Surgery

Functional Thyroid Gland Adenoma in a Dog Treated with Surgical Excision Alone

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ABSTRACT. An 11-year-old male Golden Retriever presented with progressive weight loss, tachycardia, hyperthermia, polyuria and polydipsia. A freely movable mass, 4.5 × 4 cm in size, was palpated at the cranioventral cervical region. Hormonal study revealed high levels of serum thyroid hormones, and a tentative diagnosis of hyperthyroidism due to a thyroid tumor was made. The tumor was removed surgically and diagnosed histopathologically as thyroid gland adenoma. Serum thyroid hormone levels decreased after surgery with improved clinical signs. At 12 months after surgery, the dog maintained a good physical condition with no evidence of recurrence.

KEY WORDS: canine, hyperthyroidism, thyroid gland adenoma.


Thyroid gland tumors represent 1.2 to 4% of all canine tumors [5, 8]. Most are described as carcinomas, of which less than 10% secrete thyroid hormones [2, 3, 5, 8, 10]. Benign thyroid adenomas are clinically rare, usually discovered at necropsy as incidental findings consisting of non-functional small nodules [3, 5]. In contrast, most thyroid tumors in cats are functional adenomas that result in hyperthyroidism, but are often successfully treated with thyroidectomy alone [3]. Surgical treatment of hyperthyroidism due to thyroid adenoma has been reported in a dog with only 5 weeks post-surgical follow-up [6], but to our knowledge, no similar canine case reports have yet to be reported. The present report describes a canine case of functional thyroid adenoma treated with surgical excision alone, with clinical and hormonal improvements 12 months after surgery.

An 11-year-old male Golden Retriever was presented for evaluation of progressive weight loss. The dog was active and had a good appetite without any gastrointestinal signs, but his body weight was 22.9 kg compared to 31.7 kg 15 months before presentation. The owner noticed signs of polyuria and polydipsia about 1 month prior to presentation. The dog’s heart rate was 160 beats per min and the rectal temperature was 40.6°C. A firm, freely movable subcutaneous mass, 4 × 4.5 cm in size, was palpated at the cranioventral cervical region. Ultrasonographic examination of the lesion revealed a well-demarcated mass without invasion to the surrounding tissues. The mass was aspirated for cytology under ultrasound guidance, revealing clusters of mononuclear cells suggestive of a thyroid gland tumor. The owner did not consent to further examination.

Two weeks later, the dog was readmitted because of frequent vomiting for 24 hr, and the owner requested close examination. The movable, cervical mass remained, and progression of weight loss (20.8 kg), tachycardia (180 beats per min), and hyperthermia (39.7°C) with a panting breath (120 breaths per min) were noted. Thoracic radiography revealed no evidence of metastasis or cardiac enlargement and regional lymph nodes showed no swelling on palpation. Results of hematological and biochemical examination were almost normal except for mild bilirubinemia (0.7 mg/dl) and neutrophilia (17,444 cells/µl). Hormonal measurements using the CLEIA method (Monoris, Japan) showed high serum thyroxine (T4, 8.05 µg/dl), free T4 (fT4, ≥ 6 ng/dl), and triiodothyronine levels (T3, 2.03 ng/ml), and a low serum thyroid-stimulating hormone level (TSH, 0.02 ng/ml). A tentative diagnosis of hyperthyroidism due to functional thyroid tumor was made, and since palpation indicated a resectable tumor, surgical treatment was chosen.

Midazolam (0.1 mg/kg, IV) and butorphanol (0.2 mg/kg, IV) were administrated as preanesthetic agents then five minutes later anesthesia was induced using propofol and maintained by isoflurane and oxygen. The tumor was approached via a midline incision. It was located near the normal position of the left lobe of the thyroid gland but no normal left lobe was found. The mass was carefully separated from surrounding tissue with ligation of the blood vessels connecting to the mass. A grossly well-encapsulated mass was completely removed (Fig. 1). The right lobe of the thyroid gland was not enlarged. Skin and subcutaneous tissue were closed routinely.

Fig. 1. Gross finding of the excised tumor. The tumor was well-encapsulated by the fibrous tissue.
Histopathologically, the mass consisted of irregular shaped follicles with an abundant colloid content or focal solid nests formed by tumor cells similar to thyroid follicular epithelial cells (Fig. 2, A, B). The tumor mass was well circumscribed with prominent fibrous tissues but was not of an invasive nature. The tumor cells had a densely eosinophilic cytoplasm, and their nuclei were round to oval and varied in size. Mitotic figures were rare. Hemorrhage or necrosis was partially observed in the interstitial tissues. On immunohistochemical examination, the contents of the follicles within the tumor were positive for thyroglobulin (Fig. 2C). Based on these findings, the tumor was diagnosed as a thyroid follicular adenoma.

