INTROOPERATIVE DEATH OF TWO DOGS WITH NON-NEOPLASTIC HEMOPERITONEUM

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Introduction

Hemoperitoneum, the presence of blood in the peritoneal cavity, occurs in the dog mostly as a result of rupture of hemangiosarcoma or well-vascularized abdominal organs. Possible causes of organ rupture are trauma, infection, neoplasms, external cardiac massage, or organomegaly by infiltrating neoplasms, hepatic lipodis, or amyloidosis.1,2 Necropsy of two dogs that died independently during elective surgery revealed hemoperitoneum derived from hepatic capsular damage centered around the porta hepatis (hepatic hilum). Previous undescribed pathogenesis of hemoperitoneum is speculated based on clinopathological findings of these dogs.

Materials and methods

The autopsy was performed on-site, necropsy of a Toy Poodle and a French Bulldog at 26 and 30 hours postmortem, respectively. Mild autolysis was confined to the superficial musculature of the Toy Poodle’s small intestine since the carcasses had been kept under cool condition. Various organs were collected and fixed in 20% formalin. Hematolymphosin-stained, 4-mm-thick sections were routinely prepared for microscopic examination. Clinical information was obtained from each veterinary hospital via interview and exchange of e-mails.

Results

Please see Table 1 and Fig. 1-16.

Discussion

Cause of death of the patients was likely secondary to hypovolemism, shock secondary to hemoperitoneum, cardiopulmonary arrest of unknown mechanism, or combination of these. With regard to hypovolemia, mean circulatory blood volume of laboratory Beagles is 85ml/kg.3 Intra-abdominal blood of the Toy Poodle and the French Bulldog then correspond to 89% (220ml/246.5ml) and 39% (330ml/850ml) of whole blood, respectively. Acute loss of at least one-third of whole blood from circulation is anecdotally life-threatening. Acute renal tubular necrosis in both dogs and cerebral neuronal necrosis in the French Bulldog were attributed to hypoxia.

Intra-abdominal bleeding in both patients did not seem to be associated with surgery. The Toy Poodle received no surgical manipulation of intra-abdominal organs. Five ligated wounds made during overhysterectomy were not loose to cause hemorrhage in the French Bulldog. Since signs of capsulotomy had been detected, hepatic capsular damage was judged the source of bleeding.

Table 1. Results obtained from each veterinary hospital are of the present cases.

<table>
<thead>
<tr>
<th>Dog</th>
<th>Sex</th>
<th>Age</th>
<th>Body weight</th>
<th>Cause of death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toy Poodle</td>
<td>Male</td>
<td>6 months</td>
<td>4.8kg</td>
<td>Shock, hypovolemia, hypoxia, liver injury, hemorrhage in the peritoneal cavity</td>
</tr>
<tr>
<td>French Bulldog</td>
<td>Female</td>
<td>8 months</td>
<td>7.6kg</td>
<td>Shock, hypovolemia, hypoxia, liver injury, hemorrhage in the peritoneal cavity</td>
</tr>
</tbody>
</table>

External cardiac massage aiming to recover spontaneous heart beat is integral to resuscitation attempts. Frequent complications associated with cardiac massage were rib and sternal fractures in a human retrospective study.4,5,6 Rarely, upper-rib fractures including the liver can be injured. Occurrence of liver injuries during cardiac massage was 0.6% in 2585 cardiac arrest victims.7 Information on more detailed topography of such damage, however, is lacking.

Propofol, a potent intravenous hypnotic agent, contains 10% soybean oil corresponding to 0.1g of fat for every milliliter.8,9 Though link between propofol usage and acute pancreatitis has been discussed with opposing opinions, short-term use of propofol resulted in significant elevation of serum triglyceride and pancreatic enzyme in children.10

Acute pancreatitis is triggered by co-localization of zymogen granules and lysosomes, which is associated with sustained elevation of intracellular calcium and altered calcium signaling.11,12 Such events occur with hypoxia, hyperlipidemia, and hypercalcemia.13,14 Acute pancreatitis seen in the patients could be caused by hypoxia and hyperlipidemia, both of which are possible sequelae of propofol administration.

Proposed pathogenesis of these dogs’ hemoperitoneum is shown in Fig. 17.

Conclusions

Pathogenesis of hemoperitoneum can be complex. Screening of all possible causes and careful review of past caseload will be necessary for deeper understanding of this potentially multifactorial event.

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References