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Nasal Adenocarcinoma in a 4-year-old Oriental Shorthair Cat

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ABSTRACT

The aim of this case report is to present a case of nasal adenocarcinoma in a young adult cat with underlying feline asthma. A 4-year-old, 2.3 kg, female Oriental Shorthair was referred to Massey University Veterinary Teaching Hospital with a rapidly expanding mass on its left nasal bridge and nasal discharge. Physical examination revealed stertorous respiratory sounds and a mass on the left nasal bridge measuring 3.2 cm x 2.5 cm. Computed tomography of the nasal cavity showed mass effect in the left frontal sinus with extensive orbital bone lysis and loss of calvarial bone. Radiographs of the thorax showed possible evidence of metastasis. Fine needle aspirate was performed on the mass and also regional lymph nodes. Subsequently, nasal adenocarcinoma was diagnosed through cytology. Prognosis of the patient was poor as the patient's condition was significantly complicated by asthma and possible lung metastasis. Palliative treatment was pursued using meloxicam as radiotherapy was not a viable option in this case.

Keywords: Cat; Computed Tomography; Metastasis; Nasal adenocarcinoma

INTRODUCTION

The prevalence of feline nasosinal tumours in a clinic population has been reported to be 23 tumours per 10,000 cats (Withrow *et al*., 2013). Nasal and nasosinal tumours make up 1- 8.4% of all feline neoplasms (Fujiwara-Igarashi *et al.,* 2014). The most common type of nasal tumour diagnosed in cats are lymphomas followed by tumours of epithelial origin such as adenocarcinomas and squamous cell carcinomas while the least common neoplasia diagnosed are sarcomas (Withrow *et al.,* 2013). A mechanism suggested for the development of canine nasal adenocarcarcinoma is the overexpression and accumulation of mutated p53 tumour suppressor genes (Neuman *et al.,* 2011). Nasal neoplasia is progressive and locally invasive. Metastatic rates to lungs and regional lymph nodes are low and occur late in the disease. In this report, we describe a case of neoplastic nasosinal mass that was diagnosed as a nasal adenocarcinoma through cytology and diagnostic imaging.

CASE PRESENTATION

A 4-year-old spayed Oriental Shorthair weighing 3.2 kg was referred to Massey University Veterinary Teaching Hospital (MUVTH) for a suspected neoplastic nasal mass. It is an indoor cat with a history of feline asthma which has been managed with antihistamines and bronchodilators. In mid-2019, the owners noticed a nasal mass over the left bridge that has rapidly increased in size within one month. Also reported was snorting during respiration along with increased effort and bloody nasal discharge. Prior to referral, the patient was treated by the primary veterinarian with a single injection of benzylpenicillin procaine/benzylpenicillin benzathine. A five-days course of amoxicillin/clavulanic acid 50mg per *os* was prescribed as a bacterial infection was suspected to be the cause of the soft tissue swelling on the nasal bridge. Cumulative treatment over two weeks did not resolve the mass, a fine needle aspirate was taken from the nasal mass for cytology which revealed necrosis, inflammation and atypical respiratory epithelial proliferation which were suggestive of neoplasia or mycosis thus prompting referral of the case to MUVTH.

The patient was both tachycardic (240 beats per minute) and tachypnoeic (52 breaths per minute) during examination but it was likely due to the patient's nervousness. A large mass measuring 3.5cm by 2.5cm was observed on the left nasal bridge which extended into the left eye field with no pain elicited during palpation. Globe involvement was not evident. The cat was stertorous during inspiration with increased upper respiratory sounds at the level of the trachea and both lung fields. Bronchopulmonary (alveolar) sounds were auscultated in both lung fields but they were masked by the upper respiratory tract sound. There was no enlargement of superficial lymph nodes.

