Common surgical procedures in birds

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This paper describes three surgeries that are regularly carried out in an avian practice. Avian veterinarians are required to perform a wide variety of surgeries but these three present on a regular basis.

Ingluviotomy

Surgical ingluviotomy can be performed for a number of reasons in a wide range of avian species. Common indications include:

- Foreign body removal/crop impaction/sour crop
- Obtaining crop biopsy – investigating suspect proventricular dilatation disease
- Repair of damage due to trauma
    - Barb wire injuries in raptors and wildlife
    - Crop burns in hand-reared parrots
    - Crop rupture due to flying accident

Fig 1: Buzzard with severe sour crop

Ingluviotomy is typically performed under general anaesthetic. Where a risk of regurgitation and subsequent aspiration is present (sour crop/crop impaction) the bird should be anaesthetised with its head elevated and the pharynx packed with swabs. Patients should be intubated.

Birds are positioned in dorsal recumbency and an area of feathers plucked midline just cranial to the sternum. Plucking feathers is painful for the bird – and the anaesthetist should be warned prior to plucking. The adjacent feathers should be taped out of the surgical field. A skin prep with betadine (or similar surgical prep solution) can be used to sterilise the surgical field.

Light weight, plastic, translucent drapes are best for avian patients. The bird should be draped and a fenestration cut over the incision site. Curved haemostats or a cotton tip applicator can be inserted via the mouth into the crop and carefully elevated to mark the incision site. An incision is made through the skin (taking care not to incise crop at this stage). In most cases stay sutures should be placed in the crop and an incision made (avoiding large blood vessels which are present in the crop wall). In cases of suspect PDD a blood vessel should be included in the biopsy.

Fig 2: Obtaining a crop biopsy from a Grey Parrot with suspected PDD

In cases of crop stasis or sour crop, the contents of the crop should be removed. The technique used will depend on the consistency of the contents but suction, sterile tea spoon and forceps can be utilised. Care should be taken not to damage the thin crop wall or to contaminate the surrounding soft tissues.

The crop should be closed using a monofilament suture material. Research has shown less tissue reaction occurs when PDS is used in comparison to Vicryl (monocryl was not investigated). My preference is to use Monocryl. A continuous inverting suture pattern (eg Connell) is used in two layers to create a tight seal. In very small patients an appositional suture pattern may be required to prevent restricting the crop volume. The skin can then be closed.

Delayed closure can be performed in very sick raptors with sour crop. In sour crop, the rotting meat in the crop causes toxic shock in the patient. To reduce initial surgery time, it is possible to perform ingluviotomy – remove the toxic crop contents and recover the bird without closing the surgical site. A delayed primary closure of the crop and skin following stabilisation of the bird (correcting dehydration, acid/base imbalances, shock) can be performed 12-24 hours after the initial surgery.

Placement of an air-sac breathing tube

This is a truly life-saving procedure which all avian clinicians should be able to perform swiftly and efficiently in an emergency situation. Practising this procedure on cadaver specimens prior to an actual emergency will ensure confidence with the technique.

Indications for air-sac cannulation include:

- Pharyngeal/laryngeal obstruction
- Tracheal/Syringeal obstruction
    - Fungal granuloma
    - Inhaled foreign body
    - Tracheal stricture
- Surgery of the head/neck

A short period of general anaesthesia will be required.

Fig 3: Prepared air-sac cannula with pre-placed sutures

Have ready, a sterilised air sac tube – the diameter should be 25% larger than the patient's trachea. The section of tube which will enter the air sac, should be no longer than 1/3 of the width of the patient's coelom at the level of the last rib. Sutures should be preplaced.

Unless pathology dictates otherwise, use the left caudal thoracic air sac which is larger than the right.

The anaesthetised bird should be placed in right lateral recumbency. The wing is abducted dorsally and legs retracted caudally. The last rib is located; access is either between the 7th and 8th rib, at a level 1/3 from the top of the rib, or caudal to the 8th (last) rib. The skin should be prepared sterilely and following a skin incision use blunt dissection to access the caudal thoracic air sac via the intercostal muscles.

Fig 4: Cadaver specimen showing site of air-sac breathing cannula

Fig 5: Air-sac breathing cannula inserted

Place your tube into the air-sac. Occlude the tube whilst it is sutured in place. One suture should encircle the last rib to prevent the tube migrating from the air-sac. If anaesthesia is to be maintained, then attach the anaesthetic circuit and reduce flow rate to 300ml/kg/minute.

Fig 6: Grey parrot anaesthesia being maintained via air-sac breathing cannula

This will stabilise the patient sufficiently so that diagnostics/treatment can be performed. Birds' respiratory function will often improve dramatically under anaesthetic due to fear and stress being relieved.

Surgical treatment of pododermatitis in raptors

Pododermatitis (Bumblefoot) is a condition recognised as an inflammatory and typically infected lesion of the plantar aspect of the foot, affecting either the ball of the foot or one or more toes. Bumblefoot is a common disease in large species of raptors (particularly falcons) maintained in captivity.

Brief Aetiology

Raptor's feet are protected by a thick layer of stratified squamous epithelium, which in turn is covered by a layer of keratin. On the plantar surface is a covering of hard papillae. These are thought to help to disperse the pressure of the weight bearing on the foot.

