Quality Improvement Project: Management of Complex Painful Postoperative Wounds

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INTRODUCTION

Management of painful postoperative wounds is difficult and expensive[1]:

- Medicare estimated costs for treatment of acute and chronic wounds range from $28 to $97 billion annually with surgical wounds contributing the largest amount[2]
- Over 82% of surgical patients report severe wound related pain
  - Pain affects length of stay (LOS) and patient satisfaction scores[3,4]
  - Pain can persist for weeks after discharge from the hospital, lowering a patient's quality of life[5] (QOL)
- Opioids, often prescribed for pain management, are associated with negative side effects and caused over 100,000 deaths in 2021[6,7]
- Standard of care wound therapies, including NPWT and conventional dressings, require frequent dressing changes that can be painful and increase the need for opioids and risk of dependency

There is a critical need for a multidisciplinary collaboration and quality initiatives to identify alternate modalities for management of painful acute and chronic postoperative wounds.[8]

QIP OVERVIEW & METHODOLOGY

A quality improvement project (QIP) was initiated to test the potential of a novel wound treatment technology, a transforming powder dressing (TPD*), to improve the current standard of care (SOC) practices for the management of painful postoperative wounds. 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 manage excess exudate through vapor transpiration. Once applied, TPD may be left on for up to 30 days. More 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.

Hypothesis: Utilization of TPD, an extended-wear dressing, will reduce dressing change frequency, pain scores, narcotic use, and nursing time.

Method: Prospective evaluation. Pain was measured using Visual Analog Scale (VAS) both 15 minutes before and after TPD application. Prescribed medication records were reviewed at each assessment.

Sample: 12 adults with surgical wounds and pain scores > 5 (VAS 0-10)

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Acknowledgements: This poster was created in collaboration with ULURU Inc. All protocols and clinical assessments were conducted independently by AdventHealth without any compensation.

Altrazeal® Transforming Powder Dressing (USA)

RESULTS

Sample Population (n=12):

- **Gender:** Male: n=6; Female: n=6
- **Age:** 21 - 95 years (mean: 49.1)
- **Wound Etiologies:** Diverse debrided or excised wounds - necrotizing fasciitis, hidradenitis suppurativa, burn, pilonidal cyst, peri-stomal, pressure injury, abscess, hematoma
- **Wound Size:** 7.5 - 1,350 cm^2 (mean=272 cm^2)
- **Pain Scores:** Average patient reported pain scores prior to TPD application: 8/10 (range: 6–10)
- **SOC Dressings:** NPWT or conventional moist dressings
- **Frequency of SOC dressing changes:** 3 or more times per week

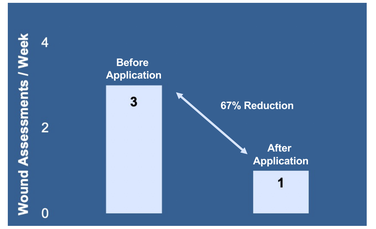
QIP SAMPLE POPULATION

Subject	Wound Type / Surgical Procedure	Sex	Age	Complication and Comorbidities	Starting Wound Area (cm^2)	Starting Pain Score	Pain Score Post Initial Application	% Pain Reduction
1	Pilonidal cyst (recurrent) excision (3rd)	M	21	Obese, non-healing wound, poor hygiene and compliance	15	8	4	50%
2	Hidradenitis suppurativa excision (axilla)	F	25	Hidradenitis suppurativa, history of non-healing wounds	72	10	3	70%
3	Necrotizing infection excision (arm)	F	43	Infection, necrotizing fasciitis	16	7	0	100%
4	Necrotizing fasciitis I&D/debridement	M	51	HIV, progressive necrotizing fasciitis	72	10	0	100%
5	Excision/debridement RLE through muscle	M	40	DVT, lymphedema, failed treatment with STSG and NPWT	1350	9	3	67%
6	Burn debridement (thigh)	M	72	CABG x 3, MI, cancer, DM	765	9	2	78%
7	Atypical wound (unknown etiology)	F	52	History of slow/non-healing wounds, stroke/paralysis	7.5	6	0	100%
8	Stage 3 pressure injury debridement	F	95	DM, dementia, kidney dx, history of slow/non-healing wounds, waldenstrom macroglobulinemia	21	8	2	75%
9	Necrotizing fasciitis excision (right thigh)	M	44	Infection, HTN, obesity, significant pain with NPWT taking morphine	900	7	3	57%
10	Peristomal irritation post ileostomy	F	30	Hirschsprung, ileostomy, renal failure	12	8	0	100%
11	Abscess excision (right buttock)	M	45	DM, obesity, HTN, multiple abscesses	9	8	0	100%
12	Hematoma post debridement (LLE)	F	71	Impaired mobility, HTN, AF, bipolar, CKD, long COVID, OSA, Hepatic stenosis	25	8	0	100%
	AVERAGE OR TOTAL COUNT	**6 M 6 F**	**49.1**		**272.0**	**8**	**1**	**83%**

