Avian Anesthesia

Javier G. Nevarez, DVM, PhD, DACZM, DECZM (Herpetology)

As our understanding of the physiology of birds improves so does our ability to provide high quality veterinary care. Anesthesia and analgesia are integral components of providing high quality veterinary care and welfare for our patients. To accomplish this goal is essential to have a well-stocked pharmacy with a variety of anesthetic and analgesic pharmaceuticals so we can design custom analgesic and anesthetic plans based on the procedure and patient's needs.

First, we must understand specific definitions of terms related to anesthesia and analgesia so that we can employ them effectively.

General anesthesia = induced unconsciousness characterized by controlled reversible depression of the CNS and analgesia. Patients under general anesthesia are not arousable and the reflex functions are attenuated. Surgical anesthesia is a deeper level that allows for painless surgery.

Sedation = a state of central depression and drowsiness with the patient unaware of its surroundings.

Tranquilization = the relief of anxiety and a state of relaxation while the patient is aware of its surroundings.

Analgesia = the freedom or absence of pain.

Local analgesia = loss of sensation in a circumscribed area.

Regional analgesia = loss of sensation or insensibility in a larger but limited body area.

Studies on injectable anesthetics are less numerous than those for mammals and reptiles. Their anatomy and physiology are also quite different. For these reasons, inhalant anesthetics remain one of the most common used anesthetics in birds although in some countries, injectables are widely used. Most avian patients are induced for general anesthesia via a face mask inhalation of isoflurane or sevoflurane in oxygen. We must remember that inhalant anesthetics do not provide analgesia once discontinued so additional analgesics are needed when performing painful procedures and surgeries.

Equipment

Small (size 2-6 i.d.) uncuffed endotracheal tubes, Doppler, esophageal temperature probe, capnograph, ECG, or a multi-function esophageal transducer (ECG and temperature) are common tools used when anesthetizing birds. A critical component of successful avian anesthesia is the ability to thermoregulate these patients. A combination of heating pads and forced air warmers is the most effective way to ensure thermoregulation. Convection is the most significant heat loss method in birds; therefore, the use of forced air warmers is the most effective way to avoid hypothermia.

Endotracheal intubation

Endotracheal intubation is straight forward in most avian species as the glottis is easily identified at the base of the tongue in the cranial aspect of the oral cavity. Uncuffed endotracheal tubes must be used to avoid necrosis of the complete tracheal rings. When selecting the size of endotracheal tube, it is best to gently palpate the trachea on the neck region and estimate based on the tracheal diameter rather than the entrance of the glottis, which is bigger than the diameter of the trachea. This makes it so that there will inherently always be some leakage from around the endotracheal tube but placement of a large tube closing a tight fit may lead to tracheal necrosis. It is also important to ensure that the endotracheal tubes are rinsed well off any

detergents or disinfectants to avoid tracheal irritation. Once intubated, the head and neck must be stabilized to avoid the tube from rubbing inside the trachea as this may also contribute to tracheal stenosis. For these reasons, the endotracheal intubation of birds, while still a good practice, must be carried out carefully and is not necessary utilized in all cases such as short anesthetic events of less than 30 minutes like for radiographs.

Pre-medication

Pre-medication in birds is most commonly performed with midazolam (0.5-1mg/kg IM) and butorphanol (0.5-1mg/kg IM) or hydromorphone (0.3mg/kg IM). Pre-medication protocols still ne to be investigated further to determine additional safe options and alternatives.

Induction and maintenance

To induce most avian patients a 5% flow of isoflurane in a 1 to 1.5L flow of oxygen is used. Birds usually are sedate enough for tracheal intubation within a minute. Once the bird is intubated a 2 to 2.5% flow of isoflurane in oxygen 1 to 1.5L/min will maintain a surgical plane of anesthesia. For tranquilization and sedation, a 1 to 1.5% of isoflurane is often sufficient.

