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transforming powder dressing

Simplify Wound Healing - Skin 2.0

TRANSFORMING POWDER DRESSING WITH EXTENDED WEAR TIME RETROSPECTIVE EVALUATION IN TRAUMA INJURIES

Jonathan M Saxe, MD, MAR, MBA, FACS; Vice Chair of Surgery; Ascension St. Vincent Medical Center, Indianapolis, IN; Medical Director, ULURU Inc.

MTEC Annual Membership Meeting, Baltimore, MD | May 2022

COMPANY MISSION | ACHIEVEMENTS TO DATE

OVERVIEW: Based in Addison, TX, we are committed to developing and commercializing innovative wound care and drug delivery systems based on our patented technologies.

MISSION: To improve the lives of patients the world over by delivering comprehensive solutions that optimize outcomes for all key stakeholders: patients, providers and payers.

ALTRAZEAL STATUS: Patent granted, FDA registered, and market launch initiated. Used in prominent hospital systems: AdventHealth, Northwestern, Northwell Health, NYU, Plaza Medical (HCA), Providence Health (LifePoint), St. Vincent's (Ascension), UPMC.

DOD / VA EFFORTS: DAPA listed. SAM registered. Introduced to MRMC, CCCRP, USAISR, USUHS, WRAIR, NMRC, 59th Wing. Approved for use in several VAMCs including Boston, Chicago, Charleston, Dallas, Sacramento and Tampa.

DOD FUNDED R&D PROJECTS: Received grant funding from the Department of Defense related to three post-marketing clinical studies as well as a number of pre-clinical studies for product development:

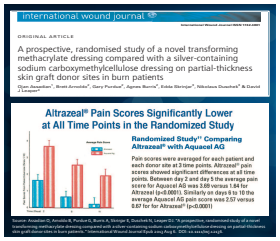
1. MTEC-NAMD: Clinical studies in diabetic foot ulcers and acute partial thickness burns
2. CDMRP-DHA: Clinical study in pressure injuries
3. SBIR-WRAIR-DHA and MIDRP-BDRD: Development of Altrazeal combinations for drug delivery

UNIQUE EXPERTISE: Clinical partnerships with global wound care experts and centers of excellence.

ABOUT ALTRAZEAL® TRANSFORMING POWDER DRESSING

Altrazeal powder is comprised primarily of two biocompatible polymers (same as those used in contact lenses). Upon hydration, Altrazeal granules aggregate to form a moist, oxygen-permeable barrier that protects the wound from contamination while helping to manage excess exudate through vapor transportation. Once applied, Altrazeal may be left in place for up to 30 days. Additional powder may be added ("topped off") as needed without requiring primary dressing changes. Simple secondary dressings may be used in areas of high friction or exudation. If clinically necessary, the dressing may be removed atraumatically by lifting off with a pair of forceps. As the wound heals, Altrazeal dries and flakes off.

EASY TO USE | ENHANCED PATIENT COMFORT

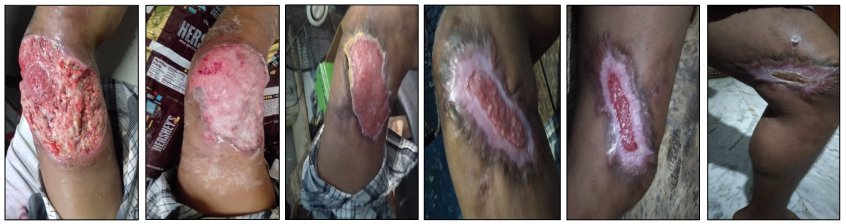


CASE SERIES OVERVIEW: FULL THICKNESS TRAUMATIC INJURIES (N=10)

A retrospective analysis of data from 10 patients with complex, full thickness traumatic wounds with elements of exposed bones, tendons and muscle was performed. All wounds were treated with Altrazeal until complete wound closure was achieved or the wounds were ready for grafting. Time to healing as well as frequency and number of dressing changes were tracked.

CASE 1: TRAUMA INJURY FROM MOTORCYCLE ACCIDENT

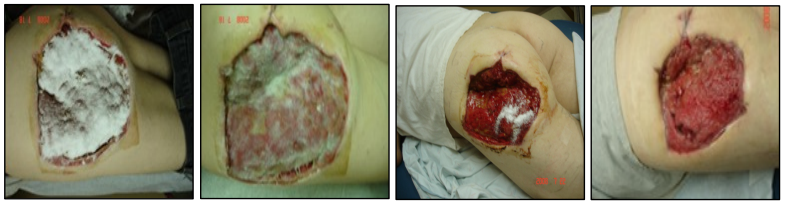
- **Patient:** 31-year-old female
- **Wound Size:** 35cm x 17cm x 17cm
- **Challenge:** Extensive wound with dressing changes required multiple times a week
- **Dressing Changes:**
  - Total: Six changes
  - Average: Once every eight days
- **Outcomes:**
  - Wound healed in 45 days
  - Avoided grafting



