PREANESTHETIC EVALUATIONS IN SMALL ANIMALS - WHICH VALUES TO LOOK FOR?

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Careful evaluation of small animal patients should be an essential first step prior to general anesthesia.

This presentation reviews some of the main points of preanesthetic evaluations in small animals, and discusses how the findings may influence anesthetic plans for the presented animals.

ECG assessment has long been a routine preanesthetic screening test in small animals older than 7 years of age in many high volume veterinary teaching hospitals in North America. With increasing availability of an ECG monitor in general practices in recent years, many clinicians have similarly incorporated the technique during anesthesia. It would be appropriate for the clinicians to review basic principles of ECG, and its limitations and usefulness in anesthetic practice.

Preanesthetic workup

patient history and physical examination

The following information about the patient will need to be filled in the anesthesia record; breed, species, sex, age, body weight, procedure, presenting problems, and case number. Patient’s medical history will be thoroughly reviewed immediately prior to anesthesia. The nature, severity and duration of illness must be summarized in the anesthesia record form. Any previous anesthetic episodes with details of anesthetic protocol and significant events must be reviewed. Past and current medications (e.g., antibiotics, aminoglycoside and neuromuscular blockers, organophosphates, H-2 blockers, NSAIDs, barbiturates, TCAs, insulin, antihypothyroidal drugs) need to be reviewed for any drug interaction with the anesthetics of choice. Concurrent secondary disease such as diarrhea and vomiting will present significant challenge in fluid balance, and appropriate risk assessment and patient stabilization are warranted.

Basic principles of physical examination should apply to animals for preanesthetic evaluations. Patient’s
body temperature, heart rate and respiratory rate (TPR) will be recorded in the anesthesia record. General body condition and fluid status of the patient will be noted in the record, with particulars such as obesity, cachexia and dehydration. Musculoskeletal abnormalities may include fracture, deformity, lameness, ataxia and paralysis, and integumental abnormalities such as skin tumor, alopecia and parasitic infestation. Any significant cardiopulmonary abnormalities may constitute a greater anesthetic hazard to the animal than abnormalities in other system such as benign skin tumor, and the anesthesia must be postponed until the condition in question is fully evaluated and corrected when possible.

Cardiopulmonary system is assessed by ausculting the heart and lung on both sides of the chest, and particular attention must be given for any unusual characteristics of heart rate and rhythm, murmurs, pulmonary crackles, and clarity of the breathing sound. The auscultation is routinely accompanied by visual observation of the color of mucous membrane and assessment of CRT for signs of hypoxemia or tissue hypoperfusion. Special considerations in anesthetic monitoring and greater choice of anesthetics must be made available in animals with underlying cardiopulmonary illness, as alteration of pharmacokinetics both in injectables and inhalants in these patient group may lead to prolonged recovery, exacerbated cardiopulmonary depression and increased incidence of anesthetic complications.

Careful palpation of abdominal organs during physical examination will help detect abnormal size or texture of liver, spleen, kidneys or GIT. The physical examination findings coupled with clinical signs such as jaundice, polyuria, polydipsia or diarrhea can assist clinicians better evaluate and manage anesthetic risks.

**Laboratory evaluations and diagnostic workup**

Minimum data base includes packed cell volume (PCV or Hematocrit), total plasma protein (TPP), blood urea nitrogen (BUN) and blood glucose. Other tests that can provide additional screening and more detailed information regarding the patient status when warranted include complete blood cell count (CBC), chemistry profile (electrolytes, creatinine, enzyme levels), blood gas analysis, urinalysis and coagulation profiles. Additionally, as indicated by physical exam and history, ECG, blood pressure measurement, radiography, echocardiography, ultrasonography, and nuclear scintigraphy may be carried out.

**Physical status**

In order to better understand animal’s condition pertinent to anesthetic risk assessment, veterinarians have been using classification of the physical status based on American Society of Anesthesiologists (ASA) grade system. ASA class I is for normal healthy animals presented for elective surgical procedures such as neutering and ovariohysterectomy. Class II reflects for animals that have mild to moderate systemic diseases including cruciate rupture and laryngeal hemiplegia. Class II reflects for animals that have mild to moderate systemic diseases including cruciate rupture and laryngeal hemiplegia. Examples of ASA III include animals for repair of protosystemic shunt or PDA, and carries greater risks than ASA II groups. ASA IV groups carry high risks with severe systemic disease that is a constant threat to life and examples include GDV and dystocia. ASA V groups are not expected to live longer than 24 hours irrespective of intervention and an example may be ruptured aorta. Each ASA grade may be classified with E if the procedure is carried out as emergency.

