



Introduction

LIGASANO® white is a therapeutical effective PUR foam with a wide range of uses for wound care and prevention.

LIGASANO® white is a fine-pored open PUR foam that - due to the nature of its surface - generates a mechanical stimulus on the tissue and therefore it promotes the local blood flow. It also improves the supply with nutrients and oxygene; this leads to an activation of the wound, especially at avital wounds. Additionally it removes surplus exudate without drying out the wound.

The mechanical stimulus usually lasts about three days; then LIGASANO® white should be changed at the latest.

The product

LIGASANO® white consists of a polyurethane foam in two thicknesses, one and two centimeters.

Besides there are varous sizes, 15x10cm to 24x16cm, as a wound dressing or as a wound band for fistulae and wounds with narrow opening.

LIGASANO® white is available sterilised (see above) or unsterilised in the sizes 59x49cm or 200x100cm.

Range of application and indication

Up to now LIGASANO® white is used both chronic and acute posttraumatic or postoperative wounds:

- decubitus
- ulcerus cruris
- diabetic foot syndrome
- arterial ulcers
- dehiscence of a suture
- laparotomy wounds
- sinus pilonidalis
- abscess (mamma, abdominal wall)
- burns (degree 2 - 3)
- wounds post VAC therapy

LIGASANO® white can be applied at contaminated and infected wounds, too.

Considerations

When we were confronted with LIGASANO® white for the first time, we were very sceptical. An open-pored dressing, that shall absorb exudate, doesn't adhere to the wound and yet keeps the wound moist en-

ough? In addition the dressing shall absorb necrotic tissue and cell detritus; therefore you don't need to clean the wound during the dressing change and necrosis is partly removed.

First we have had a look at the criterions resp. the requirements of a modern wound dressing. What has a modern wound dressing to accomplish?

- mechanical and microbic protection of the wound
- reduction of contamination
- keeping a moist climate in the wound area
- to warrant a sufficient permeability for oxygene and moist
- thermic insulation of the wound from the environment
- no adhesion with the wound surface; atraumatic removal of the dressing
- no pain during dressing change
- no toxic or allergic ingredients in the dressing
- no dispense of parts of the dressing into the wound
- biological and ecological tolerance of the material
- remove of surplus exudate
- cost and advantage realtion

Case 1

At the following is reported about a 21 old female patient with a 2° burn on the forearm.



Fig. 1.1.



Fig. 1.2.



Fig. 1.3.

During the therapy with LIGASANO® white an evident decrease of the fibrinous coat comes apparent after two dressing changes (fig. 1.1. and fig. 1.2.). The dressing was made of a 2cm thick LIGASANO® white foam. First the foam was changed daily. In the second week, after decrease of the exudate, the dressing was changed once every two days. After removal of the dressing it shows on its woundside the absorbed exudate as well as the removed fibrinous coats. The patient showed pain neither during the period she wears the dressing nor during the dressing change. There was no adhesion between dressing and wound. At the beginning of the third week the wound was epithelialised (fig. 1.3.). During the phase of epithelisation the foam was moistened with 2ml Ringer's solution.

Every dressing change involves the risk of bacterial invasion and cross-infection of the wound and leads by the influence of air to a decrease of temperature and drying-out. The removal of a fully sucked wound dressing means a lost of exudate components (intact leucocytes/granulocytes, immunoglobulines, bactericide substances, proteolytic enzymes/lysozyme, curative and analgetic substances).

Secondly we have laid down criterions for the dressing of acute and chronic wounds, to warrant a wound care that is adapted to every phase of wound healing.

The base of every wound therapy is to view on the wound conditions:

- clean?
- fibrinous coat?
- necrosis moist or dry?
- deep defect?
- superficial defect?
- undermined wound?
- infected wound?
- connections to cavities/implants/ great vessels?
- protection of the skin around the wound?

Possibly the view should take place with standardized criterions, to enable an effective therapy.

