

Cold plasma "Wound-Sanitizer" – in use observation pilot case study

Goal:

The recognition of the spectrum of action of the "Wound Sanitizer" in the routine treatment of chronic and secondary healing wound patients. Reactions to inflammation and infection, as well as healing tendencies in terms of granulation and epithelialization. Likewise, changes in the wound environment in the range of the pH value.

Inclusion criteria:

- Wounds of any genesis with a previous frustrating local therapy over 2 months.
- Secondary wounds that are difficult to heal
- Inflammation and local infections

Exclusion criteria:

- Antibiotic the last 2 weeks before starting treatment with the "Wound Sanitizer".
- Dry, black necrosis
- Allergies and/or intolerances to local therapy with the "Wound – Sanitizer"

Procedure:

- Cleaning the wound through a wet phase with a wound irrigation solution
- Application of the plasma-enriched aerosol over 3 minutes
- Covering the wound with a non-active wound dressing (spacer grid)
- Secondary dressing with non-active foam or suction compress.

Duration of observation:

- 4 weeks
- Visual documentation at the beginning and 1x weekly
- Treatment with "Wound – Sanitizer" 2x weekly

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 1:

Diagnosis: Ulc. Crur. Ven.

Gender: female

Localization: Ankle outside li

Duration: 14 weeks

Day 0:



Exudate: moderate
Wound base: no epithelialization, granulation, slight plaque
Infection: no local signs of infection
Depth: superficial
Area: Environment dry, scaly, slightly reddened

Case 1
Day 7



Exudate:	moderate
Wound base:	already onset of epithelialization, granulation, slight plaque
Infection:	no local signs of infection
Depth:	superficial
Area:	Environment slightly reddened

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 1
Day 14



Exudate:	little
Wound base:	mostly epithelial
Infection:	no local signs of infection
Depth:	superficial
Area:	slightly reddened

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 1
Day 21



Exudate: little
Wound base: almost complete epithelialization, little plaque
Infection: no local signs of infection
Depth: superficial
Area: slightly reddened

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 1
Day 28



Exudation: little
Wound base: almost completely healed
Infection: no local signs of infection
Depth: superficial
Area: no special features

Summary:

Since the beginning of local therapy with the "Wound – Sanitizer", increasing epithelialization and decrease of fibrin deposits. Due to the rapid reduction of the wound area, there was also a decrease in the amount of wound exudate.

The patient did not report a negative feeling about the therapy.

Within the observation period of 4 weeks, almost complete wound closure occurred.

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 2:

Diagnosis: times perf. Plant., DM II

Gender: male

Localization: Foot plantar left

Duration: 17 weeks

Day 0



Exudate: a lot
Wound base: granulation, wound pocket after distal
Infection: slight redness after distal and proximal
Depth: wound pocket about 2 cm
Area: wound edge macerated; area slightly keratinized

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 2

Day 7



Exudation: moderate
Wound base: granulation and incipient epithelialization
infection: no local signs of infection
Depth: Wound pocket after distal about 1 cm
Area: Wound edge slightly macerated, wound area slightly keratinized

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Fall2

Day

14



Exudation:	little
Wound base:	large-scale epithelialization, granulation
Infection:	no local signs of infection
Depth:	no wound pockets, superficial
Area:	Wound area slightly keratinized

Case 2
Day 21



Exudation: little
Wound base: large-scale epithelization, granulation
Infection: no local signs of infection
Depth: superficial
Area: Wound area slightly keratinized

Case 2
Day 28



Exudate: none
Wound base: complete epithelial
Infection: no local signs of infection
Depth: -
Area: slightly keratinized

Summary:

The patient came forward after a long frustrating treatment by the MVZ with the recommendation of amputation of the 5th toe strand. Already after a short time with the treatment with the "Wound – Sanitizer" a positive progression of the course of wound healing. The wound pocket was closed after 2 weeks, so that after 4 weeks a complete wound closure had to be detected.

Further therapy recommendation: regular podiatric treatment and adequate footwear.

