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First description of malignant retrobulbar and intracranial teratoma in a lesser kestrel (*Falco naumanni*)

**Rafael Molina López** ¹* and **Daniel Borràs Múrcia** ².

¹**Centre de Fauna de Torreferrussa**, (DMAH), Spain. ²**Citopat Veterinaria**, Barcelona, Spain.

**Short title**: Teratoma in a lesser kestrel

**Figures 1 and 2 to be in colour in printed version, on same page**

* Corresponding author:

Rafael Molina, DVM, MSc
e-mail: [rafael.molina@gencat.net](mailto:rafael.molina@gencat.net)

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First description of malignant retrobulbar and intracranial teratoma in a lesser kestrel (*Falco naumanni*)

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Abstract

Teratomas are defined as germ cell origin neoplasms that can be rarely found in either humans or animals. Their most common localization is the gonads, although extragonadal localization has also been observed. In avian medicine, there is scarce literature about the occurrence of teratomas and their clinical implications and mainly in wildlife birds. For this reason, we report the first description of a teratoma with both retrobulbar and intracranial locations in a 10-day-old chick of lesser kestrel (*Falco naumanni*) born in captivity. The raptor was treated in a center of wildlife rehabilitation because of the presence of left periocular swelling and exophthalmos. The bird worsened rapidly with signs of vestibular syndrome, ataxia and depression, and euthanasia was practised for humanitarian reasons. Histological examination characterized both masses as malignant teratomas based on the presence of tissues of the three germ cell layers and the presence of both anaplastic foci and immature tissues.
Introduction

Teratomas are germ cell origin neoplasms that contain recognizable elements of the three germ layers (ectoderm, mesoderm and endoderm). They most commonly arise from gonadal tissue in both humans and animals, although an extragonadal localization along the body midline in the mediastinum or in the central neuraxis can also be found. Teratomas affect generally juvenile or young adult animals.

In avian medicine, intracranial teratomas have been poorly described and mainly referred to chickens (Jones 1964; Campbell 1969) and ducks (Homer and Riggs 1991). For retrobulbar teratomas, there is one description reported by Schelling (1994) in a Great blue heron (Ardea herodias). In this case we report the first description of a teratoma with both retrobulbar and intracranial locations in a raptor.

Case report

A captive-born 10-day-old chick of lesser kestrel (*Falco naumanni*) showed left periocular swelling with exophthalmia. The examination of the oral cavity revealed a swelling of the palate. Fine needle cytology was performed in order to rule out an upper respiratory tract infection. A yellow-reddish viscous fluid was obtained and examined under light microscope after Diff-Quick stain. An eosinophilic matrix with some heterophils and red blood cells were observed. No bacteria or fungus grew in the culture of the fluid. There were no signs of clinical improvement after 7 days of treatment with amoxycilin and clavulanic acid at 100 mg/kg PO BID. The disease had a rapid progression and the chick began to present signs of vestibular syndrome, ataxia and
depression, and euthanasia was practiced for humanitarian reasons. The post-mortem examination revealed one multilobular mass of 1 x 0.8 cm at the retrobulbar zone and another intracranial mass under the cerebellum. Moreover, the cranial cavity was full of transparent fluid. Other macroscopic findings were congestion of lungs and liver paleness.

Results and Discussion

Histological study characterized both masses as teratomas based on the presence of tissues of the three germ cell layers (Fig 1). Besides, in the retrobulbar mass there were multiple solid areas of immature, densely packed epithelial cells with malignant nuclear criteria (Fig 2). The intracranial mass was dominated by a cystic clear space lined by a simple cuboidal epithelium over a connective base. In some areas, the wall included mature, randomly arranged tissues including neural tissue with glial and neuronal differentiation, hyaline cartilage, trabecular bone, low columnar, ciliated epithelial cell-lined tubules, mucinous-type cell glands, sebaceous glands, stratified epithelium, feather follicles, non-striated muscle fibres, adipose tissue, and fibrous and mixoid connective tissue. The adjacent neural parenchyma was distorted and compressed. No significant lesions were found in the intracoelomic organs.

Teratomas are an uncommon neoplasia that may be classified as benign (mature) or malignant (immature) depending of the degree of a malignant component or the presence of undifferentiated elements resembling those of the embryo (Schafield and Cotran 1999). The pathogenesis of extragonadal teratomas still remains unclear, although they likely originate from diploid pluripotent progenitor cells (Wagner and
others 1997) or from a wrong involvement and enfoldment of embryonic cells in different maturation stages during migration (Sano 2001). Some of those cells escape the killing immune mechanisms, producing a variety of tissues that are foreign for the part in which they grow, undergoing in some cases neoplastic transformation.

Although there are some descriptions of teratomas in raptors, all of them refer to other anatomic regions different from the head. Thus, the first recognized description of a teratoma in a raptor was reported by Forbes and others (2000), in a 10-year-old captive, male, Eurasian buzzard (*Buteo buteo*). This teratoma was found in the intracoelomic cavity and was difficult to differentiate from an adenocarcinoma. More recently, a malignant teratoma was diagnosed in a wild 1-year-old Bald eagle (*Haliaetus leucocephalus*) (Ford and others 2006). The mass was also located at the coelomic cavity, displacing and compressing the viscera. The origin of that teratoma could not be assessed.

On the other hand, brain neoplasms in raptors are rarely described in the literature (Forbes and others 2000). The curiosity of our report lies in the occurrence of a brain tumour in a lesser kestrel which was classified as a teratoma. Furthermore, it was determined to be malignant because of the presence of both anaplastic foci and immature tissues. Neurological signs and the exophthalmia were secondary to the compression of the brain by the mass. In some cases is difficult to determine whether the process is truly metastatic or a manifestation of multicentrality. In this case a multicentric development of the tumour may be a reasonable inference based on the age of the animal and its probable congenital origin.
Figure Legends

Figure 1. Retrobulbar mass characterized by multiple type tissues. In this image stratified epithelium resembling feather follicles, trabecular bone, glandular structures and immature mesenchymal tissue are seen. Haematoxylin and eosin x200 (bar = 100 µm).

Figure 2. Epithelial type cells with malignant nuclear criteria, including moderate anisocariosis, indented or vesiculated nuclear membrane, clear chromatin, one or more irregular nucleoli and a high mitotic index (arrows). Haematoxylin and eosin x400 (bar = 50 µm).

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References


Figure 2.