Pulmonary Carcinoma Metastasis in a Feline Digit

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ABSTRACT

Background: Primary pulmonary neoplasia is rare in domestic cats, with fewer than 1% of all tumors diagnosed in this species. Primary lung tumors have a high percentage of metastases, observed in up to 75% of cases in cats. The lung-digit syndrome is characterized by primary pulmonary neoplasms with metastases to the extremities of the limbs, mainly distal phalanges, possibly involving several digits and more than one limb. This report describes a case of pulmonary carcinoma metastasis in a cat digit.

Case: A 16-year-old neutered female cat was showing increased volume of the fourth digit was examined at the University of Caxias do Sul veterinary clinic. The animal also showed signs of progressive weight loss, apathy and limping on the right thoracic limb. After clinical evaluation, the animal was sent for radiographic examination of the right metacarpal/phalangeal region and the thorax. A radiopaque structure was observed with discreet central regions of radiolucency, measuring approximately 3 cm in height, 3.4 cm in length and 2.4 cm in depth in the left caudal lung, suggesting neoplasia or pulmonary abscess. Digit image revealed osteolysis of the right and middle distal phalanx measuring 2 cm in height, 3 cm in breadth and 1 cm in length. In view of these radiographic changes, we performed fine needle aspiration cytology of the digit and a nodule in the region of the skeletal musculature of the right thoracic limb. Cytological evaluation revealed cells had cilia on their surface (compatible with respiratory epithelium). The cytologic findings of the fine-needle biopsy were suggestive of carcinoma. After stabilization, the digit was amputated. The material was sent to the laboratory of the Federal University of Pelotas for histopathological examination. Histological evaluation of a digital pulmonary carcinoma metastasis was confirmed. In view of the prognosis and clinical evolution of the disease, the caretaker chose euthanasia. Necropsy and histopathological evaluation of the lung and other organs were not authorized.

Discussion: According to the literature, primary lung tumors have a high percentage of metastases, observed in up to 75% of cases in felines. The size of the tumor mass is associated with its metastatic potential, and lung tumors smaller than 1 cm in diameter usually do not present metastases. In the present case, the mass in the lung was greater than 1 cm in size and the animal already presented metastasis in the digit and in the skeletal musculature. In addition to the thoracic cavity, sites where metastases from lung tumors may occur include regional lymph nodes, skin, eyes, skeletal muscle, multiple abdominal organs, and digits. Cats with pulmonary carcinoma and digital metastasis have a median survival 67 days after diagnosis, with intervals of 6 to 122 days reported. Most patients are euthanized due to persistent symptoms of lameness, lethargy and anorexia or evolution of respiratory signs, in addition to the short survival time associated with poor quality of life. In the case reported here, euthanasia was performed after 40 days of diagnosis due to the worsening of the animal's clinical condition. The combination of radiographic, cytological and histopathological findings suggested a primary lung tumor with digit metastasis, also known as lung-digit syndrome. For felines with claudication or digital inflammation, the lung-digit syndrome should be included in differential diagnosis, even if the animal does not present clinical signs associated with the respiratory system. Primary pulmonary carcinoma should be considered in any middle-aged to elderly cat with digital disease.

Keywords: cat, metastasis, lung, digit.

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INTRODUCTION

Primary pulmonary neoplasia is rare in domestic cats, with fewer than 1% of all tumors diagnosed in this species [12]. However, several reports suggest that the incidence may be increasing, probably due to greater caregiver awareness of the health of their animals and new diagnostic technologies that influence the longevity of the feline population [3]. Air pollution and cigarette smoke, both of which have been associated with increased cases of lung neoplasms in humans, are also implicated in the increase in the number of cats with the disease [6]. The aim of this case report is to describe a case of pulmonary carcinoma metastasis in a feline digit.

