The Development of a New Technique for Quantitative Analysis and Comparison of Various Wound Dressing’s Performance in Maintaining a Moist Environment

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ABSTRACT

Despite the existence of many methods for measuring exudate handling properties of wound dressings there is still a problem how to correctly evaluate dressing performance in hospital practice. Some of the wound models developed to overcome this problem do not simulate the wound closely enough to predict dressing performance under different critically important conditions such as wound bed depth, or wound orientation. Other artificial wounds do not allow to quantitatively evaluate some significant characteristics including dressing evaporative performance, dressing’s ability to provide and maintain a moist environment at the wound and periwound skin surface.

A new type of artificial wound has been developed that allows simulating different wound conditions. It makes possible testing the dressing with different types of supportive bandages, testing the dressing in various orientations (horizontal, vertical and inclined). Another major advantage of this new model is the possibility to control exudate range and wound temperature. This new artificial wound will also allow to measure and monitor dressing performance characteristics like absorption, retention and evaporation rates, as well as dressing wicking properties. Additionally, it will allow measuring the humidity at wound surface and control the strikethrough of exudate.

Clinical tests have shown that this technique may be successfully used to evaluate the time a dressing will remain effective on the wound. Test method and the artificial wound model are described. In order to illustrate the potential value of this new technique, some testing results for different types of wound dressings including hydrofiber, hydropolymer, hydrogel and humifiber are also presented.
PROBLEM

• The growing number of available dressings makes comparison testing and choosing the correct dressing to each wound an increasingly challenging task.

• Standard dressing testing methods based on measuring specific dressing/material characteristics (absorption capacity, moisture vapor transmission rate (MVTR), etc., not always allow to predict adequately how well dressing will perform in hospital environment

• Lack of systems approach to dressing testing causes well known situations when a dressing with quite good specific characteristic does not perform in hospital practice as well as it was expected.

OBJECTIVE

• To develop a method and an apparatus for quantitative testing and evaluation the ability different wound dressings to manage exudate and maintain moist environment on wounds with various controllable characteristics.
Major Advantages of the OSNovation Wound Test Stand

• Exudate Temperature Control
• Exudate Flow Rate Control
• Exudate Pumping Cycle Control
• Ambient air temperature and humidity monitoring
• Adjustable Wound Surface: horizontal, vertical, and inclined
• Optional self-adhesive pads allow simulating different wound depths
• Ability to use different type of wound wraps, including compression wraps to simulate real dressing in-use situations
• Under-Dressing Relative Humidity Monitoring
Block Diagram of the Wound Test Stand

- Control Block:
  - Syringe Pump Control
  - Exudate Temperature Control
  - Periwound Temperature Monitor

- Syringe Pump

- Wound Model

- Simulated Wound Fluid Reservoir

- Humidity/temperature logger software

- Computer

- 12 port USB Hub

- Stand with up to 12 humidity/temperature sensors
Figure 1. Wound Dressing Test System General View: 1 – wound model, 2 – bottle for “exudate” fluid, 3 – fluid valves, 4 – syringe pump, 5 – control box.
Under-Wound Humidity Test Stand

Figure 2. Humidity Test Stand with 12 RH/Temperature sensors
Results of Enluxtra Wound Dressing Testing

Exudate level – 1 ml/cm²/day

OSNovation Systems, Inc. 888-519-2297
Results of Allevyn and Biatain Wound Dressings Testing

Exudate level – 1 ml/cm²/day
Fig. 3. Amount of retained in dressing fluid over time for Enluxtra, Biatain, and Allevyn Wound Dressings
Fig. 4. Relative humidity on dry wound surface covered with different types of dressings:
- Enluxtra Humifiber Wound Dressing
- McKesson Hydrogel Sheet Dressing with and without the upper protective film.
Conclusion

• The OSNovation Wound Simulator has been successfully used for development of Enluxtra Humifiber Wound Dressing and clinical trials proved the laboratory prediction based on the Wound Simulator tests results that Enluxtra Humifiber Dressing may be successfully used for broad variety of wound.

• The OWS has proved to be a powerful and convenient tool for obtaining specific related to dressing development and analysis data (dressing absorption capacity, absorption, retention, and evaporation rates, humidity decreasing rate, strikethrough conditions and their correlation with wound characteristics and dressing application conditions.

• The OWS also allow to obtain reliable straightforward practical recommendations for hospital use: how well the dressing will perform for different types of wound and how long it can stay on wounds under different conditions, what may help significantly decrease amount of time for choosing most appropriate dressing for a specific wound.