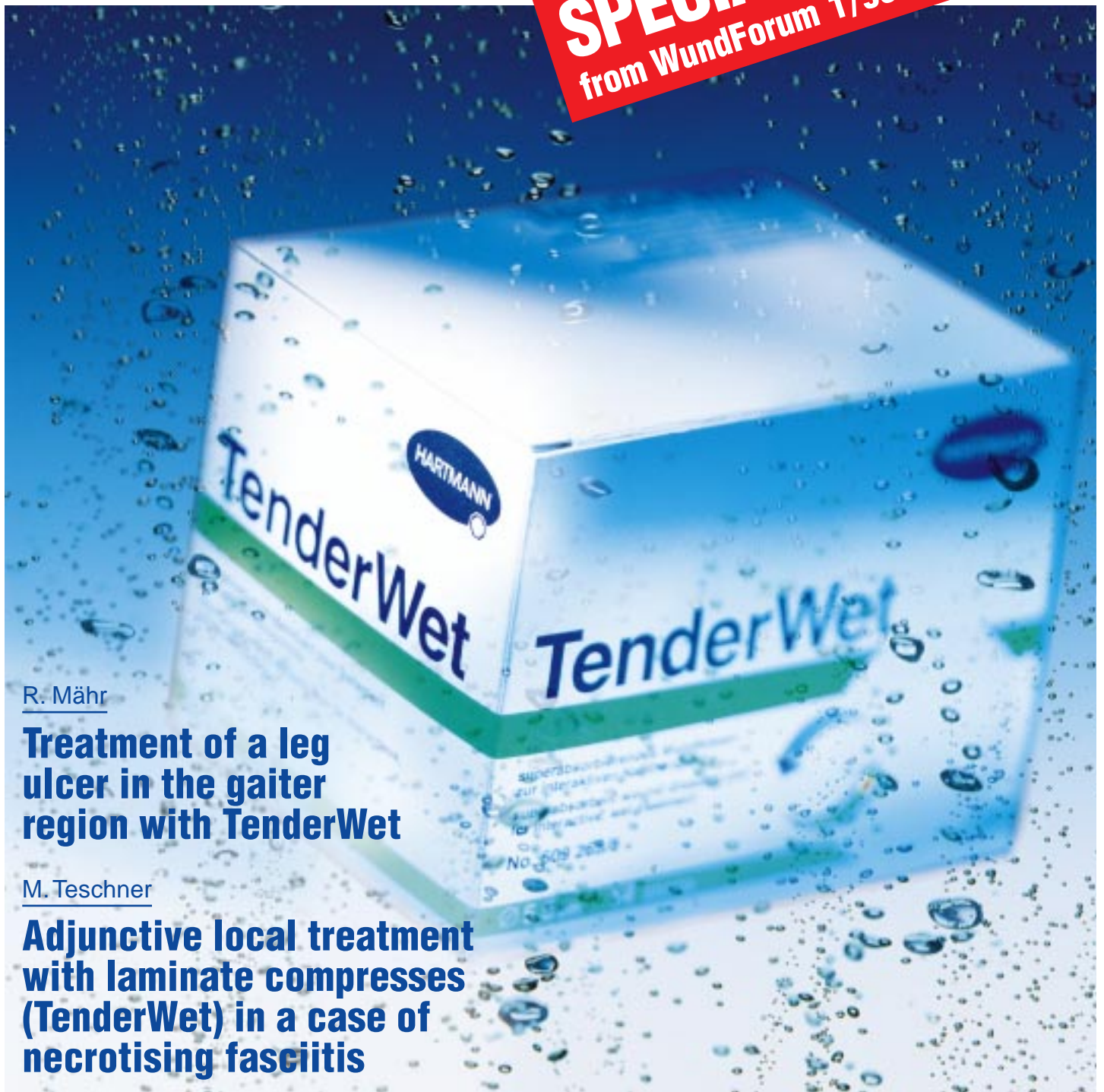


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ulcer in the gaiter  
region with TenderWet**

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**Adjunctive local treatment  
with laminate compresses  
(TenderWet) in a case of  
necrotising fasciitis**

# Treatment of a leg ulcer in the gaiter region with TenderWet

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The venous leg ulcer represents the most serious manifestation of chronic venous insufficiency; this term is used to describe a chronic impairment which sums up all advanced disease conditions that result from the disturbances of the venous blood flow within the lower extremity.