CASE

A 16-year-old neutered female of the Himalayan breed, negative for FIV and FeLV, arrived at the Small Animal Clinic, having previously been treated at another clinic. During the case history, the caretaker reported that the animal had undergone rapid progressive weight loss and swelling of the fourth digit, which was unresponsive to treatment with antibiotics and anti-inflammatories. During the consultation it was determined that the patient was showing lameness that was not observed by the caretaker, because it was an elderly animal that spent most of the time lying down. Physical examination was notable for mild dehydration, presence of a suppurated abscess in the digit of the right hind limb and nodules in the skeletal muscles of the affected limb (Figure 1).

After clinical evaluation, the wound was cleaned with saline solution and aqueous solution of chlorhexidine 0.2% (Riohex)¹ and the animal was sent for radiographic examination of the right metacarpal/phalangeal region and the thorax. A radiopaque structure was observed with discreet central regions of radiolucency, measuring approximately 3 cm in height, 3.4 cm in length and 2.4 cm in depth in the left caudal lung, suggesting neoplasia or pulmonary abscess (Figure 2A). Digit image revealed osteolysis of the right and middle distal phalanx measuring 2 cm in height, 3 cm in breadth and 1 cm in length (Figure 2B).

In view of these radiographic changes, we performed fine needle aspiration cytology of the digit and a nodule in the region of the skeletal musculature of the right thoracic limb. Cytological evaluation revealed moderate cellularity. The cells were distributed in isolation

or in small clusters. These cells were of epithelial origin, with intense anisocytosis, anisokaryosis, macrocytosis and macronucleosis. The cytoplasm was moderately basophilic and granular. In some cells, large, globular magenta-colored granules were observed. The nuclei showed finely granular nuclear chromatin. There were multiple prominent, angular nucleoli and also multinucleated cells and bizarre mitotic figures (0-2/field). The cells had cilia on their surface (compatible with respiratory epithelium). The cytologic findings of the fine-needle biopsy were suggestive of carcinoma (Figure 3).

After stabilization, the digit was amputated. The material was sent to the laboratory of the Federal University of Pelotas for histopathological examination. This revealed substantial proliferation of pleomorphic epithelial cells, with abundant eosinophilic cytoplasm and swollen ovoid nuclei with prominent nucleoli in the superficial dermis. Neoplastic cells were arranged in glandular structures with multiple layers of cells. In some areas, these cells formed solid arteries with necrotic centers. In the lumen of some vessels, neoplastic cells were observed (Figure 4).

During the postoperative period, analgesic, antibiotic and dressing changes were prescribed every two days with revision and removal of sutures scheduled for 10 days post-procedure. By the 10th day, the feline's condition had worsened; the animal was unresponsive to the environment, persistently remaining lying down. In view of the prognosis and clinical evolution of the disease, the caretaker chose euthanasia. Necropsy and histopathological evaluation of the lung and other organs were not authorized.

The combination of radiographic, cytological and histopathological findings suggested a primary lung tumor with digit metastasis, also known as lung-digit syndrome.

DISCUSSION

The lung-digit syndrome is more common in elderly cats, with a mean age of 10 to 14 years [1]. No breed or gender predisposition has been reported in felines, with the possible exception of Persian cats [5]. The present report, which describes the case of a 16-year-old Himalayan cat (a cross between the Persian and Siamese breeds), agrees with most studies suggesting that older cats are more often affected. The observation that the Persian breed would be more susceptible to lung tumors deserves follow-up of future cases for validation.

Figure 1. Abscess in fourth digit of right thoracic limb, with substantial exudate and bloody discharge.

According to the literature, primary lung tumors have a high percentage of metastases, observed in up to 75% of cases in felines [7]. The size of the tumor mass is associated with its metastatic potential, and lung tumors smaller than 1 cm in diameter usually do not present metastases [5]. In the present case, the mass in the lung was greater than 1 cm in size and the animal already presented metastasis in the digit and in the skeletal musculature. In addition to the thoracic cavity, sites where metastases from lung tumors may occur include regional lymph nodes, skin, eyes, skeletal muscle, multiple abdominal organs, and digits [6].

