time of diagnosis. This prevents a surgical cure for these patients. Currently available chemotherapy for canine thyroid carcinoma has been disappointing.

Radioactive iodine (^{131}I) therapy is the most commonly utilized adjuvant therapy for thyroid carcinoma in man. The basis for radioiodine therapy is the unique ability of thyroid cells to concentrate iodine. This capability allows differentiated thyroid carcinoma cells to preferentially concentrate radioactive iodine administered to dogs with persistent disease following surgical debulking. Because the radioiodine is only concentrated by thyroid cells, the remainder of the dog's body is spared the effects of the radiation. Recent experience and numerous scientific articles suggests a good response to radioiodine therapy for differentiated thyroid carcinoma in the dog. The benefits of radioiodine therapy are maximized by the use of careful patient screening with thyroid scintigraphy to ensure adequate radioiodine uptake by the tumor. Additional benefits are obtained by surgical debulking of the tumor and the use of an iodine restricted diet prior to radioiodine administration. An iodine restricted diet ensures maximal radioiodine uptake by the iodine deprived thyroid carcinoma cells. Regulatory requirements require the hospitalization of dogs treated with radioiodine for variable periods depending on the individual dose administered as well as patient excretion rates.

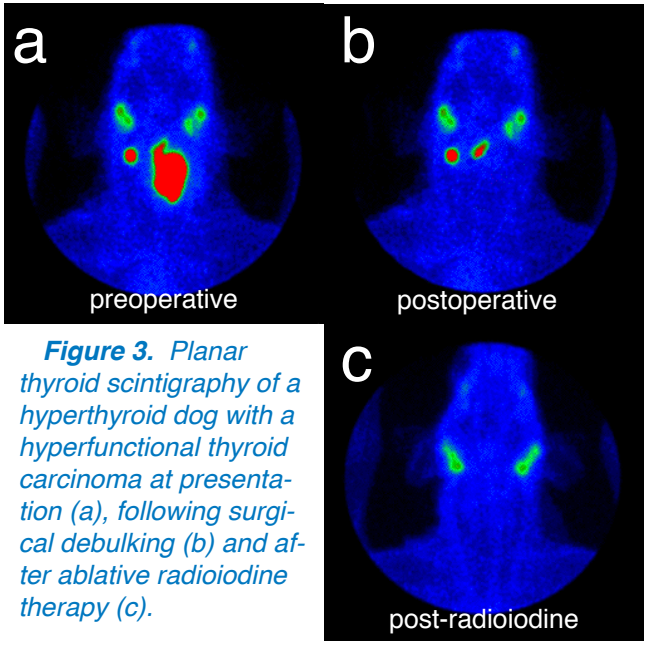

Figure 3. *Planar thyroid scintigraphy of a hyperthyroid dog with a hyperfunctional thyroid carcinoma at presentation (a), following surgical debulking (b) and after ablative radioiodine therapy (c).*

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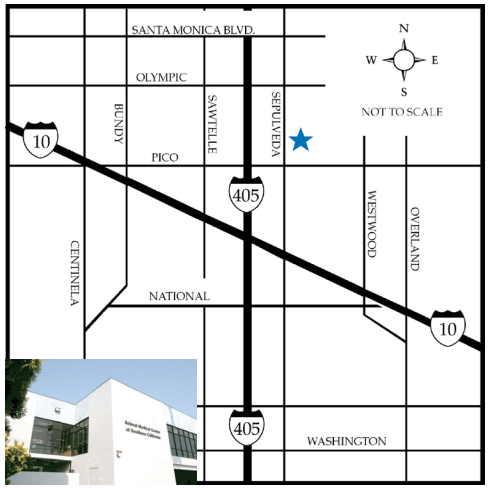

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Canine Thyroid Carcinoma

Thyroid neoplasia is probably more common in dogs than in almost any other species. Thyroid tumors account for approximately 1 to 4 % of all canine neoplasms and account for 10% to 15% of canine tumors of the head and neck. While thyroid carcinomas have been reported in virtually every canine breed, Beagles, Boxers and Golden Retrievers are at an increased risk when compared to other breeds.

Etiology:

More than 90% of all detected canine thyroid tumors are carcinomas. Approximately 85% of thyroid carcinomas in dogs are of a compact or follicular (differentiated) type. Approximately 15% or less are anaplastic (undifferentiated). Less than 5% of thyroid carcinomas in dogs originate from the parafollicular or C-cells. The C-cells of the thyroid produce calcitonin, a hormone important in calcium homeostasis. Tumors of the C-cells are called medullary thyroid carcinomas. Most dogs with thyroid tumors are euthyroid (have normal thyroid hormone levels) because thyroid tumors uncommonly produce excessive thyroid hormone levels. Only approximately 5% of dogs with thyroid carcinomas demonstrate a clinical thyrotoxicosis (elevated thyroid hormone levels). The thyroid tumors in these dogs demonstrate a markedly increased iodine uptake needed to support their increased thyroid hormone production. Despite the absence of a circulating thyrotoxicosis, differentiated thyroid carcinomas in the dog are usually capable of concentrating iodine.

