TRADITION AND MODERNITY IN VETERINARY MEDICINE, 2021, vol. 6, No 1(10): 11–14

BLOOD CHEMISTRY IN DOGS WITH SPLENIC HEMANGIOSARCOMA

Tsanko Hristov

Trakia University, Faculty of Veterinary Medicine, Stara Zagora, Bulgaria
E-mail: hristov_vet@abv.bg

ABSTRACT

There were 21 blood chemistry examinations conducted on separate dogs with the average age being 9.6±0.63years with pathohistologically proven hemangiosarcoma of the spleen. The results were compared with a control group of 10 clinically healthy dogs. We confirmed higher values of ASAT, ALAT, AP, bilirubin, hyperproteinemia, hypoalbuminemia, hyperglobulinemia, urea and creatinine.

In conclusion: hemangiosarcoma of the spleen in dogs is accompanied with data for serious kidney and liver dysfunction.

Key words: dogs, splenic hemangiosarcoma, biochemistry.

Introduction

Hemangiosarcoma (HSA, malignant hemangioendothelioma or angiosarcoma) is an extremely aggressive malignant tumor derived from the endothelium of the blood vessels with high metastatic potential and poor prognosis (Karabağli et al., 2011). It most commonly affects the spleen (28–50%) the right atrium (3–50%) and the skin (13%) but it may also be seen in many other organs (Thamma et al., 2006). The average age of newly diagnosed cases is usually between 9 and 12 years, but much younger dogs can also be affected. Breeds with a higher risk are German Shepard, Labrador, Golden Retriever. There is no clear gender predisposition. (Clifford et al., 2000). This neoplasia is more common in dogs than any other species (Lana et al., 2007). Hemangiosarcoma is the most common spleen tumor in dogs. According to multiple studies this type of tumor takes up 50% of all spleen tumors when it comes to dog and around 70% of all malignant neoplasias of the spleen (Thamm, 2007).

Materials and methods

The studies were carried out with 21 dogs referred to the Small Animal Clinic of the Faculty of Veterinary Medicine, Trakia University, Stara Zagora, between 2007 and 2016. Seventeen of the dogs were from big and gigantic breeds. The average age of the dogs being 9.6 ± 0.63 years. In all dogs the type of tumor (hemangiosarcoma) was determined after a pathohistological examination. The results of the chemical blood test were compared to those of the control group. For the control group we used clinically healthy dogs, 5 males and 5 females, between the ages of 4 and 11 years.

Blood samples were collected by venipucture of v. cephalica antebrachii in tubes with heparin as anticoagulants. Samples were assayed immediately. Blood chemistry parameters: blood sugar (mmol/L), ASAT (U/L), ALAT (U/L), total bilirubin (μmol/l), urea (mmol/l), creatinine (μmol/l), alkaline phosphatase (U/L), calcium (mmol/l) and phosphorus (mmol/l) were determined on an automated haematology analyser „Mindray BS-120“ (China). Total protein and albumin were determined in defibrinated blood. The globulin values were obtained as a difference between the total protein and albumin values for each animal.

Data were submitted to statistical analysis (Statistica v. 6.1; StatSoft Inc., 2002). Descriptive statistical methods were used to calculate means and standard errors of means (±SEM). Results were considered statistically significantly different at $p<0.05$.

Results

The results of the chemical study of dogs with hemangiosarcoma of the spleen (n=21) and the dogs in the control group (n=10) are described in Table 1.

Table 1. Blood chemistry in healthy dogs and dogs with hemangiosarcoma

	Control group	Dogs with hemangiosarcoma
Calcium (mmol/L)	2.53±0.09	2.71±0.09**
PHosphorus (mmol/L)	1.18±0.04	1.34±0.08**
Total protein (g/L)	67.1±1.66	70.65±2.76**
Albumin (g/L)	31.06±1.05	24.13±0.94**
Globulin (g/L)	36.04±1.23	46.52±3.09**
ALAT (U/L)	48.6±7.74	169.52±37.51**
ASAT (U/L)	39.8±3.51	107.09±14.39**
Alkaline phosphatase (U/L)	88.1±5.17	1129.48±275.56**
Total bilirubin (μmol/L)	8.39±0.87	18.66±2.83**
Blood sugar (mmol/L)	5.37±0.2	4.71±0.3**
Blood Urea Nitrogen (mmol/L)	6.24±0.99	10.88±1.82**
Creatinine (μmol/L)	99.73±6.12	164.96±39.88**

**p < 0.05, ** p < 0.01*

All Blood chemistry parameters tested in the dogs were statistically significantly changed ($p<0.01$).

The parameters characterizing renal function were most affected. Simultaneous increases in urea and creatinine were observed in only 23.8% of dogs. Liver enzymes (ASAT ALAT, AP) and total bilirubin were also repeatedly increased. In 61.88% of animals all three enzymes were increased. Total bilirubin was increased in 76.16% of the animals. The protein profile was characterized by a slight increase in total protein, mild hypoproteinemia and well-defined hyperglobulinemia. A total of 57.12% of dogs had increased globulin. Blood sugar was reduced relative to the control group. Serum levels of calcium and inorganic phosphorus were slightly altered.

