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CONTENTS

Comprehensive case report of a mast cell tumor in a dog: clinical, cytological and histopathological analysis

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ABSTRACT: This case describes a mast cell tumor (MCT) in an 11-year-old male dog presented with a history of 5-6 years old pendulous mass (8-10 cm diameter) with a firm base and ulcerated apex, located between the forelimbs and at the level of sternum. Fine needle aspiration cytology of the tumor revealed characteristic features of mast cell tumors, such as pleomorphic round cells with coarse basophilic cytoplasmic granules, hyperchromatic nuclei, prominentnucleoli, and an increased nuclear-to-cytoplasmic ratio, which were found consistent with the histopathological findings. Additionally,toluidine blue staining was used for the identification of mast cells. This case under scores the typical clinical presentation, cytological characteristics, and histopathological findings associated with mast cell tumors in dogs, illustrating the importance of both cytologicaland histopathological evaluation in diagnosing and managing MCTs.

Key words: Cytology, dog, histopathology, mast cell tumor (MCT),toluidine blue

Mast cell tumors (MCTs), also called mastocytomas, are among the most frequently diagnosed skin tumors in dogs. These tumors originate from mast cells that have undergone malignant transformation. The majority develop as primary tumors in the skin and represent approximately 20% of all reported skin tumors (London and Thamm,2013). Although any dog can be affected, certain breeds, including Golden Retrievers, Labrador Retrievers, Boston Terriers, Pit Bull Terriers, and Pugs, have a higher predisposition (Garrett, 2014).

Around half of the canine mast cell tumors (MCTs) are located on the trunk, perineal, and inguino-genital regions, while about 40% develop on the limbs, and the remaining 10% occur on the head and neck (Daleck *et al.,*2016). Cutaneous MCTs have a wide range of gross appearance, from firm, superficial, well-circumscribed mass with ulceration and erythema on the surface to soft, poorly defined, raised lesion which lacks ulceration or erythematous changes (Pelt *et al.,*1986).

MATERIALS AND METHODS

Case history:A male dog, aged 11 years, was presented at Veterinary Clinical Complex of Dr. G. C. Negi College of Veterinary and Animal Sciences with a history of a pendulous mass between the forelimbs and at the level of sternum. The mass had been present for about 5–6 years, and it gradually increased in size to the point where it touched the ground when the dog stood.

Clinical Examination and Diagnostic Workup:A physical examination of the growth was conducted to observe its size, color, and texture. Blood sample was taken for complete blood count (CBC) and biochemical analysis.

Cytology and histopathology: Fine needle aspirate from the growth was taken for cytological evaluation which was stained with Giemsa for 45 minutes after fixing with methanol for 5-10 minutes. The growth was then excised and received at the Depart-

ment of Veterinary Pathology for histopathological analysis. The collected tissue samples were processed using the routine paraffin embedding technique, and sections measuring 4 to 5 µm in thickness were cut and stained using the Haematoxylin and Eosin (H&E) method (Luna, 1968). Recording and microphotography of all visible microscopic lesions were performed using a binocular research microscope (Olympus, BX-40) fitted with a digital camera (Olympus, 8.1 mega pixel). Special staining with Toluidine blue was done for confirmatory diagnosis (Atiakshin *et al.,*2017).

RESULTS AND DISCUSSION

Clinical Findings: Physical examination of the growth revealed the presence of well-demarcated, raised, erythematous, hard at the base, pendulous, painful growth of around 8-10 cm diameter with a depressed,bleeding ulcer at the apex (Figure 1). These clinical characteristics align with previous observations that canine mast cell tumors (MCTs) may appear as firm, raised, and ulcerated cutaneous masses (Pelt *et al*.,1986; Mullins *et al.,* 2006). No regional lymphadenopathy was observed, indicating the absence of metastatic spread.

Hematological and Biochemical Findings:White blood cells (WBC) count was found to be in a slightly higher range, indicating secondary inflammatory response due to ulceration of the tumor (Table 1). The biochemical analysis revealed elevated levels of Alkaline Phosphatase (ALP) and Total Protein, suggestive of neoplastic activity and ongoing inflammation, likely associated with histamine release from mast cell granules (Pelt *et al.,* 1986; Zhelavskyi *et al.,* 2025) (Table 2). In the present case, the increase in Total Protein was mostly due to enhanced globulin synthesis resulting from chronic immune stimulation induced by the mast cell tumor (Tsai *et al.,*2010). Additionally, the age of the dog (11 years) may have also contributed to the elevation in Total Protein levels, as protein concentrations are known to rise with advancing age (Strasser *et al.,*1993).

