



NEWSLETTER

FROM THE PRESIDENT'S PEN...

An overdue hello to everyone! We are closing in on the final portion of yet another year. As this year races to a finish, I am happy to report that we have instituted a few changes which will likely lead to a greater exposure of the Veterinary Wound Management Society to all members and hopefully to many new potential members. Our new website (www.vwms.net) has been completed and as with nearly all transitions a few challenges were encountered along the way. Secondly, the VVMS Facebook page has also been created. Although still in its infancy, we are excited and eager to introduce the society into the realm of social media as a way to allow those interested in wound healing and the advancement of wound healing concepts, techniques, and products, a platform to communicate readily and conveniently. It is the society's hope that by use of both newsletters and social media, the advancement of wound care and the sharing of ideas will occur at a rate beyond anything that has been realized previously.

It is also a pleasure to announce the VVMS annual business meeting, to be held in conjunction with the VVMS small animal program at the North American Veterinary Conference on the 18th of January 2015. This meeting will be held during the lunch break of the small animal wound management session. Attendance to this meeting is open to all members of the society, so plan to bring your lunch and come and participate. The NAVC has always been

a welcome and wonderful venue for our society, and the 2015 program will be no exception. The line-up will include society members from all reaches of North America. In addition, a complimentary wound management laboratory will be available as well.

I would also like to remind all members that each year at this time, the members are invited to submit nominations for officers in the society. Officers are elected by the membership to a two year term. This year the Nominating Committee is seeking nominations for the office of Recorder. The Recorder is the secretary for the society and serves in several roles: 1) takes and presents the minutes at the annual business and board meetings, 2) serves as a link for communication – between members, sponsors, the public, the board. 3) Edits and prepares the quarterly VVMS Newsletter for publication. Please send your nominations to the following e-mail: fwd.vwms@gmail.com and be sure to put the word "nomination" in the subject line. When the Nominating Committee has received the nominations, candidates will be selected and the election will be held via e-survey.

Finally as a courtesy I would like to remind everyone that membership dues of \$35 will again be due by January 1st of 2015. As a gentle reminder, it must be noted that dues not received by March 1st of 2015 result in forfeiture of membership. We will also continue to offer free or complimentary memberships to students, whether

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veterinary students or veterinary technician students, as well as interns and residents. As a member, feel free to direct others that may be interested in joining the society to the website, where the initial membership application form can be found and downloaded under the membership tab on our website. This completed form can be then sent to the membership@vwms.net email address.

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Management Society

SHARING REALISTIC EXPECTATIONS WITH CLIENTS IN WOUND HEALING

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Being relatively new to the title of DVM, I set out excited, scared, and full of four years of education to be able to treat, care for, and sew up every kind of ailment known to animals. However, as many of you surely experienced on your maiden voyage of veterinary practice, I wasn't prepared for the most frequently asked question that a veterinarian is asked....."Doc what is the prognosis?". Understanding that with experience comes more knowledge of probable outcomes; I have found that sharing realistic expectations to wound management with the client can be just as important as the innovative wound treatments that we use.

The wound healing process and prognosticating the healing can be frustrating for clients, especially large animal owners. Many times the frustration is just a result of the owners trying to educate themselves by reading magazines or doing some research on "Doctor Google". Often our recommendations can be different or all out "wrong" based on some of their research. However, through educational counseling on the treatment and prognosis, clients will feel more at ease and accepting to your treatment protocol. The following are recommendations I have, or at the very least tools that I have found helpful in my journey as a new veterinarian:

At initial presentation it is important to evaluate the animal's overall health status with the client. Factors to consider when presented with a patient include: mechanism of injury, degree of contamination, tissue trauma, location of wounding, and the overall condition of the patient. When presented with an older wound it is also important to gain history from the client on what treatments have taken place due to common therapeutic strategies potentially being detrimental to the wound healing. Finally, (and the focus of this article) is; educating the client on current and future phases of wound healing by their gross appearances and having a therapeutic plan - resulting in better owner compliance and a better prognosis for the animal.