Day 1 | Day 4 | Day 8 | Day 30 | Day 37 | Day 45

CASE 2: IMPROVISED EXPLOSIVE DEVICE WOUND DUE TO M-80 ACCIDENT

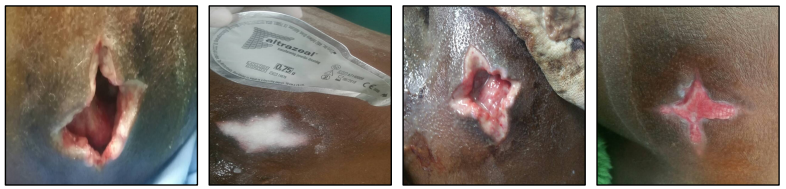
- **Patient:** 40-year-old male
- **Wound Size:** 25cm x 25cm x 5cm
- **Challenge:** NPWT discontinued due to pain. Porcine matrix failed to stimulate granulation
- **Dressing Changes:**
  - Total: Two changes
  - Average: Once every nine days
- **Outcomes:**
  - Depth reduced from 5cm to 2cm by Day 7 with single application
  - Wound ready for grafting by Day 18



Day 1 | Day 1 | Day 7 | Day 18

CASE 3: GUN SHOT WOUND

- **Patient:** 24-year-old male
- **Challenge:** Deep wound in combat situation with few medical and material resources
- **Dressing Changes:**
  - Total: Two changes
  - Average: Once every five days
- **Outcomes:**
  - Wound healed in 10 days with two applications
  - Avoided grafting



Day 1 | Day 1 | Day 4 | Day 10

CONCLUSION

A marked acceleration in healing was observed in all ten cases with reduced frequency of dressing changes relative to standard of care (once every 6.5 days on average versus daily or three times a week for standard of care). Six patients achieved complete healing without requiring grafting. Mean healing time was 23 days with three applications on average, or once every seven days. Four patients received successful grafting treatments once sufficient granulation had been achieved with Altrazeal. Average treatment time was 33 days with dressing changes every six days on average. **Clinical observations and outcomes indicate that Altrazeal presents a safe, effective and resource-efficient modality for the treatment of patients with traumatic wounds.**

Novel Treatment of Necrotizing Fasciitis with Transforming Powder Dressing

Ron Sotomayor, RN, CWOCN; Reagan Taylor, PA; Jeffrey Chiu, MD; Allan Allicock, MSN, RN, CWON | AdventHealth System; Orlando, FL

WOCNext 2022 Meeting, Fort Worth, TX | June 5-8, 2022

Background

Necrotizing Fasciitis (NF) is a rare but life-threatening soft tissue infection caused by bacteria that target the skin, subcutaneous tissue, and fascia, resulting in progressive necrosis.1 Associated mortality is 12-46% as infection can spread quickly causing severe systemic toxicity and sepsis.2 Proper management requires aggressive surgical debridement and appropriate adjuvant therapies. Early amputation of impacted tissues and maximum intensive care treatment are often required.3 Routine wound care includes utilizing conventional antimicrobial dressings or negative pressure wound therapy (NPWT) to facilitate adequate wound granulation prior to grafting. Repeated dressing changes drain medical resources, increase patient pain and exposure to infection, presenting a significant clinical challenge.

Material

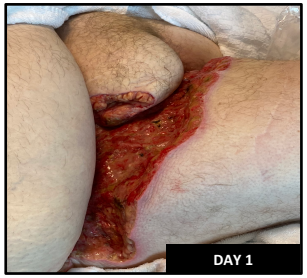
Three case studies incorporating treatment using a novel Transforming Powder Dressing (TPD) in patients with NF and other comorbidities were reviewed. In all cases, patients had extensive wounds with high pain scores, using Visual Analogue Scale (VAS), making NPWT or conventional dressing changes intolerable. In two of three cases, TPD was applied directly to the wound with secondary dressings. In one case, TPD was applied over a meshed split thickness skin graft (STSG) in the penile and scrotal area.

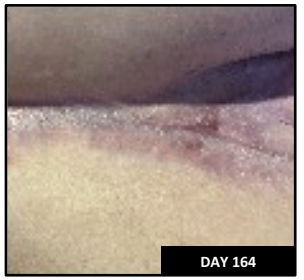
TPD is comprised primarily of biocompatible polymers (used in contact lenses). Upon hydration with saline, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor transpiration. Once applied, TPD may be left in place for up to 30 days and more powder may be added as needed without requiring full 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: 44 y/o male with DM, obesity, HTN, HCL
Wound Dimension: 50cm x 18cm x 22cm
Challenge: Extreme pain during NPWT
Treatment: Conversion to TPD
Outcomes Post-TPD Treatment:

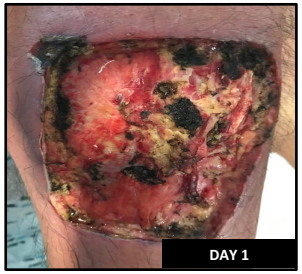
- VAS pain score reduced from 10/10 to 0/10
- Discontinued all pain and opioid medications
- Reduced home health visits (3x to 1x weekly)
- Reduced dressing encounters (<20 versus > 66 estimated with SOC)
- Avoided grafting, amputation & readmission

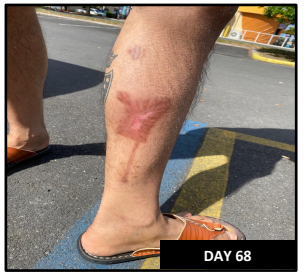




PATIENT 2: 51 y/o male with HIV
Wound Dimension: 72cm^2
Challenge: Painful daily gauze dressing changes
Treatment: Conversion to TPD
Outcomes Post-TPD Treatment:

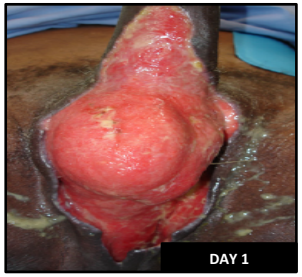
- VAS pain score reduction from 10/10 to 0/10
- Discontinued all pain and opioid medications
- Reduced dressing changes
- (11 vs. 60 estimated with SOC)
- and required visits from 3x to 1x weekly
- Avoided readmission for grafting

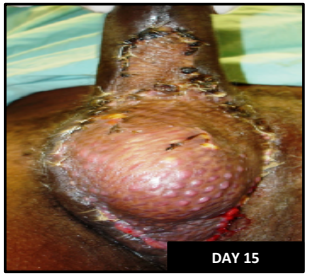




PATIENT 3: 71 y/o male with diabetes, Fournier's gangrene, penile implant malfunction4
Challenge: Painful, challenging location to conduct frequent dressing changes
Treatment: Wound was surgically debrided. Two meshed split-thickness skin grafts were applied, anchored using peripheral sutures covered with TPD and net underwear
Outcomes Post-TPD Treatment:

- Graft took by day 15 as TPD flaked off
- Reduced pain from use of fewer stitches





Conclusion

TPD presents a safe and effective modality for treatment of NF wounds with the potential to reduce healing times, pain and frequency of dressing changes.

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A Novel Transforming Powder Dressing for Healing Chronic Wounds of Multiple Wound Etiologies

David Bickers CRNP, CWOCN-AP | University of Pittsburgh Medical Center, Altoona PA

WOCNext 2022 Meeting, Fort Worth, TX | June 5-8, 2022

CHALLENGE

Delayed wound healing results from an imbalance occurring during healing stages, often resulting in conversion of an acute wound to a chronic non-healing wound.[1,2] Chronic wounds are significantly more complicated to heal than acute wounds.[2] In the US alone, chronic wounds currently affect 6.7 million people, with annual healthcare costs exceeding 50 billion dollars.[3]

Evidenced based clinical principles for optimizing wound healing include: (1) maintaining a moist (but not wet) wound environment, (2) permitting gaseous and fluid exchange while providing mechanical and bacterial protection, and (3) utilizing a dressing that is non-adherent to the wound, easy to use, comfortable and pain-free for the patient. When standard of care (SOC) therapy fails to heal a wound, alternate treatment strategies must be considered.

METHOD AND MATERIALS

We present a case series which evaluates the clinical outcomes of 3 patients with chronic wounds of different etiologies which were refractory to prescribed SOC therapy (burn, 2 diabetic foot ulcers and trauma wound).

All wounds had deteriorated or showed no clinical progress prior to conversion from SOC dressings to Transforming Powder Dressing (TPD). For purposes of consistency in our assessment, the conversion of the primary dressing from SOC to TPD was the only wound treatment factor modified.

TPD is a novel powder dressing comprised primarily of biocompatible polymers (same as those used in contact lenses). Upon hydration, 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.

SUMMARY RESULTS

- In the cases presented, each of which was refractory to SOC therapy, all wounds healed and came to complete closure after treatment with TPD.
- Average time to heal for all 4 wounds after initial treatment with TPD was 47 days.

PATIENT 1: BURN

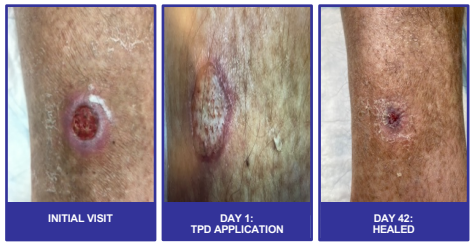
- **History:** 62 y/o male with DMT2, venous insufficiency, mild lymphedema, and deep partial thickness burn on ankle / LLE after catching sock on fire while welding
- **Wound Size:** 1.5cm x 1.5cm x 0.2cm
- **Wound Duration:** > 8 weeks (60 days)
- **Prior Treatment:** Silver Sulfadiazine 1% cream and non-adherent dressing multiple times a week
- **TPD Treatment**: Weekly applications
- **Outcome:** Fully healed in 42 days with TPD

PATIENT 2: DIABETIC FOOT ULCER

- **History:** 62 y/o female with IDDM T2, lymphedema,
- neuropathy, BMI 45.6, and two plantar DFUs
- **Wound Size:** 0.5cm x 0.5cm x 0.7cm (heel) | 1.6cm x 1.2cm x 1.2cm (5th metatarsal)
- **Wound Duration**: ~1.5 to 2 years
- **Prior Treatment**: Total contact cast with foam dressings
- **TPD Treatment**: Weekly applications
- **Outcomes**: Both ulcers fully healed within 35 days (average)
  - **Heel Ulcer:** Closed in 33 days with TPD
  - **Submetatarsal 5 Ulcer:** Closed in 37 days with TPD

PATIENT 3: TRAUMA

- **History:** 52 y/o male with CAD, renal disease, smoking disorder, and trauma wound to anterior knee
- **Wound Size:** 2.5cm x 2cm (eschar)
- **Wound Duration:** > 6 weeks (45 days)
- **Prior Treatments:** Mupirocin calcium ointment, medical grade honey, cortisone applied multiple times a week
- **TPD Treatment**: Weekly applications
- **Outcomes:** Fully healed in 63 days



CONCLUSION

The use of TPD as a universal primary dressing on non-healing wounds of different etiologies significantly improved healing times with reduced frequency of dressing changes and brought each of the non-healing wounds to complete closure. No adverse events were reported.