Therapeutically, the venous leg ulcer is often a *crux medicorum* with frequent relapses and requires lengthy courses of treatment. Ulcers are often present over several years. We present the case of an 87-year-old patient who had been suffering from an ulcer of the gaiter region for 35 (!) years. Under wet therapy with TenderWet, healing had been achieved within eleven months. It should be emphasized that the extremely unfavourable circumstances led in no way to expect the healing of the wound.

The patient was in a diminished general state of health, which increasingly worsened during the treatment because of her advanced age. She died shortly after healing of the ulcer had occurred.

Causal therapy in order to obtain a possible improvement of the venous blood flow was wholly inconceivable. The patient did not tolerate compression bandaging – which would also have been of little therapeutic use, given the degree of the patient's infirmity.

## CASE REPORT

The patient was admitted to the geriatric clinic in order to relieve her daughter who was suffering from MS. Beforehand, the patient had been taken care of at home by her daughter, in co-operation with the district nurses. Because of the manifestation of a progressive dementia over the last weeks, partially with paranoid ideas, the care

for the patient at home became increasingly difficult. The patient herself did not realise why she needed to be admitted to the hospital. An extensive chronic venous ulcer had been present at her left lower leg for approximately 35 years. It had, in general, never caused her pain.

The patient had a known extrapyramidal impairment of her movements which greatly affected her mobility. At home, she used to rely on the use of a stool which gave her a small degree of mobility and allowed her to move, her body bowed forward, over the stool. For some time, she had been known to be anaemic. Her family doctor found moderately low vitamin B<sub>12</sub> levels for which she had received a Vitarubin injection every three months, most recently on 07.09.94; she also intermittently received iron supplements.

Drugs on admission: Vitarubin i.m. every three months, Artane 2 mg 1-0-0 (for treatment of extrapyramidal impairment of movement), Tiatral 600 mg 1/2-0-0.

## Diagnosis/ initial findings

Dementia, probably of the Alzheimer's type; iron deficiency anaemia, arterial hypertension, coronary and suspected valvular cardiac disease (systolic bruit over the aortic valve / mitral valve), biventricular heart failure, suspected Parkinson's disease (rigor / cogwheel phenomenon), bilateral cataract, state after amaurosis fugax on the left (after treatment with Tiatral), stress incontinence, presbycusis, exanthema after Distraneurin, acute bronchitis.

Chronic venous insufficiency of degree III on the left leg, with extensive ulcer in the region of the entire lower leg, doughy, partly solid oedema extending to the dorsum of the foot. Flexion/exten-

sion of the left foot fixed at 90 degrees. On the right leg, presence of a coarse oedema of the lower leg and foot with varicosis of trunk and branches.

According to the initial findings (here only listed with respect to the ulcer), the general treatment endeavoured to bring about a stabilization of the patient's general state of health and / or to induce some improvement.

## Ulcer treatment

Before her admission to hospital, the extensive ulcer at the left lower leg had already been treated for several months with TenderWet compresses in the context of a clinical trial.

TenderWet is a multilayered, cushion-shaped wound dressing which contains superabsorbent polyacrylate as a constituent part of its absorbent core. Before its application, the superabsorber is saturated and activated with Ringer's solution of a given volume (depending on the size of the dressing) which is subsequently continuously delivered to the wound over a certain length of time.

Simultaneously, the wound exudate, containing germs and debris, is taken up into the absorbent core where it is safely retained. This exchange occurs because the superabsorbent has a higher affinity for protein-containing solutions than for saline solutions. Hence the wound exudate displaces the Ringer's solution from the wound dressing.

Through this principle of action, TenderWet achieves a careful and thorough wound cleansing. Moreover, wound care is enhanced by the permanently moist wound environment, with formation of granulation tissue and epithelialisation. Formation of granulation tissue and beginning epithelialisation are easily recognised on the photographs included in this case report.

The dressing was changed twice daily, in the morning and in the evening, whereby the compresses were secured through light compression, using cotton crepe bandages. Neither disinfectants nor other "substances promoting wound healing" were applied.

Moist therapy with TenderWet was strictly continued with the same dressing change schedule also during her time in hospital, and a further clear improvement of the wound condition could be observed.



**Classical ulcer of the gaiter region in a 87-year-old patient. The ulcer was present for more than 35 years.**

**Fig. 1**  
State at the beginning of treatment with the TenderWet moist therapy at home on 09.06.94.

Causal therapy, such as compression of the leg, was no longer possible because of the patient's general condition.

