PREANESTHETIC EVALUATIONS & ECG

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"If you don't look, you don't see"

PREANESTHETIC EVALUATIONS & PREPARATIONS

Introduction

- The preanesthetic examination or evaluation will influence greatly on the dose and choice of the premedicants, induction agents and maintenance agents as well as selection of anesthetic techniques.
- Thorough patient evaluation and preparation will improve patient safety and ensure successful anesthetic outcome.

Preparation of the patient

Food withholding time

- Varies between species
- Dogs and cats : usually 12 hours and minimum of 6 hours
- Ruminants: usually 24 hours, longer if GIT surgery or for long operation
- Horse: 18 - 24 hours
- Neonatal patient must not be starved because of their high metabolic demands, and to prevent susceptible hypoglycemia.

Water withholding time

- Free access to water right up to premedication except in ruminants.
- Six hour withholding time for ruminants to prevent occurrence of regurgitation and distended gut by slowing fermentation.

Fluid and electrolytes

- Correct dehydrated patient using isotonic saline, LRS, or supplement deficient electrolytes or correct excessive electrolytes.
- Stabilization of the patient in the fluid balance and electrolyte imbalance will substantially reduce deranged physiology during anesthesia.
- Volume depletion during the anesthesia will be less if adequate time is spent prior to the induction increasing the chance of survival.

- Unless life threatening and the animal can wait until fluid imbalance can be corrected, it is not recommended to subject the animal for general anesthesia.

Influence of preexisting drugs

- CNS depressants
- Endocrinological therapeutics
- Enzyme inductions
- Organophosphates, H-2 blockers, NSAIDs, barbiturates, TCAs, insulin, antihypothyroidal drugs etc.
- Antibiotics exerting neuromuscular blocking effect
  - Aminoglycosides (gentamycin, neomycin, kanamycin, streptomycin, amikacin)
  - Polymixins
  - Tetracycline
  - Lincosamides (lincomycin, clindamycin)

Signalment

- Breed
- Species
- Sex
- Age
- Weight
- Case number
- Procedure

History

- Nature and duration of illness: acute or chronic, the severity of the illness
- Any previous anesthetic episodes
- Past and current medications
- Concurrent of secondary disease: diarrhea, vomiting (fluid imbalance)

Physical exams

- Body condition; obesity, cachexia, dehydration
- Temperature, heart rate and respiratory rate (TPR)
- Auscultate the heart and lung and note any unusual characteristics and if necessary postpone the anesthesia until fully clear the questionable condition.
- Cardiopulmonary system: heart rate and rhythm, auscultate the characteristics, CRT, color of mucous membrane, exercise intolerance, coughing, dyspnea
- CNS and special senses: temperament, seizure, coma, stupor, ataxia, vision and hearing impairment
- Gastrointestinal: auscultate the gut sound, parasites, palpation

- Hepatic: icterus, abnormal bleeding
- Renal: palpate kidneys and bladder, polyuria/polydipsia, oliguria
- Integument: tumors and flea infestation
- Musculoskeletal: fractures, deformity, and lameness

Laboratory evaluations

Minimum data base

- Packed cell volume (PCV)
- Total plasma protein (TPP)
- BUN
- Glucose
- These four tests should be performed on all patients
- Provide basic information regarding fluid balance, hepatic and renal function, nutrition and oxygen carrying capacity

Other tests that can provide additional screening and more detailed information regarding the patient status

- Complete blood cell count (CBC)
- Chemistry profile (electrolytes, creatinine, enzyme levels)
- Blood gas analysis
- Urinalysis
- Coagulation profiles

Other diagnostics, as indicated by physical exam and history

- ECG
- Radiography
- Echocardiography
- Ultrasonography
- Nuclear scintigraphy

Classification of the Physical Status (adopted by the American Society of Anesthesiologists, ASA)

I. Normal healthy patient (neutering, ovaryohysterectomy)
II. Mild to moderate systemic disease (cruciate rupture repair, laryngeal hemiplegia repair)
III. Severe systemic disease. Severe dehydration (eg, portosystemic shunt disease, PDA, compensated renal insufficiency)
IV. Severe systemic disease that is a constant threat to life (GDV, equine colic, dystocia)
V. Moribund, not expected to live 24 hours irrespective of intervention (ruptured arteries)
E. Emergency surgery

Venous access

- Placement of intravenous catheter facilitate IV administration of induction agents, and also minimize the extravascular injection of irritant agents such as thiopental sodium.
- For dogs and cats 20 - 22 G, 1 - 1.5 inch long are most commonly used, and for large animals 12 – 14 G of 3 - 4 inch long are most commonly used.

