

PROSPECTIVE CASE STUDY

Evaluation of Local Wound Therapy with Plasmoeal Pro over 4 Weeks

15

Patients

5

Local Infection

5

Non-infected Ulcers

5

Hard-to-heal

Planning, supervision, data management & final assessment

Prim. Univ.-Prof. Dr. Robert Strohal

Execution, clinical procedures & primary final report

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Agenda

01

Study Objective

Primary & secondary endpoints

02

Design

Setup, visit schedule & parameters

03

Patient Cohort

15 cases in 3 wound groups

04

Case Presentations

4-week course per case

05

Analysis

Group & overall results

06

Summary

Key findings & conclusion

Study Objective

PRIMARY ENDPOINT

Improvement of Healing tendency

Assessment of wound healing over 8 documented dressing changes per case across the 4-week course.

SECONDARY ENDPOINTS



Reduction of local infection

Signs of infection over time



Change in pH value

Normalization of the wound milieu



Patient tolerance

Pain / tolerability (VAS)



Slough

Proportion of wound area covered



Exudate management

Amount & moisture balance

Study Design

4

Weeks

Observation period

15

Cases

Prospectively documented

8

Dressing changes

Standardized per case

120

Measurement points

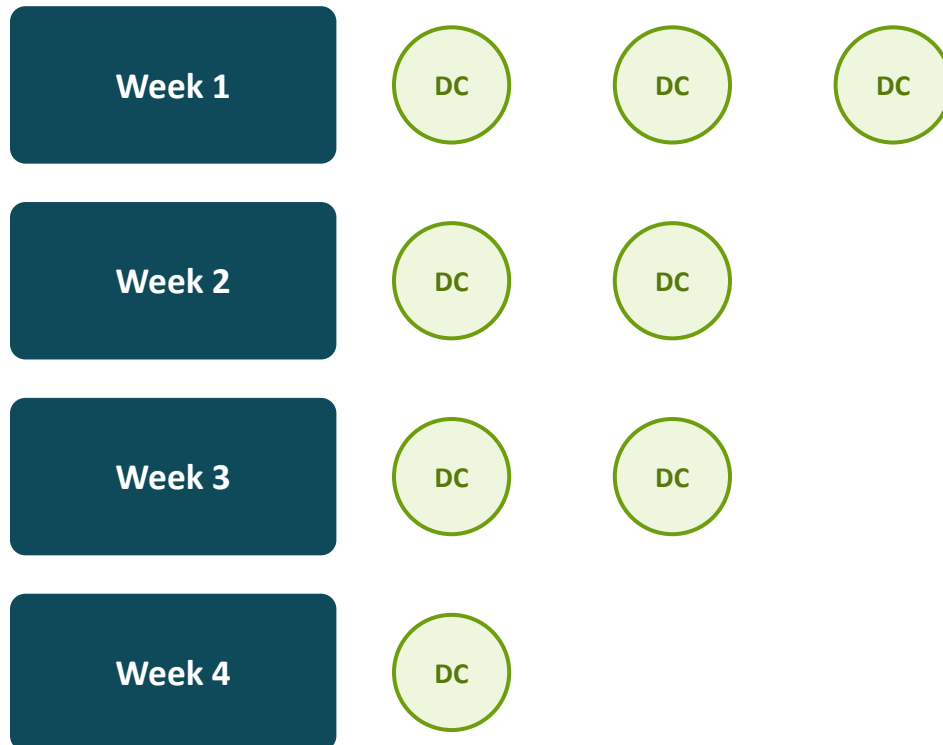
Photo & parameter records

METHODS

- Prospective, single-center observational study in 15 consecutive cases of ulcus cruris (leg ulcer).
- Application of Plasmoeal Pro (cold atmospheric plasma, CAP-A) at every dressing change.
- Standardized photo documentation and recording of pH, infection, slough, exudate and VAS.

Visit Schedule & Assessment Parameters

VISIT SCHEDULE – 8 DRESSING CHANGES



Decreasing change frequency as healing progresses.

ASSESSMENT PARAMETERS

Healing tendency

– / + / ++ / +++

Signs of infection

– / + / ++ / +++

pH value

wound milieu

Patient tolerance

VAS 0–10

Slough

% of wound area

Exudate amount

0 / + / ++ / +++

Wound area is recorded optionally to track progress.

CASE SERIES

Local Infection

Cases 1–5 · Wounds with clinical signs of infection

Case
1

Case
2

Case
3

Case
4

Case
5

01

Local Infection – Case 1

Pt 1 · 65 yrs · Ulcus cruris, lateral ankle

Local Infection

Before



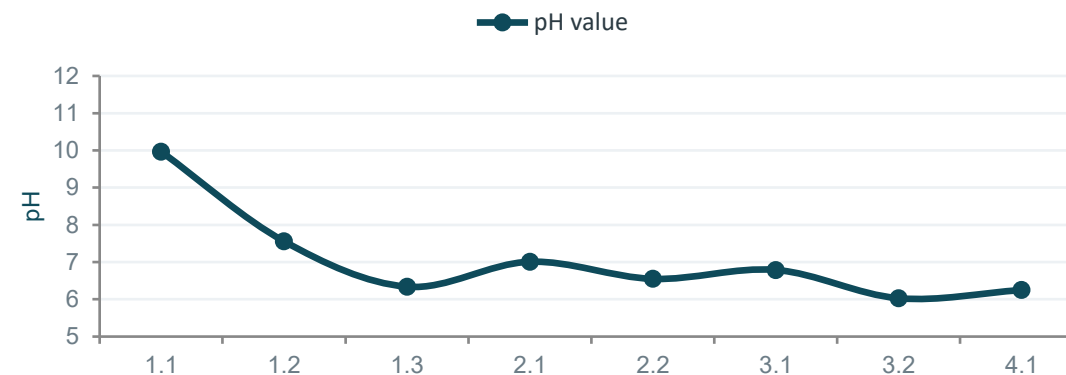
After



COURSE W1 → W4



Findings Tender on pressure, erythematous, edematous, sloughy, moderate exudate
Therapy Cleansing with NaCl 0.9% · CAP-A · wound contact layer · absorbent pad



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	++	9.97	4	100%	++
W1-V2	-	++	7.56	2	90%	+
W1-V3	+	+	6.34	0	60%	+
W2-V1	++	-	7.01	0	50%	+
W2-V2	++	-	6.55	0	40%	+
W3-V1	++	-	6.79	0	30%	+
W3-V2	++	-	6.03	0	30%	+
W4-V1	+++	-	6.25	0	10%	+

