The Acute Hemoabdomen

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Topic overview

• Initial clinical approach
• Traumatic hemoabdomen
• Spontaneous hemoabdomen
• Hemoabdomen in cats
12 yo CM Weimaraner

HR 200, sinus tachycardia, pale MM, CRT 2.5 seconds, bounding pulses, RR 32

Oxygen delivery (DO2)
Cardiac output (CO)
Arteriolar O2 content (CaO2)

Shock = poor oxygen delivery to cells

Cardiac output (CO) → HR → SV
Oxygen delivery (DO2) → Arteriolar O2 content (CaO2)

Hemoabdomen > decreased SV > decreased CO > decreased DO2

12 yo CM Weimaraner
Compensation for poor DO$_2$

- Tachycardia
- Pallor
- Prolonged CRT
- Poor pulse quality
- Altered mentation
- Cold extremities

Clinical classifications of shock

- Hypovolemic
- Cardiogenic
- Obstructive
- Distributive / vasodilatory

Characterized by TACHYCARDIA and VASOCONSTRICTION

Clinical classifications of shock

- Hypovolemic
- Cardiogenic
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Characterized by TACHYCARDIA and VASODILATION
Circulatory shock is the common pathway of cardiovascular failure

PE clues towards hemoabdomen
- Abdominal distension
  - More likely when chronic insidious pathology
- Detectable fluid wave
- Palpable organomegaly
- Abdominal pain
- Periumbilical hemorrhage?

Additional clues - vague preceding events
- Older dog with some ‘off days’
  - Can be confused with the aging process
  - Osteoarthritis flare ups?
- Increased thirst
  - Hypovolemia is a potent non-osmotic stimulus for thirst
Initial clinical approach: IV access

- Peripheral IV access to start
  - Collect blood samples
  - Administer fluids, drugs, blood products
- Can be challenging cases
  - Hypovolemic and vasoconstricted
  - May need to consider jugular vein in some cases

Improving your chances....

- Get the best stick available
- Improve visibility
  - Tourniquet
- Down dog? Use the down leg
  - Medial branch of the cephalic of the down leg

Compelling clinical pathology data

- Low or low normal PCV with disproportionately low total solids (<6 g/dL)
  - Regenerative anemia if some chronicity
  - Total solids will drop quickly
- Consumptive coagulopathy
  - Moderate thrombocytopenia (50-90 k/μL)
  - Mild PT prolongation
  - Mild-moderate aPTT prolongation
Addisonian like electrolytes?

• Hyponatremia and hyperkalemia

• Situation of chronic hemorrhage
  • Stimulates RAAS
  • Dilutional effect of drinking
  • Preserves blood volume at the expense of osmolality

Confirmation of hemoabdomen

• Point of care ultrasound (AFAST)
  • Convenient and sensitive method for identifying free fluid

• Abdominocentesis
  • Ultrasound guided
  • Blind technique

Resuscitation strategies

• Primary aim is to improve oxygen delivery to tissues
Hemoglobin content
Oxygen in plasma

IV fluids to restore blood volume

Cardiac output (CO)
Hemoglobin content
Oxygen in plasma

Arteriolar O₂ content (CaO₂)

RBC transfusions to boost hemoglobin

Oxygen delivery (DO₂)
SV

HR
Hemoglobin content
Oxygen in plasma
IV fluids to restore blood volume
RBC transfusions to boost hemoglobin
Supplemental oxygen

Fluid therapy considerations

• Give a fraction of their ‘shock dose’
  • Full shock dose – 90 ml/kg dog
  • Give 1-2 x 20 ml/kg IV bolus

• Can crystalloids make bleeding worse?
  • Large volume may induce dilutional coagulopathy
  • Rapid administration can disrupt newer blood clots
Fluid therapy considerations

• Synthetic colloids
  • Often described as part of limited volume resuscitation

• Disadvantages of synthetic colloids
  • Dose dependent coagulopathy
  • Concerns for AKI
  • Harder to obtain in some parts of the world

A Pilot Comparison of Limited Versus Large Fluid Volume Resuscitation in Canine Spontaneous Hemoperitoneum

• Faster resuscitation method
  • Achieve resuscitation endpoints sooner
  • But not necessarily resuscitated any better


Limited volume resuscitation
Hypotensive resuscitation

• Purposefully targeting lower than typical resuscitation end points

• Theory is to limit hemorrhage get into the OR
  • No veterinary data to support this recommendation

RBC transfusions to boost hemoglobin

Cardiac output (CO)

HR

SV

O2 content (CaO2)

Arterial

Hemoglobin content

Oxygen in plasma

Oxygen delivery (DO2)

Transfusion practices for treatment of dogs undergoing splenectomy for splenic masses: 542 cases (2001–2012)

Alex M. Lynch, DVM, Thorse E. O’Toole, DVM, Jessie Hamilton, DVM

• Shock, anemia, and hypocoagulability

• Dogs requiring blood products were more likely to have malignancy

Assessment of the relationships among coagulopathy, hyperfibrinolysis, plasma lactate, and protein C in dogs with spontaneous hemoperitoneum

- More compromised dogs (i.e. higher lactate) were more likely to be hypocoagulable and hyperfibrinolytic

Will *Yunnan Baiyao* help?

