Treatment Of Complicated Post-Operative Vascular Wounds: Utilizing A Novel Transforming Powder Dressing In Lieu Of Conventional Wound Dressings

Johnathan A. Allen, PA-C; Maggie Gallagher, MD; Praise Njoku Austin, MD; Nicholas Quartararo; Rajiv K. Chander, MD

Division of Vascular Surgery, James J. Peters Veterans Affairs Medical Center, Bronx, New York 10468

Symposium on Advanced Wound Care | April 26 – 30 | National Harbor, MD

INTRODUCTION

Management of surgical site wounds and complications is an important consideration for any vascular surgery team. Patients desire a dressing which is pain-free, easy to apply and requires minimal changes and manipulation. This case series evaluates the use of a novel transforming powder dressing (TPD*) with extended wear time (up to 30 days) as a wound dressing option in managing amputation sites and incisional surgical wounds complicated by dehiscence. TPD is a powder dressing that transforms upon hydration to form an oxygen permeable matrix that covers and protects the wound.

METHODOLOGY

We performed observational case reviews of post-surgical wounds in two patients with severe vascular pathology and significant co-morbidities. TPD was used as an alternative to conventional wound dressings. Patient demographics, past medical and surgical history, and anatomical pathology were described. Evaluation of wound closure progress was followed with the participation of multi-specialty teams.

DISCUSSION

Both patients experienced remarkable wound healing results and reduced pain using TPD. TPD provided the benefit of promoting wound healing, while being a less expensive alternative to other modalities that require more frequent dressing changes. It also allowed for ease of use in both clinic and home settings, significantly reducing the need of office visits for dressing changes.

Based on these results, we concluded that TPD is an appropriate treatment for use in the post-surgical setting that may be easily and competently managed by a patient at home.

RESULTS

#1 AMPUTATION SITE WOUND

71 y/o male with h/o HLD, DM, CAD (s/p CABG 1993), severe AS (s/p TAVR 2021), COPD, PAD s/p LLE angiogram with L SFA atherectomy and angioplasty on 10/2022

- Open surgical wound of the foot s/p partial 1st ray resection and wound debridement performed 11/2022 for OM
- Location: Left foot
- Baseline Measurements: 4.5 x 4.0 x 1.3 cm
- Dressing: TPD, contact layer, rolled gauze wrap
- Dressing Frequency: Weekly
- Time to Healing / Total Applications:
  - 85 days
  - 12 total applications

#2 SURGICAL WOUND C/B DEHISCENCE

72 y/o male with h/o HTN, AAA, depression, CKD3, HLD, A-fib, MI, diverticulitis, colovesicular fistula, PAD s/p R iliac stenting with femoral endarterectomy (08/2022) with postop course c/b by R groin infection and wound dehiscence

- Location: Right groin
- Baseline Measurements: 3.0 x 2.0 x 0.5 cm
- Dressing: TPD, contact layer, rolled gauze wrap
- Dressing Frequency: Weekly changes at home
- Time to Healing: 57 days with four clinic visits

Altrazeal® Transforming Powder Dressing, USA. For application instructions and risks of this device please refer to Altrazeal Instructions for Use.

Acknowledgements: This poster was developed in collaboration with Altrazeal Life Sciences Inc. All clinical cases and analyses were performed independently by the authors and no compensation was paid.

The Utility of Transforming Powder Dressing in the Treatment of Various Wound Types: A Case Series

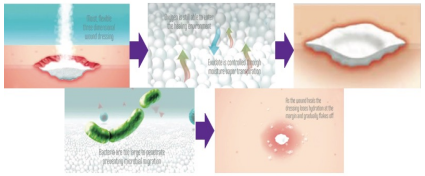
Sawyer Cimaroli, MD; Avi Hatami, MD; Brian Gillette, PhD; Scott Gorenstein, MD | NYU Langone Long Island Hospital, Department of General Surgery

SAWC Fall 2022 Meeting, Las Vegas, NV | October 13-16

INTRODUCTION:

More than 8 million people a year receive wound treatment in the U.S. Increasing health care costs, limited healthcare resources, an aging population, and life-style related diseases make wound management a growing clinical, social, and economic burden, indicating a vital need for a more effective wound management solution.

Transforming powder dressing (TPD*) forms a non-occlusive barrier which helps maintain a moist environment while facilitating the flow of excess exudate via vapor transpiration.



METHODOLOGY & MATERIALS:

- TPD is a novel, biocompatible polymer powder dressing which transforms into an extended-wear gel matrix upon hydration
- Single-center retrospective case series of various acute and chronic wounds treated with TPD
- 50 patients with 50 wounds were treated with TPD and had at least one follow-up visit during the study period

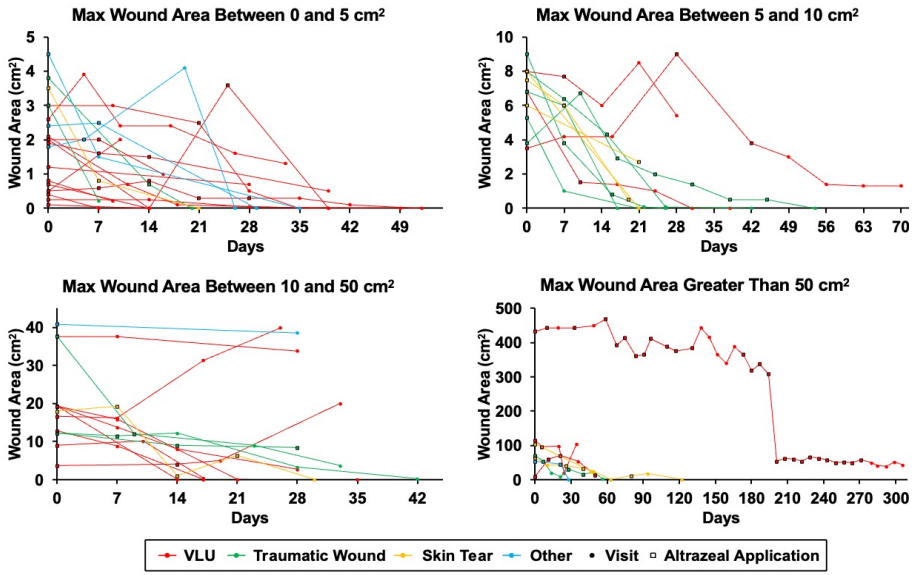
SUMMARY OF DEMOGRAPHICS	
Number of subjects	50
Number of TPD applications	129
Mean age (range)	76 years (18-99)
Male to female participants	20 (40%) / 30 (60%)
Number of current smokers	3 (6%)
Number of previous smokers	25 (50%)
Mean number of comorbidities (range)	6 (0-15)

Altrazeal® Transforming Powder Dressing

TREATMENT:

SUMMARY OF WOUND HEALING				
WOUND TYPE	TOTAL NUMBER	MEAN NUMBER OF TPD APPLICATIONS	NUMBER WITH WOUND HEALING > 10% PER WEEK**	NUMBER HEALED
Venous Leg Ulcer	27 (54%)	2.8	17 (63%)	12 (44%)
Traumatic Wound	11 (22%)	2.5	10 (91%)	6 (55%)
Skin Tear	7 (14%)	2.6	5 (71%)	5 (71%)
Other (Surgical, Arterial, Diabetic)	5 (10%)	1.6	4 (80%)	4 (80%)
TOTAL COUNT / MEAN	50	2.6	36 (72)%	27 (54%)

** Based on average healing per week from baseline to last visit



REFERENCES & ACKNOWLEDGEMENTS:

Sen CK. Human Wound and Its Burden: Updated 2020 Compendium of Estimates. Adv Wound Care (New Rochelle). 2021;10(5):281-292 | Obagi Z DG, Grada A, Falanga V. Principles of Wound Dressings: A Review. Surg Technol Int. 2019;10(35):50-57| Assadian O, Arnoldo B, Purdue G, et al. A prospective, randomized study of a novel transforming methacrylate dressing compared with a silver-containing sodium carboxymethylcellulose dressing on partial-thickness skin graft donor sites in burn patients. Int Wound J. 2015;12(3):351-356.

Acknowledgments: The study was conducted independently by NYU and no compensation was paid to the authors. This poster was presented in collaboration with ULURU Inc. For application instructions and risks of this device refer to Altrazeal Instructions for Use.

ILLUSTRATIVE CASES:

Case 1: Venous Ulcer

Case 2: Trauma | Skin Care

DISCUSSION:

Wound area reduction and positive healing trajectories were observed in nearly all wounds regardless of etiology. Complete healing was achieved in 54% of all wounds with 2.6 mean TPD applications. No TPD related adverse events were recorded.

Chronic Wounds: Complete healing was achieved in 44% of VLU treated with TPD and compression with 2.8 mean applications. TPD was ideal for venous leg ulcers because of its absorptive property and ability to conform and adhere to challenging locations.

Acute Wounds: 61% traumatic and skin tear wounds healed completely with 2.5 mean applications.

We conclude that TPD is a safe and effective way to treat acute and chronic wounds of various etiologies and locations.