CONCLUSION Near-complete healing by week 4

02

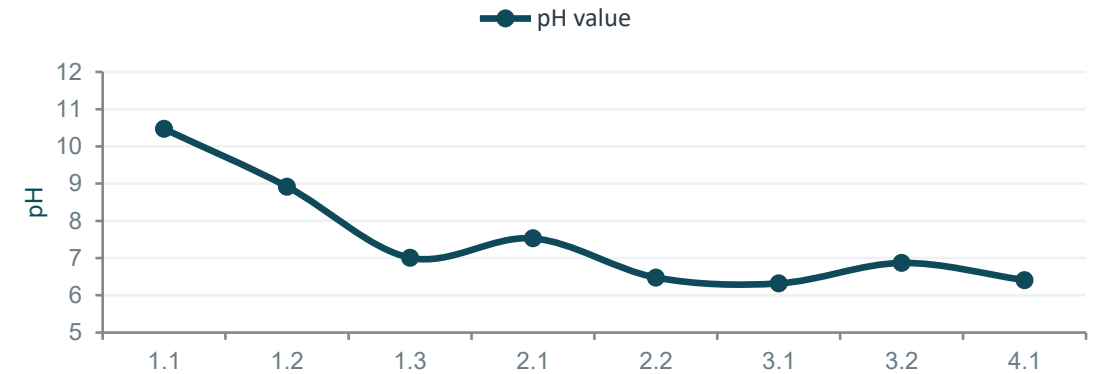
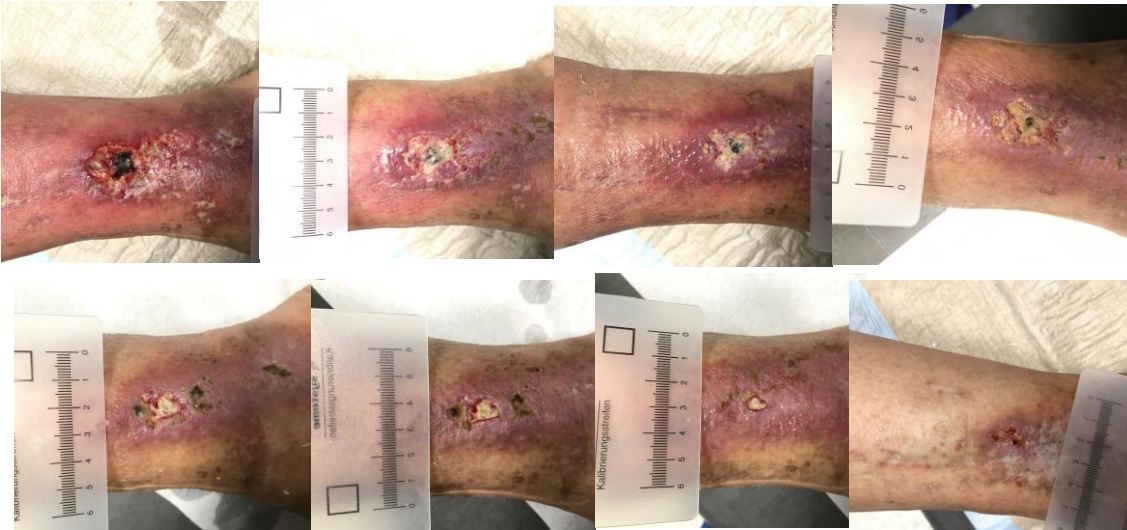
Local Infection – Case 2

Pt 2 · 71 yrs · Ulcus cruris, medial right calf

Local Infection



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	+++	10.47	6	90%	+++
W1-V2	+	++	8.92	3	70%	++
W1-V3	+	+	7.01	1	50%	+
W2-V1	++	-	7.53	0	30%	+
W2-V2	++	-	6.48	0	20%	+
W3-V1	++	-	6.32	0	20%	+
W3-V2	++	-	6.87	0	10%	+
W4-V1	+++	-	6.41	0	0%	+

CONCLUSION Near-complete healing by week 4

Findings Locally infected, centrally necrotic, heavy exudate, fine slough
Therapy Cleansing with NaCl 0.9% · CAP-A · wound contact layer · absorbent pad

03

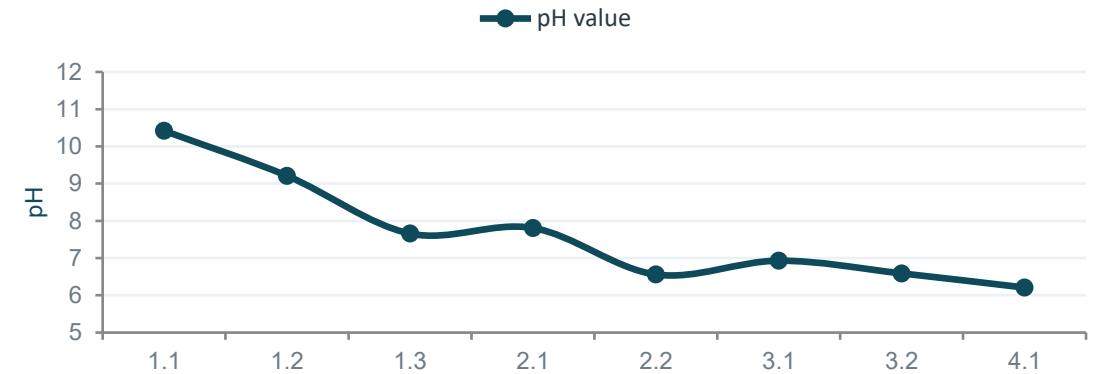
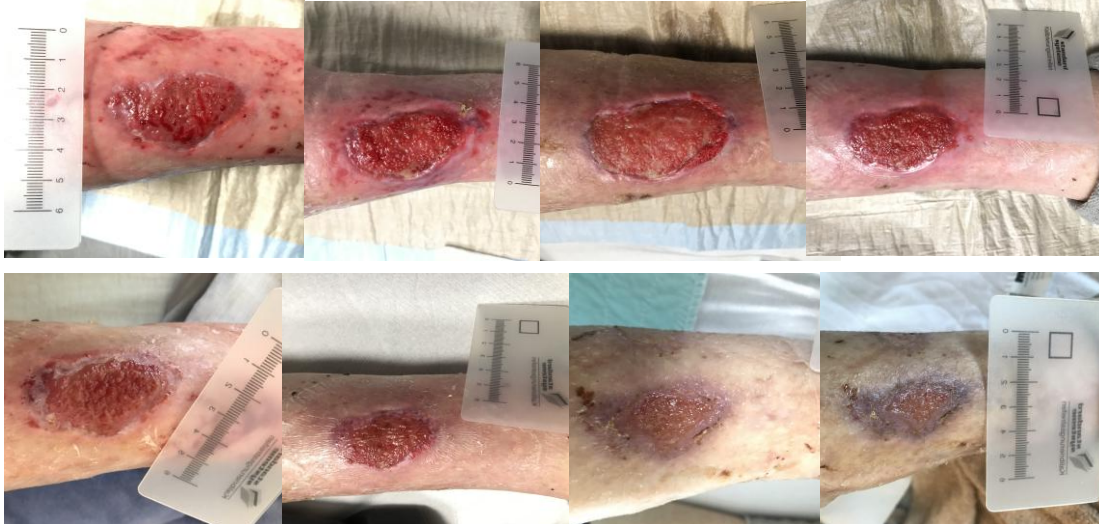
Local Infection – Case 3

Pt 3 · 58 yrs · Infected ulcerus cruris, right lower leg

Local Infection



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	+++	10.42	3	0%	+++
W1-V2	+	++	9.21	1	0%	++
W1-V3	+	-	7.66	0	0%	+
W2-V1	++	-	7.81	0	0%	+
W2-V2	+++	-	6.56	0	0%	+
W3-V1	+++	-	6.93	0	0%	+
W3-V2	+++	-	6.59	0	0%	+
W4-V1	+++	-	6.21	0	0%	+

CONCLUSION Rapid resolution of infection; epithelialization from week 2

Findings Infected, eczematous surrounding skin, erythematous, heavy exudate
Therapy Cleansing with NaCl 0.9% · CAP-A · wound contact layer · absorbent pad

04

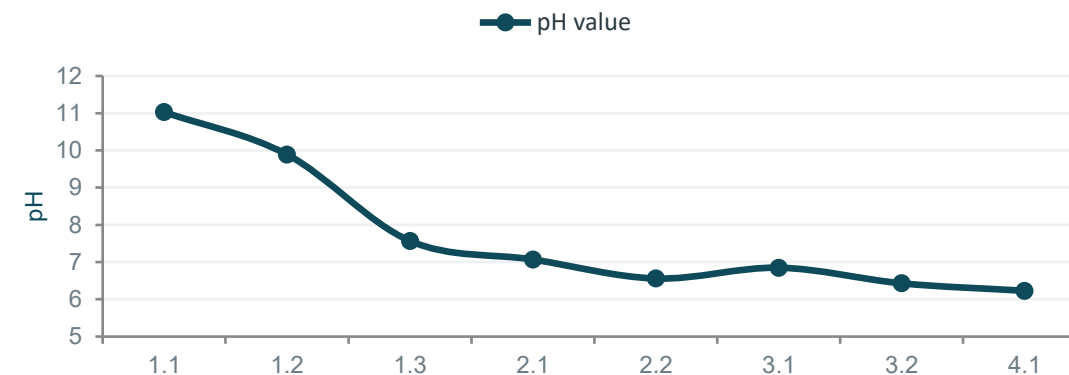
Local Infection – Case 4

Pt 4 · 76 yrs · Venous ulcer cruris, medial lower leg

Local Infection



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	+++	11.03	6	100%	+++
W1-V2	-	+++	9.89	4	100%	+++
W1-V3	+	++	7.57	1	60%	+
W2-V1	++	+	7.07	0	60%	+
W2-V2	++	-	6.56	0	30%	+
W3-V1	+++	-	6.85	0	10%	+
W3-V2	+++	-	6.43	0	0%	+
W4-V1	+++	-	6.23	0	0%	+