Fine needle aspiration (FNA) of the mass and regional lymph nodes were taken and sent for cytology. Imaging diagnostics performed were computed tomography (CT) scan and thoracic radiography. CT scan of the nasal cavity (Figure 1A) revealed a mass effect in the left frontal sinus which was filled with hyperdense material and there was evidence turbinate detail loss within the cavity. The nasal septum was deviated to the right due to mass effect, but no destruction of the septum was observed. Bone lysis of the palatine and surrounding frontal bone were appreciable on the 3-dimensional (3D) reconstructed image of the CT scan (Figure 1B).

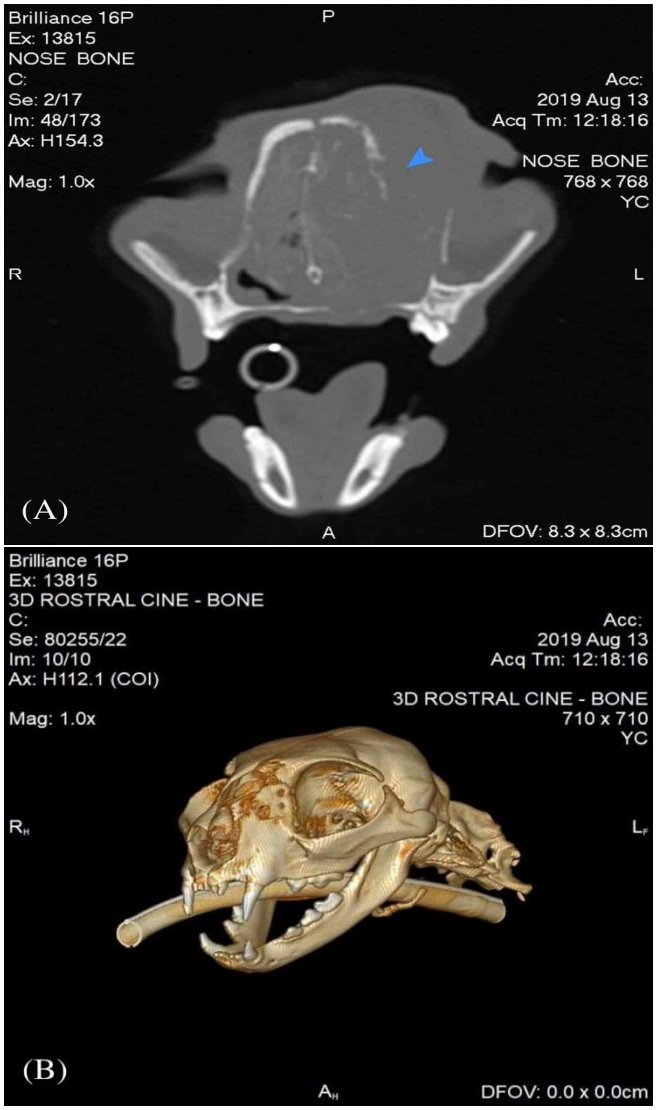

Figure 1: (A) Transverse section of the CT scan at the level of the first premolar and (B) 3-dimensional reconstruction of patient's skull. On transverse section of the CT scan, there is hyperdense material filling the left nasal cavity at the level of the first premolar (blue arrowhead). Mass effect is also evident in Fig. 1A as the nasal septum has deviated to the right. Bone lysis of the palatine and frontal bone can be observed clearly in Fig. 1B.

However, the orbital space has not been invaded by the mass. Involvement of cribriform plate and calvarial bone are also suspected. On dorsoventral view of the thoracic radiograph. bronchointerstitial patterns were evident in both left and right caudal lobes (Figure 2) This is expected in a patient with feline asthma. On the right lateral view (Figure 2B), two nodules (>2mm in diameter) were also observable caudal to the mediastinum and around the left ventricle that was suggestive of metastasis. Vertebral heart score (VHS) for the patient was 7.6v and well within the normal range for cats (7.5v - 8.0v) (James, 2000).