Contact: Scott.Gorenstein@nyulangone.org

A Procedure Using a Single Dressing Application for the Bolstering and Protection of a Meshed Skin Graft

2009 SAWC Meeting
Grapevine, Texas

Kim Eldridge, RN, CNOR, RNFA, CFCN, WCN

James Gleaves, MD, FACS

Rush Hospital
Wound Care, Hyperbaric and Limb Salvage Center

Meridian, Mississippi

Objective
The objective of this presentation is to demonstrate a new procedure for the immobilization and isolation of a meshed skin graft without dressing changes, bolstering or negative pressure wound therapy.

Introduction
Split thickness skin grafts (STSG)s are a common and very effective surgical technique to quickly provide reepithelialization for well prepared wound beds The survival or "take" of a graft is dependent on numerous factors, however, the most frequent causes of STSG failure are dislodging or shear, and accumulation of wound fluid between the graft and wound bed. The two primary methods of providing immobilization of grafts during the take period are the use of a tieover bolster or application of negative pressure wound therapy. Both of which are successful treatments but present some complications with either difficulty in observing the underlying graft or in terms of equipment and personnel resources.

Methods
We present a treatment modality suitable for immobilizing, isolating and providing a moist wound healing environment for a meshed STSG. This treatment employs a novel powder dressing. When this powder dressing is applied to a mesh graft site, it transforms into a hydrating layer that adheres to the interstitial spaces between the graft. The material appears to fill in these spaces and behaves as a protective support bolster between the mesh graft and serves to anchor the mesh to the underlying wound bed. As new tissue begins to fill in the mesh spaces through contracture, the powder dressing sloughs off.

Patient History
81 year old female with history of diabetes, CHF, PAD, PVD

Wound History
Arterial ulcer on dorsal plantar of right foot. Wound was treated for several months prior to evaluation at Rush Hospital with little success. After evaluation of Vascular Status, she was found to have severe peripheral arterial disease and required vascular intervention.

Wound Treatment
Vascular flow was established with angioplasty and stenting per vascular interventionist. This was performed with excellent results, then the patient was taken to the OR for sharp debridement and STSG. The STSG was harvested from the right thigh donor site, meshed 1:3 and then applied to the wound bed and anchored with staples.

Powder Dressing Application and Follow-up
- The powder dressing was applied immediately post- op to a thickness of 1-2 mm
- A fenestrated wound contact layer** was applied over the graft site and covered with gauze
- The contact layer was changed at day 5 and 10.
- The powder dressing was removed at day 12 with greater than 90 % reepithelialization.


Ulcer Post Sharp Debridement

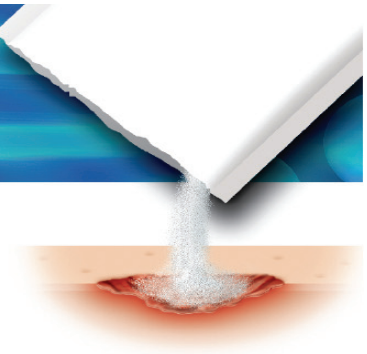

Mesh STSG in Place on Wound


Novel Powder Dressing on Wound


Day 5-No Dressing Changes


Day 10-No Dressing Changes


Day 12-Powder Dressing Removed



Results and Observations
The novel powder dressing described in this technique was initially evaluated as a covering for skin graft donor sites. Following evaluation in donor sites, the product was applied to a STSG with the hope that it could provide a convenient and comfortable treatment to protect a mesh graft during the period of "take" while the graft adheres to underlying tissue and reepithelializes across interstices.

The powder is applied with a procedure that is dramatically different from most films or pads using sprinkling rather than laying or stapling a pad in place. This application lends itself to covering the uneven surfaces of a mesh STSG. Additionally, the powder can be pressed into the spaces as it is applied over the surface. The resulting transformation from powder initially yields a white covering that gradually darkens in appearance with blood and wound fluid. The material does not resorb but does flatten somewhat over the graft surface and does not appear to allow shear forces to pull or dislodge the graft tissue as the mesh knits to the underlying wound. The chosen silicone mesh contact layer is easily removed from the powder dressing surface. Removal of the powder dressing if necessary can be accomplished by soaking the dressing in saline for several minutes after which pieces remaining on the wound can be peeled away without strong adhesion to the underlying tissue.

Conclusions
Results from this treatment were better than expected. The dressing provided a flexible, immobile surface that penetrated the gaps in the mesh graft and had strong adhesion to the underlying wound bed. The wound surface remained hydrated and the dressing did not dry or flake away from the moist tissue during the 12 day treatment. This technique appears to be a viable method of easily securing a STSG with a single dressing. The technique should be explored further to determine the best clinical practice and full benefits of this application.

This work was sponsored by ULURU, Inc.

* Altrazeal Transforming Powder Dressing
** Mepitel fenestrated silicone

Poster CS-022

Gregory Bohn MD, FACS
Medical Director
Trinity Center for Wound Care
and Hyperbaric Medicine

Graft Fixation and Wound Moisture Management with Transforming Powder Dressing*

TRINITY IOWA HEALTH
A better experience.

Introduction

Skin grafting is a fundamental method to repair skin defects and heal chronic wounds. Graft fixation and maintaining the wound environment is essential to the success of split or full thickness skin grafting. Skin grafts survive the first 24-48 hours as the result of serum imbibition. The graft is bathed in serum from the wound that supplies its nutrients via capillary action keeping the graft alive. Fixation methods prevent shear and slipping of the graft so as to hold it secure on the wound bed. Fixation allows the process of inosculation to occur as capillary buds in the wound bed align and grow into the vascular channels of the graft. Both of these processes are important for graft success and prevent graft loss.

Hypothesis

A new powder wound dressing technology can be utilized to "anchor" a meshed autograft or bio engineered skin substitute** in place on a wound without the use of fixation such as sutures or staples.

Materials and Methods

Transforming powder dressing was used to fix split thickness skin grafts and bio engineered skin substitutes. Skin grafts were harvested at 0.012 to.015 inch. The grafts were messed 1:1.5 and applied to the wound bed. Transforming powder was applied and aggregated fixing the grafts in place. Skin grafts were checked at weekly intervals until graft take was assured and documented.

Bio engineered skin substitute was meshed 1.5:1 and applied to wounds. The graft was fixed with transforming powder dressing. Wounds were followed at weekly intervals. If necessary, Bioengineered skin substitutes can be re-applied at 2 week intervals.

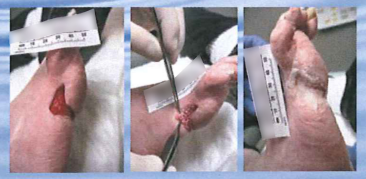
The technique was tested on two cases involving autologous mesh grafts harvested as 0.015 inch thick split thickness grafts. One case was a debrided third degree burn on the dorsal left foot. The second case involved a surgical excision where the graft did utilize limited suture fixation. In both cases with autologous grafts, the transforming powder dressing was not changed after application.

The technique was tested on two cases where living skin equivalent was meshed and applied directly to a debrided venous ulcer or DFU. In these cases, the powder dressing was left in place over the living skin equivalent for two weeks then the wound was cleaned and a new application of living skin equivalent was applied to the wound with another application of transforming powder dressing.

Case 1: Third degree burn debrided and treated with 0.0015 in ch split thickness skin graft meshed 1:1.5. Sutures and clips were not applied to this graft.

Case 2: Surgical excision site grafte with 0.015 inch autologous split thickness skin graft meshed 1:1.5. Sutures were used to anchor the edges of the graft.

Case 3: Venous Stasis Ulcer treated with Living Skin Equivalent fixed in place using Transforming Powder Dressing.



Case 4: Diabetic foot Ulcer treated with Living Skin Equivalent fixed in place with Transforming Powder Dressing. Patient was offloaded with a contact cast.

CONCLUSIONS

Transforming powder dressing can be employed as a method of graft fixation for both split thickness skin grafts and bioengineered skin substitutes. Whether applied in the operating room using split thickness skin grafts or in the clinic with bio engineered skin substitutes, the material remained in place with the grafts. The grafts were meshed and the powder material filled the spaces in the graft and securing it in place.

This method simplifies the use of bioengineered skin substitutes in the clinic setting and avoids problems with disturbing the grafts with dressing changes. Maintaining the moist wound environment without fluid build up is an important aspect of grafting and a material that optimizes the wound moisture while securing the graft in place can be beneficial. Graft take can be improved and optimize the effectiveness of these commonly used wound care products.

One other important finding from this study is that this technique of graft fixation can be used under compression wraps or in conjunction with contact casting.

REFERENCES

1. Siemionow M, Nasir S. Immunologic responses in vascularized and nonvascularized skin allografts. *J Recon Microsurg*. 2008;24:497-505.
2. MacFarlane DF. Current techniques in skin grafting. *Adv Dermatol*. 2006;22:125-38.
3. Schneider AM, Morykwas MJ, Argenta LC. A new and reliable method of securing skin grafts to the difficult recipient bed. *Plast Reconstr Surg*. Sep 1998;102(4):1195-8.
4. Zaulyanov L, Kirsner RS. A review of a bi-layered living cell treatment (Apligraf) in the treatment of venous leg ulcers and diabetic foot ulcers. *Clin Interv Aging*. 2007;2(1):93-8
5. Donohue KG, Carson P, Iriondo M, et al. Safety and efficacy of a bilayered skin construct in full-thickness surgical wounds. *J Dermatol*. Aug 2005;32(8):626-31.