Items you need to prepare on a tray for a cat presented for general anesthesia at the BVMTH

- Three ET tubes (one that would fit best, each of smaller and larger)
- Eye lube (ophthalmic ointment for eye lubrication)
- Gauze roll bandage
- One inch and half inch tapes
- Stylet
- Two to three heparinized saline flush in 3 ml syringe
- Laryngoscope and blades (size 1 and 2)
- Cuff syringe
- 4 x 4 gauze pad
- K-Y jelly
- Lidocaine 2 % 0.25 ml in TB syringe
- Two catheters 20 - 22 G, 1 – 1.5 inch long
- Injection cap
- Needles of varying size (20 G x 1”, 22 G x 1 “)
- Fluids (usually 500 ml or 1000 ml LRS) and 60 drop/ml IV set assembled, plus an extension tube if catheter is placed in hindlimb.
- Esophageal stethoscope

Drug influence

- Allergy: drug or vehicle
- Shock, asthma bronchospasm, hepatic congestion, rashes, pyrexia, blood disorders
- Overdosing: hypersensitivity, lowered metabolism
- Idiosyncrasy: genetically determined. HYPP or porcine malignant hyperthermia
- Intolerance: qualitatively normal response to abnormal dosing
- Drug interaction: synergistic, antagonistic, potentiating

Anesthetic plan

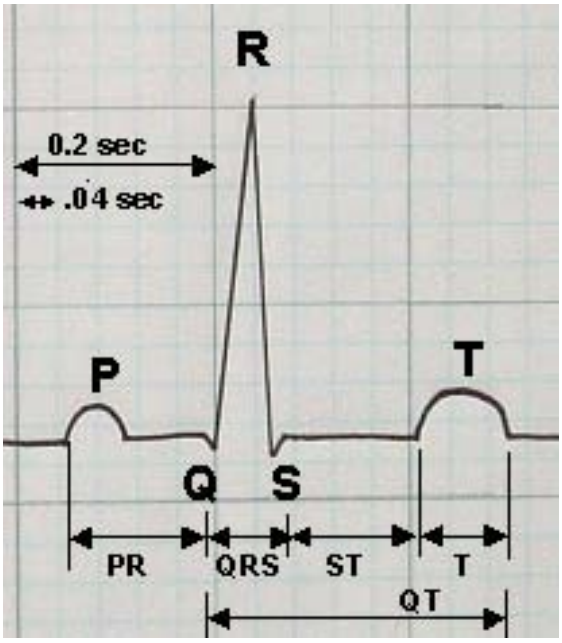
- Following a thorough preanesthetic work up, construct anesthetic protocol based on the procedure and physiologic condition of the animal.
- A variety of drug choices are available, but avoid drugs that will further compromise the preexisting disease or anticipated adverse effects related with the procedures (eg, avoid using acepromazine in animals with previous seizure history or procedures such as myelogram).

- Remember there is no safe anesthetic agent but only safe anesthetist, so ensure every effort to minimize overall risk based on your evaluation and plan.

ELECTROCARDIOGRAPHY

Electrocardiogram

- 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.
- Graphic recording of electrical potentials produced by cardiac muscle during different phases of the cardiac cycle



ECG paper chart

- **@ 25 mm/sec**
  - **one small square; 0.04 sec**
  - **five small squares; 0.2 sec**
- **@ 50 mm/sec**
  - **one small square; 0.04 sec**
  - **five small squares; 0.2 sec**

Five physiologic properties of the heart

- Automaticity
- Excitability

- Refractoriness
- Conductivity
- Contractility

ECG waveforms

- **P wave**: atrial muscle depolarization (firing of SA node)
- **QRS waves**: ventricular depolarization or contraction
  - **Q**: first negative deflection
  - **R**: first positive deflection
  - **S**: negative deflection which follows the R wave
- **T wave**: ventricular repolarization or relaxation

