



## Study about the Application of LIGASANO® white as a Primary Wound Dressing at Diabetic Feet

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The diabetic foot syndrome undoubtedly belongs to the most grave complications of diabetes: a high rate of amputations, high cost for the health insurance and increased extra pays for the persons concerned, long stay in hospitals, loss of working hours and/or early invalidism, to be dependend on outside help, immobility, restricted participation on social life, frustration, despair – this all we associate with the problem “diabetic foot” for the present. As a result of published experience of diabetic-foot-ambulances in the USA, in England and Scandinavia, there is rethinking also in Germany.

It skows that interdisciplinary care concepts, structured diagnosis and therapy, as well as “lifelong foot care” in the case of high risk patients can improve the situation, described at the beginning, significantly. On the one hand it is important to throw overboard obsolete doctrines and clichés (“diabetic feet don’t heal or only heal badly, therefore amputating them rather high”) as well as unsighted, expensive(!) polypragmatis of local wound healing and inadequate orthopedical shoe technique.

On the other hand you have to seek for effective, biologically well tolerated and economy-priced wound dressings at the same time for treating as much patients as possible without cost pressure. The following contribution deals in a broad sense with the wound treatment at patients with diabetic foot lesions and in a narrow sense with the application of LIGASANO® foam in wounds and

wound healing impairments respectively, of the above mentioned patients.

### 1. Patients and Methods:

In the period from March 1998 until January 2000 we have treated 15 patients (12 male, 3 female) with an average age of 54 years. Listed were:

- kind of lesion: wound healing impairment after amputation/resection, ulcera of the heels, malum perforans, wounds after sequestrum cut by diabetic neuro-osteo-arthropathy (= DNOAP, syn. Charcot’s syndrome)
- extend of the wound (WAGNER stage and wound phase)
- classification according to ARLT (A=pAVK, B=Polyneuropathy, C=A+B=Mischtyp)
- duration of the wound
- methods of preliminary treatment

- days of hospital stay during preliminary treatment
- proceeded amputations on the same or contralaterale leg
- days of hospital stay during the current treatment
- methods of the current treatment
- number of the ambulante consultations
- duration of healing under the current therapy
- dressing change

Apart from tabular charts there were made detailed case descriptions with photo documentations about every treated patient.

### 2. Results and Summary:

The results (tab.) speak for themselves. Details about deficiency in work are not necessary, because all patients are pensioners or invalides.

#### Dates of Patiens / Case History

Number of patient:	15
Age of the patients:	Average age 54 years (41 - 69)
Sex of the patiens:	12 male, 3 female
Diabetes diagnosed since:	average 17 years
Amputations before starting the treatment:	3 patients with amp. of the lower leg 9 patients with amp. of the toes
Further planned amputations:	at 6 patients the lower leg
Duration of treatment before:	Average 300 days (0 - 1095)
Days thereof stationary:	Average 74 days (0 - 270)
Result of the treatment:	No wound healing
Estimated cost of treatment:	
Average outpatient	226 days at 30 € = 6.780,-- €
Average inpatient	74 days at 270 € = 19.980,-- €
Average total	26.760,-- €

#### Treatment by Dr. Zemlin with LIGASANO® white

Duration of treatment:	Average 90 days (18 - 450)
Days thereof stationary:	0 days
Realised/necessary amputations:	None!
Result of the treatment:	Wound healing
Estimated cost of treatment:	
Average outpatient:	90 days at 30 € = 2.700,-- €
Average inpatient:	0 days at 270 € = 0,-- €
Average total:	2.700,-- €

I have used LIGASANO® white polyester foam since already 1994 for wound treatment. The material was first introduced to me by Mr. Rettig, a nurse and enthusiastic wound therapist from Lüchow-Dannenberg (Germany). Little by little I have recognised and appreciated the multi-purpose possibilities of LIGASANO®. It has excellent qualities as padding material over regions with a high pressure load (heels, edges of feet, plantar at malum perforans, interdigital, toe-tips) and is very helpful for the soft debridement. In doing so LIGASANO® white is soaked with Ringer's solution and then the wound will be cleansed. Due to the high frictional resistance of LIGASANO® white, necrotic layers and detritus of cells are removed from the wound gently. The debridement with a sterile toothbrush, as recommended in some literature, is superfluous.