CONCLUSION Rapid reduction of infection and wound area

Findings Infected, sloughy, heavy exudate; compression stocking

Therapy Cleansing with NaCl 0.9% · CAP-A · wound contact layer · absorbent pad

05

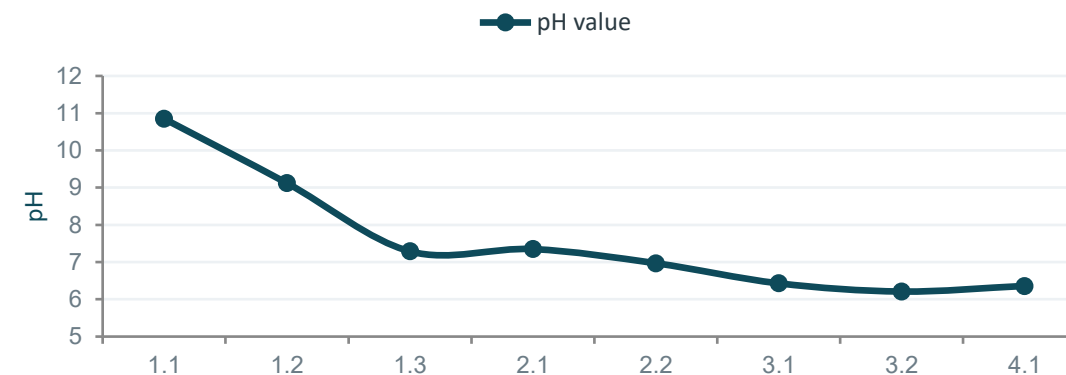
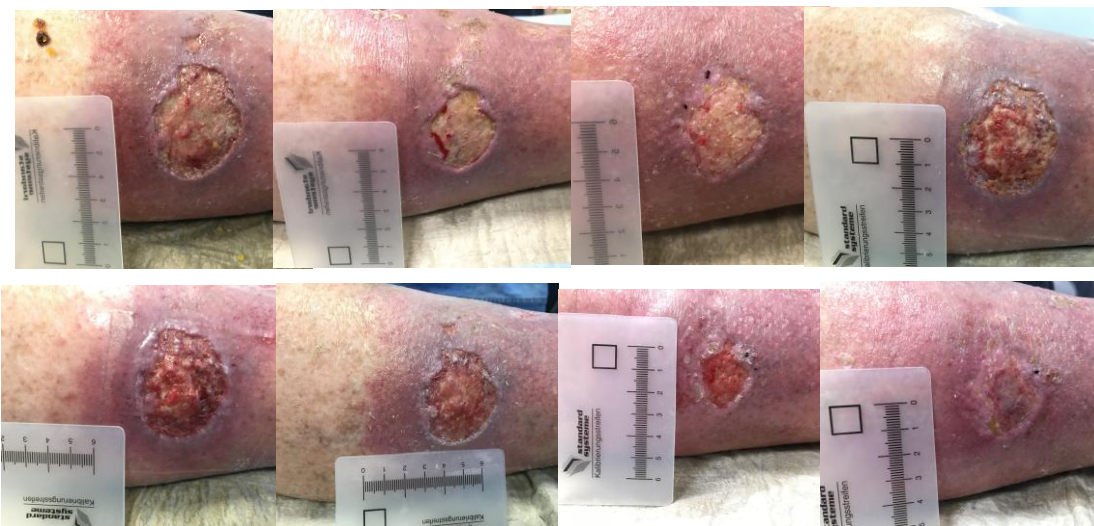
Local Infection – Case 5

Pt 5 · 67 yrs · Ulcus cruris, left lower leg

Local Infection



COURSE W1 → W4

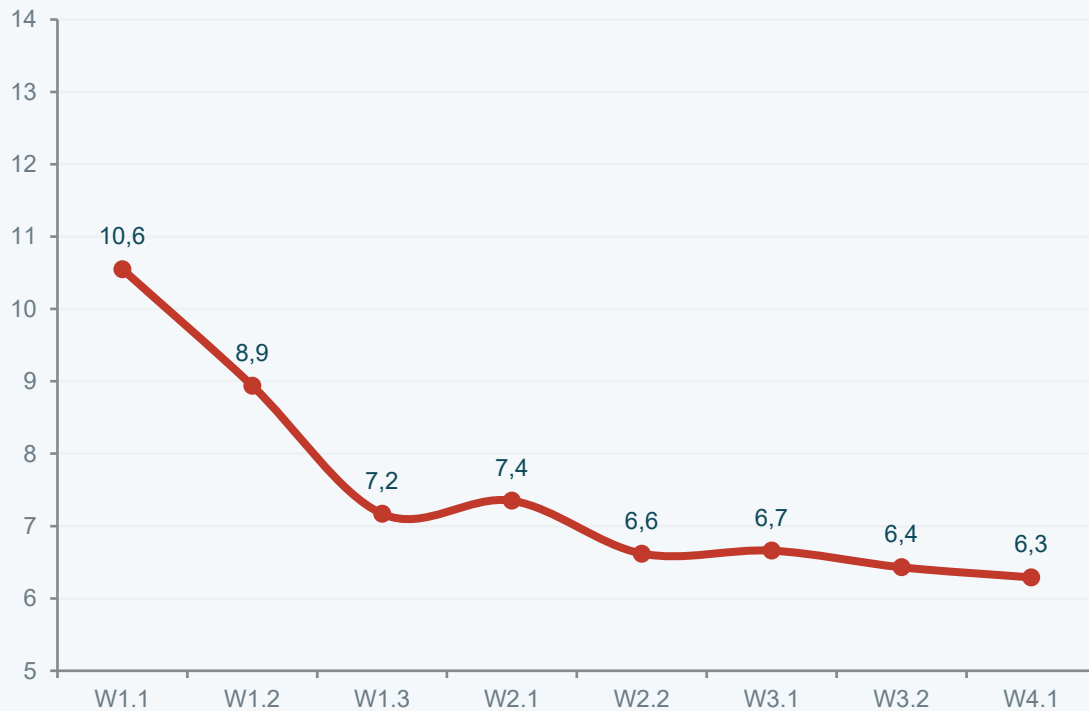


Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	++	10.85	6	100%	+++
W1-V2	-	+	9.12	2	90%	++
W1-V3	+	+	7.29	1	90%	+
W2-V1	++	-	7.35	0	50%	+
W2-V2	+++	-	6.97	0	30%	+
W3-V1	+++	-	6.43	0	10%	+
W3-V2	+++	-	6.21	0	0%	+
W4-V1	+++	-	6.36	0	0%	+

CONCLUSION Rapid reduction of infection and slough; epithelialization from week 2

Findings Infected, erythematous, heavy exudate, painful, sloughy
Therapy Cleansing with NaCl 0.9% · CAP-A · wound contact layer · absorbent pad

Group Summary

MEAN pH COURSE (n=5)**KEY OBSERVATIONS****Rapid resolution of infection**

Signs of infection usually no longer clinically detectable from week 2.

**pH normalization**

Initial pH 10–11 steadily decreases toward 6–6.5.

**Exudate & slough**

Marked decrease; transition to moist wound healing.