After surgery, the dog maintained good activity and appetite, and body temperature and heart rate returned to normal. Changes in hormone levels before and after surgery are shown in Table 1. Serum TSH levels started to increase after surgery. Levels of serum T3, T4, and fT4 at 10 days after surgery were lower than the reference range, but gradually increased thereafter. Since no clinical signs indicative of post-surgical hypothyroidism were noticed, no thyroid hormone supplement was used. The dog’s body weight increased to the level before onset of the disease to 23.9, 26.2, and 33.4 kg 10 days, 40 days, and 7 months after surgery, respectively. At 12 months after surgery, the dog maintained a good physical condition with no evidence of local recurrence, though levels of T3 and T4 were still lower than the reference range and the TSH level was higher than the reference range.

<table>
<thead>
<tr>
<th>Time</th>
<th>T4 (µg/dl)</th>
<th>T4 (ng/dl)</th>
<th>T3 (ng/ml)</th>
<th>TSH (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before surgery</td>
<td>8.05</td>
<td>≥6.0</td>
<td>2.03</td>
<td>0.02</td>
</tr>
<tr>
<td>10 days</td>
<td>0.33</td>
<td>0.69</td>
<td>0.27</td>
<td>0.03</td>
</tr>
<tr>
<td>40 days</td>
<td>0.37</td>
<td>0.65</td>
<td>0.41</td>
<td>0.05</td>
</tr>
<tr>
<td>12 months</td>
<td>0.73</td>
<td>1.12</td>
<td>0.47</td>
<td>1.03</td>
</tr>
</tbody>
</table>

T4: thyroxine, fT4: free thyroxine, T3: triiodothyronine, TSH: thyroid-stimulating hormone.

Immunohistochemical study also supported thyroid hormone production by the tumor cells. The reported signs of canine hyperthyroidism include weight loss, tachycardia, polyuria, polydipsia, polyphagia, vomiting, weakness, and heat intolerance [3, 6, 9], most of which were observed in our case. Hepatic disease with increased serum hepatic enzyme activities and bilirubin concentration [3, 6], or cardiac disease with ventricular hypertrophy [9] have also been reported in canine hyperthyroidism. The lack of these abnormalities in our case, except for mild bilirubinemia, might be have been due to less severe or a shorter period of thyrotoxicosis.

Thyroid adenocarcinomas are classified into follicular, papillary, compact (solid), and mixed types (follicular and compact), according to their histological growth patterns [1]. The present case showed a follicular growth pattern but was diagnosed as a benign adenoma because of the low level of cellular pleomorphism and lack of stromal or vascular invasion, which are key findings differentiating them from carcinomas [3]. Lawrence et al. also reported a similar case of large thyroid adenoma and resultant hyperthyroidism [6].

A decrease in serum thyroid hormones after tumor removal was observed in a previous case [6], but the duration needed for functional recovery of the remained gland is uncertain. Hormonal studies in our case showed low levels of serum T3 and T4 even 12 months after thyroidecotomy.
with a high serum TSH level possibly resulting from positive feed-back due to low thyroid hormone levels, suggesting that a longer period of time is needed for complete recovery of the atrophied gland. However, these mild deficiencies of thyroid hormones may be not clinically significant, and thyroid hormone supplements should be avoided if possible because they can delay recovery of the remaining gland [6].

Antithyroid drugs with no cytotoxic effects are not indicated for hyperthyroidism due to malignancy, though their application prior to surgery might be potentially beneficial in reducing anesthetic complications associated with thyrotoxicity [6]. Canine thyroid carcinomas are often unresectable at the time of detection, and Harai et al. [5] reported a median survival time of only 7 months following surgery alone in 17 dogs with thyroid carcinoma. However, freely movable carcinomas can often be cured by surgery alone with more than 36 months of median survival [7]. With such movable tumors, as in our case, excision with a marginal rather than a wide margin likely contributes to the successful results by avoiding complications [7]. This suggests that careful palpation with diagnostic imaging before surgery might be indispensable for evaluation of the validity of surgery and in deciding the surgical margin. The necessity of post-surgical adjuvant therapy should be considered based on the histopathological diagnosis and completeness of excision.

REFERENCES