The lung-digit syndrome is characterized by primary pulmonary neoplasms with metastases to the extremities of the limbs, mainly distal phalanges, possibly involving several digits and more than one limb [4]. To date, this phenomenon has been reported only in humans and cats [10]. In felines, digits of the thoracic limbs, which support most of the body weight, are most often affected [6]. The pathogenesis of this type of metastasis in felines remains unknown; however, clinical evidence suggests that the lymphatic and

Figure 2. Radiographic examination of the right metacarpal/phalangeal region and the thorax. A- Left lateral projection of the feline thorax revealing a radiopaque structure with discrete central radiolucency regions measuring approximately 3 cm in height, 3.4 cm in length and 2.4 in depth in the left caudal lung lobe suggestive of neoplasia or pulmonary abscess. B- Four-digit projection of the right thoracic limb, revealing osteolysis of the medial and distal phalanx, with increased volume and radiodensity in the soft tissue measuring 2 cm in height, 3 cm in width and 1 cm in length.

Figure 3. Cytology of the digit of the right thoracic limb. There are several cells of epithelial origin displaying intense anisocytosis, anisokaryosis, macrocytosis and macronucleosis. The cytoplasm is moderately basophilic. The nuclei have finely granular chromatin, the nucleoli are angular. The cells also had cilia on their surface (arrow) [Romanowsky stain; 100x].

Figure 4. Superficial and deep dermis: proliferation of neoplastic epithelial cells markedly pleomorphic, abundant cytoplasm, ovoid nuclei and swollen with evident nuclei (arrows), arranged in glandular structures, with multiple layers of cells (arrowheads) [HE; 4x].

hematogenic pathways are disseminators [8]. It could be the case that, because of the high vascularity present in the anterior limbs, there is an increase in blood flow to this area in order to dissipate body heat. The arteries supplying the digits would carry tumor emboli to the distal phalanges [9,10].

Bronchial adenocarcinoma and bronchoalveolar carcinoma have been associated with metastasis to the digits [6]. In the present case, cytology was initially chosen as the diagnostic method. Cytology suggested carcinoma, and this was also shown in cells suggesting metastasis originating from the respiratory tract. In a study of 64 cats exhibiting digital lesions, only eight were diagnosed with primary digital carcinoma, while the remaining 56 (87.5%) had digital metastases from primary lung carcinomas [11]. Based on these findings, although it was not possible to perform histopathologi-

cal confirmation of the lung lesion, the combination of the changes found in the chest X-ray and histopathology of the metastatic lesions were strongly suggestive of pulmonary neoplasia.

According to the reported cases, most cats with lung-digit syndrome show clinical signs of metastasis rather than those of the primary tumor, because evidence for primary lung neoplasia is generally silent [2]. Patients may present a history of lameness, excessive licking of the limbs and non-specific systemic signs such as low appetite, weight loss, fever, lethargy and anorexia [4]. Frequently, these signs are what lead caregivers to seek veterinary assistance, as occurred in the case described.

Clinical presentation may include firm and painful edema in one or more digits, digital skin ulceration, nail deviation or loss, purulent inflammation and erythema associated with digit and nail beds [7,12]. Respiratory signs, when they occur, may include dyspnea, tachypnea, cough, cyanosis, fever and hemoptysis [4]. Signs similar to these were observed in the present case.

The prognosis of cats with the lung-digit syndrome is quite reserved, because, in addition to occurring most often in elderly cats, the treatment options are limited and are considered only palliative, basically consisting of analgesia for patient comfort [3, 6, 7, 12].

Amputation of the affected digit can help alleviate pain and secondary infection in cats with digital metastasis; however, survival time is not altered and lesions in other digits may still develop, as most likely microscopic metastases to other digits are already present [4,6,7]. In some cases, digit amputation is necessary to obtain a representative sample for histopathological analysis, avoiding further surgery [4]. In this case, amputation was chosen both to improve the quality of life of the animal as for obtaining material for definitive diagnosis.

