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Case Report

Surgical Treatment of Primary Mast Cell Tumor in Mucosal Surface of Lower Lip in a Dog: A Case Report

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ABSTRACT

Introduction: Mast cell tumors (MCTs) have been described as a form of cancer affecting a specific type of blood cell that typically plays a role in the body's reaction to allergens and inflammatory processes. The MCTs have been classified as skin tumors in dogs which can also affect other areas of the body, such as the spleen, liver, gastrointestinal tract, and bone marrow. The present study investigated the clinical and histological signs, biological behavior, and treatment of primary oral mast cell tumors.

Case report: A 3-year-old neutered female, weighing 18 kg and classified as a medium mixed breed, was referred to a veterinary clinic in Mashhad (Iran) due to the presence of a pink, lobulated mucosal mass located on the internal surface of her lower lip. Although the vital signs were normal, clinical examination, radiology, and an incisional biopsy were performed from the lesion site under general anesthesia for histology study. Histopathological features were similar to those of mastocytoma in this case. On presentation, no concurrent mass was found on other sides of the body. Mandibular lymph nodes were not enlarged; however, the incisor teeth of the mandible were loosed. Accordingly, the primary oral MCTs were diagnosed. The surgery was done and After a follow-up period of 150 days post-excisional surgery for a Mast cell tumor, the patient remained alive and exhibited no visible signs of tumor recurrence or surgical complications.

Conclusion: The current case report defined a primary Mast cell tumor with slow tumor growth and without metastasis in the mucosal surface of the lower lip in a dog treated by complete excisional surgery only, unlike some previous studies of primary oral MCTs in dogs with aggressive biological behaviors.

1. Introduction

Mastocytoma (Mast Cell Tumor [MCT]) has been more frequently observed in dogs compared to cattle, horses, and humans[1]. This tumor is recognized as the most prevalent type of cutaneous tumor in canine, accounting for approximately 7 to 21% of all diagnosed canine skin neoplasms[2-4]. These tumors arise from the dermis or subcutaneous tissue in any location of the canine body, particularly in the upper posterior limb, as well as in the perineal and preputial areas[1]. However, a proportion of the MCTs has been found in the mucocutaneous region or mucosal surfaces[5]. The clinical behavior of this tumor is unpredictable, ranging from benign to malignant[3,4,6]. A histologic staging (I- III) describes the classification of the cutaneous Mast cell based on histomorphologic features[2]. According to the invasive biological behavior, 29%-40% of cutaneous MCTs are considered stage III and undifferentiated morphology with a metastasis rate of 55%-96%[7]. Several parameters, including genetic causes, neuter status, sex, age, weight, insurance status, and specific breed types contribute to the development of MCT[6]. Mutations of the c-kit tyrosine kinase receptor have been reported in up to 40% of dogs with a skin type of MCT, which are reported in 25%-30% of intermediate to high-grade tumors[2,5]. The MCT tumor can develop in

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dogs of any age and breed; however, it is more frequently observed in middle-aged to older dogs, particularly in breeds, such as golden retrievers, Labrador retrievers, Boston terriers, boxers, and pugs[2]. Primary locations of MCT, apart from the skin, include the oral cavity, with the liver and spleen being affected only on rare occasions[1,8]. Anatomical sites may serve as significant indicators for prognosis. The presence of MCT in visceral organs is associated with a cautious outlook[3]. Several approaches have been reported for the treatment of MCT, such as local treatments (surgery, electrochemotherapy, radiotherapy, and tigilanol tiglate (Stelfonta®)), systemic treatments (anticancer drugs and tyrosine kinase inhibitors), support, and palliative treatment. The selection of a suitable treatment approach depends on the patient's health condition and the characteristics of the tumor[9].

Previous studies have provided limited information regarding primary oral MCT, with only a small amount of clinical and histological data, as well as insights into biological behavior, being documented[10]. Although previous reports indicated that mastocytomas in the oral cavity have aggressive biological behavior, the present report described a well-differentiated primary mastocytoma in the oral cavity of a dog without aggressive biological behavior treated only by excisional surgery.

