Why they Wobble: A Practical Approach to Spinal Ataxia

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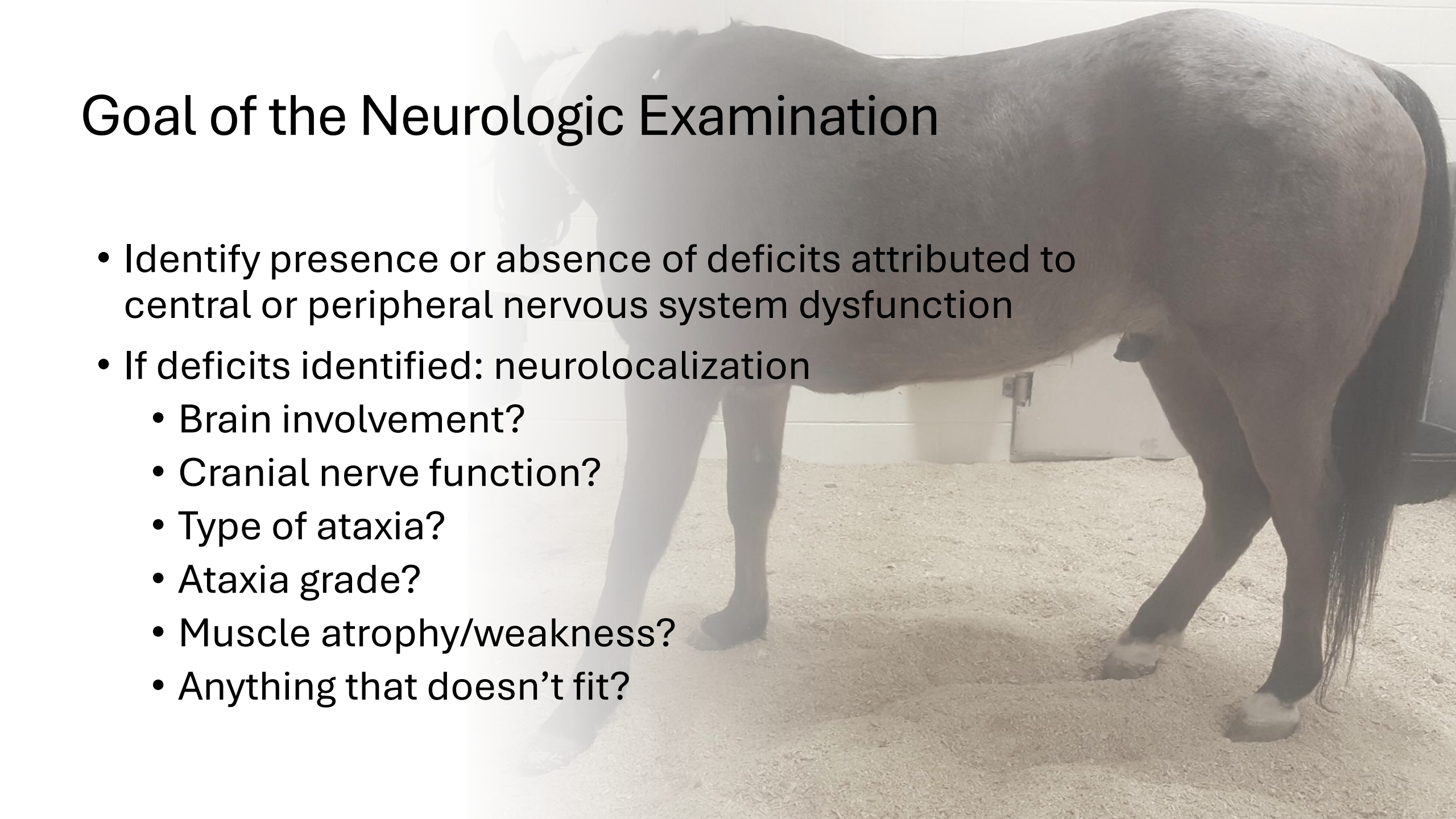
Outline

- The neurologic exam
- General proprioceptive/spinal ataxia
- Differential diagnoses
- CVCM
- eNAD/EDM

Goal of the Neurologic Examination



- Identify presence or absence of deficits attributed to central or peripheral nervous system dysfunction
- If deficits identified: neurolocalization
  - Brain involvement?
  - Cranial nerve function?
  - Type of ataxia?
  - Ataxia grade?
  - Muscle atrophy/weakness?
  - Anything that doesn’t fit?