Surgical resection of the primary tumor may slightly increase the survival time in some cases; but it will not improve the condition of the digits [3,7]. Surgical treatment of patients presenting with signs such as dyspnea and pleural effusion, as well as evidence of metastasis, have been associated with significantly shorter survival times [7,10].

Cats with pulmonary carcinoma and digital metastasis have a median survival 67 days after diagnosis, with intervals of 6 to 122 days reported [4].

Most patients are euthanized due to persistent symptoms of lameness, lethargy and anorexia or evolution of respiratory signs, in addition to the short survival time associated with poor quality of life. In the case reported here, euthanasia was performed after 40 days of diagnosis due to the worsening of the animal's clinical condition.

For felines with claudication or digital inflammation, the lung-digit syndrome should be included in differential diagnosis, even if the animal does not present clinical signs associated with the respiratory

system. Primary pulmonary carcinoma should be considered in any middle-aged to elderly cat with digital disease. As an initial approach, X-rays of the chest and the affected limb should be performed as well as cytological analysis of the lesion.

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REFERENCES

- 1 Baral R.M. 2012. Lower respiratory tract diseases. In: Little S.E. (Ed). *The Cat: Clinical Medicine and Management*. Saint Louis: Elsevier Saunders, pp.861-885.
- 2 Blackwood L. 2013. Cats with cancer, where to start. *Journal of Feline Medicine and Surgery*. 15(5): 366-377.
- 3 Clements D.N., Hogan A.M. & Cave T.A. 2004. Treatment of a well differentiated pulmonary adenocarcinoma in a cat by pneumonectomy and adjuvant mitoxantrone chemotherapy. *Journal of Feline Medicine and Surgery*. 6(3): 199-205.
- 4 Crystal M.A. & Levine P.B. 2011. Digital Diseases. In: Norsworthy G.D. (Ed). *The Feline Patient*. 4th edn. Ames: Wiley-Blackwell, pp.126-128.
- 5 D'Costa S., Yoon B.I., Kim D.Y., Motsinger-Reif A.A., Williams M. & Kim Y. 2012. Morphologic and molecular analysis of 39 spontaneous feline pulmonary carcinomas. *Veterinary Pathology*. 49(6): 971-978.
- 6 Goldfinch N. & Argyle D.J. 2012. Feline lung-digit syndrome: unusual metastatic patterns of primary lung tumours in cats. *Journal of Feline Medicine and Surgery*. 14(3): 202-208.
- 7 Hahn K.A. & McEntee M.F. 1997. Primary lung tumors in cats: 86 cases (1979-1994). *Journal of the American Veterinary Medical Association*. 211(10): 1257-1260.
- 8 Ibarrola P., German A.J., Stell A.J., Fox R., Summerfield N.J. & Blackwood L. 2004. Appendicular arterial tumor embolization in two cats with pulmonary carcinoma. *Journal of the American Veterinary Medical Association*. 225(7): 1065-1069.
- 9 Salguero R., Langley-Hobbes S., Warland J. & Brearley M. 2012. Metastatic carcinoma in the ulna of a cat secondary to a suspected pulmonary tumour. *Journal of Feline Medicine and Surgery*. 14(6): 432-435.
- 10 Sugriyama H., Maruo T., Shida T., Ishikawa T., Kanakubo K., Madarame H., Kayanuma H. & Suganuma T. 2010. Clinical findings in lung-digit syndrome in five cats. *Journal of Japan Veterinary Cancer Society*. 1(1): 8-13.
- 11 Van der Linde-Sipman J.S. & Van den Ingh T.S. 2000. Primary and metastatic carcinomas in the digits of cats. *The Veterinary quarterly*. 22(3): 141-145.
- 12 Withrow S.J. 2013. Tumors of the respiratory system: pulmonar neoplasia. In: Withrow S.J., Vail D.M. & Page R.L. (Eds). *Withrow and Macewen's Small Animal Clinical Oncology*. 5th edn. Saint Louis: Elsevier Saunders, pp.453-459.