



## Wound Care and Management in Companion Animals

Sundararajan Thilagar \* MVSc., PhD

*Faculty of Veterinary Medicine, University of Putra, Malasia..*

Approach in the management of a wound should proceed in a planned orderly manner. Attention to potentially life-threatening problems like injuries to central nervous system, injuries causing inadequate ventilation, severe bleeding, and inadequate circulation are mandatory in treating wound patients.

### *Immediate Care*

Animals with major injury may be presented with multisystem involvement. Comatose situations due to CNS injury needs immediate intubation. Injury to the upper respiratory system may result in dyspnoea requiring oxygen supplementation air way intubation or tracheostomy and corticosteroids followed by. Small amount of short acting general anesthetic propofol may be administered to carryout certain procedures. Severe dyspnoea with no clinical signs of upper airway obstruction may be due to lower airway obstruction with other complications of the thoracic cavity. Chest tube placement, needle thoracocentesis, sealing penetrating wound with K-Y jelly and bandaging may help in these patients. Patients presented with ongoing external hemorrhage due to laceration of large blood vessels can be stabilized using intravenous fluid at 60-90 mL/kg /hr in dogs and 40-60 mL/kg/hr in cats .After eliminating immediate threats to life , a more thorough physical examination focusing on all body system is performed under aseptic conditions.

### *Hair Clipping*

Hair may be clipped to facilitate exposure and wound closure, if necessary .Close shaving should be avoided since it potentiates wound infections and clipping of eyebrows should also be avoided because they may not grow.

\* Sundararajan Thilagar

Faculty of Veterinary Medicine, University of Putra, Malasia. E-mail: drsuthi@yahoo.com

### *Anesthesia*

Adequate general anesthesia is an extremely important first step. If local anesthesia is indicated, as for small traumatic injuries, 0.5% or 1.0% lidocaine is generally injected directly into the wound edges. Lidocaine can be used with epinephrine in a dilution 1:100,000 or 1:200,000 to prolong the effectiveness and control hemostasis. The maximum safe doses of lidocaine traditionally cited are 4mg/kg without epinephrine and 7mg/kg without epinephrine.

### *Scrubbing*

A sterile water-soluble gel is used to cover the wound to prevent contamination during preparation. Larger area around the wound is clipped and the area is scrubbed with either chlorhexidine or iodine in a detergent. Scrubbing of the wound should probably be limited to wounds with gross contamination and the scrub solution should be flushed with electrolyte solution. Use of surgical scrub solutions like chlorhexidine and povidone iodine, alcohol 0.5% sodium hypochlorite, 0.25% acetic acid and hydrogen peroxide on the wound is controversial since bactericidal concentrations of all these solutions are toxic to fibroblast, neutrophils and damage to the tissues. Irrigants that have been demonstrated to be non-toxic to tissues include 0.9% saline, Pluronic F-68 and Lactated ringer. Antibiotics 1% neomycin sulfate and 2% kanamycin sulfate are sometimes added to irrigants to increase their effectiveness at killing bacteria and have limited toxicity to tissues.

### *Debridement*

Debridement of all necrotic and infected tissue using sharp instruments is vital for successful wound management to avoid further bacterial growth. Further, lowered oxygen tension within the devitalized tissues may reduce the activity of leukocytes against bacteria. Debridement is performed by sharp dissection beginning superficially and progressing deeper into the wound. Viability of muscles can be assessed by bright red arterial bleeding during surgery, twitches when gently pinched and blanching on pressure followed by capillary refill. Vital structures such as nerves and tendon should be preserved. In cases where it is impossible to preserve such structures removal of the structure is planned ex. Limb injury.

### *Exploration and Lavage*

During exploration, wounds are copiously lavaged. The effectiveness of the lavage is proportional to the volume and delivery pressure of lavage fluid. A pressure lavage using 35mL syringe and 19-gauge needle successfully cleanses clots, tissue debris and bacteria. Irrigants that have been demonstrated to be non-toxic to tissues include 0.9% saline, Pluronic F-68 and Lactated ringer and clean tap water. Higher lavage pressure occasionally may be deleterious as it forces bacteria deeper into the wound. The purpose of debridement and lavage is to convert a contaminated wound containing devitalized tissues into a clean one enough to be closed by sutures.

## Wound Closure

### *Timing of wound closure*

The concept of “golden period” (6-to 12-hrs) has largely been abandoned in recent years. The wound cases should be judged for closure not only based on the duration of wound but also on the amount of local tissue trauma, the adequacy of blood supply and the degree of contamination.

### *Methods of Closure*

The choice of closures are primary closure, secondary and delayed primary closure. **Primary closure** is closed at the initial time of presentation after debridement and lavage. The criteria for the wound must be excellent hemostasis, absence of blood clots, and debris for gentle opposition of tissue layers. **Secondary closure** is the one wounds in which heal on its own. Superficial wounds involving only the epidermis and portion of the dermis will frequently heal secondarily within 1-2 weeks. The other eligible cases of wounds are punctured wounds and wounds involving concave surfaces. **Delayed primary closure** or tertiary closure is the best alternative for wound for secondary closure management since delayed primary closure facilitates ongoing assessment of wound healing. Secondary closure is performed usually 3-5 days after initial surgery. Cases of extensive skin loss necessitates the use of skin graft or flap or other reconstructive procedure.