Cytological Findings: Giemsa-stained cytological smear revealed the presence of abundant round cells with pleomorphism,prominent nucleoli, hyperchromatic nuclei, increased nuclear to cytoplasmic ratio,and small basophilic metachromatic granules characteristic of mast cells. Figure 2 shows round cells with active nucleoli, coarse chromatin material and cytoplasmic granules. Few cells exhibit blue cytoplasm. The cytological findings were in agreement with the findings of Cowell *et al*. (2007) and Subapriya *et al.* (2024).

Table 1: Complete blood count (CBC) profile

Parameter	Result	Reference Range
WBCs	12.20 X 10^3 /µL	4-12X10^3/µL
Neutrophils%	71.2%	51-72%
Lymphocytes%	25.2%	8-35%
Monocytes%	3.4%	1-9%
Eosinophils%	0.2%	0-9%
RBCs	5.90X10^6/µL	5.7-10.5X10^6/µL
HGB	11.1g/dL	9-16 g/dL
HCT	38.6%	38-52%
PLT	225X10^9/L	160-420X10^9/L

WBCs=White Blood Cells**,** RBCs=Red Blood Cells, HGB= Hemoglobin, HCT=Hematocrit, PLT= Platelets

Table 2: Biochemical profile

Test	Result	Reference Range
Glucose	107.69 mg/dL	76-119mg/dL
Bilirubin total	0.09 mg/dL	0-0.3mg/dL
SGOT	25.73 U/L	13-30U/L
SGPT	23.57 U/L	10-109U/L
Alkaline Phosphatase	124.27 U/L	1-114U/L
Total Protein	8.34 g /dL	5.4-7.5g /dL
BUN	19.68 mg/dL	8-28mg/dL
Creatinine	1.23 mg/dL	0.5-1.7mg/dL

SGOT=Serum Glutamic Oxaloacetic Transaminase, SGPT=Serum Glutamic Pyruvic Transaminase, BUN= Blood Urea Nitrogen

Table 3: Three-tier grading system for canine cutaneous mast cell tumors by Patnaik *et al.* (1984)

Grade I	Well differentiated cells, confined to dermis, absence of mitotic activity
Grade II	Moderately pleomorphic cells, infiltration into deeper dermal and subcutaneous tissue, 0 to 2 mitotic cells per high-power field (hpf)
Grade III	Pleomorphic mast cells with frequent binucleation, increased mitotic cells, extending into and replacing subcutaneous and deep tissues

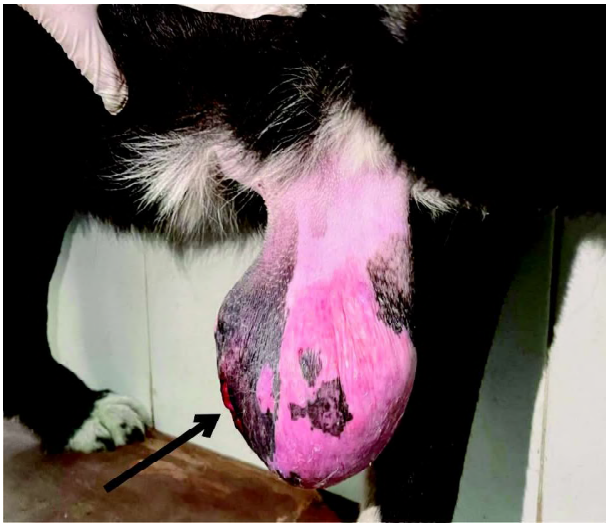

Fig.1: Pedunculated, hyperemic growth of around 8-10 cm diameter, with evident ulceration (black arrow),hanging from the ventral aspect of body.

