Subconjunctival Hibernoma in a Dog

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Case Introduction

- 10 year old, MC, German Shepherd dog
- History of a mass in ventrolateral fornix
  - One month duration
  - Light tan in color
- Ocular exam:
  - Normal vision, ocular motility, and ophthalmic test results
  - Mildly exophthalmic, non-painful
  - Length of mass: 12 mm
Differential considerations
- Retrobulbar fat prolapse
- Neoplasia
- Cystic structure
- Non-neoplastic mass

Recommendations
- MRI/CT
- FNA with cytology
- Excisional biopsy
Examination 2 Years Later

- Ocular exam:
  - Normal vision, ocular motility, and ophthalmic test results
  - Large, ventral subconjunctival mass
  - Mildly enophthalmic, non-painful
- Excisional biopsy
  - Physical examination – unremarkable
  - CBC, serum chemistry – WNL
Surgery

- Discrete mass, subconjunctival location
- Dimensions: 11 x 20 x 24 mm
- Intraoperative capsular rupture
Post operatively

- Mild ectropion
- AK - PolyBac
  - 3-4 times per day, 7 days

3 week recheck

- Mild ectropion resolved
- No evidence of tumor regrowth
Grossly: partially encapsulated, lobulated with a greasy, yellow-brown cut surface

Hibernoma
- Sheets of polygonal cells surrounded by fibrovascular stroma
- Finely vacuolated, eosinophilic cytoplasm, coarsely stippled chromatin
- Rare mitotic figures; moderate pleomorphism

Coagulation necrosis
Incomplete excision
The neoplastic cells were immunoreactive to antibodies against uncoupling-protein 1.

Not labeled by antibodies to MyoD1 (not shown) or myogenin.
Rationale

- UPC-1: Specificity of UPC-1 demonstrated in canine case series
  - upregulation of transcription → abnormal accumulations of brown fat

- MyoD1 and myogenin: transcription factors responsible for initiating striated muscle differentiation
  - brown adipocytes and skeletal myocytes regulated by the same gene (myf5)
  - transcription regulator (PRDM16) dictates commitment to brown fat
    - negative in presence of PRDM16

Ravi et al. 2013, Vet Path  
Seale et al. 2008, Nature  
Labeled with:
- rabbit polyclonal antibodies against UCP-1
- mouse monoclonal antibodies against MyoD1 and myogenin

Positive IHC controls:
- rodent brown fat
- canine fetal skeletal muscle
**Brown Adipose Tissue (BAT)**

- Hibernoma – benign neoplastic proliferation of BAT
- Thoracic and abdominal cavities in youth
  - 1% of adult adipose tissue
- Functions of BAT:
  - Thermal maintenance to neonates
  - Thermogenesis during nocturnal or hibernal periods
  - Survival on diets deficient in macronutrients or proteins
- Orbital fat = white adipose tissue
  - Does not play a role as an energy reserve
  - Provide support to the eye

Bremond-Gignac et al. 2004, Sug Rad Anatomy
Cao et al. 2004, Molecular and Cell Biology
Cannon et al. 2004, Am Phys Soc
Seale et al. 2008, PMC
Hibernomas in Veterinary Medicine

- Ochoa - abdominal hibernoma, 9 mo. Labrador Retriever
  - Incidental finding on exploratory laparotomy
  - Surgically excised; confirmed via histopathology
- Murphy et al. - subconjunctival tissue, 2 y.o. male goose
  - Surgically excised; confirmed via histopathology
  - No follow up evaluation
- Bruner et al. – Sprague-Dawley lab rats
  - Spontaneous development
- Case series of 7 canine orbital hibernomas
  - UPC-1 and electron microscopy

Ochoa. 1972, Cornell Vet
Bruner et al. 2009, Tox Path
Murphy et al. 1986, JAVMA
Ravi et al. 2013, Vet Path
Hibernomas in Human Medicine

- Variety of anatomic locations:
  - Thigh, shoulder, back, neck, chest, arm, retroperitoneum
- Non-painful/mildly sensitive
- Typical, myxoid, spindle, lipoma-like, or "non-categorized" hibernoma
- UPC-1 positive

Moretti et al. 2010, Am J Orthopedics
Papathananssiou et al. 2011, Clin Sarcoma Res
Mavrogenis et al. 2011, Orthopedics
Prognosis following excision

- Complete surgical excision reportedly curative
  - Six recurrences
  - One report: continued growth following partial excision
- No malignant transformation, metastasis, or death reported

Moretti et al. 2010, Am J Orthopedics
Brigmond-Gignac et al. 2004, Surg Rad Anatomy
Papathananssiou et al. 2011, Clin Sarcoma Res
Mavrogenis et al. 2011, Orthopedics
Lele et al. 2002, Path and Lab Med
Current Status of Patient

No regrowth in 16 months
Questions?

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