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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).

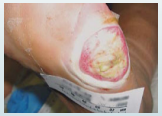
Case 1: A 47 yo Insulin dependent Diabetic white male presented with a neuropathic Wagner Grade 2 ulcer on the lateral aspect of his right foot. He had been treated with an offloading DH Walker and daily dressing with a currently available collagen silver dressing. Wound healing progress had stalled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

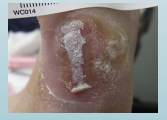
Case 3: A 57 yo white male undergoing active chemotherapy and radiation for intra-cranial metastatic melanoma lost his balance and fell against a steam heat radiator and suffered 3rd degree burn wounds to his right thigh. Concerned that the patient's debility while undergoing active chemotherapy would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

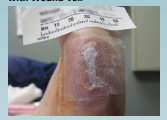
Diabetic Wagner Grade 2 Neuropathic Ulcer



Application of Powder Dressing

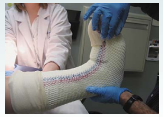


Powder Dressing Covered with Wound Veil



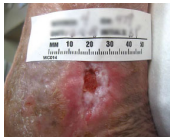
Diabetic Ulcer with Foam Before Contact Cast

Application of Contact Cast

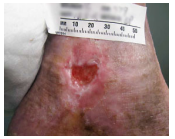


CASE 2

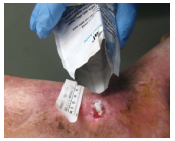
Right Leg Venous Ulcer



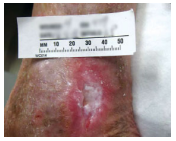
Left Leg Venous Ulcer



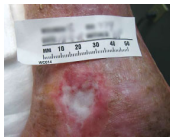
Powder Application



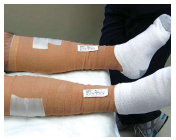
Powder Dressing Right Leg Venous Ulcer



Powder Dressing Left Leg Venous Ulcer

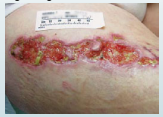


Compression Wraps Applied After Powder Dressing

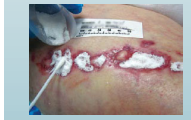


CASE 3

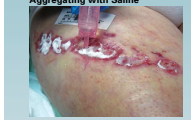
3rd Degree Durn Wound to Right Thigh



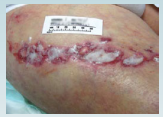
Application of Powder Dressing



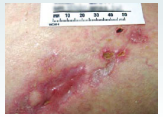
Dressing on Right Leg Burn Wound Aggregating with Saline



Powder Dressing in Place



Third Degree Burn Wound Healed



Powder Dressing and Diabetic Ulcer

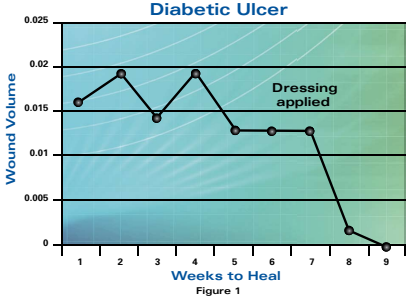
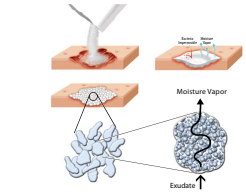
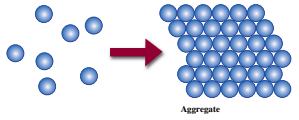


Figure 1



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.

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
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5.) Kantor J, Margolis DJ. Efficacy and Prognostic Value of Simple wound Measurements. Arch Dermatology. 1998; 134: 1571-1574.

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