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Acknowledgements: This poster was created in collaboration with ULURU Inc. No compensation was paid to the author for development of this poster.

Effective Treatment of Anticoagulated Patients with Novel Transforming Powder Dressing (TPD)

Tammy Lichtman, RN, BSN, CWON; Jeffrey Chiu, MD; Ron Sotomayor, BA, RN, CWOCN; AdventHealth System, Orlando, FL | Symposium on Advanced Wound Care (SAWC) Spring Meeting, April 2022

Background

Anticoagulants can contribute to wound healing complications by accelerating bleeding and exudation. Even minor injuries may evolve into severe soft tissue damage with increased risk of hematomas. Resulting wounds may be extensive, painful, and debilitating with high risk of infection and tissue necrosis, imposing a significant wound care challenge with limited treatment alternatives.[1] Conventional dressings require frequent changes exacerbating wound trauma and patient discomfort. Another routine therapy, negative pressure wound therapy (NPWT), has been associated with bleeding complications. Between 2009 and 2011, the FDA reported six deaths and 77 injuries associated with NPWT; bleeding complications were prevalent in all six deaths and 17 injuries, including certain patients on anticoagulant therapy.[2] Alternative therapies, therefore, must be evaluated.

Case Overview: Methodology

We present a complex case involving a patient treated with a novel transforming powder dressing (TPD*). An 88-year-old male with multiple comorbidities including atrial fibrillation was being treated with apixaban to reduce the risk of stroke and systemic embolism. The patient reported a fall, wounding his right lower extremity (RLE). His pain increased and the wound worsened despite standard of care therapy. Computed Tomography Angiography revealed a large, superficial hematoma in the lateral aspect of the right calf. Acute blood loss and anemia secondary to the hematoma was observed. DVT prophylaxis was discontinued. Excisional wound debridement and evacuation of the hematoma was performed eleven days after the initial injury. TPD was applied to the wound post-surgery and continued during home healthcare visits. The patient was observed weekly for removal of contact layer and outer dressing to assess the wound. For the first 5 weeks, the wound dressing was changed (topped off) 1 time per week. The following 8 weeks, the wound dressing was changed 1 time every other week. The final 6 weeks, the wound dressing was changed 1 time every third week (11 TPD dressing changes over treatment course).

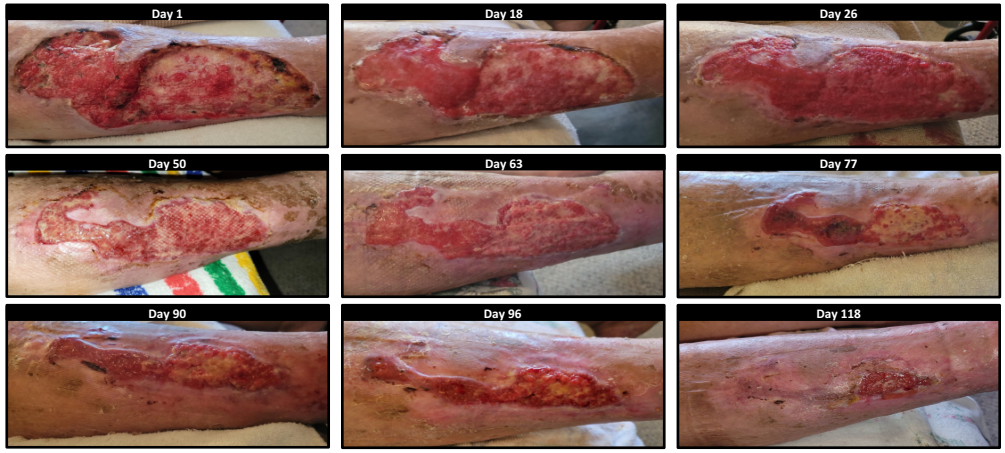
Material

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, as well as 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. Simple secondary dressings are used and changed in areas with high exudation or friction. TPD dries and flakes off as the wound heals.

**Altrazeal® Transforming Powder Dressing (USA)*

Results

- After treatment with TPD our team observed the following results:
- Reduced pain, minimal wound bleeding and a significant decrease in sanguineous drainage
- Expedited granulation: wound was ready for grafting 35 days after initial application of TPD (clinical team elected not to perform grafting)
- Significant reduction in wound size and dressing changes
- From 155 cm3 to 1.2 cm3 within 118 days
- Dressing change frequency reduced relative to standard of care dressings
- Changes every 10.7 days on average
- Homecare nursing visits reduced to once per week instead of thrice per week (standard of care)



Conclusion

After treatment with TPD, we observed a significant reduction in sanguineous drainage and overall wound size. Dressing change frequency and home health visits were reduced relative to standard of care therapies.

The wound care team recommended secondary intention wound healing with TPD as grafting was no longer required.

