

Limb Salvage in a Patient with Infected Gangrene of the Forefoot by Combining Negative Pressure and Polymeric Membrane Silver Dressings*

Wilfried Amann, Dr. H. Schwarzbach, Dr. G. Mazur, Dr.
Department of General and Vascular Surgery, Landeskrankenhaus Villach, Austria

KABEG
LKH VILLACH

INTRODUCTION

Diabetic foot syndrome is a major long term complication of diabetes mellitus with high morbidity combined with long hospital stays and a high rate of major amputations. Therefore in 1989, the St. Vincent declaration defined the aim to halve the number of major amputations in diabetic patients⁽¹⁾ - an aim which, 20 years later, is far away from being reached.

Most of these patients have a combination of diabetic neuropathy and vascular disease. This increases the risk of delayed healing and bacterial infections. Ischemia and wound infection are the main causes of amputation in the diabetic foot syndrome.

Multimodal treatment including vascular interventions, medical treatment and local wound care is mandatory to avoid major amputations.

This case shows a long course of wound therapy to avoid major amputation in a young diabetic patient with vascular complications.

Aim

To save an infected gangrenous foot on a high risk diabetic patient with three occluded crural arteries by using a combination of local wound care therapy in the form of polymeric membrane silver dressings and negative pressure wound therapy (NPWT). Vascular reconstruction was not possible in this case.

METHOD

After initial transmetatarsal amputation of the forefoot and wide opening and debridement of the wound because of bacterial wound infection we treated with Polymeric membrane silver dressings* (PMSD) followed by NPWT and then combining the two treatments when the wound started to stagnate due to pseudomonas. Dressing changes every 72 hours. The patient was also treated with prostanoids and antibiotics. (Whenever possible improvement of ischemic conditions either with interventional and/or vascular reconstruction is mandatory. If this is not possible prostanoids should be given to improve microcirculation⁴⁾). The role of antimicrobial wound dressings in multimodal treatment regimens is still unclear. NPWT is able to promote wound granulation through arteriolar dilatation and thus increase of microcirculation and transportation of exudate and debris^(2,3).

Polymeric Membrane Silver Dressings provides an additional antimicrobial effect within the membrane and reduces the grade of contamination as well as having a cleansing effect of the wound bed. The combination of both these local treatment modalities lead to an enhanced positive effect of wound healing. The same combination with reduced negative pressure (40 mm Hg) was used for covering the mesh graft. This provides an ideal modelling of the mesh graft to the wound bed and with the combination with the antimicrobial PMSD it can be left on the graft for 4 to 5 days. After this time period the mesh graft was fully integrated to the wound bed.

Systemic antibiotic treatment was obviously ineffective due to resistant local flora and ischemic conditions in the wound area. Nevertheless it is not clear if systemic antibiotic therapy is necessary if there are no signs of deep infection or systemic infection.

RESULTS

Since combining PMSD and NPWT we saw a continuous improvement. After 3 weeks the wound could be covered by a mesh graft again using PMSD and NPWT for modeling the mesh graft to the wound bed.

DISCUSSION

Combination of ischemia and infection is a frequent condition leading to major amputation in non reconstructable peripheral occlusive disease and diabetes mellitus.

PMSD and NPWT provides additional positive effects concerning wound cleansing, antimicrobial effects and improvement of granulation. After covering with mesh graft it guarantees close contact of the graft to the wound bed as well as reducing bacterial growth. This local treatment regimen in combination with basic medical treatment with antibiotics and prostanoids could probably avoid major amputation in this case.

Based on our experience, we should consider using PMSD as a first line treatment in any wound at high risk for local infection and delayed wound healing as we find in diabetic patients with vascular complications. Combination with NPWT is possible and able to enhance the positive effect on wound healing.

Further studies on local wound therapy with the combination of different advanced modalities in complex chronic wound conditions including ischemia, wound contamination and infection leading to bad healing conditions especially in diabetic patients should be performed with the aim of reducing major amputation rates.

Case report

45 year old male patient with a 10 year history of diabetes mellitus treated with diet and oral antidiabetics. The patient had peripheral artery disease (PAD) with occlusion of three crural vessels. A crural angioplasty was performed in May 2011.

Five months later the patient presented with necrosis and moist gangrene of his right 1st to 3rd toe including partial forefoot with incipient sepsis. Angiography showed occlusion of all crural vessels - no further intervention or vascular reconstruction was possible.

