



Case Report

Squamous Cell Lung Carcinoma in a Cat

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Abstract

Primary lung neoplasms are rare in small animals and present variable clinical signs. Here we report a case of a 4-year-old male cat which presented with apathy, dyspnea and pleural effusion. The cytological analysis of the pleural effusion revealed massive presence of atypical cells and the histopathological examination of the lung demonstrated tissue infiltration by atypical cells arranged in solid nests. The cytological and histopathological findings were compatible with squamous cell lung carcinoma.

Key Words: Cytology, histopathology, immunohistochemistry, lung neoplasm, cat

Introduction

Unlike humans, animals rarely present with primary lung neoplasms. In humans, the occurrence of these neoplasms is related to air pollution and smoking (16, 17). Lung neoplasms represent approximately 4% of small animal tumor cases (1), however its incidence has been growing, possibly due to the higher longevity of animals and to the increasing exposure to environmental carcinogens (15).

Primary lung neoplasms are usually malignant and its occurrence is rare in cats, with 2.2 cases/1,000 animals (4), typically affecting aged animals, with no sex or breed predisposition (13). Clinical signs noticed in these cases are quite variable and nonspecific.

These tumors usually appear as single masses, invasive or expansive, with variable color and texture (11). Histopathologically, lung neoplasms can be classified as carcinomas (bronchogenic, alveolar, squamous, adenosquamous and adenocarcinoma) or as sarcomas (fibrosarcoma, osteosarcoma, chondrosarcoma, and hemangiosarcoma) (5, 16). The aim of this article is to

describe the clinico-pathological features of a primary feline lung squamous cell carcinoma.

Case Report

A 4-year-old male mixed-breed cat was referred to the Veterinary Teaching Hospital of the College of Veterinary Medicine, UNESP-Araçatuba-SP, Brazil, due to a 5-day history of progressive apathy, hyporexia and dyspnea. Thoracic radiographic examinations were performed including the dorsoventral and right lateral projections. It was detected a homogeneous increasing in radiopacity, blocking the visualization of the cardiac silhouette and the diaphragmatic cupula, as well as the dorsal dislocation of the trachea (Figure 1), raising the possibility of pleural effusion.

The animal was subjected to thoracocentesis and 80 mL of a turbid serosanguineous fluid was collected, no apparent coagulum, pH 7.5; negative glucose test; positive Rivalta test; density of 1,035; 60g of protein/mL; 0.1g of fibrinogen/mL and high cellularity. The cytological analysis of this fluid revealed the existence of segmented neutrophils, lymphocytes, macrophages, erythrocytes and

the massive presence of atypical cells, some large cells with few vacuoles, and some small cells, with an intense basophilic cytoplasm and no evident nuclear details (Figure 2). The presence of these atypical cells suggested the occurrence of an intrathoracic neoplasm. With the worsening of the clinical signs, the animal died.

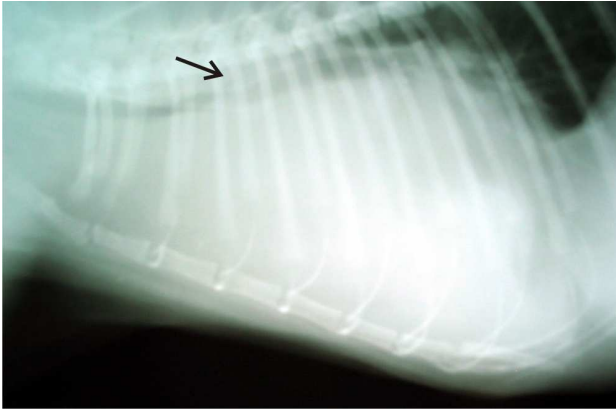


Figure 1. Thoracic radiograph from a 4-year-old male cat. Lateral view. Note the homogeneous increase in the radiopacity, with no distinction of the cardiac silhouette and the diaphragmatic cupula. Observe also the dorsal dislocation of the trachea (arrow).

