Seminoma and Parathyroid Adenoma in a Snow Leopard (Panthera unica)

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Summary

A seminoma and parathyroid adenoma were diagnosed in an aged snow leopard. The ultrastructural appearance of the seminoma was similar to that described in the dog and in man. The lack of significant amounts of rough endoplasmic reticulum, Golgi complexes and free ribosomes in the parathyroid adenoma suggested that it was non-functional. Parathyroid adenoma has not been previously described in a large wild feline.

Introduction

The prevalence of neoplasia in zoo animals is low compared with domesticated species, but is increasing in frequency (Lombard and Witte, 1959; Effron, Griner and Benirschke, 1977; Montali, 1980; Wadsworth, Jones and Pugsley, 1985). Reports of neoplasms in large felidae are rare (Port, Maschgan, Pond and Scarpelli, 1981). This paper describes the light and ultramicroscopic structure of parathyroid and testicular neoplasms in an aged snow leopard (Panthera unica).

Materials and Methods

A 20-year-old adult male snow leopard was examined because of a loss in body condition over 2 years which had accelerated over the previous 2 months. Several episodes of epistaxis and depression were noted during the 2-month period. The leopard was killed with an intravenous overdose of sodium pentobarbital and necropsied. A serum sample for biochemical and electrolyte analysis was taken before euthanasia.

Samples for light microscopical study were fixed in 10 per cent neutral buffered formalin, dehydrated in a graded series of alcohol and xylene, embedded in paraffin wax, sectioned 5-μm thick and stained with haematoxylin and eosin (HE). Representative 1-mm cubes for electron microscopy were taken from formalin-fixed tissues, washed in distilled water, post-fixed in 0·1 M Sorensen’s phosphate-buffered glutaraldehyde followed by 1·0 per cent osmium tetroxide, embedded in araldite, sectioned and stained with uranyl acetate and lead citrate.

Results

Necropsy Findings

The leopard was emaciated and dehydrated. Its teeth were coated with tartar...
and the gingiva had receded. An abscess involved the root of the left upper premolar and extended into the nasal sinus. The left testicle was 3.5 cm in diameter and contained an irregular tan-coloured mass with coalescing foci of necrosis and haemorrhage. The right testicle measured 2.0 x 1.0 x 1.0 cm and appeared normal on incision. There was mild endocardiosis of the left atrioventricular valve characterized by focal thickening of the edge. The right thyroid contained a discrete whitish mass, 1.0 cm in diameter, which corresponded to the location of the right parathyroid. Grossly, the left parathyroid was unremarkable. Petechial haemorrhages were seen on the gastric mucosa. Uroliths were present in the renal pelves and urinary bladder and the urine was cloudy. Pneumonoconiosis was evident in the lung.

**Histological Findings**

The parenchyma of the left testicle had been replaced by broad sheets of large polygonal cells which had round to oval nuclei, prominent nucleoli and dense reticulated patterns (Fig. 1). Cells contained scant cytoplasm and mitotic figures were frequently observed. Testicular veins and lymphatics were invaded by tumour cells. Foci of necrosis and haemorrhage were commonly noted throughout the tumour. The structure of the neoplasm was consistent with a seminoma, as described in other species.

Sections from the right parathyroid mass consisted of irregularly sized acini lined by columnar epithelial cells which had round, basilarly located nuclei, fine chromatin patterns and single nucleoli. The cytoplasm was abundant, stained lightly eosinophilic and occasionally was finely vacuolated (Fig. 2). Acini were separated by thin fibrous connective tissue septa and the entire mass was surrounded by a delicate fibrous capsule. On the basis of microscopic examination, a diagnosis of parathyroid adenoma was made. The contralateral parathyroid was normal.

Other microscopical lesions consisted of diffuse atrophy of germinal epithelium in the right testicle, severe bilateral interstitial nephritis and chronic urinary cystitis.

**Ultrastructural Findings**

Two types of neoplastic cells were observed by electron microscopy in the seminoma. Most of the cells were electron-lucent and had oval nuclei with finely flocculent chromatin and large nucleoli. Numerous mitochondria, polyribosomes and Golgi complexes were seen (Fig. 3). Tumour cells were in close apposition but rarely interdigitated. The second cell type was more pleomorphic, electron-dense and less numerous than the electron-lucent cells. Heterochromatin was abundant and mitochondria were more numerous. These cells were often associated with areas of necrosis and haemorrhage. Transitional forms between the two cell types were noted.

