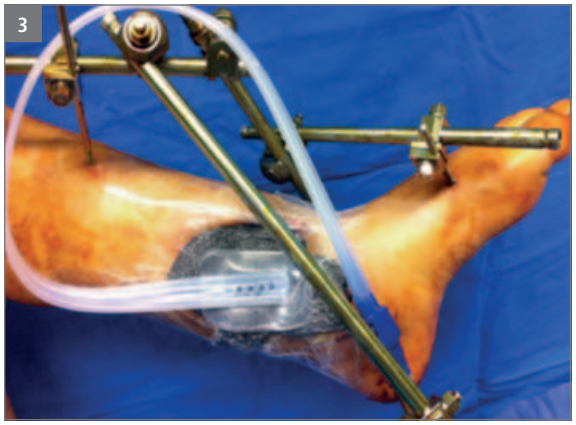
NPWT using Vivano provided good drainage of this complex wound, prevented contamination, and accelerated the formation of granulation tissue of very good quality, allowing skin grafting and subsequent autologous bone grafting. In addition, the treatment was comfortable for the patient.



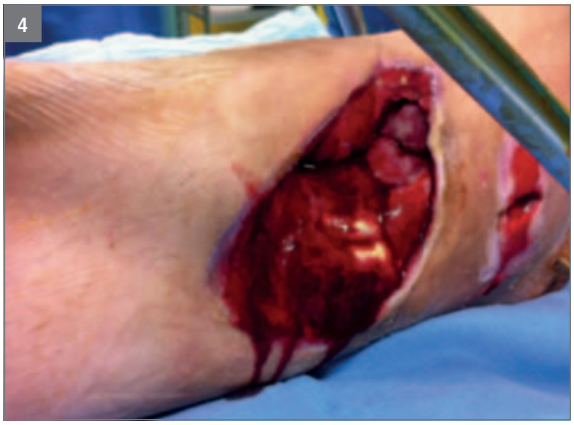
Admission: Wound contamination and bone necrosis 7 days after the injury.



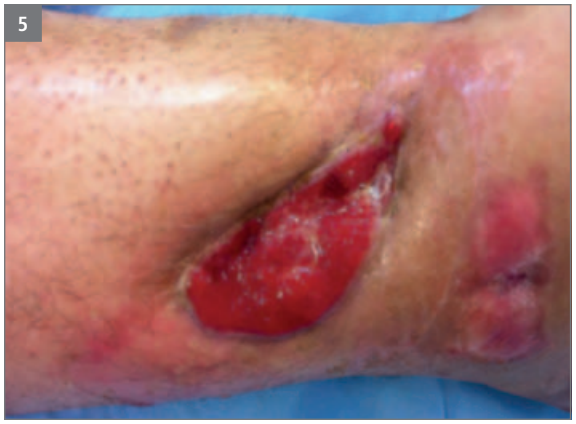
Day 0 of NPWT: X-rays following debridement, removal of necrotic bone and tibial stabilisation using external fixation.



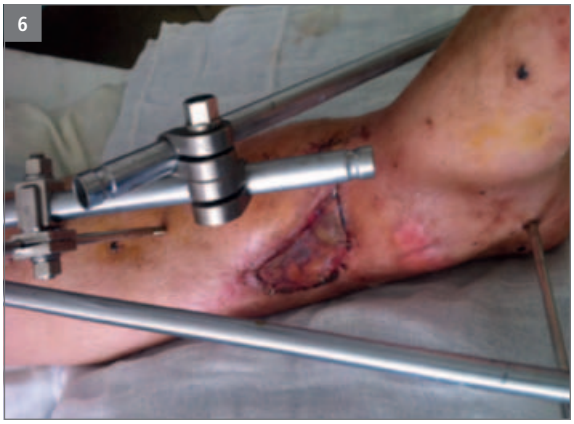
Day 0 of NPWT: The wound was treated with pressure at 125 mmHg.



Day 3: Very good granulation in the internal defect and re-epithelialisation at the skin-defect border was observed.



Day 42: The internal defect was covered with granulation tissue and there was no microbial contamination.



Day 42: Application of a skin graft to the external defect.

The role of NPWT in thoracic surgery

Zs. Szentkereszty, I. Takács, A. Enyedi, K. Szabó, Cs. Váradi, A. Csiszkó
University of Debrecen, Debrecen, Hungary

Review of negative pressure wound therapy (NPWT) use in three indications for thoracic surgery: thoracic empyema, deep infected sternal wound and chest wall infection. The primary cause of thoracic empyema is pleuro-pneumonia. Secondary causes include bronchopleural fistula (BPF), with post-lobectomy empyema (PLE) or post-pneumonectomy empyema (PPE) as the most common cause, oesophageal perforation and complications resulting from thoracic wall infections (post-thoracotomy wound infection, necrotizing fasciitis). Although the incidence of deep infected sternal wounds following cardio-vascular surgery (sternotomy) is only approximately 1–3%, it is a major complication. The chest wall infection of necrotizing fasciitis is very rare but has a high mortality rate of 59–89%. It can develop on aspiration, in connection with penetrating trauma, as descending infection from a retropharyngeal septic focus, haematogenously, or following chest tube drainage.

Aim of NPWT

In advanced-phase (stage III) thoracic empyema, NPWT is an option and may be most effective when combined with thoracostomy in order to improve wound healing and the quality of life of the patient while reducing costs. NPWT is similarly a therapy option in cases of deep infected sternal wound and chest wall infection.

Wound treatment

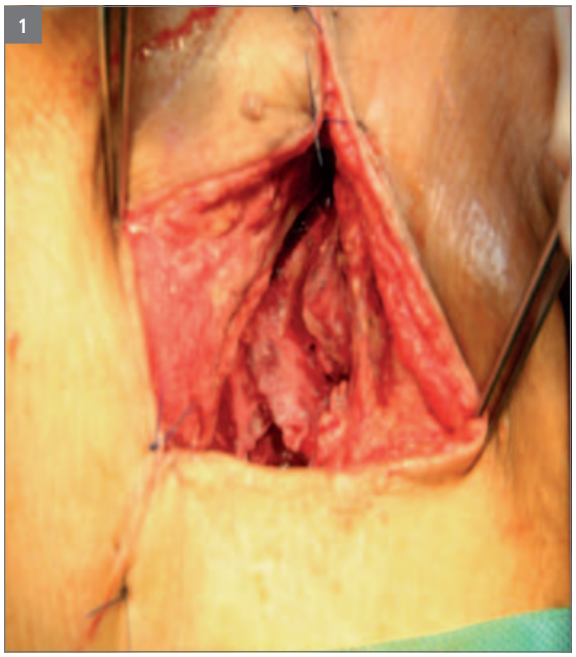
In thoracic empyema, the thoracotomy is left open, or open-window thoracostomy is performed, the wound is debrided, the cause of the empyema is eliminated, the heart and lung are covered with a non-adherent layer, the foam is inserted, hermetic closure is achieved with a hydrofilm, and negative pressure is generally applied at 100–125 mmHg (25–75 mmHg with stepwise increase for PPE and /or BPF), followed by primary closure or reconstructive surgery. The dressing is changed every 3–4 days under general anaesthesia or sedation, and NPWT can later be applied as an outpatient treatment. Complications, including pain, hypotension, tachycardia, bleeding and BPF, can be ameliorated by lowering the pressure. Treatment period was 0.5–7.7 months.

Treatment of a deep infected sternal wound involves antibiotic therapy, extensive debridement and reconstruction. The subsequent NPWT preparation and treatment is similar to that of thoracic empyema, including the dressing changes. Here, the suggested negative pressure is 100–130 mmHg, decreased to 75 mmHg in case of complications. NPWT may be combined with other drainage therapy and can act as a "bridging" therapy from septic wound to plastic surgery. There is an indication for prophylactic NPWT in critically ill patients after cardiac surgery. Complications such as pain, atrial fibrillation, bleeding BPF, lung injury and right ventricular rupture can be ameliorated by applying reduced negative pressure.

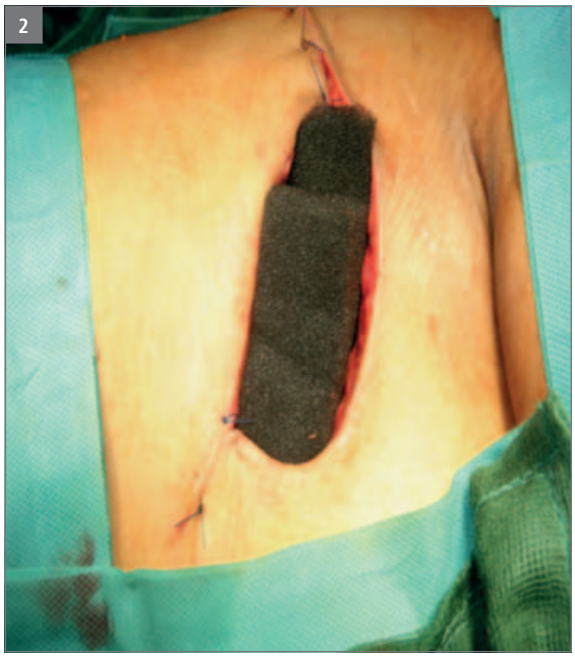
Chest wall infections require antibiotic therapy and elimination of the cause. Extensive exploration and necrosectomy of the infected region is performed. Thoracic and/or mediastinal exploration is also needed in case the infection has spread to the chest cavity or the mediastinum. Following drainage, NPWT is applied. If primary closure is not possible, plastic surgical reconstruction is performed.

Conclusion from our experiences

In thoracic empyema and deep infected sternal wounds, NPWT was well tolerated with near-100% success and a high primary closure rate. Patients subsequently had an excellent quality of life, and treatment was cost effective, with shorter hospital stay, antibiotic therapy and outpatient therapy.



Thoracic empyema: Resulting from post-lobectomy empyema.



Thoracic empyema: Application of NPWT following debridement and elimination of the cause of the empyema.

NPWT application to a wound with delayed healing following drainage of a haematoma

Heike von der Kall
Case Manageress PAUL HARTMANN AG, Germany

86-year-old woman with disrupted healing following haematoma removal from the right elbow.

Patient anamnesis

The patient was in a good general state of health for her age, with no accompanying diseases.

Wound anamnesis

Disrupted healing 11 days after removal of a haematoma from the right elbow as inpatient. The wound measured 8 cm x 5 cm x 2 cm, with a cavity measuring 2 cm at 8 o'clock on day 8 of NPWT treatment. The wound bed exhibited exposed tendon and initiation of granulation. In addition, fibrinous slough and islands of necrosis were present, and the wound was increasingly odorous. At the wound edge, reddening and swelling was observed, with very thin surrounding skin. Moderate exudation was observed with approximately 50 mL of exudate per day.

Aim of the treatment

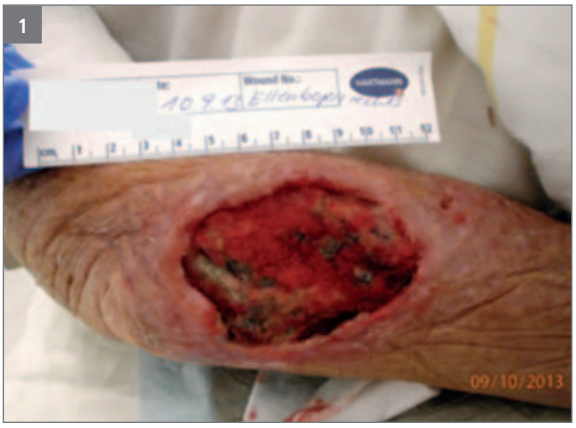
Application of negative pressure wound therapy (NPWT) using Vivano® to reinitiate wound healing.

Wound treatment

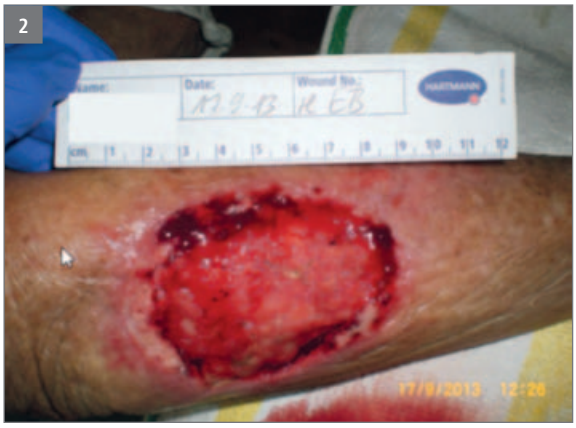
From day 4 to day 12 after haematoma removal, the patient underwent continuous NPWT of –100 mm Hg as inpatient. On day 12, the wound measured 8 cm x 5 cm x 2 cm, with some necrosis remaining in the wound bed, with fibrin and granulation tissue present, the wound edge being reddened and oedematous. The wound was debrided and the patient was transferred to the outpatient department for NPWT treatment. By day 19, good granulation was observed, including coverage of the tendon. A VivanoMed silicone layer was inserted to protect the granulation tissue. By day 22, the wound had decreased in size, now measuring 6.5 cm x 4.5 cm x 0.3 cm, with the cavity reduced in size to 0.5 cm. The wound edge was smooth. Well-developed granulation tissue was present. By day 33, the wound decreased further, measuring 4.5 cm x 4.0 cm x 0.1 cm, with slight maceration at the wound edge. NPWT was discontinued and treatment was continued with HydroTac hydroactive dressing. By day 46, the wound had healed normally.