**Healing tendency**

All 5 cases with clear healing tendency by week 4.

CASE SERIES

Non-infected Ulcers

Cases 6–10 · Quiescent ulcers in the epithelialization phase

Case
6

Case
7

Case
8

Case
9

Case
10

06

Non-infected Ulcers – Case 6

Pt 6 · 56 yrs · Venous ulcer cruris, left lower leg

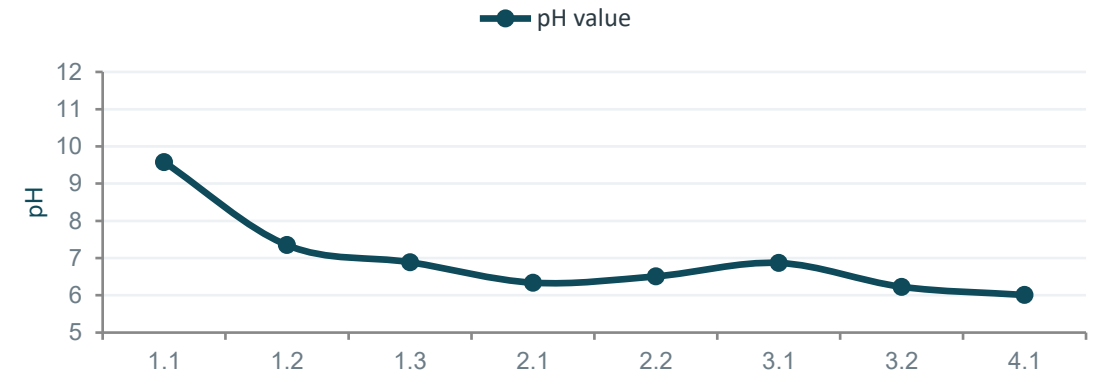
Non-infected Ulcers



COURSE W1 → W4



Findings Sloughy, non-infected; small skin island; dry, scaly surrounding skin
Therapy Cleansing with NaCl 0.9% · wound contact layer · absorbent pad



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	+	-	9.58	3	90%	++
W1-V2	++	-	7.35	0	30%	+
W1-V3	+++	-	6.89	0	30%	+
W2-V1	+++	-	6.34	0	10%	+
W2-V2	+++	-	6.51	0	0%	+
W3-V1	+++	-	6.87	0	0%	+
W3-V2	+++	-	6.23	0	0%	+
W4-V1	+++	-	6.01	0	0%	+

CONCLUSION Near-complete healing by week 4

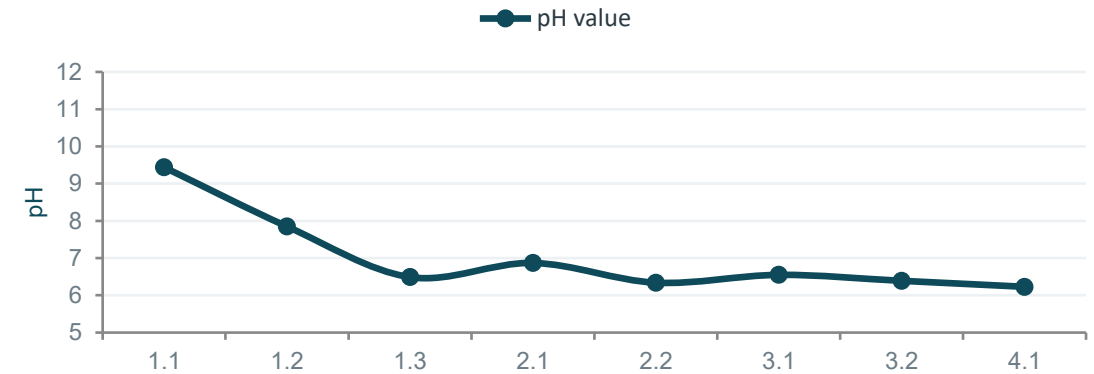
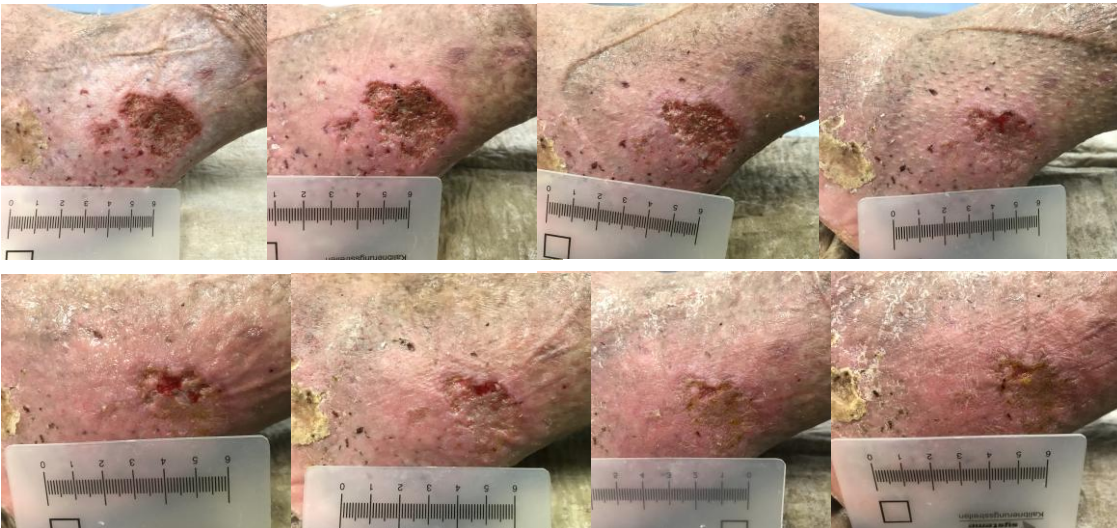
Non-infected Ulcers – Case 7

Pt 7 · 79 yrs · Ulcus cruris, right Achilles region

Non-infected Ulcers



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.44	5	0%	++
W1-V2	+	-	7.85	1	0%	++
W1-V3	+	-	6.49	0	0%	+
W2-V1	++	-	6.87	0	0%	+
W2-V2	+++	-	6.34	0	0%	+
W3-V1	+++	-	6.55	0	0%	+
W3-V2	+++	-	6.39	0	0%	+
W4-V1	+++	-	6.23	0	0%	+

CONCLUSION Epithelialization from week 2

Findings Present for months; clean, granulating

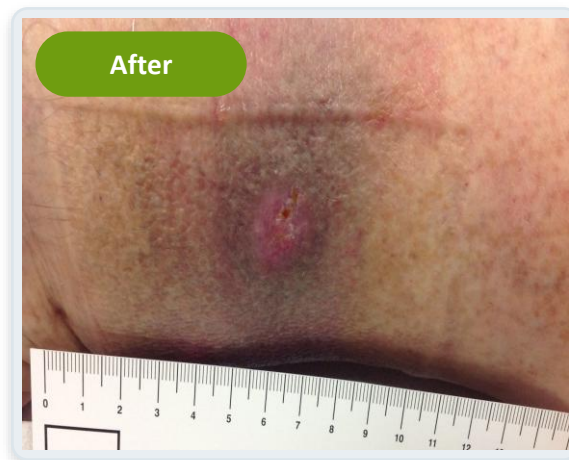
Therapy Cleansing with NaCl 0.9% · CAP-A · neutral foam dressing