Based on the results of this complex case, we conclude that patients who are at high risk for stroke and embolism and are being treated with anticoagulants should be considered for wound care treatment with TPD.

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

UPMC LIFE CHANGING MEDICINE

Novel Technique for Management of Painful Road Rash Injuries

Lori O'Shea, BSN, RN, WCC; Jenny A. Ziembicki, MD, FACS | UPMC Mercy Hospital Burn Center

Symposium on Advanced Wound Care (SAWC) | April 2022

BACKGROUND

Road rash injuries include painful skin abrasions, burns or wounds resulting from trauma accidents on cemented or tarred surfaces. Wounds vary in severity, depth, and degree[1, 2]

- Complications include infection, sepsis, wound progression, pain (often significant, resulting from wounds and wound related treatments[3,4]), embedded road debris, and devitalized tissue.
- Routine Standard of Care includes topical antibiotics, petroleum dressings, or moisture retaining therapies, and requires frequent and painful dressing changes.

CASE OVERVIEW: METHODOLOGY

20-year-old male sustained multiple injuries in a motorcycle accident, including:

- Subarachnoid head bleed
- Multiple mixed partial deep and superficial thickness wounds on his arm and legs

Initial treatment:

- Primarily focused on patient head injury and maintenance of neurological stability, which precluded use of pain medications. Because cleaning of wounds was reported as highly painful, all wounds were initially managed conservatively with simple petroleum-based contact layers and absorbent pads.

Upon hospital discharge 4 days later:

- He was treated at home by his caregiver, a wound care nurse. Due to the high level of pain, his caregiver elected to utilize TPD* to treat the wounds instead of application of topical antibiotics. Mechanical and autolytic debridement was performed to manage the exudate and remove the remaining embedded road debris.
- TPD was applied (sprinkled on the wounds), followed by a contact layer and gauze after the wounds were cleaned.

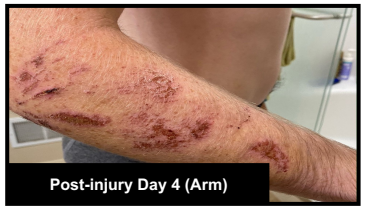
MATERIALS

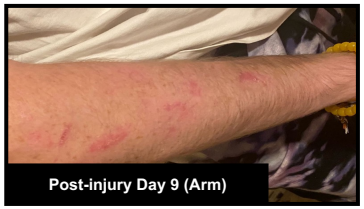
TPD is a novel powder dressing comprised primarily of biocompatible polymers. Upon hydration with saline, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor transpiration, as well as some negative pressure effects on the wound. Once applied, TPD may be left in place for up to 30 days and additional powder may be added 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.

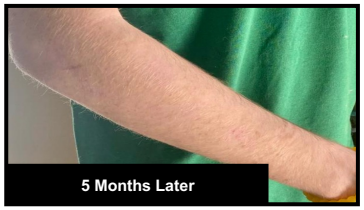
**Altrazeal® Transforming Powder Dressing (USA)*

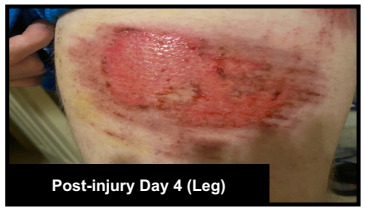
TPD APPLICATION AND RESULTS

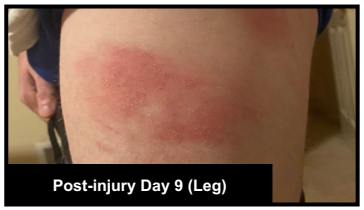
- TPD was topped off as needed, secured with contact layers, absorbent pads and a net dressing.
- On post-injury day nine, five days after initial TPD application, all wounds were epithelialized.
- Immediate pain relief was reported by the patient following TPD application.
- There were no complications of infection or wound progression.
- Post-healing scarring was minimal to absent.











CONCLUSION

Based on the accelerated wound healing, and pain reduction results associated with this patient, we conclude that TPD offers a safe and effective alternative to Standard of Care for the management of painful road rash injuries.

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Acknowledgements: This poster was created in collaboration with ULURU Inc., the owner of TPD. No compensation was paid to the authors for the development of this poster.

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PRELIMINARY EVALUATION ON THE APPLICATON OF A POWDER DRESSING IN THE FIXATION AND TREATMENT OF CHRONIC WOUNDS RESULTING FROM TRAUMA WITH EPIDERMAL SEPARATION

WINTHROP University Hospital
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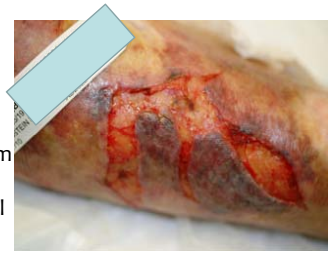
Purpose
The purpose of this evaluation was to test a protocol in the management of chronic wounds resulting from trauma with epidermal separation combining a novel powder dressing for both fixation and moist wound healing.

