

**Lost connections: equine peripheral neuropathies**

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1

**Disclosure statement**

Presenter: Sarah F. Colmer

Disclosure:  
I do not have any relevant financial or non-financial relationships with industry or commerce to disclose

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2

**What is a peripheral neuropathy?**

- Nerves **outside of the central nervous system** (brain and spinal cord)
  - Cranial nerves
  - Brachial / lumbosacral plexus
  - Spinal nerves
  - Autonomic nervous system

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**Definitions**

- **Neuropraxia** –mild compressive lesion resulting in bruising / inflammation; axon integrity is maintained; resolves in 3-6 weeks
- **Axonotmesis** – crushing of nerve; epineurium and perineurium intact
- **Neurotmesis** – most severe; complete disruption of nervous and peri-neural tissues

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**What do peripheral nerve lesions look like?**

- **Muscle atrophy**
  - Severe, rapid
- **Reflexes**
  - Decreased or absent
- **Muscle tone**
  - Decreased
- **Sensation**
  - Localized decreases

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**Anatomy review**

General somatic afferent (sensory)

Somatic efferent (motor)

Lesion in dorsal grey column = defects in sensation, decreased tone  
 Lesion in ventral gray column = lower motor neuron signs (weakness, atrophy)  
 Lesion in dorsal and lateral funiculi (white matter) = general proprioceptive ataxia

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6

### Peripheral neuropathies: relevance to clinical practice

- Neurolocalization
- Differential diagnoses
- Earlier identification / earlier referral
- Potentially earlier intervention




7

### Peripheral neuropathy etiologies

- **Trauma**
  - Falls
  - Kicks
  - Surgical positioning
- **Inflammatory/infectious conditions**
  - Equine protozoal myeloencephalitis
  - *Parelaphostrongylus tenuis*
  - Viral encephalitides
  - Polyneuritis equi
- **Toxins**
  - Stringhalt
  - Hypochaeris
- **Neoplasia**
  - Peripheral nerve sheath tumors
  - Lymphoma
- **Latrogenic**
  - Prolonged recumbency / compartment syndrome
  - Surgical positioning



8

### Important history-taking points

- Duration of clinical signs: acute vs insidious / progressive?
- Other horses in the paddock / barn / on the farm affected?
- History of trauma, recumbency, exposure to potential toxins/plants, injections?




9

### Peripheral neuropathy of a forelimb in horses: 27 cases (2000–2013)

Anne-Laure Emond DVM, Léila Bertoni DVM, Maeva Seignour DVM, Virginie Coudry DVM, and Jean-Marie Denoix DVM [View Less](#)



- 2 centers, 13-year period (relatively uncommon)
- Trauma known (37%) or suspected (48%)
  - 13 found lame in field
  - 5 collided with tree or other horse
  - 5 fell while turned out or ridden



10

### How to identify peripheral neuropathies

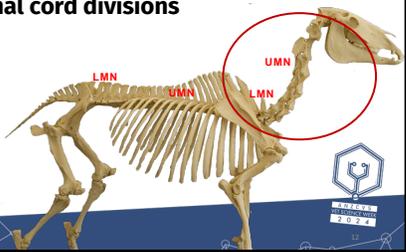
- Methodical approach for examination
  - Mentation
  - Cranial nerve evaluation
  - Assess muscling / look for atrophy (and asymmetry)
  - Spinal reflexes
  - Gait evaluation



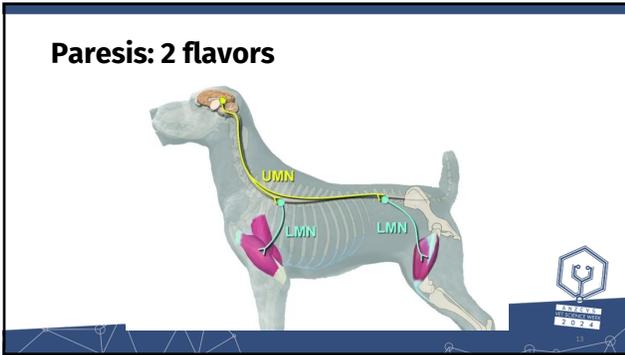
11

### General proprioceptive (spinal) ataxia: Neurolocalization

- **Functional spinal cord divisions**
  - C1-C5 **UMN**
  - C6-T2 **LMN**
  - T3-L3 **UMN**
  - L4-S1 **LMN**