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 3

Diagnosis: P.S. Healing after bypass

Gender: Male

Localization: Tibia left

Duration: 14 weeks

Day: 0



Exudate: a lot
Wound base: mostly occupied, granulation, fatty tissue
Infection: slightly reddened, a lot of exudate (bloody, greenish)
Depth: wound pocket after proximal
Area: no specialties

Fall3
Day 7



Exudation: moderate
Wound base: fibrin coating, granulation
Infection: slight redness
Depth: no more wound pocket
Area: no specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 3
Day 14



Exudation:	moderate
Wound base:	decrease in fibrin, granulation
Infection:	slightly reddened
Depth:	superficial
Area:	slightly reddened

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 3
Day 21



Exudation: little
Wound base: epithelialization and granulation
Infection: no local signs of infection
Depth: superficial
Area: no specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 3
Day 28



Exudate: little
Wound base: epithelialization
Infection: no local infection signs
Depth: superficial
Area: no special features

Summary:

Deep wound healing per sekundam with a lot of greenish exudate in the sense of infection with Gram bacteria. After treatment with the "Wound-Sanitizer" there was a rapid decrease in the amount of exudate. Exudate color bloody, serous after 2x treatment. Subsequently, there was a rapid onset of epithelialization and granulation. On the last day of the observation period , there was an almost complete wound closure with beautiful scarring.

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 4

Diagnosis: Z.n. Amputation
Gender: male
Localization: Dig V plans right
Duration: 3 weeks

Day 0



Exudate: moderate
Wound base: fibrin coating, granulation
Infection: no local signs of infection
Depth: superficial
Area: no specialties

Case 4

Day 7



Exudate: moderate
Wound base: fibrin coating, granulation, slight epithelialization from the edge of the wound
Infection: no local signs of infection
Depth: superficial
Area: no specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 4

Day

14



Exudate: moderate
Wound base: fibrin coating, granulation, epithelialization
infection: no local signs of infection
Depth: superficial
Area: no specialties

Case 4
Day 21



Exudate: moderate
Wound base: fibrin coating, granulation, increase in epithelialization
Infection: no local signs of infection
Depth: superficial
Area: no specialties

Case 4

Day 28



Exudate: moderate
Wound base: decrease in fibrin coating, granulation, increase in epithelialization
infection: no local signs of infection
Depth: superficial
Area: without specialties

Summary:

Amputation due to vascular occlusion. After revascularization and amputation of the 5th toe, local therapy with the "Wound – Sanitizer". Already after a very short time reduction of the wound area and increase in epithelialization.

Additional therapy: pressure relief through adequate footwear.

