

1 Year Retrospective Case Series: Synergy of Preserved Hypochlorous Acid (pHA) Wound Solution in Conjunction with Ovine Forestomach Matrix Grafting in Complex Plastic Surgery Wound Reconstruction Surgeries

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Background

- Wound healing is a complex physiological process, and despite advancements, managing complex wounds surgically remains challenging.
- pHA aids wound preparation by removing germs and assisting mechanical and surgical debridement.
- OFM is a biologically derived scaffold that supports cell migration, proliferation, and vascularization.

Objectives

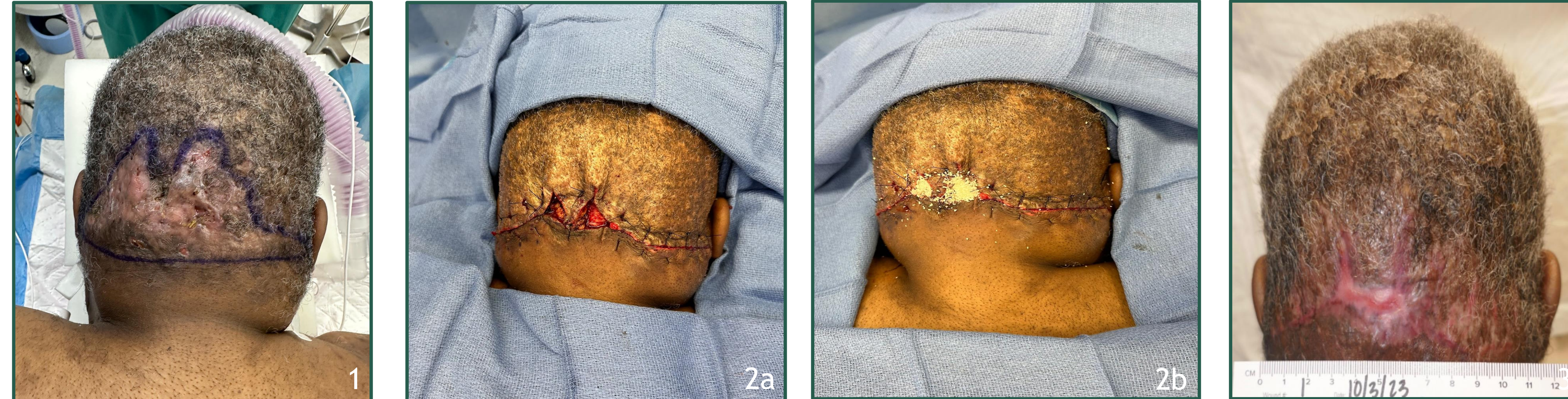
- This study explores the combined use of pure hypochlorous acid (pHA) solution and ovine forestomach matrix (OFM) grafting in plastic surgery wound reconstruction as synergistic therapeutic approaches.
- This case series explores the proposed synergy between pHA's unique germ and necrotic tissue debridement effects and OFM's biologic and structural benefits, with a goal of improved surgical wound healing outcomes.

Methods

- Retrospective review from June 2023 to June 2024 of patients who underwent OFM grafting along with pHA wound bed irrigation
- Operative techniques and perioperative protocols were examined
- Patient demographics, comorbidities, and operative cultures were reviewed
- Outcomes were assessed in the outpatient wound center, focusing on postoperative complications and/or healing process

