Wound Care Dressings

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1. Introduction

Second intention wound healing is best performed with dressings that will keep the wound moist. Modern wound healing dressings are designed to provide the appropriate amount of moisture retention for the stage of wound healing. Moist wound healing occurs when the wound exudate is allowed to stay in contact with the wound bed. Studies on people have shown that full thickness skin wounds kept in a moist environment re-epithelialize in approximately 12–15 days, whereas the same wound exposed to the air will take 25–30 days to heal.1,2 The wounds are less inflamed, cause less itching, have less eschar formation, and are more likely to heal without scarring. Wound exudate in the absence of infection provides a substrate rich in enzymes, growth factors, and chemotactic factors. The enzymes allow the debridement of the devitalized tissue, improving the “foundation” for wound healing to proceed. This has been termed autolytic debridement. Autolytic debridement occurs between 72 and 96 hours depending upon the thickness of eschar and the size/location of the wound and is achieved under occlusive dressings, provided the wound bed remains in contact with the wound fluid. Growth factors provide a stimulus for the fibroblasts and epithelial cells. The chemotactic factors stimulate the migration of more neutrophils and macrophages to phagocytize bacteria and debris while releasing enzymes to further promote autolytic debridement. A moist environment allows better migration of neutrophils and macrophages than a dry wound environment. Occlusion provides a constant thermal regulated environment leading to healthier cells, and if the appropriate dressing is chosen then bacterial penetration is reduced or prevented. Disadvantages of moist healing include bacterial colonization, folliculitis, the possibility of trauma to peri-ulcer borders, and, at least in people, allergies to the dressing material. There can be a fine balance between drying out of the wound and maceration of peri-wound tissue. Fortunately, there are new dressings available to help the practitioner in determining what to use in each case to provide an optimum wound healing environment.1,2

Many dressings have been used in the treatment of lacerations and abrasions in horses. Nonadherent dressings and gauze dressings are probably the most common dressings used. Both of these dressings are porous, allowing fluid transfer from the wound to the overdressing and from the outside of the bandage to the wound surface. If woven gauze is used, the wound exudate is quickly absorbed through the gauze and into the overdressing. This is termed vertical wicking. If nonwoven gauze is used, the wound exudate tends to flow to the edge of the gauze quickly and then is absorbed into the overdressing. This is termed horizontal wicking. The amount of moisture retention is dependent upon many factors including the amount of exudate and the type of gauze, the secondary dressing, and the frequency of dressing
change. It is difficult when using a gauze dressing to maintain a moist wound-healing environment even if a wet to dry bandage is used.\textsuperscript{3} Oclusive dressings isolate the wound from the external environment; providing many benefits over a simple gauze dressing. The occlusiveness of a dressing is measured by the evaporation of fluids from the wound surface through the dressing and ranges from minimally occlusive to completely occlusive. The benefits of occlusion include rapid autolytic debridement with less necrotic tissue, a bacterial barrier, a waterproof barrier, a decrease in pain associated with wound/dressing, ease of use, fewer dressing changes, and decreased wound healing time. The fears about occlusion are mainly centered around infection. All wounds are colonized with bacteria while they may not be actually infected. Infection in general refers to invasion of bacteria to the $10^5$ power in live healthy tissue. Signs of infection include edema, erythema, induration, and fever. Although there are concerns, studies have shown that occlusive dressings are not associated with increased rates of infection.\textsuperscript{3} The ideal dressing should keep the ulcer bed continually moist and the surrounding skin dry, or more simply stated, a dressing should manage the amount of exudate present. This determination will be dependent on clinical judgment.\textsuperscript{3}

2. Wound Dressings

There are probably as many different wound dressings as there are wound cleaning agents.\textsuperscript{3} This lecture will focus on the agents the presenter has the most experience with. Wound dressings should be chosen based upon the stage of wound healing the wound is in. The author is not aware of any single dressing that provides benefits throughout all stages of the wound healing process. Consequently, the appropriate dressing will vary through the wound treatment. In general, the stages of wound healing can be divided into the following: debridement, wound moistening, granulation tissue development and wound contraction, and epithelialization. The wound should be kept moist in all of these stages as moist wounds will generally heal in half the time as wounds left exposed to air, as long as the appropriate dressing is chosen.\textsuperscript{1,2}

Debridement Dressings

Debridement dressings are designed to remove bacteria and necrotic tissue from the wound. Debridement dressings should often be combined with some type of sharp debridement where the bulk of the necrotic tissue is removed from the wound prior to dressing application.

