The Use of Novel Formulation of a Known Wound Care Product: Pure Hypochlorous Acid (pHA) Gel: A Case Series

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Introduction

Hypochlorous acid (HOCl) is a naturally occurring molecule produced by neutrophils during the oxidative burst and is a critical component of the innate immune system.[1-2] Its potent antimicrobial preservative properties[2,3] have made it an area of interest for safe clinical applications. Recent biotechnological advancements have led to the creation of stable, pure hypochlorous acid (pHA) gels, presenting a new wound bed preparation option for wound management.

pHA has demonstrable preservative antimicrobial efficacy against a broad spectrum of germs, and it also displays low cytotoxicity to human tissues[5]. It is indicated for managing:

- Chronic Wounds[7-8,11,12]
- Surgical Incisions[6]
- Burns[9-12]
- Inflammatory Skin Conditions[1-2]

This case series highlights the clinical utility and emerging applications of pHA gel in both acute and chronic wound care settings.

Case Presentation

Case 1: 60-year-old male with a fifty-year history of severe burns.

Wound Profile: For over 20 years, this patient has suffered from a chronic, non-healing wound on his left knee, originating from a severe burn sustained at age one. The resulting burn scar contracture has caused severely limited range of motion. Despite multiple failed skin grafts, the wound never achieved full closure and recently required hospitalization for cellulitis.

Intervention: The patient began an intensive wound care regimen, including the use of pHA gel, during both the pre- and postoperative periods.

- Pre-operative: pHA gel was utilized to to encourage granulation and prepare this chronic wound for the skin graft surgery
- Post-operative: pHA gel was incorporated into each NPWTid dressing change to prevent graft loss due to infection.

Case 2: 20-year-old female with a history of recurrent keloids.

Wound Profile: a difficult-to-treat left ear and scalp wound following resection of recurrent keloids and advancement flap reconstruction. Wound healing, complicated by radiation of the wound bed, resulted in minor dehiscence

Intervention: The patient was identified as a suitable candidate for pHA gel, which was incorporated into her postoperative wound care regimen.

Case 3: 80-year-old male with a history of severe childhood burn wounds.

Wound Profile: A chronic wound on the left shin resulting from a failed skin graft and subsequent MRSA infection. The wound presented with severe fibrosis, hyper granulation, and significant slough.

Intervention: The patient was started on pHA gel as part of his wound care to facilitate better wound management prior to operative debridement.

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Highlighted Cases

Case 1

Figure 1A: Chronic non-healing wound to the left knee with severe fibrosis and burn scar contracture

Figure 1B: Post-op Day 0 following scar excision and split thickness skin graft (STSG)

Figure 1C: Healed wound to the left knee status post successful split thickness skin graft

Case 2

Figure 2A: Keloid resection with local advancement flap to irradiated skin bed immediately post operative

Figure 2B: Partial wound dehiscence at Post-Op Day 2

Figure 2C: Completely healed wound, post 5-week treatment with pHA gel

Case 3

Figure 3A: Initial presentation of chronic non-healing left anterior shin; note the significant amount of slough and the minimal amount epithelialization

Figure 3B: 4 weeks of pHA gel treatment in preparation for surgical debridement; note the stark increase of wound edge epithelialization and size of healed skin islands

Figure 3C: Wound bed prepared with ultrasonic debridement

Figure 3D: Skin graft with by autologous skin cell suspension (ASCS) to increase graft expansion ratio, minimizing donor skin harvested, and accelerate healing.