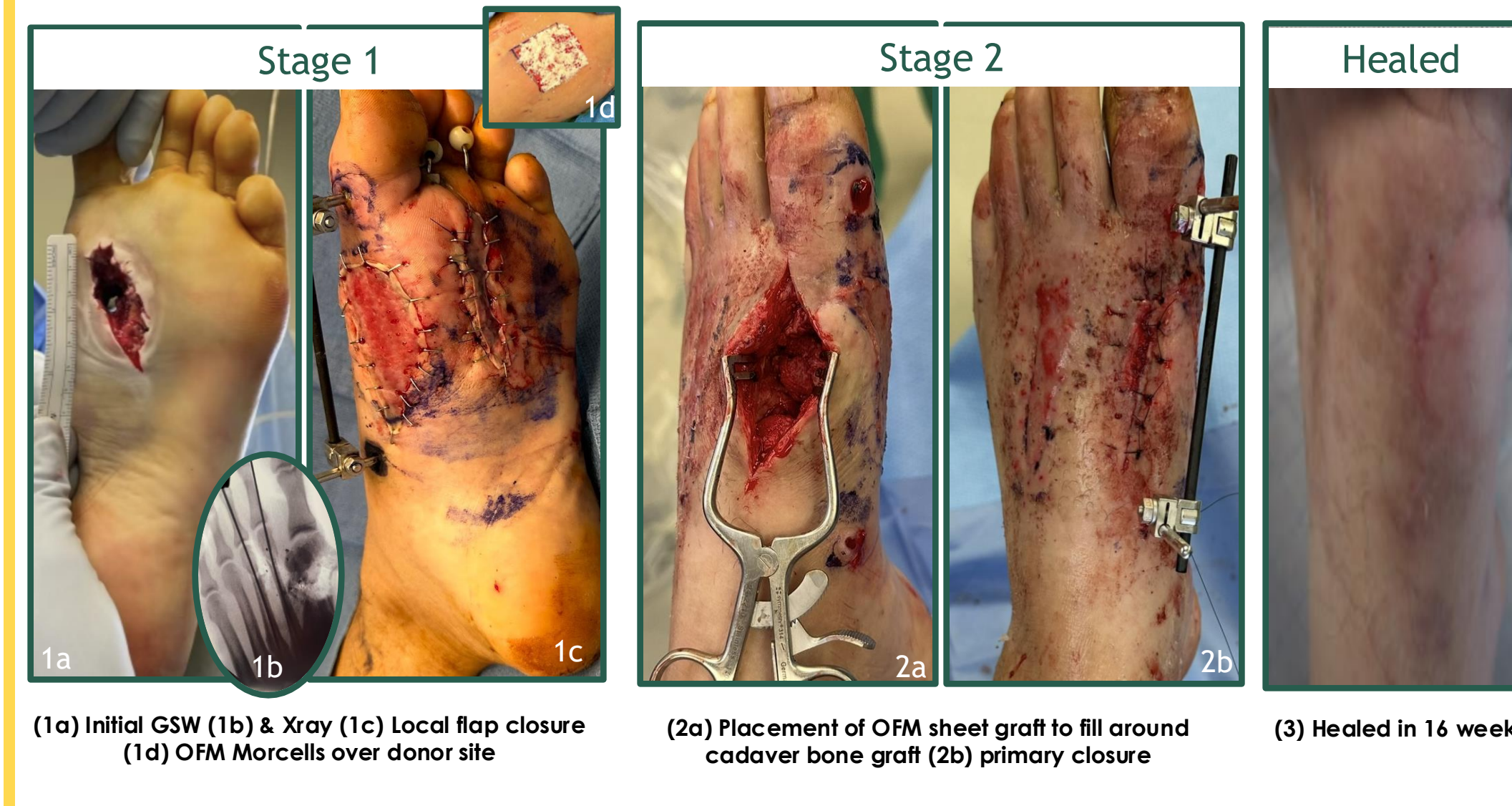
Results

Case 2: Posterior Scalp Hidradenitis Suppurativa



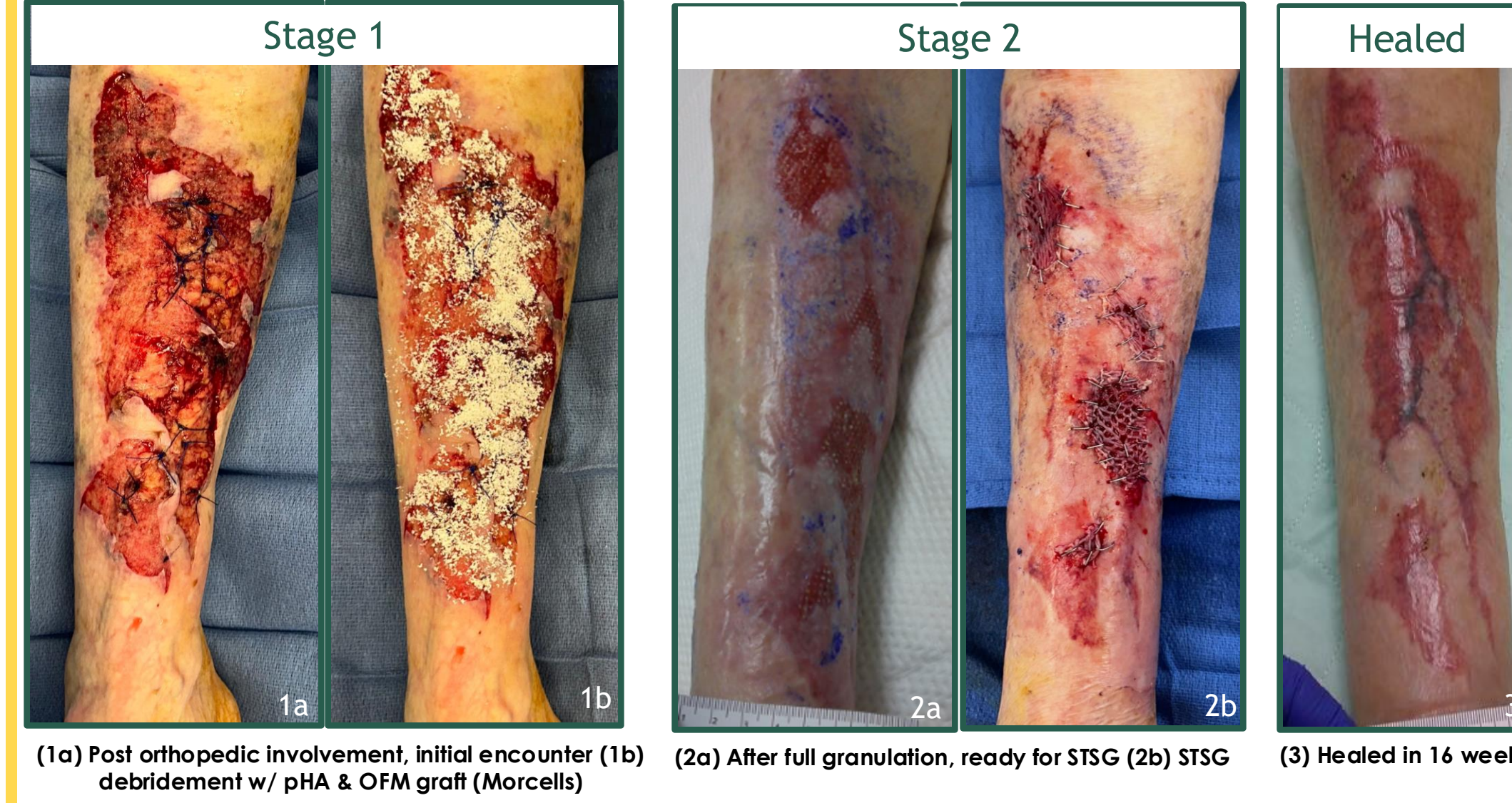
Left to right: (1) Prior to OR; (2a) closure via LTA; (2b) OFM Morcells applied on open areas; (3) Clinic photo fully healed in 6 weeks

Case 7: Gun Shot Wound to Foot



(1a) Initial GSW (1b) & Xray (1c) Local flap closure (1d) OFM Morcells over donor site (2a) Placement of OFM sheet graft to fill around cadaver bone graft (2b) primary closure (3) Healed in 16 weeks