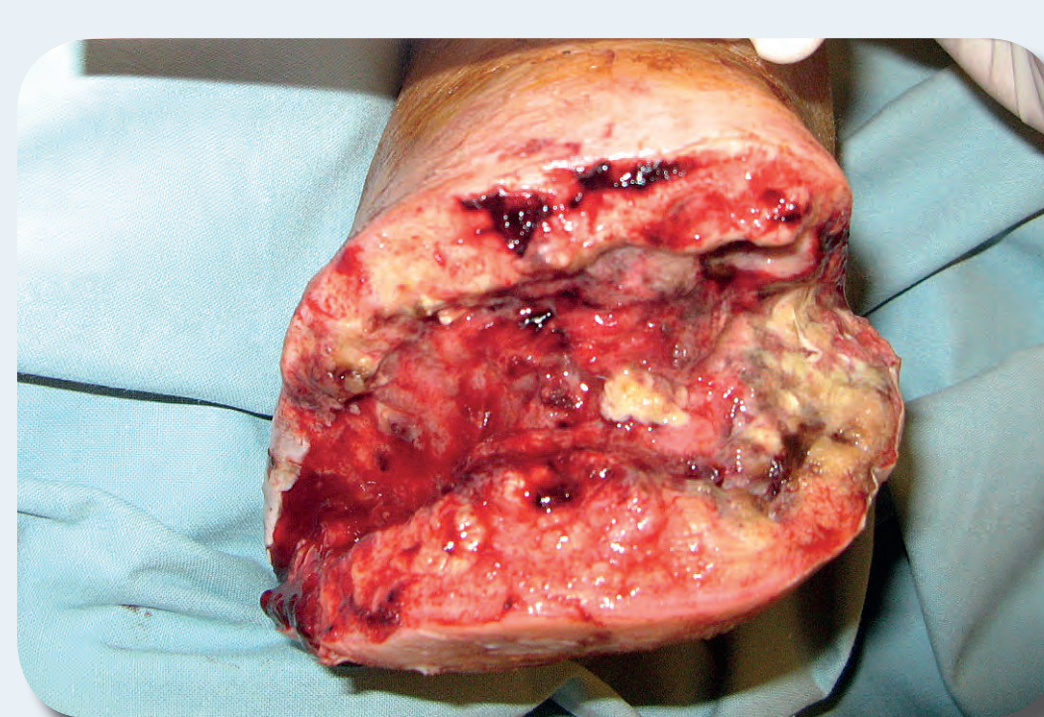
X-ray showed partially osseous destruction. TcpO₂ (transcutaneous oxygen pressure) measurement on the right forefoot was 13/35 mm Hg indicating chronic ischemia (normal > 60 mm Hg).



Day 1

Borderline amputation of toe 1-3. Angiography day 10 showed that no further vascular intervention was possible, initiated prostanoid infusions for 24 days.

Day 12 a Transmetatarsal amputation of forefoot was performed with primary wound closure.



Day 17

The wound was opened and debrided due to bacterial infection. Local treatment with polymeric membrane silver cavity dressings.

Day 24 changed to NPWT in order to speed up the healing, however the wound started to stagnate due to recurrent pseudomonas infections.



← Day 41

Day 41 we decided to combine polymeric membrane silver cavity dressings to the NPWT treatment.

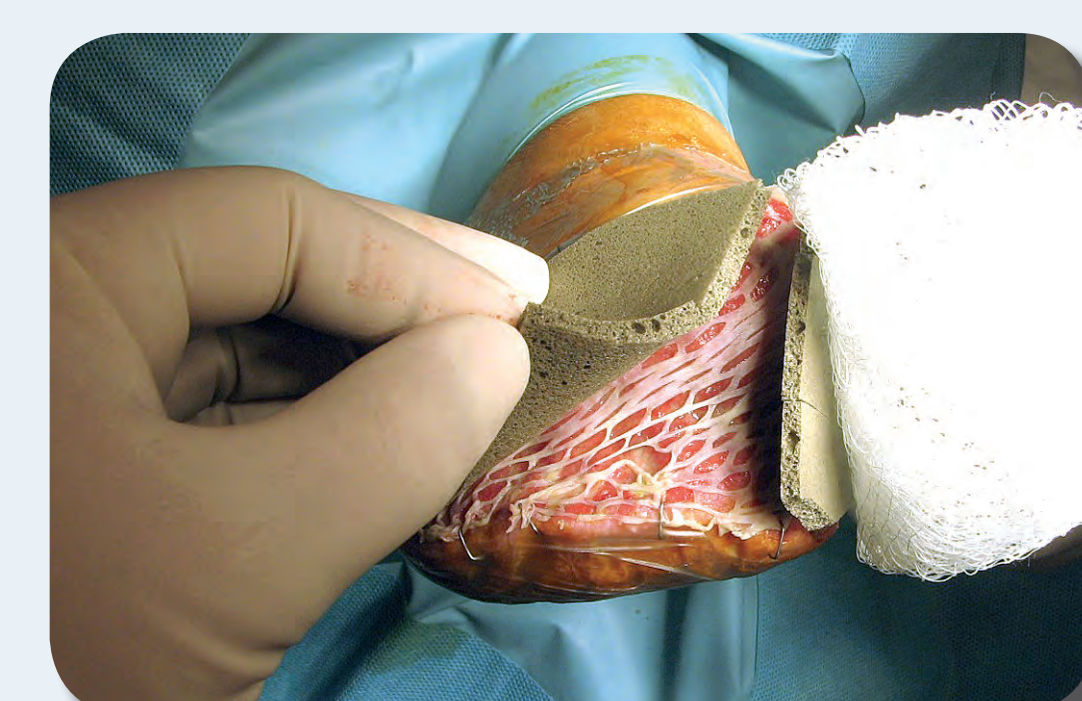
Day 44 →

Dramatic improvement of the wound so we continued with this combination for 2 weeks.

