

## Lymphoma of the trachea in a cat: a case report

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**ABSTRACT:** Diffuse large B-cell lymphoma of the trachea was diagnosed in a 14-year-old domestic shorthaired cat suffering from dyspnoea. X-ray examination revealed marked stenosis of the lumen in the thoracic segment of the trachea. Post-mortem examination of the trachea disclosed two formations. The larger, visible in the radiograph, was formed by thickened tracheal wall. The smaller one was of crest appearance and was located in the cranial segment of the trachea, immediately behind the larynx. The tumour was characterised by immunohistochemical positivity to CD79 $\alpha$  epitope in the neoplastic cells.

**Keywords:** airways; neoplasia; cat; clinic; pathology

Tumours of the trachea are reported only rarely in man and animals and adenocarcinoma, rhabdomyoma, rhabdomyosarcoma, chondroma, chondrosarcoma, osteosarcoma, lymphoma and mastocytoma are described in textbooks of veterinary pathology (Wilson and Dungworth 2002; Caswell and Williams 2007; Lopez 2007). In veterinary journals only a few case reports are published: squamous cell carcinoma in a cat (Veith 1974), lymphoma and adenocarcinoma in two separate cats (Beaumont 1982), tracheal adenocarcinoma (Cain and Manley 1983), anaplastic tracheal squamous cell carcinoma (Lobetti and Williams 1992), non-keratinizing squamous cell carcinoma (Jelinek and Vozkova 2012), all in cats, primary extranodal lymphosarcoma of the trachea (Kim et al. 1996), and tracheobronchial neuroendocrine carcinoma (Rossi et al. 2007). Additionally, tumours causing a narrowing of the tracheal lumen in cats have been described. An anaplastic giant cell adenocarcinoma of the thyroid gland has been described by Patnaik and Lieberman (1979) and a case of extranodal lymphosarcoma was described by Fujita et al. (2004). Finally, tracheal carcinoma has been described in a dog (Hill et al. 1987), and clear-cell carcinoma has been reported in the trachea of a rat (Chandra et al. 1991). This case report adds to the body of literature on tracheal tumours in animals by describing a B-cell lymphoma in the trachea of a cat.

### Case description

The case concerns a 14-year-old shorthaired tom cat which had spent all of its life in a family house with a garden and with the choice of staying in the house or outdoors. No severe disease was diagnosed in its history. Over the course of one week the owner observed progressive dyspnoea without any other clinical symptoms. At the time of presentation in the veterinary clinic the patient was apathetic, with signs of severe dyspnoea. The cat was breathing with an open mouth and with audible wheezing. Body temperature was 37,1 °C, CRT was up to 1 s, visible mucous membranes were pink, subcutaneous lymph nodes were not enlarged and palpation of the abdomen was painless, without any resistance. X-ray examination of the chest revealed severe stenosis of the tracheal lumen caused by a markedly thickened tracheal wall. The lesion was located in a segment between the 4<sup>th</sup> and 6<sup>th</sup> rib (Figure 1). Due to unfavourable prognosis the cat was humanely destroyed.

Only the trachea was available for postmortem examination because the owner did not consent to a complete necropsy of the cat. Two formations were found in the trachea. The larger one, visible in the radiograph, was formed by circumferentially thickened tracheal wall that was about 2 cm long and 6–7 mm thick. The mass was of whitish colour.



Figure 1. X-ray graph of the chest. Severe stenosis of the lumen caused by markedly thickened wall of the trachea (red arrow)