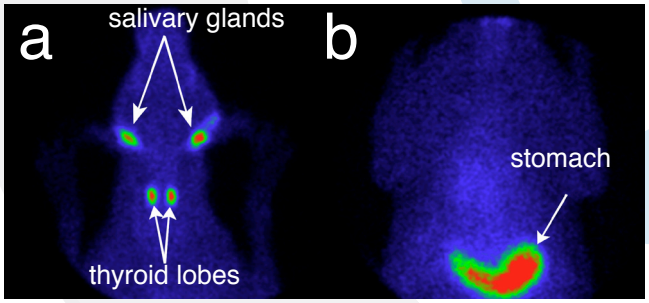

Figure 1. Planar thyroid scintigraphy of the neck (a) and chest (b) of a normal dog. The radionuclide is concentrated by thyroid tissue, salivary glands and gastric (stomach) mucosa. The nose (a) and head (b) are toward the top of the images.

Clinical Signs:

The most common and frequently only clinical sign demonstrated by dogs with thyroid carcinoma is a visible or palpable mass in the neck. Relatively early in the course of their disease, dogs will also develop intermittent coughing, intermittent dysphagia (difficulty swallowing), and dysphonia (change in bark). As the disease progresses the mass will more persistently interfere with breathing and/or swallowing leading to weight loss, regurgitation, persistent dyspnea, listlessness and anorexia (decreased appetite). The best outcomes occur in dogs with no clincal symptoms other than the palpable mass. The most common clinical signs demonstrated by dogs with thyrotoxicosis secondary to hyperfunctional thyroid carcinomas are polyuria (increased urination) and polydipsia (increased water consumption).

Diagnosis:

The diagnosis of thyroid neoplasia in most cases is based on a cytologic or histopathologic evaluation of tissue samples collected from the mass. Cytologic evaluation is usually capable of determining the source as thyroid tissue. However cytologic evaluation is frequently limited in its ability to accurately differentiate a benign thyroid adenoma from a well differentiated thyroid carcinoma. In these cases, histopathologic evaluation of a tissue sample is necessary to confirm a malignancy. Excisional biopsy samples typically provide the best opportunity to evaluate for capsular or vascular invasion as important criteria of malignancy as well as important factors in treatment planning. In the small percentage of dogs who develop a thyrotoxicosis secondary to a differentiated thyroid neoplasia, diagnosis can be aided by measurement of circulating thyroid hormone levels.
Planar thyroid scintigraphy (or thyroid scanning) is a well established diagnostic aid in the evaluation of dogs with thyroid carcinoma. Technetium pertechnetate ($^{99m}TcO_4^-$) is concentrated by thyroid tissue, salivary glands and gastric mucosa (stomach). Technetium pertechnetate is concentrated in thyroid tissue by the same mechanism as iodine. By evaluating the uptake of technetium pertechnetate on a thyroid scintigraphy it is possible to better define the nature and extent of thyroid neoplasia. Thyroid scintigraphy is an important step in the staging of the canine patient with differentiated thyroid neoplasia. Thyroid scintigraphy utilizing technetium pertechnetate can also be used as a predictor of radioiodine uptake. Additional advanced imaging, ideally MRI, is occasionaly indicated to further define the local extent of the mass before surgical intervention.

Therapy:

Most veterinary literature describes the treatment of thyroid carcinoma using surgery or surgery combined with chemotherapy. Surgery is a very important part of the therapy for differentiated thyroid carcinoma. Surgery allows confirmation of a histopathologic (biopsy) diagnosis and potentially accomplishes significant reduction in tumor volume. In dogs with small, movable, unilateral thyroid carcinomas, surgery may be curative. Unfortunately thyroid carcinoma in dogs is usually diagnosed relatively later in its course and more than 50% of dogs with thyroid carcinoma have detectable metastasis at the

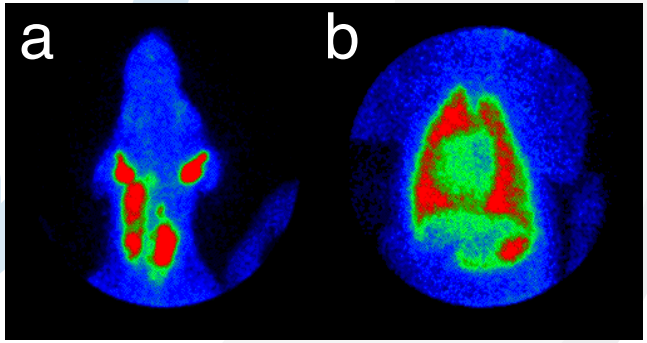

Figure 2. Planar thyroid scintigraphy of the neck (a) and chest (b) of a dog with a widely metastatic thyroid carcinoma. Multiple areas of metastasis (red) are noted in the neck (a). DIffuse pulmonary metastasis (red) is noted throughout both lungs (b).