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Research Article

Cutaneous Mast Cell Tumor in a Pug: Surgical Management and Histopathological Findings

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Abstract

Mast cell tumors (MCTs) account for 7-20% of canine cutaneous neoplasms. A six-year-old female pug was presented with a history of progressively developed swelling between the left caudal abdominal and inguinal mammary glands for two months. On clinical examination, an ulcerating hard mass was found protruding from the left lower abdomen. Cytological examination of the mass using fine needle aspiration cytology suggested cutaneous MCT. The surgical resection of the mass was performed under general anaesthesia. Histopathological findings revealed round cell tumor containing conspicuous granules and confirmed it as grade I MCT with no signs of malignancy. Postoperatively, antibiotics and analgesics were administered for seven days. The animal made an uneventful recovery.

Keywords: Mast Cell Tumor; Pug; Surgical Excision; Histopathological Grading

Introduction

Mast cell tumors (MCTs) are commonly reported canine cutaneous neoplasms accounting for about 20% of the total skin tumors [3]. The genetically predisposed breeds for MCT include Boxers, Boston terriers, Staffordshire, Pugs, and Labrador retrievers [4]. The biological behaviour of MCT is unpredictable. It can manifest either as a solitary-dermal nodule or as an ulcerated fluctuating soft mass resembling that of a lipoma. It can progress from a simple benign to a malignant metastatic form. MCT exhibits properties of distant metastasis, paraneoplastic syndrome, and local recurrence. The major complications associated with the MCTs are paraneoplastic syndrome and anaphylaxis. Most mast cell tumors are found in the skin, lungs, gut, and liver in canines. The common predilection sites of MCTs are the skin of the upper posterior limb, perineal, and preputial region. The MCTs of the muzzle, perineal and preputial area are highly prone to metastasis [2].

A *c-kit* proto-oncogene encoded type III transmembrane receptor kinase called the stem cell factor receptor (KIT) is a major determinant in MCT formation. The dysregulated expression of this gene leads to the neoplastic transformation of the mast cells [8]. The common systemic sequela of MCTs is gastric and duodenal ulcers, coagulopathies, haemorrhage, anaphylaxis, and perforating peritonitis. Histopathological grading of the tumor is a superior tool for confirmatory diagnosis as well as predicting the prognosis of the disease. Surgical excision, radiotherapy, chemotherapy, or combinations of these therapies are adopted to manage canine MCTs [2].

The present case report describes the clinical finding, surgical management, and histopathological findings of a cutaneous mast cell tumor in a pug.

Materials and Methods

A six-year-old female pug was presented to the Referral Veterinary Polyclinic and Teaching Veterinary Clinical Complex, IVRI, Bareilly, Uttar Pradesh, India, with a history of progressively developed swelling in the left lateral abdomen between the caudal abdominal and inguinal mammary glands since two months. On clinical examination, an ulcerating, hard, sessile, pedunculated mass of size 5 cm was noticed (Figure 1a and b). The physiological parameters were within the normal range. Giemsa staining of fine needle aspirate from the tumor maas revealed a population of round neoplastic cells with conspicuous granules suggestive of

Figure 1: (a) Animal presented with the tumor mass. (b) Ulcerated hard mass of 5 cm diameter.

MCT (Figure 2). No evidence of metastasis could be detected on the thoracic radiograph (Figure 3). Haematological findings included total leukocytosis, lymphocytosis, and eosinophilia (Table 1).

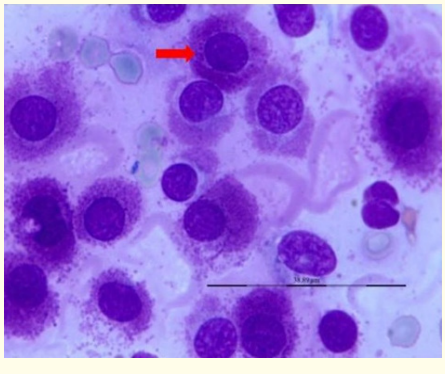

Figure 2: FNAC with round neoplastic mast cells containing cytoplasm filled with darkly stained conspicuous granules (arrow) (Giemsa staining).

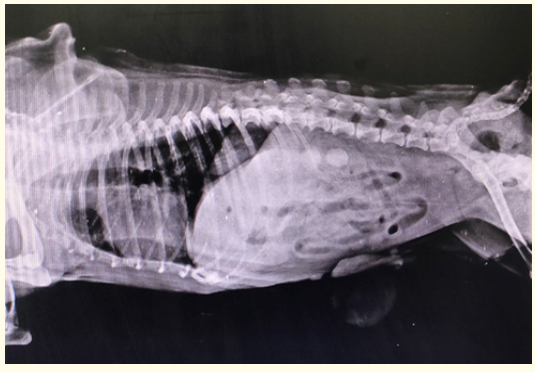

Figure 3: Thoracic radiograph without any evidence of metastasis

Parameter	Day 0 values	Reference values*
Hemoglobin (g/dL)	12.1	11.9 - 18.9
RBCs (× 10^6/L)	5	4.5 - 6.5
Total leukocyte count (per mm^3)	21,000	4 - 11,000
Lymphocyte (%)	59	20 - 45
Monocyte (%)	0	1 - 8
Basophil (%)	0	0-1
Eosinophil (%)	11	1-6
Platelet count (lakh/mm^3)	4	2-6
PCV (%)	33	35 - 57

Table 1: Haematological parameters of the dog on the day of surgery.

