Case Studies in Equine Neurology

Rob MacKay, BVSc, PhD, DACVIM
University of Florida

22-year-old Paso Fino Mare

- Acting “strangely” last several months
- Occasional compulsive walking
- Hyperresponsive to auditory stimuli
- “Radial paralysis” in left thoracic limb

Notes to self
- Abnormal behavior = dementia
- Suggests forebrain dysfunction
- Radial paralysis related?
Neurologic Exam

Interpretation 1

- Startle
- Headshaking
- Abnormal behavior = dementia
- Suggests forebrain involvement
Neurologic Exam

Menace response

Perception of touch

Interpretation 2

- Reduced menace on right side
- Normal PLR

- Reduced perception of touch on right side
- Normal local reflexes (V-VII)

= Left Visual Cortex

= Left Sensory Cortex
Rule-Outs

- Mass
  - Neoplasia
  - Cholesterol granuloma
  - Abscess
- Infectious
  - EPM
  - EEE, WEE
  - Parasite
- Toxic/metabolic
  - Leukoencephalomalacia
  - Hepatoencephalopathy
- Vascular
  - Infarct
- Trauma

More diagnostics

- CBC/chemistries - normal
- CSF
  - 12 WBC/µL (<6)
  - Protein 67 mg/dL (<80)
  - snSAG2,4/3 serum:CSF ratio >100 (>100)
- Radiography
  - Normal skull
- CT
More diagnostics

asymmetric masses

asymmetric hydrocephalus

Cholestineric Granuloma
Cholestineric Granuloma

- Cholesterol granuloma, cholesteatoma
- Common in middle-aged, old horses
- Located on the choroid plexuses of the 4th and lateral ventricles
- Mass effect
- Hydrocephalus
- Asymmetric
- Treatment
  - Steroids, surgical shunt, euthanasia

21-year-old Arabian stallion

- Show horse
- Breeding stallion
- Weight loss last 4 weeks
- Unsteady last 3 days
**Neurologic examination**

- Head tilt to right
- Falls to right
- Hypermetria (LF/LR)
- Limb weakness/ataxia
  - All 4 limbs
  - Worse on left
- Obtundation
  - Mild
- Normal behavior

**Interpretation**

<table>
<thead>
<tr>
<th>Sign</th>
<th>Localization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head tilt to right</td>
<td>Vestibular</td>
</tr>
<tr>
<td>Falls to right</td>
<td>• Asymmetric</td>
</tr>
<tr>
<td>Hypermetria (LF/LR)</td>
<td>Cerebellum</td>
</tr>
<tr>
<td>Limb weakness/ataxia</td>
<td>• Brain stem or spinal cord</td>
</tr>
<tr>
<td></td>
<td>• Worse on left</td>
</tr>
<tr>
<td>Obtundation</td>
<td>• Any part of brain</td>
</tr>
<tr>
<td></td>
<td>• Brainstem most likely</td>
</tr>
<tr>
<td>Normal behavior</td>
<td>• Not forebrain</td>
</tr>
</tbody>
</table>
Localization

- Signs thus far can be explained by a single asymmetric lesion of the brainstem/cerebellum
- CSF analysis normal
- Gets much worse over the next 2 days

Two Days Later
**Interpretation**

<table>
<thead>
<tr>
<th>Sign</th>
<th>Localization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profound obtundation</td>
<td>Any part of brain</td>
</tr>
<tr>
<td>Facial hypalgesia – R</td>
<td>Trigeminal (V) sensory</td>
</tr>
<tr>
<td>No local reflexes – R</td>
<td>Right &gt; Left</td>
</tr>
<tr>
<td>Normal facial tone</td>
<td>Forebrain (L)</td>
</tr>
<tr>
<td></td>
<td>Hypoglossal (XII; bilateral)</td>
</tr>
<tr>
<td></td>
<td>Trigeminal (Vm; bilateral)</td>
</tr>
<tr>
<td>Tongue weakness, fasciculations</td>
<td></td>
</tr>
<tr>
<td>Jaw weakness</td>
<td></td>
</tr>
</tbody>
</table>

**Localization**

- Obtundation
- V, VIII, XII
- Limb weakness, ataxia
- Hypermetria

\[= \text{Brainstem/cerebellum}\]

- Can be explained by single lesion
- Bilateral but asymmetric?
- Rapidly progressive
Rule-Outs

- Trauma
  - Poll
  - THO
- Mass
  - Neoplasm
    - Melanoma
    - Lymphoma
- Infectious
  - EPM
  - West Nile
  - Migrating parasite
- Immune-mediated
  - Polyneuritis equi

