ANALGESIA AND ANESTHESIA IN RABBITS AND RODENTS

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ANALGESIA

Common Problems

One of the biggest problems regarding analgesia in rabbits and rodents is the ability to recognize and objectively score pain. In order to provide the exotic mammal patient with an appropriate analgesic regime, it is important to realize what kind of situation will cause what kind of pain. In order to monitor the response to analgesia, the veterinarian must be able to recognize and score painful behavior in these cryptic animals. Being familiar with normal behavioral patterns in rabbits and rodents is essential to be able to detect the subtle signs of pain. In these species, the behavior pattern is more one of a ‘conservation-withdrawal’ response than the familiar ‘fight or flight’ response displayed by more domesticated pets. The behavior to withdraw and to keep quiet appears to make more sense for a prey animal than to try to fight or attract attention by vocalization or displaying problem. The author recommends the textbook “Behavior of Exotic Animals” (Bradley et al. in press) in order to become familiar with both normal and painful behavior in these patients.

The second biggest hurdle in medicating these patients is the fact that there is a significant lack of pharmacokinetic data regarding analgesic drugs in these species. For many drug dosage regimes, data about the dose and the frequency of administration is extrapolated from the data from dogs and cats. Considering the significant differences in anatomy and physiology between these species, these conclusions may not always be appropriate.

Concepts of Analgesia

Rabbits and rodents are particularly sensitive to pain and inflammation and effective analgesia enhances locomotion, increases appetite, and reduces the time of postoperative recovery for these animals. In treating pain in exotic mammals, the same logical approach used for the treatment of pain in dogs and cats should be used.

The different sources of pain should be identified and treated accordingly. The most common situations in which analgesia is appropriate are surgical cases, cases of abdominal discomfort, dental disease, trauma and animals under chronic stress. It is important to recognize the different causes of pain and to anticipate the pain and prevent it before it is inflicted (e.g. surgery). Pre-emptive analgesia has been shown to be an effective tool in fighting pain in other species and the same principles can be applied to exotic mammals. In addition, the use of pre-emptive analgesia has the advantage that by preventing pain induction allows the maintenance concentration of inhalant anesthetics to be somewhat reduced.

Post-procedure management of pain is possibly one of the most important aspects of pain control for small mammals. It is not uncommon that after a successful anesthesia and surgery and even an initial recovery where the animal had started to eat and drink, that after it was discharged the animal declined within the next 24-48 hours and possibly died. This is a typical case of inappropriate pain management. It is vital for appropriate post-procedure management of the case that there is a thorough understanding of the pharmacokinetic details of the different drugs e.g. half life, side-effects, etc.

As a general rule, analgesics should be first administered before the animal is fully recovered from anesthesia and should be continued for at least 24 hours post-procedure.

In certain conditions an animal needs to be on chronic pain medication, possibly for the rest of its life. In order to avoid harmful side effects, the analgesic medication should be tailored to the minimal dose at which all signs of pain disappear. Often a 2-3 week on, 1 week off treatment protocol might be indicated for chronic analgesic usage.

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

NSAIDs are sufficiently potent to treat musculoskeletal, and mild visceral pain. Because they have a different method of action, these agents can readily be used in conjunction with opioids (multimodal analgesia). However, different NSAIDs should not be used in combination as they may cause severe side effects such as gastric ulceration, or renal failure.

Newer NSAIDs such as Meloxicam (at 0.2 mg/kg P.O. or S.Q. SID) are very effective and can be used for prolonged periods of time without any significant side effects. They are also very effective when used in combination with opioids and usually have a 24-48 hour duration of action in most species.

Opioids

For the control of acute or chronic visceral pain, opioids are considered the most powerful and effective analgesics. However, prolonged used is not advisable due to severe side effects, especially in rabbits. Among the different side effects seen, e. g. bradycardia, respiratory depression, excessive sedation, nausea, and ileus. ileus or gastric stasis appears to be the most concerning side effect in rabbits. The opioid agonist-antagonists, such as buprenorphine, should be used as they appear to have less significant side effects.

ANESTHESIA

Just as with analgesia, anesthetic regimes for exotic mammals should follow similar logical thinking patterns as established for domesticated pets. The animal should be categorized according to their risk status using the scale created by the American Society of Anesthesiology. The entire procedure should be tailored based on this status.
The rabbit has the reputation of being extremely difficult to anesthetize. Fortunately this is an outdated concept, and if the physiological and anatomical features are taken into consideration, and the anesthetic protocol is well prepared, rabbit and rodent anesthesia can be successful and rewarding.

**Risk Assessment**

As with any other species, the patient should be adequately assessed regarding their anesthetic risk before any drugs are given. It is very common for exotic animals to be presented in an advanced state of pathology and supportive care must be administered to stabilize them before any anesthetic procedure can be undertaken. Even for routine procedures such as neutering or dental work, a minimal amount of pre-anesthetic screening should be done in order to detect any sub-clinical problems. At a minimum the pre-anesthetic screen should consist of a blood screen including the hematocrit, blood glucose, total solids and blood urea nitrogen. A Complete Blood Count and chemistry profile and/or while body radiographs are optimal in order to fully assess the animal to be anesthetized.