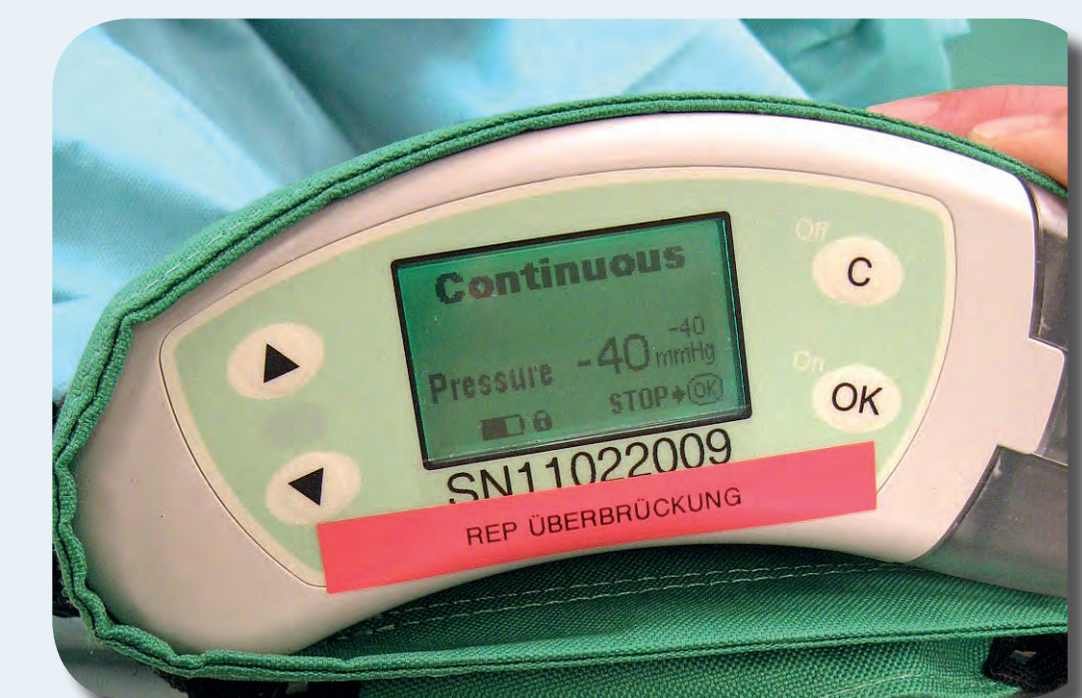


Day 59

After two weeks of PMSD combined with NPWT the wound surface was ready to be covered by a mesh graft. The mesh graft was covered by polymeric membrane silver cavity dressings.



By using PMSD as the primary wound contact layer and combining them with reduced negative pressure (40 mm Hg) to cover the mesh graft we achieved an ideal modelling of the mesh graft to the wound bed. With the combination with the antimicrobial PMSD the dressings could be left on the graft for 4 to 5 days. After this time period the mesh graft was fully integrated to the wound bed.



Day 4 after mesh graft



Day 8 after mesh graft



Control after 6 weeks showed a widely epithelialized wound. Due to his critical ischaemia it will probably take a few months before the wound has totally closed. In the meantime, the patient is no longer experiencing any pain and is able to walk with only minor limitations.

References

1. Diabetes Mellitus in Europe: a problem at all ages in all countries, a model for Prevention and Self Care: a report of a meeting organised by WHO and IDF Europe in St Vincent (Aosta), Italy, October 1989. G Ital Diabetol 1990;10(Suppl):1-143.
2. Apelqvist J, Armstrong DG, Lavery LA, Boulton AJ. Resource utilization and economic cost of care based on a randomized trial of vacuum-assisted closure therapy in the treatment of diabetic foot wounds. The American Journal of Surgery 2008; 195(6):782-8.
3. Schintler M.V., Prandl E.C. Vacuum assisted closure – what is evidence based. Eur Surg. 2008; 40(1): 11-18.
4. Lawall H., Huber R., Storck M., Diehm C. Stellenwert der Prostaglandine in der Behandlung der peripheren arteriellen Verschlusskrankheit (PAVK). Gefäßchirurgie 2008; 13(3): 164-170.

*PolyMem® WIC Cavity Dressings with and without Silver. Manufactured by Ferris Mfg. 5133 Northeast Parkway, Fort Worth, TX 76106, USA. This case study was unsponsored.