Conclusion

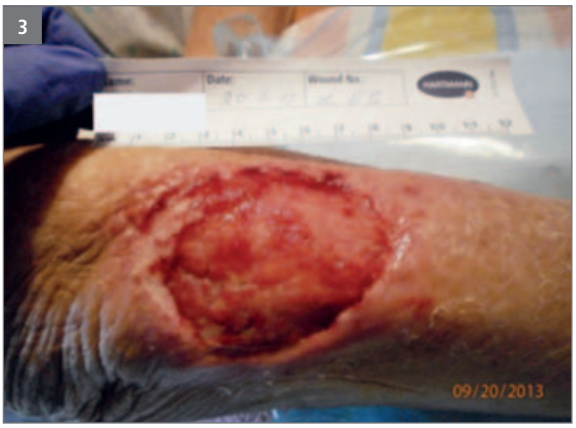
NPWT stimulated granulation tissue formation and reduced the wound size, allowing subsequent normal healing.



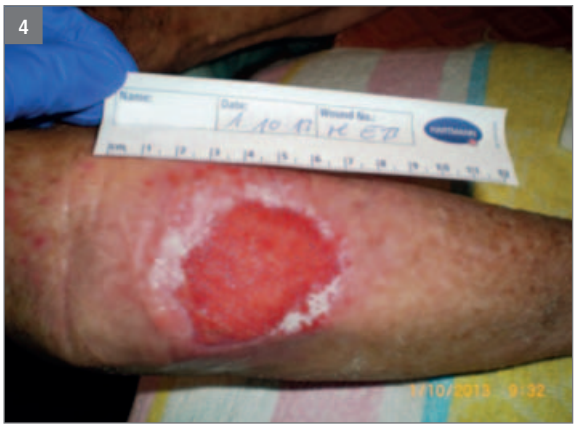
Day 12; day 8 of NPWT: Some remaining necrosis as well as fibrin and granulation tissue present. Reddened and oedematous wound edge.



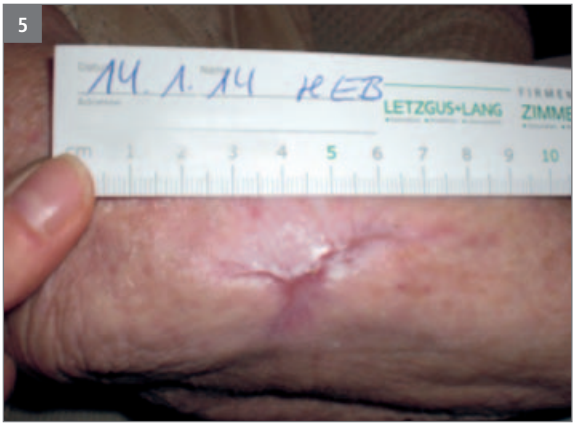
Day 19; day 15 of NPWT: Good granulation tissue formation, including coverage of previously exposed tendon.



Day 22; day 18 of NPWT: Reduced wound and cavity size, wound edge smooth.



Day 33; day 29 of NPWT: Wound size reduced further, with well-developed granulation tissue. Slight maceration of the wound edge. NPWT discontinued, treatment continued with HydroTac.



Day 138: Wound completely healed.

Clinical efficacy and cost effectiveness of NPWT in trophic venous ulcer treatment

V.N. Obolensky
Russian National Research Medical Hospital, Moscow, Russia

Aim of the study

A comparative study to assess the clinical efficacy and cost effectiveness of NPWT with Vivano® compared with traditional topical therapy in patients with trophic venous ulcers (TVU).

Patients

Twenty-one patients with TVU and CEAP VI chronic venous deficiency were divided into a test group (n=9) and reference group (control; n=12). The test group received NPWT, using the Vivano, combined with modern complex conservative treatment, including phlebotropic diosmin therapy and medical compression. By contrast, the reference group underwent traditional topical therapy, allowing for the phase of wound healing and pathogen specificity. The two groups were not significantly different as regards mean age, varicose vein disease or post-thrombotic syndrome. The inclusion criteria were the presence of a TVU requiring surgical treatment and/or free plastic surgery, an ulcer area $> 50\ cm^2$ and patient compliance. The exclusion criteria were venous eczema, blood clotting disorders and clinically significant and/or age-related psychotic disorders.

Wounds

The microbiological wound profile and mean baseline bacterial count (10^6) was similar in both groups, although the wound area was larger in the test group ($163.3 \pm 36.2\ cm^2$) compared to the reference group ($118.8 \pm 63.8\ cm^2$).

Wound treatment

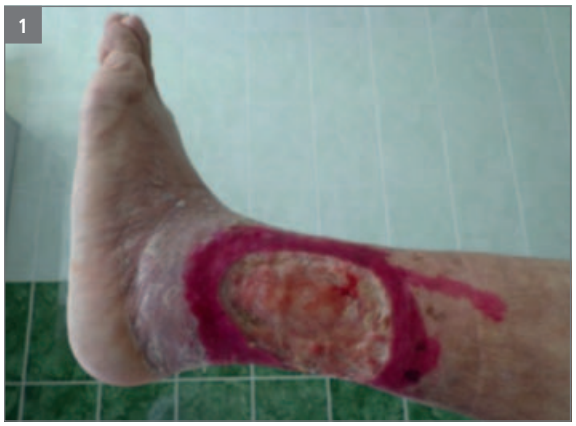
Primary superficial surgical debridement was performed, and then NPWT with Vivano® was applied for several days until there sufficient granulation tissue had formed for an autodermal transplant. Atrauman® Ag dressing was placed over the graft to prevent flap damage, and NPWT was applied in order to support graft uptake. Subsequent treatment using multilayer compression bandages comprised Atrauman® Ag, Varolast® and Putterbinde®, changed weekly. Once epithelialisation of the wound had occurred, the patient could be discharged.

Results

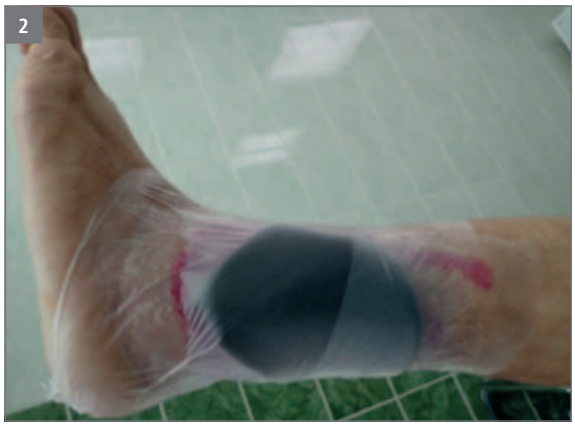
The mean in-patient stay prior to autodermal plastic surgery (APS) was significantly shorter in the test group than in the reference group (9.6 ± 1.8 and 15.7 ± 0.3 days respectively; $p = 0.004$), as was the mean duration of the in-patient stay (15.1 ± 1.9 and 22.8 ± 3.8 days respectively; $p = 0.043$), with more APS performed in the test group (9 [100%] versus 3 [25%] in the reference group). The mean cost per patient was 1282.03 € in the test (Vivano) group and 1730.26 € in the reference group (current treatment for TVU).

Conclusion

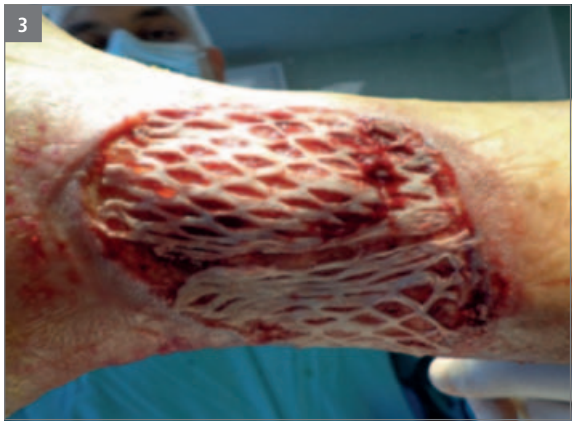
The use of NPWT in the treatment of TVU improved the treatment outcomes, shortened treatment duration and reduced treatment costs compared to the current treatment for TVU.



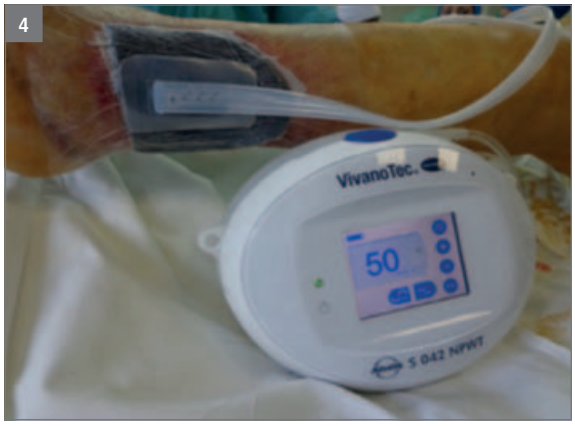
Day 1: Following superficial primary surgical debridement of the ulcer.



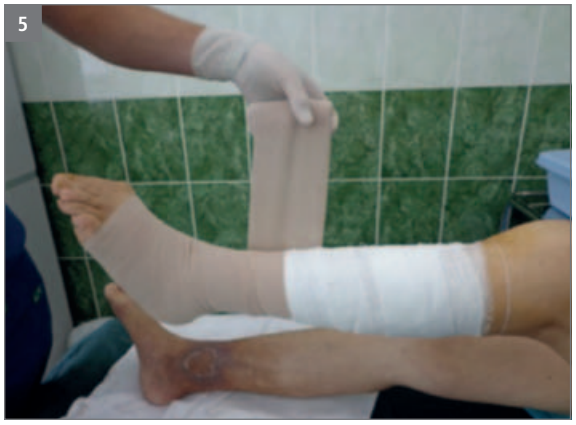
Day 1: NPWT application.



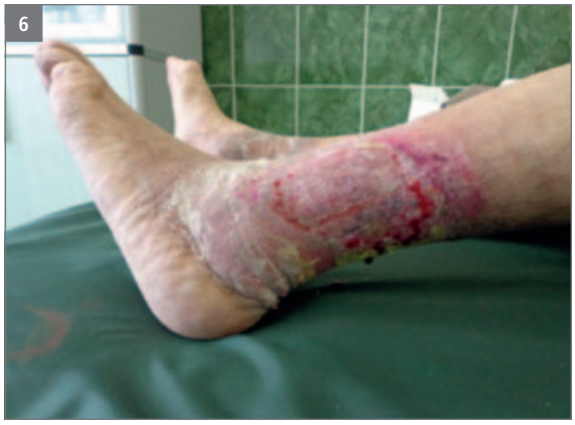
Day 4: NPWT removed. Adequate granulation tissue present for an autodermal transplant.



Day 4: Second application of NPWT, with Atrauman Ag over the graft, below the foam layer.



Day 7: As epithelialisation had occurred, NPWT was discontinued and a multilayer bandage was applied (changed weekly). The patient was discharged.



Day 18: Complete healing.

Acute and chronic wounds

S. Goryunov, I. Abramov, B. Chaparian, S. Zhidkikh, A. Prividencev, M. Egorkin
Pirogov Russian National Research Medical University, Moscow, Russia

Negative pressure wound therapy (NPWT) in the treatment of acute- and chronic-wound patients. Two representative cases out of 194 patients (91 acute and 103 chronic wounds).

Patient anamnesis

Patient 1 was a 29-year-old woman who had undergone a caesarean. Patient 2 was a 68-year-old woman who had had a progressive circular ulcer of the left shin for 1 year, and who had suffered from ulcerative colitis for 3 years.

Wound anamnesis

The wound of Patient 1 developed necrotizing fasciomyositis complicated by severe sepsis of the anterior abdominal wall after 5 days, and she received antibiotics. Pyoderma gangrenosum was diagnosed in Patient 2. The wounds of Patients 1 and 2 covered 620 cm^2 and 840 cm^2 respectively, with necrosis and fibrin in the wound bed and inflammation of areas 10 cm and 2–5 cm wide respectively in the peripheral wound region.

Aim of the treatment

NPWT was applied in acute and chronic wounds to control exudation and protect against secondary infection, as well as to accelerate elimination of inflammation in acute wounds and to stimulate reparative processes in chronic wounds.

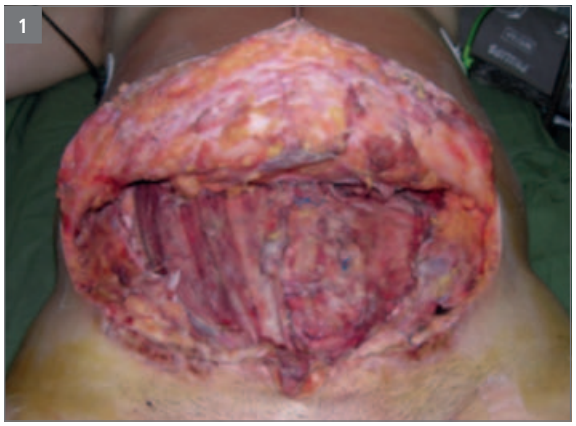
Wound treatment

Patient 1 was on a ventilator and received systemic infusion treatment with Invanz (1g) and plasmapheresis as well as local treatment with 1% Betadine solution. NPWT was proposed because the wound remained unresponsive with heavy exudation. The patient underwent necrectomy and NPWT was initiated using Vivano® with a constant pressure of –125 mm Hg, and using Sorbalgon® as secondary dressing for 9 days, and she furthermore received Invanz. The wound resolved completely with a systemic inflammatory response, the wound size decreased and the wound was filled with granulation tissue. Autodermoplasty was performed following the third dressing change. The patient was discharged with completely healed wound on day 20.