Ideally wounds should be managed by primary closure.¹ Classically the

"golden period" of 4 - 12 hours post-injury has been described as the time during which primary closure can be accomplished with minimal wound contamination and minimal healing complications.¹ Beyond this time period or if the wound is closed with known contamination, the risk of wound infection and dehiscence increases (Fig 1).



Figure 1. Contaminated wound 2 days old.

This concept is important to point out when clients are expecting a wound to be sutured up and the patient to be ready to perform the following day. It is important to tell the client that, due to tissue destruction, environmental contamination, and time elapsed before exam, the risk of the wound being infected or becoming infected is very high. For example, fecal contamination in a horse's environment contributes to the high rate of wound contamination and infection. Infection of a wound is likely when the numbers of bacteria reach a concentration of 10^6 per gram of tissue or milliliter of fluid¹ and it has been reported that 1 gram of feces contains 10^{11} bacterial organisms.² It is important to share that wounds that are infected have delayed wound healing, have a higher incidence of primary

closure dehiscence, and are often left unprotected by the immune system.² Due to these circumstances, wounds often are not able to be primarily closed.

When wounds are left to heal by second intention, the ability to recognize the gross appearance of each phase of wound healing is key for you and the client. The following are basic "big picture" topics of communication during each phase of wound healing:

Sharing that the inflammatory phase of wound healing (Fig 2) is marked by the cardinal signs of inflammation; redness, pain, heat, and swelling,³ is important. Additionally, knowing a fresh blood clot, serosanguinous or purulent exudates may be observed can help clue the owner in on what is a normal appearance of a wound during this time. After recognition, counseling with the client that mismanagement at this stage may possibly decrease the inhibition of inflammatory mediators resulting in a sustained inflammatory response and prevent wound debridement is also a topic of consideration.³



Figure 2. Acute inflammatory phase of wound with exposed bone.

Often owners perceive wounds to happen and then are healed and are unknowing of the changes that take place during each phase of wound healing. Counseling the owner on what is to be expected during the phases of wound healing can help them follow the progress of wound healing and better comply with wound care instructions. The proliferative phase of wound healing is characterized by the sequential production of two primary products – granulation tissue, and epithelium. The former is a red granular stroma making its appearance in the wound bed 3-5 days after wounding. Grossly, a red cobblestone appearance with a pink-red color is often the classic appearance for the wound and often noted by the client at this stage. Educating the owner that this appearance of the wound is due to the combination of fibroblasts, capillaries, and connective tissue matrix that fills the initial wound⁴ may help put the owner's mind at ease that positive changes are occurring. When owners realize that this granulation tissue provides a physical and physiologic barrier to infection and a surface for epithelial migration³ they can know that treatment is working in a positive direction. (Fig 3)

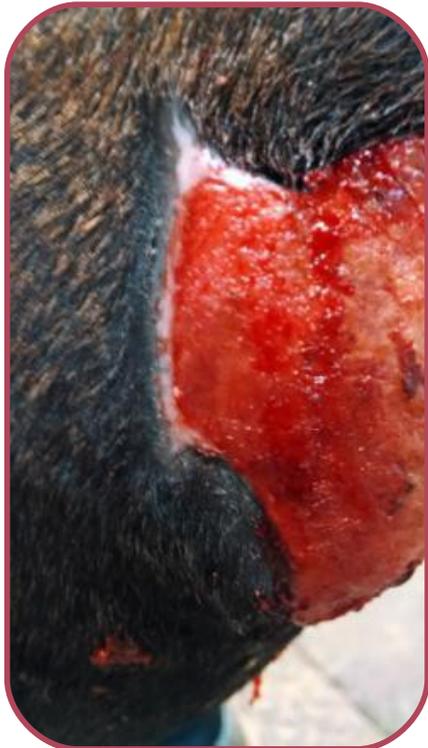


Figure 3. Proliferative phase, demonstrating the two primary products: granulation tissue (dark red central area) and epithelium (light pink border) in a wound.



Figure 4. Chronic inflammation of a wound with exuberant granulation tissue.



Figure 5. Exuberant granulation tissue.