*Hematology reference values, The Merck Veterinary Manual - 11th edition (2016).

Result and Discussion

The dog was premedicated using atropine sulphate at the rate of 0.04 mg/kg body weight subcutaneously and midazolam at 0.2 mg/kg intramuscularly. The anesthesia was induced with ketamine at the rate of 5 mg/kg body weight intravenously and maintained with 2% isoflurane till effect. After aseptic preparation of the surgical site, an elliptical incision was made approximately 3 cm away from the margin of the tumor mass. Next, the skin and subcutaneous tissue were dissected, and the major blood vessels supplying the tumor mass were ligated. Finally, the tumor mass was excised,

and the subcutaneous tissue and skin were closed in a routine manner (Figure 4a). Postoperatively, cefotaxime at 50 mg/kg body weight and meloxicam at 0.2 mg/kg was administered intramuscularly for seven and four days, respectively. The animal made an uneventful recovery without any recurrence, even after eight months of follow-ups.

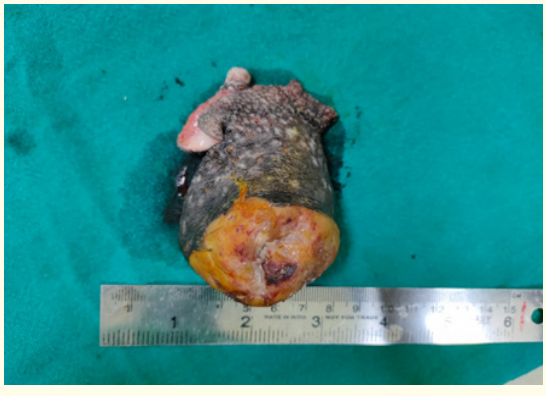

Figure 4: Resected tumor mass.

The haematological examination revealed eosinophilia, which was suggestive of degranulating tumor cells and associated histamine release. The histopathological evaluation of resected tumor mass confirmed the case as a grade 1 MCT without any malignancy lesions. The tissue sections from the mass were stained with hematoxylin and eosin (H&E). Examination of stained sections revealed densely packed, round, neoplastic mast cells with cytoplasm containing conspicuous granules (Figure 5). The degranulation of the granules possibly resulted in uncontrollable local inflammatory changes and systemic reactions evidenced by the ulcerative soft tissue mass.

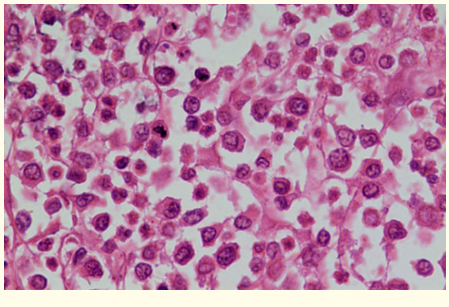

Figure 5: (a) Tissue section showing densely packed round neoplastic mast cells with cytoplasm containing conspicuous granules (asterisk) and few mitotic figures (arrow) (H&E, x40).

Tumor grading is of paramount importance in the diagnosis as far as malignancy is concerned. Grade I tumor exhibits benign features, whereas grade III features tend to be malignant. The Patnaik system, Kiupel system, mitotic index, etc., are accepted for grading MCTs. The grade I tumors are discrete, well-differentiated, and can be excised with a wide surgical resection margin. Additionally, grade I tumors show a better survival time. Large irresectable grade II tumors require radiotherapy along with surgical excision. Grade III tumors are refractory to either single or combination therapy, and the prognosis is very poor [6]. The clinical staging of MCTs has an important role in determining the prognosis of the disease. The lymph node FNAC, with more than 3% of the mast cell population, is considered to have amplified chances of metastasis [2].

Chemotherapy is mainly indicated for grade II and III tumors that tend to metastasize. The combination of vinblastine and prednisolone is the chemotherapy protocol of choice in canine MCTs [1]. Lomustine, multi-agent chemotherapy with vincristine, cyclophosphamide, hydroxyurea, and prednisolone are the other drugs used to treat canine MCTs [7]. The MCTs of the less invasive regions, such as the head or distal limb, are treated with a combination of high doses of prednisolone followed by radiotherapy. The emerging treatment modalities using protein kinase inhibitor molecule like SUII654 offers a promising role in preventing canine MCT [5].

Conclusion

The decision for surgical management of MCTs relays on the histopathological tumor grading system. Grade I tumors are easily managed with local surgical resection without any recurrence. Grade II and III tumors should be treated with surgical excision and adjuvant chemotherapy or radiotherapy. Early diagnosis and histopathological grading will aid in selecting appropriate treatment protocols and increase success rates.

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