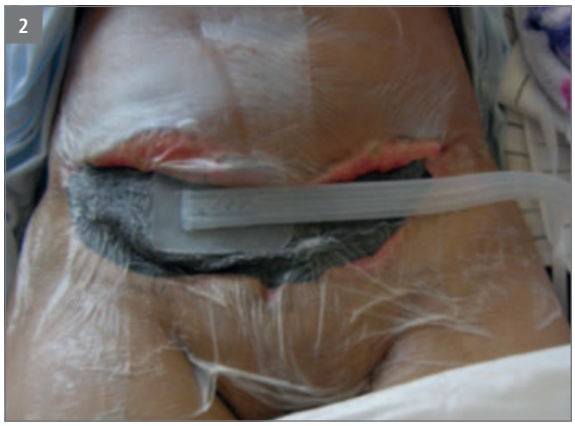
Systemic treatment of patient 2 consisted of 1000 mg prednisolone i.v. for 3 days and 1.5 g Meronem i.v. Following debridement, NPWT was initiated using the Vivano continuously at –125 mmHg with Atrauman® Ag as secondary dressing. This led to remission of the pyoderma gangrenosum, and the wound was covered in granulation tissue after 10 days of NPWT. Autodermoplasty was performed 5 days later, with supportive therapy of 40 mg prednisolone and 4 g sulfasalazine. The patient was discharged 6 days later.

Conclusion

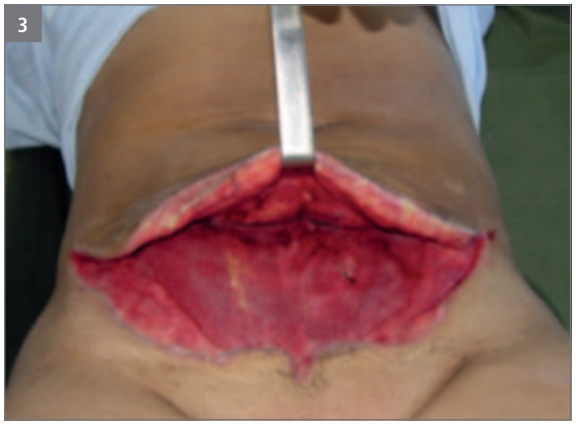
Positive results were obtained in 186 out of 194 patients. NPWT led to significant optimisation of acute and chronic wound treatment. This included well-controlled exudation, rapid elimination of acute inflammation and stimulation of reparative processes, leading to accelerated wound preparation for plastic surgery and reduction of time and costs.



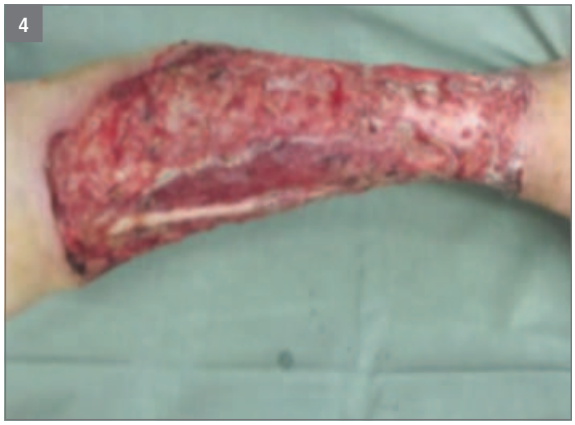
Patient 1: Five days after caesarean the patient developed necrotizing fasciomyositis with severe sepsis of the anterior abdominal wall.



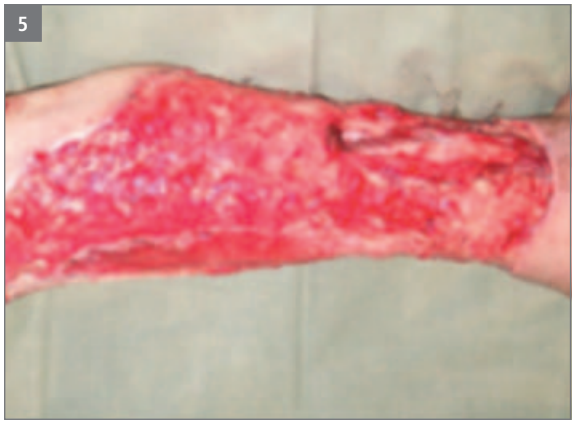
Patient 1, NPWT: A constant negative pressure of –125 mmHg was applied for 9 days, with Sorbalgon as secondary dressing.



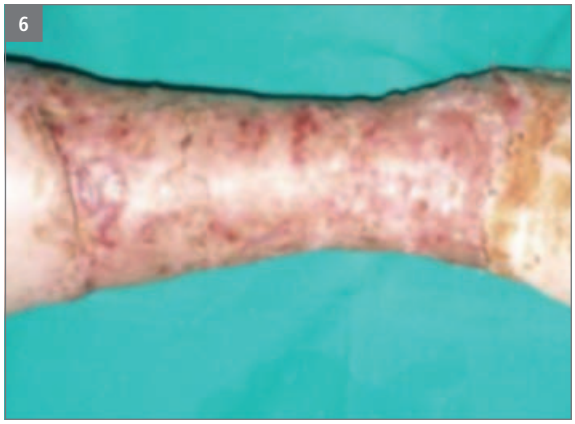
Patient 1, day 9: The wound had resolved completely and was filled with granulation tissue, allowing successful autodermoplasty.



Patient 2, NPWT day 0: Chronic ulcer with underlying pyoderma gangrenosum debrided prior to initiation of NPWT.



Patient 2, day 10: Remission of the pyoderma gangrenosum. The wound was covered in granulation tissue.



Patient 2, discharge: Following NPWT, autodermoplasty was performed and the patient was discharged 6 days later.

Chronic wound in diabetic foot

Włodzimierz Klonowski
Płock, Poland

A 38-year-old man with diabetes presented with a purulent and gangrenous wound on the sole of the right foot.

Patient anamnesis

The patient suffered from insulin-dependent diabetes with arterial hypertension, and was being treated with insulin, ramipril and simvastatin. On admission, the patient had a severe infection of the right foot. A blood test indicated 20.2 mM glucose, 38.2 mg/L C-reactive protein, 18 g/L white blood cells and a body temperature of 38.2°C. Previous systemic treatment included antibiotics (amoxicillin and clavulanic acid), a non-steroidal antirheumatic (diclofenac sodium) and a painkiller (paracetamol). The silver-dressing Dermazin® was applied as topical wound treatment Amputation was not proposed.

Wound anamnesis

The wound measuring 12 cm × 8 cm on the sole of the right foot was purulent and gangrenous, was inflamed in the peripheral wound area and exhibited a grade 4 PEDIS (perfusion, extent, depth, infection, sensation) classification. The brachial index was approximately 0.75.

Aim of the treatment

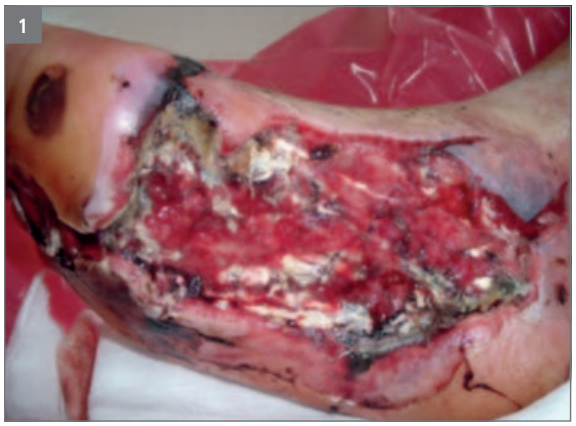
Negative pressure wound therapy (NPWT) was applied to support granulation formation, allowing subsequent skin grafting, and to stimulate healing.

Wound treatment

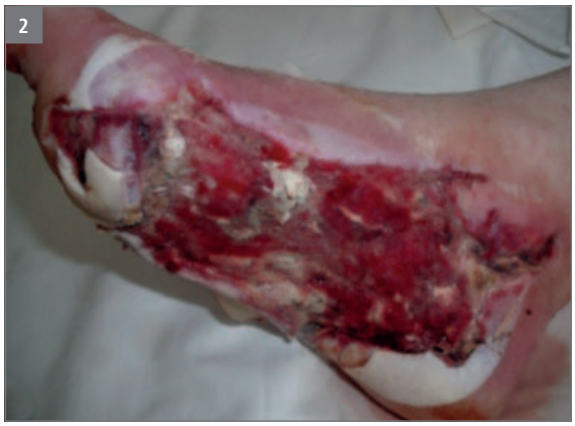
On the first day, an incision was made and the wound was debrided. The silver-containing dressing Atrauman® Ag and the dressing pad TenderWet® were applied, and the patient received the antibiotic ertapenem (1 x 1.0 g) and intensive insulin therapy. On day 2, the patient had pain and infection, and was treated with the antibiotics ertapenem and enoxaparin. The Atrauman Ag and TenderWet dressing was continued. Wound swab on day 4 indicated **Bacteroides vulgatus**, **Peptococcus** species, **Enterococcus faecalis** and **Enterobacter faecalis**, and antibiotic medication was therefore changed to imipenem and the wound was debrided. Once authorisation was obtained after 17 days, as this was the first patient to receive NPWT, treatment was initiated. Now that NPWT using Vivano® is established, the approval of the hospital authorities is no longer required, and delays are thus avoided. Good granulation was found on day 36, skin grafting was performed and NPWT was applied continuously at –60 mmHg. By day 65, the wound had healed completely and the patient was discharged on day 66 without pain or infection, and received insulin, ramipril and simvastatin together with Hydrocoll® dressing.

Conclusion

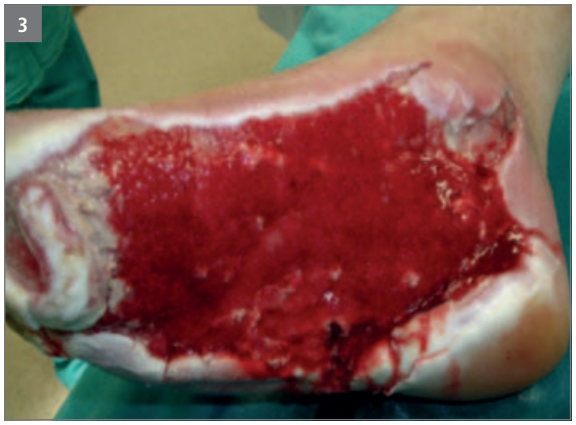
NPWT using Vivano® proved more effective than standard local treatment of diabetic foot.



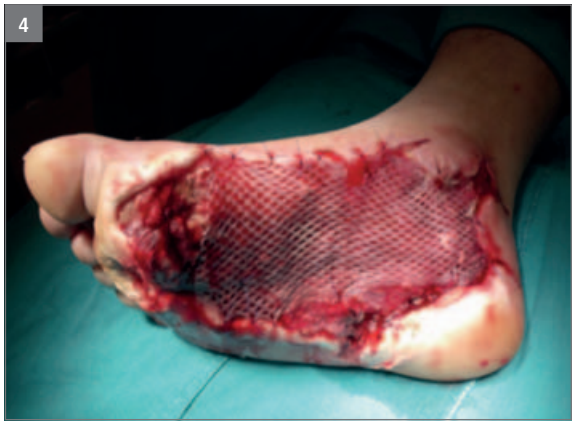
Day 2: Painful and contaminated wound.



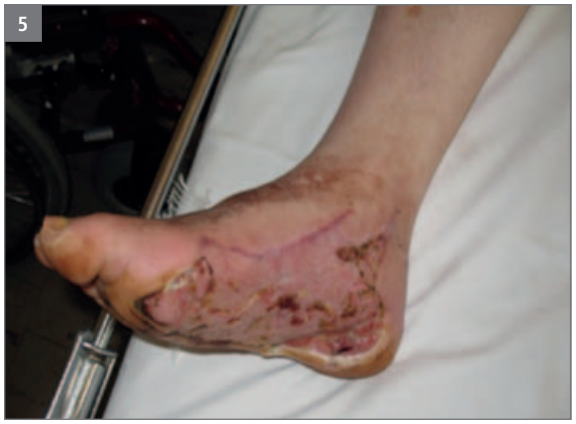
Day 4: Tissue culture revealed a range of bacteria. The wound was debrided and treated with Atrauman Ag and TenderWet dressings.



Day 35: After 18 days of NPWT, the wound showed good granulation.



Day 36: After 19 days of NPWT, skin grafting was performed. NPWT was continued.



Day 65: The wound was completely healed and the patient was discharged from hospital the following day.

NPWT treatment of a pressure ulcer stage IV on the heel in a patient with diabetic foot

Warnecke outpatient nursing team and Dr. med. Axel Wagner
Weserbergland medical practice, Beverungen, Germany

70-year-old man with stage IV pressure ulcer of the left heel.

Patient anamnesis

The patient had type II diabetes mellitus, suffered from vascular dementia and was immobile. In addition, the patient suffered from peripheral arterial occlusive disease and renal insufficiency, and had been treated with haemodialysis since 2008.

