Fibrocartilaginous embolic myelopathy and traumatic IVDE

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Overview

- Pathophysiology
- Clinical presentation
- Diagnostic investigations
- Treatment
- Prognosis
What is fibrocartilaginous embolic myelopathy (FCEM)?
FCEM - pathophysiology

- Source of the fibrocartilage (FC):
  - nucleus pulposus
  - vertebral growth-plate
  - metaplasia of the vascular endothelium

- How does the FC gain access to the SC vasculature?
Arterial and venous blood supply
FCEM - pathophysiology

- Direct penetration of NP fragments into:
  - Spinal arteries
  - Spinal veins (arteriovenous anastomoses)
  - Sinusoidal venous channels within the vertebral bone marrow
  - Newly formed inflammatory BV within a degenerated IVD
  - Embryonic remnant BV within the NP
- Valsalva maneuver
- Sudden rise in intradiscal pressure > arterial BP
FCEM - Clinical presentation

- peracute (<6 hours) onset of nonprogressive and nonpainful (after the first 24 hours) and often lateralized neurological deficits (ND)
- physical activity at onset of ND in up to 80% of dogs
- sudden and transient hyperalgesia at the onset of ND in up to 61.5% of dogs
- lateralisation of ND in 52.8% to 86.5% of dogs
Sophie, 9 y, FS, EBT, peracute onset left hemiparesis and anisocoria
Bronson, 4y, 3m, SBT, acute onset severe monoparesis, normal myelogram
<table>
<thead>
<tr>
<th>Study</th>
<th>Total number of dogs</th>
<th>Number of dogs with AD and HD</th>
<th>Percentage of large or giant breed dogs</th>
<th>Age (years, median and range)</th>
<th>Male to female ratio</th>
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<td>% of dogs with lateralisation of neurologic signs</td>
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Differential diagnoses

- IM due to other sources of emboli
- Acute non compressive NP extrusion
- IVD extrusion (compressive)
- Haemorrhage (eg, secondary to coagulopathy)
- Neoplasia (intra- and extramedullary)
- Infectious and immune-mediated focal myelitis or meningomyelitis
- Vertebral fracture, subluxation/luxation
FCEM- Diagnosis

- **Definitive diagnosis** only histological
- Survey radiographs
  - rule out vertebral fracture, sub-luxation/ luxation, neoplasia and osteomyelitis/ discospondylitis
- Myelography
  - rule out compressive SC disease (IVD extrusion, neoplasia)
  - intramedullary pattern
- CT or CT- myelography
  - rule out compressive SC disease (IVD extrusion, neoplasia)
  - intramedullary pattern
- MRI
  - diagnostic imaging modality of choice
- CSF
FCEM- MRI
FCEM- CSF

- Normal

- Aspecific abnormalities:
  - xanthochromia
  - mild to moderate pleocytosis (7–84 WBC/ul)
  - elevated protein concentration (reported in up to 46% of dogs with HD of FCEM and in 44-75% of dogs with AD of FCEM)
FCEM- Treatment

- Nursing care
- Physical rehabilitation
- Neuroprotection
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<th>Percentage of dogs with partial or complete recovery</th>
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Dogs with a lesion length–vertebral length ratio > 2.0 or a percent cross sectional area of the lesion ≥ 67% were significantly more likely to have an unsuccessful outcome than those with lower values for these parameters.
FCEM/ IM- cats

- 19 cats with a presumptive diagnosis of IM
- C1–C5 (30%), C6–T2 (30%), T3–L3 (25%), L4–S1 (15%)
- Inciting or predisposing causes
- Median time to recovery of ambulation was 3.5 days (3–19 days)
- 15 (79%) cats had a favourable outcome
- Median F up 3y 1m (6m- 10y 4m)

Acute non compressive nucleus pulposus extrusion (ANNPE)

- traumatic disc extrusion
- traumatic disc prolapse
- dorsolateral intervertebral disc “explosion”
- high-velocity–low volume disc extrusion
- Hansen type III intervertebral disc disease
healthy intervertebral disc (hydrated NP)
subjected to a brief excessive force (e.g. during vigorous exercise or following trauma) => sudden increase in intradiscal pressure
NP rapidly projected toward the spinal cord through a tear in the annulus fibrosus
spinal cord contusion
NP dissipates within the epidural space without resulting in a compressive mass
Hydrated nucleus pulposus extrusions

non-compressive

compressive

Beltran JASAP 2011
De Risio JAVMA 2009
ANNPE
Traumatic disc extrusion

- Laceration of the dura mater
- Penetration of the spinal cord parenchyma
- Subarachnoid-pleural fistula (Packer et al, VRUS 2004; 45, 523-527)
ANNPE- Clinical presentation

- Peracute (<6 hours) onset myelopathy
  - Associated with physical activity
    - Running, playing, or jumping 25/42 (60%) dogs
    - Traumatic event (witnessed or suspected) 17/42 (40%) dogs

De Risio JAVMA 2009
ANNPE- Clinical presentation

- Neurological deficits
  - referable to site and extent of the spinal cord injury
    - T3-L3 67% (28/42) dogs, C1-C5 (6), C6-T2 (6), L4-S3 (2)
    - spinal shock!
  - often lateralised: 62% (26/42) of dogs
  - non progressive after the first 24-48 hours
  - spinal hyperalgesia during palpation of the affected spinal segments in 57% (24/42) dogs
3y-5m-old, M, Boxer
peracute onset difficulty ambulating with PLs (L>R) while playing in the garden 7 hrs before presentation

- video
ANNPE- Diagnosis

- **Definitive diagnosis only histological**
- Survey radiographs
  - rule out vertebral fracture, sub-luxation/ luxation, neoplasia and osteomyelitis/ discospondylitis
- Myelography
  - rule out compressive SC disease (IVD extrusion, neoplasia)
  - intramedullary pattern above a collapsed intervertebral disc space
- CT or CT- myelography
  - rule out compressive SC disease (IVD extrusion, neoplasia)
  - intramedullary pattern above a collapsed intervertebral disc space
- MRI
  - diagnostic imaging modality of choice
- CSF
ANNPE- Treatment

- Analgesia, Nursing care
- Anti-inflammatory medications
- Neuroprotection
- Exercise restriction 4-6 weeks
- Physical rehabilitation
ANNPE- Outcome

- Outcome successful in 28/42 (67%) dogs and unsuccessful in 14/42 (33%) dogs
- Prognostic factors:
  - loss of nociception
  - on univariate analysis
    - extent of the intramedullary hyperintensity on sagittal and transverse T2-weighted MR images
    - detection of intramedullary hypointensity on T2* GE images

De Risio JAVMA 2009
On multivariate analysis: maximal cross-sectional area of the intramedullary hyperintensity on transverse T2-w MRI was the best predictor of outcome.

THANK YOU FOR YOUR ATTENTION