GENERAL WOUND ASSESSMENT

Avian wounds come in many forms and result from many causes. The general principles of wound management used in small animal practice are similar with bird medicine. Some anatomic and physiologic differences do exist with birds which may change some treatment strategies.

As a general rule, all wounded avian patients deserve a complete history and physical examination prior to setting a treatment plan. Antibiotics are considered with bite wounds, necrotic and infected tissue, and any time infection is a concern. When possible, culture and sensitivity should direct antibiotic choice; otherwise safe broad-spectrum antibiotics are recommended. Birds should be stabilized as much as possible prior to anesthetic events and provided with cardiorespiratory, dietary, and fluid support, pain management, and hemorrhage control as needed.

Open wounds should be protected with bandages, surgical closure and/or semi-occlusive bandages. Necrotic wounds should be debrided prior to closure. Consider primary closure for clean wounds less than 24 hours old. Give burn wounds 3 to 7 days post injury to better delineate normal and dead tissue prior to surgical wound closure. Because avian skin is so thin and is rapidly revasularized, free skin grafts work better in birds than most other animals. When cleaning the injured site, create a 2- to 3-cm circumferential featherless zone around the wound.

Although little information exists on suture material in birds, chromic catgut, polyglactin 910, polydioxanone (PDS), monofilament nylon and monofilament stainless steel have been evaluated in rock doves (Columba livia). From this information and the author’s experience, PDS is slowly absorbed and causes minimal tissue reaction making it suitable for both internal and skin closure use. The function of the bird and how the injury will affect the avian patient should be considered. With some exceptions, injured wild birds should be managed with the intent to release the patient back to the wild. Many wounds may not be initially life-threatening but may result in long-term injuries that preclude normal flying, hunting or escape techniques. Some of these birds may need to be humanely euthanized.

General principles are provided. Addressing each type of possible avian wound goes beyond the scope of this article.

AVIAN SKIN

Avian skin is quite different from that in mammals. While birds have epidermal, dermal and subcutaneous layers, the epidermis is extremely thin with typically only three to five cell layers (except over thicker nonfeathered areas such as the feet, beak, legs and face). With the exception of the uropygial gland, avian skin typically lacks glands and is dry and inelastic over much of the body. However, individual keratinocytes act as holocrine glands and can produce oils.

Avian wound healing has been described in three phases including inflammatory, collagen and maturation. Wound healing in birds begins with a clot and inflammatory response much as with mammals. Heterophils and monocytes, later followed by lymphocytes, infiltrate the avian wound (inflammatory phase). Next fibroblasts and then capillaries proliferate (collagen phase). Last collagen fibers organize and ultimately orient themselves in relation to the tension placed on the edges of the wound (maturation phase). In this last phase, the wound contracts attempting to bring epithelial margins back together closing the wound and can take weeks to months to complete.

As another notable avian feature, normal bruising results in a greenish discoloration in the bird. After hemoglobin is broken down, biliverdin pigment accumulates giving the greenish color within 2 to 3 days post injury.

SKIN PROTECTIVE DEVICES

Aside from instances of self-mutilation, most birds will not continue to traumatize their wounds (surgical, injury, etc). Surprisingly, birds rarely pull at sutures after surgery. If birds do self-mutilate their wounds, this may suggest pain and the cause should be investigated and dealt with as needed (pain medications, evaluate the surgery site, etc.). Birds that have primary wounds from self-mutilation deserve a full medical and behavioral workup. Regardless, neck collars and bandages can be useful when birds self-traumatize their wounds or when open wound management is needed.

As a general rule, adherent bandages are used during the initial inflammatory stage of healing. Nonadherent bandages are reserved for the proliferative and remodeling stages of healing.

Nonstick (Tegaderm, 3M Company, St Paul, MN) or minimally adhesive (VetWrap, 3M Company Animal Care Products) bandaging material can be used to protect a tissue bed and prevent serum leakage from a wound. Semi-occlusive dressings (Tegaderm) may be poorly adhesive but can be laid over a cleaned wound and then covered with a bandage. Cyanoacrylic products or tissue glue (Nexaband, Veterinary Product Laboratories, Phoenix, AZ) can be used to repair minor incisions or lacerations. Aseptically applied VET BIOSIST (Cook Veterinary Products, Spencer, IN), a protein matrix bandage consisting primarily of porcine collagen, is hydrated and sutured to a wound and acts as an epithelial framework. If the patient does not reject the VET BIOSIST, the bandage material is incorporated into the host tissue. The use of this product requires a light bandage covering.