We use LIGASANO® white as a primary wound dressing for about two years and were surprised of its stimulating effects in secretion and granulation! And precisely in deep wounds LIGASANO® white is obviously superior to alginates and hydrocolloids, above all as a result of its additional capillary effect.

For the application of LIGASANO® white in deep wounds we cut the material in various sizes and shrink-wrap it. Subsequently the stripes are going to be sterilised by steam and distributed for the home care. If the dressing is not changed by nursing staff but by the patient or his relatives, we prescribe sterile one-way tweezers.

Finally we use LIGASANO® white also as a secondary wound dressing for padding over every wound dressing, as it is the uppermost layer, because a soft drainage pressure and warmth is also necessary for wound cleaning. For this purpose LIGASANO® bandages are best qualified for.

Beside the above mentioned multi-purpose application possibilities of LIGASANO® the comparatively low cost of this material are a further great advantage! For this reason LIGASANO® white belongs to our foot ambulance as an unrenounceable part of dressings.

## Case Descriptions

### Case 1

58 years old, female, type 2 diabetes mellitus, duration of 22 years, dialysis since 1994 because of diabetic nephropathy, laser coagulated retinopathy, insulin therapy 3x normal at night NPH insulin, coronary heart disease, cardiac dysrhythmia.

1992 resection of the 2<sup>nd</sup> left metatarsal bone because of a perforating ulcer of the foot; at that time this is healed completely. At 1998/05/05 first visit in our ambulance by reason of a 26 month old recurrent perforating ulcer of the right foot with projection to the 3<sup>rd</sup> metatarsal bone. Hitherto hospital stay 81 days without drastic improvement. No decompression measures took place. The amputation of the lower leg was advised.

#### Local pre-therapy:

Ointment containing chlorophyll, irrigation with H<sub>2</sub>O<sub>2</sub> solution and hypertonic NaCl solution, antiseptic gauze. Change of dressing two times daily by nursing service, referral by the dialysis practice.

#### Actual findings at 1998/05/05:

Distinct prominence of the forefoot, plantar, bilateral, claw toes, arterial pulses strong, dry and scaly skin, hypaesthesia, sensibility for temperature and pain lapsed, no provocation of patellar and achilles reflex; indolent ulcer, plantar, 1.6 x 1.1cm with a depth of 2cm; The exploring forceps breaks into crumbled structures.



Fig. 1.1.: Findings at 1998/05/05

Resection of bone and cartilage debris with a bone curette and Luer's bone nibblers, irrigation with Oxoferin®, inlay with a sterile LIGASANO® white pack, cut to fit, which is changed once daily and soaked with Ringer's solution, and

over this a mull dressing. Because fixative bandages are not tolerated by the patient, we fix the dressing with hypoallergenic plaster.

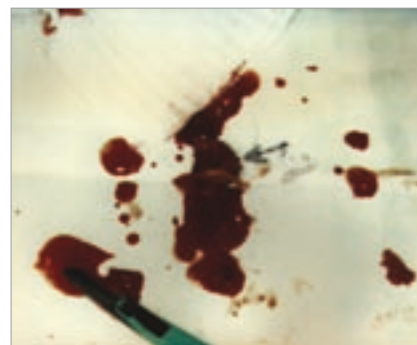


Fig. 1.2.: Resection of bone and cartilage debris

Adequate instruction of the very cooperative patient, which on her part informs the nursing service. We provide her with sterile LIGASANO® white packs (cut to fit, sterilised with steam and heat-sealed in our ambulance). Decompression: decompressive bandage shoe. During wound inspection at 1998/05/14 measurement for orthopaedic foot wear. Already in 1998/07/07 remains only a very plain wound.



Fig. 1.3.: Control of the wound at 1998/07/07

Closure since 1998/08/10. Until the complete healing 7 ambulant consultations. Supply with orthopaedic boots.



Fig. 1.4.: August 1998

In September 1999 recurrence at the left foot, state after passing of a sequester. With Luer's bone nibblers and a bone curette the same procedure takes place as in May 1998 at the right foot.



Fig. 1.5.: 1999/09/25

Wound inspection at 1999/11/04, the wound is highly granulated, the transition in the epithelisation phase is visible. The patient died in December 1999 from acute cardiac failure.