*Altrazeal ®Transforming Powder Dressing-ULURU, Inc.
** Apligraf ®-Organogenesis Inc.

Case Series: Treatment of Complex Post-Operative Vascular Wounds with a Novel Transforming Powder Dressing (TPD)

Johnathan A. Allen, PA-C; Xiomara Benavide-Lopez, MD; Bessie M. Roca Loor, MD; Dian G. Nesbeth, NP; Rebecca K. Barksdale, RN; Nicholas Quartararo; Rajiv K. Chander, MD

Division of Vascular Surgery, James J. Peters Veterans Affairs Medical Center, Bronx, New York 10468

INTRODUCTION

Vascular ulcers occur in an estimated 1 to 3 percent of adults worldwide and remain a public health issue with significant economic and psychosocial impacts.

Wound management of vascular ulcers requires frequent dressing changes and drain valuable material and labor resources.

This case series aimed to evaluate the safety and efficacy of utilizing a novel transforming powder dressing (TPD*) with extended wear time as an alternative treatment modality in three patients with complex vascular wounds of varying etiologies.

METHODOLOGY

We performed an observational case series assessment on complex wounds of differing etiologies resultant of sequela related to severe vascular pathology. Each patient was observed to have significant co-morbidities complications with history of poor wound healing and one or more wounds refractory to standard of care (SOC) treatment and required consideration for alternate treatment to facilitate wound healing. Three patients were treated with TPD. Patient demographics, past medical and surgical history, and anatomical pathology were described. Evaluation of wound closure progress was followed with the participation of multi-specialty teams.

RESULTS

#1. ARTERIAL INFECTED / NECROTIC ULCER

- 71 y/o male, PVD with claudication, CLI
- Left fem-pop bypass in-situ c/b infection. Subsequent native artery revascularization, bypass coil embolization/ligation, refractory ulcer post distal infective / necrotic tissue evacuation

Outcome: TPD used at home with good healing. Dressing changes reduced from once every 2 days (NPWT) to once a week (TPD).

Arterial Medial Ulcer: 2-Weeks Post TPD

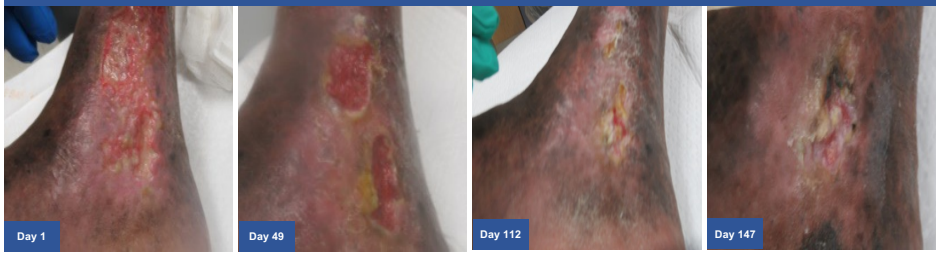
Arterial Lateral Ulcer: 2-Weeks Post TPD

#2. REFRACTORY VENOUS ULCER

- 73 y/o male, refractory VLU
- Bilateral GSV ablations

Outcome: LLE ulcer healed and RLE ulcer was significantly reduced with TPD. Dressing changes reduced from once every other day (various antimicrobial dressings) to once a week (TPD).

Venous RLE Ulcer: 5-Months Post TPD

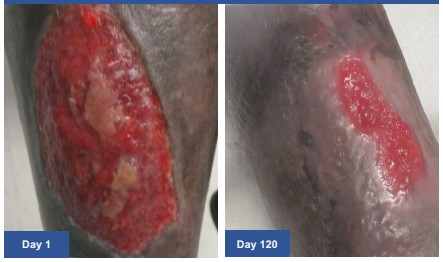


#3. REFRACTORY GRANULOMATOUS ULCER

- 74 y/o male, PVD progressed to rest pain, CLI
- Right fem-AT bypass with PTFE. Disease progression at distal anastomosis with jump bypass from PTFE to distal AT using basilic vein

Outcome: Significant wound area reduction of chronic granulomatous wound with TPD. Dressing changes reduced from thrice (various antimicrobial dressings) to once per week (TPD).

Granulatomous RLE Ulcer: 4-Months Post TPD



CONCLUSION

All patients experienced accelerated healing and wound area reduction with TPD despite significant co-morbidities, vascular complications, and poor history of wound healing. Based on these results, we conclude that TPD is appropriate for use in complex vascular wounds with varying etiologies: active infection, venous stasis, and chronic granuloma wounds. TPD has the benefit of promoting wound healing while being a less expensive alternative to other modalities that require more frequent dressing changes and is easy to use in both clinic and home settings.

***Altrazeal® Transforming Powder Dressing, USA.** For application instructions and risks of this device please refer to Altrazeal Instructions for Use.

Acknowledgements: This poster was created in collaboration with ULURU Inc. All clinical cases and analyses were performed independently by the authors and no compensation was paid.

A Novel Pre-Grafting Wound Management Technique to Promote Granulation in Complex Painful Wounds

Jonathan M. Saxe, MDMAR, MBA, FACS; Ascension St. Vincent Hospital, Indianapolis, IN, USA; Mounir Mabrouk, MD; Alexandria University, Egypt | WOCNext 2022 Meeting, Fort Worth, TX, June 5-8, 2022

BACKGROUND

Skin grafting (SG) is used to provide coverage in both acute and chronic wound settings. Preparation of the wound bed with development of granulation tissue is vital for graft success.[1] Traditional standard of care (SOC) wound management principles involve debriding the wound followed by negative pressure wound therapy (NPWT), bolstering or conventional dressing applications to accelerate wound healing prior to grafting.[2] Current SOC is limited in complex painful wounds. NPWT deployment and application is often difficult and painful.[3] Pain is also a significant issue often associated with repeated wound dressing changes.

METHODOLOGY & MATERIAL

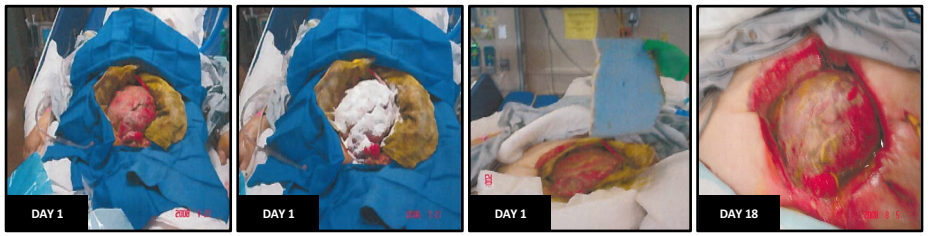
Three case studies incorporating treatment with Transforming Powder Dressing (TPD) to promote granulation in patients with complex wounds are reviewed. In each case, patients had extensive wounds with high levels of reported pain. Prior treatment in all cases failed to progress wounds to the stage to permit grafting. Cases reviewed include a large abdominal wound resultant of an automobile accident, complex wounds associated with uncontrolled chronic vasculitis, and an improvised explosive device (IED) accident. TPD was introduced to facilitate and promote granulation and allow grafting.

TPD is comprised primarily of biocompatible polymers. Upon hydration with saline, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor transpiration. Once applied, TPD may be left in place for up to 30 days and additional powder may be added ("topped off") as needed without requiring primary dressing changes. Simple secondary dressings may be used in areas of high exudation or friction. TPD dries and flakes off as the wound heals.

RESULTS

PATIENT 1: 40 y/o female with large complex abdominal wound resultant of car accident
Challenge: NPWT could not be placed due to risk of fistula
TPD Treatment: TPD applied to wound with foam for excess exudate absorption
Outcomes Post-TPD Treatment:

- Wound was ready for grafting by Day 18



PATIENT 2: 42 y/o male with non-healing progressive venous ulcer, uncontrolled vasculitis, infection history, necrosis, exposed bone
Challenge: High pain score (9/10), failed SOC treatment
Treatment: TPD 2x/week in the first week and 1x/week after
Outcomes Post-TPD Treatment:

- Significant reduction in pain
- Granulation tissue covered bone and patient was grafted
- Avoided amputation

PATIENT 3: 40-year-old male with a 25cm x 25cm x 5cm IED blast wound due to consumer firework accident (M-80)
Challenge: NPWT was discontinued due to patient pain, porcine matrix failed to stimulate granulation
Treatment: TPD applied weekly
Outcomes Post-TPD Treatment:

- Wound depth reduced from 5cm to 2cm by day 7
- Wound was ready for grafting by day 18

CONCLUSION

A marked acceleration in granulation was observed in all three cases. Patients reported reduced pain and the frequency of dressing changes were also reduced relative to SOC. No adverse events were reported. Based on the clinical observations and outcomes, we conclude that TPD presents a safe and effective modality for preparing complex painful wounds for successful grafting.

REFERENCES

1. Kirsner, R. S., Bernstein, B., Bhatia, A., Lantis, J., Le, L., Lincoln, K., Liu, P., Rodgers, L., Shaw, M., & Young, D. (2015). Clinical Experience and Best Practices Using Epidermal Skin Grafts on Wounds. Wounds : a compendium of clinical research and practice, 27(11), 282–292.
2. Harries, R. L., Bosanquet, D. C., & Harding, K. G. (2016). Wound bed preparation: TIME for an update. International wound journal, 13 Suppl 3(Suppl 3), 8–14.
3. Upton, D., & Andrews, A. (2015). Pain and trauma in negative pressure wound therapy: a review. International wound journal, 12(1), 100–105.