08

Non-infected Ulcers – Case 8

Pt 8 · 71 yrs · Ulcus cruris, right lower leg

Non-infected Ulcers

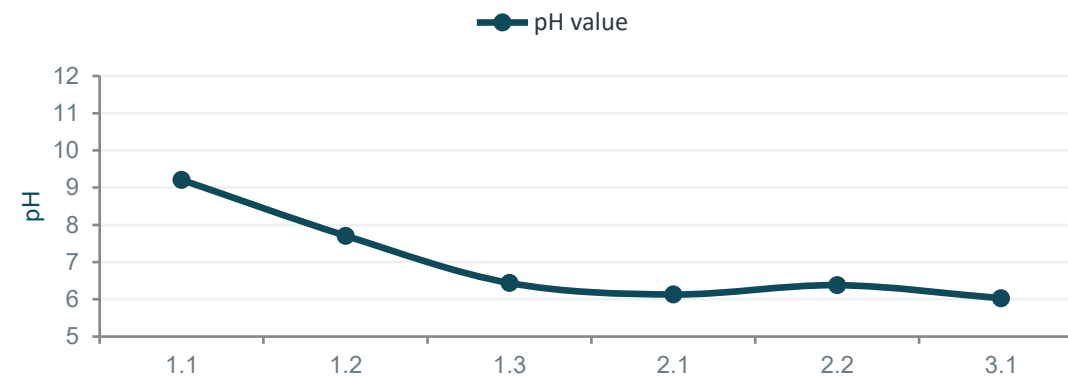


COURSE W1 → W3



Findings Lightly sloughy; livid discoloration of surrounding skin; no signs of inflammation

Therapy Cleansing with NaCl 0.9% · CAP-A · neutral foam dressing



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.21	0	50%	++
W1-V2	+	-	7.71	0	50%	+
W1-V3	++	-	6.44	0	0%	+
W2-V1	++	-	6.13	0	0%	+
W2-V2	+++	-	6.38	0	0%	+
W3-V1	+++	-	6.03	0	0%	+

CONCLUSION Rapid healing by week 3

09

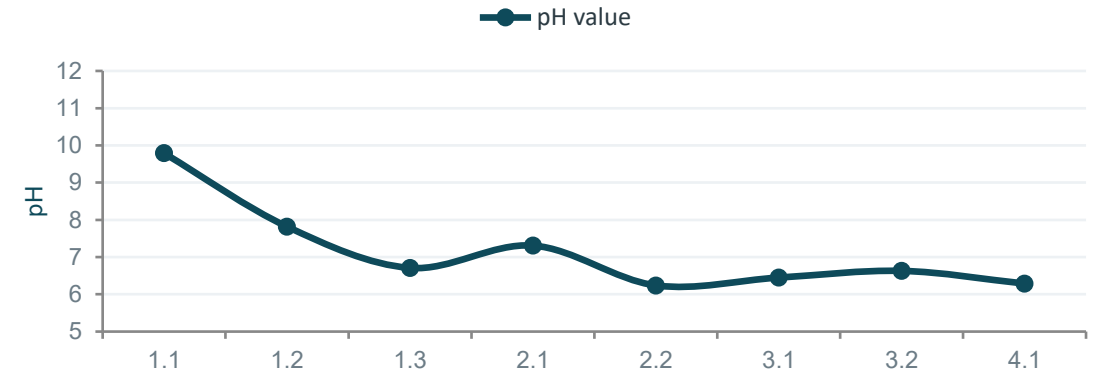
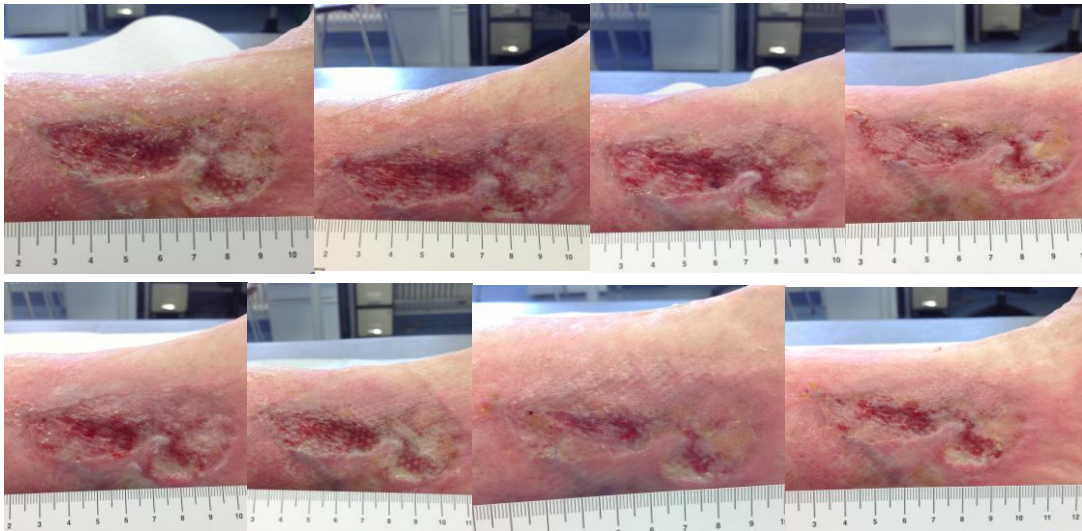
Non-infected Ulcers – Case 9

Pt 9 · 64 yrs · Ulcus cruris, left medial lower leg

Non-infected Ulcers



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.79	3	40%	+++
W1-V2	+	-	7.82	1	30%	++
W1-V3	+	-	6.71	0	20%	+
W2-V1	++	-	7.31	0	10%	+
W2-V2	++	-	6.24	0	10%	+
W3-V1	++	-	6.45	0	10%	+
W3-V2	+++	-	6.63	0	10%	+
W4-V1	+++	-	6.29	0	10%	+

CONCLUSION Marked reduction in wound area; epithelialization from week 2

Findings Lightly sloughy, granulating; no infection

Therapy Cleansing with NaCl 0.9% · CAP-A · neutral foam dressing

10

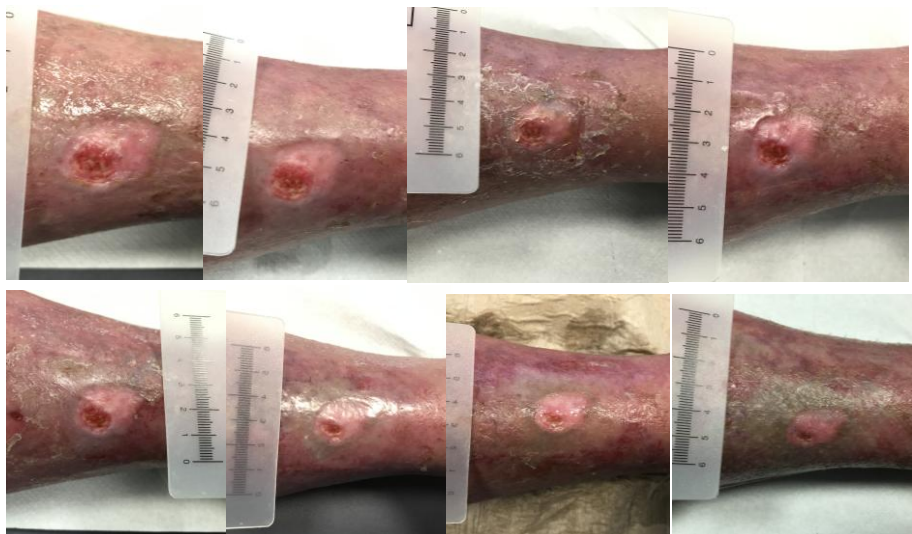
Non-infected Ulcers – Case 10

Pt 10 · 81 yrs · Ulcus cruris, left lower leg

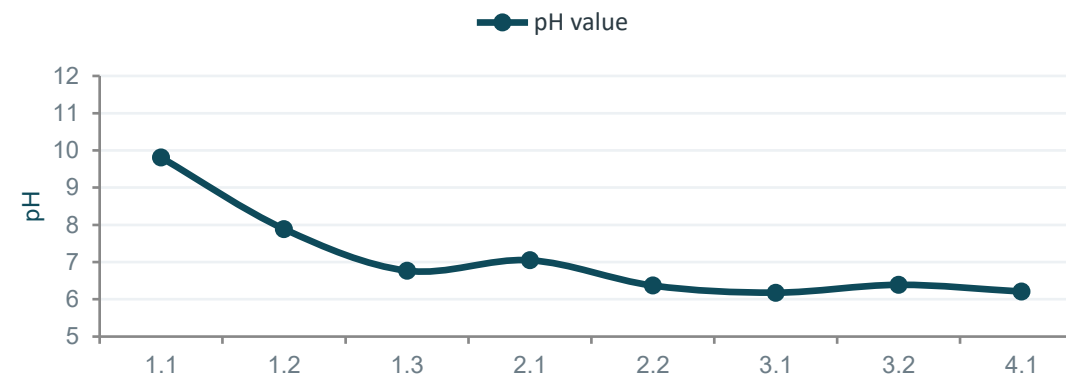
Non-infected Ulcers



COURSE W1 → W4



Findings Clean, granulating; no signs of infection
Therapy Cleansing with NaCl 0.9% · CAP-A · neutral foam dressing