**Route of Delivery**

Once the animal has been adequately assessed and declared ready for anesthesia, the procedure should be planned and the anesthetic plan should then be tailored according to the needs of the procedure. Different forms of anesthetic agent delivery are available and should be chosen according to factors such as the length of the procedure, status of animal, kind of procedure and anesthetic drugs and equipment available.

Injectable anesthesia is commonly used for quick procedures such as the removal of incisor teeth, where an endotracheal tube in the way and would be difficult to maintain during to the manipulation of the head. The most commonly used injectable drug combinations are alpha-2-agonists used in combination with ketamine and propofol.

While the alpha-2-agonists and ketamine can be given IM or SQ, propofol must be given IV. While propofol is very useful as an induction agent, it should not be used as the sole anesthetic agent for longer procedures due to the fact that it can cause apnoea following injection, and when given in high doses it can cause respiratory arrest. This is especially seen when giving the concentrated drug (10mg/ml) in bolus form. In order to avoid this risk it is advisable to dilute it well with D5W solution. Injectable agents are also commonly used as a premedication before the general anesthesia. Drug combination like ketamine with midazolam is a very useful tool for premedication or even prolonging anesthesia with small increments given as I.V. boluses. Other combination like butorphanol, midazolam and glycopyrrolate (all given I.M.) or butorphanol, ketamine and xylazine +/- midazolam (all given I.M.) are also very good combination as a premedication. Useful resource of different drug combinations for ferrets and rabbits and the different indication can be found in Blaze and Giowaski.¹

The inhalant route of administration works extremely well in these patients. The author prefers sevoflurane, however isoflurane is well accepted by the rabbit as well. The major problem encountered with inhalant anesthesia (without pre-medication) is the breath holding encountered with rabbits. It is best to ‘preload’ with 100% oxygen via face mask for a few minutes. The anesthetic gas is then introduced and the concentration slowly increased by 0.5% increments. Breath holding is usually observed at concentrations of approximately 2% - 2.5% sevoflurane. When monitoring breathing it is important to observe the abdominal muscles, and not just focus on the nose twitch in order to correctly observe for breath holding.

When breath holding is seen, simply decrease the concentration of the gas by 0.5-1% and stay at this concentration for a few more minutes before increasing the concentration again. Eventually the animal will not continue resist the noxious stimulus and the desired anesthetic depth can be achieved. Intubation can be achieved in several different ways. The simplest way in rabbits is by using an endoscopic-assisted technique. This can be done with an otoscope introduced into the oral cavity until the caudal border of the soft palate can be visualized. The scope of the ET tube can then be used to push the soft palate ‘up’ and expose the glottis for visual intubation.

Alternatively a semi-rigid “needle-scope” (<1 mm) can be used where the needle scope is threaded through the ET tube and then the scope is introduced into the cranial trachea by visualizing the glottis. The ET tube is then simply advanced along the scope down into the trachea. Different ‘blind’ techniques have also described however these techniques are often less successful and require a significant amount of training. Since rabbits are obligate nasal breathers, the simple technique of delivering the anesthetic gas via a nose mask is also very effective even for longer procedures.

Nasal intubation can also be used and is fairly easy to perform. An ET tube can be introduced into the trachea via the nasal route. Adequate measurements should be taken on the animal before the procedure is started to ensure that the tube is long enough. The ET tube is gently introduced into one nostril of the heavily sedated animal and fed in a ventral medial direction along the meatus. The soft palate is usually lodged under the pharynx and the ET tube will therefore eventually slide into the trachea. However due to the risk of introducing potential pathogens from the nasal cavity into the lungs, this technique is not recommended for routine intubation. In order to intubate small rodents the author uses the lab animal intubation kit and the Rodent Work Stand available from Hallowell (www.hallowell.com).

¹ The author is very grateful to Dr. Annet Blaze for the opportunity to update the anesthesia section of the earlier edition of Exotics—Small Mammals. The surgical section of the earlier edition was written by Dr. John Glowaski.
Maintenance of Anesthesia

The success of the entire anesthetic procedure is heavily dependent on the supportive care given the animal during the procedure. Vigilant monitoring of the patient during the entire anesthetic period is of utmost importance. A well-trained anesthetic technician is an indispensable monitoring aid and will improve the successful outcome of the procedure significantly. The use of a pulse oximeter should be considered as providing a basic level of monitoring. EKG probes and possibly capnography can be added in order to provide additional support.

Direct venous access in the patient is extremely important and therefore an intravenous catheter should always be placed prior to induction. Emergency drugs should also be calculated before induction and kept within immediate reach during the procedure. Intravenous fluids should be administered throughout the procedure, and a rate of 10 ml/kg/hr generally ensures adequate hydration of the normovolemic patient. This volume can alternatively be given in IV boluses over 30-60 min.

One of the most critical problems to overcome during anesthesia in small exotic patients is hypothermia. Due to the high surface area to body volume ratio in small patients, these animals will become hypothermic very quickly. It is of utmost importance to support their body temperature even for very short duration procedures. Circulating warm water blankets can used and they should be set up well in advance of the procedure in order to allow the system to warm up adequately. Alternatively surgical gloves can be filled with warm water and can be used as small hot water bottles. Care must be taken not to burn the skin of the small patient with this method. When IV access is available warmed fluids will provide additional supportive care.

SUMMARY

With the right preparation and the right equipment, rabbit and rodent anesthesia does not have to be a frightening procedure and can be done with great success.

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