12



13

### The brachial plexus

- **Convergence of: C6, C7, C8, T1, T2 spinal nerves**
- **Nerves arising from the plexus:**
  - 1. Suprascapular → supraspinatus, infraspinatus
  - 2. Axillary → deltoideus, teres minor, cleidobrachialis
  - 3. Radial → extensor muscles (elbow, joint, carpus; digit)
  - 4. Musculocutaneous → flexor muscles of elbow
  - 5. Median and ulnar → caudal antebrachial flexor muscles

Most common cause of brachial plexus pathology?  
**Trauma!** (compression, stretching, tearing)

14

### Peripheral neuropathy of a forelimb in horses: 27 cases (2000–2013)

Anne-Laure Emond DVM, Léila Bertoni DVM, Maeva Seignour DVM, Virginie Coudry DVM, and Jean-Marie Denoix DVM

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- Muscle atrophy – consistent finding (81% of horses)
- Suprascapular nn = supraspinatus and infraspinatus atrophy
- Axillary nn = deltoideus atrophy
- Radial nn = above + (ante)brachium

15

### Sensation

Figure 33.4 Autonomous zones of the major nerves of the front and rear limbs.

16

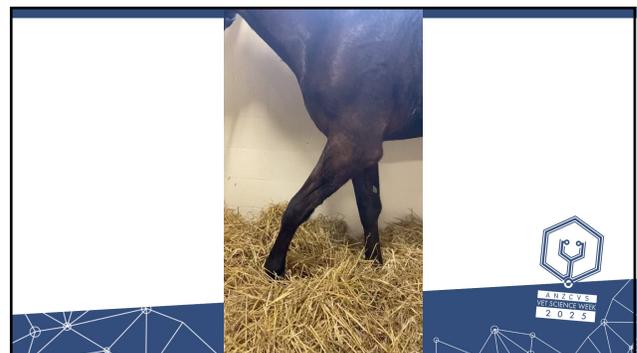
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- 11/14 horses with predominant **radial** nn injury:
  - Dropped elbow
  - Inability to flex shoulder or extend distal limb
  - Severe to non-weight bearing lameness
  - Toe-dragging
- 3/14 were more mild:
  - Atrophy
  - Mild lameness w/ stumbling
- **26% improved**

17



18

### Peripheral neuropathies of the forelimb

- **Median and ulnar**
  - Secondary to fracture of humerus or external trauma
  - Hyperextension of carpus, fetlock, pastern joints
  - Stiff, goose-stepping gait
  - Hypalgesia of medial and/or lateral/caudal limb



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19

### Peripheral neuropathies of the forelimb

- **Suprascapular (Sweeney)**
  - Sweeney = "shoulder slip"
  - Supra and infraspinatus muscles (atrophy)
  - Cranial edge of scapula; collisions, kicks
  - May circumduct the limb
  - Lateral movement of shoulder (seen from front)



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### "Sweeney"

- **Sweeney** – (~70 days)
  - Can have scar tissue entrapping nerves if not improved
  - Permanent fibrosis
  - Potentially surgical



21

### Peripheral neuropathies of the pelvic limb

- **Femoral**
  - L4-L5; innervation to quadriceps
  - Inability to extend stifle; NWB
  - May dog sit if bilateral
  - Atrophy in 1-2 weeks
  - Trauma, dystocia, GA, abscesses, tumors, fracture, FPM



22

### Peripheral neuropathies of the pelvic limb

- **Femoral**
  - Prognosis: variable
    - Remain standing = better
    - Treatment is supportive and non-specific

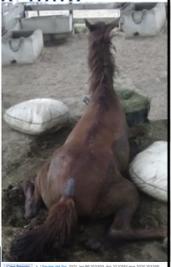



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23

### Peripheral neuropathies of the pelvic limb

- **Obturator**
  - Adducts of thigh
  - **Etiologies:**
    - Damaged during foaling/dystocia
    - Sacral fractures
  - **CS:** can't adduct pelvic limb, trouble rising
  - **Px:** guarded; reported 50% survival post-foaling per some reports



Postpartum Polyneuropathy in a Mare: A Case Report  
Journal of Equine Veterinary Science, Volume 34, Number 10, October 2014  
DOI: 10.1111/jevs.12222  
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24