Wet to dry bandages are beneficial in large wounds that are not amenable to primary closure. Clean the defect. Soak gauze bandages with an antiseptic solution or sterile isotonic fluid and lay over the wound. Apply a thicker layer of dry gauze sponges on top of the wet sponges and use a bandage to hold everything together.
Change the bandages frequently as removal debrides and keeps the wound clean and helps stimulate granulation tissue. Once a healthy granulation tissue bed is present, nonadherent bandages can be used. The wound will either contract and eventually close or surgical assistance may be required.

Create a fast, hard fixative using super glue and baking soda. Dr Pat Redig reported mixing cyanoacrylate adhesive (also known as ‘super glue’) or other thin modeling cyanoacrylate with baking soda. Simply apply baking soda over a desired area and then add a drop of cyanoacrylate. The combination rapidly forms a firm adhesive that can be shaped with a grinding tool and colored as needed. Additional layers can also be added as needed. This works great for filling in beak defects and building beak prostheses.

The simplest distracting device is to place a tape tag over a bandage that the bird can otherwise reach and damage. Butterfly the central portion of a tape strip leaving two sticky ends. The sticky ends are then applied to the bird’s bandage leaving a tape tag sticking out. Until the birds get use to the bandage, they often only chew on the tag if at all.

Neck collars should be reserved for birds that insist on self-traumatizing their wounds. As mentioned above, the cause of the self-mutilation should be identified and corrected if possible. Neck collars should be temporary. There are a variety of neck collars available from homemade (plastic and radiographic film ‘E-collars’, foam pipe insulation, etc.) and manufactured (plastic clamshell, plastic circular disks, etc.) models. The author primarily uses foam pipe insulation because it is inexpensive, effective, easily placed and because it is soft it tends to not cause pressure wounds.

**SKIN DISINFECTANTS**

Oftentimes skin wounds should be cleaned prior to surgical closure or bandaging. While sterile saline and other isotonic solutions can safely be used to clean and irrigate superficial wounds, bacterial contamination is common requiring chemical disinfectants. Povidone iodine (1%) and chlorhexidine diacetate (0.05%) have both been found to be equally effective at cleaning skin (in mammals). However, povidone iodine has been associated with skin reactions in some dogs. Also, povidone iodine has been shown to be toxic to fibroblasts in concentrations as low as 1-5%. Chlorhexidine at 0.05% is considered very effective and safe as a wound irrigating solution. Hydrogen peroxide (3%) is minimally effective against most bacterial organisms but is sporocidal and should be used to clean wounds that may be contaminated with clostridial organisms. Hydrogen peroxide is also toxic to fibroblasts and other tissues and is used best as a single lavage treatment.

In birds, water-miscible ointments are optimal can be applied to the skin over wounds. Oil-based ointments should be avoided or used minimally because they inhibit normal thermoregulatory function of the feathers. Silver sulfadiazine cream (Silvadene Crème, Boots Pharmaceuticals, Lincolnshire, IL) is effective against most bacteria and fungi, promotes epithelialization, penetrates necrotic and eschar tissue (good for burn wounds) but can damage fibroblasts and impeded wound contraction. Use caution with topical steroid products as these compounds may be absorbed systemically from the skin in birds.

**BANDAGING TECHNIQUES**

Bandaging techniques are useful in stabilizing fractures, traumatic injuries and intravenous and intraosseous catheters. The avian leg is anatomically similar to the mammalian leg except for the tarsometatarsus and distal. It is difficult to immobilize femoral fractures with external fixation alone in birds. The cardinal rule of splinting (immobilize the joint above and below the fracture) should be followed. Bandaging material should be soft and pliable as cast padding for the initial layer followed by a self-adherent bandage (VetWrap) for the outer layer. Reinforce the bandage, when necessary, with wooden splints, aluminum rods or human orthopedic products such as Orthoplast (Johnson & Johnson Products, New Brunswick, NJ) or Hexcelite (Hexcel Medical Co, Dublin, CA). At room temperature Orthoplast and Hexcelite are firm, but after placing in hot water, can be made to conform to the shape of a bird’s limb. Semi-occlusive bandages (Tegaderm) are useful for self-induced traumatic lesions and abrasions. Rectangular sheets are cut into strips before removing the opposite backing material.

Most simple mid-shaft fractures heal within 3 weeks in otherwise healthy avian patients. Other fractures may require 4 to 6 weeks to heal. Regardless, most fracture stabilizing bandages are left on for 4 to 6 weeks. Open fractures and comminuted fractures should be given a guarded prognosis. Open fractures should be treated with antibiotics based on culture and sensitivity results. Advise the patient’s owner to use smooth-sided cages without perches (aquarium or plastic carrier) to prevent climbing during the healing period. Joints bound too long with a bandage may develop decreased range of motion. Splinted, or otherwise bandaged, birds should be regularly evaluated by an avian veterinarian and given physical therapy as needed.

