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BIOCHEMICAL CHANGES IN THE BLOOD AND ASCITES FLUID OF THE DOGS WITH PERITONITIS

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Abstract. The aim of the study was an analysis of biochemical changes in the blood and ascites fluid of the dogs with peritonitis. The study was conducted on five dogs with septic peritonitis. The examinations were performed as follows: the history and clinical examination, abdominal ultrasound examination, morphological and biochemical examination of selected blood parameters, abdominocentesis and peritoneal fluid examination. In all the dogs the fluid was turbid and bloody, it had high specific gravity, a high level of leucocyte, high concentration of protein, high activity of LDH and a low concentration of glucose. The results of the analysis of biochemical parameters in the ascites fluid suggest septic peritonitis. In all the affected dogs the fluid from the abdominal cavity was transdute. A low concentration of glucose in the peritoneal fluid is an atypical change in dogs with septic peritonitis. The fluid in septic peritonitis usually had a high concentration of total protein and a high concentration of albumin. In our study in all the cases the fluid had a high activity of LDH. These changes are not only typical of septic peritonitis but very often constitute a helpful element of multivariate analysis of septic peritonitis. The microscopic examination of the ascites fluid revealed large numbers of neutrophils and mononuclear cells. The bacteriological examination from the ascitic fluid of dogs showed positive cultures in all the cases. In the fluid from the affected dogs we isolated: *Escherichia coli, Clostridium* spp., *Clopsylo-oxytata, Citrobacter sreundii*, *Streptococcus constellatus, Peptostreptococcus anaerobius* and *Enterococcus* spp.. In all the cases bacterial flora in the abdominal cavity was mixed.

Keywords: dog, peritonitis, abdominocentesis, abdominal fluid

Introduction.The peritoneum is a membrane that lines the abdominal cavity and produces a small amount of fluid that lubricates the abdominal contents (1, 6, 7). In addition, the peritoneum is also responsible for forming adhesions, or scars, in the presence of an inflammatory process. Peritonitis in dogs is characterized as a severe complication of diseases in the abdominal cavity. Peritonitis is an inflammation of the peritoneum which most often is given an adverse prognostic with the potential of fatal evolution (1, 2, 4, 6). It presents itself in three forms: aseptic, septic and combined (4). The septic form is the most common, in which the pathogenic microorganisms rapidly proliferate incurring a severe infectious process. Peritonitis results in the accumulation of excessive fluid within the abdominal cavity. It can be associated with abdominal trauma, abdominal surgery or pancreatitis (2, 3, 4, 6).

Task, the aim of the article. The aim of the study was an analysis of biochemical changes in the blood and ascites fluid of the dogs with peritonitis.

Material and methods. The study was conducted on five dogs with septic peritonitis (1 German Shepherd, 1 American Staffordshire Bullterrier and 3 mixed breeds, aged 4 ± 3 years, 3 females and 2 males). The examinations were performed as follows: the history and clinical examination, abdominal ultrasound examination, morphological and biochemical examination of

selected blood parameters, abdominocentesis and peritoneal fluid examination. The fluid collected from the peritoneal cavity was evaluated according to Light's criteria modified by the author (colour, translucency, special gravity, pH, total protein concentration, glucose, lactic dehydrogenase, leukocyte count, microbiological and cytological examination of the fluid).

Results of researches. The clinical history revealed lethargy and anorexia in all the examined dogs. One dog presented vomiting and diarrhea. In all cases the clinical examination revealed painfulness on abdominal palpation. Clinical signs associated with peritonitis can be vague and non-specific. Peritonitis is often difficult to diagnose. Depression and diffuse abdominal pain of a degree greater than that usually seen following abdominal surgery or trauma are often present (3, 5, 6). The pain may be localized but generalized pain is more common and the animal will often have a tense or "splint" abdomen during palpation. Vomiting and diarrhea may be observed. Abdominal distension may be noted if sufficient fluid has accumulated (6). All the affected dogs in abdominal ultrasound examination had fluid in the peritoneal cavity. The results of morphological and biochemical parameters are shown in Tab. 1.

Tab. 1

Test results of chosen morphological and biochemical parameters in blood

Parametr	Mediana ± SD
erythrocyte [t/l]	4,8 1 ± 0,35
hematocrit [l/l]	0,33± 0,01
hemaglobin [mmol/l]	7,05 ± 0,21
MCV [f/l]	70,5 ± 4,94
MCH [f/mol]	1,47 ± 0,07
MCHC [mmol/l]	20,9 ± 0,28
leucocyte [g/l]	31,75 ± 11,24
limfocyte [%]	7,4 ± 0,84
monocyte [%]	1,45 ± 0,07
granulocyte [%]	91,05 ± 0,91
thrombocyte [g/l]	164 ± 21,21
urea [mmol/l]	4,2 ± 1,69
creatinine [μmol/l]	52,9 ± 62,36
AspAT [U/l]	58 ± 2,82
AlAT [U/l]	23,5 ± 0 ,7
ALP [U/l]	145 ± 123,86
total protein [g/l]	59 ± 1,41
albumin [g/l]	21,5 ± 2,12
amylase [U/l]	1008,5 ± 119,19
lipase [U/l]	1256 ± 627,91

The laboratory blood examinations in the all dogs show marked leukocytosis which is the most common laboratory finding in animals with peritonitis (2, 4, 6). The predominant cell type is the neutrophil and a left shift is often but not always apparent.

