A special supplementary issue on

Wound management for technicians and nurses

- Wound healing mechanisms and phases
- Acute traumatic wound management
- Dressing choice
- Day-to-day management
- Problematic wounds
- Wound reconstruction

To complement...
An hour-long webinar by European Specialist in Small Animal Surgery Laura Owen on practical wound management

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Welcome to this special supplementary issue of Feline Focus, the first international veterinary nurse and technician journal to focus on cats. This issue covers wound management for technicians and nurses in preparation for an hour-long webinar on Tuesday, 2 December 2014 by European Specialist in Small Animal Surgery, Laura Owen, on practical wound management. It provides informative tips on wound management in cats that can be applied in practice, as well as giving you a sneak peek of the webinar content.

Feline Focus will be published monthly online from 2015 and we would love to feature more articles written by nurses and technicians. Please contact us if you are interested in contributing.

Sam Taylor, Veterinary Editor
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Wound management for technicians and nurses: what do we need to know?

Abstract: Wound healing occurs either by primary intention (sutured wounds) or secondary intention (open wounds). Feline patients frequently present with acute traumatic wounds due to road traffic accidents, and a delay in presentation is common. Life-threatening injury should be ruled out, analgesia provided and fluid deficits addressed prior to wound management. Lavage and debridement are conducted under anaesthesia, followed by application of an appropriate dressing. At subsequent bandage changes, the contact layer chosen should be suitable for the stage of wound healing. Regular wound assessment, including photography, helps monitor healing and infected or non-healing wounds should prompt investigation for pathogens (swab, biopsy and culture) or underlying disease (e.g., FIV/FeLV infection).

Introduction
Wound management can be a challenging part of veterinary practice. However, with improved knowledge of wound healing, wound management and dressing materials, these cases can be very rewarding. Nurses play a vital role in wound management; often being responsible for placing dressings and cleaning wounds.

Wound healing
Wound healing can be divided into primary (or first intention) healing, (i.e., sutured surgical wounds), or second intention healing, (i.e., open wounds).

Primary healing
In sutured surgical wounds, where the tissues are directly apposed or have only a small dermal gap, formation of a fibrin seal should occur 4–6 hours postoperatively to protect the wound against invasion of microorganisms and to prevent fluid leakage.

Second intention healing
Second intention wound healing occurs in three overlapping phases:

1. Inflammatory phase
The inflammatory phase primarily occurs in the first 72 hours post-injury. During this phase...
Clinical nursing

essential functions are wound debridement, protection from invasion by microorganisms and the production of cytokines and growth factors to stimulate the proliferative phase.

2 Proliferative phase
The proliferative phase begins 3–5 days post-injury. Fibroblasts are stimulated to migrate into the wound and lay down a collagen matrix. Angiogenesis also occurs, bringing new blood vessels into the wound and providing nutrients and oxygen. These combined events result in the production of granulation tissue within the wound bed. In cats, the inflammatory phase is commonly prolonged and granulation tissue is both later to appear and slower to form.

Granulation tissue contains myofibroblasts, which are responsible for wound contraction (up to 30% reduction in surface area in loose-skinned areas). It also provides a surface scaffold for epithelialisation to take place. Granulation tissue is also highly resistant to penetrating infection and thus, once the wound bed is completely filled, systemic antibacterial therapy is usually no longer required (Figure 1). Importantly, although wound contraction is relatively rapid, epithelialisation progresses very slowly, meaning that it often takes weeks to months for a large wound to heal by second intention healing. Epithelialisation also produces a thin, hairless scar in place of normal skin, which is at risk of further trauma during normal daily activity.

3 Maturation phase
The maturation phase begins 2–4 weeks post-injury and involves the remodelling of collagen into a superior ‘basket weave’ formation to increase the wound’s tensile strength.

The acute traumatic wound
The most common type of traumatic injury in feline patients is a road traffic accident, although many others are possible. What is common to many feline injuries is that they are not witnessed and the time from injury to presentation is not known. This means that the ‘golden period’ of 6–8 hours post-injury for treatment is often missed.