Systematic neurologic examination

- Mentation/ stance/ posture
- Muscle mass & symmetry
- Cranial nerve exam
- Cervical and thoracolumbar palpation and reflexes
- Cervical range of motion
- Baseline motion examination
  - Walk – straight line & serpentine
  - Small circles
  - Backing
- Advanced motion examination
  - Tail pull
  - Head elevation
  - Obstacle navigation
  - Incline/ decline walking
  - Blind-folding

Modified Mayhew Ataxia Grading Scale

Grade 0: Normal
Grade 1: Subtle
Grade 2: Mild
Grade 3: Moderate
Grade 4: Severe
Grade 5: Recumbent

	Upper Motor Neuron	Lower Motor Neuron
Lesion location	Brain, brainstem, spinal cord (cranial to affected limbs)	Peripheral nerve, nmj, spinal cord (at level of affected limbs)
Muscle Tone	Increased → normal	Decreased
Reflexes	Increased → normal	Decreased → absent
Atrophy	Mild, disuse-related	Marked
Fasciculations	Rare	Common
Strength	Weakness without atrophy	Weakness with atrophy
Postural Reactions	Delayed or absent	Delayed or absent
Gait abnormalities	Stiff, spastic	Short-strided, toe dragging

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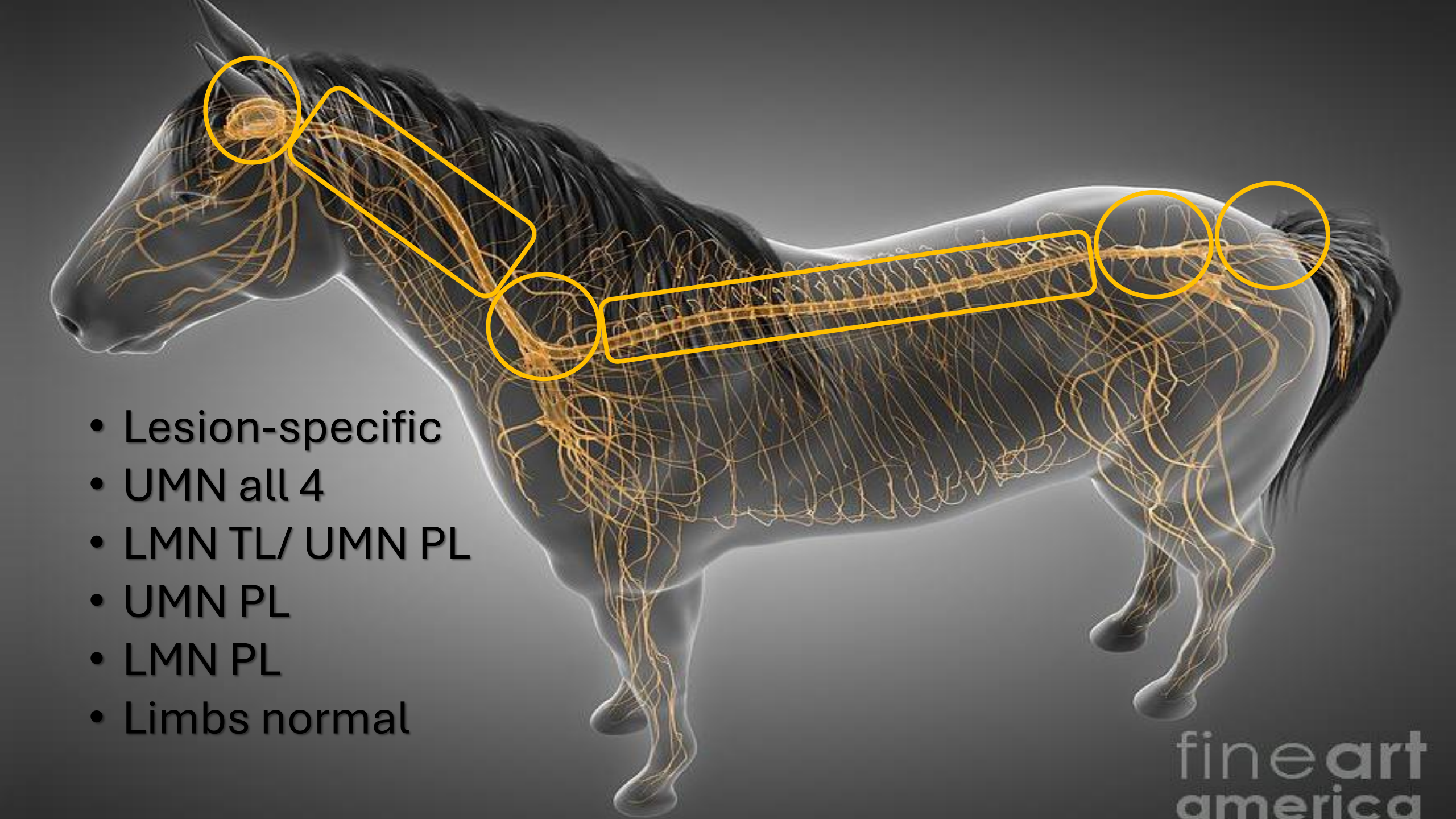
• Lesion-specific
• UMN all 4
• LMN TL/ UMN PL
• UMN PL
• LMN PL
• Limbs normal
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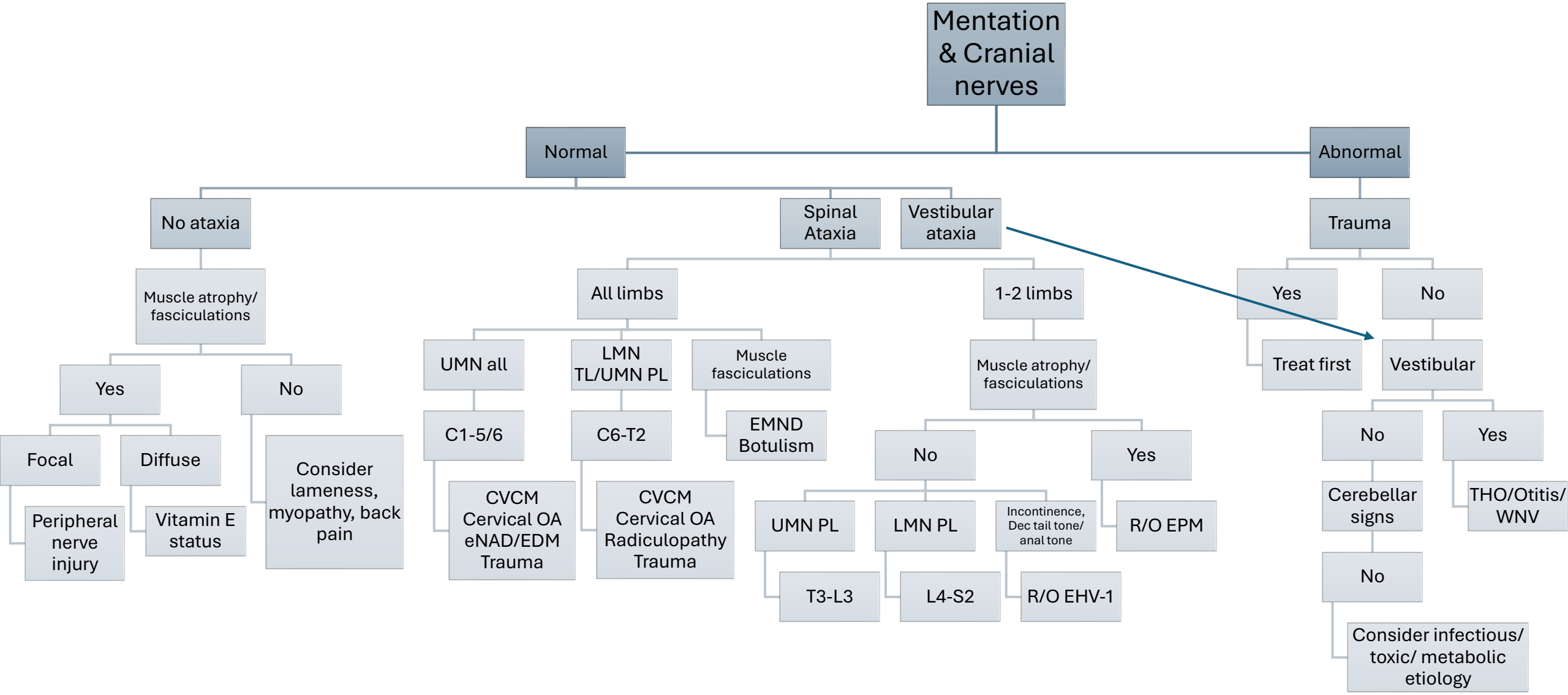
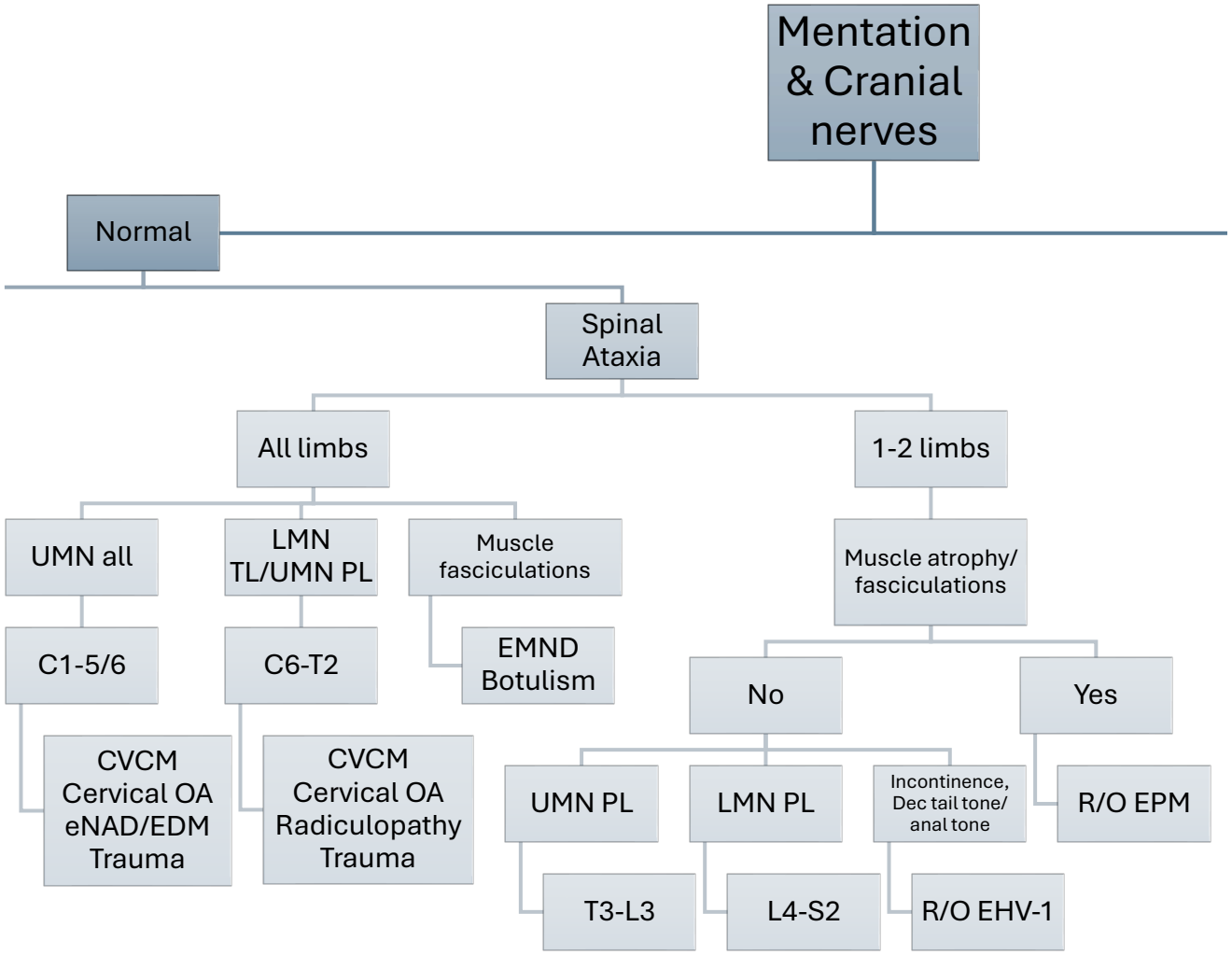
america