Wound anamnesis

A stage IV pressure ulcer of unknown age measuring 5 cm x 5 cm x 0 cm (prior to debridement) was present on the left heel with exposed bone in the wound bed. The wound was infected with Pseudomonas aeruginosa and Escherichia coli, and was inflamed, with reddening, swelling, pain and elevated temperature at the wound edge. The ulcer was increasingly odorous and exudate production was <50 mL/day.

Aim of the treatment

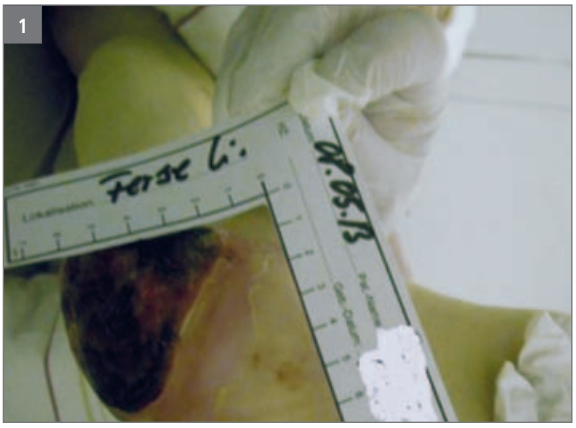
Application of negative pressure wound therapy (NPWT) using Vivano® to stimulate complete granulation over the exposed bone, improve the blood supply and prevent amputation.

Wound treatment

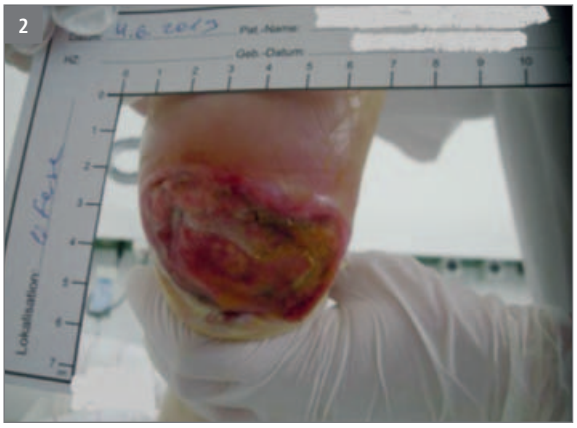
Multiple debridements alternating with interactive wound treatment was performed. On day 27, following further debridement, inpatient NPWT was initiated, with change of dressings approximately twice a week (19 times in total). Granulation tissue formation had started by day 35, with good coverage of the bone. By day 55, in addition to granulation, the bone was completely covered with fibrin. An improved blood supply and reduced fibrin were found on day 65. On day 69, increased fibrin levels of the wound and maceration of the the affected areas was observed. Hydrocoll Thin was applied to protect the wound edges. By day 79, there were good levels of granulation tissue while the maceration was reduced. Maceration was no longer present on day 86. On day 90, NPWT was discontinued (day 63 of application). Further wound care was performed using HydroTac.

Conclusion

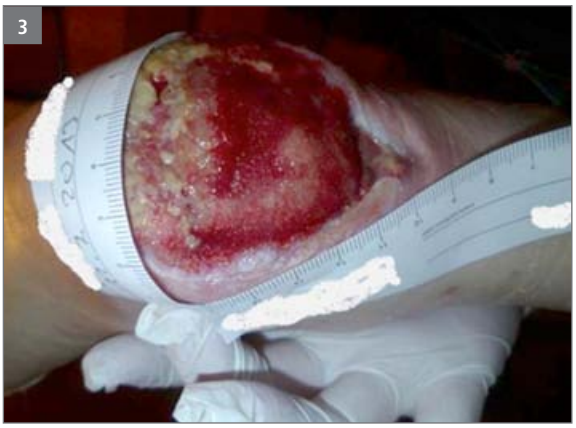
NPWT stimulated wound healing, with full coverage of the exposed bone, good granulation tissue formation and an improved blood supply, obviating the need for amputation.



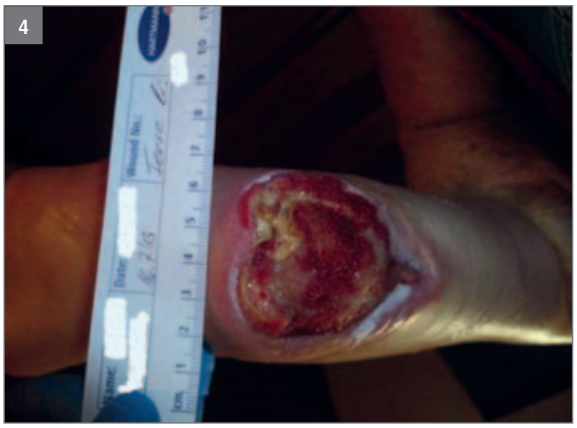
Day 0: Dry, necrotic wound.



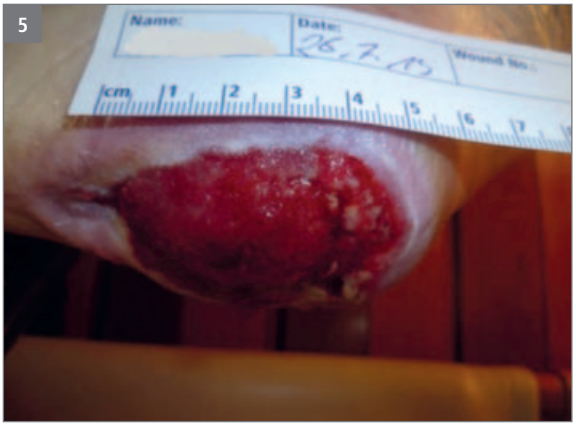
Day 35; day 0 of NPWT: Exposed bone is visible after debridement.



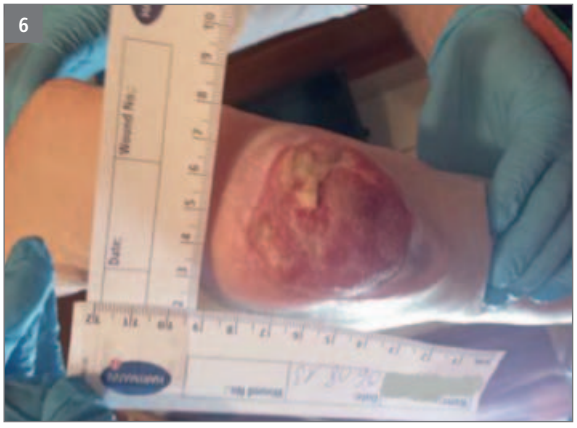
Day 65; day 38 of NPWT: Bone covered by granulation tissue with an improved blood supply and reduced fibrin level.



Day 69; day 42 of NPWT: Increased fibrin production and maceration at the wound edge. Hydrocoll Thin applied to protect the wound edge.



Day 79; day 52 of NPWT: Maceration levels reduced, good granulation.



Day 90; day 63 of NPWT: No maceration, good granulation. NPWT discontinued, further treatment with HydroTac.

Inpatient NPWT treatment of a mixed leg ulcer

Rainer Stengel, medical practice with diabetological focus, Niesky and Sylvia Müller
healthcare supply store Rosenkranz, Görlitz, Germany

87-year-old woman with a mixed mixed leg ulcer located medially on the left lower leg.

Patient anamnesis

The patient was immobile and allergic to all glues and silicone. In addition, the patient suffered from chronic venous insufficiency, peripheral arterial occlusive disease and lymphoedema.

Wound anamnesis

A mixed stasis ulcer of 11 months duration, measuring 10.0 cm x 8.7 cm x 0.5 cm, was present medially on the lower left thigh, with tendon exposed. The ulcer was infected-, with **Acinetobacter baumanii** and produced 100 mL of exudate per day. The wound edge was strongly reddened, oedematous and macerated. Prior to treatment initiation, the wound exhibited extensive fibrinous slough and granulation.

Aim of the treatment

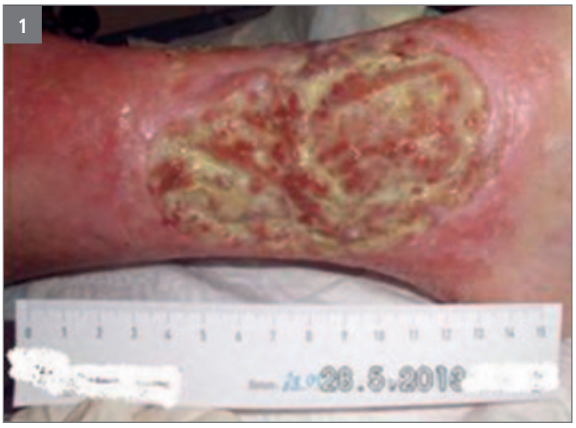
Application of negative pressure wound therapy (NPWT) using Vivano® to reduce wound oedema, optimise exudate management, clean the wound, remove toxins, reduce microbial colonisation and build up granulation tissue.

Wound treatment

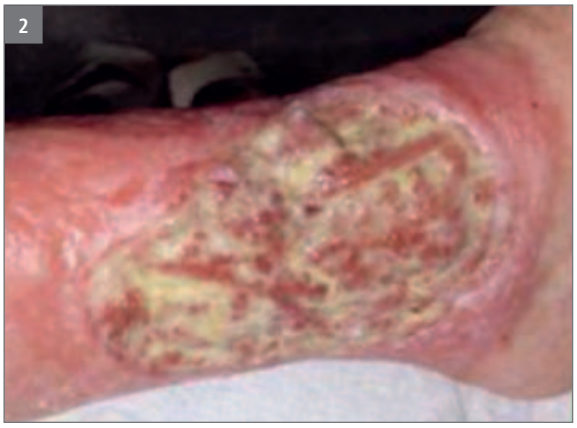
NPWT was initiated, but by day 9 no change in the fibrinous slough and granulation had occurred. In contrast, on day 13, increased granulation and a clear reduction of the fibrinous slough was observed. One week later (day 20), increasing granulation tissue formation and significantly reduced fibrin levels were found. NPWT was discontinued on day 51, while treatment was continued with TenderWet active 24. On day 55, the wound exhibited an improved blood supply, granulation to skin level and no remaining fibrin.

Conclusion

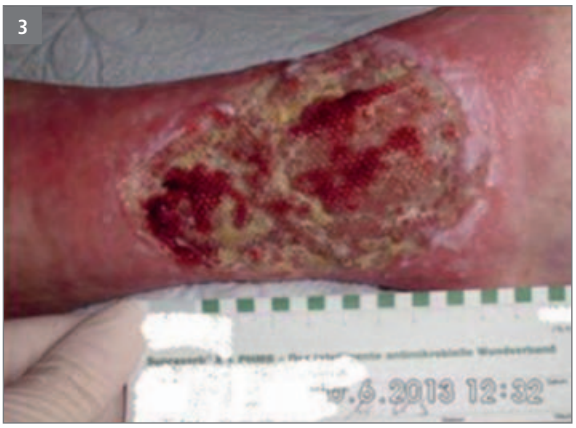
NPWT stimulated granulation tissue formation and improved the blood supply to the wound while the fibrin receded completely.



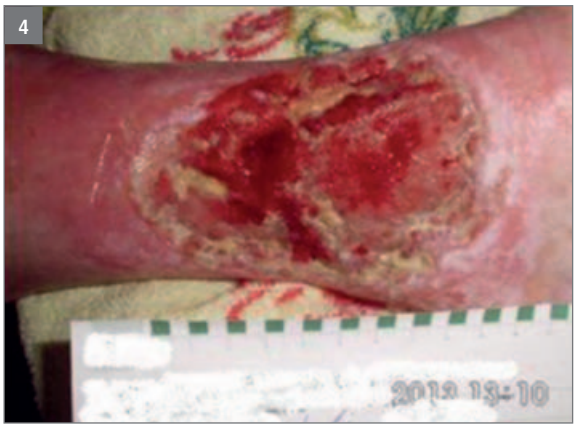
Day 0: Extensive fibrinous slough and granulation.



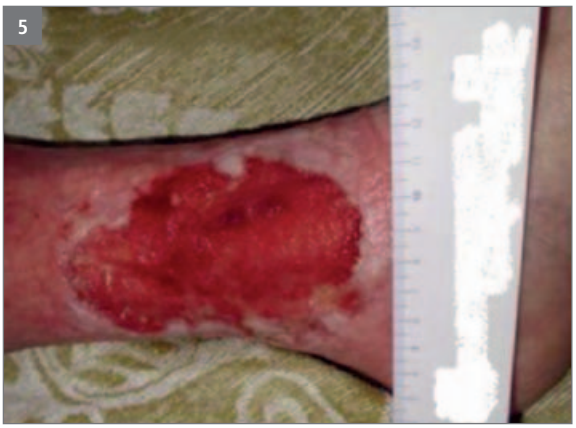
Day 9: No alteration in the wound condition.



Day 13: Increased granulation and clearly reduced fibrinous slough.



Day 20: Increasing granulation tissue formation and significantly reduced fibrinous slough.



Day 55: Improved blood supply, granulation to skin level and no fibrinous slough.

NPWT treatment of a stage IV sacral pressure ulcer

de Boer – your outpatient healthcare
Bevern, Germany

71-year-old woman with a stage IV sacral pressure ulcer.

Patient anamnesis

The patient was immobile, had type II diabetes mellitus and suffered from urinary and faecal incontinence.

Wound anamnesis

Stage IV sacral pressure ulcer of almost 2 years duration, measuring 7 cm x 6 cm x 4 cm, with a cavity measuring 3.5 cm extending from 10 to 2 o'clock following debridement, with 80 mL of exudate being produced per day. Exposed fascia and bone were found in the wound bed. There was no evidence of microbial infection. The wound edge was strongly reddened, oedematous and macerated.