FNA sample results revealed a large number of clumped and single epithelial cells showing marked anisokaryosis and prominent single nucleoli. Scattered binucleated forms and occasionally mitotic neoplastic figures. Some cells appeared columnar with polar nucleus. In one smear, these neoplastic epithelial cells form irregular clumps which were admixed with numerous neutrophils; degenerate/nondegenerate and mucoid matrix with a large area of tissue necrosis. Morphological diagnosis was nasal carcinoma/adenocarcino ma with marked secondary neutrophilic inflammation and tissue necrosis. Submandibular and nasopharyngeal lymph nodes samples were non-diagnostic as there were inadequate cells sampled.

The definitive diagnosis for this patient is nasal adenocarcinoma based on the imaging and cytology findings. Prognosis was poor as CT scans revealed extensive loss of orbital bone and probable loss of the calvarial bone. The patient's condition was further complicated by feline asthma which causes further restriction of the airways. Thoracic radiographs also showed possible pulmonary metastasis, which further worsened the prognosis. Suggestive therapy was megavoltage radiotherapy to allow local control of the rapidly growing neoplastic mass (Biller *et al*., 2016). Meloxicam was used to control the pain and inflammation from the expanding mass. Unfortunately, radiotherapy was deemed too costly and logistics was difficult to arrange. The owner opted for palliative care and eventual euthanasia of the cat.

DISCUSSION

Differentiation between nasal diseases calls for imaging modalities like radiography and computed tomography (CT) scan, as clinical signs of neoplasia is often non- specific (sneezing, nasal discharge etc). When advanced imaging is unavailable, standard radiographic views for diagnosis of nasal neoplasia includes lateral, dorsoventral and most importantly open-mouth oblique views (Withrow *et al.*, 2013). An open–mouth oblique view enables visualisation of the caudal nasal cavity, cribriform plate and isolated nasal cavity. Radiographic findings consistent with nasal and nasosinal neoplasia include displacement of midline structures, unilateral changes such as soft tissue opacity, loss of turbinates and bone invasion (Nemanic *et al.,* 2015). CT scans have the ability to differentiate between neoplasia and chronic rhinitis. Observation of unilateral mass, turbinate destruction and extension of disease into adjacent soft tissue or mass effect often suggests a neoplastic disease (Haney *et al*., 2009). In this cat, CT scans revealed a mass effect and extensive turbinate damage within the left nasal sinus.