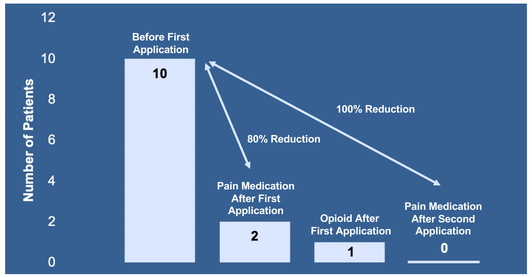
POST TREATMENT WITH TPD:

- **Reduction of Average VAS Pain Score: 83% (range 50% - 100%)**
  - All patients reported pain reduction within few minutes of first application
  - 6/12 patients reported 100% pain reduction after TPD treatment
- **Reduction of Pain Medication: 80%** after first TPD application
  - All pain medications were discontinued by the second TPD dressing application
- **Frequency of Wound Care Assessments or Dressing Changes:** Reduced from 3 or more / week to 1 / week
- **Complications:** All wounds healed without any complications. No adverse events were reported

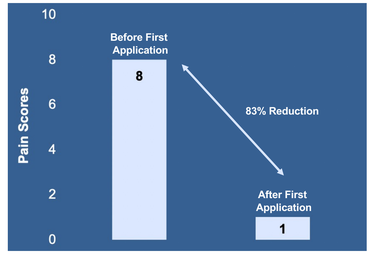
WOUND ASSESSMENTS



PAIN MEDICATION



PAIN SCORES



CONCLUSION

Pain can adversely impact healthcare costs, clinical outcomes, LOS, patient satisfaction/HCAHPS scores and QOL[1,3,4,5]. The QIP data suggests that TPD presents a safe and effective solution for management of painful postoperative wounds.

The following observations were recorded for all patients:

- Reduction in patient-reported pain scores and prescribed pain medications
- Decrease in wound assessments and nursing time for dressing changes
- Achievement of full wound closure with no wound related complications

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.

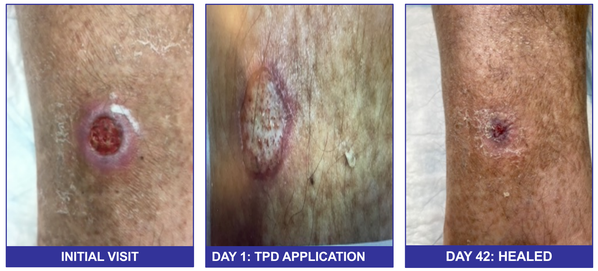
TPD is a novel powder dressing comprised primarily of biocompatible polymers (same as those used in contact lenses). Upon hydration, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor transpiration. 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 ULCERS

- **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.

UPMC LIFE CHANGING MEDICINE

Novel Technique for Management of Painful Road Rash Injuries

Symposium on Advanced Wound Care (SAWC)
April 2022

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

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.

