CASE REPORT: ACUTE MYLOID LEUKEMIA IN A DOG

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Signalment:

Magic, a castrated dog male, 13 years of age, small mixed breed; 10 kg.

Anamnesis:

No previous history. House pet with current vaccinations and treatments.

Chief complaint:

Two days before presentation Magic showed gastrointestinal signs of vomiting and diarrhea and neurological symptoms of head pressing and lack of balance.

On physical examination its body temperature was 38.3°C and respiratory rates and heart rates were normal. The dog presented very depressed and weak.

Its mucous membranes were pale and icteric. On abdominal palpation no abnormality was revealed. Its prescapular and popliteal lymph nodes were slight enlarged.

No neurological abnormalities were evident during the examination.

Laboratory examinations

TABLE 1 Clinical - pathological findings:

a) Hematology

Parameter	Result	Units	Expected range ($x10^3/\mu L$)
WBC	72.6	$x10^3/\mu L$	8.0-17.0
RBC	2.2	$x10^6/\mu L$	5.0-8.1
HgB	4.8	G/dL	12.0-18.0
HCT	15.1	%	37.0-55.0
MCV	68.6	FL	60.0-77.0
MCH	21.8	pg	20.0-25.0
MCHC	31.8	G/dL	32.0-36.0
PLT	5	$x10^3/\mu L$	150-500

b) Differential leukocyte count

Parameter	Result ($x10^3/\mu L$)	Expected range ($x10^3/\mu L$)
Neut	43.56	3.60-13.10
Neut stab	4.36	0.00-0.68
Lymph	0.00	0.27-4.10
Mono	24.86	0.18-1.35
Eosin	0.00	0.12-0.75
Baso	0.00	0.00-0.17

TABLE 2 Biochemistry results

Test	Result	Unit	Reference range	
Glue	57	mg/dL	60	147
Choi	184	mg/dL	10.0	60.0
Urea	138.1	mg/dL	10.0	60.0
TP	4.29	g/dL	4.9	7.2
ALP	975	U/L	8	155
ALT	362	U/L	6	70
AST	167	U/L	10	43
Amylose	909	U/L	350	1300
Ca	8.65	mg/dL	9.1	11.7
Crea	2.18	mg/dL	0.5	1.5
Pi	9.9	mg/dL	2.3	6.4
Alb	1.24	g/dL	100	300
Globulins	3.05	g/dL	2.3	4.5
T.Bil	4.19	mg/dL	0.0	0.7
GGT	3	U/L	4	25
Lipase	104	U/L	3	375
Cl	117	mmol/L	97	120
K	4.2	mmol/L	3.5	5.4
Na	150	mmol/L	139	150

Fig 1

Large mononuclear cell population showing severe atypia. The nuclei are highly pleomorphic.The chromatin material appears course to reticular.

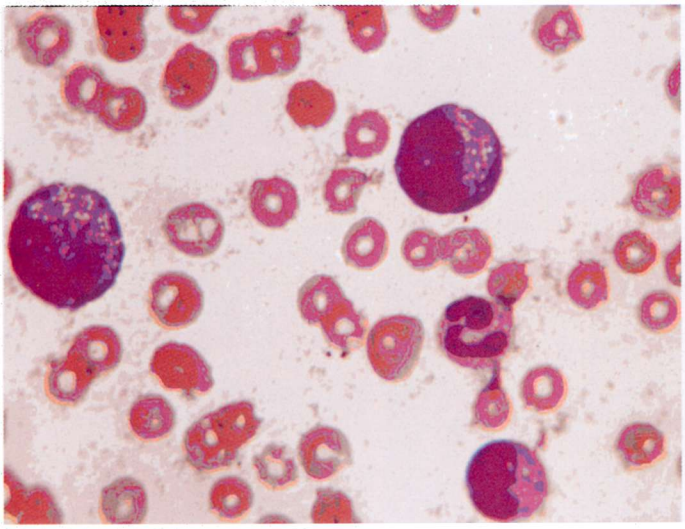
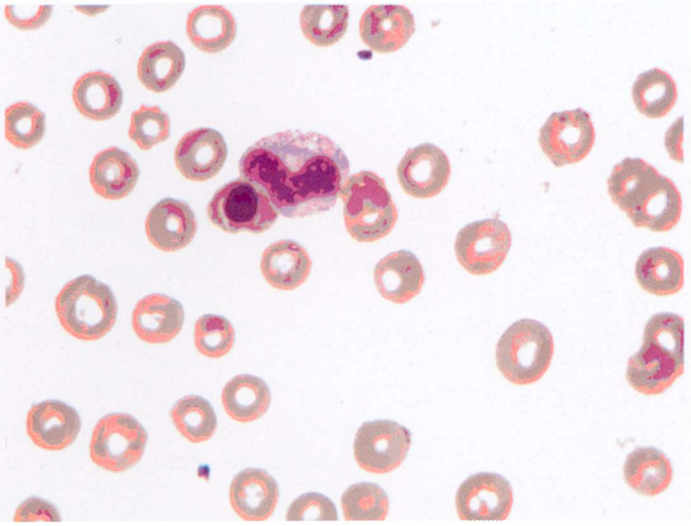


Fig 2

Severe thrombocytopenia is evident on the slide. A band neutrophil and normoblast are present



Leukocyte changes:

- Severe leukocytosis with a marked left shift including the appearance of metamyelocytes without toxic changes.
- The mononuclear cell population appeared to be neoplastic showing severe atypia. The cells were mostly rounded and 3-7 times that of an erythrocyte. The nucleus was highly pleiomorphic varying from round to kidney-shaped to clover-shaped. The appearance of the chromatin material was course to reticular and it was often possible to distinguish a nucleolus. Nucleoli were also large and pleiomorphic.
- The cytoplasm was deeply basophilic in color containing multiple fine vacuoles.
- Many cells show signs of karyorhexis and karyolysis.