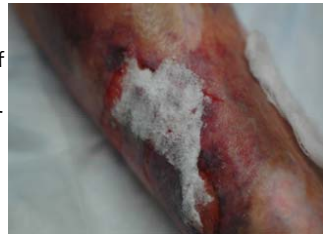
Background
A common wound seen in wound care centers is a chronic wound resulting from trauma with epidermal skin separation. This primary acute wound is commonly called a skin tear and is typically found on elderly patients. This wound often becomes chronic if not treated properly. Skin tears have been identified as a common, acute injury sustained by the aged in extended care facilities [1-3] and changes to aging skin make this population more susceptible to skin tear injuries [1, 3-9]. A skin tear is defined as "A laceration of the epidermis, most often associated with minor trauma and involving a separation of the epidermis from the underlying connective tissue so that a flap of skin is created".

Methods:
Six patients were evaluated in a case series without controls. Patients ranged in age from 62 to 93 with a mean age of 76 years. For each patient, wounds were assessed and treatment history was documented. In all cases the trauma with epidermal separation occurred prior to referral to the wound center. The wounds were cleaned and the powder wound dressing was applied. The intact dressing was covered with a contact layer followed by a rolled gauze dressing and/or ace wraps for compression if indicated.. Patients were assessed at approximately 7 day intervals at which time the dressings were changed and the wound size and appearance were evaluated.

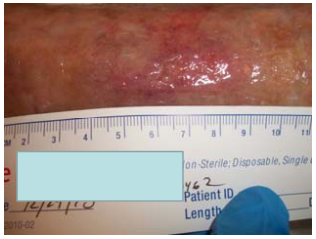
92 year old female with chronic wound resulting from skin tear on anterior tibial surface



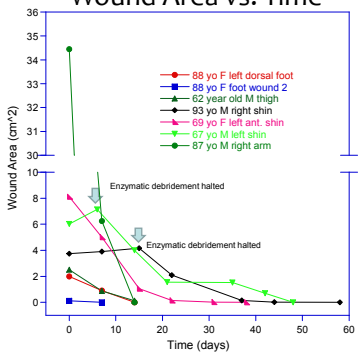
Application of powder dressing after assessment and debridement



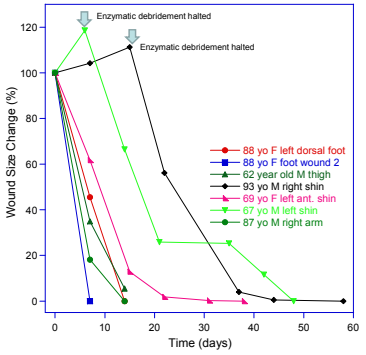
Day 28 after weekly evaluation and dressing changes



Wound Area vs. Time



Wound % of Original Size vs. Time



Results
For the patients evaluated, six (6) patients had a total of seven (7) wounds that healed using the powder dressing. No wounds failed to heal,. The data was not generated as a prospective clinical study with inclusion criteria. Data are shown below for wound healing with and without preriods of enzymatic debridement:

Parameter	Post Enzymatic Debridement	Debridement Included
Minimum Healing Time	7 days	7 days
Maximum Healing Time	36 days	48 days
Mean	19.8 days	24.6 days
Median	14 days	14 days
Std Deviation	10.5	16.4

Two patients showed an initial increase in wound area. These increases occurred with the application of an enzymatic debriding agent in conjunction with the powder wound dressing.

Of the six patients, only two reported pre-treatment pain. Both reported a decrease in pain after the application of the powder wound dressing. One reported a change from 8 to 1 with the application of the dressing on a pain scale of 1-10 (10 being the worst) and the other 5 to 0.

In all cases the dressing was applied without adhesive fixation and wrapped loosely in cotton gauze. The dressings were changed on a weekly schedule with the exception of two 14 day intervals when patients were not present for weekly dressing changes..

The dressing remained in place for all patients during the evaluation period.

Conclusions
The data shows that the powder dressing can be safely applied to a skin tear and used to anchor that tear during a treatment protocol with a 7 day interval between evaluations. A clinical study has been implemented using randomization and controls for the treatment of skin tears using this treatment protocol.

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Comparison in Management of Large, Open Combat Wounds in Service Personnel Using Negative Pressure Wound Therapy as Standard of Care and a Novel Powder Dressing

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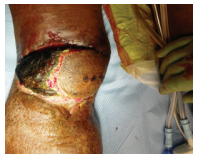
Introduction

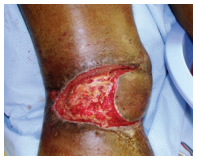
Combat trauma produces wound patterns that are seldom observed in civilian hospitals and require complicated surgery and post-operative care. The damage created by explosive devices depends on a number of factors, including the type of explosive, and the environment within which the detonation takes place. Injuries are dependent on the power of the explosion, the proximity of the casualty to the explosion and the environment (open or confined). When the energy of an explosion is directed towards tissue it creates a wound that is catastrophic to deep tissue and that will require surgical reconstruction until fully healed. In addition, this type of wound is universally accompanied by penetrating shrapnel which carries bacteria deep into the wound. Currently blast wounds in Uniformed Services Hospitals are managed uniformly with negative pressure wound therapy (NPWT), which is used to stabilize the wound, remove bacteria from tissue, and ultimately provide a well-vascularized granulation bed suitable for subsequent grafting.

This set of cases details the post-operative management of three combat trauma wounds where a combination of NPWT and a novel powder dressing are used to achieve closure.