**Fig. 2 / 3**  
Clearly visible, increasing improvement of the wound condition with beginning epithelialisation.

**Fig. 4**  
State of the leg on 23.05.95; the ulcer has healed. Even if it must be assumed that the wound closure would have been unstable over a long period, the healing of the wound, achieved only through the local wound treatment with TenderWet, must be seen as remarkable in the specific situation of this patient.

Her stay in hospital lasted from 08.09.94 to 17.11.94, on which date the patient, who was by then in a good general condition, was transferred to a nursing home. At the home, the original wound treatment with TenderWet was continued under adequate control until complete wound closure had occurred. The patient died on 19.07.95.

## CONCLUSION

Moist therapy with TenderWet also proved successful in this case of an ulcer in the gaiter region, which had affected the patient for more than three decades. Because of the patient's specific condition, her treatment could only

be palliative. Since there was no possibility of a causal therapeutical approach, the question remains whether a relapse would not have sooner or later occurred. However, the effort to induce healing of the ulcer without burdensome treatment, represented an event which, despite her dementia, the patient experienced at least partially as positive.

## SUMMARY

### Venous leg ulcer therapy with TenderWet

A leg ulcer existing for about 35 years which completely healed upon treatment with the new wound dressing TenderWet. This remarkable therapeu-

tic result can essentially be regarded as being due to the wound dressing, since the patient's general condition excluded additional causal therapy. Wet therapy with TenderWet generates a permanently moist wound environment that continuously sustains thorough wound cleansing and, at the same time, favours the formation of granulation tissue and epithelialisation of the wound.

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# Adjunctive local treatment with laminate compresses (TenderWet) in a case of necrotising fasciitis

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## INTRODUCTION

As a rare form of epifascial soft tissue infection, the necrotising fasciitis has been known for more than 100 years and is today still feared because of its high lethality due to sepsis. Characteristic is a fast, at times dramatic, evolution with necrotic colliquation of the skin and the subcutaneous tissue, with propagation to shallow and deeper fascias, leaving the muscular tissue unaffected.

The term "necrotising fasciitis", introduced by Wilson in 1952 and preferred nowadays, is based on the observation that, in contrast to the necrosis of the fascia, the occurrence of gangrene of the skin is only inconstant. The spreading of germs associated with the body, and an inflammation in the sense of an auto-immune reaction, are thought to be aetiologically relevant. As to the pathogenesis, a multifactorial process is reported, in which increased tissue pressure, vascular thrombosis and bacterial toxins work synergistically. It is not known why first of all the fascias are affected.

In many cases, a minor injury or a surgical intervention such as an appendectomy or an inguinal hernia operation precede the disease. Predisposing factors and/or risk factors are diabetes, arteriosclerosis, obesity, lymphoma, chronic alcoholism, more than 50 years of age, and drug addiction.

Usually, no typical germ is found responsible for the necrotising fasciitis. Microbiological analysis predominantly reveals  $\beta$ -haemolytic streptococci of group A (*Streptococcus pyogenes*), which favour the soft tissue necrosis

through production of hyaluronidase and lipase, but also staphylococci, other streptococci, *E. coli*, clostridia and *Pseudomonas aeruginosa*. Blastomycetes have also been isolated. It is not uncommon to find several germs. However, it is not possible to prove the presence of germs in every affected patient. Also, the portal of entry is not always found.

According to the literature, the inflammation of the epifascial tissue has been seen more frequently in recent years. The increased virulence of the triggering and synergistically acting bacteria lies obviously at the base of this higher incidence. Even today, the mortality of this illness is higher than 20%. Essential for the therapeutic procedure and the prognosis are an early diagnosis, immediate radical surgical therapy and systemic antibiotic medication, which is started immediately after bacteriological sampling, using high doses of a broad spectrum antibiotic. This is to be continued according to the screening results for resistance, i.e. as soon as possible after receipt of the antibiogram.

Local treatment is additionally applied, whereby the wound care decisively contributes to the healing process. The use of differentiated local treatment by means of laminate moist therapy (TenderWet) is demonstrated with the example of a patient with necrotising fasciitis which spread from the right lower leg. This treatment was given alongside the surgical intervention and the administration of antibiotic medication.

## CASE REPORT

Hospital admission of the 62-year-old obese patient (height 158 cm, weight 86 kg) for treatment of an ulcer of the right lower leg. The ulcer gained rapidly in size over a period of 2 weeks. An ambulatory local antiseptic treatment using an iodine preparation had led to no improvement of the wound condition and the worsening pain. The patient had a history of varicosis lasting over many years.