Finally we worked out the significance of a comprehensive overlapping wound management:

- avoiding long-term therapies
- long-range reduction of cost
- improved and faster remedial success
- good cosmetic results
- less or no pain during dressing change
- ensure of quality
- improved education (specialists for wound care
- orientation to standards
- contentment for patients, physicians and nurses

Can LIGASANO® white fulfil this criterions?

Methodics / Efficacy

The choosed LIGASANO® white as an unsterile unit in the size 59x49cm with a thickness of two centimeters. The thickness of two centimeters is very much important to avoid the drying-out of the wound. By the foam-thickness of two centimeters the dressing is getting more compact; therefore an undue lost of exudate is avoided. The material

for the particular wounds was cut, packed and sterilised in our own steriliser. This has an economic advantage: LIGASANO® white can be cut and sterilised for the specific patients; therefore the patients have every time the suitable dressing for themselves.

At superficial wounds the dressing is applied - overlapping the wound edges for about 2 cm - and (on extremities) affixed with an elastic bandage. In the case of abdominal wounds LIGASANO® white is fixed with skin-friendly plaster strips. Consider that LIGASANO® white must always have contact with the wound ground to effect the mechanical stimulus. This mechanic stimulus is intensified by the patient's body motions that produce additional tractive and thrusting forces in tangential direction.

By means of this property you can observe a visible increase of wound exudation at stagnant wounds, only a few days after the beginning of the therapy with LIGASANO® white. Underneath you can watch the detachment of fibrine and necrotic material.

From a wound depth of 0.5cm on, LIGASANO® white is cut on size, inserted into the wound and covered with an additional layer of LIGASANO® white. Wound cavities and undermines are treated with the LIGASANO® white wound strip. When you use a pair of forceps for the treatment, please pay attention to cover its point with LIGASANO® white, before you insert it into the wound cavity. By this you can avoid hurt and pain for the patient. Tampon the wound strip like a zigzag pattern into the wound. We recommend to change it at the latest after two or three days; in the case of infected wounds daily.

The fine-pored structure of LIGASANO® white produces, as mentioned before, a slight suction effect on the wound by its capillary attraction. Thus LIGASANO® white can absorb wound exudate and cell detritus. A mazeration of the wound is avoided. If the wound is heavy contaminated or infected you can use a wound disinfectant for assistance. In parallel a systemic therapy with antibiotics may suggestive at wound infections and in particular at the diabetic foot syndrome.

Basically you have to notice the following items at wound care:

- examination of the causes (why does the wound heal badly or stagnates) and their elimination
- accompanying therapy
- nutrition
- surgery or plastic surgery

Case 2

Fig. 2.1. to 2.4. shows, how a wound in the inguinal region (state after abscess removal) with a depth of 3cm and a wound undermining to medial 8cm, is dressed with LIGASANO® white.



Fig. 2.1.



Fig. 2.2.



Fig. 2.3.

In this case we decided for LIGASANO® white with a thickness 1cm to tampon resp. fill the wound. Alternativ you can work with the LIGASANO® white wound strip, too. The wound was covered with LIGASANO® white with a thickness of 2cm and fixed with an elastic bandage.



Fig. 2.4.



Fig. 2.5.

After two days LIGASANO® white was changed, because its absorptive capacity was exhausted. LIGASANO® white allows to be removed from the wound atraumatic and without pain (fig. 2.5.).

Case 3

The therapeutic effect of LIGASANO® white was shown especially at the care of abdominal, postoperative wound healin impairments. During the phase of secretion LIGASANO® white was changed once daily, until the bottom of the wound was clean and began to granulate. In the second phase of the wound healing the dressing was changed once every two days. We paid attention that there was no adhesion between dressing and the new constituted tissue.

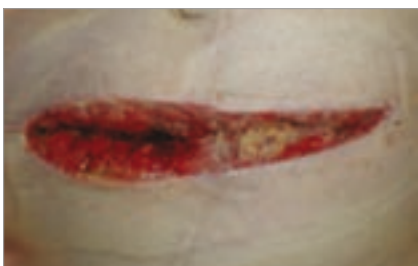


Fig. 3.1.