Road traffic accidents are frequently the cause of acute traumatic wounds in cats, and the ‘golden period’ of 6–8 hours post-injury for treatment is often missed.

At the time of presentation, the most critical step is to evaluate the cat for the presence of any life-threatening injuries, such as pneumothorax, diaphragmatic rupture, penetrating abdominal wound, spinal fracture, etc. Many patients also present with some degree of hypovolaemic shock and dehydration and this requires treatment before the wound is addressed. During this assessment and stabilisation phase, any wounds

Figure 1: Wound bed on the dorsal paw filled with healthy granulation tissue
Clinical nursing

should simply be covered with waterproof, clean material (eg, an incontinence sheet or surgical drape) to prevent further contamination. Gloves should be worn by all personnel who handle the patient. Appropriate analgesia, usually buprenorphine or methadone, should be given as soon as possible.

Once stable, initial cleaning and assessment of any wound is best performed under general anaesthesia. For limb wounds, two orthogonal radiographs are indicated to check for any orthopaedic injuries which may complicate management or increase the financial cost of the injury.

Dressings
Dressings will initially require daily changes, with increasing intervals as wound healing progresses. In the early stages, it is vital that sufficient

Following complete patient assessment and stabilisation; full examination, lavage and debridement of the wound can be carried out.

- Wear examination gloves, and cover the examination table with a waterproof cover. Expose the wound and fill with aqueous jelly (eg, KY jelly) to prevent further hair and dirt contamination.
- Liberally clip the hair surrounding the wound and clean with dilute chlorhexidine solution to reduce contamination and to enable any additional wounds to be identified.
- Change gloves and lavage the wound copiously with warm, isotonic crystalloid solution (eg, Hartmann’s or 0.9% saline). The lavage pressure should be sufficient to remove contamination from the wound surface but should not be excessive to avoid damaging healthy tissue and driving microorganisms and debris deeper into the wound. Lavage is best performed using a 500 ml fluid bag, giving set, three-way tap and an 18 G needle.
- Once lavaged, change gloves for sterile surgical gloves and obtain tissue samples for bacteriology. Following sample collection, broad spectrum antibiotics can be started, pending culture and sensitivity results.
- Consider surgical debridement if obviously non-viable tissue is present within the wound (Figure 2). Perform debridement cautiously to avoid the removal of potentially healthy surviving tissue.
- Explore penetrating wounds to assess their full extent, especially over the thoracic or abdominal regions.
- Take photographs of the wound for future reference.
- Dress the wound appropriately and recover the cat from anaesthesia.

Figure 2: Non-viable tissue being debrided using a number 10 scalpel blade
consideration is given to the overall well-being of the cat to aid wound healing and to ensure that secondary complications do not occur. This includes:

- accurate recording of food and fluid intake – consider ongoing intravenous fluids and feeding tubes for anorexic or inappetent cats;
- daily weight checks (allowing for differences in bandages);
- careful planning of the timing of dressing changes to ensure starvation periods are kept to a minimum;
- monitoring of urination and defecation in case litter tray access is impeded by bandaging;
- monitoring of analgesia requirements;
- careful checking of the bandage to ensure it has not become wet or soiled in the confined kennel environment, risking bandage injury.

Choosing a primary contact layer
The most appropriate type of contact layer to use is dependent upon the stage of wound healing. Other considerations may be availability, vet/nurse preference and owner finances. In the inflammatory phase of wound healing, the main aims are to debride the wound completely, to control infection and to promote the formation of granulation tissue. Heavily contaminated wounds will commonly benefit from use of ‘wet-to-dry’ dressings, where moistened sterile swabs are placed into the wound for 24 hours.

Removal of the adhered swabs at the next dressing change strips away necrotic and infected material on the surface of the wound. This method can be very effective; however, it is painful to remove the swabs and therefore heavy sedation/anaesthesia must be used. ‘Wet-to-dry’ dressings should also only be used for a minimal period (generally less than 3 days), as removal of the swabs will damage healthy tissue attempting to repair the wound. Alternatives in less contaminated wounds would be to use a hydrogel or honey dressing, due to their autolytic debridement properties. Both will rehydrate dry necrotic tissue, allowing it to be lavaged away at the next dressing change. Additionally, honey has antibacterial activity.