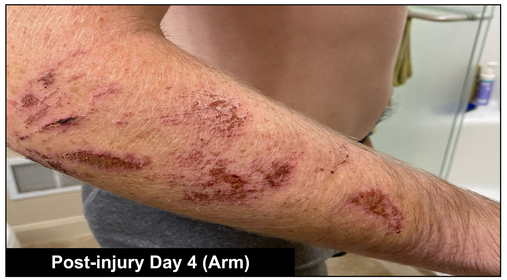
MATERIAL

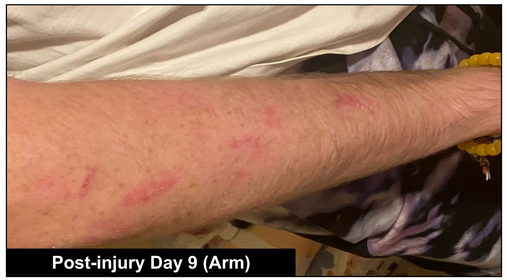
TPD is a novel powder dressing comprised primarily of biocompatible polymers (same as those used in contact lenses). Upon hydration with saline, TPD granules aggregate to form a moist, oxygen-permeable matrix that protects the wound from contamination while helping to manage excess exudate through vapor 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 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.

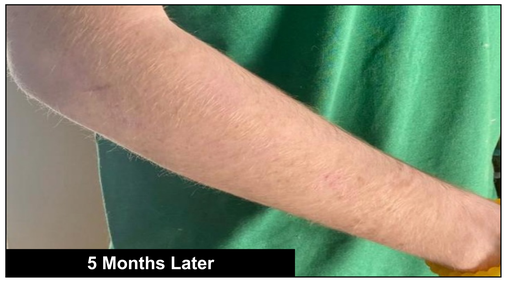
*Altrazeal® Transforming Powder Dressing (USA)

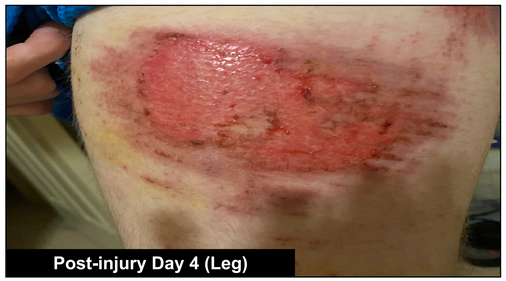
TPD APPLICATION AND RESULTS

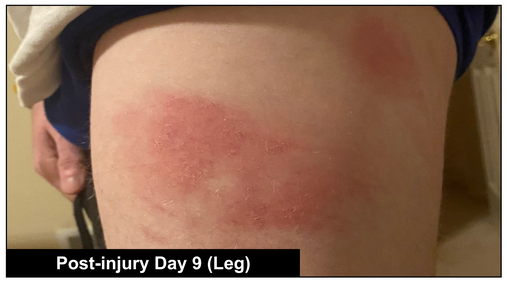
- TPD was topped off as needed, secured with contact layers, absorbent pads and a net dressing.
- On post-injury day nine, five days after initial TPD application, all wounds were epithelialized.
- Immediate pain relief was reported by the patient following TPD application.
- There were no complications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

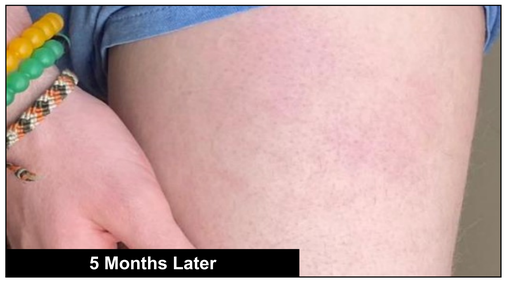

Post-injury Day 4 (Arm)


Post-injury Day 9 (Arm)


5 Months Later


Post-injury Day 4 (Leg)


Post-injury Day 9 (Leg)


5 Months Later

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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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).

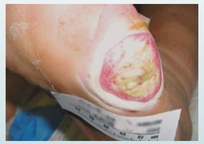
Case 1: A 47 yo Insulin dependent Diabetic white male presented with a neuropathic Wagner Grade 2 ulcer on the lateral aspect of his right foot. He had been treated with an offloading DH Walker and daily dressing with a currently available collagen silver dressing. Wound healing progress had stalled 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.