2. Case report

A 3-year-old neutered female, weighting 18 kg medium mix-breed dog with a pink and lobulated mucosal mass on the internal surface of her lower lip was referred to the pet clinic in Mashhad in 2023 for dysphagia, present blood in saliva, and without response to antibiotics drugs. The mass was discovered approximately eight weeks ago. After clinical examination and radiology, an incisional biopsy was performed using a sharp scalpel blade (N: 10) from the lesion site under general anesthesia for histology study.

2.1. Histopathological study

A biopsy was performed on the mass after administering anesthesia, which consisted of an intravenous injection of a combination of midazolam (Caspian Tamin, Iran) at a dosage of 0.2 mg/kg and ketamine hydrochloride 10% (Alfasan, Netherlands) at a dosage of 6 mg/kg[11] by surgical incision and plunged into in 10% formalin that referred to the Pathology Department of the School of Veterinary Medicine, Ferdowsi University of Mashhad, Iran. Tissue was fixed in formalin 10% and following tissue processing, ovarian samples were embedded in paraffin blocks, sectioned at 5 µm, and stained with haematoxylin and eosin (H and E) for light microscopic examination.

2.2. Radiographic study

Patients were directed to the Radiology Department at the School of Veterinary Medicine, Ferdowsi University of Mashhad, Iran, for radiological services.

2.3. Surgery

Seven days before the surgical procedure, prednisone (Nisopred®, Iran) was given at a dosage of 1 mg/kg orally every 24 hours to mitigate peritumoral edema[10]. The xylazine (Alfasan, Netherlands) at a dosage of 1 mg/kg was administrated IM as a premedication medicine[11]. The cephazoline (Cefzolix®, Iran) (22 mg/kg IV) was administered to prevent infection[12]. Following the intravenous administration of an anesthetic combination consisting of midazolam (Caspian Tamin, Iran) at a dosage of 0.2 mg/kg and ketamine hydrochloride 10% (Alfasan, Netherlands) at a dosage of 6 mg/kg, the dog was intubated and placed in a dorsal recumbent position[11](Figure 1). Anaesthesia was maintained with an inhalation agent (Isoflurane [Piramal Critical Care, USA]). Following the aseptic preparation of both the oral cavity and the surgical site, a full-thickness mass along with a minimal margin of 1 cm of normal soft tissue and bone was excised through

Figure 1. The 3-year-old neutered mixed breed dog with Mast cell Tumor (arrow), in the mucosal surface of the lower lip was intubated and positioned in dorsal recumbency

Figure 2. Open mouth radiograph of the mandibular dental arcade in the 3-year-old neutered mixed breed dog with Mast cell Tumor

bilateral rostral mandibulectomy, adhering to the protocol outlined by Fossum[12] in the small animal surgery textbook. Meloxicam (Meloxivet® 2%, Iran) at 0.2 mg/kg, SC, and morphine (Opirect®, Iran) at 0.1 mg/kg, SC, were injected as analgesic agents[11].

A pink, lobular, and fragile mass (roughly 2 × 1 × 0.5 cm) was found on the mucosal surface of the lower lip. The incisor teeth of the mandible were loosed. Vital signs were reported to be normal and no mass was found on other sides of the dog's body. The mandibular lymph nodes exhibited no signs of enlargement.

At intervals of 30, 60, 90, 120, and 150 days post-surgery, there was no visible indication of tumor recurrence or surgical complications on the operated side.

Soft tissue mass (rostral aspect of left mandible) and osteolysis (rostral part of both mandibular bones) were observed in the radiology report (Figure 2). Furthermore, mandibular incisors were loosed, and left and right lateral thoracic radiographs indicated no evidence of metastatic lesions and lymphadenomegaly.

The microscopic analysis of the mass demonstrated a proliferation of round cells characterized by eosinophilic cytoplasm and spherical nuclei. Mitotic figures were rare (0- 2 per high power field). The necrotic foci, collagen fiber degeneration, inflammatory cell infiltration, and blood cell lakes in various sizes and shapes were seen (Figure 3).