Acknowledgements: This poster was developed and presented in collaboration with ULURU Inc.; Jonathan M. Saxe, MDMAR, MBA, FACS currently serves as Medical Director for ULURU Inc.

Treatment of Large Painful Lower Extremity Ulcer with Edema and Deep Vein Thrombosis (DVT) Using Transforming Powder Dressing (TPD)

Reagan Taylor, PA-C; Joshua Goldberg, MD; AdventHealth Medical Group; Orlando, FL | Symposium on Advanced Wound Care (SAWC): April 2022

Background

The management of lower extremity (LE) wounds in patients with chronic edema is challenging. Edema may be present for many reasons, including deep venous thrombosis (DVT), which can result in morbidity and mortality if not properly treated.[1,2] Skin damage, prolonged healing times, infection, malodor, and diminished quality of life (QoL) all may develop from excessive wound exudate.[3]

Pain, another common issue in LE wounds like venous ulcers, as well as in cases of LE chronic edema, can negatively impact patient compliance with seeking wound care, further reducing time to healing and overall QoL.

Case Overview: Methodology

A 39-year-old male presented with DVT, chronic RLE edema, and a large leg ulcer. He sought treatment only after he was unable to walk.

Treatment Course:

- Circumferential excisional debridement through muscular fascia was performed resulting in a wound area of 1,350 cm^2
- Negative pressure wound therapy (NPWT) was applied post debridement
- A second debridement was performed four days later and NPWT treatment was continued
- A Split thickness skin graft (STSG) procedure was conducted two days later, and the graft was covered with a NPWT device
- Patient reported high levels of pain, requiring management with hydromorphone, oxycodone, and hydrocodone
- After 2 weeks NPWT therapy was discontinued, and the patient was transitioned to Transforming Powdered Dressing (TPD*) and discharged from the hospital
- Pain scores, wound dimensions and number of dressing changes were tracked

**Altrazeal® Transforming Powder Dressing (USA)*

Results

The following effects were noted post-TPD treatment:

- Wound was fully healed within 28 days with three applications of TPD
- Pain score (based on the validated Visual Analog Score) reduced from 9/10 to 3/10 after the first application of TPD
- TPD was reapplied 1 week later, and pain score was reported as 0-1/10
- Additional TPD was applied 6 days later, and pain score was reported as 0
- The wound was observed to be fully healed two weeks later without any further applications of TPD

Day 0: Pre-Surgery | Day 1: Initial TPD Application | Day 8: 2nd TPD Application | Day 14: 3rd TPD Application | Day 28: Wound Healed

Materials

TPD is a novel powder dressing comprised primarily of biocompatible polymers (same as those used in contact lenses). Upon hydration with saline, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor transpiration, and some negative pressure effects on the wound. Once applied, TPD may be left in place for up to 30 days and additional powder may be added ("topped off") as needed without requiring primary dressing changes. Simple secondary dressings may be used in areas of high exudation or friction. TPD dries and flakes off as the wound heals.

Conclusion

Based on the outcome of this challenging case, which included significant initial comorbidities and high pain levels, treatment of patients with LE wounds associated with edema and DVT which are refractory to SOC and advanced wound care therapies should be considered for treatment with TPD.

References

1. Trayes, Kathryn P, et al.; Edema: Diagnosis and Management. American Family Physician, vol. 88, no. 2, 2013, pp. 102-10.
2. Kesieme, E, Kesieme, C, Jebbin, N, Irekpita, E, Dongo, A. (2011). Deep vein thrombosis: a clinical review. Journal of blood medicine, 2, 59–69. https://doi.org/10.2147/JBM.S19009
3. Aviles Jr, F; Managing the "Weepy Leg" of Chronic Wound Edema. Wound Care Learning Network; September 2019; https://www.hmpgloballearningnetwork.com/site/twc/articles/managing-weepy-leg-chronic-wound-edema

Acknowledgement: This poster was developed in collaboration with ULURU Inc.

UTILIZATION OF TRANSFORMING POWDER DRESSING TO FACILITATE HEALING IN TREATMENT RESISTANT VENOUS LEG ULCERS

Alisha Oropallo, MD1; Amit Rao, MD[1]; Udit Bandari, MD2, Mounir Mabrouk, MD3, Johnathan Allen, PA-C4, Rajiv K. Chander, MD4

(1) Northwell Health System, Comprehensive Wound Care Healing and Hyperbaric Center, Lake Success, NY; (2) Charak Palika Hospital, New Delhi, India; (3) Alexandria University, Alexandria, Egypt; (4) James J. Peters VAMC, Bronx, NY

American Professional Wound Care Association (APWCA) Wound Week 2022

BACKGROUND

The management of patients with venous leg ulcers (VLUs) is particularly challenging for providers. VLUs can last weeks, months or even years if not properly treated. Skin damage, prolonged healing times, infection, malodor, excessive pain, and diminished quality of life all may develop from excess wound exudate associated with VLUs. Current treatment paradigms for patients with VLUs are often ineffective, resulting in refractory wounds. Alterative treatment strategies are currently under investigation and should be considered for patients whose wounds are resistant to healing with current treatment modalities.

MATERIAL AND METHOD

This case series describes the clinical course of four patients with Stage 4 VLUs refractory to standard of care therapies. Consequently, treatment in all four cases was converted to a novel Transforming Powder Dressing (TPD)*.

Time to healing, frequency of dressing changes and pain scores were evaluated.

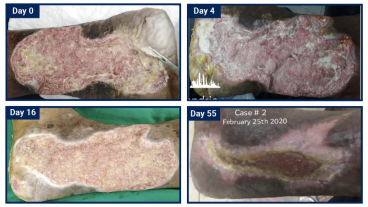
About TPD: TPD is a novel powder dressing comprised primarily of biocompatible polymers (same as those used in contact lenses). Upon hydration with saline, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor transpiration. Once applied, TPD may be left in place for up to 30 days and additional powder may be added ("topped off") as needed without requiring primary dressing changes. Simple secondary dressings may be used in areas of high exudation or friction. TPD dries and flakes off as the wound heals.

*Altrazeal® Transforming Powder Dressing (USA)

RESULTS

Patient 1: 48 y/o male
Wound Duration: 7 months
Pain score: 8/10
Prior Treatment: 4-layer compression changed every 4 days
Outcomes with TPD:
- Healed in 65 days
- Five TPD applications
- Reduced dressing changes (every 15 days on average versus every 4 days with SOC)
- Avoided amputation

Patient 2: 48 y/o male
Wound Duration: 24 months
Pain score: 9/10
Prior Treatment: 2-layer compression changed every 3 days
Outcomes with TPD:
- Healed 25cm x 15cm wound in 150 days without grafting
- 22 TPD applications
- Reduced dressing changes (every 7 days on average versus every 3 days with SOC)



Patient 3: 62 y/o male
Wound Duration: 24 months
Pain score: 8/10
Prior Treatment: 4-layer compression changed every 4 days
Outcomes with TPD:
- Healed in 60 days
- Reduced pain scores
- Five TPD applications
- Reduced dressing changes (every 12 days on average versus every 4 days with SOC)

Patient 4: 54 y/o female
Wound Duration: 24 months
Pain score: 8/10
Prior Treatment: 4-layer compression changed every 5 days
Outcomes with TPD:
- Healed in 75 days
- Reduced pain after 2nd application
- Seven TPD applications
- Reduced dressing changes (every 10 days on average versus every 4 days with SOC)

CONCLUSIONS

All 4 wounds (median duration: 24 months, range: 7 to 24 months) healed with a median healing time of 70 days (range: 60 to 150 days) with six TPD applications (range: 5 to 22). Frequency of dressing changes was reduced from once every 3 to 5 days to once every 11 days (range: 7 to 15 days) on average. Pain reduction was experienced in all four cases after TPD application. The reported cases highlight the effectiveness of TPD in the treatment of refractory VLU wounds.

References: Shi, C., Dumville, J. C., Cullum, N., Connaughton, E., & Norman, G. (2021). Compression bandages or stockings versus no compression for treating venous leg ulcers. The Cochrane database of systematic reviews, 7(7), CD013397. https://doi.org/10.1002/14651858.CD013397.pub2

Acknowledgement: This poster was developed and presented in collaboration with ULURU Inc.

For application instructions and risks of this device refer to Altrazeal Instructions for Use | EDU - 0014

The Utility of Transforming Powder Dressings in the Management of Stage 4 Chronic Venous Leg Ulcers

Chitang J Joshi, Joshua Weissman, Shin Young Yu, Peter Ullrich, Robert D Galiano
Northwestern Feinberg School of Medicine, Division of Plastic and Reconstructive Surgery

Symposium of Advanced Wound Care (SAWC) | Fall 2021 Meeting

Introduction

Venous leg ulcers (VLUs) remain a public health issue with significant economic and psychosocial impacts. Due to chronicity and high recurrence rate, VLU care is costly for the individual and the healthcare system. Yearly care costs average between $13,653 - 18,986 per patient. Standard treatment options tend to utilize compression therapy or direct wound care. There is no consensus as to which dressings promote wound healing significantly better than others do.

