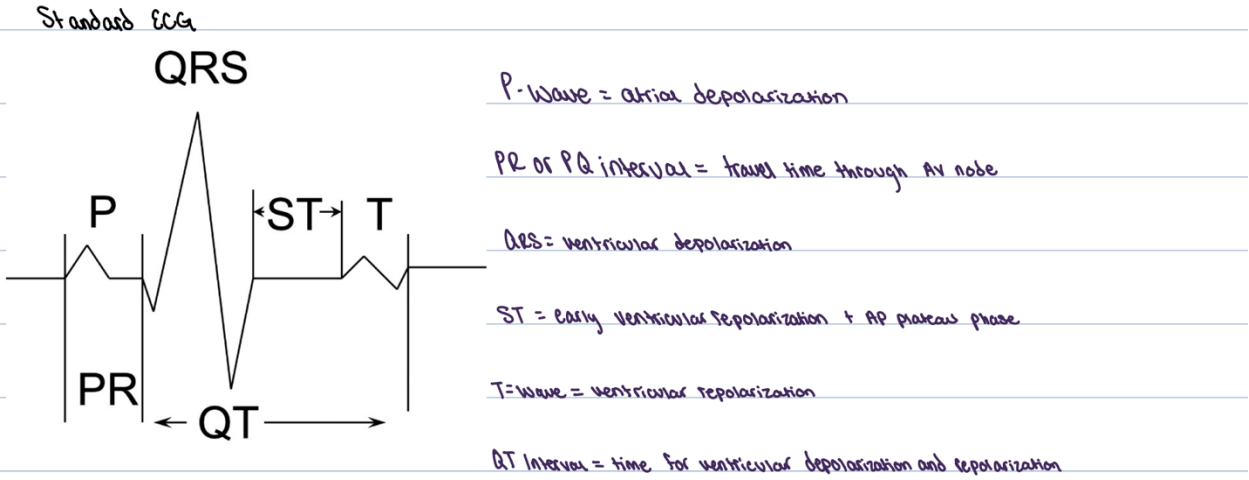
VET433C: Electrocardiogram

Review

Path of electrical activity of the heart: SA > AV > BOH > Purkinje Fibers

Breaking down the ECG



Why run an ECG?

- Clinical signs: weakness, episodes of collapse / syncope
- Abnormal heart rhythm or heart rate on auscultation
- Diagnosed with heart disease or systemic disease associated with causing arrhythmias
- Monitoring of critically ill patients or patients under anesthesia that may be likely to have arrhythmias

Calculating Heart Rate from an ECG

*You NEED to know the paper speed!

Average Heart Rate

Count the number of QRS complexes in 30 big boxes

Multiply by 10 for 25 mm/sec to get bpm

Multiply by 20 for 50 mm/sec to get bpm

Instantaneous Heart Rate

Ruse the R-R interval in mm

At 25 mm/sec there are 1500 mm/minute (25 mm/sec x 60 sec/min = 1500 mm/min)\

(1500 mm) / (R-R interval in mm) = bpm

VET433C: Electrocardiogram

At 50 mm/sec there are 3000 mm/minute (50 mm/sec x 60 sec/min = 3000 mm/min)

(3000 mm) / (R-R interval in mm) = bpm

Normal Heart Rates

Species	Heart Rate (bpm)
Cow	48-84
Horse	28-44
Cat	140-220
Dog	60-160

AV blocks

Delayed or absent conduction through the AV node leading to longer PR interval or P waves without a QRS complex

Types of AV Blocks

- 1st degree
  - Every P wave has a QRS but the conduction through the AV node is slower than usual
  - ECG findings: Prolonged PR interval, all P waves conducted
  - Cause: Increased vagal tone
    - GI, respiratory, or brain disease
  - Stimulus or atropine can obliterate this block
- 2nd degree
  - Some P waves are conducted and some are not
  - Low-Grade second-degree AV block: Every other P wave or less is blocked
  - High-Grade second-degree AV block: > every other P wave is blocked
    - Not atropine responsive and is an indication for a pacemaker
  - Mobitz type I (Wenchebach phenomenon)
    - PR gradually prolongs until a P wave is blocked
    - Cause: Increased vagal tone
    - Simulus or atropine can obliterate
  - Mobitz type II
    - PR interval is unchanged, P waves randomly blocked
    - Often does not respond to stimulus/atropine
    - May be secondary to heart disease (idiopathic AV nodal fibrosis is the most common)
    - If high-grade, pacemaker implantation is recommended because of the association with symptoms and sudden death
- 3rd degree

- No P waves conducted – QRS dissociated
- Ventricular or junctional escape rhythm
- No response to stimulus or atropine
- Typically due to disease affecting the AV node (idiopathic fibrosis, myocarditis, neoplasia)
- Pacemaker implantation is recommended

P-wave abnormalities

P pulmonale (tall P wave) – RA enlargement; conduction from SA node starts in RA so more right atrial cells lead to a taller than normal P wave

-often seen with pulmonary stenosis, pulmonary hypertension, and tricuspid valve dysplasia

P mitrale (wide P wave) – LA enlargement; slight delay before current gets to LA so more atrial cells lead to a wider than normal P wave

-often seen with myxomatous mitral valve disease, dilated cardiomyopathy, and patent ductus arteriosus

QRS abnormalities

Increased QRS duration: Ventricular enlargement, bundle branch blocks

Reduced QRS size: Pericardial or pleural effusion, obesity, hypothyroidism

Increased R wave amplitude: Left ventricular enlargement pattern

Deep sharp S wave with right cranial axis deviation: Right ventricular enlargement

Deep sharp S wave with left cranial axis deviation: Left anterior fascicular block