At this point the topic of exuberant granulation tissue can be addressed or may be relevant to the present wound by visualization of a highly vascularized, irregular, and unhealthy appearing tissue characterized by the presence of dark, congested wound stroma with many grooves and clefts.⁵ (Figs 4,5)

After discussing granulation, the second process of the proliferative phase, namely epithelialization, is the next important topic to communicate with the client. Clients should be told that the appearance of new epithelium is usually first noticed along the wound edge (Fig 3), about 6 days after the initial trauma. Owners should also know that this time can be more rapid in superficial wounds due to the availability of undamaged epidermal cells from viable areas such as remaining skin flaps.⁶ Time frame wise, epithelialization has been shown to progress at 0.2mm/day in wounds involving the trunk of the horse, and 0.09mm/day in wounds of the distal limbs.⁶

As healing of the wound progresses, owners may express their concerns about scar formation and the cosmetic appearance. During this time, explaining to the client about wound contraction is important. I like to explain these issues by following the process of wound contraction through the 3 classical phases of wound healing: lag phase, rapid contraction (during the proliferative phase), and slow remodeling (during the maturation phase), so that the client will be prepared for changes in wound size as the wound contracts. The lag phase is characterized by an increase in wound size due to inflammation and tension from surrounding tissue, and can last between 5-10 days. Visually, the rapid contraction during the proliferative phase of healing can be seen by the narrowing of wound margins. During this time the general appearance remains red in color due to the vascular supply of the granulation tissue. Finally, after the wound is fully epithelialized, it goes the maturation phase, as collagen remodeling is taking place, causing a further reduction in the size of the scar. (Fig 6) This is due to the rearrangement of collagen fibers into a more organized matrix and replacement of type III collagen with type I.⁶

In closing, the veterinarian and client must share the same expectations of wound healing. This is accomplished by preparing owners for a likely outcome and being realistic in the amount of time needed for healing. In addition, what to monitor for when treating the wound at home should be explained. Topics of discussion should include, but are not limited to, differences of wound exudates and the general features of healthy and unhealthy wound appearance. The owner should also be aware of common complications in wound healing and be able to identify the possibility of sequestrum formation if bone has been exposed, the appearance of exuberant granulation tissue, and uncontrolled wound contraction. Making realistic assessments together and sharing common expectations with clients will allow for better treatment options and compliance.



Figure 6. Scar contraction during the remodeling phase of wound healing.

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small animal wound management

CASE REPORT: SECOND INTENTION HEALING OF A HIND LIMB DEGLOVING WOUND IN A DOG

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A 10 year old female spayed American Eskimo was presented to the emergency service at Animal Emergency & Specialty for treatment of a large degloving wound involving her right tarsus, as well as a large laceration to her right medial thigh. The cause of the wound was unknown as the patient was in a fenced yard at the time. On presentation the patient was quiet, alert, and responsive. Cardiovascular parameters were stable with only a mild tachycardia (120 beats per minute) and tachypnea (40 breaths per minute). Orthopedic evaluation revealed a non-weight bearing right pelvic limb lameness with pain on flexion of the stifle. No ligamentous instability was present in the stifle or tarsus.

Neurologic evaluation was normal. A 6 inch laceration was present involving the medial aspect of the right thigh with a distal pocket extending to the level of the stifle. A circumferential degloving wound of the right tarsus, involving the skin and subcutaneous tissues, extended from approximately 3 inches proximal to the tarsus to 1 inch distal, exposing the calcanean tendon and lateral saphenous vein. On admission, a moderate amount of plant material and dirt was present within the tarsal wound; the wounds were covered with a soft padded bandage to prevent further contamination.