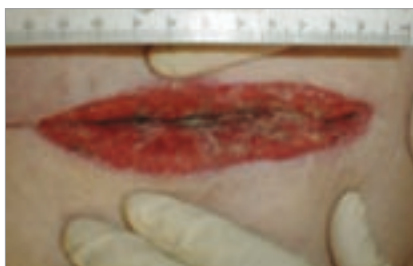


Fig. 3.2.



Fig. 3.3.

From fig. 3.1. to 3.3. three weeks passed. Additional to the therapy with LIGASANO® white the wound edges were adaptes during the phase of granulation with steristrips, to reduce the wound furthermore in size and to achieve a good cosmetic result.

Case 4

Fig 4.1. and 4.2. show the wound cleaning effect of LIGASANO® white; in this case a clean wound ground with sufficient blood supply became visible after one week. The wound was dressed with the LIGASANO® white wound strip and covered with LIGASANO® white PUR foam with a thickness of 2cm.



Fig. 4.1.



Fig. 4.2.

Case 5

LIGASANO® white PUR foam is very good qualified for wound conditioning of burns. In the following case we report about a 55 years old patient with a carcinoma. This man suffered, as a result of cerebral metastases, from perception disorders and contracted himself 2° to 3° burns on the thigh and the lower leg by hot water during bathing (fig. 5.1. and 5.2.)



Fig. 5.1.



Fig. 5.2.



Fig. 5.3.

First the patient was at the intensive care unit. The dressing was made traditionally with pads, moistened by saline solution. Fibrin and necrosis developed, daily chirurgical debridements were the consequence, which only were able to made under anesthesia. After a dressing change with LIGASANO® white PUR foam done twice, there was no persistence of fibrin and the wound cleaned itself more and more.

We notice a - for this case - very quick and efficient wound healing, because the therapy with antibiotics and the carcinoma disease had to be considered. We worked with a LIGASANO® white PUR foam in a bigger size, that was cut suitable to the wound. The interspace between the toes was dressed with LIGASANO white, too, and the dressing was fixed with an elastic bandage. At this time we wade a daily dressing change and by help of an analgetic therapy it was tolerated almost without pain.



Fig. 5.4.



Fig. 5.5.

Between fig. 5.4.,5.5. and fig. 5.6.,5.7. seven weeks passed. The result was so positive surprising that the traumatologists renounced a skin grafting because of the quick wound healing. Also the D5, taken for avital at the beginning, was saved under the therapy with LIGASANO® white PUR foam. The patient was discharged from hospital after two month and treated as an outpatient.



Fig. 5.6.



Fig. 5.7.

Case 6

LIGASANO® white PUR foam may lead to a significant reduction of germs in the wound area. This showed us the progress of wound healing at a 65 years old female patient with an infected venous ulcer cruris. Before the treatment with LIGASANO® white the wound was treated with an argentic dressing, that didn't lead to the desired success after three weeks. At admission in the hospital the skin was heavy reddened and irritated. The wound showed fibrinous coats (fig. 6.1.). Directly after primary wound cleaning the wound was dressed with LIGASANO® white.



Fig. 6.1.



Fig. 6.2.

After two weeks of treatment with LIGASANO® white PUR foam the wound was nearly completely healed and the wound area wasn't irritated (fig. 6.2.). An adapted compression therapy supports the wound healing.

Case 7 and 8

In the case of stagnant wounds that already exist partly several years (fig. 7.1. and 8.1.) and where almost all wound healing measurements did not improve the wound healing, we noticed an evident improvement of the wound situation by using LIGASANO® white PUR foam.



Fig. 7.1.

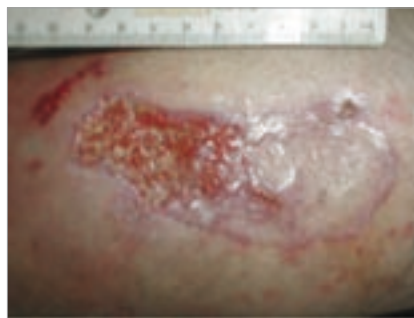


Fig. 7.2.

Between fig. 7.1. and 7.2. 17 days were passed, between fig. 8.1. and 8.2. 18 days.