Hypertonic Saline

Hypertonic saline dressings are woven gauze dressings impregnated with 20\% saline. They provide an aggressive, nonelective debridement. They work by drawing the fluid out of bacteria and diseased cells, reducing their attachment to the wound bed, and then lifting them out of the wound when the dressings are changed. In the author’s opinion, they are the most effective debridement dressings available.\textsuperscript{3} Hypertonic saline can be made by dissolving 200 g of salt in 1 L of boiling water. Lower concentrations of hypertonic saline do not appear to be as effective. This debridement dressing should be discontinued when the wound no longer appears infected.

Antimicrobial Dressing

One antimicrobial dressing\textsuperscript{b} is a loosely woven gauze impregnated with polyhexamethylene biguanide (PHMB). PHMB is an antimicrobial that disrupts the cell walls of microorganisms. There is no developing resistance known to PHMB.\textsuperscript{3} The dressing was originally developed to apply over a wound to stop bacterial penetration (it is also used in baby wipes and contact lens cleaning solutions). It is now accepted that the dressing will kill bacteria when placed into a wound. It comes as a dry dressing and should be moistened with saline prior to use in a wound. Similar to hypertonic saline, this dressing should not be used as a primary dressing after the wound has been effectively debrided and the bacterial numbers have been appropriately reduced. It can, however, be used as a secondary dressing to limit bacterial penetration to the wound bed.\textsuperscript{4}

Honey

Honey has been used to improve wound healing for centuries. Some types of honey, such as honey derived from specific plants like the Manuka bush, seem to have even more antimicrobial effect than would be seen with the natural hyperosmolality present in all honey. Not all honey is created equal in this effect, so only honey that is known to have antimicrobial benefits (Manuka honey) should be used in wound care.\textsuperscript{3,9}

Moistening Dressings

Although most of the wounds presented to the veterinary practitioner are necrotic and infected, some wounds are dry, often from inappropriate wound care. In these wounds, a gel dressing should be applied to “donate” moisture to the wound and improve the wound healing process. Gel dressings commonly contain water, glycerin, and a polymer. Some gel dressings incorporate a gauze that helps them maintain their normal shape. Either the amorphous or the formed dressings can be used to add moisture to a dry wound. As soon as the wound is moist, another dressing should be used.

Granulation Tissue Development and Wound Contraction

Dressings

Calcium Alginate

In the past, exuberant granulation tissue has been the bane of the equine practitioner, and to think that one might choose a dressing specifically to encourage granulation tissue would have been frowned upon. However, one of the complications of equine wound
healing is the lack of inflammatory response that is formed by the horse after wounding. Calcium alginate dressings will lead to an effective inflammatory process that will help wound healing proceed in an effective order. Another valuable benefit of the alginate dressings is that they contain a lot of calcium that is “donated” to the wound to encourage wound contraction. These dressings can also be placed directly on exposed bone that has been curetted to minimize bone sequestrum formation. As soon as granulation tissue fills the wound, these dressings should be discontinued.

Epithelialization Dressings
Semi-occlusive foam dressings help to finish off the wound healing process. The foam dressings will increase the surface temperature of the wound by 1–2 degrees, which will preferentially select for epithelialization. They are a relatively closed cell design so that the granulation tissue does not grow into the foam. The added benefit of foam is that it contains the same PHMB as described above in the debridement dressings to limit bacterial growth on the surface of the wound. It is not recommended to add any other agent to the wound during the epithelialization process. In summary, there are many options for wound dressings that have either negative effects or unknown effects on the wounds. It is the veterinarian’s job to make sure to select a wound cleaning agent or a dressing that will encourage the most functional and cosmetic end result. The author feels that the best healing results will occur with wounds that are covered and kept moist through the healing process regardless of the location of the wound on the horse. If uncertain what the dressing does, find out before using it. Many of these materials have quite detrimental effects on the wound.

Acknowledgments

Declaration of Ethics
The Author has adhered to the Principles of Veterinary Medical Ethics of the AVMA.

Conflict of Interest
The Author has no conflicts of interest.

References and Footnotes
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aCurasalt, Covidien/Medtronic, Minneapolis, MN 55432-5604.
bKerlix AMD, Covidien/Medtronic, Minneapolis, MN 55432-5604.
cAMD Foam, Covidien/Medtronic, Minneapolis, MN 55432-5604.