### Case 2

61 years old, male, type 2 diabetes mellitus, duration of 25 years, insulin therapy since only one year with 3x normal and NPH insulin at night. 1993 amputation of the 1<sup>st</sup> and 2<sup>nd</sup> left toe because of infection. In February 1999, 13 days of stay in a hospital for internal disease, 12 days surgery, metatarsectomy of parts of the 3<sup>rd</sup> and 4<sup>th</sup> metatarsal bone by reason of diabetic neuropathic osteo-arthropathy with destruction of the metatarsophalangeal articulation joints and sequestration. Referral to our ambulance because of open wounds plantar and dorsal for further therapy.

#### Local pre-therapy:

Until metatarsectomy with urea ointment and irrigation with Ringer's solution.

#### Actual findings at 1999/03/18:

Plantar a residual wound in the granulation phase, 1.3 x 2.4cm; dorsal a plane lesion, 1.2 x 0.7cm in granulation phase. Both lesions stage 1 according to WAGNER. The left foot is heavy deformed and overwarmed, the medial border of the foot is prominent. The X-ray pictures show additionally a fracture of the 5<sup>th</sup> metatarsal bone. The diabetic neuropathic osteo-arthropathy is type 1 according to SANDERS. Classical symptoms of polyneuropathy, no indication for arterial occlusive disease, onychomycotic nails. Because of instability of the foot we manufactured a neuropathy-adapted cast, made of polyurethane up to the knee. This cast could be removed at night and for dressing change.



Fig. 2.1.: 1999/03/18 plantar



Fig. 2.2.: 1999/03/18 dorsal, state after 2/3 metatarsectomy

The local treatment is carried out with sterile stripes made of LIGASANO® white, the application is made by the patient himself. In the meantime it amounts once more to sequestration medial. The lesion, developed from this, heals after 7 days of wound treatment with LIGASANO® white.



Fig. 2.3.: 1999/05/21 healing plantar



Fig. 2.4.: 1999/05/21 healing dorsal

### Case 3

59 years old, male, type 2 diabetes mellitus, known since 11 years, therapy with insulin since one year; coronary heart disease. State after myocardial infarct in June 1998;

adrenal insufficiency in need for substitution, heavy nicotineism. Amputation of the left lower leg (injury in his youth); amputation of the right hallux in 1988; amputation of the 2<sup>nd</sup> right toe in November 1998, since then wound healing disorder. The amputation of the contralateral leg is advised, because revascularisation is impossible. First visit in our ambulance at 1999/02/24.

#### Local pre-therapy:

Ointment containing povidone-jodine, footbathes

#### Actual findings at 1999/02/24:

Non-painful lesion in the amputation area of the 2<sup>nd</sup> right toe. The exploring forceps hits after 1.5cm on bones (WAGNER 2, type C according to ARLT). Furthermore plane ulcers at the medial foot border and the heel, necrotic coatings. Foot pulses: A popl. good echogenic, A dors. ped. poor, Doppler pressure 100mmHg at systemic pressure of 140 Torr systolic, thereby warm and dry feet. Additionally symptoms of polyneuropathy (sensitivity for temperature and pain lapsed, no ischaemia pain despite significant arterial disease). Shoe supply calamitous (too narrow, too short, hard toe caps).



Fig 3.1.: 1999/02/24 lesion in the amputation area



Fig. 3.2.: 1999/02/24 ulcers on heel and medial foot border

Refresh of the wounds and excision of the necrosis with the scalpel, in the resection area daily change of the sterile LIGASANO® white stripes, soaked with Ringer's solution. At the medial foot border application of LIGASANO® white and a dressing with activated carbon and silver in turn, because we have made good experiences with it in patients with arterial occlusive disease. Additionally we apply a bandage of LIGASANO® white (5cm in width) for padding over the primary dressing. Furthermore the patient received a temporary shoe supply and after the complete healing adapted orthopaedic shoes.



Fig. 3.3.: 1999/04/24



Fig 3.4.: 1999/05/18

At 1999/04/24 the wound in the amputation area is nearly and at 1999/05/18 completely closed. The wounds at the heel and the foot border are completely closed at 1999/09/24. A control at 2000/06/08 shows no recurrence.