Case 22: Crush Injury - Right Lower Leg



(1a) Post orthopedic involvement, initial encounter (1b) debridement w/ pHA & OFM graft (Morcells) (2a) After full granulation, ready for STSG (2b) STSG (3) Healed in 16 weeks

Case	Age, Sex	Wound Type/Location	Wound Management * All wounds were prepped w/ pHA wound solution	Type of OFM	Outcome
1	72 F	Pressure ulcer of sacral region, stage 4	Debridement with matrix graft placement	OFM Morcells	Transferred to LTAC and healing well w/ granulation and epithelialization w/o complications. Healed in 7 weeks
2	58 M	Posterior Scalp Hidradenitis suppurativa	wide resection w/ partial closure via LTA & OFM graft to the remaining open areas	OFM Morcells	healed successfully w/ granulation and epithelialization in 6 weeks w/o complications
3	62 F	Acute pressure injury to (L) tibia & knee	Stage 1: Knee – excision, OFM graft ¹ Tibia – I&D, OFM graft, burning of exposed bone & blue vessel loop lacing, Stage 2: knee – flap & graft closure Tibia – STSG. For each stage, INPWT was used	OFM Morcells ¹ OFM Matrix sheet ²	fully healed w/o complications in 9 weeks w/ no complications
4	45 F	Eschar post hematoma at her dialysis site (LUE)	Inpatient I&D w/ OFM graft	OFM Morcells	fully healed w/o complications in 7 weeks w/ no complications
5	29 F	Recurrent pilonidal cyst of gluteal cleft	Excision & OFM graft placed on wound base prior to closure via LTA	OFM Matrix Sheet	fully healed w/o complications in 6 weeks w/ minor wound dehiscence
6	75 M	Necrotic (R) lower leg wounds	I&D w/ OFM graft, INPWT	OFM Morcells	Lost to follow up, but initially healing well w/ no complications
7	42 M	Gunshot wound to the left foot	Local flap closure to a wound of the left first and second metatarsal with OFM grafting ¹ over the donor site and over remaining defect surrounding cadaveric bone graft ²	OFM Morcells ¹ OFM Matrix sheet ²	Successful wound healing in 16 weeks with minor wound care
8	85 M	Non-healing left forearm wound with exposed tendon	Debridement with matrix graft placement over tendons	OFM Matrix sheet	Successful granulation and epithelialization after 12 weeks. No complications
9	48 F	Skin necrosis at the left ankle and lower leg due to contusion and hematoma	Debridement and matrix grafting	OFM Matrix sheet	Lost to follow up, but initially healing well w/ no immediate complications. No bleeding or exposure of bone or tendon
10	68 F	Gangrenous and necrotic lower extremity wounds to bilateral lower legs	Staged excision of chronic wounds followed by split thickness skin graft placement and FINE matrix grafting to help with STSG take	OFM Morcells	95% initial take of the graft. Prolonged healing course due to comorbidities. Full wound healing with no significant complications.
11	77 F	Severe calciphylaxis diffusely over to left leg w/ small calciphylaxis wounds to the right leg	Wide excision with local flap closure to the left leg. Several 2-3 cm areas of necrotic non-infected calciphylaxis to the right leg excised with matrix graft placed	OFM Morcells	Complete wound healing in 19 weeks w/ superficial wound healing complications requiring extended wound management
12	18 M	Recurrent gluteal cleft pilonidal cyst with abscess	Wide excision with matrix graft placement	OFM Morcells	Healed completely post operatively. Returned after 6 months with a new pilonidal cyst. This was resected and has remained healed
13	57 M	Bilateral lower extremity calciphylaxis wounds	Debridement and matrix graft placement	OFM Morcells	Full granulation of wounds in 6 weeks. No immediate necrotic or infectious complications
14	19 M	Recurrent gluteal cleft pilonidal cyst w/ abscess	Wide excision and wound debridement with matrix graft placement	OFM Morcells	Full wound healing in 4 weeks w/o complications
15	58 F	Non-healing wounds to the bilateral thighs	Sharp debridement with matrix graft placement	OFM Morcells	Healed w/ minor superficial wound dehiscence in 8 weeks
16	87 M	Skin necrosis to (L) LLE from hematoma	Sharp debridement and FTSG. Matrix graft placed over the graft to encourage take	OFM Morcells	Good take of graft with complete healing at 12 weeks
17	22 M	Gluteal cleft pilonidal cyst and abscess	Wide excision and wound debridement with matrix graft placement	OFM Matrix sheet	Full initial healing w/ recurrence of pilonidal cyst at 4 months
18	21 M	Gluteal cleft pilonidal cyst and abscess	Wide excision and wound debridement with matrix graft placement	OFM Morcells	Full initial healing w/ minor superficial wound dehiscence
19	65 F	Advanced pelvic osteomyelitis and multiple pressure injury wounds	Sharp debridement and muscle flap closure with matrix graft as implant	OFM Morcells	Due to advanced osteomyelitis she developed a recurrent deep serum at the operative site. This was drained successfully and treated w/ abtx
20	28 M	Gluteal pressure injury	Excision, OFM graft implant, hamstring/gluteal muscle flap reconstruction w/ direct skin closure, INPWT	OFM Matrix sheet	Transferred to LTAC and fully healed w/o complications in 6 weeks
21	M	pilonidal cyst of gluteal cleft	Excision & OFM graft placed on wound base prior to closure via LTA	OFM Matrix sheet	Fully healed w/o complications in about 4 weeks
22	72 F	Crush injury w/ exposed bone & tendon (R) lower leg	Stage 1: Debridement and matrix graft placement for wound bed preparation. Stage 2: STSG Transfer to postacute LTAC	OFM Morcells	Fully healed after minor wound debridement in 16 weeks w/o major complication or reoperation
23	74 M	(R) calf ulcer post trauma	Planned postprocedural closure - I&D, STSG w/ OFM graft w/ multiple pHA irrigations during inpatient stay, INPWT used	OFM Morcells	Transferred to LTAC and fully healed w/o complications in 7 weeks
24	17 M	pilonidal cyst w/ abscess of gluteal cleft	Excision & drainage w/ OFM graft placed on wound base prior to closure via LTA	OFM Morcells	Fully healed w/o complications in about 6 weeks