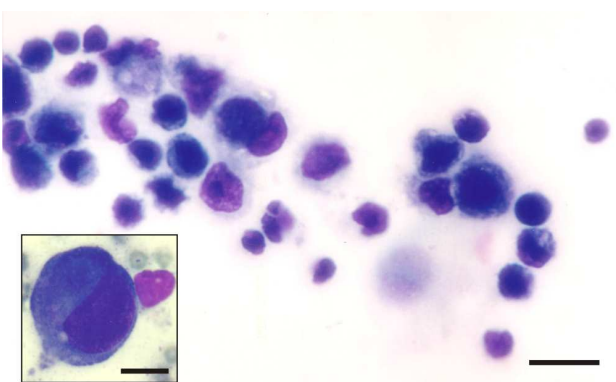


Figure 2. Cytological preparation of the pleural effusion from a 4-year-old male cat. Note cluster of large roundish and basophilic cells, high nucleus/cytoplasm ratio, and irregular nuclear membrane. Bar = 50 μ m. *Inset:* higher magnification of a neoplastic cell exhibiting intense cytoplasmic basophilia, which covers nuclear details. Panoptic stain. Bar = 20 μ m.

At postmortem examination a whitish mass occupying approximately three-quarters of the thoracic cavity was observed. The mass was firm, with nodular surface and a central cavity related to an area of necrosis and hemorrhage. The mass also infiltrated the intercostal musculature, resulting on adherence between the lung and the parietal pleura. Only the cranial pulmonary lobes presented with gross evidence of being functionally capable. The heart presented with concentric hypertrophy and confined by the affected pulmonary lobes (Figure 3).

Samples of the lungs were formalin-fixed and embedded in paraffin, sectioned at 5 μ m, and stained with

hematoxylin-eosin (HE). Immunohistochemical evaluation was also performed, with the anti-cytokeratin antibody (clones AE1/AE3; 1:50; Dako M3515) after antigen retrieval in steamer with citrate buffer (pH 6.0). The LSAB+ (Dako K0690) amplification method was used and the reaction was revealed by using 3,3'-diaminobenzidine (DAB; Dako K3468).

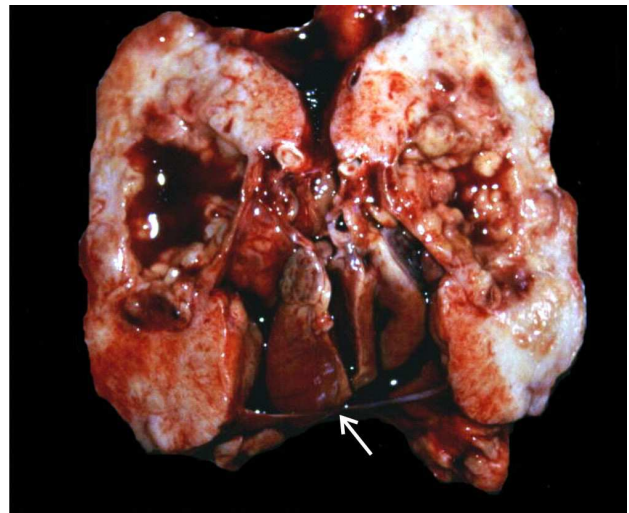


Figure 3. Gross feature of the lungs from a 4-year-old male cat with squamous cell carcinoma. Note the whitish mass, with nodular surface and central cavitation (necrosis), compressing and infiltrating the pulmonary lobes.

Histopathological examination demonstrated the lung parenchyma infiltrated by atypical cells arranged in solid nests. The neoplastic cells are polyhedral, with nuclear size variation and prominent nucleolus. A small number of abnormal mitoses are detected. In the cytoplasm of some neoplastic cells there is an amorphous eosinophilic material, similar to keratin deposits. In the core of the nests there are no typical keratin pearls, but keratin debris are seen (Figure 4). Nests of neoplastic cells were also observed infiltrating the intercostal musculature. Further, immunohistochemistry revealed the neoplastic cells to be positive for cytokeratin (Figure 5).

The high-grade of anaplasia, the occurrence of metastasis in the parietal pleura, and the aggressive cell infiltration in the adjacent tissues characterized this as a malignant neoplasm. The histopathological diagnosis was lung squamous cell carcinoma.

Discussion

In the data presented herein, we report a case of a primary squamous cell lung carcinoma with pleural effusion in a cat. Pleural effusion is an unspecific finding which may be due to a wide range of diseases (6,20). The main causes of pleural effusion in cats are congestive heart failure, hypoalbuminemia, feline infectious peritonitis, lung lobe torsion and neoplasms, such as lymphomas and

carcinomas (3), and these tumors can be primary, or more frequently, metastatic (19).