- Non-specific hemostatic agent
- Anecdotal benefits in dogs with hemangiosarcoma
- Laboratory work to suggest some antineoplastic effect on hemangiosarcoma cell lines

Alternatives to allogenic transfusions

- Autotransfusion of shed blood

- Characteristics
  - Defibrinated
  - Warm and fresh
  - Improves oxygen carrying capacity

- Concerns
  - Infection risk?
  - Metastatic potential?
Does autotransfusion accelerate metastasis?

- Dogs with hemangiosarcoma already have distant metastases
- Metastasis associated with hemangiosarcoma progenitor cells rather than differentiated cells
- Case by case decision based on risks vs. benefits

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Traumatic hemoabdomen

• Blunt trauma
• Penetrating trauma
• Biopsy associated
• Failure of surgical hemostasis

Traumatic hemoabdomen

• Reported to occur in 23% of blunt trauma

• Surgery is rarely needed so source of bleeding is rarely known with certainty

• When is surgery needed?
  • Failure to stabilize with conservative means
  • Massive blood product requirements
Traumatic hemoabdomen

- Abdominal wraps are unlikely to help
  - Risk could make things worse
  - But probably do neither

- Antifibrinolytic medications
  - Reasonable consideration in the traumatic hemoabdomen

Penetrating injuries in dogs and cats

A study of 16 cases


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Spontaneous hemoabdomen

- Neoplastic
- GDV
- Anaphylaxis
- Anticoagulant rodenticide toxicity
- Pit viper envenomation

Prediction of malignancy

- Rapid and accurate identification of malignancy
- Especially recognition of hemangiosarcoma
- But the reality is:
  - Clock is ticking
  - Timely decisions
  - Interventions are invasive
  - Interventions are expensive

How likely is malignancy in a dog with a splenic mass?

- Samples to pathology labs
  - 50:50 benign: malignant
- Hemangiosarcoma
  - 4% of all tumors
  - 20% of all sarcomas

Scrutinizing the 50:50 rule

Smaller dogs

- Benign v malignant prevalence similar
- Hemangiosarcoma overall less common


Prevalence of hemangiosarcoma in anemic dogs with a splenic mass and hemoperitoneum requiring a transfusion: 71 cases (2003–2005)

- Benign lesions
  - Higher mass-to-spleen ratio
  - Higher mean splenic weight


Clinical clues for malignancy

<table>
<thead>
<tr>
<th>BENIGN</th>
<th>MALIGNANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Younger dog</td>
<td>Older dog</td>
</tr>
<tr>
<td>Effusion absent</td>
<td>Effusion present</td>
</tr>
<tr>
<td>Higher mass-to-spleen ratio</td>
<td>Lower mass-to-spleen ratio</td>
</tr>
<tr>
<td>Higher splenic weight</td>
<td>Lower splenic weight</td>
</tr>
<tr>
<td>Higher serum total protein</td>
<td>Lower serum total protein</td>
</tr>
<tr>
<td>Higher platelet count</td>
<td>Lower platelet count</td>
</tr>
<tr>
<td>No transfusion</td>
<td>Transfusion given</td>
</tr>
</tbody>
</table>

Pre-operative imaging

- What are you aiming to get from imaging?

- May help prepare you for surgery
  - Is this a surgery you want to tackle?
Ultrasound

- Convenient but not perfect
  - Number of lesions or appearance does not predict tumor type
  - Problems with larger or deep chested dogs

Ultrasound vs. CT

- CT may be better in dogs >25 kg
- Overlap between CT images and histological diagnosis
- Hospital dependent with respect to availability and practicalities

Overlapping image characteristics

Jones et al. Vet Radiol Ultrasound 2016;57(2):144-153
Surgical considerations

- **Timing of surgery**
  - Some period of hemodynamic resuscitation recommended
  - Some dogs fail to stabilize easily (or for long) though
  - Challenging to predict how long stability can be maintained

- **It’s not always the spleen!**
  - Imaging may or may not help figure this out
  - The surgery needed may be complex
  - Referral might be reasonable (e.g. liver masses, adrenal masses)
Reasons for mortality

- **Short term**
  - Related to shock syndrome
  - Coagulation dysfunction
  - Arrhythmia

- **Medium term**
  - Arrhythmia
  - Coagulation dysfunction

- **Long term**
  - Benign or malignant

Portal system thrombosis

Median survival times (benign lesions)

- **Non ruptured incidental masses**
  - Benign MST 436 days
  - Malignant MST 110 days

- **Hematoma**
  - MST 647 days
  - 4 of 35 did develop metastatic disease eventually
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Compensation for poor DO$_2$

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- Bradycardia
- Pallor
- Prolonged CRT
- Poor pulse quality
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- Only 8 of 65 survived to discharge
- 46% had abdominal neoplasia
- Hemangiosarcoma was the most common neoplasm
- Spleen was the most common site for neoplasia


Conclusions

- Symptoms and resuscitation approaches are similar with both traumatic and spontaneous hemoabdomen
- Traumatic hemoabdomen is typically managed conservatively
- Predicting malignancy in spontaneous hemoabdomen cases is challenging
- Mortality may occur in the short, medium and long term after the identification of hemoabdomen