Measuring

- **P-R interval**
  - Reflects activation of the AV junction. The beginning of P wave to the beginning of QRS complex
- **S-T segment**
  - Represents the time interval from the end of the QRS to the onset of the T wave (early phase of ventricular relaxation)
- **Q-T interval**
  - Summation of ventricular depolarization and repolarization. Measured from the onset of the Q wave to the end of the T wave

Leads

- Lead 1 = right arm (-), left arm (+)
- Lead II = right arm (-), left leg (+)
- Lead III = left arm (-), left leg (+)
- AVR = right arm (+), halfway between left arm and left leg (-)
- AVL = left arm (+), halfway between right arm and left leg (-)
- AVF = left leg (+), halfway between left arm and right arm (-)
- Positive and negative electrodes attached to the surface to the skin
- Upward deflection: electrical impulse traveling towards a positive electrode
- Downward deflection: impulse towards a negative electrode
- Flat line: isoelectric

ECG recording technique

- Place the patient on a table or clean floor
- Attach ECG leads, moistened with alcohol or electrode gel
- Record ECG in lateral or standing position
- Record lead II for 30-60 seconds at 25 mm/sec to assess arrhythmias

- Record a brief tracing at 50 mm/sec for ease of assessment of P-QRS-T waveforms
- Observe the following during the ECG recording
  - Whether the top and bottom of the waveform are all seen
  - Adjust the alignment as appropriate
- Decrease the sensitivity to ½ cm = 1 mV if QRS complexes go off the paper
- Increase the length of the trace if arrhythmia is present
- R waves should be positive in lead I if negative, check the lead wires to determine whether they are attached to the correct limbs. If correct, then a true abnormality exists.

Canine ECG normal values

Rate

- 70 to 160 beats/ min for adult dogs
- 60 to 140 beats/min for giant breeds
- up to 180 beats/min for toy breeds
- up to 220 beats/min for puppies

Rhythm

- Normal sinus rhythm
- Sinus arrhythmia
- Wandering sinus pacemaker

P wave

- Width: maximum 0.04 sec (2 boxes wide); maximum 0.05 sec (2 ½ boxes wide) for giant breed
- Height: maximum 0.4 mV (4 boxes tall)

P-R interval

- Width: 0.06 to 0.13 sec (3 to 6 ½ boxes)

QRS complexes

- Width: maximum 0.05 sec (2 ½ boxes) in small breeds; maximum 0.06 sec (3 boxes) in large breeds
- Height: maximum 2.5 mV in small breeds; maximum 3 mV (30 boxes) large breeds

S-T segment

- No depression: not more than 0.2 mV (2 boxes)
- No elevation: not more than 0.15 mV (1 ½ boxes)

T wave

- Can be positive, negative, or diphasic
- Not greater than ¼ amplitude of R wave

Q-T interval

- Width:0.15 to 0.25 sec (7¼ - 12¼ boxes) at normal heart rate

Feline ECG Normal Values

Rate

- 120 to 240 beats/mm

Rhythm

- Normal sinus rhythm
- Sinus tachycardia (physiologic reaction to excitement)

P wave

- Width: maximum, 0.04 sec (2 boxes wide)
- Height: maximum, 0.2 mV (2 boxes tall)

P-R interval

- Width: 0.05 to 0.09 sec (2¼ to 4¼ boxes)

QRS complex

- Width: maximum, 0.04 sec (2 boxes)
- Height of R wave: maximum, 0.9 mV (9 boxes)

S-T segment

- No depression or elevation

T wave

- Can be positive, negative, or diphasic; most often positive
- Maximum amplitude: 0.3 mV (3 boxes)

Q-T interval

- Width: 0.12 to 0.18 sec (6 to 9 boxes) at normal heart rate

Arrhythmias

Definition of arrhythmias

- An abnormality in the rate, regularity, or site of origin of the cardiac impulse.
- A disturbance in conduction of the impulse such that the normal sequence of activation of the atria and ventricles is altered.