Cardiac arrest is often preceded by apnea; therefore, intermittent positive pressure ventilation (IPPV) should be used in birds that are showing signs of hypoventilation or breathing erratically. This is essential to help maintain proper gas exchange and improve anesthetic success

Analgesia

Preemptive analgesia is the administration of an analgesic agent prior to a surgical procedure. The basis of preemptive analgesia is to reduce or prevent prolonged central nervous system changes resulting from pain induced by the surgical procedure that may contribute to postoperative pain. Preemptive analgesia may be used for skin incisions, internal and orthopedic surgical procures through nerve blocks. Lidocaine is commonly used in birds but bupivacaine is longer acting and should be considered for longer, more invasive procedures. Eutectic mixture of local anesthetic (EMLA), is a topical cream mixture of 2.5% lidocaine and 2.5% prilocaine. Although no studies have been performed to scientifically measure EMLA cream's effectiveness in avian species, its use prior to venipuncture and biopsy collection has been anecdotally reported.

Opioid analgesic agents are used commonly in veterinary practices for pain management. Unfortunately, there is limited information on the effectiveness of these drugs across the wide breadth of avian species. There is also a lack of scientifically derived data on the concentration and distribution of the μ-, κ-, and δ-opioid receptors in different avian species' central nervous system. Information regarding the concentration and distribution of the opioid receptors in individual avian species is important because it is the drug's binding to these receptors from which analgesia is obtained. There has been a recent emphasis in the study of opioids in birds, but these studies have been limited to a few species. Historically butorphanol has been the most widely used opioid in birds but its effects are short lived and often required administration every 2-4 hours with doses of 2-5 mg/kg. Hydromorphone has been shown to have some analgesic properties in Amazon parrots at 1-2 mg/kg but also caused agitation and nausea. Buprenorphine, has shown mixed results in affecting analgesia in avian studies, specifically in parrots. Tramadol has also shown high variability across species.

Nonsteroidal anti-inflammatory drugs (NSAID) are arguably the most used analgesic agents in avian medicine. The newer generation of NSAIDs target the inhibition of the cyclooxygenase (COX) enzyme in the arachidonic acid pathway. The COX-2 class of drugs has been promoted over the COX-1 class because of less physical side effects, especially affecting the gastrointestinal and renal systems. Meloxicam and celecoxib are effective COX-2 inhibitors used often in avian medicine.

Due to the high variability of effects from available analgesics, the best approach is to practice multimodal analgesia in which multiple agents and approaches are applied. This involves the use of opioids concurrently with NSAID/s and the application of local or regional analgesia when performing painful procedures. Through the combination of various drugs and techniques, it is more likely that synergistic action will have desired effects while also minimizing deleterious effects.

Once an analgesic agent has been selected the duration of treatment should be established. Of course, depending on the speed of recovery the treatment period can be reduced or extended, but never without careful consideration. All analgesic agents have potential side effects, therefore judicious use is recommended. When the patient does not show any overt clinical signs associated with pain and when you feel recovery can progress without pain medication then analgesic administration should be discontinued.

Signs of Pain in Birds
Fluffed feathers
Change in normal behavior
Anorexia
Reluctance to move
Self-mutilation
Feather destruction
Lameness
Low perching angle (down on hocks)
Squinting or closed eyes
Lack of preening

Recovery
The recovery period is the most critical phase of anesthesia in birds and requires close monitoring. Maintenance of thermoregulation and ventilation is crucial during the recovery phase. Hydration is also important and IV boluses of fluids at 10-15 ml/kg can be administered as needed to support the vascular system. A major challenge of avian anesthesia is the difficulty in obtaining accurate blood pressure readings through the direct technique. It is certainly possible to catheterize their arteries for obtaining direct blood pressure measurements, but it requires a level of expertise and commitment that must be developed over time. Non-invasive blood pressure is neither accurate nor reliable and is therefore not a good alternative.

Tips for success
Avian anesthesia and analgesia are carried out successfully despite the inherent risks. Some key elements for successful events are listed below.

1. Stabilizing the patient whether it be through fluid therapy, thermal support, and/or nutritional support
2. Providing proper thermoregulation, before, during, and after the procedure
3. Using pre-emptive and multimodal analgesia
4. Close monitoring and application of IPPV
5. IV or IO fluid therapy for patients undergoing surgical procedures, especially those with expected blood loss
6. Minimizing anesthesia time. Risk will increase significantly after 1-1.5 hours.
7.

Guzman DSM, Hawkins MG. 2023 Treatment of pain in birds. Vet Clin North Am Exot Anim Pract. 26(1):83-120.