Fig. 8.1.



Fig. 8.2.

A Comparison of Cost at Wound Treatment

Adequate use of LIGASANO® white with regard to cost efficiency. A comparison of traditional wound treatment and modern ideal-moist wound treatment systems at the example LIGASANO® white.

A question of definition:

traditional

- mull compresses
- fleece compresses
- gauze dressings
- moistened dressings (soaked e.g. with Ringer's solution or NaCl)

The used dressings are not able to maintain the moist wound milieu. The wound exudate is removed from the wound.

ideal-moist

- film dressings
- PUR foam dressings
- hydro gel dressings
- hydrocolloid dressings
- Alginates in connection with hydrocolloid dressings

These products imitate the conditions as under a closed vesica. They leave the endogenous healing factors in the wound.

Definition of traditional wound dressings

The traditional wound dressing is partly equal to the dry wound dressing. There are used dry or moistened mull compresses that dry out in the wound and may adhere to the wound ground. Because of the less absorptive capacity, you need a daily dressing change.

Definition of modern wound dressing

At modern wound dressings a moist wound milieu for all phases of the wound healing is produced and maintained. The particular phases of wound healing turn from the phase of wound cleaning and exudating by the phase of granulation into the phase of epithelisation.

The products used at the modern wound treatment imitate the conditions as under a closed vesica. The support of the physiological wound milieu promotes the multiplication of tissue cells as well as the required cell migration and epithelisation.

Meaning of the moist wound milieu

The principle of the modern moist wound treatment with modern wound dressings has established itself in the medical care of wounds. Beside the wound cleaning the dressing should have a high absorptivity of surplus exudate, should keep the wound moist and should not adhere to the wound ground. Through the modern dressings a physiological wound milieu is created just as a safe protection against external influences.

Modern wound care products are able to accelerate the wound healing because of their properties. They cause an optimal moist wound milieu, whereby the single phases of wound healing are protected. Modern wound dressings don't adhere with the wound ground and may be released during dressing change tissue-gentle and without pain.

Chronic Wounds in Germany

Prevalence

Ulcus cruris	1.0 - 2.0% of the inhabitants	= 1.2 Mio. people
Decubitus	1.2 - 2.2% of the inhabitants	= 1.3 Mio. people
Chronic wounds	3.0 - 4.0% of the inhabitants	= 2.5 Mio. people

Cost

	1980	1996
Ulcus cruris	0.92 Billion Euro	1.33 Billion Euro
Decubitus	?	2.15 Billion Euro
Total	?	3.48 Billion Euro

Saving potential at the public health system

- ideal-moist wound dressing
- better prevention

1,5 Billion Euro

Source: Prof. Dr. Pelka, professorship for applied statistics at the University of the German Federal Armed Forces Munich

Expenditure of care and cost of therapy

- frequency of the required dressing changes
- cost of one dressing change

- time per dressing change
- duration of the whole therapy until the complete healing
- rate of complications / recurrence
- quality of the patient's life (pain, freedom of movement, frequency of treatment, cross infections)

Costing

factors included

- dressing material
- wound therapeutic agents
- cleansing materials

- consumption materials
- personnel cost

not considered factors

- better quality of life
- earlier rehabilitation of working capacity
- avoidance resp. reduction of sub-sequence cost (rehabilitation)

Cost of Material per Dressing Change and per Week

	traditional	LIGASANO® white
disposable kidney bowl (paste-board, 1 piece)	0.19 €	0.19 €
disposable trousers, sterile, 1 pair	0.82 €	0.82 €
disposable trousers, unsterile, 2 pcs.	0.19 €	0.19 €
disposable hypodermic needle, 1 piece	0.21 €	0.21 €
disposable syringe, 1 piece, 20ml	0.08 €	0.08 €
disposable support, 2 pcs. Moltex 40 x 40 cm	1.51 €	1.51 €
ES compresses 10 x 10 cm, sterile, 6 pcs.	1.25 €	1.25 €
hydrogen peroxyde 3%, 50ml	0.70 €	
wound therapeutic agent 5 gr Iruxol N	2.45 €	
compresses for ointment 10 x 10 cm, 2 pcs.	2.09 €	
Fixing fleece 10 x 40 cm	0.82 €	
isotonic saline solution 100ml		1.70 €
LIGASANO® white		1.74 €
cost per dressing change	10.31 €	7.69 €
cost per week	7 x 10.31 € 72.17 €	4 x 7.69 € 30.76 €