And the diagnosis is.....
20-month-old TB colt

- Purchased at sale in Canada 2 months ago
- Transported to Florida 6 weeks ago
- In training 4 weeks
- Off behind last week?
- Recumbent in stall this morning
- Dog-sitting
- Referred
20-month-old TB colt

- Recumbent in trailer
- Normal vital signs
- Anesthetized to stall
- CSF tap (LS and AO)
- Recovered and re-evaluated
Neurologic examination

- Very weak pelvic limbs
- Strong thoracic limbs (normal?)
- Patella reflexes present (hyper?)
- Couldn’t roll into sternal
- Can stand in sling
- Turgid distended bladder (rectal)
Differentials

- EHV-1 myeloencephalopathy
- EPM
- Trauma
- Epidural abscess
- West Nile myeloencephalitis
- Equine degenerative myeloencephalopathy
- Migrating parasite

Diagnostics

- CBC, chemistry
- CSF cytology
- Serum:CSF snSAG2,4/3 ratio (EPM test)
- EHV-1 PCR (and serology)
- West Nile virus IgM capture ELISA
- Thoracic vertebral radiographs
 Initial therapy

- Flunixin
- Dexamethasone
- Sulfadiazine/pyrimethamine (ReBalance)
- Ponazuril (Marquis)
- Stand PRN with sling
- Catheterize bladder BID

…two days later
Further localization

- Cutaneous trunci defect
- Left thoracic limb ataxia
- Left pelvic limb weakness
- T11, left>right
- C1-T2, left>right
- L3-S2, left>right

Therefore definitely focal, probably multifocal

THEREFORE PROBABLY EPM

Laboratory results

- CBC/chemistries normal
- CSF cytology
  - 7 WBC cells/µL (<6)
  - 52 mg/dL protein (<80)
- snSAG2,4/3 ratio = 6.5 (>100)
- WNV IgM capture negative (@ 1:400)
- EHV-1 nasal swab/buffy coat PCR-negative
- Thoracic vertebral radiographs normal
Clinical Course

- Able to roll sternal at 5 days
- Stand without assistance at 8 days
- Discharged day 14 grade 2/4 pelvic limbs

Plan
- 56 days ponazuril
- 180 days SDZ/PYR

5-yo Oldenburg Mare

- b. Holland
- Imported to US 2010
- 2011 national 5 year old USEF dressage champion
- Presented for fever and hyperesthesia
History

• Several days fever
  • Flunixin-responsive
• Neurologic signs developed
  • Hyperesthesia
  • Aggression
  • Ataxia

Presentation

• Vital signs: Normal
• Neuro exam:
  • Intermittent aggression/hyperesthesia/somnolence - Forebrain ± brainstem
  • Limb hypermetria - Cerebellum
  • Weakness, ataxia all 4 limbs - Brainstem to T2
• Rule-outs:
  • EEE, WNV, EHM, rabies, EPM, verminous myeloencephalitis, bacterial meningitis/abscess
Plan

• **Diagnostic:**
  - MAC-ELISA - WNV, EEE
  - qPCR nasal swabs, buffy coat for EHV-1
  - snSAG2,4/3 serum:CSF ratio for EPM
  - CSF cytology

• **Treatment:**
  - Valacyclovir
  - Ponzauril
  - Flunixin

Results

• CSF markedly abnormal
  - 380 cells/μL (0-5), 14 % PMNs
    - Consistent with EEE, *H. gingivalis*, WNV

• EEE, WNV, EPM immunodiagnostics negative

• 50 mg/kg fenbendazole 2X

• Continued flunixin as needed

• Variable temp, spiked to 104 F

• Submitted Lyme multiplex CSF and serum
  - Horse had been stabled in New Jersey ~6 mo previous
Results contd

- Lyme multiplex
  - Serum negative
  - CSF positive!
- Diagnosis = neuroborreliosis

2 months of treatment

- Neuro exam
  - Blindness right eye, normal PLR
  - Ptosis/miosis/cataract left eye (uveitis/chorioretinitis?)
  - Consistent with left forebrain dysfunction
CSF Data
Equine Neuroborreliosis

• Doxycycline & ceftiofur ineffective in horses?
  • Doxy/minocycline, ceftriaxone, K pen humans
• K penicillin (rifampin) was effective in treating clinical signs but was followed by relapse
• Metronidazole may treat atypical forms (“rings”, “spores”, “granular forms”)

Back to Work