Transforming powder dressing (TPD) forms a non-occlusive barrier on the wound bed that helps optimize wound moisture to promote healing. Extended wear time reduces dressing changes, infection risk and complications, presenting a promising new treatment modality.

Materials and Methods

We used a novel methacrylate-based transforming powder dressing, which transforms in-situ to a shape-retentive wound matrix once in contact with moisture. (Altrazeal® TPD, ULURU Inc.).

Patients had chronic, Stage 4 VLUs that failed to heal after standard of care therapies. Days to healing, number of dressing changes, days between dressing changes, and pain scores were recorded.

Results

62-year-old male with a non-healing VLU. Wound prior to TPD is shown on the left. The wound at Day 14, Day 28, and the completion of wound healing at Day 45 are also shown.

48-year-old female with a non-healing VLU for seven months. Wound prior to application of TPD is shown in the top left image. The wound at Days 15, 30, 48, and 65 are shown sequentially. A significant reduction in wound size is visible after the second dressing change and complete wound closure was observed within 60 days.

54-year-old female with a painful, non-healing VLU for two years. Wound prior to TPD application is shown followed by Days 14, 30, 50, and 70. Patient expressed significantly less pain after second TPD change. Wound reduction was visible by the 3rd change with complete wound closure by Day 70.

Conclusion

TPD presented a safe and effective modality for treatment of chronic VLUs; significantly reducing the duration of healing, patient pain and the number of dressing changes.

References

1. Berenguer Pérez M, et al. "Epidemiology of Venous Leg Ulcers in Primary Health Care: Incidence and Prevalence in a Health Centre — A Time Series Study (2010-2014)." International wound journal 16.1 (2019): 256–265
2. Rice JB, Desai U, Cummings AK, Birnbaum HG, Skornicki M, Parsons N. Burden of venous leg ulcers in the United States. J Med Econ. 2014 May;17(5):347-56
3. Darwin E, Liu G, Kirsner RS, Lev-Tov H. Examining risk factors and preventive treatments for first venous leg ulceration: A cohort study. J Am Acad Dermatol. 2021 Jan;84(1):76-85
4. S Palfreyman, Simon, E Andrea Nelson, and Jonathan A Michaels. "Dressings for Venous Leg Ulcers: Systematic Review and Meta-Analysis." *BMJ* 335.7613 (2007): 244–248. Web

Northwestern

Contact: chitang.joshi@northwestern.edu

Acknowledgement: This poster was developed and presented in collaboration with ULURU Inc.

University Medical Center Hamburg-Eppendorf

2018 European Association of Dermatology and Venerology (EADV) Congress, Paris, France

CVderm German Center for Health Services Research in Dermatology

IVDP Institute for Health Services Research in Dermatology and Nursing

P2323 | Case Series: Chronic Wounds Treated With a Novel Transforming Powder Dressing

Natalia Kirsten[1,2], Nicole Zander[1], Matthias Augustin[1,2]

[1]Institute for Health Services Research in Dermatology and Nursing (IVDP), University Medical Center Hamburg-Eppendorf, Hamburg, Germany | [2]Scientific Advisors, ULURU Inc.

BACKGROUND

Chronic wounds are associated with differing burdens for patients, health care professionals and health care systems. There is a high impact on quality of life for patients. Pain, exudation, malodor, and the resulting restrictions of leisure activities are typical. Transforming Powder Dressing (TPD) represents a novel transforming methacrylate-based dressing in powder form. Hydration of the powder granules leads to an irreversible aggregation. The resulting dressing conforms exactly to the wound surface and provides a moist wound environment. We present the results of a case series of patients with chronic stagnating wounds treated with TPD.

OBJECTIVES

The objective was to evaluate the impact of treatment with TPD on the reduction of wound size and pain score over an observational period of 12 weeks.

METHODS

We treated 11 patients with chronic wounds of different etiologies (Table 1) with Transforming Powder Dressing. All patients had received the best practice treatment and had experienced stagnation of wound healing for at least three months prior to the treatment with TPD. The observational period lasted 12 weeks. Wounds were inspected for a dressing change (or addition / top-off of more powder) every seven to fourteen days by a wound specialist. For every visit wound size and pain score (on the visual analogue scale - VAS) were obtained. Descriptive measures were computed. Quantitative variables were described as qualitative data as n in %, as mean with standard deviation (SD) for continuous variables. All analyses were performed using IBM SPSS, Windows® software version 23.0.

RESULTS

Study population

We included and analysed data of 11 chronic wounds from 11 patients, of which seven patients (64%) were female. The mean age was 63 years. The wounds were of different etiologies. Table 1 shows basic characteristics of the study population.

Tab. 1 Study population

Patient Number	Age in years	Gender	Duration before treatment in months	Etiology of the wound
1	74	Female	24	Post-thrombotic syndrome
2	61	Female	11	Pyoderma gangrenosum
3	24	Female	12	AV-Malformation
4	76	Female	12	Postoperative wound healing disorder
5	70	Female	12	CVI and mixed connective tissue disease
6	52	Female	156	Urticaria vasculitis
7	79	Female	7	Calcinosis cutis
8	64	Male	28	Peripheral arterial occlusive disease
9	72	Male	10	Diabetic foot and peripheral arterial occlusive disease
10	71	Male	8	Peripheral arterial occlusive disease
11	47	Male	30	CVI and mixed connective tissue disease

RESULTS

Wound size

The mean wound size decreased from 12.6 cm² at visit 1 to 2.7 cm² at last visit in week 12 (Table 2, Figure 1). The mean relative difference of wound size between visit 1 and the last visit was reduced by 40.9 % (SD 86.6 %). Four of 11 wounds full closure.

Tab. 2 Wound size in cm²

		Day 0	After 4 Weeks	After 8 Weeks	After 12 Weeks
Number of patients	Valid	11	11	9	7
	Missing	0	0	2	4
Mean		12.60	8.85	3.78	2.65
Median		8.75	7.50	1.33	1.08
Standard deviation		13.69	12.82	5.28	3.05
Minimum		1.80	.30	0.00	0.00
Maximum		49.00	45.50	14.00	6.96

Figure 1. Wound size (cm²)

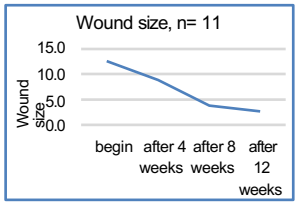
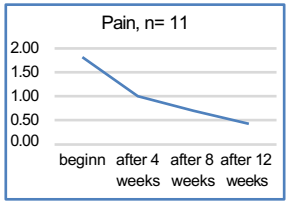


Figure 2. Pain score (VAS 0-10)



Painscore

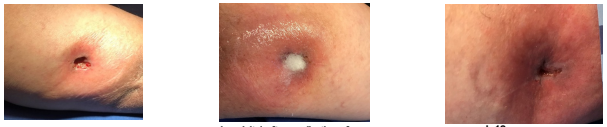
The pain score decreased from 1.8 (SD 2.1) at visit 1 to 0.4 (SD 1.1) at the last visit (Figure 2). Four of 11 patients had painless wounds.

Drop outs

During the treatment period 3 dropouts were observed. Patient 2 discontinued treatment because lack of time for consultations. Patients 10 and 11 discontinued treatment because of the progression of the wounds in week 8.

Clinical presentation

Figure 3. Patient 1 - Postoperative wound healing disorder



a = week 0 | b = visit 1 after application of powder dressing | c = week 12

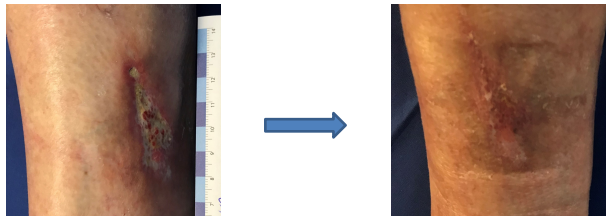
RESULTS

Clinical presentation

Figure 4. Patient 6 – Urticaria vasculitis

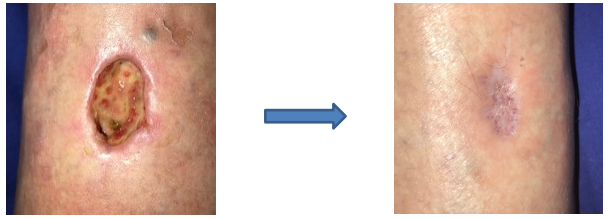
a = week 0 | b = visit 1 after application of powder dressing | c = week 12

Figure 5. Patient 5 - CVI and mixed connective tissue disease



a = week 0 | c = week 12

Figure 6. Patient 7 – Calcinosis cutis



a = week 0 | c = week 12

CONCLUSION

TPD offers a promising approach to treat chronic wounds. Reduction of wound size and pain contribute to a better quality of life and can reduce costs for the health care system. A highly beneficial characteristic of TPD observed during this study was the marked reduction in the frequency of dressing changes. In clinical routine, the mean period between dressing changes was about 2 weeks, suggesting the product offers a promising alternative to conventional dressings.

