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Injectable versus Inhalational Anesthesia in Veterinary Medicine

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INJECTABLE VERSUS INHALATIONAL ANESTHESIA IN VETERINARY MEDICINE

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INTRODUCTION

Introduction

Is the better, safer choice in small animal surgery injectable or inhalational anesthesia? Having begun volunteering in a vet's office when I was six-years old I was exposed to many of the practices of vet med at a young age. I grew up watching the use of injectable anesthetics such as Ketamine and Telazol but inhalational anesthetics were frowned upon because of their harshness upon the patient. Now in a world of technology when my home-practice switched hands, it switched anesthetics too, to an inhalational anesthesia, Isoflurane. This point of view being it was more efficient than injectable anesthetics, because the possibility of multiple injections was avoided thus putting the patient through a lesser amount of stress. But is this really the case? Throughout the course of this poster, the advantages and disadvantages of injectable and inhalational anesthesia will be explored through a look at two widely-used anesthetics Ketamine and Isoflurane.

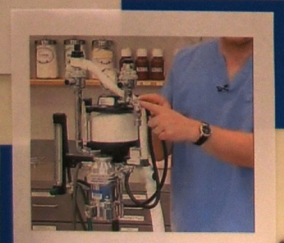
There are three recognized components of anesthesia:

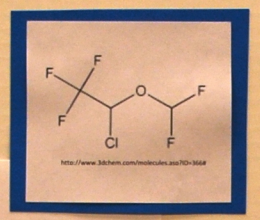
- Analgesia (pain relief)
- Amnesia
- Immobilization

Some anesthetics may induce all three components but some must be used in "cocktails" of sorts to achieve the full anesthesia.[2] Anesthesia is never a simple endeavor, much is still to be learned about how certain aspects of it work. It has generalized effects on the central nervous system as well as other areas of the body making it hard to determine the exact effects on the patient.[2] These effects vary from anesthetic to anesthetic.

Technology

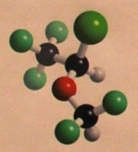
As one might assume, for two very different types of anesthesia there are very different technologies associated with each form of anesthesia. For Ketamine and other injectable anesthetics the technology involved is minimal, a vial of the anesthetic and a syringe, but for inhalational anesthetics the process is much more involved. Expired gas analysis is used in many large Veterinary clinics. Expired gas analysis involves the use of mass spectrometry to assess the concentrations of each gas exhaled.[1] These measurements are known to be "quite reliable," but due to the cost associated with the use of mass spectrometry, infrared analyzers have become more popular in more recent years.[1]

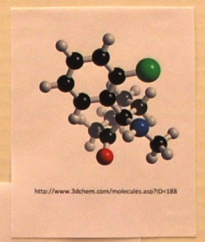




Isoflurane

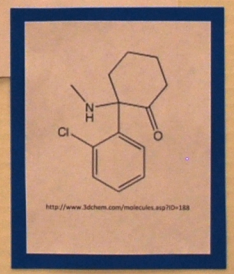
Isoflurane is a commonly used inhalational anesthetic for surgeries in veterinary medicine. Generally anesthesia is induced with an injectable anesthetic or sedative and then full anesthesia is achieved through intubation or a nose cone.[2] Intubation is the use of an endotracheal tube to maintain open airways and administer oxygen and anesthesia. Intubation is the preferred method of induction and maintenance when it comes to inhalational anesthesia for the added ventricular support keeps airways from collapsing mid-surgery or during recovery.[2] Isoflurane is widely used because it elicits a rapid response from the patient, but with this convenience there also comes risk. Isoflurane is known to cause respiratory and cardiovascular depression or the inability of each of these systems to maintain a suitable level of functionality.

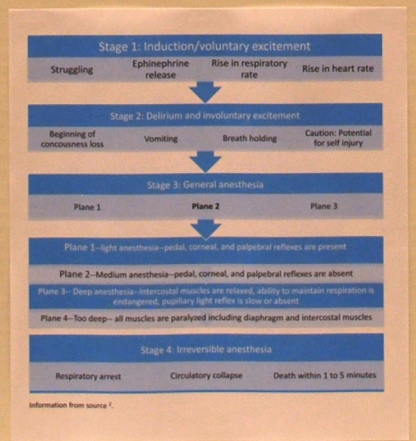




Ketamine

Ketamine is a commonly used injectable anesthetic that induces a state of unconsciousness where the patient is dissociated from the environment with minimal response to pain.[3] Ketamine is relatively easy to administer and does not require the expensive delivery system that an inhalational anesthetic would. Sedation with Ketamine preserves swallowing and palpebral reflexes (the palpebral reflex is exhibited when the eyelid is touched and a blink reflex results), but is known to cause an apneustic breathing pattern and increased muscle tone.[3] An apneustic breathing pattern affects small animal patients the same way sleep apnea affects humans. This is why additional ventilation support is preferred in procedures utilizing inhalational anesthesia. A prolonged recovery time is often a result of induction by Ketamine.[3]





Information from source [2].

CONCLUSION

Anesthesia is a difficult venture due to the generalized effects upon a patient. Through a closer look at Ketamine and Isoflurane a favored anesthesia will arise.

Injectable anesthetics frequently don't provide all three of the previously mentioned components of anesthesia and are often used in combinations to compensate for this. Ketamine is not a potent analgesic, meaning that it is not effective in blocking pain, but it does create a state of dissociation from the environment in which a patient won't respond to pain.3 Ketamine, like other injectable anesthetics, is relatively easy to administer. Unfortunately it takes a comparatively long time to induce the desired level of anesthesia with Ketamine. This can take from 20 to 45 minutes. Another shot is required to reverse the anesthesia. High doses of Ketamine can result in a condition similar to catalepsy, which is a state of paralysis and muscular rigidity. Despite these disadvantages Ketamine is a widely used anesthetic.

Inhalational anesthetics require expensive machinery to vaporize the liquid anesthetic. When asked about the comparative pricing between Ketamine and Isoflurane Megan of Graham Vet Clinic replied "Drop for drop Iso is cheaper, but when you factor in the cost of the machine, it is harder to tell which is cheaper." Isoflurane is widely utilized for its ease of use, after intubation the turn of a dial can deepen or reverse the anesthesia due to the rapid response time associated with inhalational anesthetics. Unfortunately intubation cannot be performed without sedating the patient first. Isoflurane is notorious for causing cardiovascular and respiratory depression.

The choice of injectable versus inhalational anesthesia is an arbitrary decision among vets everywhere. However, throughout years of practice, veterinarians have discovered a winning combination to conquer the dilemma. Most clinics sedate a patient with an injectable anesthetic like Ketamine in order to intubate. Once intubation has been accomplished the patient can be attached to the anesthesia machine, thus giving the simplicity and precision of an injectable anesthetic as well as the ease of use of an inhalational anesthetic such as Isoflurane.

Literature Cited

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[2] http://www.ahc.umn.edu/rar/anesthesia.html , University of Minnesota, "*Guidelines for the Use of Anesthetics, Analgesics and Tranquilizers in Laboratory Mammals.*"

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[4] Jamison, Megan, Vet Tech, Graham Veterinary Clinic, Arthur IL. Personal communication, November 2014.