Ultrastructurally, the parathyroid adenoma had undergone autolysis but was composed primarily of chief cells which had electron-lucent cytoplasm containing many clear, membrane-bound vacuoles and mitochondria (Fig. 4). Dilated arrays of endoplasmic reticulum and a few electron-dense granules
Laboratory Findings

Bacteriological cultures of swabs taken from the nasal abscess yielded a
Fig. 3. Electron micrograph of seminoma. Small electron-dense cells (ED) containing many mitochondria are interspersed among the large electron-lucent (EL) cells. Uranyl acetate and lead citrate stain × 4500.

Fig. 4. Electron micrograph of parathyroid adenoma. Chief cells contain mitochondria and clear membrane-bound vacuoles. Uranyl acetate and lead citrate stain × 3900.

Neoplasms of the thyroid (Hubbard, Schnürer, 1986a, b) and dog (Engle and Brodie, 1978; Nielson, 1983; P. unica) (Effron et al., 1979; Wallach and Boever, 1983). Some (Moulton, 1978) (Wallach and Boever, 1983) report that a sequence of ultrastructural changes in morphology seen in seminomas are in agreement with these findings.

Although specific reference to Pseudomonas sp.; S. pneumoniae was reviewed, phosphorus concentrations were consistent.
Tumours in a Snow Leopard

Table 1
Laboratory findings in a snow leopard with a seminoma and parathyroid adenoma

<table>
<thead>
<tr>
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<th>Reference values of snow leopard*</th>
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<tr>
<td>Blood urea nitrogen (mmol per l)</td>
<td>33·5</td>
</tr>
<tr>
<td>Creatinine (μmol per l)</td>
<td>636·5</td>
</tr>
<tr>
<td>Calcium (mmol per l)</td>
<td>2·3</td>
</tr>
<tr>
<td>Phosphorus (mmol per l)</td>
<td>2·7</td>
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*International Species Inventory System 1987, Normal Physiological Data.

Pseudomonas sp.; Streptococcus sp., Group G and Corynebacterium pyogenes. Klebsiella pneumoniae was recovered from the urine. Serum urea nitrogen, creatinine and phosphorus concentrations were raised as shown in Table 1.

Discussion

Neoplasms of the testes and parathyroid glands are rare in large wild (Hubbard, Schmidt and Fletcher, 1983; Schmidt, Hubbard and Fletcher, 1986a, b) and domestic felidae (Cotchin, 1957; Schmidt and Langham, 1967; Engle and Brodey, 1969; MacVean, Monlux, Anderson, Silberg and Roszel, 1978; Nielson, 1983). A Sertoli cell tumour has been reported in a snow leopard (P. unica) (Effron et al., 1977), clouded leopard (Neofelis nebulosa) (Griner, 1983; Wallach and Boever, 1983) and jungle cat (Felis chaus furax) (Wallach and Boever, 1983). Seminomas are uncommon in animals other than the dog (Moulton, 1978) but seminomas have been reported in a clouded leopard (Wallach and Boever, 1983).

Electron microscopic evaluation of the seminoma in this case revealed two different cell types which have been previously described in canine and human seminomas (Pierce, 1966; von Bomhard, Pukkavesa and Haenichen, 1978). The fine structure of the electron-lucent cell type resembles that of immature germinal epithelium, whereas the small pleomorphic cell appears to be more differentiated. The observation of cells in various degrees of transition, suggests that a sequence of maturation exists between the two cell types. Certain ultrastructural characteristics such as intercellular bridges and organelle morphology seen in normal testis were lacking in this tumour. These findings are in agreement with those reported for canine seminoma (von Bomhard et al., 1978).

Although species differences occur, chief cells comprising functional parathyroid adenomas are usually actively synthesizing parathyroid hormone and contain large lamellar arrays of rough endoplasmic reticulum, prominent Golgi complexes and many clusters of free ribosomes in the cytoplasm (Roth and Capen, 1974; Martin and Capen, 1983). Few mature secretory granules are seen, indicating that parathyroid hormone is secreted at a faster rate than it is synthesized. In contrast to functionally active chief cells, large quantities of endoplasmic reticulum and significant numbers of secretory granules were not
observed in this tumour. The altered serum biochemical and electrolyte values obtained from this snow leopard are more consistent with those seen with primary renal insufficiency rather than hyperparathyroidism due to neoplasia. Serum parathyroid hormone was not measured.

References


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