Table 1: Patient demographics, wound management, type of OFM and outcome. I&D: incision and drainage, LTA: local tissue arrangement, INPWT: incisional negative pressure wound therapy, STSG: split thickness skin graft

Key Pearls

- pHA wound solution can be beneficial as an adjunct to OFM grafts for various wound types to assist in integral debridement and help prepare the wound bed for OFM grafting
- For complex non healing wounds, OFM grafts are a beneficial addition to plastic surgical reconstructive procedures for successful healing

Results

- 24 cases were reviewed with various wounds requiring plastic surgical reconstruction (table1)
- 15 patients healed without reoperation, 3 of which had a prolonged healing course (7,10,11)
- 3 patient experienced minor wound dehiscence which resolved with local wound care (5,15,18)
- 3 patients required reoperation (12,17,19)
- 2 patients were lost to follow-up but on discharge had no known complications (6,9)
- Cultures were sent from all patients revealing growth of various pathogens

Conclusion

- This study demonstrates the potential benefit of combining pHA solution for wound preparation prior to OFM grafting for improving healing outcomes in patients with complex wounds undergoing reconstructive surgery.
- The results reveal high rates of successful healing with a majority of patients achieving wound closure without reoperation.
- While some patients experienced minor complications, overall outcomes suggest the synergy of pHA and OFM may enhance healing by promoting antimicrobial effects and providing a supportive scaffold for tissue regeneration.

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