Erythrocyte changes:

- Normocytic normorchromic anemia with no evidence of regeneration.
- Many precursor erythrocytes appeared in the blood smear from metarubricytes to basophilic rubricytes.

Platelet changes:

- Severe thrombocytopenia as confirmed in the blood smear with the appearance of megaplatelets.

Biochemistry (Table 2):

- Mild azoetmia and hyperphosphatemia
  - Since urine specific gravity was not measured, a renal azotemia could be only speculated since the dog was not dehydrated on physical examination
- Mild hypocalcemia (Total calcium)
  - When correcting the calcium according to the albumin level, a normocalcemia was speculated.
- Hypoalbuminemia and low albumin\globulin ratio
  - Hypoalbuminemia and a low alb\glob ratio could be attributed both to a state of hepatic failure (globulins could be WNL due to globulins secretion by immunocytes) and a state of protein loosing pathology most probably the latter which could be verified by the urinary protein to creatinine ratio
- Hyperbilirubinemia
- Increased activity of liver enzymes
  - Increased ALT and AST activities indicated hepatocellular damage while increased ALP activity and hyperbilirubinemia indicated cholestasis

Diagnosis

In light of the hematological results (tables 1 and 2), and especially in view of the blood counts and the morphological appearance of the cells in the blood smear (figs 1 and 2,) a diagnosis of ACUTE MYLOID LEUKEMIA (AML) preferably AML M4 (myelomonocytic) or M2 (AML with maturation), or MALIGNANT HISTIOCYTOSIS was made.

A final diagnosis could only be made by immunohistochemistry and cytochemistry staining.

Discussion

The presence of an elevated total nucleated cell count, many of which were blast cells, with concurrent severe anemia and thrombocytopenia was compatible with the diagnosis of acute leukemia. Bone marrow aspiration or core biopsy is sometimes warranted in order to achieve this diagnosis.

Differentiation between a lymphoid or myeloid origin can be suspected on morphologic criteria - lymphocytic cells in origin tend to be 1.5-4 times the size of an erythrocyte, a

round nucleus, a dense and smooth chromatin pattern the could contain a visible nucleolus and a narrow, basophilic and mostly agranular cytoplasm.

On the other hand, myeloid cells in origin tend to be bigger, with a lower N\C ration, a more indented nucleus and lighter and sometimes granular cytoplasm.

A definitive diagnosis can be made using advanced techniques such as flow cytometry and immunohistochemestry.

Acute myeloid leukemias (AML) are uncommon neoplastic myeloproliferative disorders originating from non-lymphoid hematopoietic stem cells, including granulocytic, monoctic, erythrocytic and megakaryocytic lineages. Viruses, chemicals, ionizing radiation and antineoplastic drugs have been associated with AML. Clinical signs associated with AML are nonspecific. Lethargy, weakness, inappetance, fever, splenomegaly, hepatomegaly and mild lymphadenopathy are frequently observed. Leukocytosis, severe anemia, and thrombocytopenia are common laboratory findings. Blast cells are usually, but not always, present in high numbers in the peripheral blood. AML blast cells generally have more abundant cytoplasm that may contain fine granules.

Acute myeloblastic leukemia and myelomonocytic leukemia are the most commonly reported as acute myeloid leukemias of dogs. Cytochemical staining is positive for peroxidase, chloroacetate esterase, leukocyte alkaline phsophatase and acid phosphatase which supports and diagnosis of acute mylomonblastic leukemia (1).

Malignant histiocytosis is a rapidly progressive, ultimately fatal, proliferative histiocytic condition affecting older dogs and cats. In dogs and cats lesions consistently occur in the visceral organs, specifically the lung, liver, spleen, lymph nodes, bone marrow, intestine and central nervous system, but they may be present anywhere. Clinico-pathological features are inconsistent but anemia, thrombocytopenia and bilirubinemia are reported in 30-50% of cases. Phagocytosis of erthrocytes, leukocytosis, neoplastic cells and hemosiderinare generally prominent.

Positivity of lysozyme and α-1-antitrypsin (αAT) by cytochemical staining supports a diagnosis of Malignant histiocytosis (2)

REFERENCES

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2. Deheer, LH. And Grindem, CB. Histiocytic disorders. In Schalm's Veterinary Hematology. Eds: Feldman, BF., Zinkl, JG. And Jain, NC. Lippincott Williams and Wilkins, Philadelphia. pp. 696-705. 2000.