

Utilizing the Self Regulating Moisture Control of a Humifiber Dressing to Manage a Single Complex Wound

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ABSTRACT:

Chronic wounds are often complex and have clearly been shown not to be homogeneous. The wound biofilm which covers the vast majority of the chronic wound shows significant differences in the constituent microbes at different locations within the wound. This heterogeneity of wound biofilm combined with the different tissue types that are often contributing to the wound bed along with different degrees of degradation of the host tissue can present significant problems for most traditional dressings. Certain areas, such as the wound edge that struggles with active wound biofilm producing marked inflammation and therefore exudate, have different moisture control needs versus areas of exposed bone or low inflammation. Currently, available dressings tend to be engineered to solve a single problem, such as too much exudate (absorption) or wound desiccation (hydration), which can limit their overall effectiveness in a complex wound. Complex wounds with areas of different properties therefore may benefit from a self-regulating dressing. A novel Humifiber advanced wound dressing has a unique feature of self-adjusting its material properties in response to specific moisture conditions encountered within the wound. This fiber is able to simultaneously sequester large amounts of exudate over highly exudative regions and donate moisture to prevent desiccation of non-draining portions of the wound. The use of Humifiber dressings simplifies wound care by assuring optimal moisture balance for the ever changing wound conditions within the complex chronic wound.

OBJECTIVE:

- To evaluate the ability of a new self-adaptive advanced wound dressing* to facilitate optimal moisture balance in the wound bed and peri-wound area of complex chronic wounds.

BACKGROUND:

- Chronic wound surfaces are often extremely heterogeneous and complex, characterized by constantly changing sequential and dimensional conditions.
- For example, wound biofilm which covers the vast majority of the chronic wound shows significant differences in the constituent microbes at different locations within the wound.^{1,2}
- Heterogeneity of wound biofilm, different tissue types within the wound bed, and varying degrees of host tissue degradation³ present a challenging environment for most traditional dressings.
- Certain areas, such as the wound edge that struggles with active wound biofilm producing marked inflammation and therefore exudate, have different moisture control needs versus areas of exposed bone or low inflammation.
- Currently available dressings tend to be engineered to solve a single problem, such as too much exudate (absorption) or wound desiccation (hydration), which can limit their overall effectiveness in a complex wound.
- Complex wounds with diverse properties therefore may benefit from a self-regulating dressing.

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Case 1: Basal cell carcinoma of the temporal region

62-year-old male with a chronic, progressive soft tissue radionecrosis wound of the left facial and temporal region following severe radiation damage post basal cell carcinoma. Multiple biopsies showed no recurrence of cancer, yet the patient has exposed cranium and zygomatic arch as well as exposed dura.



A. Chronic osteoradionecrosis wound prior to use of humifiber dressings includes drainage from the frontal sinus out into the wound, significant inflammation of the dura down through the orbit, and desiccation and severe dryness of the exposed cranial bone and zygomatic arch. Wound edges are actively inflamed and highly exudative, whereas the dura and the bone remain much drier.



B. Two weeks following initial use of humifiber dressing, sinus drainage is controlled and pink granulation buds are present in the wound bed.



D. After 3 months of humifiber dressings, wound edges appear healthy, and all dimensions are smaller.

Case 2: Fourth metatarsal head following amputation

67-year-old diabetic male with a draining, dehiscid incision at the right foot fourth metatarsal head following toe amputation.



A. Diabetic wound post amputation and debridement with copious drainage and wound edge maceration



B. Humifiber dressing is applied between toes and overlapping onto intact skin



C. After 1 week of humifiber dressings, wound edge maceration is resolving due to dressing absorption capabilities. Slight erythema is present at the wound edges.



D. Peri-wound is free of maceration and erythema after 3 weeks of humifiber dressings. Wound edges remain moist and begin coming together



E. After 6 weeks of humifiber dressings, the wound is well granulated over tissue and bone



F. At 4-months, the diabetic wound is completely closed

Case 3: Chronic lower extremity venous stasis ulcer

49-year-old female presented with a draining venous stasis ulcer that had been present on her right shin for 6 months.