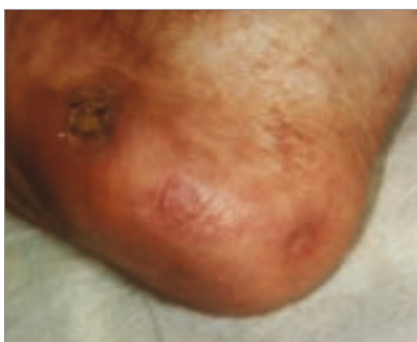


Fig. 3.5.: 1999/08/04

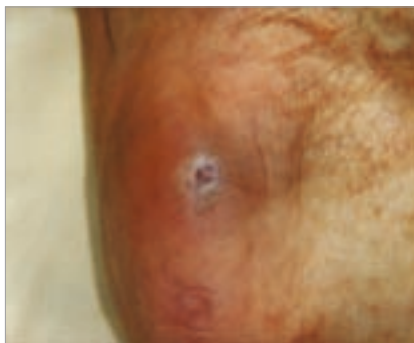


Fig. 3.6.: 1999/09/24

#### Case 4

52 years old, male, type 1 diabetes mellitus with a duration of 27 years. Proliferative retinopathy, state after cryocoagulation and vitrectomy bilateral; insulin 3x normal, NPH insulin in the morning and in the evening. Multiple hospital stays because of recurrent lesions of the feet for at least 60 weeks between 1988 and 1998. Amputation of four toes of every foot, only the great toes are preserved. Extensive diabetic neuropathic osteo-arthritis, which was misjudged for years and it was not taken in consideration concerning orthopaedic shoes, the patient get open lesions of the feet again and again. Most of the previous operations took place from plantar and because of this stress for the sole of the foot by multiple scars.

#### Local pre-therapy:

Footbathes with chamomile and Rivanol, Betaisodona gauze and dry compresses respectively.

#### Actual findings at 1998/09/30:

First visit with two deep lesions at the right foot latero-plantar after sequestration. At this time a retinal haemorrhage with imminent loss of sight occurs. The admission in a specialised hospital for sequestrectomy at the right foot we put back, because an immediate cryocoagulation of both eyes had priority. Excision of porotic bone



Bild 4.1.: 30.09.1998

material with Luer's bone nippers and bone curette. Systemic antibioticosis with 3x300mg clindamycin for several weeks. Daily tamponading with LIGASANO® white, soaked with Ringer's solution, and on it gauze compresses and LIGASANO® white for padding. Immobilisation to a large extend, only the going on the heels is allowed.

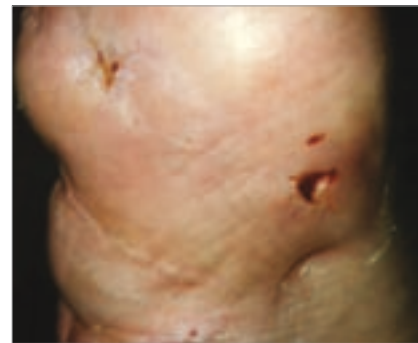


Fig 4.2.: 1998/12/18: small superficial bleeding after resection of a callus

#### Monitoring visit in our ambulance at 1999/12/18:

The wound is completely healed.

#### Case 5

50 years old, male, type 2 diabetes mellitus, duration 22 years. Ulcer of the right heel since September 1998, diabetic retinopathy, coronar heart disease, state after aortocoronary bypass, wound state 2 according to WAGNER, classification ARLT C. Insulin therapy 3x normal insulin; early, noontime and late NPH insulin.

#### Local pre-therapy:

With several ointments, powder and sodium borate, under it progredient deterioration. 67 days of hospital stay because of the ulcer.

#### Actual findings at 1998/12/17:

At the first visit in our ambulance the patient had an ulcer of the right heel with a dimension of 20x25mm and a depth of 15mm, phlogistic reaction of the environmental tissue and smeary coatings. Bacterial smear of the wound: streptococcus G1, pseudomonas species. Warm feet, anhidrosis, pulses of the feet poorly palpable, indolent lesion. By reason of the extend findings and the arterial occlusive disease, hospitalisation in a surgical clinic, where at the same time the vascular diagnosis takes place. An extensive bilateral arterial occlusive disease exists, no possibility of revascularisation. The amputation of the lower leg as an ultima ratio was proposed.

**Another visit in our ambulance at 1999/02/25:**

Size of the ulcer 18x25mm, depth 5mm, partly exposed calcaneus.



Fig. 5.1.: 1999/02/25

Beginning of the local treatment with sterile LIGASANO® white, soaked with Ringer's solution and hid own blood, daily dressing change. Hypergranulation was cauterised with an AgNO<sub>3</sub> pen very carefully. In March 1999 the wound surface reaches skin level and minimises itself continuously until the final wound closure in May 2000.



