Case report: Compact cellular (solid) carcinoma containing Hurthle cell areas in the thyroid gland of a dog

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SUMMARY

A 7-year-old Collie dog was referred to the clinics of the department of surgery of the veterinary faculty of Istanbul University with a complaint of swelling in the neck, suggesting a thyroid disease. Two separate masses, located at the upper and median 1/3 parts of the neck were detected at physical examination and were surgically removed. Grossly, encapsulated solid masses (4x3x2cm³ and 2x1x1cm³) with lobular, haemorrhagic and greyish-white cut surfaces were detected. Histological examination revealed wide, eosinophilic polygonal cells with tiny cytoplasmic granules and centrally localized prominent nuclei. Smaller cells forming insular structures along with cell clusters that constituted fusiform bundles were observed, as well. In some fields, follicles containing colloid matrix were remarkable. The masses were diagnosed as follicular compact cellular carcinoma containing Hurthle cell areas that are rarely described in dog thyroid carcinomas.

Keywords: Dog, thyroid tumour, compact cellular carcinoma, Hurthle cell

INTRODUCTION

Thyroid tumours are known to constitute 1.2-3.8% of all tumours in dogs. Most of them were reported to be malignant non-functioning carcinomas [2, 5]. Thyroid tumours detected in dogs were majorly classified as follicular, compact (solid) cellular and follicular–compact cellular carcinoma. Anaplastic, undifferentiated, malignant mixed and papillary carcinomas and medullar carcinomas originating from parafollicular C cells were reported to be less frequent [3, 7, 12]. Although the incidence of metastasis in these tumours was not directly associated with size, they had tendency to metastasize to the lungs at earlier stages by invading cranial and caudal veins of thyroid before affecting retropharyngeal and caudal cervical lymph nodes [4, 11]. Oncocytic or oxyphilic cells, called as Hurthle cells, are large, polygonal cells originating from metaplastic transformation of mature glandular or non-glandular epithelial cells. They contain numerous mitochondria and thus have large eosinophilic cytoplasm. Hurthle cell tumours that originate from follicle cells are usually arranged in follicular, trabecular/solid or papillary growth patterns [4]. While oncocytic cell tumours originating from the thyroid gland are frequently seen in humans, compact cellular (solid) carcinoma with Hurthle cells are rarely encountered in dogs [10]. Hurthle cell (oxyphilic-oncocytic) adenoma is not frequently seen, either [3, 13].

The present case was intended to be published due to the fact that the tumour is a compact cellular (solid) carcinoma including dense Hurthle cell areas which are rarely observed in thyroid tumours in dogs.

CASE HISTORY AND CLINICAL FINDINGS

A 7 years old female Collie dog was presented to the clinics of the veterinary faculty of Istanbul, Turkey, because of the complaint of neck swelling. In the clinical examination two masses located at the upper and median 1/3 parts of the
neck were detected. The larger mass was punctuated and a bloody fluid was extracted. Considering the localization, the masses were thought to originate from the thyroid gland they were surgically removed. The excised masses had dimensions of 4x3x2 cm$^3$ and 2x1x1 cm$^3$ respectively, and were encapsulated. The cut surfaces were lobular, containing local small haemorrhagic fields and they were gray-white in colour.

Tissue samples from the 2 masses were fixed in 10% neutral buffered formalin and embedded in paraffin, sectioned (5 µm), mounted on glass slides and the sections were stained with Haematoxylin and Eosin, and Masson’s Trichrome, periodic acid – Schiff (PAS) and then Congo red stain. In addition, all the slides were immunohistochemically stained using Avidin-Biotin-Peroxidase method for evidencing thyroglobulin, chromogranin or calcitonin and they were examined under light microscope.

**Pathological findings**

No thyroid tissue was detected outside the fibrous capsule. Tumour tissue was limited within the capsule. Tumour cells were forming islets that were generally localised at conglomerates but some were separated by thin fibrous septa. Tumour cells in those islets had three different morphologies. Firstly, some of them were polygonal cells with an eosinophilic cytoplasm and centrally located nuclei typically like Hurthle cells (figure 1). A second group of cells were similar to the first group but they were smaller and they formed insular structures (figure 2). The third group included fusiform cells with an eosinophilic cytoplasm and prominent chromatin, which constituted bundles. There was mild pleomorphism (figure 3). All those cell types were forming solid areas, in which small thyroid follicles filled with colloid were also found (figure 4).
Neither necrosis nor lymphocyte infiltration was detected in the tumour side, but they were significantly present around the capsule. Neoplastic cells were infiltrated to the capsule and to the vessels in the capsule at several sites (figure 5A and 5B).

No positive fields were detected in PAS and Congo red staining. Immunohistochemical evaluation of thyroglobulin, calcitonin and chromogranin showed negative labelling for thyroglobulin and chromogranin and a rare and weak positive staining was detected for calcitonin.