Discussion

Abnormalities in blood chemistry are often reported in literature. The changes we found in the protein profile of dogs with spleen hemangiosarcoma are similar to those described by other authors (Arol et al., 2014). Hyperglobulinemia is a diagnostically significant change in cancer dogs and is due to an acute or chronic inflammatory response to tumor infiltration (Lallo, et al., 2016). The reduced albumin/globulin ratio may be a prognostic indicator of survival in tumor patients (Zhang et al., 2016). Changes in ACAT, AJIAT and bilirubin are indicative of severe hepatobiliary disorders

and liver dysfunction. They are the result of hepatic circulatory disorders, tissue hypoxia, cholestasis, and erythrocyte hemolysis (Gavazza, 2009). The increase in alkaline phosphatase observed in all animals is one of the most commonly reported haematological abnormalities in cancer dogs. (Ahlyum, 2011). Our results are largely similar to those found by Garzotto et al (2000). According to them, high levels of alkaline phosphatase correlate with short patient survival. Paraneoplastic hypoglycemia has been reported in lymphoma, hemangiosarcoma, leiomyosarcoma, mammary adenocarcinoma, plasma cell tumors, renal adenocarcinoma (Battaglia et al., 2005; Lee et al., 2012). Extrapancreatic tumors induce hypoglycaemia through increased of tumor glucose utilization, decreased hepatic glycogenolysis, or glycogenogenesis (Bergman, 2007). Clinical signs due to hypoglycaemia occur when serum glucose falls below 2.5 mmol/L (Finora, 2003). Anorexia, increased protein catabolism and weight loss are all possible causes of increased urea (Gavazza 2009). Hepatic dysfunction is associated with disturbance of the ornithine cycle and also leads to an increase in urea. In 23.8% of dogs, urea and creatinine were increased concurrently, indicating ongoing renal failure. Renal dysfunction develops as a result of tumor-cell infiltration or deposition of calcium salts in the renal parenchyma, with subsequent vasoconstriction and development of renal azotemia (Bergman, 2007). Cell infiltration with monocytes, leukocytes, and lymphocytes can also cause renal ischemia with acute renal failure (Kelly 2006).

Conclusion

Hemangiosarcoma of the spleen in dogs occurs with serious abnormalities in the biochemical blood indicators. The developing liver dysfunction and kidney failure further aggravate the prognosis for this tumor.

References

1. Ahlyum M., Lee E., Kim A., Lee E., Hong I., Jeong K. (2011). Canine hemangiosarcoma in a female Jindo dog. Lab Anim Res, 27(4), 361–363.
2. Albuquerque R., Alice M, Xavier F., De Andrade O., Nascimento T., Silva L., Veloso F., Carlos S. (2014). Unilateral Renal Capsule Hemangiosarcoma in an American Pit Bull Terrier Bitch. Acta Scientiae Veterinariae, 42, 1–5.
3. Battaglia L., Petterino C., Zappulli V., Castagnaro M. (2005). Hypoglycaemia as a Paraneoplastic Syndrome Associated with Renal Adenocarcinoma in a Dog. Veterinary Research Communications, 29(8), 671–675.
4. Bergman P.J. (2007). Paraneoplastic Syndromes. In „Withrow and Macewen's Small Animal Clinical Oncology". by Saunders, an imprint of Elsevier Inc., St. Louis, Missouri 63146, 77–94.
5. Clifford C.A., Mackin A.J., Henry C.J. (2000). Treatment of Canine Hemangiosarcoma: 2000 and Beyond. JVet Intern Med., 14, 479–485.
6. Finora K., (2003). Common Paraneoplastic Syndromes. Clinical Techniques in Small Animal Practice, 18(2), 123–126.
7. Garzotto C.K., Berg J., Hoffmann W.E., Rand W.M. (2000). Prognostic Significance of Serum Alkaline Phosphatase Activity in Canine Appendicular Osteosarcoma. J Vet Intern Med, 14, 587–592.
8. Gavazza A., Sacchini F., Lubas G., Gugliucci B., Valori E. (2009). Clinical, laboratory, diagnostic and prognostic aspects of canine lymphoma: a retrospective study. Comp Clin Pathol, 18, 291–299.
9. Karabağli G., Düzgün O, Yildar E, Erdoğan Ö, Gürel A. (2011). A Hemangiosarcoma Case in a Dog. J. Fac. Vet. Med. İstanbul Üniv., 37 (2), 161–165.

10. Kelly K.J. (2006). Acute Renal Failure: Much More Than a Kidney Disease. Semin Nephrol, 26, 105–113.
11. Lallo M.A., Ferrarias T.M., Stravino A., Rodriguez J.M., Zucare R.C. (2016). Hematologic abnormalities in dogs bearing mammary tumors. R. bras. Ci. Vet., 23(1–2), 3–8.
12. Lana S., U'ren L., Plaza S., Elmslie R., Gustafson D., Morley P., Dow S. (2007). Continuous Low-Dose Oral Chemotherapy for Adjuvant Therapy of Splenic Hemangiosarcoma in Dogs. Journal of Veterinary Internal Medicine, 21(4), 764–769.
13. Lee J.-Y., Shin B.-J., Park J.-Y., Lee Y.-W., Park S.-J., Kim M.-C., Jeong S.-M. (2012). Longissimus lumborum muscle metastasis from mammary gland adenocarcinoma in a dog. Korean J Vet Res, 52(4), 281–283.
14. Thamm D.H. (2007). Miscellaneous Tumors. In „Withrow and Macewen's Small Animal Clinical Oncology". by Saunders, an imprint of Elsevier Inc., St. Louis, Missouri 63146, 785–795.
15. Thamma D.H., Dickersona E.B., Akhtarc N., Lewisb R., Auerbachc R., Helfanda S.C., MacEwena E.G. (2006). Biological and molecular characterization of a canine hemangiosarcoma-derived cell line. Research in Veterinary Science, 81(1), 76–86.
16. Zhang F., Sun P., Wang Z., Wang D., Zha D., Wang F.; Fu J., Xu R., Li Y. (2016). Low preoperative albumin-globulin score predicts favorable survival in esophageal squamous cell carcinoma. Oncotarget, 7, 1–11.