Fig. 5.2.: May 2000

**Case 6**

41 years old, female, type 1 diabetes mellitus, duration 15 years. Insulin therapy: insulin pump with H-Tronin. Wound healing disturbance at the right foot after amputation of toes (3-5) and metatarsectomy (4-5), diabetic neuropathic osteo-arthropathy (Charcot foot). Cause for the amputation of the toes were infected clavi. Initial local therapy in the hospital: treatment with jodine and footbaths. Because of a progressive infection with osteomyelitis, amputation of the toes and afterwards metatarsectomy take place. 61 days of hospital stay. Due to the poor healing tendency amputation is suggested.

**Actual findings at 1999/07/16:**

Findings at the first visit in our ambulance: gaping wound at the right lateral forefoot, dimensions of 10x1.5cm with a depth of 1cm. Smearly brownish tinges wound coating, anhidro-

sis, feet over-warmed, swollen and contracted; sensibility for temperature, vibrations and touches is lapsed, pulses of the feet vigorous palpable, pes equinus in supinate position.

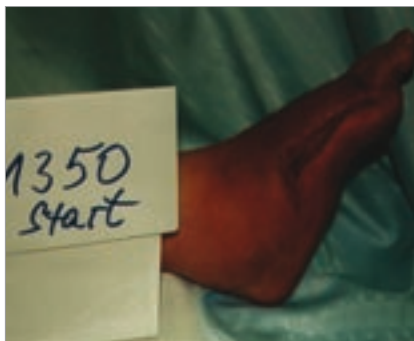


Fig. 6.1.: 1999/07/16

Beginning of the local treatment with an extensive debridement by scalpel and bone curette. Afterwards refreshing of the wound edges, application of sterile LIGASANO® white (soaked with the patients blood). We equio the patient with a cast, adapted to neuropathy because of acute risk of fractures. After six weeks closure of the wound.



Fig. 6.2.: 1999/08/13

**Case 7**

71 years old, male, type 2 diabetes mellitus with a duration of 21 years, wound healing disturbance at the lateral border of the foot after amputation of toes 4 and 5 with partly metatarsectomy of the 5<sup>th</sup> metatarsal bone in Juli 2000.

**Local pre-therapy:**

Postsurgical wound treatment with Iruxol, zinc ointment and showering; under this treatment worsening. As three month after discharge no tendency to heal is observable and furthermore a serious irritation has developed, the family doctor refers to our ambulance.

**Actual findings at 2000/09/05:**

Left foot swollen, wound with a length of 6cm and a maximum width of 2cm, smearly coated, surrounding area reddened and oedematous. The foot is

warm, foot pulses are alleviated palpable, alleviated sensibility for temperature and touches. State after amputation of 2 toes and metatarsectomy of the 5<sup>th</sup> metatarsal bone (ARLT C).

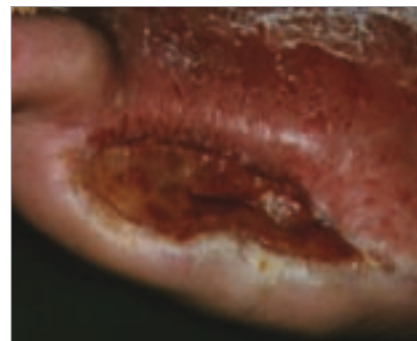


Fig. 7.1.: 2000/09/05



Fig. 7.2.: 2000/09/05

After debridement, application of a sterile LIGASANO® white pack, soaked with Ringer's solution, Cerson ointment for the wound environment. In the further progress after two month wound closure and decline of the allergic skin appearance.



Fig. 7.3.: progress

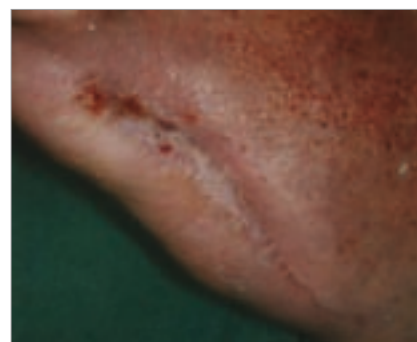


Fig. 7.4.: 2000/11/05

### Case 8

50 years old, male, type 2 diabetes mellitus, duration 10 years. Diabetic polyneuropathy, coronary heart disease. Insulin therapy with two injections of combination insulin 30/70. Wound healing disorder after amputation of the 2<sup>nd</sup> and 3<sup>rd</sup> right toe and metatarsectomy of the 2<sup>nd</sup> and 3<sup>rd</sup> right metatarsal bone, 9 days of hospital stay.