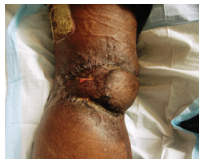
Saphenous artery fasciocutaneous flap coverage of a posterior popliteal wound with exposed nerve from a rocket-propelled grenade attack in Iraq.
Patient is a healthy 38 year old male with a concominant closed head injury.
Initial treatment was serial debridements with VAC coverage for ten days. The procedure was complicated by superficial skin necrosis which was managed by debridement and NPWT (4 days) followed by skin grafting covered with the powder dressing for 10 days.
Patient is now five months post-injury with a healed wound pending secondary nerve grafting.



Partial Flap loss
Pre-debridement



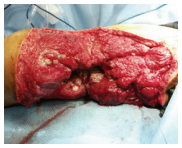
Post-debridement



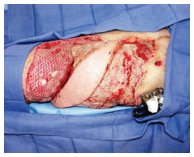
2 weeks post grafting

Latissimus dorsi myocutaneous free-tissue transfer with large skin grafts to the wound 2 weeks following injury.
Patient is a 26 year old male healthy medic who suffered an open fracture of his anterior knee/thigh with large soft tissue loss.
Initial pre-flap management was serial debridement and VAC dressings. Post-flap dressings were NPWT as a bolster over the recipient graft sites and the powder dressing to his skin-graft donor sites and the recipient site following removal of NPWT. The graft sites required two additional applications of the powder dressing until complete re-epithelialization occurred at 3 weeks following flap procedure.

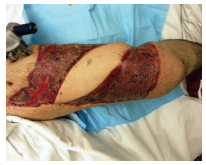
Patient is now 3 months post-op with a healed wound and ambulatory. He is also currently being treated by osseous distraction/lengthening of his femur fracture. Patient will require subsequent tendon grafting to improve knee extension power.



Initial Wound following debridement
NPWT, and external distractor

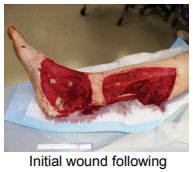


Flap inset with
Surrounding Skin Grafts

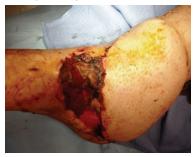


Three weeks post-op

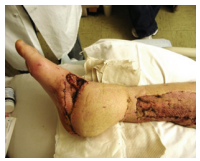
Anterolateral thigh free-tissue transfer and large skin grafting five months ago.
Patient is a 22 year old male healthy infantry soldier who suffered an IED blast injury to his lower leg and ankle with an open ankle fracture, exposed tendons and a segmental nerve deficit. The other injury was a traumatic below-knee amputation of the opposite leg.
Initial management was serial debridement, NPWTfor 10 days prior to free flap.
Post-op management was NPWT bolster over skin grafted areas with transition to powder dressing for two weeks (three applications required).
Patient is completely healed, ambulatory and awaiting nerve grafting



Initial wound following
debridement, and NPWT,



One week post free flap, powder
wound dressing in place



Three Weeks
Post Grafting

Discussion

Complicated trauma cases involve detailed assessment and planning prior to reconstructive surgery. The choice of techniques for post-operative management is critical and can often be overlooked after the surgical procedure is completed. For trauma cases involving reconstructive surgery with flaps or skin grafts, the conventional choice is NPWT or bolster dressing(s). These techniques are viable and functional options. A novel powder dressing was evaluated as a choice for covering and protecting a flap or mesh STSG after the application of NPWT. This technique was evaluated to determine if it was possible to transition from NPWT to the use of a unique powder dressing for closure. The data set is limited, however, the powder dressing does appear to cover and protect a wound during closure with dressing changes at intervals between 3 and 7 days.

Conclusions

It is possible to transition from NPWT to the use of a novel powder dressing in post operative care of combat trauma cases involving reconstructive surgery. Further studies as to the timing of the transition would benefit the development of best clinical practice for the use of this novel dressing.

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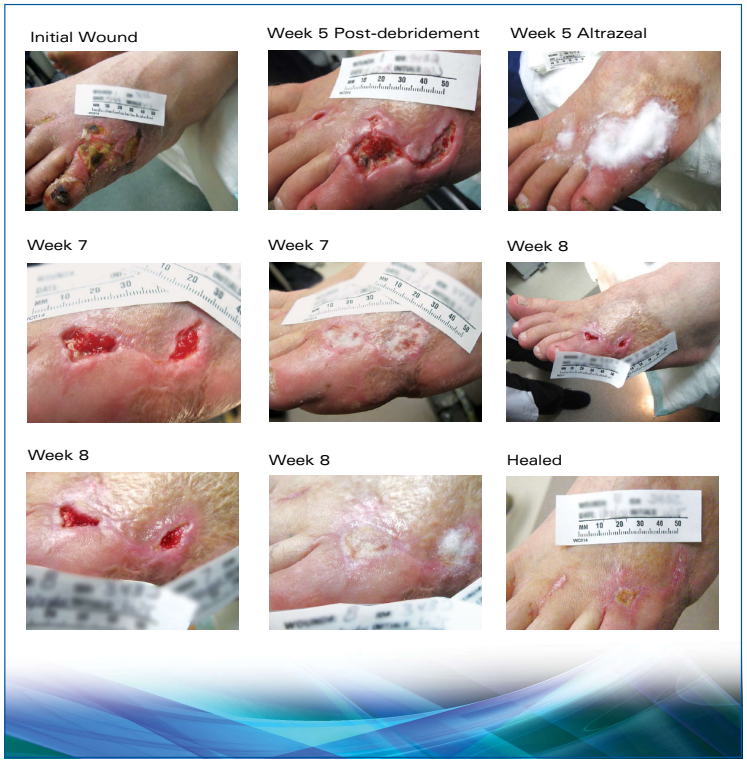
Powder Dressing with high Moisture Vapor Transpiration Rate may have physical influence on wound healing