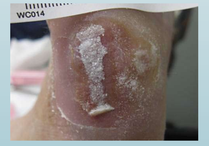
Case 3: A 57 yo white male undergoing active chemotherapy and radiation for intra-cranial metastatic melanoma lost his balance and fell against a steam heat radiator and suffered 3rd degree burn wounds to his right thigh. Concerned that the patient's debility while undergoing active chemotherapy would 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

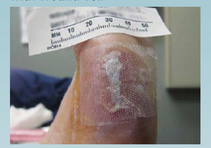
Diabetic Wagner Grade 2 Neuropathic Ulcer



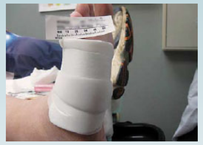
Application of Powder Dressing



Powder Dressing Covered with Wound Veil



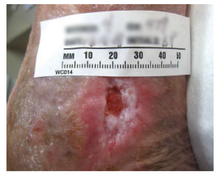
Diabetic Ulcer with Foam Before Contact Cast



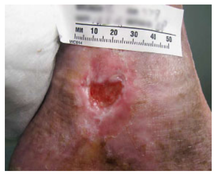
Application of Contact Cast

CASE 2

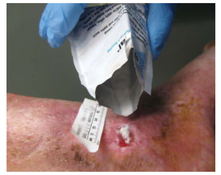
Right Leg Venous Ulcer



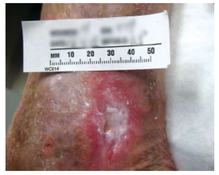
Left Leg Venous Ulcer



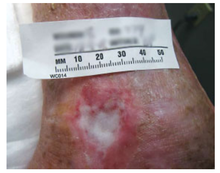
Powder Application



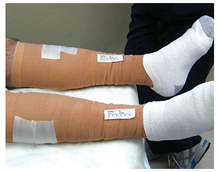
Powder Dressing Right Leg Venous Ulcer



Powder Dressing Left Leg Venous Ulcer

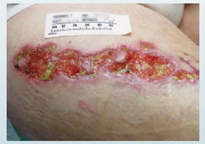


Compression Wraps Applied After Powder Dressing

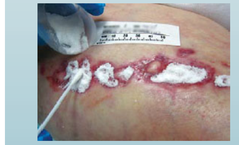


CASE 3

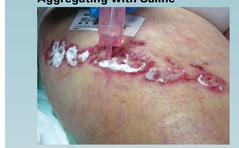
3rd Degree Durn Wound to Right Thigh



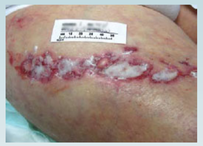
Application of Powder Dressing



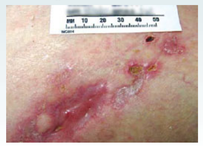
Dressing on Right Leg Burn Wound Aggregating with Saline



Powder Dressing in Place



Third Degree Burn Wound Healed



Powder Dressing and Diabetic Ulcer

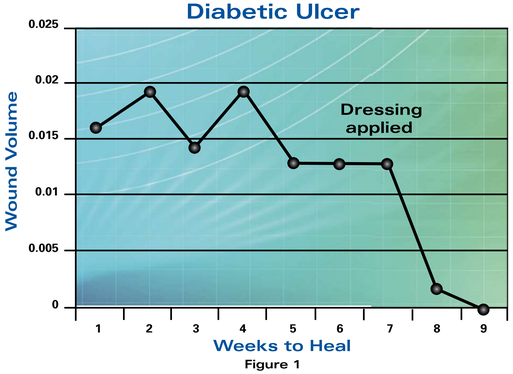
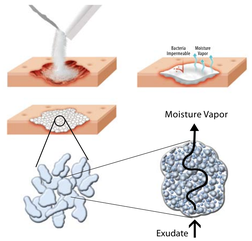
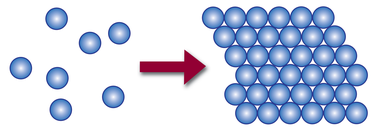


Figure 1



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.

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