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.81	2	0%	++
W1-V2	+	-	7.89	0	0%	+
W1-V3	++	-	6.77	0	0%	+
W2-V1	+++	-	7.05	0	0%	+
W2-V2	+++	-	6.37	0	0%	+
W3-V1	+++	-	6.18	0	0%	+
W3-V2	+++	-	6.39	0	0%	+
W4-V1	+++	-	6.21	0	0%	+

CONCLUSION Rapid epithelialization; near-complete healing by week 4

Group Summary

MEAN pH COURSE (n=5)**KEY OBSERVATIONS****Early epithelialization**

Epithelialization predominantly from week 2.

**Rapid healing**

Several cases nearly healed by weeks 3–4.

**Stable milieu**

pH stabilizes early within the physiological range.

**Low exudation**

Consistently low, well-controlled exudate amount.

CASE SERIES

Hard-to-heal Wounds

Cases 11–15 · Chronic, treatment-resistant wounds

Case
11

Case
12

Case
13

Case
14

Case
15

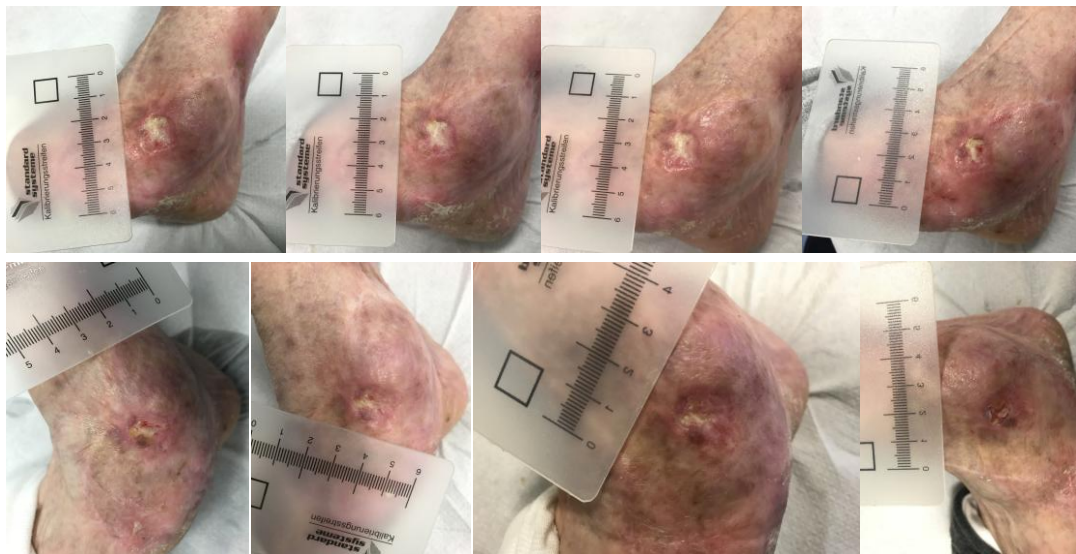
Hard-to-heal Wounds – Case 11

Pt 11 · 72 yrs · Ulcus cruris, left lateral ankle

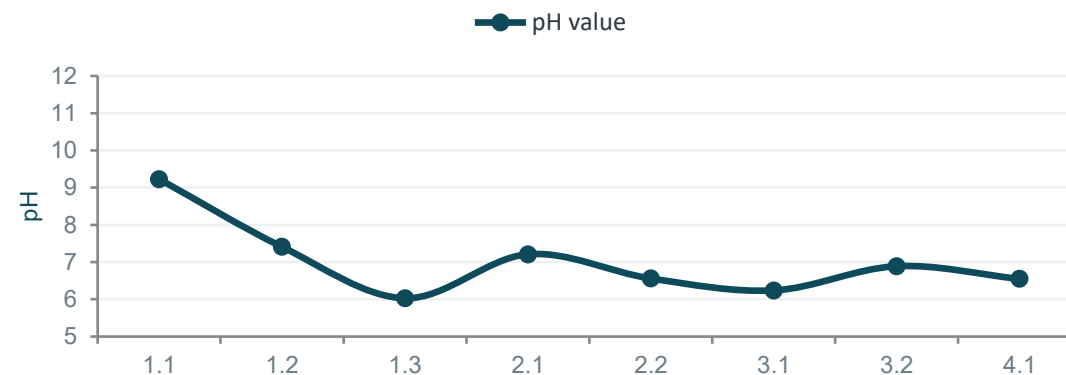
Hard-to-heal Wounds



COURSE W1 → W4



Findings Sloughy ulcer; edematous wound margin; no signs of infection
Therapy Cleansing with NaCl 0.9% · wound contact layer · absorbent pad



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.23	2	90%	++
W1-V2	+	-	7.41	1	80%	+
W1-V3	+	-	6.03	0	60%	+
W2-V1	++	-	7.21	0	30%	+
W2-V2	+++	-	6.56	0	30%	+
W3-V1	+++	-	6.24	0	20%	+
W3-V2	+++	-	6.89	0	10%	+
W4-V1	+++	-	6.55	0	0%	+

CONCLUSION Near-complete healing by week 4

12

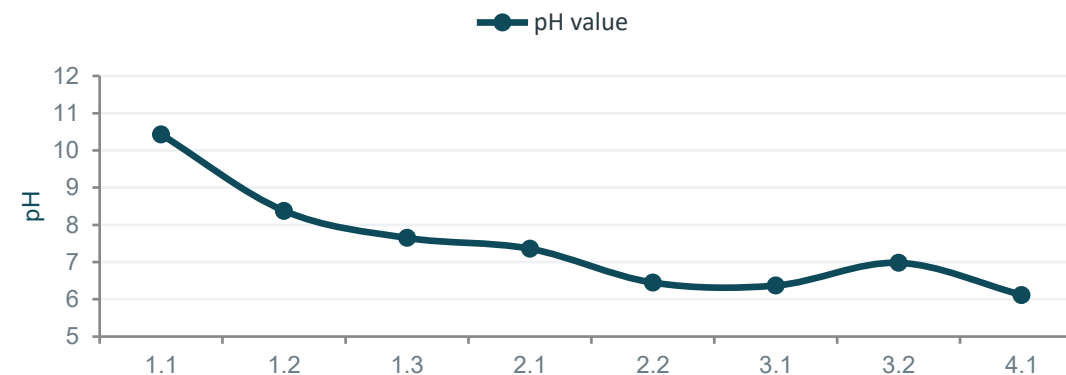
Hard-to-heal Wounds – Case 12

Pt 12 · 46 yrs · Venous ulcer cruris, right lower leg

Hard-to-heal Wounds



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	10.43	5	100%	++
W1-V2	+	-	8.38	2	90%	+
W1-V3	+	-	7.65	1	10%	+
W2-V1	++	-	7.36	0	10%	+
W2-V2	+++	-	6.45	0	0%	+
W3-V1	+++	-	6.37	0	0%	+
W3-V2	+++	-	6.98	0	10%	+
W4-V1	+++	-	6.12	0	0%	+