**Tape Splant**

Tarsometatarsal and tibiotarsal fractures are easily diagnosed by palpation and can be supported with the use of a tape splint in small birds (< 300 g). Under anesthesia, the bird’s leg is plucked and inspected for signs of a compound fracture. Some compound fractures are best stabilized surgically. Otherwise, the fracture is manually reduced and overlying skin is sutured or otherwise closed as needed. Once stable, run a thin strip of overlapping lightly adhesive bandage such as VetWrap from the foot to the distal femur (tibiotarsal fracture) or mid proximal tibiotarsus (tarsometatarsal fracture). Next, place overlapping butterfly tape strips up and down the bandage. Use hemostats to crimp both ends of the butterfly tape strips. Cut the free tape ends (leaving enough for the “crimp.” Most uncomplicated
tarsometatarsal and tibiotarsal fractures heal within 4 to 6 weeks.

**“Football-type” Bandage**

The "football-type" bandage is used to immobilize toes and as a temporary bandage for bumblefoot. A large ball of soft gauze is placed within the grasp of the foot. The toes are then bound to this ball by wrapping more gauze over and around them. The whole ball may be taped to the foot and the bird may be able to bear weight on it.

**Plastic Spica Bandage**

Plastic splints can be used for simple, aligned fractures of the femur in small birds (< 300 g). A splint can be molded from heat activated dental and other products or padded aluminum finger splints. This is a modification of a Robert Jones bandage discussed below, except that the padded molded splint extends from the tibiotarsus proximally and over the bird’s pelvis in an inverted U-shape to immobilize the femur against the body of the bird.

**Modified Robert Jones Bandage**

The Robert Jones bandage should be limited to any fracture of the tibiotarsus, or soft tissue injuries of the hock joint and distal structures. This bandage is most useful in birds under 500 g. Use Thermostap or similar material and cut in an L-shape. Adjust the size of the arms of the L based on the bird. Make the vertical portion of the L as long as the tibiotarsus and the horizontal portion as long as the tarsometatarsus. Next, place a layer of padding material around the leg from the foot up to the proximal femur. Add a layer of cling or cotton gauze, tightening gently while wrapping. Heat the thermoplastic splint in hot water until it becomes clear and malleable. Position and mold the splint along the lateral aspect of the leg. Wrap the final layer of VetWrap around the material before the splint hardens.

**Schroeder-Thomas Splint**

A Schroeder-Thomas splint is used to stabilize fractures of the tarsometatarsus and distal one third of the tibiotarsus. Indications for these splints include fractures of the tarsometatarsus in small psittacine birds and fractures close to the hock. Wire material used in the splint and should be made with two right-angle bends next to the ring at the top so that the splint is parallel to the long axis of the leg. Position the leg so with some flexion at the hock joint. Apply a light bandage to the leg with gauze and tape. Suspend the leg within the splint by alternating strips of tape placed cranially and caudally with the toes extended to the end of the splint. Cover the splint with bandage material.

**Ehmer-type Bandage**

Place the leg in an Ehmer sling like as used in a dog or cat. Fold the tarsometatarsus against the tibia, and wrap gauze around both. If necessary, bind the leg to the body. Use for a dislocated hip or for temporary stabilization of fractures involving the leg.

**Figure of 8 Bandage**

Birds with wing fractures commonly presents with a dropped wing. Some fractures heal well with external coaptation only, with return to full function. However, bandages should be reserved for wing fractures in birds not required to return to full flight (aviary and cage birds). The wing is especially amendable to splinting as it can be splinted in the normal physiological position. A figure-of-8 bandage provides adequate stabilization for fractures of the radius and ulna, carpometacarpus, and digits and when used in conjunction with a body wrap, some fractures of the pectoral girdle and humerus. This bandage is easily placed in anesthetized patients.

Hold the wing in a normal flexed position away from the body with primary and secondary wing feathers parallel to each other as the carpus is flexed. Incorporate all scapular (shoulder) feathers into the bandage. Apply a layer of light gauze wrap or cast padding beginning as high in the axilla as possible on the medial aspect of the humerus. Continue the wrap on the dorsal surface of the wing up to the carpus, and then circle the carpus from lateral to medial ending on the ventral portion of the carpus. Pass the bandage along the ventral wing surface from the carpus and back to the axillary region. Repeat until the wing is held lightly but securely in a flexed position. Excessive layering will cause a bulky and uncomfortable bandage. Cover the gauze or cast padding with a layer of VetWrap or similar material.

To form a body wrap, use the padding material to hold the wrapped wing next to the body in a natural position. The padding is placed around the body and caudal to the opposite wing at the axillary region. Repeat the body wrap going cranial to the opposite wing, forming a vest. Add a thin layer of VetWrap or similar material. Use caution such that the caudal extent of the ventral portion of the body wrap does not interfere with leg movement.

**REFERENCES**