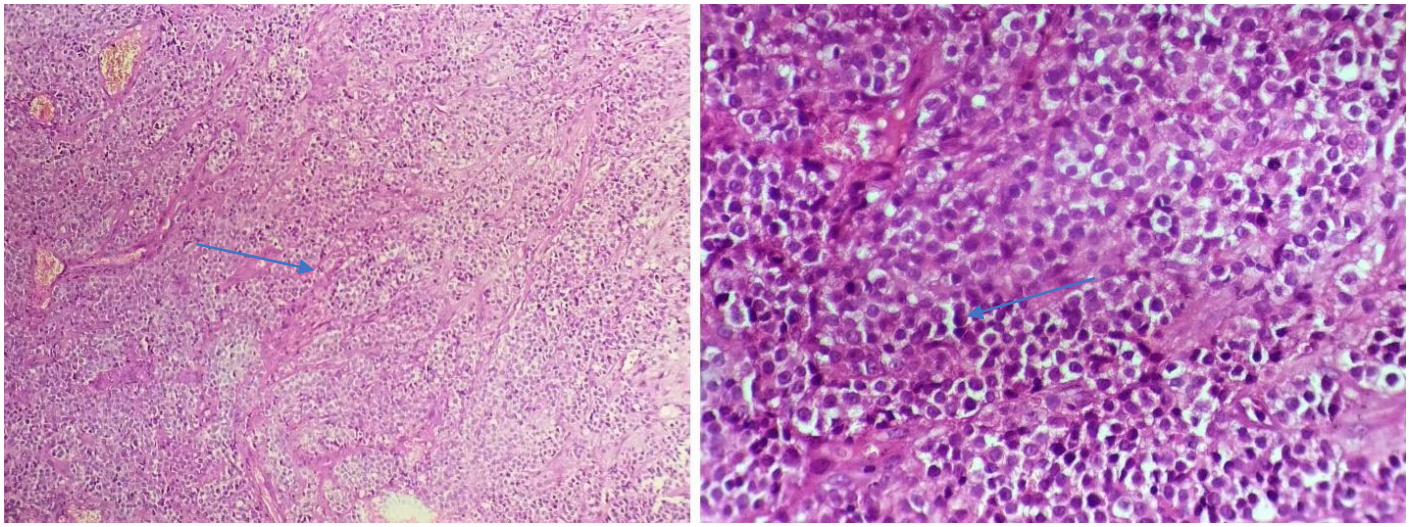

Figure 3. Photomicrograph of oral Mast cells Tumor sections stained with hematoxylin and eosin (H and E) in the 3-year-old neutered mixed breed dog with Mast cells Tumor (arrow), Mast cells proliferate with eosinophilic cytoplasm and round-shaped nuclei (arrow). Necrotic foci, collagen fiber degeneration, inflammatory cell infiltration, and blood cells varying in size and shape are seen (Magnification 400x)

3. Discussion

The prevalence range of primary tumors of the oral cavity was reported from 0% to 5% of all canine MCTs[10]. Numerous reports lacked sufficient data to determine whether the MCTs of the oral cavity were identified as a primary tumor or classified as a metastasis[9,10]. In the present study, lack of cutaneous lesions, absence of either pulmonary or distant metastases at presentation time, results of physical examination, regional lymph node palpation, diagnostic imaging, and histologic examination established extracutaneous sites of origin for the reported mast-cell tumor.

Garrett[2] indicated that the survival time for dogs with local metastases in the lip was reported to be six months or less at the time of MCT diagnosis. In addition, the presence of mastocytoma on the muzzle, mucocutaneous junction, or mucosa in the oral cavity, has been reported with more aggressive biological behavior and a high risk of regional lymph node metastasis[5,13,14]. The occurrence of

documented metastasis to the local (mandibular) lymph nodes ranged from 55% to 59% in cases of primary mastocytoma affecting the muzzle, oral cavity, and perioral regions[2]. However, a recent study reported that 72% of dogs with mastocytomas arising from the oral and perioral regains had metastases in lymph nodes at presentation time[5].

Dogs with metastasis MCTs in their lymph nodes exhibited a poor prognosis, and the prevalence of lymph node metastasis within this cohort significantly influenced both clinical outcomes and treatment strategies[7,15].