Background:
Hydrogels and hydrocolloid dressings have many favorable properties and improve wound healing while maintaining a moist wound environment (4). A new powder dressing conforms to the wound surface and has a high Moisture Vapor Transpiration Rate (1). Although the precise mechanism of action has not been determined, it is believed that this close contact and high moisture vapor transpiration rate (MVTR) creates a low pressure at the interface between the dressing and wound bed that stimulates the formation of healthy granulation tissue (2). This novel new dressing was placed on a post surgical foot wound that had not shown improvement with standard wound care.

Methods:
Standard wound measurements are recorded weekly as part of the patient's wound documentation. The timing of application of powder dressing technology to the wound was evaluated by observed change in wound volume over time. Wound volume was calculated using the formula: Wound Volume = Length x Width x Depth x .8. This data was then displayed in graph form (Figure 1) to observe the change with the application of this new dressing product.

Results:
The patient's wound did not demonstrate healing as measured by wound volume calculations in the first 4 weeks of wound care. The wound volume decreased precipitously after application of this powder dressing. The wound showed a decrease in volume measurement by 52.6% in the first week of dressing therapy. Volume reduction continued in the second week of therapy with the wound volume recorded measuring a 95.3% reduction in wound volume compared to the patients initial visit measurements. If the dressing creates a low pressure at the dressing - wound interface by way of the high Moisture Vapor Transpiration Rate promoting healthy granulation tissue formation, this dressing may stimulate healing by influencing physical characteristics of cells.

Case Study:
39 yo white male had suffered crush injury to the dorsum of his left foot. A split thickness skin graft was applied to cover the acute crush injury. Recent orthopedic corrective surgery was performed and resulted in a new skin and tissue deficit on the dorsum of his foot. He was referred to wound care to "clean up the wound in preparation for a skin graft". After 4 weeks of standard wound care, the wound had stagnated as tracked using standard wound volume measurement calculations. Powder dressing became available in our clinic and was applied to the wound. The dressing remained in place and was changed weekly at his clinic visit. Debridement was performed at each clinic visit. This patient experienced a rapid healing trajectory as demonstrated in Figure 1. His wound went on to heal without requiring an additional skin grafting procedure.



Powder Impact on Healing

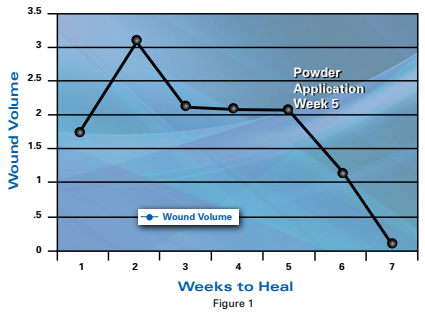
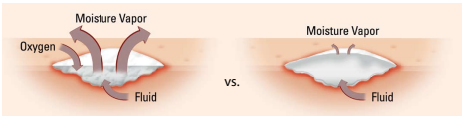


Figure 1

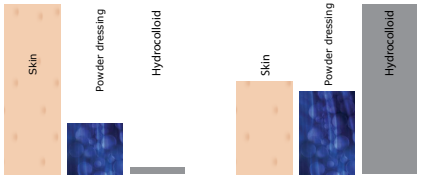
Mechanism of Action – Exudate Management



Powder Dressing
12,000g/m²/24 hours

Hydrocolloid
1100 g/m²/24 hours

Mechanism of Action – Physical Properties



Conclusions:
Powder dressing applied to this wound promoted a vigorous granulation response and healed a wound expected to require a skin graft. The wound had not demonstrated significant progress in 4 weeks sufficient to predict healing based on well accepted parameters (7). After application of powder dressing, the wound started on a steep healing trajectory (fig. 1). This wound progressed and closed without requiring an additional operative procedure to skin graft.

Micro-stress on cell walls can cause cellular proliferation and favorably impact on wound healing (3). Given the high moisture vapor transpiration rate of this material compared to other dressings; 12,000g/m²/24hrs vs 1100 g/m²/24hrs (2), the dressing may have a physical affect on the proliferating cells, wound fibroblasts in the wound bed and the wound margin to promote granulation formation and healing. Once the dressing is formed, the particles create capillary forces that pull moisture into the dressing and it evaporates at the dressing air interface. This transpiration of moisture vapor pulls with a significant force and creates a pressure differential of 200-300 millitorr at the wound dressing surface (2). Negative pressure of as little as 100 millitorr produces stress on cells and brings about conversion into rapidly metabolizing fibroblasts (wound fibroblasts). Further work to better correlate this low negative pressure and its affect on wound fibroblasts and granulation tissue formation with subsequent wound healing would help in understanding the affects brought about with this dressing material.

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