Bumblefoot is attributed to one of two main aetiologies:

1. Firstly any penetration of the foot (ie a talon, thorn or other sharp foreign body, or abrasive object) may introduce infection into the dermis or sub dermal tissues.
2. Secondly and far more commonly, captive birds may suffer from an avascular necrosis of the plantar aspect of the ball of the foot or a toe. This is due to enforced use of unsuitable perches, or due to greater periods of inactivity, during which time they are taking excessive weight on their feet. Such an area of avascular necrosis causes failure of the normal epidermal defence mechanisms, facilitating the migration of pathogenic bacteria through the skin.

Fig 7: Grade 3 Pododermatitis secondary to talon penetration

Pododermatitis cases are generally classified into one of five categories

- **Class 1:** Early devitalisation of a prominent plantar area without disruption of the epithelial barrier – ischaemic necrosis or early callous formation
- **Class 2:** Localised inflammation/infection of underlying tissues in direct contact with devitalised area, with no gross swelling,
- **Class 3:** More generalised infection with gross inflammatory swelling of underlying tissues. The origin may be puncture wounds or ischaemic necrosis, however by this stage the initial cause is of minor significance in comparison with the gross on-going pathology.
- **Class 4:** Established infection with gross swelling and involvement of deeper vital structures. Radiology and surgical exploration will often be required to differentiate types III from IV. Class IV is a chronic condition causing tenosynovitis and occasionally arthritis and osteomyelitis.
- **Class 5:** Extension of Class IV and is characterised by crippling deformities, such cases have previously been considered to be inoperable and best euthanised without treatment.

Fig 8: Osteomyelitis and bone lysis in Grade 5 Pododermatitis

Clinical management
If cases can be detected as Class I stage, then nearly all will immediately respond to conservative therapy. It is important to remember Bumblefoot is a preventable disease, most often caused by husbandry deficiencies. Whatever stage a case is diagnosed, if the underlying husbandry cause is not addressed, the case will inevitably recur.

Each case of Bumblefoot should be classified and the appropriate investigative procedures should be carried out:

- microbiology,
- radiology/CT examination,
- surgical investigation.

Where possible, swabs should be taken for bacteriology and sensitivity testing prior to surgery.

Fibrotic reaction after surgery can encapsulate infective organisms within 3-5 days of surgery (*Cooper 1978*). If sensitivity testing is carried out at the time of surgery, the results may not be available in time to be effective prior to fibrotic encapsulation of infective organisms. Empirical antimicrobials (eg co-amoxiclav, marbofloxacin) can then be administered pre-operatively while awaiting culture and sensitivity.

Surgery
The aim of surgery is to reduce the antigen loading and where possible, completely remove infected and fibrotic tissue. When this is achieved, a necrotic infected area can be converted into a clean, vascular surgical site that may be closed to heal by primary intention.

The skin is carefully prepared to remove any bacterial contamination. A tourniquet is applied to the leg, for a minimal period during surgery to allow a blood free surgical field. The bird is placed in lateral or dorsal recumbency, with the talons extended by a stationary device as described by *Remple (1993)*.

Fig 9: Device for restraining feet during Bumblefoot surgery:

The initial incision should include all devitalised or ischaemic areas of the plantar aspect of the foot. The direction and size of the initial incision will take into account directions of tension and the requirement for normal post-surgical function. All fibrotic, ischaemic, necrotic, exudative and caseous material is removed. Particular care is given to avoiding tendons and vessels. All surrounding tissues are debrided.

Fig 10: Fibrotic and caseous material excised with pyogenic membrane in Grade 3 Pododermatitis

In some cases of Class 3 (often depending on isolated bacterial organism) and the majority of Class 4 & 5 pododermatitis, prior to closure of the wound, cavities are explored between phalanges 1 and 2, between 2 and 3 and on the lateral aspect of the foot between phalanges 3 and 4 (in a position above the plantar surface, over which the jessie cannot rub). Into each of these cavities an antibiotic-impregnated polymethyl methacrylate (AIPMMA) bead is placed (*as described by Remple and Forbes 1998*). These beads will continue to release antibiotics into the local area surrounding the previously infected tissue for a period of months. These beads may be left in situ but later removal is often preferable. The beads positioning allows them to be removed from the dorsal aspect of the foot.

Following full assessment of IV and V cases, it may be considered that first degree healing is not practical. Such a decision will be based upon the bacterial isolate and the degree of tissue damage and ischaemia. In such cases the wound edges are drawn together, (trapping AIPMMA beads inside), often using a purse string suture but are not closed. Topical wound management using a combination of antibiotics, anti-inflammatories and disinfectants (egF10SC) can be utilised.

Following surgery it is imperative that pressure is effectively relieved from the plantar foot. In a normal stance the total bird's weight is applied to this particular area. In recent years a number of different systems have been advocated, in essence a soft (pressure sparing) dressing, which achieves weight bearing around the periphery of the foot (away from the ball of the foot) is required. We find yoga matting a very useful product in raptors. Different materials and thickness will be required depending on the species being treated. The dressings will require changing every 7-10 days. Raptors will require their food to be cut into manageable pieces.

Fig 11: Pressure relieving foam pad formed from yoga type matting. This is held in place using cohesive dressing (eg Vet Wrap).

The progress of wound healing is assessed when the dressings are changed. In severe cases, repeat surgeries may be required. Dressings can be removed when the surgical wounds have fully healed – although absorbable suture material (such as monocryl) is often used. Sutures are removed in 7-10 days in most cases.

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