**Discussion**

Dog thyroid tumours are reported to onset between 5-15 years of age (mean 9-9,6 years), not depending on gender but to be seen more frequently in Boxer, Beagle and Golden retriever strains [3, 5, 8, 12]. The dog in the presented case is 7 years old and thus in the age range defined in literature, however it is out of strain predisposition as it is a Collie breed. Unilateral thyroid tumours are reported to be two times more frequent than bilateral ones [3]. It was previously reported that out of 19 dogs with thyroid carcinoma, 9 tumours originated from the right lobe of the thyroid gland, 6 originated from the left, and 4 were considered to be bilateral [8]. Bilateral involvement was detected in the present case.

Tumours originating from follicle cells of the thyroid are evaluated as follicular, compact cellular (solid), follicular-compact cellular and papillary adenocarcinomas in veterinary pathology [2, 3, 10, 12]. However, this classification is not made according to the nuclear characteristics of cells as in human pathology but was in accordance with the morphological features [3, 7, 10]. In veterinary pathology, the thyroid gland tumour is classified as follicular when it forms follicular structures consisting of cubic or columnar epithelial with or without colloid; it is called compact cellular (solid) if it consists of cells with centrally localized nuclei and pale eosinophilic and granular cytoplasm [3, 7]. Additionally, these tumours are reported to have larger, eosinophilic Hurthle cell (oxyphilic) areas that have dense granular cytoplasm [3, 7, 10]. Tumours that have both follicular and solid areas are called follicular-compact cellular carcinoma. Papillary carcinomas are characterized by papillary structures formed by single or multiple lines of cubic cells extending into cystic spaces and they are surrounded by fibrovascular stroma. Additionally, these cells have nucleus vacuoles formed by the invagination of cytoplasm into the nucleus [3, 7]. However, in human pathology, when a tumour forms follicular or solid structures and lack papillary structures, in case that it contains characteristic empty looking, “Orphan Annie Eye”, nucleus structures, it is called “papillary carcinoma” [4, 11]. In addition to this, if a follicular tumour consists of cells with granular, eosinophilic cytoplasm in majority, this tumour is called “Hurthle cell tumour” [11]. Hurthle cell tumour may have solid, follicular or insular areas but the most characteristic feature of this tumour is that the cells are in the appearance of Hurthle cells. The reason that these tumours are classified according to their nuclear features in human pathology is the distinctive behaviour they have. As an example, papillary tumours metastasize through lymphatic vessels but follicular or Hurthle cell tumours metastasize by blood [4, 11]. In the present case due to the presence of thin granular, vacuolar eosinophilic cells and Hurthle cells with larger, prominent, granular and eosinophilic cytoplasm, the tumour is classified as “compact cellular carcinoma with Hurthle cell areas”. Solid carcinomas are reported rarely to have Hurthle cell areas in literature [7]. MOORE *et al.* [10] reported that they detected Hurthle like cells in a small area only in one of the 18 dogs with follicular/compact cellular thyroid carcinomas. TANG *et al.* [13] detected Hurthle cell adenoma in a dog by histological, ultrastructural and immunohistochemical diagnostic methods. In the reported case, Hurthle cell areas were extended.

Tumours with volumes larger than 100 cm³ are reported to metastasize to lungs in dogs [9]. Additionally, survival time is reported to be between 3 and 48 months (mean 10.5 months). The volumes of the present tumours were smaller than 100 cm³ and 15 months after surgery, the general
condition of the dog was improved; the animal had put on weight and the repeated radiography did not reveal any tumour mass.

In human pathology, the issue of whether thyroid tumours generated by thyreocytes forming follicles and that have nucleus features not resembling papillary carcinoma show a malignant behaviour by capsular and vascular invasion or not, was a matter of debate up to recent times [1, 11, 15, 16]. Several authors have reported some cases showing a malignant character considering the degree of capsular invasion (< 50% or > 50% of the thickness of the capsule and presence of nests of neoplastic cells outside the capsule) [6, 14-16]. But, as usually the surgical extraction of these tumours was sufficient, the accurate evaluation of the tumour malignancy was not required in practice [6, 11]. Nowadays the follicular lesion is considered as malignant if vascular invasion is seen in or out of the capsule and/or tumour has infiltrated the whole capsule, and it is called as “minimal invasive carcinoma”. On the other hand, diagnosis of follicular adenoma accounts for the tumours which have neither capsular nor vascular invasion and also those with the degree of invasion restricted under the values given above [1, 6, 11]. In the reported case, the dog lived for 15 months despite the capsule and vascular invasion and apart surgical extraction, it has received no other treatment. KLEIN et al. [8] reported that the mean survival time for solid carcinomas was 44 months after only surgical extraction performed on 20 dogs with thyroid tumours, and that no correlation was detected between survival time and histological classification. Additionally, it is reported that only capsular invasion and minimal vascular invasion had good prognosis in human follicular thyroid tumours and surgical excision is sufficient for treatment [1, 14, 15] as also reported here.

As a conclusion, it seems there is no such approach for veterinary pathology in the present text books [3, 7] and literature [2, 5, 10, 12]. In our opinion this might be due to the fact that thyroid tumours are seen less frequently than other tumours but the consideration of evaluation criteria used in human pathology may be beneficial for treatment and follow-up of thyroid tumours in dogs.

References