Age	Sex	Wound Description	Treatment Duration	Avg. Wound Dimension Δ / Day		Outcome	Further Procedures
				Surface Area (cm^2)	Volume (cm^3)		
60	M	Chronic nonhealing wound to the left knee with multiple failed skin grafts and burn scar contracture due to burns 50 years ago. Most recent wound has been present for over a year. Status-post STSG wound dimensions 5.3cm x 6.7cm x 0.2cm	8 weeks ** Post-op tx duration 28d*	↓ 1.268*	↓ 0.254*	Successful granulation to the wound bed to prepare for skin graft. Post operatively, successful skin graft healing in conjunction with pHA gel administration to graft site.	STSG to the left knee with NPWTid placement with pHA solution. Fully healed with preserved range of motion.
20	F	Status-post recurrent keloid resection to the left ear and scalp with local advancement flap. Wound healing, complicated by radiation of the wound bed, resulting in minor dehiscence	39 days	↓ 0.123	↓ 0.012	Fully healed wound	Well healed, no further procedures scheduled at this time.
72	F	Chronic pressure ulcer to the left buttock with significant associated pain	28 days	↓ 0.107	↓ 0.15	Significant improvement of wound area	No further procedures scheduled at this time
80	M	Chronic nonhealing wound to the left anterior lower leg due to childhood burns over 70 years ago. While the grafts had initially healed, the patient developed new venous leg ulcers in the setting of severely fibrotic, previously grafted skin. The wound is fibrotic and hyper granulated, with significant slough, and is colonized with MRSA and Pseudomonas.	42 days	↓ 18.374	↓ 5.512	Significant decrease in slough presence with good wound bed granulation	Intraoperative wound debridement with NPWTid placement with pHA solution.
72	M	Chronic left ankle wound due to repaired Achilles tendon rupture. Over a year of treatment at multiple wound care centers failed to achieve durable closure despite skin substitute grafts and an autologous split-thickness skin graft. Presented after initial skin graft failure. Recently underwent wound excision and advanced bipedicled fasciocutaneous reconstruction from the lateral ankle. The flap healed well with slight necrosis and dehiscence, medial to the incision at the flat insert, requiring debridement and autologous skin graft.	7 weeks	†	†	No evidence of post operative infection and about 70% take of most recent skin graft	Scheduled for graft revision of the left ankle.
68	F	Skin flap necrosis to the left breast following mastectomy. Small area of eschar which required sharp debridement. Wound cultures were positive for pseudomonas.	2 weeks	†	†	Successful wound bed healing with no evidence of infection or dehiscence	No further procedures scheduled at this time.
73	M	Recently resected squamous cell carcinoma of the scalp. Intraoperative complications necessitated delay of final reconstruction	3 days	†	†	No complications, good wound healing.	Proceeded with flap reconstruction 3 days after initial procedure.
32	F	Status-post excision of right axillary hidradenitis suppurativa and release of axillary scar contracture with local flap reconstruction.	Used intra operatively	N/A	N/A	Satisfactory wound healing	No further procedures scheduled at this time.
62	M	Status-post recent skin graft to the right leg due to chronic circumferential venous ulcer.	4 weeks	†	†	pHA gel was been applied post operatively at the time of NPWT change. He has had over 95% initial take of graft. Fully healed at 4 weeks post-op.	Placed in LTACH for further care.
87	F	Wound to the right posterior lower leg due to squamous cell skin cancer treatment with fluorouracil.	61 days	↓ 0.018	↓ 0.005	Fully healed wound	No further procedures scheduled at this time.
73	M	Chronic nonhealing wound to the right lower leg with ongoing draining	49 days	↑ 0.300	↑ 0.060	No change in wound healing	No further procedures scheduled at this time.
62	M	Recent traumatic wound to the left anterior lower leg	7 days	↓ 2.500	↓ 0.250	Fully healed wound	No further procedures scheduled at this time.
72	M	Chronic venous ulcerations to the left lower leg due to previous DVT 10 years ago	56 days	↑ 0.441	↓ 0.542	Improvement to wound bed with increased tolerance to wound care	No further procedures scheduled at this time.
63	M	Chronic venous ulcerations to bilateral lower legs with drainage ** wound dimensions only documented for Left Lateral Ankle wound.*	14 days	↓ 2.143	↓ 0.214	Wounds fully headed with good pain control	No further procedures scheduled at this time.
58	M	Status-post complex buried penis reconstruction	21 days	↓ 0.781	↓ 0.078	Noted easy application with minimal pain. Healed completely with no evidence of infection.	No further procedures scheduled at this time.

† Unable to calculate change in wound dimensions – missing follow up wound measurements

Key Pearls

- For <u>both</u> preoperative and postoperative care, pHA gel supports the **management and aids in the mechanical debridement of complex wounds, including those that are critically colonized or infected**.
- pHA gel is beneficial in cases where standard wound care is challenging due to **difficult-to-reach locations** or pain during treatment.
- pHA gel **enhances time efficiency**, requiring significantly less time than traditional wound soaking with pHA solution.

Methods

- This case series presents patients with complex operative and non-operative wounds, requiring advanced wound care and innovative treatments modalities to facilitate healing.
- A pure hypochlorous acid (pHA) gel formulation was incorporated into each patient's wound care regimen.
- Clinical/Wound-Specific, patient-reported, and practical outcomes were qualitatively compared to historical experiences with traditional pHA solution-based treatments (e.g., soaks).

Results

- Application of pHA gel resulted in **notable improvements in wound granulation** across a diverse cohort of patients.
- Patients reported **high satisfaction** with the treatment, particularly noting the **reduced time required for dressing changes compared** to traditional pHA soaks.
- All patients demonstrated **successful granulation and wound healing**, allowing them to progress effectively to the subsequent stages of their individualized wound care plans.
- These positive outcomes underscore the potential of pHA gel as an **efficient and effective tool** in enhancing wound management.
- **Postoperative use** of pHA gel on split-thickness skin graft (STSG) sites was associated with **high graft take rates**, supporting its role in **promoting** graft healing and reducing the risk of graft loss.

Conclusion

- The development of a stable pHA gel formulation represents a **novel extension** of the established uses of pHA solution.
- This formulation offers the potential for **broader clinical application**, particularly in wounds at increased risk for bacterial contamination.
- Sustained antimicrobial preservative activity in use and biocompatibility are critical for optimal healing in these complex cases.
- The positive findings from this case series **support the need for further study** and application of this treatment to a broader patient population.