Exotic Small Mammal Anesthesia

Exotic small mammals (formerly known as pocket pets) are challenging creatures to work with anesthetically. When working with dogs and cats, it is usually easy to intubate, place an intravenous catheter and run fluids, hook up an ECG, place a blood pressure cuff, and keep track of the core body temperature. This can be much more difficult on many exotic small mammals. How do we compensate for the lack of monitoring? We may not be able to, but we as anesthetists can do our best to monitor the patient under anesthesia and be able to anticipate the needs of the patient.

Preparing for the Anesthetic Procedure

Whether the animal needs to have general anesthesia because of a routine procedure such as a rabbit spay or it has come into the clinic on emergency for a fractured limb, the same protocols and procedures are usually followed. A general rule of thumb (although there are exceptions) is that all animals under anesthesia obtain some sort of fluid therapy, whether it is intravenous, intraosseous, or subcutaneous. Emergency drugs should be precalculated and drawn up prior to an animal going under anesthesia for any length of time. This may seem wasteful because most of the time the drugs are not used and need to be discarded once the animal has fully recovered. Drugs are always pre-drawn prior to starting the anesthetic procedure, because under many circumstances, there is not a lot of time to figure out doses and draw up drugs once the patient starts doing poorly under anesthesia. A cheat chart can be hung on the wall for quick reference or a spreadsheet program can be created. Spreadsheets are helpful, as one can be created for each major group of animals commonly seen in your practice (e.g., chinchillas, rabbits, rats, etc.). The spreadsheet should remain simple and contain the common drugs used during emergency situations. Spreadsheet programs are nice because they can be used over and over again. By just inputting the patient’s weight, the program will calculate the proper drug doses for you.

It is important to have everything set up and within hand’s reach before starting the anesthetic procedure. This includes all equipment that may be needed, such as an ECG, blood pressure cuff and sphygmomanometer, pulse ox, endotracheal tube, catheter supplies, fluids, drugs, syringe pump, etc. Being prepared will help the procedure move along in an organized fashion. It is important to have pediatric items such as 26g and 24g IV catheters, 3.0 mm uncuffed ET tubes and smaller (18g to 14g catheters can be adapted into tiny ET tubes), mini-volume IV lines, etc.

Fluid therapy routes in small mammals under anesthesia include subcutaneous, intravenous, and intraosseous (IV and IO fluid therapy can be difficult in some small rodents) administration. Vessels used for IV catheterization include the cephalic and lateral saphenous in most small mammals. In rabbits the auricular veins can be used, but the cephalic and lateral saphenous should be attempted first. In rats, the lateral tail veins can be used to place an IV catheter. If IV access is not possible due to poor perfusion, an IO catheter can be placed. It is best to use a spinal needle when possible because there is less chance of the lumen getting clogged with a bone core when being placed. A regular hypodermic needle can be used when needed. The IO catheter is usually placed in the proximal femur or the tibial crest if the patient is large enough. Common fluids that can be given include crystalloids such as Lactated Ringers Solution (+/- dextrose) and sodium chloride, and colloids such as Hetastarch. With the exception of Hetastarch (dose will vary by species), anesthetic maintenance in small exotic mammals for most fluids is 10ml/kg/hour. This is the same rate used with dogs and cats. It is important to monitor the patient when on IV or IO fluids, as some patients can become fluid overloaded. If the anesthetic procedure is long, the fluids can be given at 10ml/kg/hour for the first hour and then dropped down to 5ml/kg/hour to help prevent excess fluid overload (although this may not be appropriate in some situations). Fluid rates should be adjusted based on the needs of the individual patient. This is especially true if giving fluids via the IO route. If subcutaneous fluid therapy is chosen, then fluids are generally given at a rate of 60ml/kg/day. Subcutaneous fluids are only given either when a procedure is very short and IV catheter is not necessarily needed (i.e., ultrasound or radiographs under anesthesia) or an IV catheter is unable to be placed (i.e., the animal is very small or the vessels have been blown).

Anesthetic Monitoring Equipment

Monitoring exotic small mammals under anesthesia is extremely important. Many of the patients being anesthetized weigh between 30 grams and 6.5 kilograms (most weighing under 3.5kg). Due to the small size of these patients, what type of monitoring equipment can be used? Most of the same equipment used on small cats can be used on rabbits and ferrets as well. For major surgical procedures or when anesthetizing a high-risk patient, monitoring equipment such as an ECG, Doppler and sphygmomanometer with blood pressure cuff, temperature probe, pulse
oximeter, and capnograph should be used when at all possible. Arterial catheters (when possible) can also be placed for measuring direct blood pressure and taking blood gases. If anesthetizing a patient for a minor surgical procedure or the patient is considered low-risk, the minimal monitoring equipment should include, but is not limited to, temperature probe or thermometer (if the patient is not too small), Doppler with sphygmomanometer and blood pressure cuff, +/- pulse oximeter, and capnograph. If the patient is too small to obtain a true blood pressure reading, the anesthetist should look for trends. For example, if the blood pressure cuff is too large (commonly happens with small rodents) and the blood pressure consistently reads a systolic of 70 but then suddenly drops to 40, you know that either the cuff slipped or came off or you are seeing a downward trend, indicating hypotension. Looking at trends can be a helpful and informative way to manage your patient.