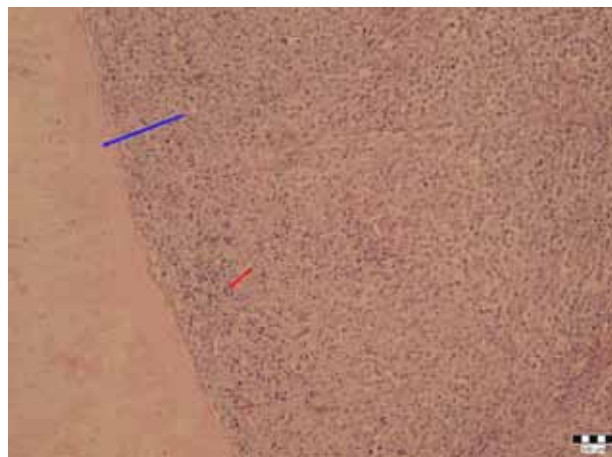


Figure 2. Diffuse lymphoma in the trachea. Tracheal cartilage (blue arrow) and small lymphocytes disseminated in the tumour (red arrow). Staining with haematoxylin and eosin

The smaller one was located in the dorsal region of the cranial segment of the trachea, immediately behind the larynx. It appeared as a crest formation, dimensions about 2 cm × 4 mm × 3 mm and was also of whitish colour.

Samples for histopathological examination were fixed in 10% neutral buffered formalin, embedded in paraffin wax, sectioned at 5 µm thick slices and stained with haematoxylin and eosin. The common immunoperoxidase method was applied to serial sections for the detection of T-cells and B-cells. Antigens were unmasked by boiling of the slides for 10 min in 0.1M citrate buffer, pH 6.0. Endogenous peroxidase activity was blocked with 3% H<sub>2</sub>O<sub>2</sub> for 15 min. The following primary antibodies were used: Polyclonal rabbit anti-human CD3, diluted 1 : 25 (DakoCytomation, Glostrup) and monoclonal mouse anti-human CD79 αcy, diluted 1 : 25 (DakoCytomation, Glostrup). Binding of the primary antibodies was detected by

means of the Streptavidin-Biotin Universal detection System (Ultratech HRP, Immunotech Marseille) and the DAB Chromogen Kit (Ultratech DAB, Immunotech Marseille). The slides were counter-stained with haematoxylin.

Both surfaces of the tracheal cartilage were surrounded by a lymphoid neoplasia (Figure 2). The architecture of the neoplasia was diffuse and consisted of large cells with round to slightly irregular nuclei, some of them with shallow cleavage. The nuclear membrane was thick and the chromatin was fine with parachromatin clearing. A prominent single nucleolus was situated predominantly in the centre of the nuclei; however, in some of the cells an impinging of the nucleolus on the nuclear membrane could be observed. Mitotic activity was moderate. The mitotic index (mean number of mitoses over 10 fields examined with the ×40 objective) was 3.6. Some of the mitotic figures were atypical. The cytoplasm was slightly eosinophilic and the cytoplasmic membrane was inconspicuous. Apoptotic bodies were disseminated in the neoplastic tissue, but tingible body macrophages were absent (Figure 3). Small, apparently differentiated, lymphocytes were disseminated in the neoplastic tissue as single cells or as aggregates of different

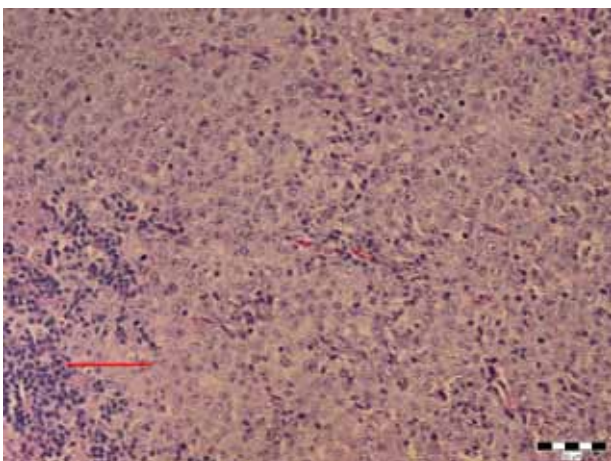


Figure 3. Diffuse large cell lymphoma. Round to slightly irregular nuclei, thick nuclear membrane and fine chromatin with parachromatin clearing. Prominent single nucleoli situated predominantly in centre of the nuclei. Aggregates of small lymphocytes (red arrow). Staining with haematoxylin and eosin



Figure 4. Neoplastic cells labelled with CD79  $\alpha$ cy antibody. Immunoperoxidase reaction



Figure 5. Neoplastic cells not labelled with CD3 antibody. Immunoperoxidase reaction

size. On immunohistochemistry the neoplastic cells and small lymphocytes were not labelled with CD3 antibody. All lymphoma cells were labelled with CD79  $\alpha$ cy antibody. Part of the small lymphocytes was labelled with CD79  $\alpha$ cy while the remainder did not express this epitope (Figures 4 and 5).