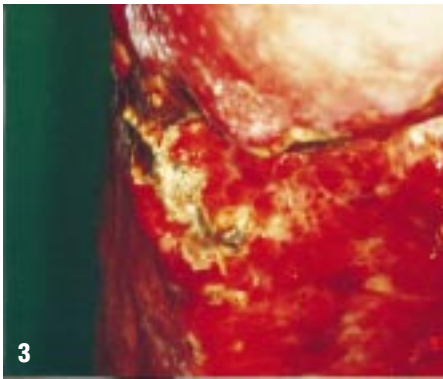
The initial examination on admission to hospital revealed a distinctive varicosis of the trunk and the branches of the right long saphenous vein with incompetence of the Cockett perforating veins of groups I, II and III. The medial aspect of the distal third of the lower leg was affected by an ulcer of a diameter of about 3 cm with a greasy coat and considerable perifocal inflammatory reaction. The defect had reached the muscular fascia. Increased pigmentation of the adjacent skin and atrophic changes within a bordering area of a width of approximately 5 cm were found. The blood circulation of the right leg was not impaired; the arteria dorsalis pedis and the arteria tibialis posterior were palpable. Onychomycosis was present at the big toe. Examination of microbiological swabs taken from the depth of the ulcer revealed the presence of *Staphylococcus aureus* and *Proteus mirabilis*.

## TREATMENT AND CLINICAL PROGRESS

2 months after the treatment had been started and after giving local wound care to the venous ulcer by means of débridement of necrotic tissue and enzymatic wound cleansing, a split skin graft could be applied to a by now well granulated wound bed. Meanwhile, the incompetence of the perforating veins had also phlebographically been documented.

Since the local condition and the pain made a satisfactory compression therapy impossible, it was decided to proceed to a ligation of the perforating veins. The operation was carried out 4 months after the wound treatment had begun.

Within a post-operative period of 8 days, a dramatic destruction of the skin and the subcutaneous tissue occurred, with the formation of a circular necrosis that highly endangered the right leg. Clinically, there was fever of 39 °Celsius.



**Fig. 1–3**  
62-year-old patient with  
necrotising fasciitis of the  
right lower leg, 2 weeks af-  
ter radical surgical débride-  
ment; well granulating  
wound; island-shaped  
necroses, undermining of  
the proximal edge of the  
wound (close-up Fig. 3).

us, laboratory tests showed leukocytosis with 17,000 leukocytes/ $\mu\text{l}$ , and also anaemia with a haemoglobin content around 9 g/dl. No antibodies against mitochondria and smooth muscle tissue could be detected. Bacteriological tests continuously found *Staphylococcus aureus* and *Proteus mirabilis*. No air was seen on radiological examination of the lower leg. Histological examination revealed an acute inflammation with granulocytes; and also necrosis of the epidermis, the entire dermis, and the fascia. 9 days after ligation of the perforating veins, an extensive necrosectomy became necessary, which led to a very huge loss of skin and subcutaneous tissue in the region of the right lower leg. Cephazolin was intravenously administered for antibiotherapy. Locally, the wounds were treated with TenderWet compresses, and the dressings were changed twice daily. The patient tolerated the change of the laminate compresses without experiencing any pain. The signs of inflammation subsided completely within a period of 4 days. The repeated débridement of

necrotic areas became subsequently necessary (Fig. 1 to 3 show the findings 2 weeks after necrosectomy and local wound care through application of laminate compresses). Already 4 weeks after primary necrosectomy, satisfactory granulation of the wound bed allowed the plastic closure of the defect by means of mesh grafts taken from the thighs. The transplanted skin grafts healed without complication (Fig. 4 to 6).

#### DISCUSSION

The diagnosis of necrotising fasciitis is primarily a clinical one. The immediate surgical and antibiotic intervention is decisive for the prognosis of this potentially life-threatening illness. Differential diagnostic considerations must include especially the erysipelas (with obligatory lymphangitis and lymphadenitis; fever; small lesions without dramatic propagation; no necrotising changes); the gas gangrene (deep and extensive injury affecting also the muscular tissue; with intramuscular and subcutaneous air inclusions; crepi-

tation; proof of the presence of clostridia); Meleney's ulcer (generally the result of a combined infection due to streptococci and staphylococci; slow evolution; few local necroses; low systemic toxicity); purpura fulminans (consequence of a systemic intravascular coagulopathy; cultures for bacterial agents are negative); and progressive post-operative wound infection. For the healing process of the often extensive wound areas after radical surgical débridement, often including frequently repeated necrosectomy (as in our patient), the adjunctive local treatment is, together with the antibiotic therapy, of greatest importance. Two factors hereby determine the outcome:

1. The undisturbed secondary healing with remission of the inflammatory changes; in most cases a primary wound healing cannot be attained because of the extent of the wound. The regression of the inflammation depends not only on the surgical removal of necrotic cell detritus as a bacterial culture medium, but also on other aspects of local treatment, not at least because of the fact that the intravenously administered antibiotics often reach only low local tissue concentrations, because of insufficient arterial wound perfusion as part of the ischaemic reactions in necrotising fasciitis, and possibly because of pre-existing arterial occlusive disease. Rather than eliminating locally the germs in the wound itself, the real purpose of the antibiotic therapy is primarily the prevention of bacteraemia and septic complications, as well as limiting the possible concomitant infection of the better perfused perifocal skin and subcutaneous tissues. Topical wound care plays, insofar, a co-determining role in the therapy of wound infection. Relevant thereby is the remission of the manifest wound inflammation, which must not be obtained through radical eradication of the local germ flora, but through the reduction of the number or elimination of pathogenic germs. The conversion of pathogenic into non-pathogenic bacteria is permissible; even highly dosed local antiseptics cannot, as a rule, avoid bacterial colonisation after a lengthy process of wound healing. It is against this background that the local treatment must be carefully chosen, particularly because the potent antimicrobial effect of a local antiseptic or



**Fig. 4–6**  
**Closure by plastic surgery**  
**(mesh graft) 4 weeks after**  
**extensive necrosectomy.**

The fluid (Ringer's solution) stored in the compresses, is continuously released onto the wound. Large volumes of wound exudate are taken up in exchange. Cleansing action, through permanent fluid delivery on the one hand, and absorption of toxins, cell detritus and germs on the other hand, further the restoration of the physiological healing process and render possible the redistribution of macrophages, monocytes and lymphocytes within the wound.

This principle of combining moist therapy with simultaneous absorption has proven its effectiveness in our patient; after rapid initial progression of the necrotising changes of the lower leg as part of the underlying illness, the destructive process could be brought to a halt. After repeated preparation of the wound bed with the help of TenderWet compresses, the secondary plastic closure of the wound was successfully achieved.

#### SUMMARY

The example of a 62-year-old patient serves to illustrate the rare clinical picture of necrotising fasciitis. It appeared after surgery for incompetent perforating veins. The early surgical intervention, necrosectomy and antibiotic medication, are decisive for the prognosis of this infectious disease which is often life-threatening and takes a dramatic course with facultative degradation of the skin and the subcutaneous tissue, as well as obligatory necrosis of the muscular fascias. In order to prevent wound infections or to reduce their frequency, and to prepare the wound bed, local wound treatment is often decisively involved in the most extensive wounds. In the case presented here, wound care proceeded entirely without disturbance, helped by the use of laminate compresses (TenderWet) as a novel form of combined moist and absorbent therapy and rendered possible the early plastic closure with a mesh graft.

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anti-infective agent can be accompanied by serious side-effects. The inhibition of wound healing, allergic reactions and the occurrence of bacterial resistance are well known examples.

2. The preparation of the wound bed for secondary closure by plastic surgery requires the wound bed to be free from infection and to possess a proliferating granulation. Bacterial contamination – not infection – is in itself no problem for this pre-operative preparation, since it leads neither to systemic septic complications, nor to impaired wound healing.

In our patient, the use of laminate compresses (TenderWet) has proved helpful to wound care as an adjunctive treatment with the repeated surgical necrosectomy. The chemically inert and non-medicated compresses con-

tain a synthetic superabsorbent in the form of a multilayer laminate of interlinked polyacrylates which is enveloped in a knitted polypropylene fabric. In contrast to sponges or other tissues, the superabsorbent polymers do not release their liquid content under mechanical pressure. In this way, a stable mass forms, the main constituent part of which is a fluid. The escape of this fluid is prevented by the presence of the macromolecular matrix. Due to their high absorbency, superabsorbent polymers can take up several times their net weight in the form of fluid. The biological principle of action of what is termed bioactive moist therapy is based on a combination of the traditional, well known wet therapy, with the possibility of making simultaneously available the absorption of exudate.