A. Chronic, edematous venous leg ulcer with raised wound edges and exposed tendon after 6 months of advanced wound care and prior to humifiber dressing application



B. Two weeks following initial application of humifiber dressing, drainage and edema are considerably decreased, and wound edges are level with the peri-wound skin. The wound is granulating normally.



C. After 2 months of humifiber dressings, ulcer is 85% granulated, including over tendon. Peri-wound skin is healthy with very slight erythema.



D. Venous stasis ulcer is completely granulated over tendon after 3 months of humifiber dressings.

METHODS:

- We prospectively evaluated effectiveness of a novel humifiber advanced wound dressing in facilitating moisture balance in chronic and subacute wounds.
- With patient consent, consecutive wounds, regardless of etiology or amount of exudate, were included in the evaluation.
- Wounds were debrided of all necrotic tissue, and culture-specific topical antibiotics were applied when appropriate.
- A self-adaptive Humifiber dressing (sized 10.2 x 10.2 or 12.7 x 15.2 cm) was placed over the wound, overlapping 2 to 3 cm onto intact skin. When more than one dressing was required, dressings were placed side by side and taped with cotton tape. Dressings were secured with a gauze wrap.
- Initially, dressings were changed daily in wounds with moderate to heavy drainage, and changed every other day in wounds with minimal drainage.
- Dressing change frequency was gradually reduced to **one per week** as appropriate.
- Patients were evaluated by clinic once per week or every other week.
- Dressing leakage, dressing strike-through, desiccation or drainage accumulation in the wound bed, granulation tissue ingrowth into dressing, and peri-wound maceration were noted.
- Length of evaluation was 12 weeks or until wound was completely re-epithelialized, whichever occurred first.

RESULTS:

- 17 patients with 22 chronic wounds were evaluated
- 10 patients were male and 7 were female; average age was 63 years old (range: 39 to 84 years)
- Wound types included pressure ulcers (n=6), diabetic foot wounds (n=4), chronic radiation wound (n=1), venous leg ulcers (n=7), and dehiscid surgical incisions post amputation (n=4).
- There were no instances of dressing leakage or strike-through during use of humifiber dressing; in one case of a morbidly obese patient with a plantar diabetic foot ulcer, the dressing shifted considerably underneath the tape, but the outer layer of the dressing did not tear.
- No areas of wound surface desiccation, including over exposed tendon or bone, were observed during the study period.
- Wound edges remained moist and there was evidence of wound edge leveling in all wounds treated.
- Prolonged peri-wound maceration was not observed and additional skin protection was not needed in any of the cases.
- Dressing change and debridement frequency were reduced in 18/22 (81.8%) and 16/22 (72.7%) wounds, respectively, after 2 weeks of humifiber dressings, compared to initial 2 weeks of application.
- Humifiber dressings were non-adhering; dressing removal was quick, painless and non-traumatic in all wounds. Tissue ingrowth into the dressing did not occur in any of the cases.

CONCLUSIONS:

- Dressing self-adapted to multiple wound conditions, from areas prone to dryness to areas with copious drainage, at the same time within the same wound. All wound surfaces appeared optimally moist throughout each healing phase with no need for dressing customization.
- Notable improvements of wound edge conditions were observed during use of humifiber dressing.
- The humifiber dressing effectively managed wound exudate while protecting the peri-wound skin.
- In the majority of cases, formation of biofilms and slough re-accumulation were reduced with the humifiber dressing, therefore reducing the need for debridement over time.
- Use of this one-fit-all dressing can simplify wound care by controlling exudate, preventing desiccation, eliminating peri-wound maceration, and facilitating optimal moisture balance for the ever-changing wound conditions within the complex chronic wound.