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 5

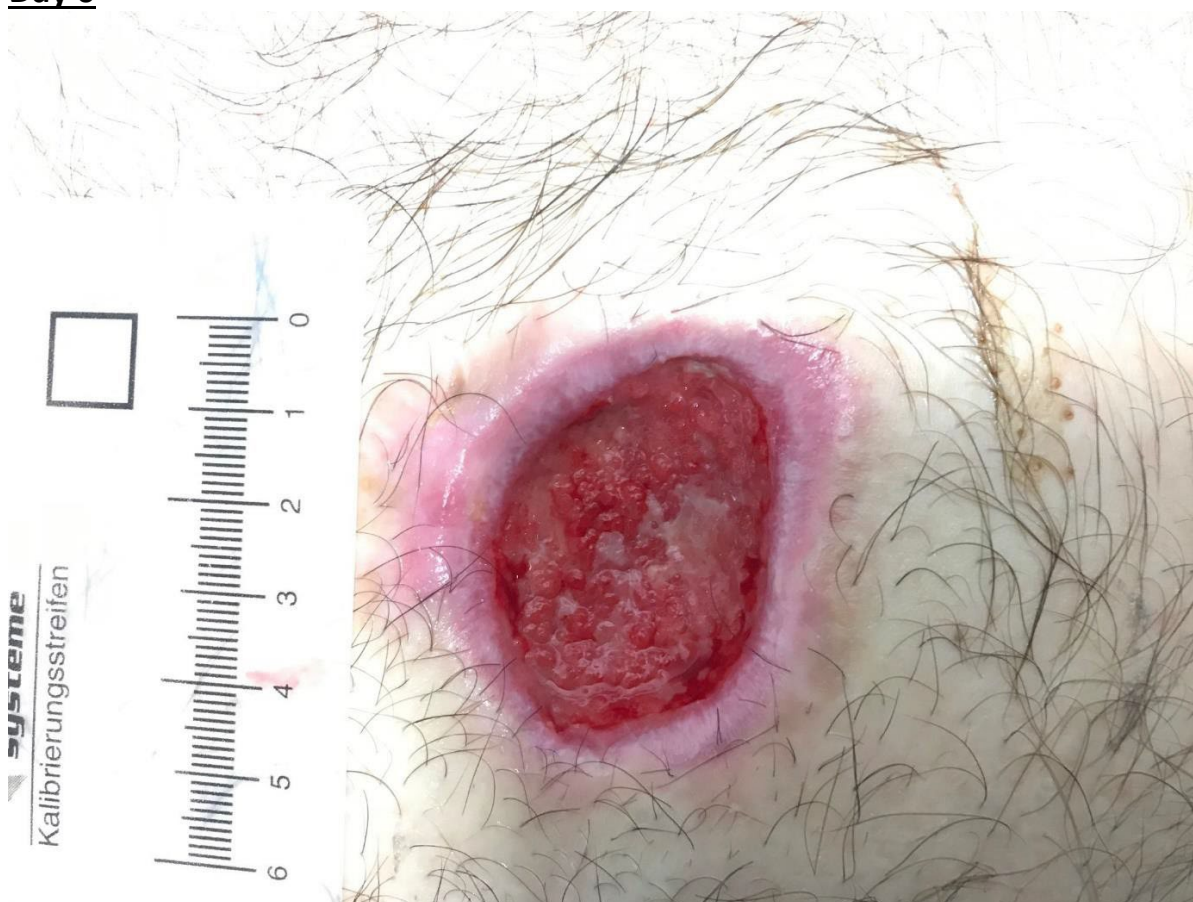
Diagnosis: Traumatic due to self-harm

Gender: Male

Localization: Abdomen

Duration: 3 weeks

Day 0



Exudate: a lot
Wound ground: granulation
Infection: Gram – rod
Depth: 1 cm
Area: without specialties

Case 5

Day 7



Exudate: moderate
Wound base: granulation, incipient epithelialization
infection: smear negative, no local signs of infection
depth: 0.5 cm
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 5
Day 14



Exudate: moderate
Wound base: granulation, progressive epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without special features

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 5

Day 21



Exudate: moderate
Wound base: granulation, increasing epithelialization, wound area significantly smaller
infection: no local signs of infection
Depth: superficial
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 5

Day 28



Exudate: little
Wound base: granulation, increasing epithelialization, wound area significantly smaller
Infection: no local signs of infection
Depth: superficial
Area: without special features

Summary:

Pat with self-injury with scissors. Wound initially strongly exuding, greenish exudate, no healing tendency by treatment by the family doctor.

Rapid decrease in microbial load after 2 treatments with the "Wound – Sanitizer". Conspicuously rapid epithelialization from the edge of the wound

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 6

Diagnosis: Metal removal after implant infection

Gender: Male

Localization: inner ankle left

duration: 4 weeks

Day 0



Exudate: A lot

Wound base: plaque

Infection: Redness, pain, smear: staphylococci, streptococci

Depth: 2 cm

Area: weeping, inflammatory, eczematous

Case 6
Day 1



Exudate: moderate

Wound base: occupied, granulation

Infection: slight redness at the edge of the wound

Depth: 2 cm

Area: significant improvement of the skin condition

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 6

Day 2



Exudate: moderate
Wound base: granulation
Infection: no local infection signs
Depth: 2 cm
Area: significant improvement

Case 6

Day 3



Exudate: moderate
Wound base: granulation
Infection: no local signs of infection
Depth: 1.5 cm
Area: significant improvement

Summary:

Pat after metal removal in case of infection of the implant. Wound environment clearly affected. Strongly weeping, eczematous, reddened. Special attention to the course of the skin situation through the application of "Wound – Sanitizer". Already on the following day significant improvement of the skin condition, without the use of additional steroid-containing topicals.

After 3 days of use with cold plasma almost normal skin condition.