## DISCUSSION AND CONCLUSIONS

It is not known why tumours in the trachea, both in humans and animals, are rare. Their aetiology is also not well defined. In one case long-term exposure of a cat to cigarette smoke in the household of a heavy smoker was presumed as a contributory aetiological factor in the genesis of this type tumour (Jelinek and Vozkova 2012). An association between feline lymphoma and passive exposure to cigarette smoke has been proposed, but no link to respiratory tract neoplasia is documented in this species (Bertone et al. 2002). Histological classification of tumours of the respiratory system of domestic animals surprisingly does not mention lymphomas (Dungworth et al. 1999).

It is interesting that extranodal lymphoma occurs in the trachea although the mucosa associated lymphatic tissue (MALT), characterised as nonencapsulated concentrated areas of lymphocytes including lymph nodules, is not described in veterinary histology textbooks and is not observed in histological slides examined in common histopathological diagnostics. On the other hand, bronchus associated lymphatic tissue (BALT) is well known. Extranodal marginal zone B-cell lymphoma of MALT (MALT lymphoma) is characterised as low-grade lymphoma

usually arising in a background of chronic inflammation and associated with the mucosal surface of the respiratory or enteric system (Valli et al. 2002). It mostly appears in mature dogs and cats. MALT lymphomas are usually composed of small lymphocytes of intermediate type with indented nuclei, or there may be a more mixed pattern with larger lymphoid cells similar to centrocytes and centroblasts. The characteristic lesion consists of follicular hyperplasia in a submucosal site, with progression to a monomorphic cell population that invades the mucosa in a “lymphoepithelial lesion” that destroys glands and ulcerates the surface epithelium (Valli et al. 2002). The morphological characteristics of lymphoma in our case were different. Head et al. (2003), however, state that low grade MALT lymphoma in the gastrointestinal tract may undergo transformation to high-grade lymphoma. It cannot be therefore entirely excluded that such a transformation has happened in the trachea of our patient.

In our case the cytological and architectural properties were similar to large B-cell lymphoma. Large cell lymphomas, presumably of the B-cell type, most commonly occur in the cow, cat, horse and pig (Valli and Gentry 2007). In the cat, diffuse large non-cleaved cell lymphomas make up 10% and cleaved-cell lymphomas, 13% of lymphomas (Valli et al. 2002). Large B-cell lymphoma includes several types of which diffuse large B-cell (noncleaved, cleaved) lymphoma is one type. This type of lymphoma is characterised by frequent mitoses and numerous tangible body macrophages that, however, were not observed in our case. Large cell immunoblastic lymphoma are characterised by numerous mitoses and tingible-body macrophages, the cytoplasm is variable in volume and

often deeply stained (basophilic) but this was also not observed in this present tumour.

The presence of small, differentiated lymphocytes in the tumour could perhaps lead to a diagnosis of T-cell-rich B-cell lymphoma. This lymphoma progresses slowly and is characterised by a mixed population of numerous small cleaved-cell T cells and large neoplastic B cells which constitute about 5% to 10% of the total population. In this case large neoplastic B-cells predominated, and small lymphocytes were not numerous, did not have cleaved nuclei and were not labelled with CD3 antibody.

In summary, a large B-cell lymphoma was diagnosed in the trachea of a 14-year-old shorthaired tom cat. The subtype of the lymphoma could not be determined because its histological picture did not entirely correspond to any of those specified in the official histological classification of haematopoietic tumours in animals.

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