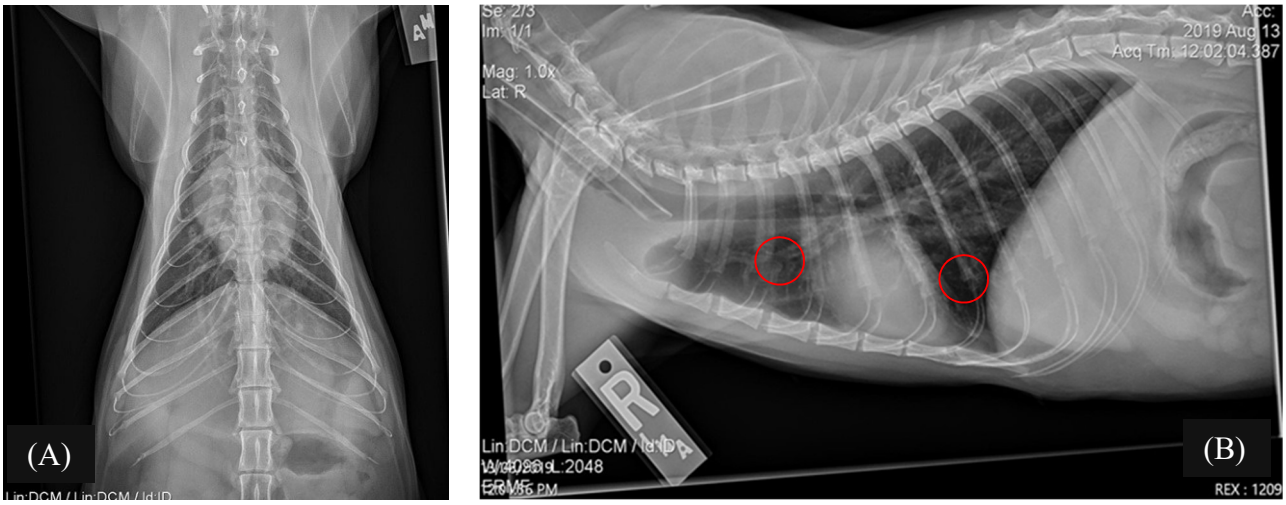

Figure 2: (A) Dorsoventral (DV) view and (B) right lateral view of the thorax On DV view, Bronchointersitial pattern is evident on both caudal lung fields with doughnuts and tram lines. Vertebral heart score was 7.6 (normal). Bronchointerstitial pattern was observed and is expected in patients with feline asthma. Red circles indicate nodules that are likely to be metastasis from primary tumour in left nasal cavity.

Furthermore, bone loss in the orbital and calvarial bone were evident. For a definitive diagnosis of nasal carcinomas, a core biopsy sample is needed but was unavailable in this case. A nasal biopsy in a cat should be obtained using a closed suction technique, a bone curette or a small "cup" biopsy instrument via the nares to ensure adequate tissue is sampled (Malinowski, 2006). Expected histopathological findings for adenocarcinoma include, presence of tubular structures that may be papillary, tubulopapillary or acinar (Meuten, 2017). In low-grade adenocarcinomas, there are glandular spaces or papillary fronds lined by cuboidal or columnar cells in a single layer or pseudostratified appearance. The cells would appear uniformly round or oval nucleus with unnoticeable nucleoli. In high grade adenocarcinoma, glandular spaces are irregular with solid sheets of cells exhibiting cellular pleomorphism, nuclear atypia and high mitotic counts.

The recommended treatment for nasal tumours is radiation therapy (Biller *et al*., 2016). Megavoltage and orthovoltage may be effective treatments (Woods, 2015). A protocol of curative intent would be achieved with a total dose of 48 Gray. It is more likely that palliative protocol would be used in this case due to cost constraints. Palliative protocol is intended to relieve pain and improve quality of life in patients (Fujiwara-Igarashi *et al*., 2014). A daily protocol of 4 Gray for 5 fractions or coarse-fractionated treatments of 6 to 9 Gy delivered weekly or biweekly (Cooper *et al.*, 2008; Fujiwara-Igarashi *et al.,* 2014). Chemotherapy using non-steroidal anti-inflammatories (NSAIDs) and anti-neoplastic drugs have been reported. Drugs previously used includes doxorubicin, carboplatin, and piroxicam. Case reports by Cooper *et al.,* (2008) and Marioni-Henry *et al.,* (2007) have shown survival times in patients were prolonged after diagnosis through chemotherapy. However, both protocols have not been investigated in larger number of cats. Hence, if chemotherapy were pursued, a longer survival time would be unknown, and the owner should be informed. Surgical removal alone is not recommended in cats as they tolerate the procedure poorly due to excessive haemorrhage (Murphy, 2008).

Palliative care for this patient includes management of chronic pain associated with the bone lysis as observed in the CT scans (Withrow *et al*., 2013). NSAID such as meloxicam is used to reduce inflammation associated with tumours through its cyclooxygenase inhibition. Additionally, oral opioids such as tramadol or morphine can be administered (Dobson and Lascelles, 2011). Proper nutrition is required to manage cancer cachexia in oncology patients which is associated with the up-regulation of ubiquitin-proteasome pathway (Dobson and Lascelles, 2011; Little, 2012). Dietary recommendation for feline cancer patients includes less than 25% carbohydrates, 25-40% fat and 40-50% protein on a dry matter basis (Little, 2012).

Conclusion

This report documents a cat that has been diagnosed with nasal adenocarcinoma via computed tomography and cytology from fine needle aspirate samples whose prognosis was complicated with feline asthma. The best course of treatment would be radiotherapy but could not be pursued in this case due to logistical limitations.

Conflict of Interest

The authors declare that they do not have any conflict of interest.

Author's Contribution

All authors contributed to the development of the manuscript at different levels. This includes patient examination, hospitalization, clinical evaluation, interpretation of diagnostic test results, discussions, manuscript drafting, proof reading and editing.

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