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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:

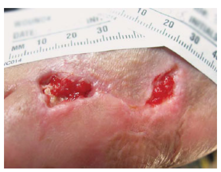
39 yo white male had suffered crush injury to the dorsum of his left foot. A split thickness skin graft was applied to cover the acute crush injury. Recent orthopedic corrective surgery was performed and resulted in a new skin and tissue deficit on the dorsum of his foot. He was referred to wound care 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.

Initial Wound

Week 5 Post-debridement

Week 5 Altrazeal

Week 7

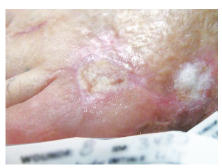


Week 7

Week 8

Week 8

Week 8



Healed

Powder Impact on Healing

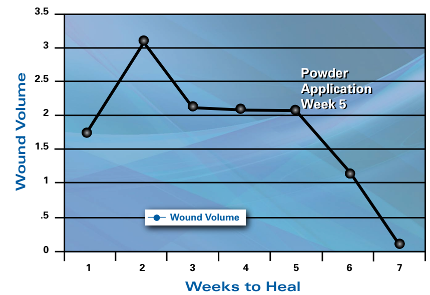
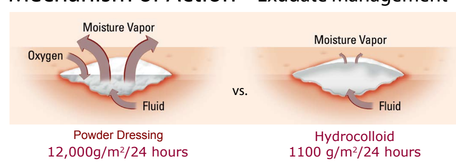
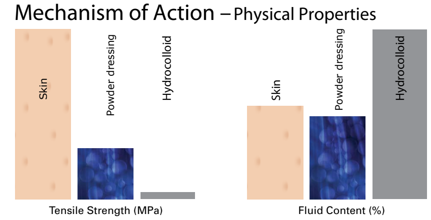


Figure 1

Mechanism of Action – Exudate Management



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.

References:

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