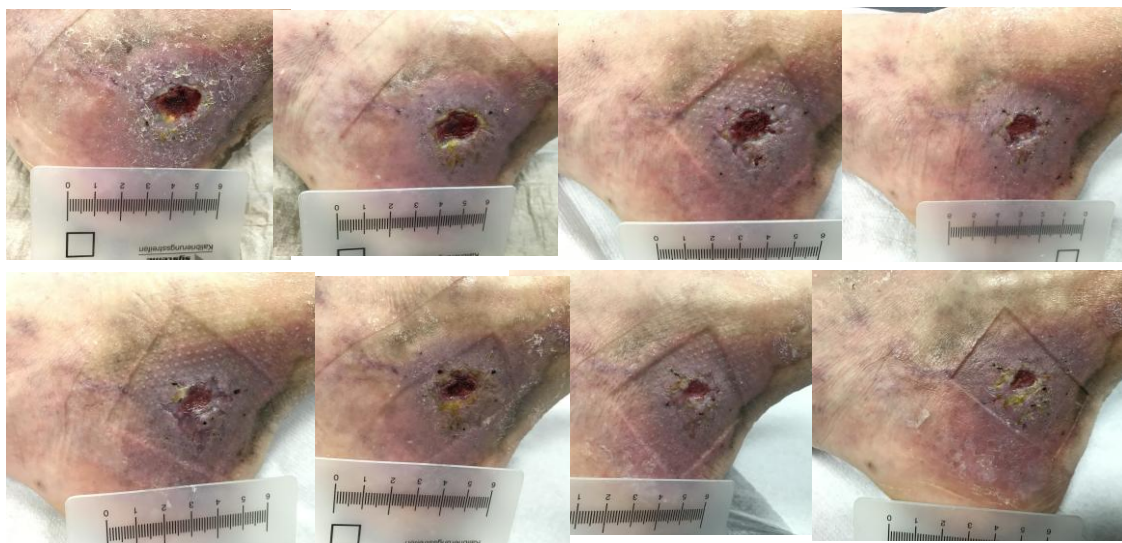
CONCLUSION Near-complete healing by week 4

Findings Non-infected, present for years; compression stockings; sloughy, weeping

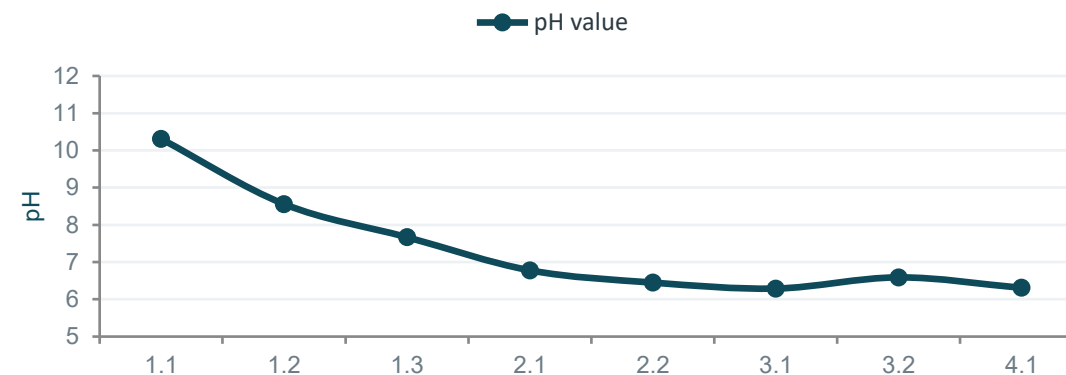
Therapy Cleansing with NaCl 0.9% · wound contact layer · absorbent pad



COURSE W1 → W4



Findings Non-infected, present for months; superficial; dry, scaly surrounding skin
Therapy Cleansing with NaCl 0.9% · neutral foam dressing



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	10.31	2	10%	++
W1-V2	+	-	8.56	0	0%	+
W1-V3	++	-	7.67	0	0%	+
W2-V1	++	-	6.78	0	0%	+
W2-V2	++	-	6.45	0	0%	+
W3-V1	+++	-	6.29	0	10%	+
W3-V2	+++	-	6.59	0	0%	+
W4-V1	+++	-	6.31	0	0%	+

CONCLUSION Substantial reduction in wound area

14

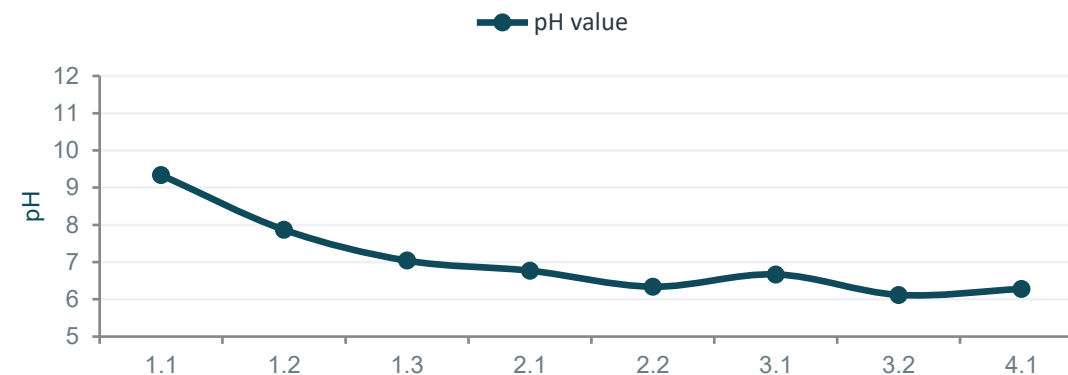
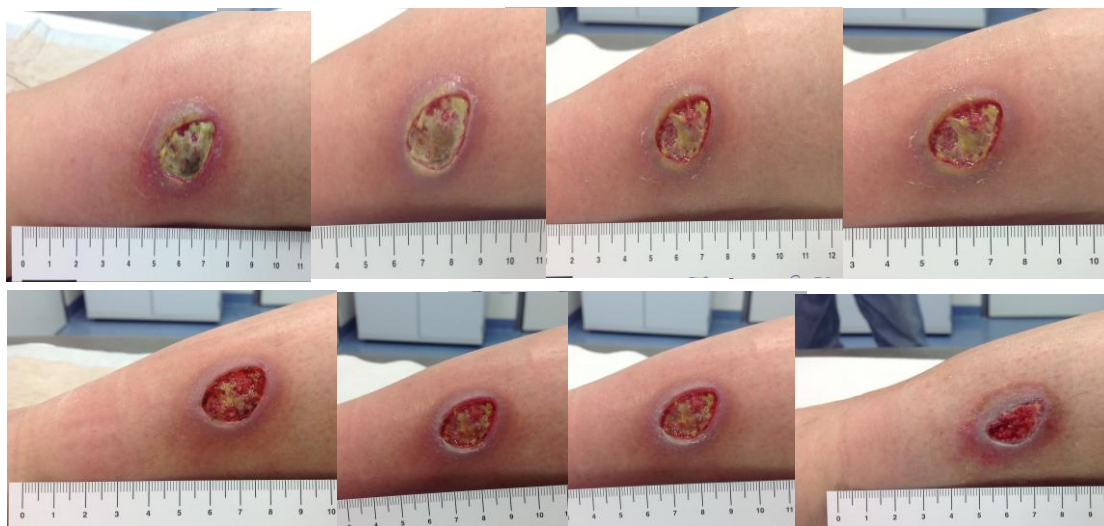
Hard-to-heal Wounds – Case 14

Pt 14 · 45 yrs · Ulcus cruris, right calf

Hard-to-heal Wounds



COURSE W1 → W4



Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.34	5	90%	+++
W1-V2	+	-	7.87	2	80%	++
W1-V3	+	-	7.04	0	70%	+
W2-V1	++	-	6.77	0	60%	+
W2-V2	+++	-	6.34	0	40%	+
W3-V1	+++	-	6.67	0	20%	+
W3-V2	+++	-	6.12	0	20%	+
W4-V1	+++	-	6.28	0	0%	+