Contact: Natalia Kirsten, MD, Institute for Health Services Research in Dermatology and Nursing (IVDP), University Medical Center Hamburg-Eppendorf (UKE), n.kirsten@uke.de

Controlling Wound Edema with Fuzzy Yarn Focused Compression in Direct Contact with Granulation Tissue Speeds Healing

Recurrent Pretibial Stasis Ulcer

Veteran of seven Pacific island LCT landings, presents with a 4th recurrence of bilateral stasis ulcers. Patient seen here wearing bilateral Longitudinal Yarn Compression Stockinets, size medium.

Problems

- Stasis Dermatitis and Ulcer x 20 years

Initial presentation of left pretibial ulcer covered with Lidocaine jelly, wound was debrided with a curette. Skin appears translucent due to subdermal water. Skin is thin and painful to touch because of inflammation. Recurrent ulcers triggered by summer heat and dyshidrosis.

Right leg. Patient has bi-lateral painful 5mm pitting pretibial edema. Note the magnitude of dermatitis from venous insufficiency, serum weeps from skin breaks during the heat of the day.

Rx Day #5. Polymer powder prior to placing freshly laundered stockinet over the healing wound. After the stockinet is in place on the wound, the powder is "fixed" with a spray of saline. The gel forms a flexible elastic dressing that maintains a moist wound without maceration of surrounding skin. Gel draws edema fluid from the wound surface by capillary action. Gel and LYC stockinet act in tandem to control wound surface water.

We encourage patients to reuse the soiled stockinet after it is removed from the wound. This instruction may seem counter intuitive to health care providers. Laundering the textile is cost effective for outpatient wound care. The nylon and spandex textile tolerates multiple trips to the washing machine. The hot water cycle does not degrade spandex tensile strength.

Day #5 of Yarn Focused Compression (YFC) with stockinet in direct contact with the granulating wound. Observe how robust the skin appears after 4 days of elastic compression with fuzzy yarn: less red, less refraction of light from water logged dermis. For comparison, see above photo. Wound granulation tissue has sprouted epithelial islands. Epithelial cell migration from the skin edges is obvious.

It seems counter intuitive to put clean stockinet on an exudative surface. As seen in the photo, there are no cornrows in the granulation tissue as family members had resumed putting gauze over the raw wound surface to keep the LYC compression textile clean.

Rx

- Polymer powder LYC dressings 2x week

Outcome

- Polymer powder gel controls ulcer pain. Patient compliance is high,
- Ulcers heal with two wound center visits over 32 days

Day #13 of Yarn Focused Compression and polymer therapy. The white eschar consists in part of gel. We did not debride this eschar during this wound center visit .The gel forms a rubbery wound dressing that separates from the wound as epithelization occurs. Wound went on to heal with no further clinic visits.

Observe the topology of the granulating wound surface. Elastic compression delivered by fuzzy yarns has created "cornrows" in the healing wound. We posit that direct contact YFC speeds healing by controlling edema and increasing oxygen delivery to the metabolically active healing interface.

RX Day #32 shows complete healing of the ulcer and progressive improvement of the stasis dermatitis.

Observe the topology of the granulating wound surface. Elastic compression delivered by fuzzy yarns has created "cornrows" in the healing wound. We posit that direct contact YFC speeds healing by controlling edema at the healing interface and increasing oxygen delivery to the metabolically active cells in a manner similar to Negative Pressure Wound Therapy.

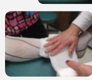
Stasis Ulcer

Ambulatory hemodialysis patient with stasis dermatitis and pedal pulses. Massive pitting pretibial edema is due to congestive heart failure and renal insufficiency. Edema of this magnitude prevents capillary perfusion and dramatically inhibits healing.

Problems

- Calf Skin Slough
- Hemodialysis
- Diabetes
- Coronary Disease
- Saphenous Vein Harvest Incision

Pretibial ulcer treated with alginate on the wound surface and a four layer dressing. Note weeping present on the granulating wound surface. Note the glassy reflection of light from surface tissue water. Weeping friable granulation tissue results from extensive edema fluid in the wound. Edema reduces capillary oxygen delivery which leads to poor healing.



Response to therapy with alginate under a four layer dressing is not good. Because of wound water, a decision to use Yarn Focused Compression (YFC) in Direct Contact with granulation tissue. Zinc oxide is applied to wound and Longitudinal Yarn Compression stockinet is used as the first layer of a four layer dressing. Dr. Scott Wattenhofer MD, FACS, an Omaha vascular surgeon suggested this Yarn Focused Compression as an alternative to a classic calamine lotion UNA boot.

The first layer of this Wattenhofer dressing is LYC stockinet. This dressing uses Yarn Focused Compression (YFC) textile to "squeeze" water out of the granulating wound surface. It is key that fuzzy yarn is in direct contact with the friable granulation tissue. The tradition of using gauze on the wound is hard to break. The goal is "cornrow" furrows in the granulation tissue. Cornrow furrows result from elastic compressive forces. Fuzzy yarn appears to have a "Rooke" effect that is salutary to healing. Said another way, the fuzzy textile helps wounds to heal.

Against traditional wisdom, note nurse placing the gauze on top of (not underneath) the compression stockinet. Gauze above the compressed wound absorbs exudate. Key is that fuzzy yarns must be in direct contact with the healing surface to control wound edema. Old habit is hard to change. Second layer is cast padding, third layer elastic bandage and fourth layer cobam.

Rx

- Poor response to four layer dressing
- To control wound edema LYC stockinet is placed directly on wound surface

Outcome

- Yarn Focused Compression directly on wound surface results in healing

This photo taken two weeks after the photo above. Note the zinc oxide residue. Healing complete after 2 weeks of Wattenhofer dressing. LYC textile in direct contact with the tissue has helped the wound to epithelize in 14 days. Fuzzy yarn delivers compression and creates cornrow furrows on the healing surface. Fuzzy yarn may "stent" the tissue and speed healing.

Chronic Stasis Dermatitis

Bilateral chronic stasis dermatitis with history of recurrent ulcers.

Problems

- Chronic Stasis dermatitis
- Warm weather triggers bilateral calf stasis ulcers
- Peripheral Vascular disease

R calf ulcers. Note shiny thin skin and intense inflammation. The process that created these ulcers was triggered by hot spring temperatures in the Midwest that induced sweating and dyshidrosis.

Left medial calf stasis dermatitis with superficial painful ulcers.

Polymer applied to the stasis ulcers. The YFC textile is placed on over the powder dressing. Saline is used to transform the powder into a gel.

Dressing removed after four days. Note that the textile is in direct contact with the wound surface. Note the cornrow furrows in granulation tissue. Cornrows form beneath fuzzy yarns delivering elastic compression. Not island of epithelial cell sprouting in the corn row furrows.

Rx

- Polymer powder gel
- Yarn Focused Compression in direct contact with wound granulation tissue

Outcome

- Rapid control of stasis dermatitis and skin edema
- Rapid epithelization of wound surface

Get heals wound in 5 weeks.

Recurrent Pretibial Stasis Ulcer

A veteran of the U.S. Army Air Corps who served in occupied Japan has had a 10 month unrequited relationship with a local wound care center. Enzyme debridement had not been effective. Pedal pulses were present. Patient takes Prednisone 5mg daily for COPD.

Problems

- Stasis Dermatitis, recurrent ulcers x 20 years

Left calf wounds increased in number while attending another wound clinic. Patient refused elastic compression stockings. Ulcers were debrided with curette. Note the lidocaine jelly. Observe the thin edematous inflamed skin and macerated full thickness eschar.

This photo shows a classic stalled wound in chronic stasis dermatitis. Healing cannot progress because of untreated stasis dermatitis and multiple co-morbidities. These ulcers are painful and pain has prevented adequate debridement over the prior 10 months of therapy in a wound center.

Rx Day #4. Wound has been treated with Longitudinal Yarn Compression stockinet and polymer powder. Note the pyocyanic pigment in exudates. This stockinet will be washed in a washing machine, set to "Hot", and used again.

Rx Day #4. Compare this photo to the previous. In four days, the skin looks more robust: erythemia has decreased dramatically and the shiny reflection of light from thin skin has decreased as subdermal edema abates. Epithelial cell migration can be seen along the ulcer edges. Note how LYC changes the topology of the wound surface.

Rx Day # 4. Powder is sprinkled through longitudinal yarns after the stockinet has been placed over the open wounds. Stretching the spandex allows powder to fall like snow onto the wound surface. After dusting the ulcer with 2mms of powder, saline spray is used to "fi x" the powder into a gel.

Rx

- Polymer powder dressings (2 per week)

Outcome

- Polymer powder gel controls ulcer pain
- Longitudinal Yarn Compression stockinet (LYC) in direct contact with granulation tissue speeds healing
- Ulcers healing, at time of publication, after 17 days of Longitudinal Yarn Compression.

Rx Day #11. Because the wound is covered with polymer, removing the stockinet is not painful. Stockinet will be laundered and reused. Healing progress is slow for the ulcer that has not been adequately debrided, still progress is obvious.

Rx Day #11. With using and Longitudinal Yarn Compression, note that the eschar is separating from the ulcer that the patient had previously refused to be debrided.

At time of publication, the wounds are on treatment day #17, thus the fate of these 10 month old pesky ulcers is not certain. For complete healing wounds may require engineered skin substitute or skin grafting. Patient is grateful because he no longer has pain. Family is grateful because cost of supplies has been small.

