Functional cystic thyroid adenoma in a cat

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Possible causes of cystic ventral cervical masses in cats include thyroid, thyroglossal duct, and parathyroid cysts; however, the possibility that such masses represent cystic thyroid adenomas or cystic thyroid carcinomas should also be considered.

Magnetic resonance imaging, nuclear scintigraphy, and measurement of parathyroid hormone concentrations in fluid from ventral cervical cysts may help in differentiating thyroid, thyroglossal, and parathyroid cysts.

A 9-year-old 3.4-kg (7.5-lb) spayed female calico cat was referred to the Veterinary Teaching Hospital at Washington State University for treatment with sodium iodide I 131 because of hyperthyroidism. The referring veterinarian had initially diagnosed hyperthyroidism 3 years previously on the basis of serum thyroid hormone concentrations (151.9 nmol/L; reference range, 20.6 to 39.9 nmol/L). Treatment with methimazole (T 4) was initiated at that time. Additionally, amoxicillin (15 mg/kg [7 mg/lb], PO, q 12 h) and dexamethasone (1.2 mg/kg [0.5 mg/lb], PO, q 12 h) were administered for treatment of chronic stomatitis. Nine months later, the stomatitis became refractory to this treatment. Therefore, administration of amoxicillin was discontinued, and clindamycin (7.4 mg/kg [3.4 mg/lb], PO, q 12 h) was added to the treatment regimen. The cat had a 4- to 5-year history of a ventral cervical mass, and the owner reported that the mass had begun to increase in size several weeks prior to examination at the teaching hospital. The mass had not been aspirated or biopsied prior to referral. In preparation for 131I treatment, administration of methimazole had been discontinued 2 weeks prior to examination at the teaching hospital.

At the time of initial examination, the cat was bright, alert, and responsive. Heart rate was high (180 beats/min), and the cat had moderate dental tartar, a large soft abdomen, poor body condition, a slightly thin haircoat, and a large (4 × 7 × 10 cm) mass palpable over the ventral aspect of the trachea. The mass was warmer than the surrounding tissue and appeared to displace the trachea, esophagus, common carotid arteries, and jugular veins laterally. It was not mobile and could not be separated from the underlying structures in the cervical region. The only other abnormal finding during physical examination was a grade-II systolic murmur that was best heard over the left cranial aspect of the thorax.

Differential diagnoses for the cervical mass that were considered at this time included abscess, cyst (ie, thyroglossal duct cyst, thyroglossal cyst, and parathyroid cyst), neoplasia (ie, thyroid adenoma or adenocarcinoma, parathyroid adenoma or adenocarcinoma, and squamous cell carcinoma), and salivary mucocele. To our knowledge, descriptions of thyroglossal duct cysts and parathyroid cysts in cats have not been published, but these conditions were considered because of the location of the lesion. The tachycardia was attributed to hyperthyroidism. The cardiac murmur was attributed to the altered physiologic state associated with hyperthyroidism, although valvular and muscular cardiac disease could not be ruled out, because echocardiography was not performed.

A CBC, serum biochemical analyses, urinalysis, and thoracic radiography were performed; serum thyroid hormone concentration was measured; and a fine-needle aspirate of the mass was collected. The CBC revealed minor changes consistent with a stress leukogram. Serum biochemical abnormalities included hyperproteinemia (8.9 g/dL; reference range, 6.4 to 7.8 g/dL), hyperglobulinemia (5.7 g/dL; reference range, 3.4 to 4.4 g/dL), high alanine aminotransferase (ALT) activity (176 U/L; reference range, 30 to 80 U/L), and high alkaline phosphatase (AP) activity (48 U/L; reference range, 11 to 28 U/L). The hyperglobulinemia was attributed to chronic inflammation associated with severe gingivitis, the cervical mass, or both. High ALT and AP activities are common findings in hyperthyroid cats; therefore, these abnormalities were not pursued further. Urinalysis revealed proteinuria (2+), hemoglobinuria (4+), and bacteriuria (> 100 RBC/HPF); urine specific gravity was > 1.035. Results were considered consistent with trauma during cystocentesis; renal concentrating ability was considered to be normal. Thoracic radiography was performed to identify signs of cardiac disease and to check for possible metastases, because neoplasia was 1 of the differential diagnoses being considered for the cervical mass. The cardiac silhouette and pulmonary vasculature appeared normal. No metastatic lesions were observed, but a soft tissue mass superimposed over the diaphragm in the area of the esophageal hiatus was observed. Positive-contrast gastroscopy, performed with fluoroscopy, revealed a mild hiatal hernia, which was believed to be benign and unrelated to the other disease processes in this patient. Serum T 4 concentration was high (145.4 nmol/L; reference range, 20.6 to 39.9 nmol/L), confirming the diagnosis of hyperthyroidism. Fine-needle aspiration of the cervical mass yielded 2 ml of serosanguineous fluid, which was submitted for cytologic analysis. Most of the cells were RBC, some of which were undergoing erythrophagocyto-
sis. The nucleated cell population consisted of mildly degenerate neutrophils (71%), macrophages (19%), and lymphocytes (2%). No microorganisms or neoplastic cells were observed. Findings were most consistent with inflammation and previous bleeding. Because of the size and cystic nature of the lesion and the low cellularity of the fluid obtained from it, an abscess, mucocele, and squamous cell carcinoma were considered unlikely. Thyroid or parathyroid cyst and neoplasia were considered the most likely differential diagnoses.