As a side note, it is important to use pediatric equipment for most of the exotic small mammals being anesthetized, for example, small blood pressure cuffs, platinum needle ECG probes, and side stream adaptors for capnography. Using pediatric equipment will give more accurate results.

**Anesthetic Induction**

Most animals are given pre-medications prior to being placed under general anesthesia, although this will depend on the preference of the clinician and will vary with each patient being worked with. Common pre-medication drugs used in exotic small mammals such as rabbits and rodents include glycopyrrolate, butorphanol, midazolam, ketamine, and buprenorphine. Common pre-medications used in ferrets include drugs such as atropine, glycopyrrolate, midazolam, butorphanol, acepromazine, and oxymorphone. A current exotic animal formulary should be consulted before administering any drugs (rabbits, chinchillas, and guinea pigs are sensitive to many drugs, including most opioids, which may cause GI stasis). Most drugs are given directly into the muscle because uptake is generally quicker, but most drugs can be given subcutaneously as well. After pre-medications have been given, the animal should be placed in a clean and empty cage while the drugs take effect. This generally takes 10 to 20 minutes, but depends on the drug combination used and the disposition and mentation of the patient. After the pre-medications have taken effect, general anesthesia can be induced.

There are a few different techniques that can be used to induce anesthesia. When at all possible, it is suggested to pre-place a catheter, pre-oxygenate the patient, and induce anesthesia with injectable drug combinations such as ketamine and diazepam or ketamine and midazolam. This works very well in rabbit and ferret patients. Propofol can be used as an induction agent in ferrets, but is not suggested in other small mammals as they are often difficult to intubate and apnea is a potential side effect of injecting propofol too quickly. If a catheter cannot be pre-placed, (often the case in small exotic mammals such as guinea pigs, chinchillas, and other small rodents), the patient can either be masked down or placed in an induction chamber using a gaseous inhalant anesthetic such as isoflurane or sevoflurane. A small mask can be placed over the face similar to a dog or cat, or the animal can simply be placed in an induction chamber. The heart and respiratory rates should be monitored from the time the animal is induced until the time the animal awakes from anesthesia. This will help prevent any anesthetic-related problems, including death. In some cases, placing a face mask on the patient’s head can be stressful; therefore an induction chamber should be used. Induction chambers are great because they potentially provide a less stressful induction to the patient. Unfortunately, the heart rate cannot be monitored during the time induction is taking place. There are pros and cons to either induction method. The induction method should be chosen based on the needs of the patient. Assessing the plane of anesthesia is accomplished in the same manner as for a dog or cat. The most common ways to assess anesthetic depth include eye position, jaw tone, palpebral reflex, and the toe pinch.

Once the patient is induced, placing the catheter (if not already placed), inserting an endotracheal tube (if possible), and hooking up the monitoring equipment should be accomplished. This can become a tricky situation because attaching all of the monitoring equipment, placing a catheter, and inserting the endotracheal tube should not take longer than the procedure the animal is being anesthetized for. It is then up to the clinician and anesthetist to decide what the most important tasks are that should be accomplished and then set a time limit. It is easy to spend 45 minutes hooking up 5 different pieces of equipment and then only spend 20 minutes on the actual procedure itself. This is something that should be avoided. This is also a good time to make sure the animal is on a heating source such as a heating pad or hot air blanket. Small mammals have a very large surface area to volume ratio, which means they will lose body heat very fast. Keeping them warm is an essential part of a speedy recovery.