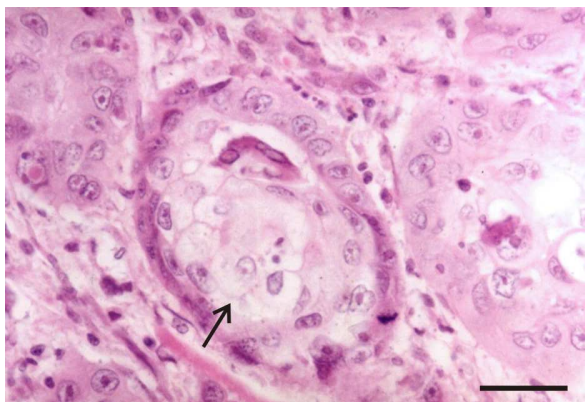


Figure 4. Histopathological features of the squamous cell lung carcinoma from a 4-year-old male cat. Observe a nest (arrow) composed of neoplastic cells and with keratin debris but without typical keratin pearls. HE. Bar = 50 μ m.

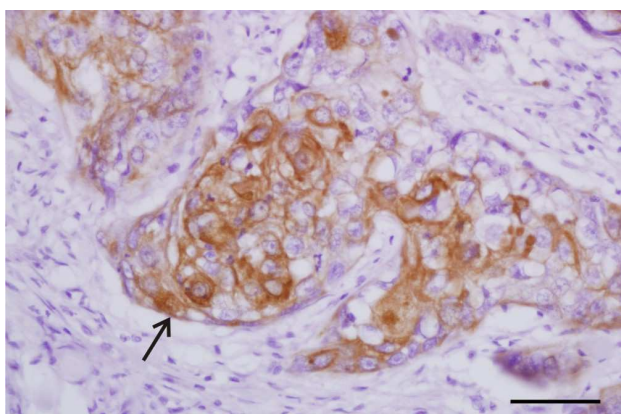


Figure 5. Immunohistochemical features of the squamous cell lung carcinoma from a 4-year-old male cat. Note a nest of neoplastic cells (as in Figure 4) with intense cytoplasmic staining for cytokeratin (cells in brown; arrow). Streptavidin-biotin-peroxidase complex method. Bar = 50 μ m.

The clinical signs observed in primary lung neoplasms are rather variable and unspecific, such as apathy, anorexia, dyspnea, lethargy, weight loss, weakness and vomiting (8, 9), similar to those noticed in the animal of this case report. Further, it is possible to notice tachypnea, thoracic pain during manipulation, hemothorax, pneumothorax, pleural effusion, and as the most common paraneoplastic syndrome, hypertrophic osteopathy (10). The incidence of metastases after primary lung neoplasms is extremely high in companion animals, reaching 75% in cats (20).

Even though some authors agree that both right and left lungs are equally affected by neoplasms as observed in the case reported herein, other authors describe that in cats left lobes are more affected than the right lobes (13). Diagnosis may be achieved by means of complementary examinations, such as thoracic

radiography, which may be helpful to determine the presence and localization of the neoplasm, as well as to detect regional lymph node hypertrophy, pleural effusion and airway compression (12), and by means of cytological preparations after bronchoalveolar lavage, or histopathology from lung biopsies (7, 14).

Animals affected by primary lung neoplasms are frequently older than 12 years of age (5, 13), differently from the case reported herein, in which the animal was only 4-year-old. On histopathological examination of lung neoplasms there is marked anisokaryosis and anisocytosis, perinuclear halo, binucleation and multinucleation, evident nucleoli, and variable amount of mitoses (7, 9). The differential among lung neoplasms is the expression of cytokeratin profiles similar to those observed in epidermal keratinocytes (19). The detection of only a squamous component without an acinar and a squamous combination, allow us to diagnose a squamous cell carcinoma.

In the case reported herein, the clinical signs were rather unspecific and the radiographic examination, which is useful to aid the differential diagnosis of intrathoracic neoplasms, was inefficient, revealing only the occurrence of pleural effusion. The cytological analysis of the effusion, which is a helpful tool to the rapid differentiation between infectious and non-infectious diseases, was important to diagnose the occurrence of a neoplasm. However, as the analyses of respiratory cytology specimens present some pitfalls, histopathological and immunohistochemical examinations were necessary to correctly identify this uncommon pulmonary neoplasm of the cat.