Laura Landon-RN
Manager, Bergan Mercy Hospital Wound Care Clinic-Omaha, Nebraska

Pam Chelesvig-BS
Director of Human Research, Kohll's Corporation-Omaha, Nebraska

Martin Winkler-MD FACS
Creighton University College of Medicine-Omaha, Nebraska
University of Nebraska College of Medicine-Omaha, Nebraska

Controlling Wound Edema with Yarn Focused Elastic Compression in Direct Contact with Granulation Tissue Speeds Healing

Behavioral Objectives:

· Define advantages of mechanical control of wound surface edema in the face of lymphatic insufficiency, infection and skin ischemia due to arterial and venous insufficiency.
· Understand why lymphatic insufficiency and edema impairs cell division and healing.
· Understand new mechanical options to manage granulation tissue edema.

Problem: Edema remains under appreciated as an enemy of healing. Edema resulting from over zealous major burn resuscitation with IV fluids was recognized to increase the depth of burn tissue injury. Burn thereapy paradigms changed. Negative Pressure Wound Therapy (NPWT) changed the wound healing paradigm by recognizing wound surface edema is treatable (1). Landon observed that LYC is safe in ischemia (2). Can elastic compression, directly in contact with wound granulation tissue, control edema and increase wound healing similar to NPWT? Kozeny, in 2006, described the powerful effect that Longitudinal Yarn Compression (LYC)* has on limb edema. Yarn Focused Compression** (YFC) changes the topology of the skin surface. Fuzzy yarn under tension creates "cornrow furrows" with islands of uncompressed skin between each yarn (3). This study applies Kozeny physiology to granulation tissue.

Methods: Stasis ulcers were covered zinc oxide ointment (one patient) and powder*** (three patients). LYC stockinet, directly on wound granulation tissue, was the fi rst layer of a three layer dressing. Dressings changed weekly.

Results: Photos illustrate healing. End point was healed wound. Costs are discussed.

Conclusions: Elastic compression delivered by fuzzy yarn* alters granulation surface topology and appears to speed healing. Controls wound edema and appears to effectively control wound pain.

References:

(1) Andros, George MD; Niezgoda, Jeffrey A. MD, FACHM, FACEP; et al, "Consensus Statement on Negative Pressure Wound Therapy (V.A.C.® Therapy) for the Management of Diabetic Foot Wounds". Supplement, Ostomy Wound management, June 2006

(2) Landon, L., et al; "Yarn Focused Compression Safely Enhances Wound Healing in Arterial Ischemia" poster presentation, Abstract in press, Symposium of Advanced Wound Care, Washington, DC, September 2009

(3) Kozeny, D., Stott, K., "Longitudinal yarn compression textile: An innovative treatment for leg swelling." Journal of Vascular Nursing, Volume 25, Issue 3, Pages 62-62, September 2007

(4) Fitzgerald, R., Bharara, M., Mills, J., Armstrong, DG (2009); "Use of a Nanoflex powder dressing for wound management following debridement for necrotizing fasciitis in the diabetic foot." International Wound Journal, 6(2): 133-139

*EdemaWear®, Compression Dynamics, Omaha, Nebraska, www.EdemaWear.com

**EdemaWear®, Compression Dynamics, Omaha, Nebraska, www.EdemaWear.com

***Altrazeal™ Uluru Corporation, Addison, Texas, www.UluruInc.com

National Science Foundation Grant Award Number 0650233

University of Nebraska Medical Center

Creighton University School of Medicine

www.CompressionDynamics.com
www.UluruInc.com

Serendipity: Use of a Novel Transforming Powder Dressing to Treat Chronic Wounds Reduces Lower Extremity Wound Pain in Patients with Venous Wounds

2010 SAWC Meeting
Orlando, FL

Catherine T. Milne APRN, MSN, BC-ANP, CWOCN
Darlene Saucier APRN, MSN, BC-FNP, CWCN

Connecticut Clinical Nursing Associates, LC
Bristol Hospital Wound, Ostomy, Lymphedema Center
Bristol, Connecticut

Clinical Problem: Wound pain is a significant issue for many patients with chronic wounds. 80% of patients with venous leg ulcers (VLUs) experience pain.[1] Its sequelae include fatigue, alterations in interpersonal relationships, sleep disturbances, and depression[2, 3].

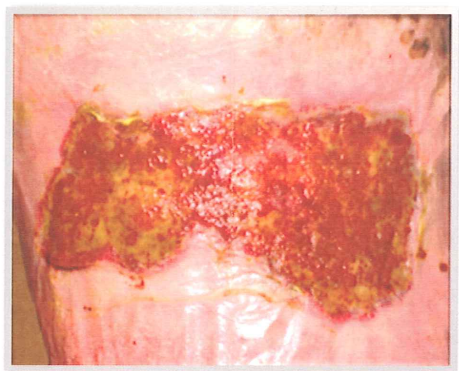
Methods: Seven patients with VLUs were treated with a transforming powder dressing (TPD) * during an initial evaluation of this dressing's utility in wound management. All patients had failed previous attempts using various advanced dressings, bioengineered skin, or split thickness skin grafts. All had varying levels of non-adherence to the systemic plan of care – including inconsistency with compression garments/dressings, management of glucose, and routine, consistent dressing changes. Age of wounds varied from 3 to 27 years. All patients reported pain as an inhibiting factor with adherence with recommended regimen and wound sizes and had not decreased in several months.

Initial Application of Transforming Powder Dressing

Initial Application of Transforming Powder Dressing

Presented Case: 62 year old male developed a right lower leg ulceration after post-phlebitic syndrome as a sequelae to a work accident. Co-morbidities include obesity, +MRSA, COPD, HTN, hyperlipidemia and Type 2 diabetes. Patient lives alone and refused home health services after receiving care from 5 different agencies. Patient has received a number of previous treatments for the last 27 years including STSGs, compression, NPWT, bioengineered skin, lymphedema, IV and oral antibiotics, pain management referral, and a variety of topical antimicrobial and non-antimicrobial dressings. Adherence to the treatment plan would vary but always would eventually fail. Pain associated with the wound itself, coupled with treatment pain often hindered compliance. The patient refused further surgical interventions to achieve wound closure. Pain levels were reported by the patient as 9-10 continuously.

At the time of application of the TPD followed by a nonadherent dressing to absorb drainage, the patient reported immediate reduction of wound pain to a level of 2. Within 2 weeks of continuous pain reduction, he agreed to light compression. He has steadily increased his compliance to the recommended treatment regimen and is now on full therapeutic compression levels but continues to refuse other modalities of care.



5 Months on Treatment Regimen of TPD with Compression

15 Months on Treatment Regimen

Results: All patients reported serendipitous and unexpected improvements in pain levels within 15 minutes of TPD application. As a result, this group of chronic wound patients increased compliance I to the recommended treatment plan – including compression, the mainstay of VLU treatment. All patients reduced oral pain medications and had slow, steady decreases in wound size and drainage.

Conclusion: The mechanism of sudden reduction of wound pain after dressing application may have several explanations including bacterial toxin binding, high moisture vapor transmission rate, or Substance P blockade. Regardless of the physiological mechanism, the reduction of pain in this group, this serendipitous finding and its subsequent impact of patient adherence and quality of life measures warrants further study

1. Nemeth KA, Harrison MB, Graham ID, et al. Understanding venous leg ulcer pain: results of a longitudinal study. *Ostomy Wound Management*. 2004; 50:34-6.
2. Woo K, Sibbald RG. Chronic wound pain: a conceptual model. *Advances in Wound and Skin Care*. 2008; 21(4):175-188.
3. Goncalves ML, de Gouveia Santos VL, de Mattos Pimenta CA, Suzuki E,
4. Komegae KM. Pain in chronic leg ulcers. *JWOCN*. 2004; 31:275-83

* Altrazeal™ Transforming Dressing-ULURU, Inc.

Financial Disclosure: Costs associated with poster presentation were provided by ULURU, Inc.

IR-042

Gregory A. Bohn, MD, FACS, Medical Director
Trinity Wound Care and Hyperbaric Medicine
Bettendorf, Iowa

Application of a Novel New Wound Conforming Dressing

Purpose:
The purpose of this presentation is to demonstrate the versatility of a new powder dressing.

Background:
The ideal wound dressing would maintain a moist wound environment, allow gaseous exchange so that oxygen, carbon dioxide and water vapor can pass in and out of the dressing, be thermally insulating, be impermeable to bacteria to protect from contamination, be non-traumatic and not adhere to the wound, be user friendly and easy to apply, remain in place, be cost effective and have minimal need for secondary dressing (2,3,4). Dehydrated particles that contain a methacrylate backbone and a terminal hydroxyl group have been developed such that when placed in a wound and exposed to physiological fluid aggregate into a structural gel that intimately covers the wound (1). Poly-2-hydroxyethylmethacrylate (pHEMA) and Poly-2-hydroxypropylmethacrylate (pHPMA) particles are synthesized as a powder that can be applied into a wound and hydrated with saline by drip method or misting that aggregate into a wound contour conforming dressing (1). When hydrated, this dressing aggregates to a final content of approximately 65% moisture by weight (1). This presentation illustrates uses of this novel new technology with three clinical case studies.