Classification of arrhythmias

- Abnormalities of impulse formation or impulse conduction are the basis for the following classification

- Normal sinus impulse formation
  - Normal sinus rhythm
  - Sinus arrhythmia (typically associated with respiratory cycles)

- Disturbances of sinus impulse formation
  - Sinus bradycardia
  - ***Sinus tachycardia***

- Disturbances of supraventricular impulse formation
  - Atrial premature complexes
  - Atrial tachycardia
  - Atrial fibrillation
  - Atrioventricular junctional premature. complexes
  - Atrioventricular junctional tachycardia

- Disturbances of ventricular impulse formation
  - Ventricular premature complexes
  - Ventricular tachycardia
  - Ventricular asystole
  - Ventricular fibrillation

- Disturbances of impulse conduction
  - Sinus arrest or block
  - Sick sinus syndrome
  - Atrial standstill
  - Ventricular pre-excitation
  - First-degree atrioventricular block
  - Second-degree atrioventricular block

- Third-degree atrioventricular block
- Left bundle branch block
- Right bundle branch block

Interpreting Arrhythmias —the Simple Steps

- Arrhythmias can be intimidating. Therefore, it is important that we find a simple approach for analyzing rhythm strips. Systematically following the five-step method outlined below has proven to be both simple and effective.

Step 1. Calculate the heart rate

- Decide whether the heart rate is rapid, slow, or normal.

Step 2. Assess the rhythm

- Scan the strip from left to right, noting if the R-R intervals are regular or irregular.
- A caliper is a handy tool for plotting P-P and R-R intervals.

Step 3. Identify the P waves

- **Normal P wave (positive and rounded on Lead II)** -indicates that the impulse is originating in the SA node.
- **P wave that differs from normal in shape and is upright**—may represent an ectopic pacemaker in the atrium.
- **P waves that are inverted**—on lead II, indicate that the impulse was formed in or near the atrioventricular junction.
- **Absence of P waves**—signifies atrial fibrillation, atrial standstill, or buried P waves in QRS complexes of AV junctional rhythms.
- **P waves can be superimposed**—on a portion of the QRS complex, S-T segment, or T wave of the preceding cardiac cycle in various supraventricular tachycardias

Step 4. Assess QRS shape and duration

- **Normal duration QRS complexes**—identical to those recorded before an arrhythmia, indicate normal activation of the ventricles. These complexes are either formed in the SA node or from an abnormal site anywhere above the bundle of His.
- **Wide QRS complexes**—with various configurations indicate an ectopic pacemaker below the bundle of His (ventricular) or a lesion in the intraventricular conduction system (bundle branch block).

Step 5. Relationship between P waves & QRS complexes

- Normally, there should be one P wave for every QRS complex, with a constant P-R interval.

- P waves may precede normal QRS complexes by different time spans.
- **Long P-R intervals**—indicate an AV conduction delay
- (1° AV block).
- **Short P-R intervals**—are seen with accessory conduction around the AV node, or in AV junctional rhythms in which the P wave is positioned close to the QRS complex.
- **P wave not followed by a QRS complex**—an AV block (2° AV block) has occurred. If the P-R interval lengthens gradually until a P wave occurs without a succeeding QRS complex, another form of 2° AV block has occurred.
- **P-R intervals vary**—in 3° AV block the relationship of the atria and ventricles is interrupted. One impulse forming 'site is the SA node; the other is an independent ventricular escape rhythm.

Finally, last step: Name that arrhythmia

- Place the arrhythmia within the classification.
- The best name for an arrhythmia always identifies exactly which part of the heart is not working properly.

Commonly used Anti-arrhythmic drugs

- Atropine: 0.02-0.04 mg/kg for treating sinus bradycardia
- Glycopyrrolate: 0.01-0.02 mg/kg treating for sinus bradycardia
- Lidocaine: 1-2 mg/kg over 3-5 min for treating VPCs, maximum 8 mg/kg (use lower dose in the cat with maximum not exceeding 4 mg/kg)
- Procaineamide: 2-4 mg/kg over 3-5 minutes for treating VPCs, usually given when VPC treatment is nonresponsive to lidocaine, maximum 20 mg/kg

Further readings

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- Goldberg S. Clinical physiology made ridiculously simple *MedMaster, Inc.* Miami, FL 1995