VETERINARY SPECIALTY
HOSPITAL

New Concepts in Wound Management

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When presented with a wounded patient the clinician should adhere to the basic principals of open wound management to initially treat the wound. There continues to be attempts to produce treatment protocols, that when added to basic wound treatment, that are designed to enhance and shorten the time of wound healing. As veterinarians we need to understand the physiology of wound healing and the cellular effects of our treatments in order to make appropriate decisions about managing these traumatic wounds. The decisions we make can enhance the healing process but inappropriate treatment may result in prolongation of wound healing or failure of wound closure.

When a patient is first presented with an open wound, life threatening injuries must be addressed and the patient's conditions stabilized prior to addressing the open wound. During this initial evaluation and treatment of the patient, simply covering the wound sterile saline soaked gauze will keep the wound moist and limit further wound contamination.

Wound Evaluation:

To properly assess and initially treat a wound the patient is ideally placed under general anesthesia. If the patient is unstable or a poor anesthetic risk initial evaluation and some surgical procedures may be performed with narcotic tranquilization and regional anesthesia including epidurals. The appropriate wound treatment for an individual patient will be determined by the heath status of the patient, the condition of the wound and the financial ability of the owner. The condition of the wound is influenced by the degree of contamination and the likely bacteria present as influenced by the location and conditions of the wounding, the relative size of the wound and how long the wound has been open. The condition of the tissues and the local blood supply will depend on the type of injury present (abrasion, avulsion, incision, laceration, crushing, puncture burn, or gunshot wound). The condition of the surrounding local tissues will determine if there is adequate skin available for a tension free closure without the accumulation of dead space.

Debridement:

Use sharp dissection (scalpel blade) to remove obviously dead and necrotic tissue and devitalized skin to the level of healthy bleeding tissue. Grossly contaminated tissue may also be sharply dissected at his time. Great care should be taken when debriding tissues around nerves, tendons and vessels. It is best to be conservative and serially debride around these structures employing chemical as well as mechanical debridement. Tissue and skin viability may be difficult to assess in the early stages so debridement may be delayed 48 to 72 hours to allow the tissues to declare their viability.

Wound Lavage:

Sterile water soluble gel should be placed in the wound and the surrounding hair should be liberally clipped. The skin surrounding the wound should be cleaned with an antiseptic soap being careful not to let soap enter the wound which will cause additional cellular damage. Wound lavage should be aimed at providing a large volume to remove debris and bacteria from the wound. Tap water can be used as an inexpensive way to deliver large volumes of fluid to an open wound. Tap water is hypotonic and non-sterile but has been used in clinical studies without obvious adverse effects on healing or infection rates. Sterile saline solution is commonly used as a lavage fluid but has shown in vitro toxicity to fibroblasts due to its acidity. Lactated ringers solution is a sterile isotonic fluid that is less acidic than saline. Additives may be added to the lavage solutions to add antimicrobial activity to the lavage solutions. Chlorhexadine 2% solution diluted 1:40 to a final dilution of 0.05% will provide a wide spectrum of antimicrobial and sustained residual activity that is not inactivated by organic material. Chorhexadine precipitates in electrolyte solutions but this does not appear to affect it antimicrobial properties. The appropriate lavage solutions may be delivered with a 35 cc syringe and 19 gage needle to deliver a pressure of 8 psi. Pulse lavage systems are available commercially which can deliver large volumes of fluid rapidly under pressure. bag and is effective for aggressive lavage of contaminated wounds.

Wound Management:

After the wound has been evaluated, debrided and lavaged a decision must be made about wound closure. If a wound is clean enough to be closed, closing the wound will decrease cost and hospitalization time but an inappropriately closed wound will increase costs and cause morbidity and increased hospitalization for the patient. There are four options for wound management:

Primary closure: Used only for clean wounds or wounds that can be debrided and converted to a clean wound.

Delayed primary closure: If there is any question if the wound is clean enough to close primarily, the wound managed open until it is clean and can be closed prior to the formation of granulation tissue (3-5 days).

Secondary closure: A contaminated wound is treated open until the wound is clean and closed after the formation of a granulation tissue bed.

Second intention healing: The wound is allowed to heal by wound contraction and re-epithelialization.

When a wound is clean enough to close it may be closed with local tissues, local and axial pattern skin flaps, free skin flaps or skin grafts. When a wound is clean enough for closure, active or passive drains may be required to control dead space.

Open Wound Management:

Open wound management is aimed at converting a contaminated wound into a clean wound that can be closed. Devitalized tissue may be removed by serial sharp excision enzymematic debridement, or mechanical debridement with wet-to-dry bandaging.

After the initial surgical debridement of a contaminated wound, mechanical debridement with wet-to-dry bandages can be employed to further remove necrotic tissue and debris. Non-adherent bandages can be used after a wound has a good granulation tissue bed and is free of necrotic tissue and debris. Hydrogel occlusive dressings have also been shown to enhance epithelialization in non-infected wounds.

Topical Wound Treatments:

Topical wound treatments are products that are applied to wounds to stimulate or enhance wound healing. They enhance wound healing by stimulating production of cytokines or growth factors within the wound Topical preparations that have shown some effect on wound healing include acemannan, D-glucose polysaccharide, hydrolyzed bovine collagen, porcine collagen products, and tripeptide-copper complex to name a few. Topically applied platelet derived growth factor (Regranex) has been shown to improve healing in chronic diabetic foot ulcers in man. Sugar and honey have been advocated as a wound dressing to treat large contaminated wounds. Sugar and honey are readily available inexpensive materials that when applied to a wound is considered bactericidal due to the high osmolatlity. This high osmolality is also responsible for moving edema fluid out and drawing macrophages into the wound. The other advantage of using sugar and honey is to provide the wound with a local nutrient source to promote granulation tissue productions.

Skin Expansion/Stretching:

Using the natural elastic properties of skin, large areas of skin loss may be, over time, covered with the surrounding tissues. Using elastic tape or rubber to apply constant tension on the skin around a wound the surrounding skin, over time, can extend beyond its natural inherent elasticity. This “extra skin” may be used to close wounds that would otherwise require skin grafts or flaps.

Wound Modification:

Application of a pulsed electromagnetic field to wounds has recently been shown to enhance wound epithelialization and possibly early wound contraction. Vacuum assisted wound closure devices have been used to promote wound closure by drawing tissues closed, mobilization of interstitial fluid and removal of bacteria through uniform application of negative pressure.

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