#### Local pre-therapy:

Treatment with Rivanol compresses.

#### Actual findings at 2000/01/17:

Smear coated wound (dinebsion 9x23mm with a depth of 6mm) in the resection area. Warm feet, foot pulses palpable, classical symptoms of polyneuropathy.



Fig. 8.1.: 2000/01/17

Beginning of the treatment with intense debridement. After this application of a sterile LIGASANO® white pack, soaked with the patient's blood respectively Ringer's solution. Already after two weeks beginning of epithelisation and complete closure in March 2000.



Fig. 8.2.: March 2000

### Case 9

65 years old, male, type 1 diabetes mellitus, diagnosis in 1988 (real duration about 20 years). Insulin therapy with 3x normal insulin and NPH insulin at night. Diabetic retino-, neuro- and nephropathy (dialysis needed). State after multiple metatarsal bone fractures at bilateral diabetic neuropathic osteo-arthropathy (Charcot feet).

#### Actual findings at 1998/06/18:

Passage of a sequestrum at the right midfoot planto-lateral. Formation of a 2.5cm deep cavity which is irrigated with Lavasept.



Fig. 9.1.: 1998/06/18

Insertion of a Septopal mini chain until 1998/07/06. Afterwards daily insertion of a sterile LIGASANO® white pack, soaked with Ringer's solution. For pressure distribution supply with a neuropathy-adapted cast.



Fig. 9.2.: 1998/07/17

Another visit in our ambulance at 1998/07/17: the cavity is only 5mm deep, no signs of inflammation. At 1998/09/23 complete closure of the lesion.

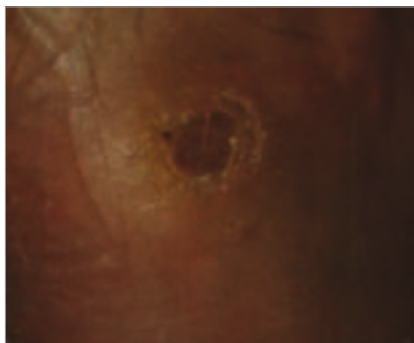


Fig. 9.3.: 1998/09/23

### Case 10

69 years old, male, type 2 diabetes mellitus, diagnosis in 1975, insulin therapy with 3x normal insulin and NPH insulin at night. Coronary heart disease, arterial occlusive disease and diabetic polyneuropathy. State after apoplexy with incomplete hemilateral paralysis. During the following therapeutic treatment in

a hospital for rehabilitation a great lesion at the right heel emerges. It was treated with a hydrocolloid dressing. According to his daughter's predication the wound became greater and greater, why the patient went to see our ambulance after discharge.

#### Actual findings at 1999/09/07:

Great ulcer with macerating wound edges, foul-smelling wound coating, multiple necrosis.



Fig. 10.1.: 1999/09/07

After extensive debridement and removal of the 6mm deep necrosis, wound dressing with sterile LIGASANO® white. For decompression of the heel supply with an interrim shoe.



Fig. 10.2.: progress

Already at 1999/12/23 the wound is minimised for 2/3, clean wound in granulation phase. No further monitoring because the patient died from a cerebral tumour.

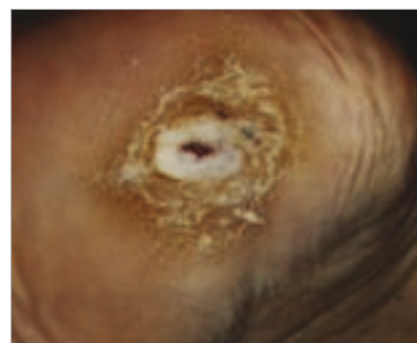


Fig. 10.3.: 1999/12/23

### Case 11

49 years old, male, type 2 diabetes mellitus, diagnosis in 1975, treatment with oral antidiabetic agent. Diabetic retino-, neuro- and nephropathy (dialysis needed), coronary heart disease, arterial hypertension. State after amputation of the right forefoot, recurrent plantar ulcers of the feet at diabetic neuropathic osteo-arthropathy (Charcot feet). Because of this ulcers six month of hospital stay. Pre-treatment with Betaisodona and Rivanol.

