How to Improve Anesthesia and Analgesia in Small Mammals

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KEYWORDS

• Small mammals • Anesthesia • Analgesia • Pain assessment

KEY POINTS

- The routine use of cardiovascular and respiratory monitor devices is essential for a good outcome in small mammal anesthesia.
- Physiologic differences between species and variation between individual animals should be considered when choosing an anesthetic protocol.
- The development of new pain assessment tools (eg, mouse grimace scale) can help recognize and alleviate pain.

In 2008, Broadbelt and colleagues[1] stated the overall risk of anesthetic and sedation-related death in rabbits to be 1.39% in the United Kingdom. That is more than 8 times the anesthetic risk in dogs. In this study, the risk in healthy rabbits was estimated to be 0.73% and in sick rabbits it was 7.37%. Postoperative death accounted for 64% in rabbits. Most other small animal species also had higher mortality risks. Due to the increased risks, careful selection of an appropriate anesthetic protocol is needed and continuous monitoring of the patient under anesthesia until fully recovered is mandatory. The advancement in patient monitoring and supportive care has substantially improved the safety of anesthesia in small mammals and is discussed in this article.

The overall goal is to focus on a practical clinical approach to anesthesia and pain management in small mammals. It should be understood that because of the limited number of published studies related to anesthesia and analgesia in small mammals, the author is drawing from her own clinical experience and extrapolating from what is known in other species. Whenever possible, reference is made to published information.

PREANESTHETIC EVALUATION

A thorough physical examination, including accurate body weight, and baseline values for heart rate, respiration rate, and body temperature (if possible without causing too

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much stress for the patient) are obtained for reference during anesthesia. Reviewing the medical history and a minimum diagnostic panel including packed cell volume, total protein, glucose and urea nitrogen should be included to determine the patients "fitness" for anesthesia (**Box 1**).

FASTING

Fasting times depend on species, clinical status, and the potential for regurgitation. Rabbits do not regurgitate or vomit so fasting is not recommended. It does not significantly reduce gastrointestinal volume and may cause ileus in guinea pigs and other herbivores.[2] High metabolic rates and small glycogen reserves predispose to hypoglycemia.[3] In ferrets, vomiting and aspiration can occur, so fasting is warranted but should not exceed 4 hours unless the presence of an insulinoma has been ruled out.[4] Small rodents should not be fasted because vomiting does not occur and hypoglycemia is a consequence.

STABILIZATION

Ideally, all patients should be physically stable before anesthesia induction. If sufficient time is available, abnormalities, such as dehydration, anemia, hypoglycemia, electrolyte imbalance, and acid-base disturbances, should be corrected. Vascular access (intravenous [IV] or intraosseous) should be attained in unstable patients and in those undergoing prolonged procedures or invasive procedures that may lead to significant blood loss. Unfortunately, small animal size and difficulties in catheter placement often require continuing the procedure without vascular access.

MONITORING

Patient monitoring helps detect early homeostatic imbalance before damage to organ systems become irreversible. The cardiovascular, respiratory, and central nervous systems are the essential body systems, and failure of one usually leads to failure of the others and consequently patient death. The small patient size, physiologic features, and unfamiliarity and limited information accessible for each species make monitoring more difficult. Higher metabolic rates and increased tissue oxygen consumption in smaller patients reduce the tolerance to even brief hypoxemia. Irreversible central nervous system damage occurs within less than 30 seconds of respiratory arrest.[4] Despite these challenges, similar principal and technique used in dogs and cats can be extrapolated to the small mammal.

Box 1
ASA physical status classification system

I Normal healthy patient

II Patient with mild systemic disease

III Patient with moderate to severe systemic disease, or multisystem disease

IV Patient with severe systemic disease that is a threat to life

V Patient is moribund and not expected to live 24 hours with or without intervention

Abbreviation: ASA, American Society of Anesthesiologists.
Adapted from ASA. New classification of physical status. Anesthesiology 1963;24:111.