### Peripheral neuropathies of the pelvic limb

- **Sciatic**
  - Extensors of hip, flexors of stifle, flexors of tarsus and extensors of digit
  - Limb/foot hangs behind horse; stifle and hock extended
  - Well-protected in adults; may be more vulnerable in foals
  - Subjected to intramuscular injection-associated injury
  - Ddx: pelvic fx, EPM, osteomyelitis
  - Px: guarded; some may improv with time



25

### The examination: a case example



26

### The examination: a case example



27

### The examination: a case example



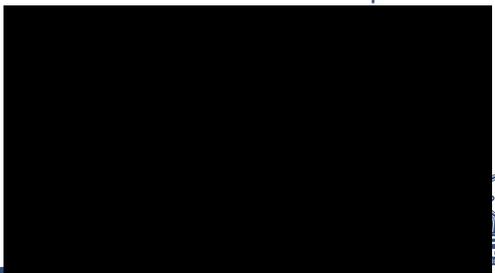
28

### The examination: a case example



29

### The examination: a case example



30

## Diagnosing peripheral neuropathies

- Blood analysis**
  - CBC/biochemical profile
  - Vitamin E / selenium
  - Toxins (lead etc)
  - Infectious disease testing
- Imaging**
  - Radiographs for fracture, luxation
  - Ultrasonography
- EMG**
- CSF analysis**



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31

## General treatment for peripheral neuropathies

- Acute phase:**
  - Minimizing inflammation
  - Systemic NSAIDs / steroids
  - Topical NSAIDs if relevant
  - Cold water hosing
  - Stall confinement
- Chronic phase:**
  - Limited exercise
  - Physical therapy



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32

## Stringhalt

Quantification of surface EMG signals to monitor the effect of a Botox treatment in six healthy ponies and two horses with stringhalt: preliminary study  
Equine Vet J. 2009 Mar;41(3):313-8. doi: 10.2746/042516409v41n03p313

Shivering and Stringhalt in horses  
Review | Vet J. 2022 Apr;202(10):829. doi: 10.1016/j.tvjl.2022.105829. Epub 2022 Apr 21.  
S J Vaberg<sup>1</sup>, S E A Schrama, A E Elgersma, J T M Mees, P de Cocq, W Back

- Known and unknown causes
- Can be traumatic, EPM, etc
- Unipedal stringhalt (Vs pasture-associated)
  - All breeds, all ages
  - Most common tx: lateral digital extensor myotectomy
    - Removes tendon and 7-10 cm of muscle belly
    - Variable success



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33

## Bilateral stringhalt associated with Hypochaeris radicata in Uruguayan horses

Toxicoin. 2024 Jul;245:107780. doi: 10.1016/j.toxicoin.2024.107780. Epub 2024 May 29.

Mizael Machado<sup>1</sup>, Ana Laura Camacho<sup>2</sup>, Charles Coubrough<sup>3</sup>, Cintia R R Queiroz-Machado<sup>4</sup>, Camila Custodio<sup>5</sup>, Claudio S L Barros<sup>6</sup>, Franklin Riet-Correa<sup>7</sup>, Alejo Menchaca<sup>8</sup>

- False dandelion / catsear
- Drought conditions
- Bilateral stringhalt
- Sporadic or epizootic
- Not just in Australia




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34

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- Chronic, distal, peripheral axonopathy
- Neurogenic muscular atrophy
- Toxic principal / pathogenesis remain unknown




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35

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- Mild-marked unilateral or bilateral hyperflexion during front and back movements
- Bunny hopping with speed increases
- Loss of muscle mass and tone in pelvic limbs
- Reluctance



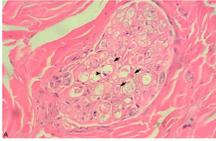

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36

> *Toxicol.* 2024 Jul;245:107780. doi: 10.1016/j.toxicol.2024.107780. Epub 2024 May 29.

### Bilateral stringhalt associated with Hypochaeris radicata in Uruguayan horses

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- 10 yo TB mare
- Unilateral → bilateral hyperflexion in 2 weeks
- No improvement with anti-inflammatories
- Bilateral extensor digital lateral tenotomy
- Complete regression; ridden 4 months later



37

> *Vet Rec.* 2011 Oct 29;169(18):476. doi: 10.1136/vr.d6959. > *J Anim Physiol Anim Nutr (Berl).* 2010 Dec;94(6):712-20. doi: 10.1111/j.1439-0396.2010.01019.x.