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 7

Diagnosis: Diabetic ulcer

Gender: Male

Localization: Big toe

Duration: 5 weeks

Day 0



Exudate: moderate

Wound base: fibrin coating, granulation

Infection: redness

Depth: superficial

Area: Wound edge slightly macerated, wound environment partly scaly, dry, keratinized

Case 7

Day 7



Exudate: moderate
Wound base: slightly occupied, granulation
infection: no local signs of infection
depth: superficial
Area: without specialties

Case 7
Day 14



Exudate: moderate
Wound base: granulation
Infection: no local infection signs
Depth: superficial
Area: without specialties

Case 7
Day 21



Exudate: moderate
Wound base: granulation, incipient epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without specialties

Case 7
Day 28



Exudate: moderate
Wound base: slightly occupied, granulation, increasing epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without specialties

Summary:

Pat after weeks of self-therapy with various means. After the start of therapy with the "Wound –Sanitizer" increasing improvement of the wound situation.
Rapid decrease in signs of inflammation and rapid onset of epithelialization

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 8

Diagnosis: traumatic injury in existing skin graft

Gender: male

Localization: Achilles tendon

Duration: 3 weeks

Day 0



Exudate: moderate

Wound base: plaque

Infection: no local infection signs

Depth: 0.5 cm

Area: dry, scaly, wound edge edematous

Case 8

Day 7



Exudate: moderate
Wound base: plaque, granulation, already onset of epithelialization
Infection: no local signs of infection
Depth: 0.5 cm
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 8
Day 14



Exudate: moderate
Wound base: granulation, epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without special features

Case 8
Day 21



Exudate: little
Wound base: granulation, increasing epithelisation
infection: no local signs of infection
Depth: superficial
Area: without special features

Case 8
Day 28



Exudate: little
Wound base: significant increase in epithelialization, almost wound closure
Infection: no local signs of infection
Depth: superficial
Area: without special features

Summary:

Pat injures himself while cycling on skin graft, which had healed for 3 years. Open, gaping wound with visible tendon. Previous treatment by the plastic surgeon, who has recommended a new skin graft as usual with such wounds. Pat wants conservative treatment and avoidance of surgery.

Local therapy with "Wound – Sanitizer" leads to rapid cleansing, granulation and epithelialization of the wound. Almost complete closure during the observation period.

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 9

Diagnosis: Ulc.crur. ven
Gender: female
Localization: Outer ankles
Duration: 5 weeks

Day 0



Exudate: a lot
Wound base: plaque
Infection: Exudate yellowish, cloudy, redness, pain
Depth: superficial
Area: Redness, slight maceration of the wound area

Case 9

Day 7



Exudate: moderate
Wound base: slightly occupied, granulation
Infection: Exudate bloody serous, no pain
Depth: superficial
Area: slightly reddened

Case 9

Day

14



Exudate: moderate
Wound base: Granulation, significant reduction of wound area
Infection: no local signs of infection
Depth: superficial
Area: without special features

Case 9

Day 21



Exudate: moderate
Wound base: granulation, epithelialization
Infection: no local signs of infection
Depth: superficial
Area: dry, scaly

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 9

Day

28



Exudate: moderate
Wound base: granulation, epithelialization, strong reduction of wound area
Infection: no local signs of infection
Depth: superficial
Area: without specialties

Summary:

Chronisch venous ulcer for several weeks. Previous therapy through home care. After starting with the "Wound – Sanitizer" immediate, significant improvement of the wound conditions. Very rapid decrease in wound area during the observation period. Pain already after the 2. Treatment significantly reduced Additional therapy: compression

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 10

Diagnosis: Ulc. crur. ven
Sex: female
Localization: Lower leg right
Duration: 7 weeks

Day 0



Exudate: A lot
Wound base: plaque
Infection: Redness, exudate amount, pain
Depth: superficial
Area: Redness, slight maceration

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 10

Day 7



Exudate: moderate
Wound base: slightly occupied, granulation
infection: no local signs of infection
depth: superficial
Area: without specialties

Case 10
Day 14



Exudate: moderate
Wound base: slightly occupied, granulation, onset of epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case

10

Day

21



Exudate: moderate
Wound base: granulation, progressive epithelialization
infection: no local signs of infection
Depth: superficial
Area: without specialties

Case 10
Day 28



Exudate: moderate
Wound base: occupied, granulation, significant reduction of wound area
Infection: no local signs of infection
Depth: superficial
Area: without specialties

Summary:

Frustrane treatment and stagnation of the wound situation over several weeks.
After application with "Wound – Sanitizer" rapid onset of wound healing. Decrease in the signs of infection and reduction in the amount of exudate after a short time.
Sharp decrease in wound areas during the observation period
Additional therapy: compression

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 11

Diagnosis: Ulc.cruur.
ven gender: female
Localization: Lower leg rebi-side
Duration: 3 weeks

Day 0



Exudate: moderate
Wound base: plaque
Infection: dark fibrin deposits, redness
Depth: superficial
Area: locally reddened

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 11

Day 7



Exudate: moderate
Wound base: plaque, granulation
Infection: no local infection signs
Depth: superficial
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 11

Day 14



Exudate: moderate
Wound base: slightly occupied, granulation
infection: no local signs of infection
depth: superficial
Area: without specialties

Case 11
Day 21



Exudation: moderate
Wound base: slightly occupied, granulation, epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 11

Day 28



Exudation: moderate
Wound base: granulation, epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without specialties

Summary:

After the start of local therapy with the "Wound – Sanitizer", rapid removal of deposits and signs of infection. Until the end of the observation period, rapid increase in epithelialization.
Additional therapy: compression

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 12

Diagnosis: Ulc.crur. ven
Sex: male
Localization: Lower leg right
Duration: 5 weeks

Day 0



Exudate: little
Wound base: plaque
Infection: local redness
Depth: superficial
Area: slight redness

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 12

Day 7



Exudate: little
Wound base: plaque
Infection: no local infection signs
Depth: superficial
Area: without special ties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 12

Day 14



Exudate: little
Wound base: occupied, granulation
Infection: no local infection signs
Depth: superficial
Area: without specialties

PRAXIS FÜR
WUNDBEHANDLUNG

— SLYCARE GmbH —

Case 12

Day 21



Exudate: little
Wound base: slightly occupied, granulation, massive increase in epithelialization
Infection: no local signs of infection
Depth: superficial
Area: without specialties

Case 12

Day 28



Exudate: little
Wound base: granulation, almost complete epithelialization
Infection: no local signs of infection
Depth: superficial
Area: no special features

Summary:

Rapid reduction of signs of infection. Removal of coverings without additional measures.
Unusually rapid epithelialization up to almost wound closure during the observation period.
Additional measures: Compression

Summary of the observation results:

Goal:

The recognition of the spectrum of action of the "Wound Sanitizer" in the routine treatment of chronic and secondary healing wound patients. Reactions to inflammation and infection, as well as healing tendencies in terms of granulation and epithelialization. Likewise, changes in the wound environment in the range of the pH value

1. Very rapid **decrease in the signs of infection**
2. **Inflammation** of the skin is reduced in the shortest possible time **without additional measures with steroids**
3. **In the case of wounds that are difficult to heal**, a **positive progression** of wound healing could be observed.
4. In many cases, **wound closure** occurs in a **very short time**
5. **Fibrin coatings** are reduced, **granulation** and **epithelialization** are promoted.
6. The application is **simple** and does not require any specially trained personnel
7. The **pH value decreases** with each treatment, so that it can be assumed that there is already **stimulation of wound healing** during the treatment.
8. No **intolerances** were found
9. The use was classified by the patients as **not noticeable to pleasant**.
10. The **pain situation** could be **improved** in a short time

In view of previous observations, the "Wound – Sanitizer" can be recommended for the local therapeutic treatment of secondary healing wounds, chronic wounds, infected wounds and inflammation of the skin as a supporting additional measure.

USP:

There is very good data on cold atmospheric plasmas, which prove that microorganisms are reduced, and wound healing is promoted by the reaction with the plasma-producing gas.

The Wound Sanitizer differs from other plasma devices on the market in that the plasma is applied to the wound surface in enriched aerosols. This prevents and delays primary adhesion, which is essential for the formation of biofilms.

Also known is the positive effect of plasmas in combination with hyper/hypochlorous acid solutions on wound healing and reduction of microorganisms.

With the Wound Sanitizer there is the possibility to combine this combination and apply it directly to the wound. Future treatment options are also possible through this type of plasmaproduction

Gilbert Hämmerle, DGKP, AZWM Wound
Outpatient Clinic LKH Bregenz/Austria
Practice for Wound Treatment Slycare GmbH Greiz/Germany