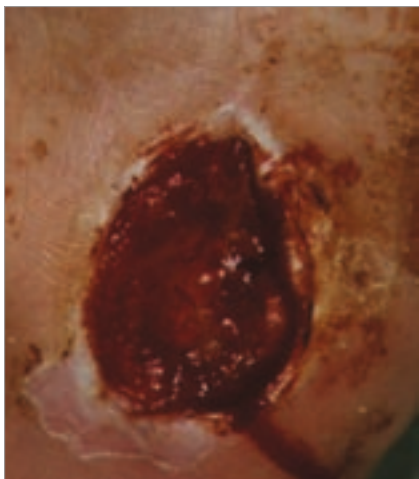


Fig. 11.1.: 1998/12/14

#### Actual findings at 1998/12/14:

Perforating ulcer of the left foot, plantar 12x14mm with a depth of 5mm.

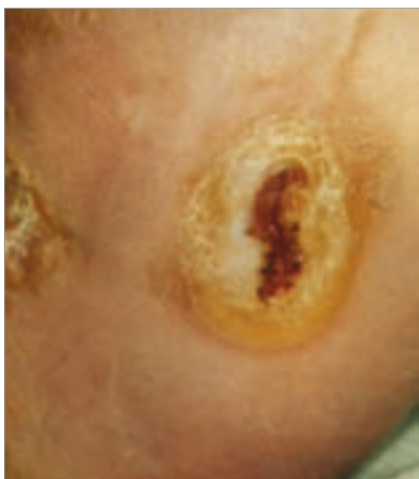


Fig. 11.2.: progress

For wound therapy application of a sterile LIGASANO® white pack, soaked with Ringer's solution. For stabilisation and pressure distribution supply with a cast, adapted to neuropathy.

Wound closure under therapy with LIGASANO® white within 36 days.



Fig. 11.3.: complete wound healing

### Case 12

69 years old, male type 2 diabetes mellitus, diagnosis in 1987. Insulin therapy 3x normal insulin and NPH insulin at night. Coronary heart disease with global insufficiency, arterial occlusive disease with concomitant neuropathy (no possibility for revascularisation), state after apoplexy.

Pressure ulcer at the left foot caused by too tight footwear. During the four month lasting hospital stay, treatment with Betaisodona gauze and Rivanol. due to the worsened local findings prearrangement of the patient for amputation of the lower leg. Thereupon he left the hospital at his own request.

#### Actual findings at 1998/10/6:

Perforating ulcer of the left foot, 20x20mm in projection to the 5<sup>th</sup> metatarsal bone lateral, uncovered tendon left, warm feet, rosy looking, no foot pulses palpable (ARLT C, Wagner 2).



Fig. 12.1.: 1998/10/06



Fig. 12.2.: 1998/10/6 detail picture

Refreshing of the wound edges, application of sterile LIGASANO® white, soaked with the patient's own blood (after debridement), respectively Ringer's solution at the daily change of the sterile LIGASANO® white pack. Already at 1998/10/23 the wound is filled with red granulation tissue and at 1998/11/26 it is covered with tender epithelial tissue, which stabilises during the next weeks.



Fig. 12.3.: 1998/11/26

### Case 13

64 years old, male, type 2 diabetes mellitus, diagnosis in 1969. Insulin therapy with two injections of combination insulin 30/70. Arterial occlusive disease and concomitant neuropathy, polyneuropathy and coronary heart disease. Because of a recurrent onychitis at the right 1<sup>st</sup> great toe with osteomyelitis, the patient underwent himself a surgical revision (removal of the osteomyelitic end phalanx, partial resection of the great toe). The postsurgical wound treatment is carried out stationary for 22 days. Local toxicant substances and footbathes were not used, but alginates soaked with Ringer's solution. However no complete wound closure was achieved. Mainly it comes to exudation from the depth again and again, because the wound edges whealed quickly (so-called pseudo-closure).

### Actual findings at 1998/09/13:

Wound edges are healed in the resection area, the exploration in the depth shows a 1cm deep wound.



Fig. 13.1.: 1998/03/19

Refreshing of the wound edges and scraping out the wound with a sharp spoon, there is discharge of malodorous secretion and residues of alginate.