Methods:
A new powder dressing became available. To evaluate this dressing in our clinic, we applied the dressing to a variety of wounds. Applied alone, under compression wraps and under contact casts; this powder dressing was observed for ease of use, staying in place, and for effectiveness in healing wounds by weekly wound measurements (5).

Case 1: A 47 yo Insulin dependent Diabetic white male presented with a neuropathic Wagner Grade 2 ulcer on the lateral aspect of his right foot. He had been treated with an offloading DH Walker and daily dressing with a currently available collagen silver dressing. Wound healing progress had stalled and powder dressing was used under a contact cast to better offload and treat his neuropathic ulcer. A breathable wound veil was placed over the aggregated dressing along with a foam under the cast. The wound healed on a sharp trajectory based on calculated wound volume measurements (Figure 1).

Case 2: A 59 yo white male with chronic venous stasis had been on palliative care with his ulcers for 30 months. He had in the past been treated with bioengineered skin grafts, operative skin grafts, and multiple different wound products. He currently was returning to the clinic for twice weekly Multi-layer compression wrapping. Powder dressing was applied weekly after selective debridement while his compression wraps were changed twice weekly. The powder dressing was applied and covered with veil and absorbent foam under the compression wraps. Patient went on to heal his wounds.

Case 3: A 57 yo white male undergoing active chemotherapy and radiation for intra-cranial metastatic melanoma lost his balance and fell against a steam heat radiator and suffered 3rd degree burn wounds to his right thigh. Concerned that the patient's debility while undergoing active chemotherapy would not support a graft or heal a donor site, dressing therapy was to be used. After debridement of dead eschar, powder dressing was used without a secondary dressing. It stayed in place over the course of the week and reduced the patients pain. His wound healed without grafting.

CASE 1

Diabetic Wagner Grade 2 Neuropathic Ulcer

Application of Powder Dressing

Powder Dressing Covered with Wound Veil

Diabetic Ulcer with Foam Before Contact Cast

Application of Contact Cast

CASE 2

Right Leg Venous Ulcer

Left Leg Venous Ulcer

Powder Application

Powder Dressing Right Leg Venous Ulcer

Powder Dressing Left Leg Venous Ulcer

Compression Wraps Applied After Powder Dressing

CASE 3

3rd Degree Durn Wound to Right Thigh

Application of Powder Dressing

Dressing on Right Leg Burn Wound Aggregating with Saline

Powder Dressing in Place

Third Degree Burn Wound Healed

Powder Dressing and Diabetic Ulcer

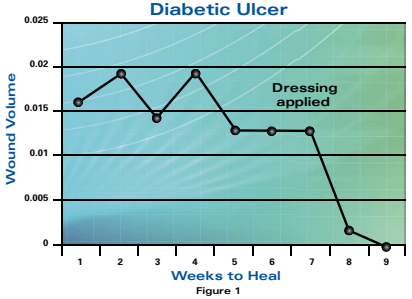
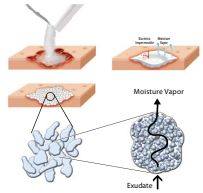
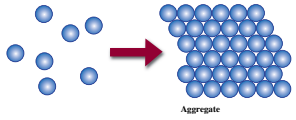


Figure 1



The dressing components consist of polymer particles. The polymer particles are composed of 85% poly-2-hydroxyethylmethacry-late (pHEMA) and 15% poly-2-hydroxypropyl methacrylate (pHPMA). The polymers pHEMA and pHPMA are both non-resorbable, non-degradable, hydrophilic crosslinked polymers that are in the ratio of 85:15 by weight and maintain a fluid content of approximately 68% by weight of the matrix. The powder aggregates (coalesces) immediately and irreversibly from polymer particles into an intact dressing. There is no chemical reaction during dressing formation. The dressing binds together physically and not chemically and remains bound together with the wound exudate through hydrophilic/hydrophobic interactions, hydrogen bonding and VanDerWaal forces. An illustration of the dressing displaying the mechanism of action is shown.



Aggregate

Conclusions:
Powder dressing is a versatile new wound dressing material that can be applied in a variety of wound conditions. The ability to leave the dressing in place for up to 30 days is a characteristic that is desirable in applications where dressings aren't typically changed daily. Treating wounds under contact casting is one such application. Dressing worked well under contact casting in the treatment of diabetic neuropathic ulcers. A similar observation was made in use in conjunction with compression wrapping of venous stasis wounds. Although the compression wraps were changed twice weekly according to our protocol, the dressing was left in place for the week and changed at the patients weekly physician visit after debridement. In treatment of burn wounds, this dressing reduces pain and does not require frequent changes which also reduces painful dressing change episodes. It stays in place and does not require a secondary dressing. This treatment brought about healing of a third degree burn wound in a difficult patient who was undergoing active chemotherapy. Dressing worked well in these 3 applications and all three wounds healed.

References:
1.) St. John J V, Brown S A.,Hatef DA, Unzeitig A W, Noble D, Waller L K, and Ponder B C. Formulation development and in vivo testing of a novel powder wound dressing. The University of Texas Southwestern Medical Center at Dallas, Department of Plastic Surgery, 1801 Inwood Rd., Dallas, TX 75390
2.) Turner TD. Products and their development in wound management. Plast Surg Dermatol Aspects. 1979; 75-84
3.) Thomas S, Loveless P. A comparative study of the properties of six hydrocolloid dressings. Pharm J 1991; 247:672-675.
4.) Sharman D, Moist wound healing: a review of evidence, application and outcome – Review. Diabetic Foot, The Autumn 2003.
5.) Kantor J, Margolis DJ. Efficacy and Prognostic Value of Simple wound Measurements. Arch Dermatology. 1998; 134: 1571-1574.

TRINITY IOWA HEALTH SYSTEM
A better experience.
Diversified Clinical Services
Healing Wounds. Changing Lives.
ULURU, Inc.

Hyperbaric & Wound Care Associates

Exceptional Results

Altrazeal™ Transforming Powder Wound Dressing: The Clinical Experience

Jeffrey A. Niezgoda, MD, FACHM, FACEP, FAPWCA, John V. St. John, PhD

The Centers for Comprehensive Wound Care & Hyperbaric Oxygen Therapy, Aurora Health Care and Hyperbaric & Wound Care Associates, Milwaukee, WI | ULURU, Inc., Addison, TX

Introduction

The optimal moist dressing should maintain intimate contact at a wound surface yet allow high rates of moisture vapor transfer, prevent external contamination, while extending the dressing change interval. We demonstrate a new product that meets these criteria. Altrazeal™, a Transforming Powder Wound Dressing is designed to interact, protect and seal the wound bed, ultimately resulting in optimized wound healing. When applied to a wound, the nanoflex particles hydrate upon interaction with wound exudate. Hydration causes the particles to rapidly aggregate forming a strong uniform gel material with intimate contact to irregular surfaces of the wound bed.

Technology Description

Altrazeal™ Transforming Powder Wound Dressing is applied to wounds by pouring or sprinkling the product onto the open wound. Immediate and irreversible aggregation occurs upon contact with wound exudate. Normal saline or hypochlorous solutions may be added to provide additional moisture in wounds without heavy drainage. The hydrogel aggregate seals the wound and provides a strong but flexible dressing that has been maintained in some patients for up to 18 days. The dressing remains in intimate contact with the wound surface without a secondary dressing while allowing high moisture transpiration. The aggregate can be easily removed without harming underlying granulating tissue and then reapplied as necessary.

Conclusion

A series of patients with a variety of wound types have been successfully managed with Altrazeal™ Transforming Powder Wound Dressing. The early clinical experience demonstrates excellent patient toleration, with superb clinical results with improved wound healing trajectories. Additional benefits include a single application with extended wear times with or without a secondary dressing.

1. *Control of Vascular Proliferation and Healing in Acute Wounds with Controlled Release of VEGF from Hydrogel Nanoparticle Dressings* 2008 World Biomaterials Meeting, Oral Presentation, **Strategies for Vascular Regeneration Symposium**, *Amsterdam*, J. St. John (presenter), B. Ponder, D. Hatef, J. Huang, S. A. Brown.

2. *Hydrogel Nanoparticle Aggregates at the Wound-Dressing Interface* 2007 Fall Materials Research Society Meeting. Oral Presentation, **Solids at the Biological Interface Symposium**. *Boston* J. St.John (presenter), L. Waller; D. Moro; D. Hatef; S. A. Brown

Application Technique

Sprinkle Altrazeal™ on Clean Wound Base

Hydrate Altrazeal™ with Saline

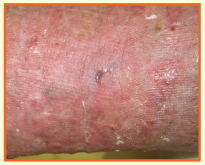
Cover Aggregated Altrazeal™ with Nonadherent Dressing

Case Study 1

7-29-2008
Ulcer present for 6 months.

8-5-2008
Altrazeal™ applied.

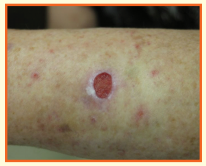
8-8-2008



8-12-2008
Wound Healed.

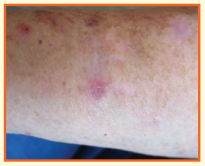
Case Study 2

7-7-2008
Ulcer present for 6 months.



8-18-2008
Altrazeal™ initiated.

9-15-2008



10-21-2008
Wound Healed.