An intravenous catheter was placed and a 3mcg/kg bolus of fentanyl

administered prior to starting a 3mcg/kg/hr CRI. Ampicillin/sulbactam was administered at a dose of 30mg/kg IV. Complete blood count and biochemistry panels were unremarkable. Radiographs of the right pelvic limb revealed extensive subcutaneous emphysema and no bony involvement. The patient was premedicated with 5mg of diazepam IV, induced with 40mg of propofol and maintained on isoflurane. The fentanyl CRI was continued intraoperatively. The bandage was removed and sterile lubricant applied to the wounds. The right pelvic limb was clipped and prepped for aseptic surgery. A 1L bottle of sterile saline with holes in the lid was used to lavage a large amount of the gross contamination

from the wound. In the operating room the leg was draped using standard 4 quadrant technique. Gross debris and devitalized tissue were removed using a combination of blunt and sharp dissection. The wounds were lavaged with 2L of sterile saline using a 35cc syringe, and an 18GA catheter. Once the wound was debrided and lavaged, the wounds were explored. The edges of the proximal portion of the medial thigh wound were healthy and were closed in two layers using 2-0 polydioxanone in a cruciate pattern in the superficial fascia and subcutaneous tissue and 3-0 nylon in the skin. The distal portion was left open and packed with calcium alginate. Tacking sutures were placed in a simple interrupted pattern in the retracted skin distal to the tarsus to prevent further retraction and cover as much of the calcaneus as possible. (See figures 1-3) Bacterial cultures were obtained immediately following initial debridement and lavage. Calcium alginate was applied over the tarsal wound followed by sterile nonadherent pads and cast padding. A modified Robert Jones bandage was placed on the limb and anesthetic recovery was uneventful.



Figure 1. Post initial debridement, lavage and tacking of distal skin. Lateral aspect right tarsus.

The patient was maintained on intravenous fluids, fentanyl, and ampicillin/sulbactam until eating and drinking at which point she was transitioned to tramadol, carprofen, and amoxicillin/clavulanic acid. Bandage changes were performed every 1-2 days depending on the presence of strikethrough. The wounds were gently lavaged and bandaged with calcium

alginate dressing prior to placement of a modified Robert Jones bandage each time. The patient's pain and use of the limb steadily improved and she was discharged 4 days after her initial trauma.



Figure 2. Post initial debridement, lavage, and partial closure of medial thigh wound. Medial aspect, right pelvic limb.



Figure 3. Post initial debridement, caudal aspect of right tarsal wound.

Options for definitive treatment of the large degloving tarsal wound included a free mesh skin graft once the wound bed was healthy enough, a genicular axial pattern flap, second intention healing, or amputation. Axial pattern flaps are based on a single direct cutaneous artery and vein that supply a specific area of skin. Compared to free skin grafts, axial pattern flaps have the advantages of recruited blood supply and decreased risk of flap failure. Unfortunately, this wound was so large that the proposed axial pattern flap would have allowed closure of only a portion of the defect. A mesh skin graft was initially selected for the ability to completely cover the defect with a skin graft harvested from the lateral thorax. Skin grafting requires a healthy bed of granulation tissue, post-operative

immobilization, and good infection control to be successful. The plan for this patient was to perform a mesh skin graft once the wound bed was healthy enough. Second intention healing was considered a less ideal option because of the potential for wound contracture and delayed or incomplete healing given the circumferential nature of the wound.

In preparation for grafting, bandage changes were performed every 1-3 days using calcium alginate dressings initially, followed by hydrogel dressings and an overlying Robert Jones bandage. Alginate dressings are derived from seaweed and form a moist gel within the wound bed by exchanging sodium from wound fluid with the calcium in the dressing. These dressings work well for highly exudative and infected wounds due to their good absorptive properties. Calcium alginate promotes a good environment to maximize the body's natural debridement process. Alginate was used in these wounds until a healthy granulation bed was present and the wound became less effusive. Once the effusion lessened, hydrogel was used.

Hydrogels are water or glycerin based, nonadherent, occlusive dressings that provide a moist wound environment. Hydrogels are best used in low exudate wounds that are largely free from necrotic debris or bacterial contamination. They promote autolytic debridement and ensure the wound stays adequately hydrated. This helps maintain a healthy granulation bed for epithelialization. Prolonged contact between intact skin and hydrogel dressings can result in tissue maceration and should be avoided. Exuberant granulation tissue can develop with prolonged use making frequent reassessment of the wound bed necessary.