### *Tensile Forces Relieving and Mobilization Techniques*

Surgical techniques for the management of tensile forces during wound closure include undermining of surrounding skin, walking sutures to redistribute tension throughout the wound, multiple relaxing incisions designed to redistribute tensions in alternative directions, local skin flaps used to move tissues from areas of relative excess into areas of relative need. **Undermining**: This is an effective method of reducing tension during wound closure. Skin is undermined parallel to the proposed direction of the advancement. Undermining, while reducing tension and facilitates wound closure, also increases wound dead space. In most instances, drains should be placed to manage dead space after extensive tissue undermining. Either active latex drains or active closed suction drains can be successfully placed. **Walking sutures**: Initially a suture is placed in the undermined skin and fascia nearest its centre. As the suture is placed, the base of the skin is advanced slightly towards the wound centre. The limitation of this procedure may increase the infection due to multiple ischemic foci formation and quantity of foreign material placed within the wound. **Multiple relaxing incisions**: Relaxing incisions are considered when after undermining skin surrounding the wound, tension continues to preclude direct closure. Incisions of 1-2cm in length are made on either side of the wound.

### *Materials for Wound Closure*

Materials available for wound closures are suture, staples, tapes, and tissue adhesives. Of these, sutures are most commonly used. Absorbable sutures such as those made of plain or chromic catgut, polyglactin 910 (Vicryl), polyglycolic acid, (Dexon) and polydioxanone (PDS) are generally used for dermis, fat, muscle or superficial fascia. Non-absorbable sutures, such as those made of nylon, ethibond or polypropylene (Prolene), are most commonly used for skin and for deeper structures that require prolonged wound support such as the fascia of the abdominal wall or tendons. Synthetic absorbable materials are preferable to chromic or plain catgut because the former are absorbed by simple hydrolysis and with little inflammatory response.

Sutures are usually removed at day 4 or 5 from the face and by day 7 from other areas where skin tension is limited. Sutures should remain longer in wounds which are subjected to a greater amount of stress, such as wounds in the lower extremities and wounds closed under tension

### *Pattern of Wound Closure*

*Small linear defect (fusiform):* can be approximated side-to-side closure starting from the middle of the wound and placing sutures on either sides alternately. *Circular and ovoid wound:* closed after making circular /ovoid wounds into fusiform wounds by excising triangular skin pieces at the opposing ends of the defect. The width and length ratio is to be 1:4. *Triangular and rectangular, square:* These types of wounds are closed using a technique of centripetal closure.

Other wound management options include second intention healing skin flap and skin graft in large skin wound. This approach will be chosen as an alternative procedure of direct closure. Free skin grafts provide the only viable alternative to the problem of reconstructing some of larger skin deficits involving the distal limb. According to the thickness of the skin either full thickness or split thickness can be attempted. Underlying hypodermal and loose adipose tissue is carefully removed with fine scissors until the pigment of the dermal layer is apparent. The free graft is detached from the donor site. The success rate of acceptance is improved by a. Maintaining the blood supply till the free graft is detached from the donor site. b. Placing few "Tacking sutures" while laying the graft on the recipient site. c. Restriction of mobility of the skin after grafting. Flaps can be used to close any uninfected wound. They do not require vascular wound bed as grafts do, because they maintain their blood supply after transfer and do not depend on revascularization for survival. Flaps are indicated for wounds containing denuded bone, cartilage, tendon or nerves that cannot be closed by direct approximation.

### **Antibiotics**

Antibiotics should not be used as routinely for appropriate wound management, but administered to treat a possible developing or subclinical infection. Cultures at the time of surgical debridement are the best approach to identify the organism and effective antibiotics since no concrete information is available from clinical research in animals. However in animals requiring parenteral medication, penicillin combined with an amino

glycoside or a second generation cephalosporin combined with a fluoroquinolone provides broad spectrum coverage. Enterococcus species are often sensitive to only ampicillin, clavamox, timentin or vancomycin.

### **Surgical Drains**

It is a temporary surgical implant which provides and maintains a channel of exit .Providing surgical drains facilitate exudating fluids (blood serum exudates), foreign materials, and air from the wound or body cavity. The dead space can be eliminated using a tacking suture or a pressure bandage .Surface acting drain, Penrose drain, tube drain, suction system are the common implants that can be used in our patients. The drain is removed as soon as possible to reduce the possibility of wound contamination

Lesions to evacuate capillary bleeding- 24 hrs  
Bacterial infection -2-3 days  
Union of tissue after large mass removal-5-10 days

### **Bandaging**

The wound is left open after initial debridement and is covered with a sterile permeable dressing such as petrolatum gauze, which is surrounded by a thick absorbent layer of padding, a conforming bandage, and an elastic adhesive bandage layer. The wound is examined and the bandage can be changed daily.

### **Role of Cytokines in Wound Healing**

Cytokines are also promising tools in the biologic modifications of the wound healing process. Cytokines are produced by platelets, macrophages, endothelial cells, epithelial cells and smooth muscle cells. Many commercial products like growth factors, and other materials like gelatin ,honey can be used to promote wound healing.

### **Disturbances of Wound Healing**

Local factors include infection, foreign bodies, tissue hypoxia, venous insufficiency, local toxins, mechanical trauma and irradiation .Systemic factor include malnutrition, cancer, diabetes mellitus, uremia, jaundice, old age, corticosteroids and chemotherapeutic agents.