VPM 152, Disturbances of Circulation, Lab 2: Hemorrhage, thrombosis and infarction

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• Arrange yourselves into groups of 6 and choose one of the 5 stations to work at

• Work through the questions (10 – 15 minutes)

• Then we will discuss them all together
Hemorrhage

Hemorrhage

- Escape of blood from the cardiovascular system
- To the exterior or enclosed within a tissue

Causes

- Trauma
- Septicemia
- Neoplasia
- Coagulation disorders
- Thrombocytopenia
Hemorrhage - examples

Trauma (gunshot): hemorrhage to the exterior and within the tissues of the head.
Hemorrhage - examples

Trauma (electrocution): fracture of the cervical vertebrae and hemorrhage into the surrounding soft tissues and into the spinal canal.
Hemorrhage - examples

Blood in the thoracic cavity = hemothorax
Petechial and ecchymotic hemorrhage

**Petechiae**
- Pin-point foci of hemorrhage ~ 1-2 mm in size

**Ecchymoses**
- Blotchy irregular areas of hemorrhage > 1-2 cm
Hemorrhage - examples

Hematoma: Accumulation of blood in a tissue forming an extravascular clot

Dog: hematoma within the omentum
Thrombosis

- Formation of a solid mass within the blood vessels or heart – adhered to the endothelium

- Abnormal blood flow

- Endothelial injury

- Hyper-coagulability
Thrombosis

Endothelial injury

Trauma, vasculitis (infectious or immune-mediated) toxins, neoplasia, DIC, etc

Abnormal blood flow

Local stasis or reduced flow, (eg GI torsion), cardiac disease, aneurysm, turbulent blood flow

Hyper-coagulability

Can occur during inflammation, neoplasia, pregnancy, glomerular disease, DIC, Cushing’s disease
21 year old horse with recurrent bouts of colic. Euthanized and submitted for necropsy.

Describe the changes:

Cranial mesenteric artery

Aorta
15 year old horse with recurrent bouts of colic. Euthanized and submitted for necropsy.

Changes noted include:
- Dilation of the mesenteric artery
- Aneurysm
- Roughening of the intimal surface
  - Inflammation (arteritis)
- Clotted tan material adhered to the intima
  - Thrombus

Horse case
Changes noted include:

- Dilation of the mesenteric artery
  Aneurysm
- Roughening of the intimal surface
  inflammation (arteritis)
- Clotted tan material adhered to the intima
  Thrombus

Abnormal blood flow

Endothelial injury

Horse case

How do these changes lead to thrombosis?
Horse case

15 year old horse with recurrent bouts of colic. Euthanized and submitted for necropsy.

Small (~1cm) slender worms embedded in the thrombus — *Strongylus vulgaris*

Fragments of a thrombus may break off → *embolus* and become lodged further downstream → intestinal infarction and colic

Possible sequella?
Cat case

5 year old cat with sudden marked pain, no femoral pulses and cold hind limbs

Describe the changes:
Cat case

5 year old cat with sudden marked pain, no femoral pulses and cold hind limbs

Changes noted:
• Tan to red friable mass within the lumen of caudal abdominal aorta and extending into the iliac arteries

= Aortic thrombus (saddle thrombus)
Cat case

5 year old cat with sudden marked pain, no femoral pulses and cold hind limbs

Other changes noted:
- Enlarged heart
  = Myocardial hypertrophy
- Dilation of the left atrium with a large tan thrombus within the chamber
  = Mural thrombus, left atrium
Hypertrophic cardiomyopathy → Heart enlargement with atrial dilation
Infarcts

= Area of ischemic (coagulation) necrosis caused by occlusion of the arterial supply or the venous drainage

- Most infarcts result from thrombotic/embolic events or vascular occlusion due to twisting of a vessel
- Gross Appearance: Wedge-shaped areas with the base at the periphery and the apex towards the center. Acutely they are red to tan and raised. Chronically they are depressed firm and tan-white (fibrosis)
Cow case

Kidney from a cow diagnosed with vegetative valvular endocarditis (mitral valve)
Kidney from a cow diagnosed with vegetative valvular endocarditis (mitral valve)

Describe the lesion:

- Multiple, irregular areas of pallor surrounded by a bright red rim are scattered multifocally over the cortical surface of the kidney
Cow case

On cut section:

- These areas extend into the parenchyma as wedges with the base at the cortical surface and the apex in the medulla.
Kidney from a cow diagnosed with vegetative valvular endocarditis (mitral valve)

Morphologic Diagnosis:
Renal infarcts, multifocal, acute
Cow case

Kidney from a cow diagnosed with vegetative valvular endocarditis (mitral valve)

Possible Etiology:

Thromboembolism from the mitral valve lesion
Dog case

12 year old dog suspected to have DIC

Generalized yellow discolouration of the tissues

Icterus
Dog case

12 year old dog suspected to have DIC

The lungs are wet and dark red

Pulmonary edema and congestion
12 year old dog suspected to have DIC

Describe the lesion:
Multiple irregular areas of red discolouration surrounded by a thin zone of pallor

Morphologic diagnosis:
Myocardial infarcts, multifocal, acute
Dog case

12 year old dog suspected to have DIC

Possible Etiology:

DIC → increased coagulability of the blood → thrombosis of the myocardial vessels

DIC = Disseminated intravascular coagulation → sudden formation of widespread fibrin in microcirculation. Once the coagulation factors are consumed → hemorrhage may occur

DIC occurs secondary to: septicemia, shock, severe burns, systemic viral infection, neoplasia etc.
Dog case

Renal and perirenal hemorrhage
Questions?

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