Aim of the treatment

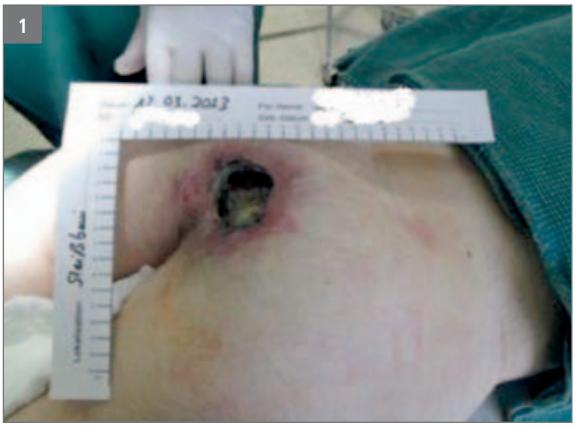
Application of negative pressure wound therapy (NPWT) using Vivano® to clean the wound, stimulate granulation tissue formation and bring the wound edges closer together.

Wound treatment

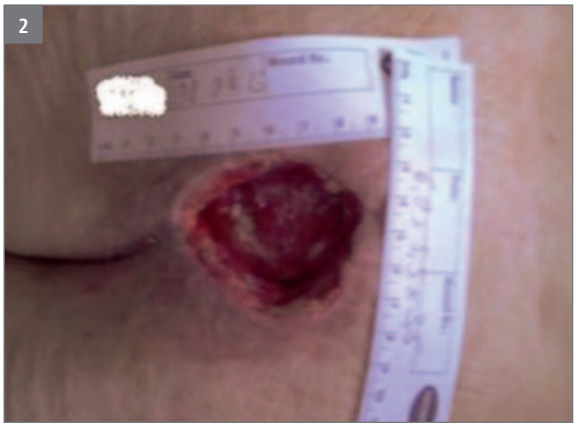
The wound was debrided, and inpatient NPWT was initiated, with change of dressing approximately twice a week (38 times in total). On day 27, bone and fascia were exposed. By day 41, the bone was covered with granulation tissue, the wound was 2.5 cm deep and the cavity extending from 10 – 12 o'clock had been reduced in size and now measured 2 cm. The wound depth and the cavity had both been further reduced by day 55, measuring 1.5 cm and 1 cm respectively, and remaining unchanged in size on day 62. By day 87, although the wound was still unchanged in size, blood supply had increased. On day 121, the wound had decreased in size, now measuring 3.5 cm x 2.5 cm x 0.5 cm, while the cavity still measured 1 cm, but now extended from 7 to 10 o'clock. One week later (day 128), the cavity had closed and NPWT was discontinued, treatment being continued with Sorbalgon alginate dressing.

Conclusion

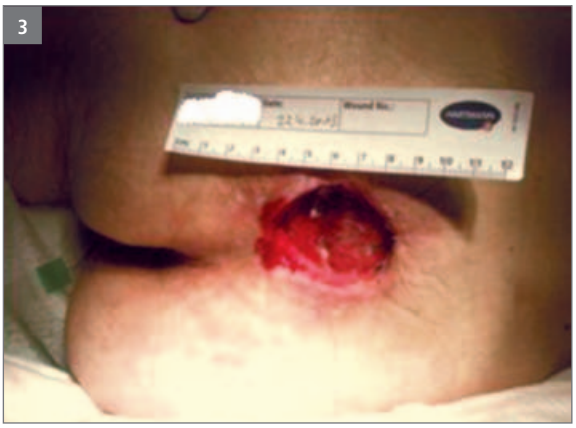
NPWT stimulated granulation tissue formation and improved the blood supply to the wound, while the cavity was successfully closed.



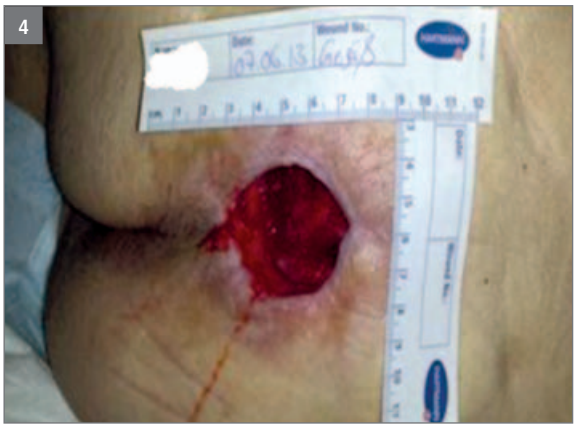
Day 0: Necrotic sacral pressure ulcer; wound of almost 2 years duration.



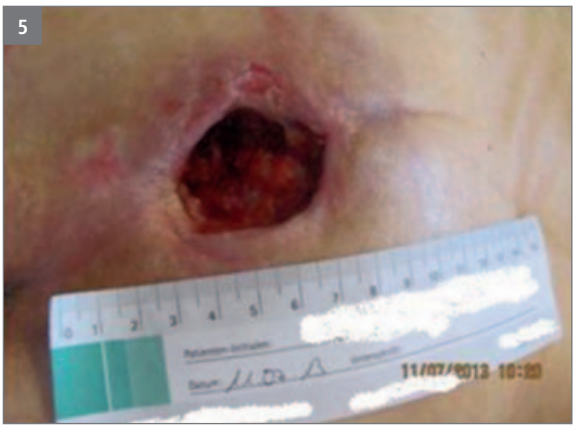
Day 27: Bone and fascia exposed.



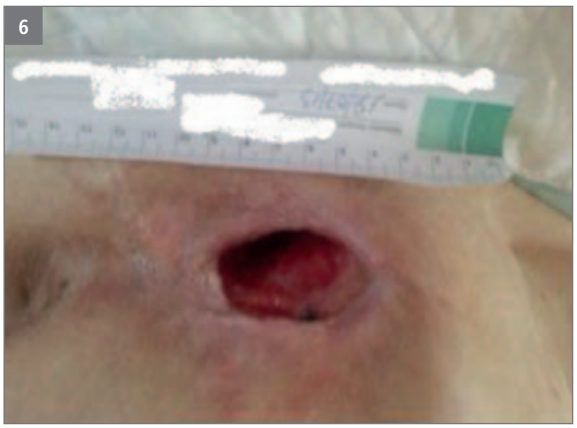
Day 41: Bone covered with granulation tissue, cavity and wound depth reduced.



Day 87: Reduced cavity and wound depth, with increased blood supply.



Day 121: Reduced wound size.



Day 128: Cavity closed, NPWT treatment discontinued.

NPWT application for diabetic foot with stage IV heel pressure ulcer

Katrin Willing
Certified wound advisor, AWM, PAUL HARTMANN AG, Germany

57-year-old woman with stage IV pressure ulcer of the left heel.

Patient anamnesis

The patient had impaired health, was in a wheelchair, was obese, had type II diabetes mellitus, suffered from diabetic polyneuropathy, stage IV peripheral arterial occlusive disease of the left side and arterial hypertension, and was a heavy smoker, due to which she had a femoropopliteal bypass in the left leg.

Wound anamnesis

Stage IV pressure ulcer of the left heel measuring 9 cm x 9 cm x 4.5 cm, with 20 % fibrin and 80 % granulation, and with exposed bone exhibiting osteomyelitis. The freshly operated wound was infected with **Proteus mirabilis** and **Enterococcus species**, was inflamed, with reddening, swelling, pain and increased temperature at the wound edge, and produced approximately 80 mL of exudate per day.

Aim of the treatment

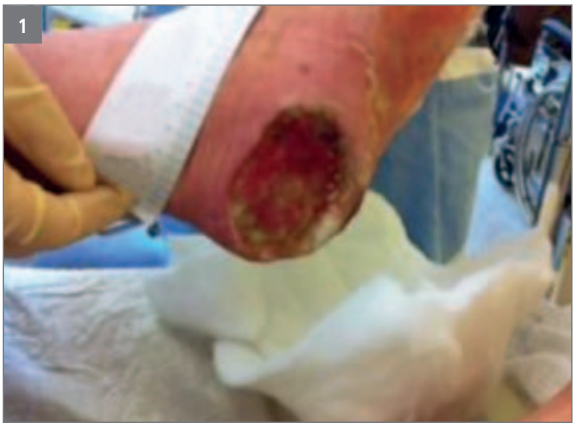
Application of negative pressure wound therapy (NPWT) using Vivano® to achieve complete granulation over the exposed bone, to improve the blood supply, to prevent amputation, and for wound cleansing.

Wound treatment

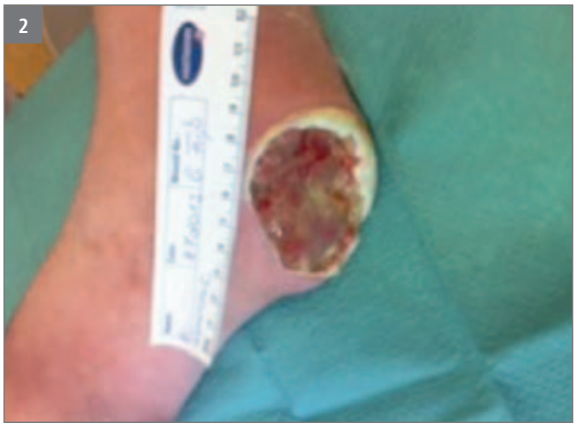
The patient received wound debridement as inpatient (day 0). On day 8, outpatient NPWT treatment was initiated with a continuous negative pressure of –130 mmHg, and was continued until day 11. From day 12 to day 20, the wound was treated with HydroTac dressing. On day 21, NPWT was resumed with the same conditions as previously and was continued until day 28 – a combined total of 12 days. Wound treatment was continued with TenderWet Plus. The patient was readmitted to receive mesh graft transplantation on day 36, using tissue taken from the right upper thigh. From day 43 to day 63, the patient received outpatient treatment with TenderWet Plus, by which time the transplant had taken. Wound treatment was continued with Hydrotul or Hydrogel and Zetuvit Plus until the wound had healed, which was observed on day 132.

Conclusion

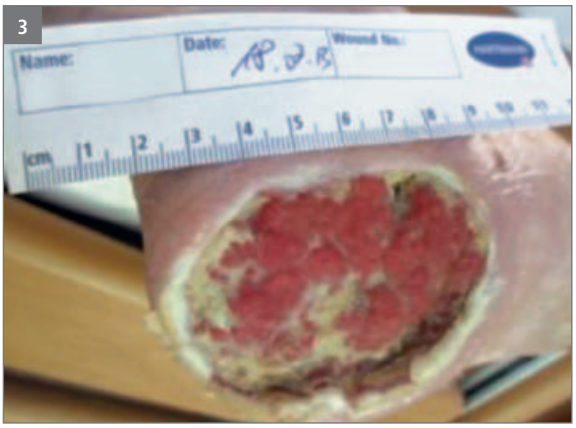
NPWT stimulated wound healing for a subsequent successful skin transplant and eventual complete healing.



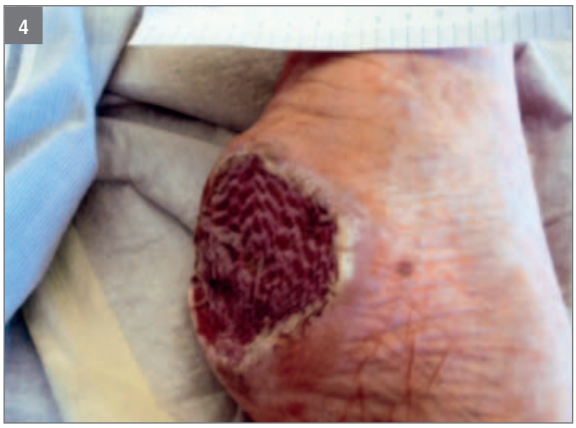
Day 0: Following debridement, a wound measuring 9 cm x 9 cm x 4.5 cm with exposed bone; 20 % fibrin and 80 % granulation.



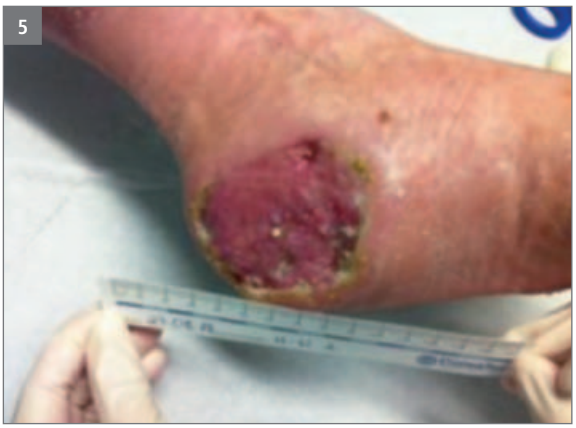
Day 13: After 4 days of NPWT. Increasing granulation.