Approximately 10 days after injury the wound bed was healthy enough for grafting. Bacterial cultures were negative and the patient was re-presented for grafting. However, upon further discussion with the owner regarding hospitalization, financial, and confinement concerns, the owners elected to attempt second intention healing. Three weeks after injury the medial thigh wound was healed and the tarsal degloving wound was contracting and epithelializing. Bandage changes continued 2-3 times a week. The wound had decreased to 35-40% of the circumference of the limb by 5 weeks

post injury and the bandage was changed to an adhesive patch bandage due to repeated difficulty with slipping of the modified Robert Jones given patient activity levels. Bandage changes were reduced to once weekly with application of a small amount of hydrogel to maintain a moist wound environment under an adhesive patch bandage. The wound can be seen at week 6 in figures 4 and 5.



Figure 4. Six weeks post injury, craniolateral aspect of right tarsal wound showing healthy granulation bed with epithelialization from wound edges.

The wound was completely healed by 9 weeks following injury. The patient is doing well with 4 months of follow up. The hair has almost completely regrown, and there is minimal scarring. This case represents a case of a 360 degree proximal tarsal degloving injury which was successfully managed as an open wound. While grafting would have resulted in faster resolution and ultimately been about the same cost of open wound management, a second surgical procedure was avoided for this patient with good outcome.



Figure 5. Six weeks post injury, caudal aspect. New epithelium can be seen as the pale white skin on either side of the wound. The caudal aspect of the wound continues to epithelialize and is almost bridging.

technician tip

CARE FOR THE NEGATIVE PRESSURE WOUND THERAPY PATIENT

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Negative wound pressure therapy (NPWT) involves applying subatmospheric pressure to a wound. The idea behind this is to decrease healing time, particularly for large open wounds. Negative pressure significantly stimulates granulation tissue and improves wound perfusion, providing a better environment for healing. NPWT is becoming more common in the veterinary community. This brief article will focus on a case of a young dachshund named Stanley.

He presented to the emergency service due to an unknown trauma that caused a degloving injury covering over 50% of his dorsal and lateral torso, making his truncal skin essentially a large flap. He was treated for shock, and his wounds were flushed and debrided, followed by wet-to-dry bandages. The bandages were changed daily for 2 days to mechanically debride the wound. On the third day NPWT was applied using foam. The entire area was clipped and sharply debrided. The foam was cut to the shape of the wound. An airtight seal was made around the wound. The vacuum was turned on and set at

120mmHg on an intermittent setting. It is important to make sure the foam contracts down and the pressure desired is reached in order to fully take advantage of the properties of the wound vac. The vac is monitored hourly to make sure the pressure is consistent. If there is a drop in pressure, the line and bandage must be examined for leaks; if one is found it must be repaired to re-establish negative pressure. The amount and characteristics of the wound fluid are monitored daily. As treatment progresses the fluid should become more serosanguinous.

Shortly after presentation Stanley developed a fever; initially the wound fluid had a dark brown color and a fetid odor. As time went on the fluid volume became less, and the color became serosanguinous towards the end. As the wound fluid changed to a more healthy appearance, the fever resolved. Approximately every 3 days his dressing was changed. The first bandage change showed significant granulation tissue growth. Obvious dead or necrotic tissue was debrided. This was repeated twice during the 7 days of NPWT. A definitive

closure was performed when the wound vac was removed and a culture of the tissue submitted. The majority of that initial skin flap remained viable. The cranial and caudal edges were undermined and the flap advanced and closed primarily. Stanley was discharged from the hospital and returned for bandage changes. At his first bandage change a small area at a 3-point closure had died; this area was debrided and left to heal by second intention. During his hospitalization, Stanley had developed a resistant infection and was placed on Amikacin. During this time his urine was monitored for casts due to the nephrotoxic nature of Amikacin. Two weeks after closure, his repair had healed and the small area of skin necrosis had contracted and begun to epithelialize; by three weeks it was completely healed. In my experience wounds such as his would have taken a significantly longer time to heal, but with the addition of the wound vac his healing time significantly decreased.