**Preanesthetic preparation of supplies and venous catheterization**

For increased efficiency it is best to establish routines, and this may include setting up a generic accessories
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tray. The tray may house the following items prepared in small animals presented for general anesthesia; ET tubes, eye lube, gauze roll bandage, heparinized syringes, cuff syringe, K-Y jelly, catheters, laryngoscope and blades, 4x4 gauze pad, and esophageal stethoscope.

Food, water and stabilization

Food must be withheld prior to inducing general anesthesia, as vomitus at perioperative periods may present as a significant life threat. The food withholding time varies between species and age, but it is usually recommended to be 12 hours with a minimum of 6 hours in dogs and cats. Water should be always available right up to premedication in order to prevent dehydration. Animals that have signs of dehydration need to be treated prior to anesthetic induction with isotonic saline or LRS, or any appropriate choice of crystalloids to correct deficient or excessive electrolytes.

Drug interaction

Drug interaction of previously administered medication with anesthetics to be employed is an important consideration as overdosing or hypersensitivity may occur due to changes in metabolism and excretion. A medication such as chloramphenicol has been shown to compete in metabolism of anesthetics that are metabolized by cytochrome P450, necessitating the dose of anesthetics for induction.

Following thorough preanesthetic work up, an anesthetic protocol is constructed based on the procedure and physiologic condition of the animal. A variety of drug choices are available, but an emphasis is directed to avoid drugs that may further compromise the preexisting disease, or to reduce anticipated adverse effects related with the procedures (e.g., avoiding ketamine in animals with previous seizure history or procedures such as myelogram).

Electrocardiography

Electrocardiogram is a graphic recording of electrical potentials produced by cardiac muscle during different phases of the cardiac cycle, and figure below details different waveforms.

ECG is recommended for dogs and cats over 7 years old prior to general anesthesia as part of preanesthetic work-up to screen underlying systemic diseases and abnormalities. It is also recommended to incorporate ECG monitoring continuously during the anesthesia. Therefore, understanding basic principles and limitations of ECG is critical both for efficient diagnostic and therapeutic steps for animals scheduled to be anesthetized.

Normal Canine heart rates are 70 to 160 beats/min for adult dogs, 60 to 140 beats/min for giant breeds, up to 180 beats/min for toy breeds and up to 220 beats/min for puppies. ECG rhythms are typically normal sinus rhythm or sinus arrhythmia, with no significant clinical relevance to anesthetic risks. Normal feline heart rates are considered to be between 120 and 240 beats/min for adult cats. ECG rhythms in cats are typically normal sinus rhythm or Sinus tachycardia (physiologic reaction to excitement.

Commonly used antiarrhythmic drugs include atropine at 0.02-0.04 mg/kg or glycopyrrolate at 0.01-0.02 mg/kg intravenously treating for sinus bradycardia, and lidocaine 1-2 mg/kg IV over 3-5 min for treating ventricular arrhythmia such as premature ventricular complexes with maximum dose not to exceed at 8 mg/kg/
It is important to note that lower dose of lidocaine must be used in the cat with maximum amount not to exceed 4 mg/kg because of increased toxicity in this species. When VPC treatment is nonresponsive to lidocaine, procaineamide may be administered at 2-4 mg/kg IV over 3-5 minutes with a maximum dose at 20 mg/kg. Although similar to lidocaine in antiarrhythmic classification as class I sodium channel blocker, procaineamide differs slightly on the site of action potential generation of the ventricles resulting in successful treatment when lidocaine fails. Procaineamide has a longer duration of effect requiring less frequent dosing should the arrhythmia persist for an extended period, but one must note that these all carry significant arrhythmogenic potential and their use must be at strict restriction with close monitoring of clinical signs of overdosing and toxicity such as muscle twitching, depression, vomiting and sudden collapse.

Summary

It is expected that careful preanesthetic evaluation of patient combined with appropriate preanesthetic stabilization would minimize anesthetic risks resulting in greater patient safety at perianesthetic periods. Diagnostic ECG as part of preanesthetic workup may be indicated in selected populations to provide more detailed information on the patient’s cardiovascular condition, and to better assist the clinician’s anesthetic management.

Further readings

Tilley LP and Burtnick NL. 1999. Electrocardiography for the small animal practitioner, Made easy series, Tefton New Media, Jackson, Wyoming


Dubin D. 1996. Rapid Interpretation of EKG’s Cover publishing company, Tampa, FL