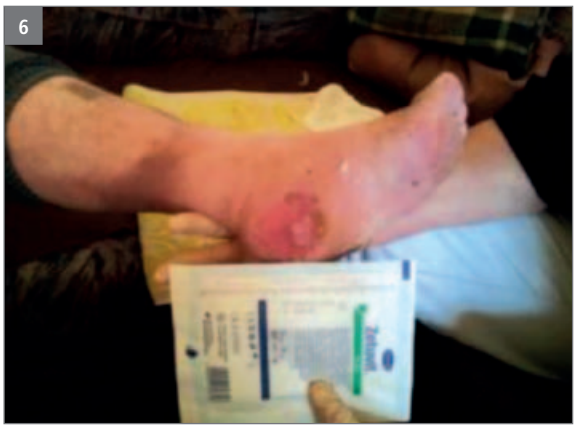
Day 23: After 7 days of NPWT. Bone completely covered and wound size deceased to 7 cm x 5.5 cm x 0.8 cm.



Day 36: Mesh graft transplantation performed (12 days of NPWT treatment completed 8 days previously).



Day 63: Transplant has taken.



Day 132: Wound healed.

Outpatient NPWT treatment of pilonidal sinus

Alexandra Scherf
day-care hospital, Hessen, Germany

44-year-old man with pilonidal sinus.

Patient anamnesis

The patient was in very good health, was obese and had no accompanying illnesses.

Wound anamnesis

Pilonidal sinus over the coccyx measuring 6.2 cm x 4.3 cm x 3 cm with exposed coccyx fascia. The freshly operated wound was infected with **Escherichia coli** and **Enterococcus faecalis** species, exhibited slight signs of inflammation, was odorous and produced approximately 75 mL of exudate per day. The wound exhibited good granulation and there was haemorrhage at the wound edge, which was sutured. Treatment with Voltran and NovaMin controlled pain.

Aim of the treatment

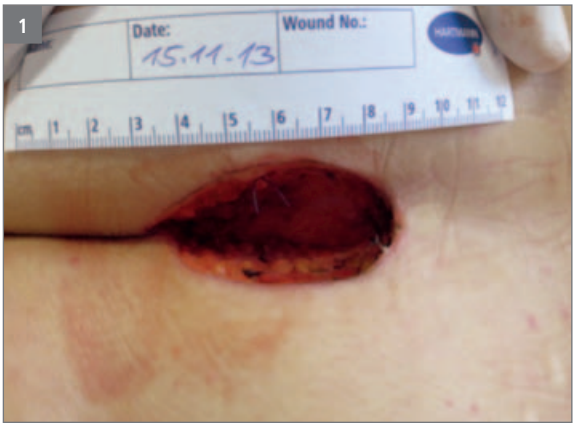
Application of negative pressure wound therapy (NPWT) using Vivano® to achieve complete granulation over the exposed coccyx and rapid healing, to prevent an infection, and for wound cleansing.

Wound treatment

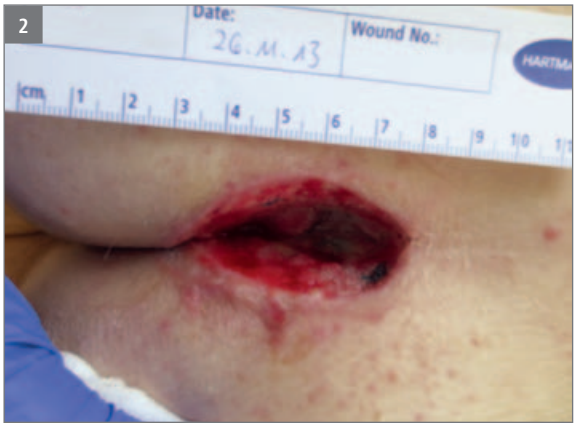
The patient received NPWT treatment with a continuous negative pressure of –125 mmHg for 35 days, with 10 dressing changes, dressings being changed twice a week. By day 11, epithelialisation had started from the wound edge. The wound had decreased in size, new measuring 6 cm x 3 cm x 3 cm, with minimal fibrin levels and good granulation. On day 21, the wound had diminished further in size, and measured 6 cm x 2 cm x 2.9 cm. Very good granulation had developed and no fibrin remained. Slight hyperkeratosis had developed at the wound edge. On completion of NPWT treatment, the wound measured 4.5 cm x 1 cm x 0 cm, with extensive epithelialisation. Further treatment with 2–3 episodes of wound irrigation, moist, then dry gauze, and wearing of well-fitting underwear. An alternative here would be Hydrocoll, HydrocollThin or HydroTac (moist environment).

Conclusion

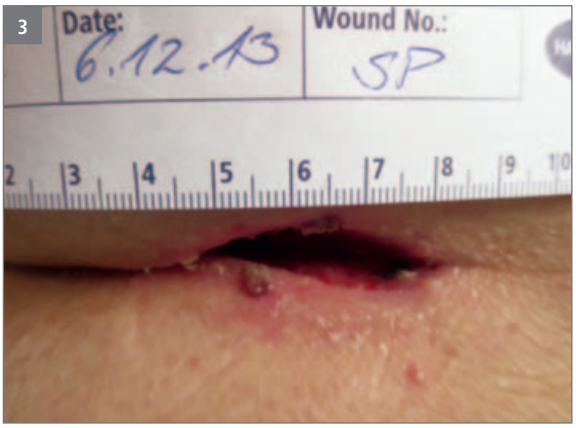
NPWT supported wound healing producing extensive epithelialisation.



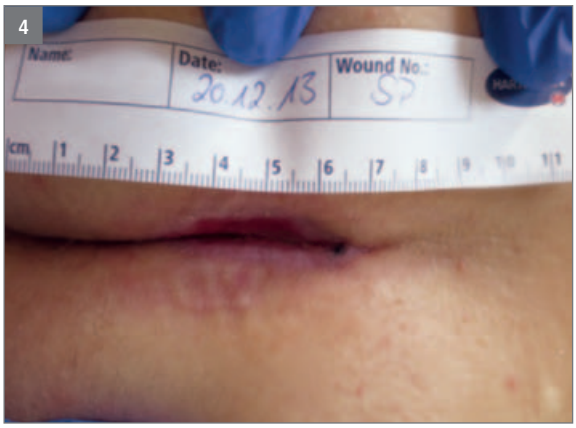
Day 0: Wound measuring 6.2 cm x 4.3 cm x 3 cm with exposed coccyx, good granulation and haemorrhage at the edge. NPWT initiated.



Day 11: Wound size reduced and epithelialisation started at the edge. Minimal levels of fibrin and good granulation.



Day 21: Wound size decreased to 6 cm x 2 cm x 2.9 cm. Very good granulation and slight hyperkeratosis at the wound edge.



Day 35: NPWT discontinued. Wound measuring 4.5 cm x 1 cm x 0 cm, extensively epithelialized.

Closure of third- and fourth-degree burns of the fingers, dorsum of the hand, and forearm

Darko Jurisic
Bencevic General and County Hospital, Slavonski Brod, Croatia

A 58-year-old woman with third- and fourth-degree burns of the fingers, dorsum of the hand, and forearm.

Patient anamnesis

The patient had sustained burns to the face, chest wall and left forearm, hand and digits.

Wound anamnesis

The major injury consisted in fourth-degree burns to the underside of the left forearm and digits, accompanied by second- and partial third-degree burn injuries of the second digit.

Aim of the treatment

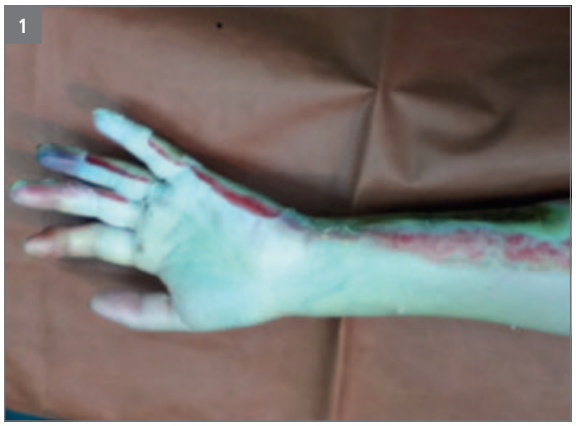
Application of negative pressure wound therapy (NPWT) with Vivano® to assist in the closure management of third- and fourth degree-burns.

Wound treatment

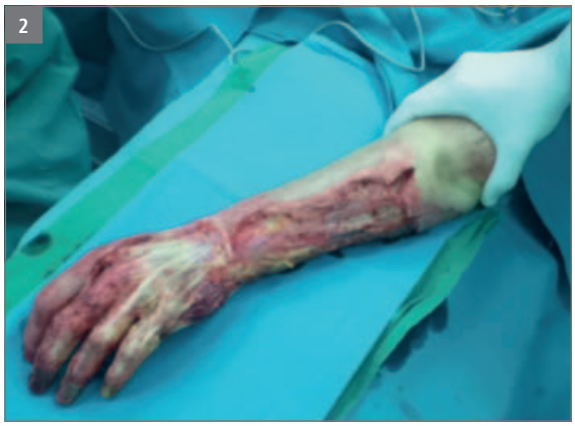
Primary debridement of the wound and escharectomy of the digits was performed. NPWT was initiated using Vivano®. Normally, Atrauman® Ag is applied under the foam. After 3 weeks, the patient developed acute gasteroenterocolitis, with elevated temperature and inflammatory parameters and presence of norovirus. Systemic treatment involved loperamide and diet. Four weeks post-injury, the tendons required debridement. The entire fifth digit was amputated along with the fourth digit, which was amputated from the proximal interphalangeal joint. A skin flap to cover the finger stump was created from the palm side of fourth and fifth digits. Despite good granulation after 4 weeks of NPWT, a significant amount of bone remained exposed. The exposed arm bone was debrided, and standard bone debridement was partially performed on the third and fourth digits. The wound healed properly but was very tough and hard due to the gasteroenterocolitis. Wound infection was found again, with elevated inflammatory parameters and **Enterobacter cloacae** and leukocytes in the wound. Systemic treatment was administered for 5 days with Tazocin (piperacillin and tazobactam). The vacuum was removed and the wound irrigated three times daily. Six weeks after initial debridement, there was sufficient granulation without any obvious infection. A large mesh graft was applied and NPWT was restarted. The graft had not attached 1 week later, but the patient decided to discharge herself before receiving additional treatment. The patient returned 3 months after the injury with almost complete attachment. There was a very small but significant wound on the distal and proximal interphalangeal joints of the third digit, the latter being unstable. Arthrodesis of the proximal joint was performed with sequential debridement of the distal and proximal joints and of the middle part. The opposition of the first and second digits was normal while wrist function was almost normal. The appearance of the hand was very good. Further improvement was observed during 13 months post-injury follow-up.

Conclusion

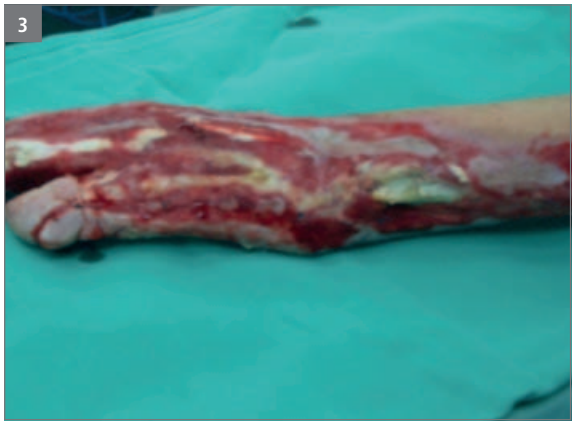
NPWT is a valuable option for the closure of this type of wound. It reduced wound complexity and prepared the wound for coverage with mesh graft, producing lasting and durable skin with more natural coverage than flap surgery. No additional debulking procedures were required.



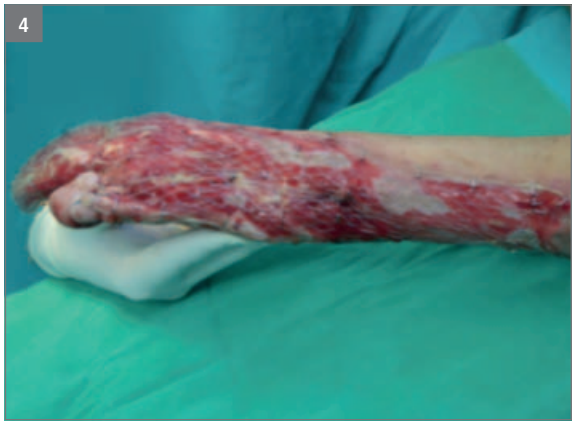
Major burns: Fourth-degree burns to left forearm underside and digits, accompanied by second- and partial third-degree burn injuries of the second digit.



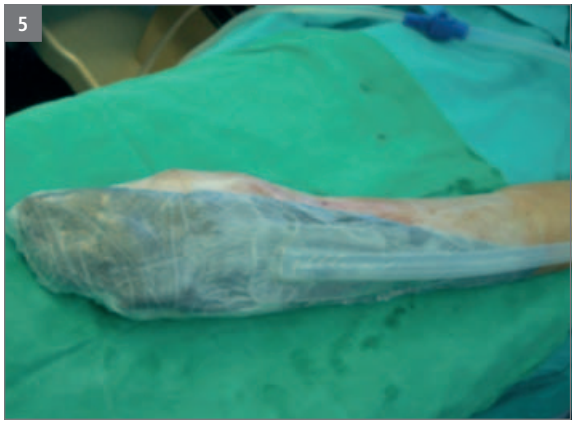
Wound preparation: Primary debridement of the wound and escharectomy of the digits.