CONCLUSION Rapid reduction of slough and rapid granulation; epithelialization from week 2

Findings Sloughy, present for months; heavy exudate; inflamed wound margin

Therapy Cleansing with NaCl 0.9% · wound contact layer · absorbent pad

15

Hard-to-heal Wounds – Case 15

Pt 15 · Ulcus cruris, plantar right great toe

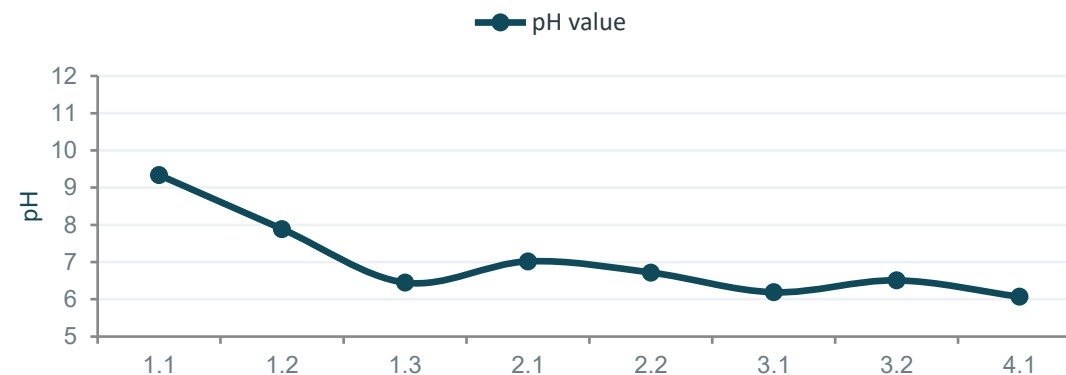
Hard-to-heal Wounds



COURSE W1 → W4



Findings Lightly sloughy, non-infected; sparse granulation
Therapy Cleansing with NaCl 0.9% · CAP-A · neutral foam dressing

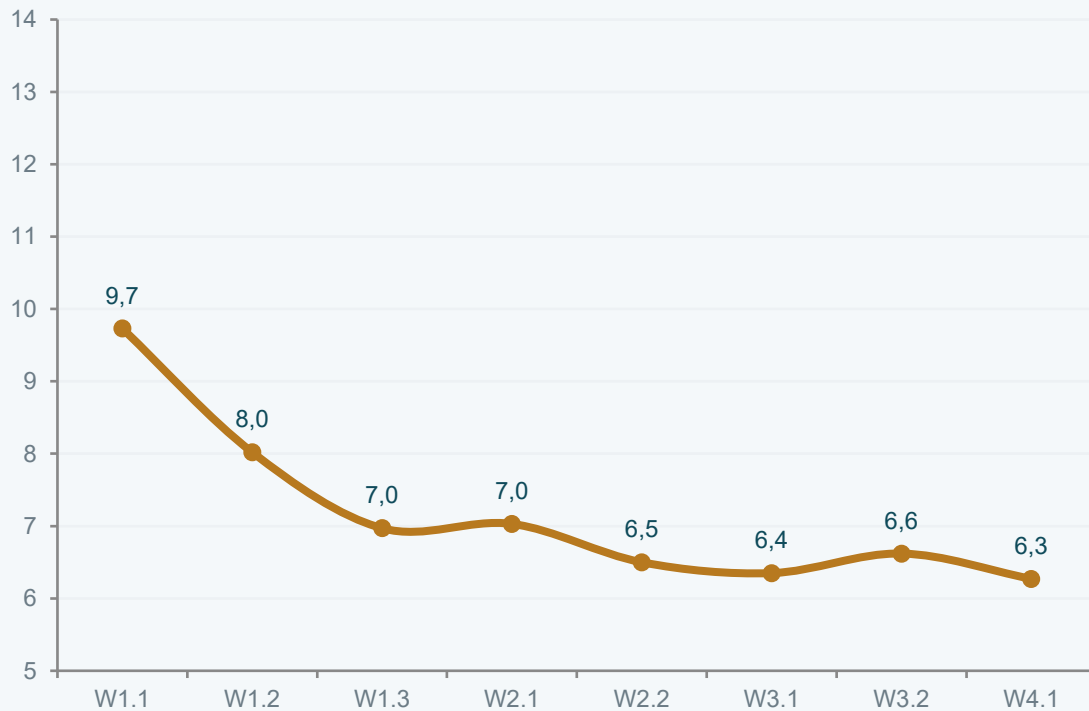


Visit	Heal.	Inf.	pH	VAS	Slough	Exud.
W1-V1	-	-	9.34	3	50%	++
W1-V2	+	-	7.89	0	20%	+
W1-V3	+++	-	6.45	0	0%	+
W2-V1	+++	-	7.02	0	0%	+
W2-V2	+++	-	6.72	0	0%	+
W3-V1	+++	-	6.19	0	0%	+
W3-V2	+++	-	6.51	0	0%	+
W4-V1	+++	-	6.07	0	0%	0

CONCLUSION Rapid improvement toward healing by week 4

Group Summary

MEAN pH COURSE (n=5)



KEY OBSERVATIONS



Progress despite stagnation

Even long-standing wounds show a clear healing tendency.



Substantial area reduction

Marked reduction of wound area over 4 weeks.



pH normalization

Decrease in pH despite the chronic course.

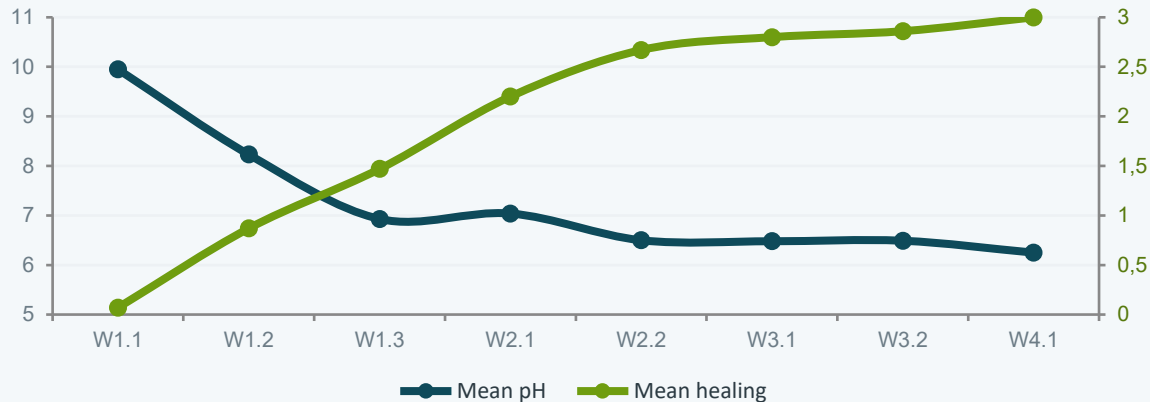


Good tolerance

Pain (VAS) drops rapidly; application well tolerated.

Overall Cohort Analysis

MEAN pH & HEALING TENDENCY (n=15)



OVERALL RESULTS



Wound area reduction Reduction of wound area in all 15 cases.



pH course Decrease of ~1.5–2 per treatment; stabilization at pH 6–7.



Exudate Rapid decline to low–moderate exudation – ideal moist wound care.



Infection score Marked decrease in signs of infection as early as week 1.



Patient tolerance No adverse events; application mostly perceived as comfortable.

15/15

Cases with
area reduction

≈ 6.3

stable final pH
(milieu normalization)

0

adverse
events

SUMMARY

Plasmoheal Pro shows a consistently positive healing course across all wound types

Healing

Improved healing tendency in all 15 cases, regardless of wound type.

Milieu

Normalization of wound pH to 6–7 – the basis for physiological healing.

Infection

Rapid decline in signs of infection within the first week.

Tolerance

No adverse events; comfortable application for patients.