Abdominocentesis was performed in all the cases. It is a very useful tool for the diagnosis of peritonitis, but can produce negative results in early cases or in those with localized peritonitis. Approximately 5 to 6 ml/kg of the abdominal fluid is required to produce a positive abdominal tap (6). The peritoneal cavity of healthy animals contains <1 ml/kg of clear yellow transudate which reduces friction between the abdominal organs. In all the dogs the fluid was turbid and bloody, it had high specific gravity, a high level of leucocyte, high concentration of protein, high activity of LDH and a low concentration of glucose (Tab. 2).

Tab. 2

Test results of chosen morphological and biochemical parameters in ascites fluid

Parametr	Mediana ± SD
leucocyte [g/l]	79 ± 56,7
special gravity	1,034 ± 0,005
pH	7,25 ± 0,35
total protein [g/l]	45,25 ± 10,96
albumin [g/l]	42,15 ± 10,11
glucose [µmol/l]	0,57 ± 0,67
LDH [U/l]	137± 24,04

The results of the analysis of biochemical parameters in the ascites fluid suggest septic peritonitis. In all the affected dogs the fluid from the abdominal cavity was transdute. A low concentration of glucose in the peritoneal fluid is an atypical change in dogs with septic peritonitis (7). The fluid in septic peritonitis usually had a high concentration of total protein and a high concentration of albumin (1, 5). In our study in all the cases the fluid had a high activity of LDH. These changes are not only typical of septic peritonitis but very often constitute a helpful element of multivariate analysis of septic peritonitis. The microscopic examination of the ascites fluid revealed large numbers of neutrophils and mononuclear cells. Bacteria were not observed. A cytological analysis of the ascites fluid usually shows toxic degenerative neutrophils with intracellular or extracellular bacteria. Bacteria are sometimes not seen in patients with bacterial peritonitis, especially if they have been receiving antibiotics.

The bacteriological examination from the ascitic fluid of dogs showed positive cultures in all the cases. In the fluid from the affected dogs we isolated: *Escherichia coli, Clostridium* spp., *Clopsylo-oxytata, Citrobacter sreundii*, *Streptococcus constellatus, Peptostreptococcus anaerobius* and *Enterococcus* spp.. In all the cases bacterial flora in the abdominal cavity was mixed.

In all the affected dogs exploratory surgery was performed. In 2 dogs peritonitis was caused by intestinal trauma (foreign body), in 1 dog- by intestinal obstruction and in 2 dogs -by pyometra.

S u m m a r y

Septic peritonitis usually results from bowel perforation, penetrating wounds, surgical contamination, extension of a urogenital infection (ruptured pyometra or prostatic abscess), or it is secondary to biliary rupture with bacterial contamination. Such infections are usually polymicrobial, with increasing contribution from anaerobic bacteria, the more aboral the penetration to the intestinal tract is. Endotoxin is liberated as bacteria proliferate in the peritoneal exudates causing a cascade of events that affects many organ systems and can lead to septic shock and death. Early diagnosis is the first step to avoid serious secondary systemic disease from sepsis. Unfortunately, common clinical signs seen with peritonitis are nonspecific. Abdominocentesis and fluid analysis prove to be very important in early diagnosis. Prognosis depends on the source of infection and treatments given. It is of no debate that early recognition of the problem and aggressive treatment improve survivability of the patient.

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БІОХІМІЧНІ ЗМІНИ У КРОВІ І АСЦИТНІЙ РІДИНІ У СОБАК З ПЕРИТОНІТОМ

Р е з ю м е

Септичний перитоніт як правило є результатом перфорації кишки, проникаючих ран, хірургічного втручання, перебігу урогенітальних інфекцій (піометральна грижа або простатичний абсцес), вторинна до печінкової грижі з бактеріальним зараженням. Такі

інфекції є як правило полімікробними із зростанням впливу анаеробних бактерій залежно від їх проникнення в травний тракт. Ендотоксин вивільняється, коли бактерії розмножуються у перитональних виділеннях, що спричиняє серію подій, які впливають на багато систем органів і можуть призвести до септичного шоку і смерті. Рання діагностика є на ранніх етапах є першим кроком щоби уникнути серйозного вторинного системного септичного захворювання. На жаль, звичайні клінічні ознаки перитоніту не специфіковані. Абдоміноцентоз та рідинний аналіз дуже важливі при ранній діагностиці. Прогноз залежить від джерела інфекції та лікування. Немає сумнівів, що рання діагностика проблеми та радикальне лікування збільшують шанси пацієнта вижити.

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БИОХИМИЧЕСКИЕ ИЗМЕНЕНИЯ В КРОВИ И АСЦИТНОЙ ЖИДКОСТИ У СОБАК С ПЕРИТОНИТОМ

А н н о т а ц и я

Септический перитонит как правило является результатом перфорации кишки, проникающих ран, хирургического вмешательства, протекания урогенитальных инфекций (пиометральная грыжа или простатический абсцесс), вторичная к печеночной грыже с бактериальным заражением. Такие инфекции как правило являются полимикробными с возрастанием влияния анаэробных бактерий в зависимости от их проникания в пищеварительный тракт. Эндотоксин высвобождается, когда бактерии размножаются в перитональніх отделениях, что становится причиной серии событий, которые влияют на много систем органов и могут привести к септическому шоку и СМЕРТИ. Ранняя диагностика является первым шагом, чтобы избежать серьезного системного септического заболевания. К сожалению, обычные клинические признаки перитонита не специфицированы. Абдоминоцентоз и анализ жидкости очень важные при ранней диагностике. Прогноз зависит от источника инфекции и лечения. Нет сомнений, что ранняя диагностика проблемы и радикальное лечение увеличивают шансы пациента вижить.

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