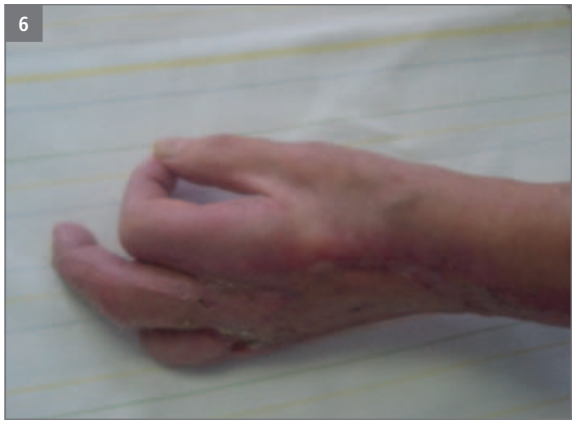
Four weeks post-injury: Tendons debrided. The fifth digit and part of the fourth digit were amputated. Skin flap created over digit stump.



Six weeks post-injury: Sufficient granulation to allow application of a large mesh graft.



NPWT: Reapplied following grafting.



Functional hand: Opposition of the first and second digits was normal with very good appearance of the hand 3 months after injury.

Endoscopic vacuum therapy in the upper gastrointestinal tract

M.G. Laukötter, T. Vowinkel, D. Palmes, N. Senninger, R. Mennigen
Dept. of General and Visceral Surgery, University Medical Centre, Münster, Germany

Major upper GI tract leakages are life-threatening surgical complications. Emergency operations for perforations and anastomotic leakages are associate with high overall morbidity and mortality rates. The gold standard of treatment is endoscopic implantation of a flexible covered mesh stent. Associated problems include a lack of drainage, stent migration, inadequate defect closure, granulation tissue ingrowth preventing removal and scar strictures. EVT for anastomotic leakage after rectal resection was adapted for the upper GI tract. A success rate of 84–100% is reported based on the limited data available.

Aim of the study

Adaptation and evaluation of vacuum sponge therapy for anastomotic leakages and wall defects in the upper GI tract.

Patients

Here, EVT was applied in 31 cases (21 men, 10 women, aged 50–82 years) of upper GI tract perforations from January 2011 to February 2014.

Wounds

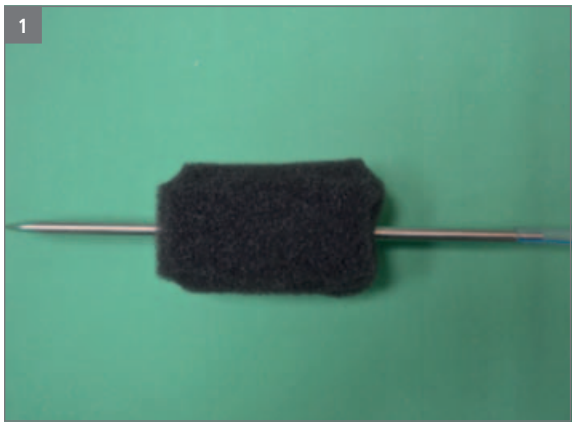
The indications for therapy were anastomotic insufficiency (23), iatrogenic oesophageal perforation (4), traumatic oesophageal perforation (1), Boerhaave's syndrome (2) and tumour perforation (1).

Treatment and results

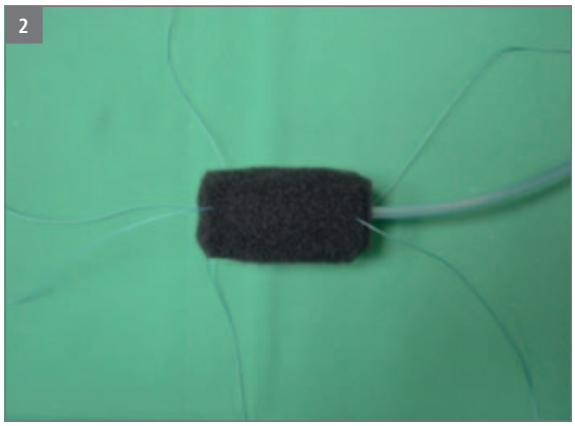
The sponge is trimmed to fit the geometry of the wall defect/wound cavity and is perforated with a metal rod to which the gastric tube is connected. The rod is removed and the sponge is fixed firmly to the distal end of the gastric tube using sturdy threads. This is then attached in parallel to the endoscope using a loop at the end of the foam element which is attached to the endoscopic grasper. The whole system is inserted into the wall defect/wound cavity under direct vision. The tube is diverted through the nose and connected to the vacuum pump run with a negative pressure of –120 to –125 mmHg. Success is defined as significant improvement in septicaemia, elimination of necrosis, increase of granulation and ultimately cavity regression until complete closure is achieved. The median EVT duration was 29 days (4–114 days), depending on the indication, and eight endoscopic interventions (1–29), with a maximum of eight sponge changes, depending on wound cavity size, patient condition and the degree of septicaemia.

Conclusion

Complete closure was achieved in 94% of all cases, with no complications or therapy failure, and no unintended defect enlargement during endoscopic examination or therapy. Drainage is possible with EVT, in contrast to stenting. EVT can be applied in nearly all possible cases of upper GI-tract leakage, and may come to replace stent therapy in these patients.



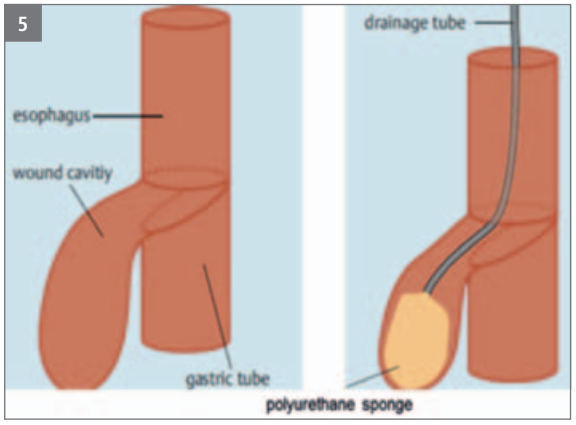
Step 1: Insertion of gastric tube into cut-to-size foam.



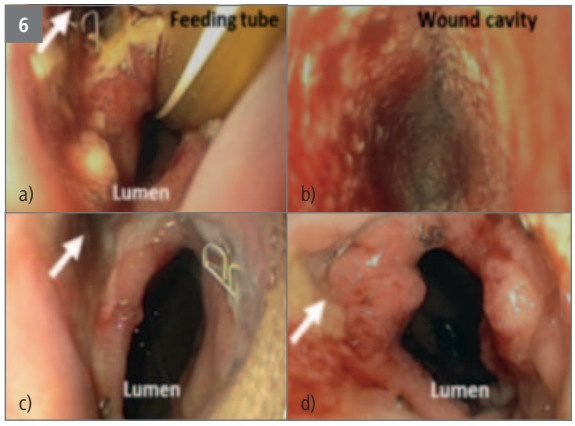
Step 1: Rod removed and sturdy threads applied.

Step 1: Foam fixed firmly to gastric tube to avoid slipping.

Step 2: Sponge fixed via looped thread to the endoscopic grasper.



Placement: Insertion of the sponge into the wound cavity.



Successful treatment: Patient with anastomotic insufficiency following oesophageal resection: a) Typical wound cavity (white arrow). b) Base of the wound cavity after the second change, showing good granulation tissue formation. All inflammation fluid has been drained. c) After sixth to seventh endoscopic change, the cavity is too small for sponge insertion, and the sponge is instead positioned in the lumen adjacent to the cavity. d) Successful completion of therapy.

Endoscopic NPWT in the upper gastrointestinal region

J.F. Lock, S. Reimer, M. Scheurlen, C.-T. Germer
University Clinic Würzburg, Würzburg, Germany

The incidence of anastomotic leaks is relatively high in the upper GI region, particularly after oesophagectomy and gastrectomy, and is reported to occur in approximately 20% and 4% of all cases respectively. Since these procedures are frequent, anastomotic leaks pose a major clinical problem with high risk due to abscess formation, peritonitis, mediastinitis, sepsis and potential mortality. Endoscopic therapy for rectal anastomotic leaks has been adapted to the upper GI region, using a vacuum pump combined with a sufficiently large collecting receptacle.

Aim of the study

Evaluation of E-NPWT application in anastomotic leakages in the upper GI region using the Vivano® system.

Patients

Five patients with perforations of the upper gastrointestinal (GI) region were treated with endoscopic negative pressure wound therapy (E-NPWT), specifically using the Vivano® system.

Wounds

One patient had suffered a spontaneous perforation of the oesophagus, while the other four had postoperative leaks, one with two perforations, following oesophago-gastrostomy (2), oesophago-jejunostomy (1) and gastric fundus surgery (1). The mean perforation diameter was 16 ± 9 cm.

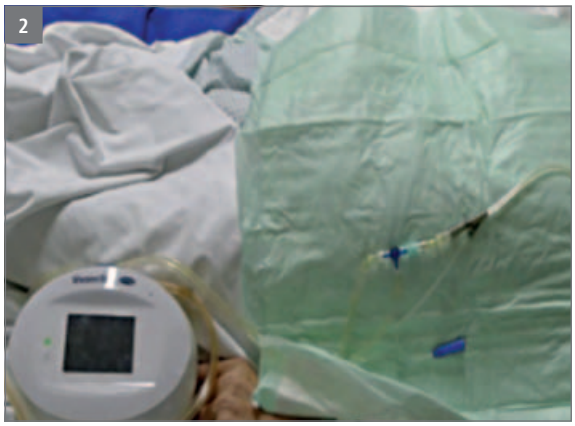
Treatment and results

The gastric tube was placed through the nose, drawn out of the mouth and inserted into the sponge. The sponge was fixed to the endoscope, inserted orally and positioned intraluminally for small perforations or initially intracavitarily for larger defects, switching to intraluminal application when almost closed. Continuous negative pressure of up to –125 mmHg was applied for a median of 10 days (1–56 days) with 3 E-NPWT sessions (1–17), depending on perforation size, with a sponge change every 3–4 days. Closure was achieved directly in four patients. One patient with a postoperative leak after oesophago-gastrostomy developed a secondary fistula of the bronchi. E-NPWT was discontinued and surgical treatment led to full recovery. Biliary secretion removal was optimal and no malfunctions occurred. All patients achieved normal mucosa and food intake.

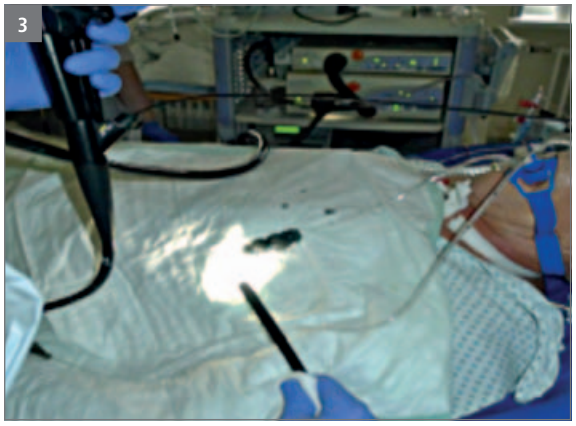
Conclusion

E-NPWT appears to be an effective therapy for upper GI leaks and has become the primary strategy for such patients in the department.

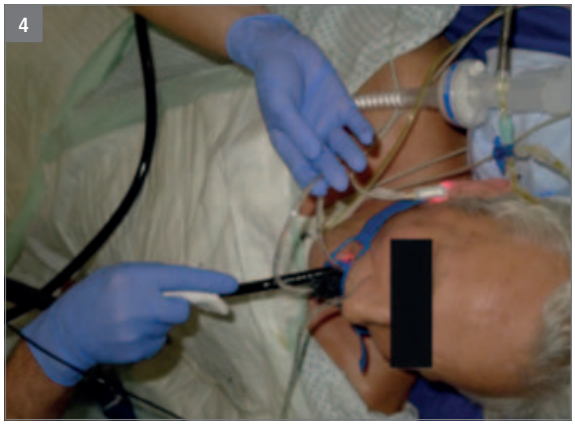
E-NPWT: Centres in Germany reporting endoscopic negative pressure wound therapy (E-NPWT).



Connection to Vivano unit: Short connection between the unit and gastric tube to avoid blockage.



Sponge preparation: Sponge fixed firmly to the gastric tube, which has been passed through the nose and drawn out of the mouth.



Sponge insertion: Sponge is inserted fixed to the endoscope.

Drainage: Removal of biliary fluid by the Vivano pump.

NPWT in maxillofacial surgery

Iwona Niedzielska, Maciej Nowinski, Katarzyna Sciskala
Medical University of Silesia, Katowice Poland

A 64-year-old woman with complicated wound healing of the face and neck following oncological surgery.

Patient anamnesis

The patient had squamous cell carcinoma of the mandible, was a smoker and had previously undergone other cancer surgery. There was a family history of cancer.

Wound anamnesis

The patient underwent surgical removal of oncologically altered tissue, mandibular reconstruction with a titanium plate and reconstruction of the mucose cavity using a free musculocutaneous flap. She developed marginal necrosis of the skin-muscle flap near the lower lip, purulent exudation from the neck wound, extraoral wound dehiscence on the chin and neck, lymph accumulation in the lower neck and moderate inflammation in the peripheral wound area. Escherichia coli was present.

Aim of the treatment

Application of negative pressure wound therapy (NPWT) with Vivano® in cranio-maxillofacial surgery.