### Australian stringhalt in the UK

Naomi de Pennington, Chris Colles, Elizabeth Dauncey

### Longitudinal study of Australian stringhalt cases in France

C Domange <sup>1</sup>, A Castelnau, G Collignon, M Pumarola, N Prymenko

- Remove horses from pasture
- Take care during times of drought
- Herbicide / spot-treating individual plants
- Phenytoin?
- Taurine?



38

> *J Anim Physiol Anim Nutr (Berl).* 2010 Dec;94(6):712-20. doi: 10.1111/j.1439-0396.2010.01019.x.

### Longitudinal study of Australian stringhalt cases in France

C Domange <sup>1</sup>, A Castelnau, G Collignon, M Pumarola, N Prymenko

### Prognosis

	Grade I n = 7	Grade II n = 10	Grade III n = 12	Grade IV n = 19	Grade V n = 16	Grade VI n = 6
Laryngeal abnormalities	0	0	3	5	2	3
Atrophy, weight loss	0	0	3	5	2	4
Spontaneous recovery*	7	10	7	11	0	0
No recovery after 2 years†	0	0	3	4	5	2
Death	0	0	0	0	2	4

\*spontaneous recovery: it seems without surgery or phenytoin treatment. stringhalt often observed only in damp or muddy weather.

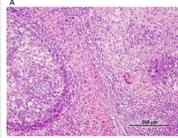
- Spontaneous recovery in 37/70
- 6 underwent tenotomy;
- 3/6 recovered, stumble 1 year post
- Positive results in 9/13 on phenytoin
  - 1 month, 1 year, periodically...



39

### Polyneuritis equi

- Also known as cauda equina syndrome / neuritis
- Can affect all breeds and ages
- Unknown etiology; potentially auto-immune components
  - T- and B-cell inflammatory infiltrates
  - Demyelination



Journal of Veterinary Internal Medicine 2006;20:1061-1068  
© Paul Adams

**Antemortem Diagnosis of Polyneuritis Equi**  
M. Akman, S.A. Kalkan, B. Ingham, J. Hodges, T.A. Grubbs, M.M. Christopher, G.D. Smetzer, R.J. Higgins  
First published: 19 May 2009  
https://doi.org/10.1111/j.1939-2298.2008.01884.x



40

### Polyneuritis equi

- Clinical signs
  - Progressive paralysis of tail, anus, rectum, bladder, + pelvic limb weakness and ataxia
  - Perineal hyperesthesia → hypalgesia
  - Penile prolapse with urine dribbling
  - Muscle atrophy
  - +/- cranial nerve dysfunction




41

### Polyneuritis equi

- Differential diagnoses
  - EPM (US)
  - EHV-1 / EHM
  - Other viral encephalitides
  - Sacral fracture
  - Meningitis
  - Sorghum cystitis



Figure 1. A horse in the classic anoregic "big hump" stance that is unable to rise into a normal stance. (Photo courtesy of Dr. George Allen)



42

## Polyneuritis equi

- **Diagnosis**
  - Definitely made **postmortem**
  - No specific antemortem diagnostic test
  - Essentially diagnosis of exclusion
  - CSF often abnormal

CSF Characteristics	
Color:	Colorless
Clarity:	Clear
Nucleated cell count:	266 (176) / $\mu$ L
RBC count:	140 (158) / $\mu$ L
Total Protein:	77/NA-LTT mg/dL

**Diagnosis**  
**INTERPRETATION:** Suppurative inflammation; Macrophages containing pink globular to amorphous material (See comment)

**DESCRIPTION:** Multiple cytospin slides are of good quality and high cellularity. Slides contain 79% non-degenerative neutrophils, 13% small lymphocytes and 8% macrophages amid small numbers of red cells and stain precipitate. Many of the macrophages are filled with abundant light pink globular to amorphous material which greatly distends the cytoplasmic volume. Some macrophages also contain blue material which may be hemosiderin.



43

## Polyneuritis equi

- **Treatment**
  - Palliative
    - Management of urinary +/- fecal incontinence
    - Parenteral feeding with some cranial nerve deficits
  - Anti-inflammatories
    - Corticosteroids – 0.05-0.1 mg/kd dexamethasone
- **Prognosis**
  - Poor



44




**Questions?**  
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45