Although the cat had been referred solely for radioactive iodine treatment because of hyperthyroidism, it seemed prudent to further characterize the nature of the cervical mass, because such lesions are not typical of cats with hyperthyroidism. Furthermore, hyperthyroidism is uncommon in cats < 8 years old, and hyperthyroidism had initially been diagnosed when this cat was only 5 years old. Excisional biopsy of the mass was not attempted because of the extent of the lesion and its apparent adherence to underlying structures. Incisional biopsy was considered but not performed because of concerns that the size of the mass and the amount of stretching of the overlying skin may inhibit healing. In human patients with similar masses, noninvasive diagnostic tests that have been used include magnetic resonance (MR) imaging, nuclear scintigraphy, and biochemical analysis of the cystic fluid. Magnetic resonance imaging was performed the day after admission, using a 1 T unit with the cat in dorsal recumbency. On the MR images, a mass could be seen in the right-ventral portion of the neck extending 6 cm caudally from the level of C1 (Fig 1). The greatest transverse diameter of the mass was 4 cm, and cervical structures were markedly displaced to the left, except for the right jugular vein and common carotid artery. The mass was homogeneously bright on T2-weighted, proton density-weighted, and T2-weighted fat-suppressed images, but an area of less bright signal intensity was seen in the dependent portion of the mass. This area was separated from the larger, nondependent portion of the mass with a horizontal line. Results were suggestive of a large cyst filled with proteinaceous fluid in which contents were separated by gravity. Several irregular areas of tissue with signal intensity equal to that of connective tissue were seen in association with the left and ventral walls of the cyst. These structures were thought to represent soft tissue masses arising from the wall and extending into the lumen of the cyst. A second mass was identified on the left side of the trachea, at the level of C1 and C2. This mass had the same intensity as the tissue within the cyst, was approximately 3 cm long and 1 cm wide, and was thought to be a hyperplastic left thyroid gland lobe. Mandibular salivary glands with a normal appearance were identified bilaterally. Thyroid scanning with 0.78 mCi of sodium pertechnetate Tc 99m was performed on the following day; images were obtained with a gamma camera with a low-energy general-purpose collimator. Increased radiopharmaceutical uptake with a complex multifocal pattern was seen in the entire cervical region (Fig 2). The most pronounced areas of uptake were on the left side in an area that corre-

Figure 1—Transverse T2-weighted magnetic resonance image of the neck of a cat at the level of C2. A large cystic structure (C) has displaced the trachea (T) and esophagus (E) to the left. A soft-tissue mass (M), which most likely represented a hypertrophic left thyroid gland lobe, can be seen to the left of the esophagus. Soft tissue masses in the cyst wall (small black arrows) had the same signal intensity as the mass (M) on the left side.

Figure 2—Scintigraphic image of the cat in Figure 1 obtained following administration of sodium pertechnetate Tc 99m; the cat was in ventral recumbency. The area of the neck had marked uptake of radiopharmaceutical with a heterogeneous pattern. The area of uptake corresponded to the area occupied by the large cystic structure on the magnetic resonance images and likely represented thyroactive tissue in the cyst wall. The most cranial nodule on the left side (arrow) likely represented the hypertrophic left thyroid gland lobe. Radioactivity in the right antebrachium represented radiopharmaceutical remaining at the site of injection.
Smallestimal calcium concentrations were low, compared with reference ranges for serum (19 to 27 mg/dl), protein (9.5 g/dl), and phosphorus (10.6 mg/dl). Reference range for serum concentration, 3.8 to 5.4 mg/dl) concentrations were high, compared with reference ranges for serum and CO2 content (7.8 mmol/L; reference range for serum concentration, 16 to 27 mmol/L) was low. Whether the high concentration of T4 in the cyst fluid was simply a result of equilibrium with T4 in serum or a result of unusual processing of T4 by neoplastic thyroid cells associated with the cyst could not be determined. In people with thyroid cysts, the cyst fluid may have high aspartate aminotransferase and lactate dehydrogenase activities and high total protein, total bilirubin, and uric acid concentrations, compared with serum;4 or the fluid may have high acid phosphatase, aspartate aminotransferase, amylase, and lactate dehydrogenase activities and high iron and total bilirubin concentrations.5 In people with parathyroid cysts, the cyst fluid consistently has high concentrations of PTH.6,7 Thus, other than the high total protein concentration, results of analysis of fluid from the cyst in this cat were not consistent with the findings for fluid from thyroid or parathyroid cysts in people. In reviewing the literature, we did not find any information on T4 concentration in cyst fluid from people suspected to have thyroid cysts.