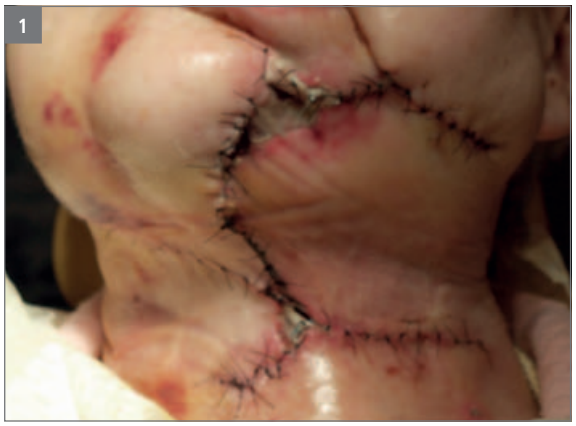
Wound treatment

Necrotic tissue was removed and NPWT was initiated with Atrauman® Ag as an interface dressing. Medication consisted of antibiotics, anticoagulants and painkillers. By day 10, there was some granulation, however, another problem had started lower down on the neck. The polyurethane foam was extended to cover this too, allowing simultaneous application of negative pressure of –100 mmHg. On day 12, the lower wound was sutured. Hospitalisation was ended on day 15 when infection was absent. The patient was checked every 2 days to change the vacuum dressing, in combination with Atrauman® Ag, Sorbalgon® and Hydrosorb® gel.

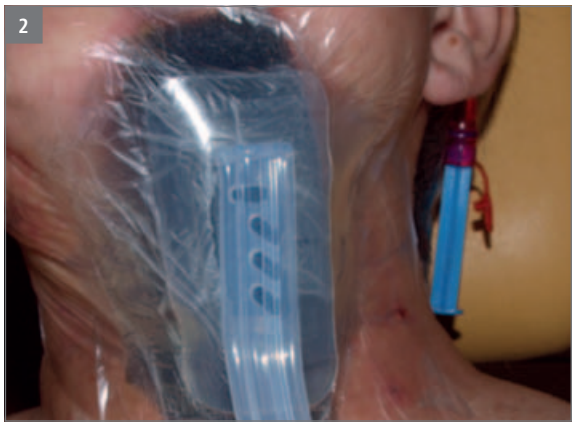
By day 23, the patient had no infection or pain and the upper wound was granulated. Consequently, the first NPWT phase was ended, while Atrauman® Ag and Sorbalgon® were still applied. After 61 days, complete re-epithelialisation was observed. The patient was hospitalised on day 65 to partially remove the reconstructive plate, followed by flap reconstruction, immediately applying a negative pressure of –85mmHg for 2 days, using Atrauman® Ag as interface dressing. Atrauman® Ag and Aquagel were applied for a further 11 days until there was no wound dehiscence or infection, and hospitalisation was ended. The patient received painkillers for moderate pain and Hydrosorb® gel was applied, which was changed every 2 days for 2 weeks. Complete healing was observed 1 week later.

Conclusion

NPWT with simultaneous antibiotic treatment resulted in complete healing of cranio-maxillofacial wounds. In complicated cases, NPWT helps to prepare wounds for further treatment.

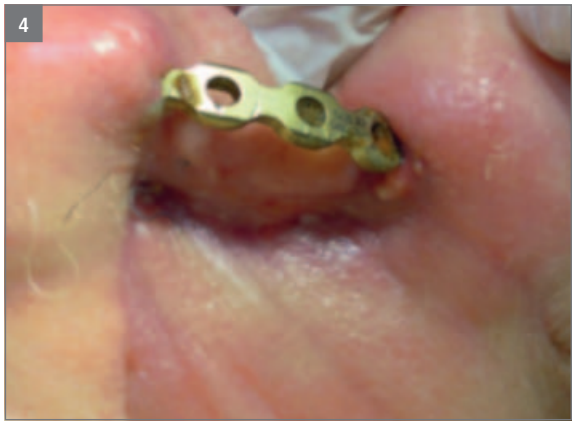


Day 0: Necrotic wound with purulent exudation.

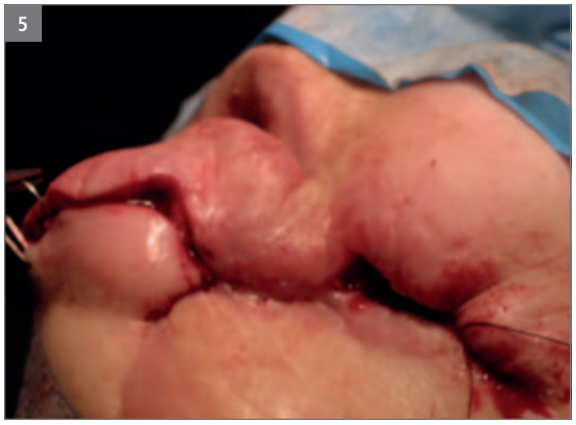


Day 0: Initiation of first NPWT phase.

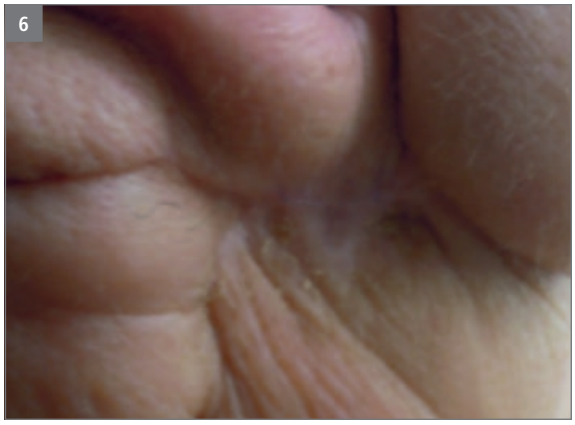
Day 23: First phase of NPWT ended. Lower wound closed, upper wound granulated.



Day 61: Re-epithelialised upper wound.



Day 65: Partial removal of titanium plate and flap reconstruction. Second NPWT application phase for 2 days.



Healed wounds: Wounds on the chin and neck were healed 3 months after starting the initial NPWT.

Prevention strategies in arthroplasty using NPWT

Rolf Becker
Eduardus Hospital, Cologne, Germany

The incidence rate of implant-related infection increases with the degree of surgical complexity, reaching 15% in mega implants and tumour prostheses. With the increasing number of revision surgeries per year, this will have an impact on the total number of infections.
A wide range of bacteria together with fungi are associated with implant infections. Factors including ageing, obesity, poor dental status, open wounds, infected pressure sores, intertrigo, fungal skin infection, psoriasis, leg ulcers, diabetic foot, treatment for rheumatism and rheumatoid arthritis, haematogenous seeding, previous operations and cortisone therapy provide a route for infection.

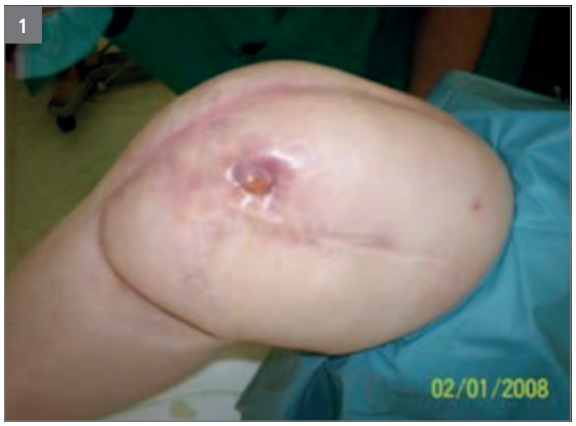
New concept to improve the procedure for implant infections by anticipation rather than response.

Joint punctures are performed prior to revision surgery to attempt to detect potential infection. Should infection be found, a two-stage revision is performed. The prosthesis is explanted together with radical debridement of the infected material and jet lavage to rinse the wound. A spacer is inserted at the joint, which allows movement. It is recommended to keep the operating time within the wound to 10 min. When attempting to preserve hip implants, it is preferable to replace all the interchangeable components if possible. Aspiration is performed as routine, using the Vivano® system in negative pressure wound therapy (NPWT). When applying NPWT, it is better to excise than to incise the foil to avoid leakage and system failure. The wound should be dry to avoid clotting in the foam and it is unnecessary to tighten the foil because this may lead to outer skin surface damage.

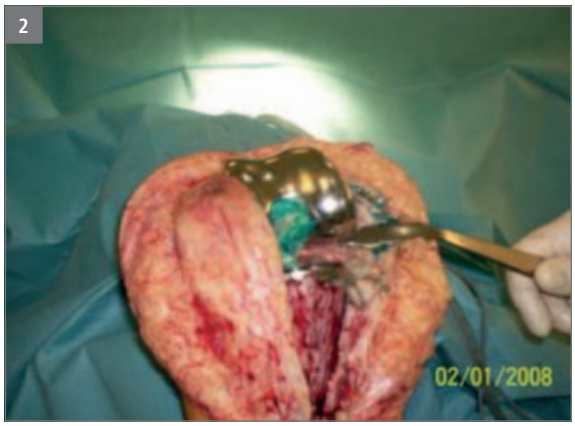
Systemic antibiotic treatment (6–8 weeks) is initiated, later using oral antibiotics. Regular checks in the clinic are important to monitor clinical parameters. Antibiotic therapy is discontinued 7 days prior to performing three consecutive weekly joint punctures under sterile conditions with long-term incubation to test for infection. A cultivation of at least 10 days is recommended, because low-level infection does not normally appear until after 5–6 days. Once three consecutive punctures are infection-free, reimplantation can be performed. Patient follow-up after 1 year is recommended to ensure that there is no loosening of the prosthesis.

Conclusion

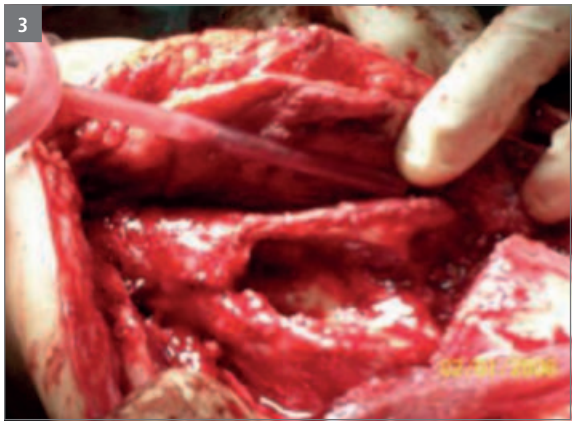
This new concept lowers costs, requires less NPWT, allows better management of the patient, makes it easier to plan operations and reduces wound complications, including the need for further revisions/operations, although patient comfort during the treatment is reduced.



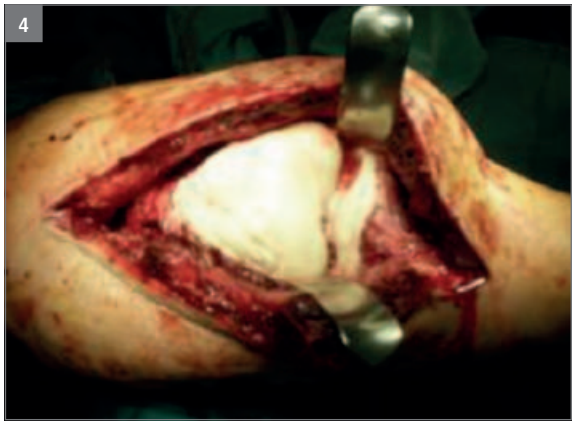
Infection: Chronic fistula with knee joint infection.



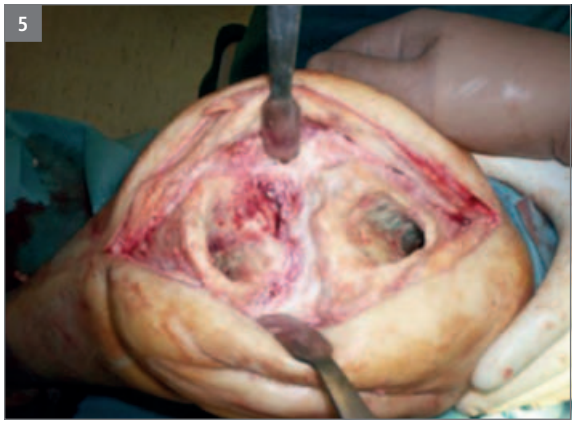
Joint infection: In this fistula, there is a deep infection and the prosthesis must be removed. Methylene blue indicates the defect size, which requires debridement.



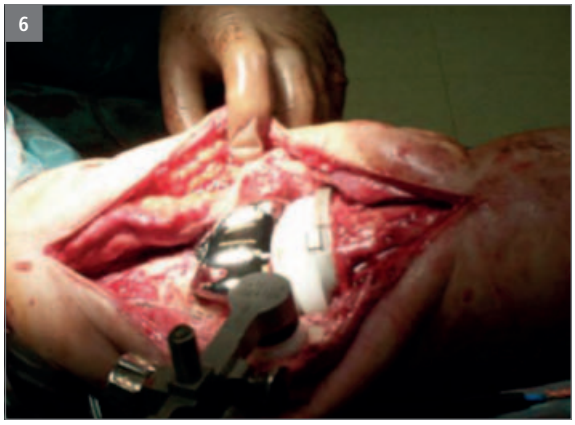
Explantation: The prosthesis is removed and the defect is debrided.



Spacer insertion: A pre-fabricated or self-built spacer is inserted.



Reimplantation: Once the wound is infection-free, the spacer is removed to allow insertion of the new implant.



Reimplantation: New implant inserted.

Notes

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PAUL HARTMANN AG
Paul-Hartmann-Straße 12
89522 Heidenheim
Germany

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