References

1. ANDREASEN BC. Bronchoalveolar lavage. **Vet. Clin. North Am. Small Anim. Pract.**, 2003, 33, 69-88.
2. CARPENTER LG., WITHROW SJ., POWERS BE., OGILVIE GK., SCHWARZ PD., STRAW RC., LARUE SM., BERG J. Squamous cell carcinoma of the tongue in 10 dogs. **J. Am. Anim. Hosp. Assoc.**, 1993, 29, 17-24.
3. DEMPSEY SM., EWING PJ. A Review of the pathophysiology, classification, and analysis of canine and feline cavity effusions. **J. Am. Anim. Hosp. Assoc.**, 2011, 47, 1-11.
4. DORN CR., TAYLOR DON., SHNEIDER R., HIBBARD HH., KLAUBER MR. Survey of animal neoplasms in Alameda and Contra Costa Counties, California. II. Cancer morbidity in dogs and cats from Alameda County. **J. Natl. Cancer Inst.**, 1968, 40, 307-318.
5. DUNGWORTH DL., HAUSER B., HAHN FF., WILSON DW., HAENICHEN T., HARKEMAA JR. Histological Classification of Tumors of the Respiratory System of Domestic Animals. 2 ed. Washington: Armed Forces Institute of Pathology and American Registry of Pathology, 1999.
6. ETTINGER S. Textbook of Veterinary Internal Medicine, Philadelphia, 1996, 848-853.
7. GARMA AVINA A., The cytology of squamous cell carcinoma in domestic animals. **J. Vet. Diag. Invest.**, 1994, 6, 238-246.

8. HAHN KA., MCENTEE MF. Primary lung tumors in cats: 86 cases (1979-1994). **J. Am. Vet. Med. Assoc.** 1997, 211(10):1257-1260.
9. IDOWU MO., POWERS CN. Lung cancer cytology: potential pitfalls and mimics - a review. **Int J. Clin. Exp. Pathol.** 2010, 3(4): 367-385.
10. KIM YS., BHANG DH., KIM MK., SEO KW., JOO MS., PARK JH., CHOI MC., LEE CW., HAN HR., HWANG CY. Primary lung tumors in five dogs. **J. Vet. Clin.** 2005, 22, 288-295.
11. LOPEZ, A. Sistema respiratório. In: CARLTON, W. W.; MCGAVIN, M. D. **Patologia veterinária especial.** 2.ed. Porto Alegre: Artes Médicas Sul, 1998: 188-190.
12. LUÍS JPS., PONTES JV., CARVALHO AC. Neoplasias primárias do pulmão em cães a propósito de três casos submetidos a cirurgia. **Rev. Port. Ci. Vet.**, (2005) 100 (553-554) 95-102.
13. MORRI, J., DOBSON J. **Oncologia em Pequenos Animais.** São Paulo, Roca. 2007.
14. MYER W. **Manual Saunders Clínica de Pequenos Animais.** 2ª edição, Ed. Saunders, São Paulo. 1998.
15. PAOLONI MC, ADAMS WM, DUBIELZIG RR, KURZMAN I, VAIL DM, HARDIE RJ. Comparison of results of computed tomography and radiography with histopathologic findings in tracheobronchial lymph nodes in dogs with primary lung tumors: 14 cases (1999-2002). **J. Am. Vet. Med. Assoc.** 2006;228(11):1718-1722.
16. SERENO M., ESTEBAN IR., ZAMBRANA F., MERINO M., RAPOSO CG., GOMES ML., SAENZ EC. Squamous-cell carcinoma of the lungs: Is it really so different? **Crit. Rev. Oncol. Hematol.** 2012. doi: [10.1016/j.critrevonc.2012.06.009](https://doi.org/10.1016/j.critrevonc.2012.06.009)
17. SHIELDS PG. Molecular epidemiology of smoking and lung cancer. **Oncogene.** 2002, 21(45): 6870-6.
18. VILLIERS EJ., DUNN JK. Collection and preparation of smears for cytological examination. **In Pract.**, 1998, 20, 370-377.
19. WILSON DW., DUNGWORTH DL. Tumors of the respiratory tract. In: Meuten D.J. (Ed.) 4ed. Iowa State University Press, Ames, 2002, 365-399.
20. WITHROW, S.J. Lung cancer. In: WITHROW, S. J.; MACEWEN, E. G. **Small animal clinical oncology.** 4.ed. Philadelphia: Saunders, 2007, Cap.22, p.517-523.