Because findings for this cat were most suggestive of a functional thyroid cyst, specific treatment for hyperthyroidism was deemed appropriate at this time. On day 6, the cyst was drained of approximately 40 mL of serosanguineous fluid to decrease pressure on cervical structures. One hundred milliliters (29 ml/kg [13.2 mg/lb]) of sterile sodium chloride (0.9% NaCl) solution was administered subcutaneously to replace fluid that may translocate from the vascular compartment into the cyst and because the cat had not been eating or drinking well while hospitalized. Five milliliters of sodium iodide I 131 was administered subcutaneously, and the cat was maintained in isolation, in accordance with state regulations. After being placed in isolation, the cat became lethargic and refused to eat. On day 8, a nasogastric tube was inserted, and a commercial liquid diet (32 ml/kg [14.5 mg/lb], q 12 h) and water (5.9 ml/kg [2.7 mg/lb], q 12 h) were administered through the tube. Because of radiation safety regulations, no diagnostic tests could be performed to determine the cause of the patient’s condition. The cat’s appearance did not improve during the next 2 days, and on day 10, the cat was found dead in its cage with bloody vomitus in and around its mouth.

The cause of the cat’s death was thought to most likely be a result of aspiration of vomitus secondary to dysphagia caused by the mass and the nasogastric tube. However, the possibility that the cat died of acute thyrotoxic crisis could not be discounted, as radioactive iodine treatment and withdrawal of antithyroid medications are predisposing factors in people with acute thyrotoxic crisis.7 The owner declined a complete necropsy evaluation. Because of unobtainable information on T4 concentration in cyst fluid from people suspected to have thyroid cysts.
complex and extensively arborizing papillae supported by a central fibrovascular core (Fig 3). In some of the papillae, cells were thickly piled and occasionally formed small follicular structures. Most cells had uniform eosinophilic cytoplasm, but some cells contained gray-brown cytoplasmic granules and others had abundant foamy cytoplasm. Most of the cells had uniform, round, approximately 4- to 5-μm-diameter, densely chromatic, centrally located nuclei that contained a single small nucleolus. In some areas, however, there was more variation. Some cells had nuclei that were 2 to 4 times the diameter of others, had more conspicuous nucleoli, and were oval, piriform, indented, or polygonal. A few of the larger nuclei had central eosinophilic zones, which are compatible with cytoplasmic invaginations. Several clusters of cells underwent squamous differentiation. Mitotic figures were not seen. The lumen of the cyst contained uniformly stained amphophilic fluid compatible with colloid.

Cystic thyroid adenomas are rare in cats, and to our knowledge, only 2 cases have been reported previously.8,9 One of these cats was initially examined because of respiratory distress; dyspnea had apparently developed as a result of laryngeal paralysis secondary to pressure on the recurrent laryngeal nerve. The other cat did not have any clinical signs associated with the mass, but the mass was removed, because it had increased in size during the preceding 12 months.9 In the former case, the cat had not been evaluated for hyperthyroidism prior to surgical excision. In the latter case, the cat's serum T4 concentration was within reference limits.

A previous report10 described a German Shepherd Dog examined because of a large ventral cervical mass that was determined to be functional cystic thyroid adenoma causing hyperthyroidism. Serum T4 and T3 concentrations were high in that dog, and the diagnosis was confirmed on the basis of histologic examination of an excisional biopsy specimen. The mass in this dog was smaller (5 × 3 × 3 cm) than the mass in the cat described in the present report and was freely movable within the subcutaneous tissues, making surgical excision possible. Surgical excision of the entire mass in the cat described in the present report would have been extremely challenging because of its size and intimate involvement with underlying structures.

In this cat, evaluating fluid aspirated from the cyst, as is often performed in human patients, was helpful in ruling out parathyroid disease. Determining PTH concentrations in cyst fluid and T4 concentration in serum, as is often performed in human patients, was helpful in determining the cause of ventral cervical cysts in cats. However, performing biochemical analyses on cyst fluid in this cat did not provide any additional diagnostic information.

The major differential diagnoses for a ventral cervical cyst lined by thyroid cells are a cystic thyroid gland or cystic thyroglossal duct.11,12 but the possibility of a cystic thyroid carcinoma or thyroid adenoma should also be considered. With papillary thyroid carcinomas and thyroid adenomas, mitotic figures are rare or absent.13 Although complex arborizing papillae and a cystic center are features of papillary thyroid carcinomas, the major criterion for papillary thyroid carcinomas—invasion—was not seen in the specimen from this cat, suggesting that the cat instead had a cystic thyroid adenoma. However, because only portions of the mass were examined histologically, the possibility of invasion cannot be ruled out. Thyroid adenomas may arise from the thyroid gland or the thyroglossal duct, and in this cat, it could not be definitively determined on the basis of results of histologic examination alone whether the mass originated from the thyroid gland or the thyroglossal duct. However, diagnostic imaging did not reveal 2 thyroid glands in addition to the mass, which has been the case in dogs with thyroglossal duct tumors.13,14 Furthermore, the absence of ciliated epithelial cells, stratified squamous epithelium, and basally oriented nuclei suggested that the mass was not an ectopic or cystic thyroglossal duct15,13 and had not originated from the thyroglossal duct.

References

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