Newer technology providing negative pressure wound therapy is now an excellent option for debridement of wounds and rapid stimulation of granulation tissue. As well as the many advantages to the wound itself, dressing changes are only required every 3–7 days, reducing the need for starvation for sedation and improving nutrition/reducing morbidity in these patients (see Figure 3).

In the early proliferative phase of wound healing, wounds are generally exudative and a dressing with reasonable capacity for absorption is ideal, (eg, foam dressings). Feline wounds are often less exudative than their

Tip
Do not neglect the nutrition of a cat with a wound. Accurate recording of food intake and early use of tube feeding is indicated to maximise general health and therefore wound healing.

Figure 3: Cat shown lying comfortably and paying no attention to the negative pressure wound therapy system applied to her right hindlimb
canine counterparts, hence additional measures to improve the moisture content of the wound may be required in some patients, (eg, use of hydrogels). In addition to absorption, foam dressings will also help retain moisture in the wound due to their semi-occlusive backing. In the late proliferative phase, exudation of the wound is reduced and maintaining a moist environment becomes more important than absorption.

It is also important to consider the type of bandage used to hold the primary dressing in place when managing feline wounds. Cats are often intolerant of dressings and may need measures to prevent them from interfering with the bandage, such as an Elizabethan collar (consider a 'soft' version). Alternatives such as ‘tie-over’ dressings or negative pressure wound therapy may be better tolerated (see Figure 3).

**Day-to-day management**

In order to optimise wound healing, it is important that the wound is properly assessed and appropriate decisions made regarding its ongoing management at every dressing change. Where possible the same staff should deal with the wound, but in a practice situation where this is difficult, taking photographic records (incorporating a measurement) of the wound at each visit enables assessment of progress (see Figure 4). In particular, questions which should be asked are:

- Has the wound progressed since the last dressing change?
- Is there any sign of infection or excessive inflammation?
- Is the surrounding skin healthy?
- Is it appropriate to consider surgical closure?

**The problem wound**

Wounds become problematic when they fail to progress (chronic wounds) or become infected.

**Infected wounds**

Infected wounds can usually be readily dealt with. However, it is worth remembering that cats do become infected with unusual pathogens such as mycobacteria. In some cases, histopathology or extended culture/PCR (polymerase chain reaction) of tissue may be required for diagnosis and treatment. Provided that a complete granulation bed is present, topical therapy is usually the preferred treatment method for infected wounds. The most commonly used topical therapies are silver or honey dressings, or negative pressure wound therapy.

**Chronic (non-healing) wounds**

The most common reason for the development of chronic wounds is poor wound management. In many cases, this can be avoided by adhering to the principles outlined above. In other cases identifying the underlying cause is the most important factor (eg, tension, abrasion, corticosteroid treatment, systemic disease, positive retroviral status), which when addressed (if possible) should allow the wound to heal.
When assessing progression of feline wounds, it is important to be aware that wound granulation, contraction and epithelialisation all occur more slowly in the cat compared with the dog. Therefore, expectations for wound healing should be realistic.

**Wound reconstruction**  
Possibilities for the reconstruction of wounds should be considered at the outset of management of an acute injury. In cats where second intention wound healing is slow, management requires the patient to be confined to a cage or indoors, and bandages are poorly tolerated; early reconstruction with a skin graft or flap can often be a preferable (and in many cases cheaper) option.

**Conclusion**  
Wound healing in cats may be slower than in dogs. However, with accurate assessment, attention to nutrition and correct bandaging and reconstruction, wound management can be satisfying. The veterinary nurse or technician plays a crucial role not only in wound management but also in overseeing the general health and welfare of what are often sensitive patients enduring long hospital stays.

**References**  

**FREE WEBINAR**

**Wound management for nurses/technicians – what do we need to know?**  
by European Specialist in Small Animal Surgery  
Laura Owen  

**Tuesday, 2 December 2014**  
20:00 – 21:00 (GMT)

Learn new techniques to help with practical wound management

An invitation to this event will be emailed out to all veterinary nurse and technician members, which will contain the link to access the webinar.
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