Use of a New Antimicrobial Dressing (TheraBond) on a Non-healing Wound

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Abstract: The wound care specialist is often confronted with wounds previously treated with many different products that remain resistant to closure. This report describes the use of a new antimicrobial dressing (TheraBond 3D, Choice Therapeutics, Wrentham, MA) to close a perineal wound in an area that had been radiated prior to abdominal-perineal resection to treat colon cancer. The rapid healing achieved warrants further investigation of this novel dressing.

Case Report

A 47-year-old man with Stage 3 colon cancer was seen with a non-healing perineal wound 6 months after abdominal-perineal resection. The patient received preoperative radiation therapy. Postoperatively, the perineal wound broke down and became infected. The wound measured 1 cm x 2 cm and was 3 cm in depth. Chemotherapy was delayed pending wound healing. The patient required hydrocodone-paracetamol (Vicodin) for pain control.

The wound was debrided twice following the original surgery. Despite this and the use of many different wound products, the wound continued to drain copious amounts of exudate. The patient required a feminine napkin and multiple daily dressing changes to keep the area dry. At the patient's first visit to the author's clinic, the dressing was changed to TheraBond® 3D Antimicrobial Barrier Systems (Choice Therapeutics, Wrentham, MA) every week. No other changes were made to the treatment protocol. Within 6 weeks, the wound was closed and the drainage had ceased. The patient began chemotherapy 2 weeks later.

Discussion

Radiation injury refers to the morphologic and functional changes that can occur in noncancerous tissue as a direct result of ionizing radiation. These complications can range from mild to debilitating, and in some cases are life-threatening. Ionizing radiation causes damage to tissue by means of energy transference. This energy generates highly reactive chemical products such as free ion radicals. The free radicals subsequently combine with normal body chemicals and react with cellular components, ultimately causing intracellular and molecular damage. The primary cell components that

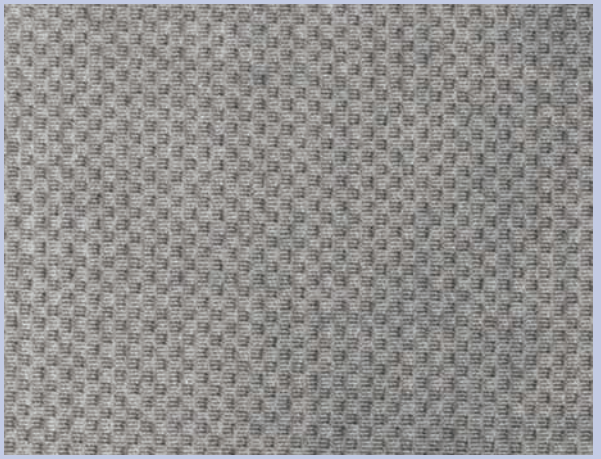

Figure 1. The dressing consists of a single piece of woven fabric.

Figure 2. The 3D delivery system is designed to maintain an ideal moist, but not wet, healing environment.

are injured are cellular and nuclear membranes and deoxyribonucleic acid.[1]

Changes in vasculature, effects on fibroblasts, and varying levels of regulatory growth factors result in the potential for altered wound healing whether radiation is given before or after surgery. Surgical factors such as incision size, as well as radiation parameters such as dose and fractionation, are important considerations in developing treatment plans.[2] Transforming growth factor (TGF)-β is an important regulatory growth factor that regulates many aspects of wound repair including inflammation, chemotaxis, and extracellular matrix deposition. Epithelialization of incisional wounds is accelerated in mice null for Smad3, which is a key cytoplasmic mediator of TGF-β signaling. Cutaneous wounds made in Smad3-null mice after irradiation display decreased wound widths, enhanced epithelialization, and reduced numbers of neutrophils and myofibroblasts compared to wounds in irradiated wild-type littermates. Chemotaxis of neutrophils and primary dermal fibroblasts to TGF-β requires Smad3, but differentiation of fibroblasts to myofibroblasts by TGF-β does not.[3]

The effectiveness of ionic silver as an antimicrobial is well established.[4,5] Silver is an effective antimicrobial agent with low toxicity, which is important especially in the treatment of burn wounds where transient bacteremia is prevalent and its fast control is essential. Drugs releasing silver in ionic forms are known to get neutralized in biological fluids and upon long-term use may cause argyria and delayed wound healing. Given its broad-spectrum activity, efficacy, and lower cost, the search for newer and superior silver-based antimicrobial agents is necessary. Silver nanoparticles have been shown to kill gram-negative and positive bacteria efficiently and have good antifungal properties. Silver nanoparticles may provide a safer alternative to conventional antimicrobial agents in the form of a topical antimicrobial formulation.[6]

Silver impregnated fabrics may also provide a better alternative to conventional topical antimicrobial products. The dressing consists of a single piece of woven fabric (Figure 1). It has a perforated contact surface, struts designed to provide capillary action and insulation for the wound, and a smooth outer surface that is designed to transfer fluid and exudate into an absorbent outer dressing. Overall, the directional flow of this 3D delivery system is designed to maintain an ideal moist, but not wet, healing environment and to minimize the probability of the contact dressing becoming saturated (Figure 2). This antimicrobial dressing is manufactured based upon two technologies: an autocatalytic/electroless manufacturing process and 3D spacer technology. The autocatalytic/electroless technology is used to bond silver to more than 99% of the fibers in the fabric. The 3D spacer technology is designed to facilitate fluid and exudate transfer away from the wound. The dressing delivers ionic silver and provides antimicrobial activity for 14 days, which also makes it cost effective.

Conclusion

The rapid wound healing achieved in this case suggests that the use of TheraBond 3D in other surgical, as

well as other non-healing wounds, should be further examined.

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