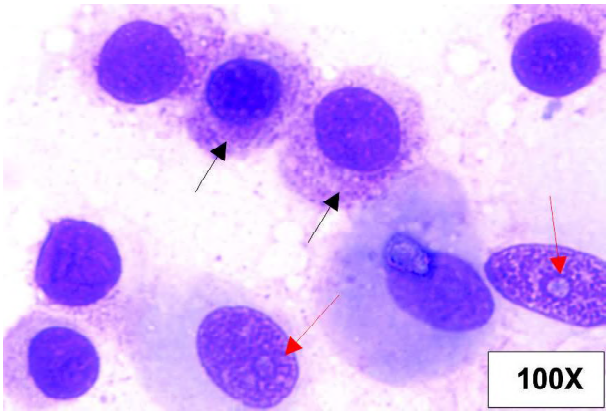

Fig.2:Cytosmear (at oil immersion):Presence of abundant round cells with prominent nucleoli (red arrow), metachromatic granules (black arrow), hyperchromatic nuclei, increased nuclear to cytoplasmic ratio, pleomorphism in cells. (Giemsa stainx100x)

Histopathological Findings: H&E-stained tissue section revealed the presence of multiple densely cellular areas in the deep dermis and subcutaneous tissue. The cells were darkly stained mast cellsof variable size, round to irregularly oval, with prominent and multiple nucleoli, and hyperchromatic nucleus (Figure 3). When stained with toluidine blue, numerous small, basophilic granules, also known as metachromatic granules, were seen in the cytoplasm of these cells (Figure 4). Similar histological findings were reported by Meuten (2002) and Subapriya

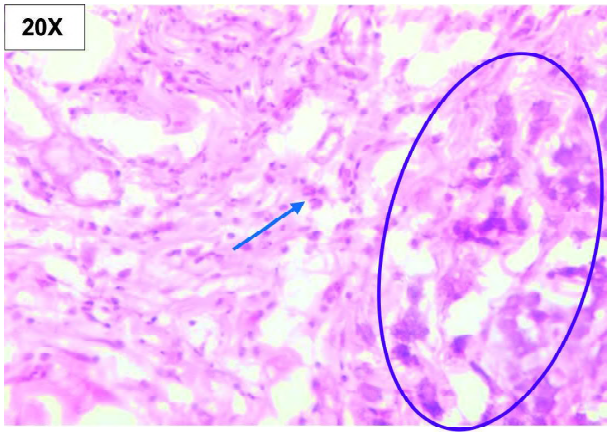

Fig.3:H &E stained tissue section (20X magnification) showing the presence of darkly stained mast cells (within purple circle) along with eosinophils (blue arrow) in deep dermis layer (H&Ex20x)

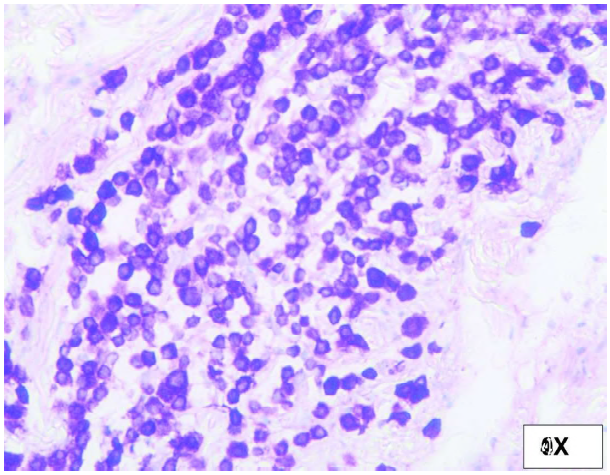

Fig.4:Tissue section stained with Toluidine Blue at 40X magnification showing abundant mast cells (stained purple) and showing characteristic metachromatic granules in cytoplasm with pleomorphism (Toluidine bluex40x)

et al. (2024). Eosinophils were also seen alongside these cells. The diagnosis of mast cell tumor was made based on these histological features. According to the three-tier grading system of Patnaik *et al.* (1984), the neoplasm was placed in Grade II due to presence of moderately pleomorphic cells, limited to deeper dermal and subcutaneous tissue and exhibiting 0-2 mitotic cells per high power field (hpf) (Table 3).

CONCLUSION

This case describes a Grade II mast cell tumor in an

elderly dog, diagnosed through cytology, histopathology, and toluidine blue staining. Cytology revealed round cells with anaplastic changes and granules, while histopathology confirmed mast cell infiltrates in dermis and subcutis. Elevated alkaline phosphatase and proteins indicated neoplastic activity, with absence of lymphadenopathy suggesting localization. Prognosis varies with tumor grade, site, and metastasis; low-grade tumors respond well to surgery, whereas high-grade require aggressive therapy. This case highlights the importance of routine veterinary check-ups and integrated diagnostics for early detection and improved canine welfare.

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