Intubation can be extremely difficult if not impossible in some species of small mammals. Intubating ferrets is among the easiest because they are very similar to cats. Generally a 2.0 to 3.5mm size endotracheal tube is used. The
use of lidocaine will help with laryngeal spasms. Rabbits can be difficult to intubate, but luckily there are a few techniques that can be used to accomplish this task. Due to the oral anatomy, the rabbit’s mouth does not open very wide. The cheeks are fleshy, which also makes it hard to see the tracheal opening. Blind intubation is usually the easiest way to intubate a rabbit. This can be done using an esophageal stethoscope or by simply putting your ear to the endotracheal tube and slowly moving the tube toward the tracheal opening. Once the tube is close to the trachea, you will be able to hear and feel the breath on your ear. With practice, you will be able to tell when the tube is right on top of the tracheal opening. When the rabbit takes a breath, simply slip the tube into the trachea. Lidocaine should always be used to help with laryngeal spasms. This greatly increases your chances of successfully intubating the rabbit. When attempting to intubate a rabbit, make sure the head is hyper-extended. This will help the tube slip into the trachea. Rats can be intubated using a very small laryngoscope and usually an 18 or 16 gauge IV catheter modified into an endotracheal tube. Mice, hamsters, guinea pigs, and chinchillas are very difficult to intubate. In general, these species are not routinely intubated, but an endotracheal tube should always be ready in case the animal goes into respiratory arrest. A rigid endoscope can be used to intubate many exotic small mammals including rabbits, guinea pigs, and chinchillas. This technique is usually reserved for trying to intubate guinea pigs and chinchillas, but it can be used with rabbits that may be difficult to intubate. Any intubated animal should be placed on a positive pressure ventilator or hand ventilated as needed. This will ensure the animal is being properly ventilated.

Anesthetic Maintenance
Most commonly, exotic small mammal patients are maintained on inhaled anesthetics such as isoflurane or sevoflurane. The percentage will vary based on the patient, the procedure being performed, and the preanesthetics used.

Supplemental Drugs
Rabbits are notorious for having extremely low blood pressure when being maintained on inhalant anesthetics. It is important to try and reduce the need for increased percentages of gas anesthesia. When possible, the anesthetist should consider using pain management techniques such as running a fentanyl CRI or placing an epidural. These techniques are generally the same techniques used with dogs and cats. Exotic small mammals recover much faster when provided with appropriate pain control. If hypotension continues to be a problem and the inhalant anesthesia cannot be decreased, a fluid bolus and/or a dopamine CRI should be considered.

There are several anesthetic protocols that can be used on exotic small mammals. Protocols are often developed based on clinician preference, experience, and what drugs the clinic stocks. It is important to remember that exotic small mammals are not little dogs and cats. The anesthetist should be familiar with the anatomical differences between the different species and drugs that are appropriate to use on the patient being anesthetized.

Record Keeping
It is important to keep some sort of anesthetic record for each patient that is anesthetized. The anesthetic record should consist of a piece of paper that can be placed into the patient’s normal record and be able to be easily reviewed if the patient is anesthetized again in the future. Anesthetic records should be simple and easy to read. At a minimum, the record should have a space for weight, heart and respiratory rates prior to and during anesthesia, pre-medications used, what the animal was induced with and maintained with, how much fluid was given if any, the temperature of the animal, what the blood pressure was, the size of the endotracheal tube used if any, and a comments section.

Blood Transfusions During Anesthesia
Blood transfusions can be given when necessary. A general rule of thumb is to consider transfusing when the animal’s PCV is between 15% and 20%. The limiting factors include vascular access and obtaining a safe blood product. Artificial blood products can be given to many small mammals, but they don’t come without potential risk, as there have not been a lot of studies showing what products are safe or effective. A current exotic animal formulary should be consulted before giving any artificial blood product. Whole blood can also be given for transfusion. A donor of the same species is needed to obtain fresh whole blood from. The donor animal should be deemed healthy by performing a complete physical examination and running a complete blood count and biochemistry panel. If there is only a limited amount of blood, the complete blood count should be chosen over the biochemistry. Blood drawn from the donor should be collected in a syringe containing the anticoagulant citrate-phosphate-dextrose-adrenaline (CPDA). The dilution will depend on the species being worked with. Cross-matching
the donor to the recipient should be performed when possible. Ferrets do not seem to have recognized blood types; therefore cross-matching is not generally performed. This will help reduce the risk of the recipient cross-reacting with the donor’s blood once it has been given. It is important to always use a blood filter when performing a blood transfusion on any patient. When giving a blood transfusion during an anesthetic procedure, it is important to first flush the IV line with sodium chloride (NaCl 0.9%). Once the line is fully flushed, the transfusion can be started.

**Recovery and Postoperative Pain Medications**
The patient should continue to be monitored until it is awake and extubated (if intubated). If a painful procedure was performed on the animal, postoperative pain medications should be given to the patient. Common postoperative pain medications include opioids such as butorphanol, buprenorphine, oxymorphone (used commonly in ferrets), and NSAIDs such as meloxicam. If the patient was on a fentanyl CRI during anesthesia, the CRI can be maintained and provides excellent pain management post-op. Regardless of the pain medication chosen, it should be given as needed postoperatively to provide appropriate pain relief to the patient. Exotic small mammals recover poorly and often will become anorexic when in pain. This can be a death sentence for herbivorous mammals such as rabbits, guinea pigs, and chinchillas. The IV catheter should not be removed until the animal is fully awake and it is no longer needed. Always remember that pain management plays a key role in a speedy recovery for the exotic small mammal patient!