Fig 13.2.: state after extensive debridement

Daily application of sterile packs of LIGASANO® white, soaked with Ringer's solution. Complete closure after 21 days.



Fig. 13.3.: 1998/04/04 complete wound closure

### Case 14

54 years old, male, type 2 diabetes mellitus, diagnosis in 1992. Insulin therapy with 2x combination insulin. Coronary heart disease, silent myocardial infarction, arterial hypertension, arterial occlusive disease and concomitant neuropathy, adiposity, state after amputation of the right toe (4) and partial metatarsectomy (4+5) right, chronic

osteomyelitis with wound healing disorder for two years. Before long and unsuccessful inpatient treatment in a non-specialised surgical clinic.

First visit in our ambulance in May 1998, referral in a specialised surgical clinic for diabetic feet to resect the osteomyelitic metatarsal bones once more. discharge with clean and still gaped wounds in our ambulant treatment.

### Actual findings at 1999/02/23:

Wound with a dimension of 70x6mm and 3mm depth at the right foot dorso-lateral after metatarsectomy and under it a small lesion of 10x4mm.

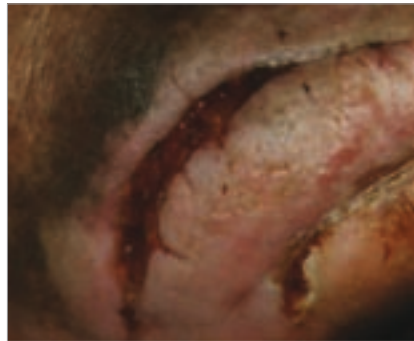


Fig. 14.1.: 1999/02/23

After debridement and refreshing of the wound edges, application of sterile LIGASANO® white. Wound closure after four weeks of treatment. Ensuing supply with orthopaedic footwear.

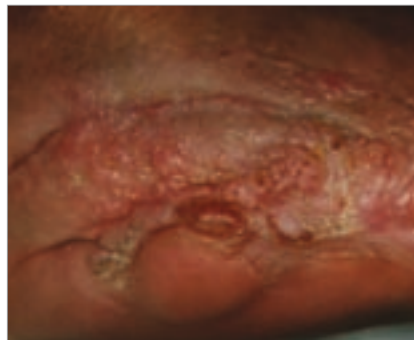


Fig. 14.2.: wound closure after four weeks

### Case 15

72 years old, male, type 2 diabetes mellitus, diagnosis in 1977. Insulin therapy with 2x combination insulin 30/70. Coronary heart disease, nephropathy (dialysis needed), diabetic neuropathy with diabetic neuropathic osteo-arthropathy. state after amputation of the right lower leg and the 1<sup>st</sup> and 2<sup>nd</sup> left toe. Perforating ulcer with projection on the 2<sup>nd</sup> and 3<sup>rd</sup> metatarsal bone since three years. Altogether 9 month of hospital stay, wound treatment

ambulant and stationary with common salt irrigations and several insertions of Septopal mini chains.

### Actual findings at 1998/07/15:

Perforating ulcer of 18x16mm with inserted Septopal chain.



Fig. 15.1.: 1998/07/15

Removal of the Septopal chain with the forceps, under it the structure of the metatarsal bone is visible. Assuming that this is a sequestrum, careful attempt of removal with Luer's bone nibblers. But the assumed sequestrum is the osteomyelitic mutated part of the 2<sup>nd</sup> metatarsal bone. After irrigation of the wound with Lapasept, a 2cm deep cavity remains, which is treated with sterile LIGASANO® white and irrigation with Oxoferin. Closure within four weeks.

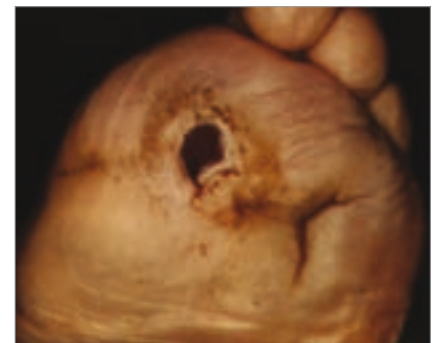


Fig. 15.2.: progress

At the first day of treatment, we additionally made a special cast. A supply with orthopaedic footwear takes place after closure of the ulcer.



Bild 15.3.: Abheilung nach 4 Wochen