Average Personnel Cost per Week

weekday	traditional wound treatment		LIGASANO® white	
	time element	cost	time element	cost
Monday	20 minutes	16.64 €	15 minutes	12.48 €
Tuesday	20 minutes	16.64 €		
Wednesday	20 minutes	16.64 €	15 minutes	12.48 €
Thursday	20 minutes	16.64 €		
Friday	20 minutes	16.64 €	15 minutes	12.48 €
Saturday	20 minutes	16.64 €		
Sunday	20 minutes	16.64 €	15 minutes	12.48 €
total per week	140 minutes	116.48 €	60 minutes	49.92 €

Average cost of a nurse refunded according to Kr. 5

Total Cost per Week / Duration of Treatment in Comparison

	traditional wound treatment	LIGASANO® white
material cost	72.17 €	30.76 €
personnel cost	116.48 €	49.92 €
total cost per week	188.65 €	80.68 €
duration of treatment	12 weeks	8 weeks
cost of treatment	2263.80 €	645.44 €

the determined prices are not prices for hospitals but for pharmacy of a commercial pharmacy in Germany. At the calculation of the personnel cost we refer to the care minutes. For the wound treatment with LIGASANO® white PUR foam we come to an average of 15 minutes per dressing change, because the surgical debridement is omitted in contrast to the traditional wound treatment. By the case descriptions is shown, that the wound treatment with LIGASANO® white leads to a faster wound healing. We agree on an average of 8 weeks compared with the traditional wound treatment with an average of 12 weeks.

Thus **the cost advantage** in opposite to the traditional wound treatment **amounts to 1618.36 €**.

Summary

The therapy with LIGASANO® white proves to be a very good and efficient method of wound treatment for more than 30 treated and documented patients. From this 30 patients with chronic wounds the wounds of 21 patients have been completely healed. The wounds of 6 patients have shown a distinctive improvement of the wound situation up to granulation. These patients were discharged from hospital early and treated as an outpatient. Three patients didn't show an improvement of their wounds under the therapy with LIGASANO® white. But in these three cases it has been unable to get an improvement of the wound with any measure. 8 patients had slight pain during the period they wore the dressing, that was treated with analgesics. 5 patients had slight pain at removal in the course of dressing change, which was minimised by previously moistening the dressing with Prontosan® W (wound irrigation solution).

LIGASANO® white can be cut and applied onto the wound easily. With the LIGASANO® white wound strip we found an easy and effective dressing for the treatment of deep, undermined wounds and fistulae, that is less expensive compared with the traditional wound therapy. It was also conspicuous that we did not need to make surgical debridements by using LIGASANO® white, because the wounds cleaned themselves decidedly quickly. Finally is mentioned, that we renounced for wound irrigation during the therapy because cell debris and exudate is absorbed by the dressing and was not found in the wound. That means the wound does not need to be cleaned additionally during the therapy with LIGASANO® white (see cost comparison). During the therapy we paid attention to an integral wound therapy - that means research of the causes, treatment of the causes, avoidance of high risk factors that affect the wound healing, nutrition and analgesic therapy.

The question whether LIGASANO® white PUR foam can fulfil the criteria of a modern dressing, is recommended positively after these experiences.

Bibliography

- Schlusserwertung AWB Prontosan® Gel und Lösung, Dr. med. T. Eberlein, 01/2001
- Anwendungsanleitung Ligasano® by Ligamed®, 01/2002

Correspondence address:

Ansgar Möller
Wundmanagement
Städtisches Klinikum Bielefeld Mitte
Teutoburger Str. 50
D - 33604 Bielefeld
phone: +49-(0)521/581 10 78
fax: +49-(0)521/581 10 97
email: ansgar.moeller@sk-bielefeld.de