Certain findings obtained from a history and physical examination have been identified as indicators of prognosis. Recent, rapidly progressive, and fixed to deeper tissues, ulcerated MCT had a more guarded prognosis in dogs[2]. In this case, no evidence of depression, lethargy, enlarged mandibular lymph node, or lymphadenopathy has been reported. Besides the incisor teeth loosening, osteolysis of the rostral part of both mandibular bones was illustrated in radiology findings in this case. The thoracic radiograph excluded the possibility of metastasis from MCTs and the presence of lymphadenomegaly.

According to available data, risk factors, such as age, weight, and breed were associated with canine MCTs. A heightened risk of cutaneous MCTs has been observed in dogs weighing between 30.01 and 40.00 kg and aged between 8 and 10 years in England[6]. Sinonasal MCTs were observed in medium to large-breed male dogs with an average age of 10 years[16]. In the current study, the patient's age did not fall within the high-risk age, and no association was recorded between MCTs and sex[6].

The patient in the present study was a 3-year-old neutered female dog, weighing 18 kg and classified as a mix-breed. Most features of histopathology in this case were similar to previous reports[1,17]. Pathological findings showed that most mastocytomas are combined of well-differentiated cells with variable eosinophilic cytoplasmic granules metachromatically in histological slides stained Giemsa and toluidine blue stains[10]. Several reports have indicated the presence of eosinophil infiltration within the tumor; however, significant infiltration of these cells has not been noted in this particular case. Furthermore, mitotic figures were not common and all tumors were non-encapsulated[8-10]. Additionally, some reports found the presence of necrotic cells, fibrosis, and mineralization in these tumors but fibrosis and calcification were not observed in the present study[7,9].

The treatment strategies for mastocytoma tumors have been thoroughly detailed in the textbooks Clinical Veterinary Oncology and Kleintieronkologie[1]. Surgery excision has been described as the mainstay in mastocytoma tumor therapy[1,10,17-19]. The recurrence of canine MCTs has been recorded as low as 5%-11% in low, and intermediate-grade with surgery[10]. Radiation therapy, chemotherapy, and steroid therapy may serve as effective adjunctive or primary treatment options for dogs diagnosed with high-grade mast cell tumors[1,3,9,10, 17-21]. Rassnick Rassnick et al.[18] indicated that postoperative radiation therapy may decrease the recurrence of canine mast cell tumors (MCTs) and enhance survival rates. It was recorded that up to 97% and 86% of dogs, respectively were disease-free and without recurrence after one year of radiation therapy[18]. Systemic chemotherapy has been employed as a treatment for canine MCTs classified as grade III, as well as for dogs with moderately differentiated grade II MCTs, in cases where surgical excision or radiation therapy was either not feasible or unsuccessful[18]. Due to an increase in incisional complications, careful utilizing adjunctive chemotherapy, ≤ 30 days after surgery was suggested[22]. In addition, the use of prednisone could decrease tumor volume without an increase in postoperative incisional complications to facilitate complete tumor excision in canine MCTs[22]. In the present study, complete excision was performed 7 days after administration of oral prednisolone. Moreover, bilateral rostral mandibulectomy surgery was done due to osteolysis of rostral mandibular bones. The dog survived 150 days after surgery, experiencing no surgical complications and showing no visible signs of tumor recurrence.

4. Conclusion

The present case report investigated a well-differentiated primary mastocytoma in the oral cavity of a dog treated by excisional surgery. Although previous reports indicated that mastocytomas in the oral cavity have aggressive biological behavior, such as rapid tumor growth or metastasis, the present reported, evidence of cutaneous lesions, local lymphadenomegaly, metastasis, and tumor recurrence was not observed 150 days after excisional surgery. However, a large number of canine oral mastocytomas with further data are required.

Declarations

Competing interests

The authors declare that they have no conflict of interest.

Authors' contributions

Ensiye Sajadian Jaghargh conducted the concept-actualization, data curation, investigation, methodology, supervision, validation, and writing, of the original draft. Ali Mirshahi did data curation, investigation, methodology, validation, writing, review, and editing. Hanieh Shaterzadeh Yazdi did methodology, validation, and writing – review and editing.

All authors checked and approved the final version of the manuscript for publication in the present journal.

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Availability of data and materials

Except for the raw data, authors accept sharing of the data after publishing the article.

Ethical Considerations

The authors declare that this manuscript is original and is not being considered elsewhere for publication. Other ethical issues have been checked by the authors.

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