Identifying ataxia

The process


Mentation & Cranial nerves
Normal
Abnormal
No ataxia
Spinal Ataxia
Vestibular ataxia
Trauma
Muscle atrophy/ fasciculations
All limbs
1-2 limbs
Yes
No
Yes
No
Focal
Diffuse
No
UMN all
LMN TL/UMN PL
Muscle fasciculations
Muscle atrophy/ fasciculations
Treat first
Vestibular
Peripheral nerve injury
Vitamin E status
Consider lameness, myopathy, back pain
C1-5/6
C6-T2
EMND Botulism
No
Yes
No
Yes
CVCM Cervical OA eNAD/EDM Trauma
CVCM Cervical OA Radiculopathy Trauma
UMN PL
LMN PL
Incontinence, Dec tail tone/ anal tone
R/O EPM
Cerebellar signs
THO/Otitis/ WNV
T3-L3
L4-S2
R/O EHV-1
No
Consider infectious/ toxic/ metabolic etiology

The process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UMN PL
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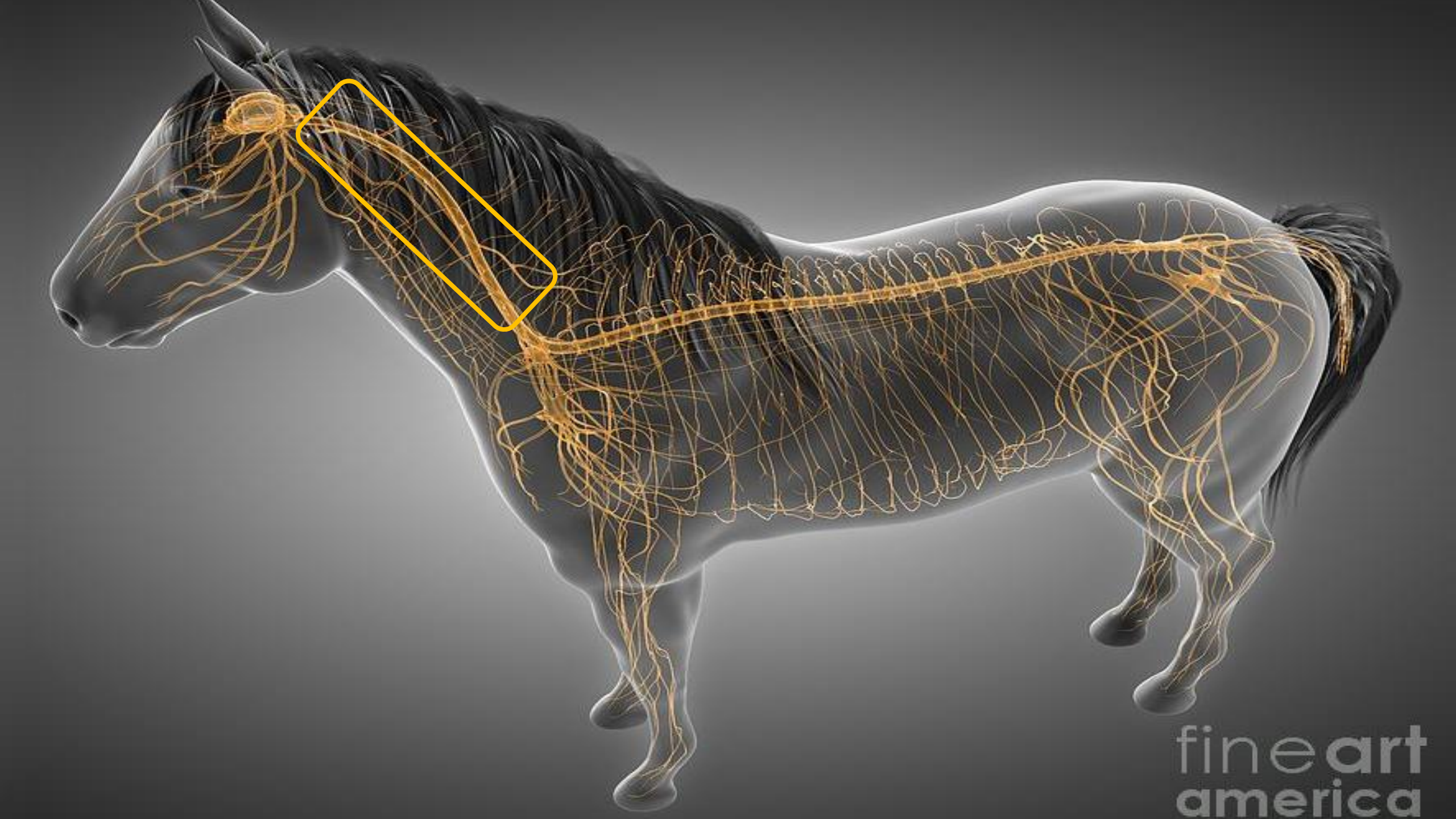
Incontinence, Dec tail tone/ anal tone
R/O EPM
T3-L3
L4-S2
R/O EHV-1

General proprioceptive /spinal ataxia

- Abnormal limb placement and foot flight
  - Accentuated limb crossover in straight line
  - Absent limb crossover/pivoting in circle
  - Abduction/adduction errors
  - Excessive circumduction
  - Abnormal protraction
  - Toe dragging
- Inconsistent gait abnormalities
- Abnormal stance/ posture
- Secondary weakness
- Truncal sway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Differential diagnoses

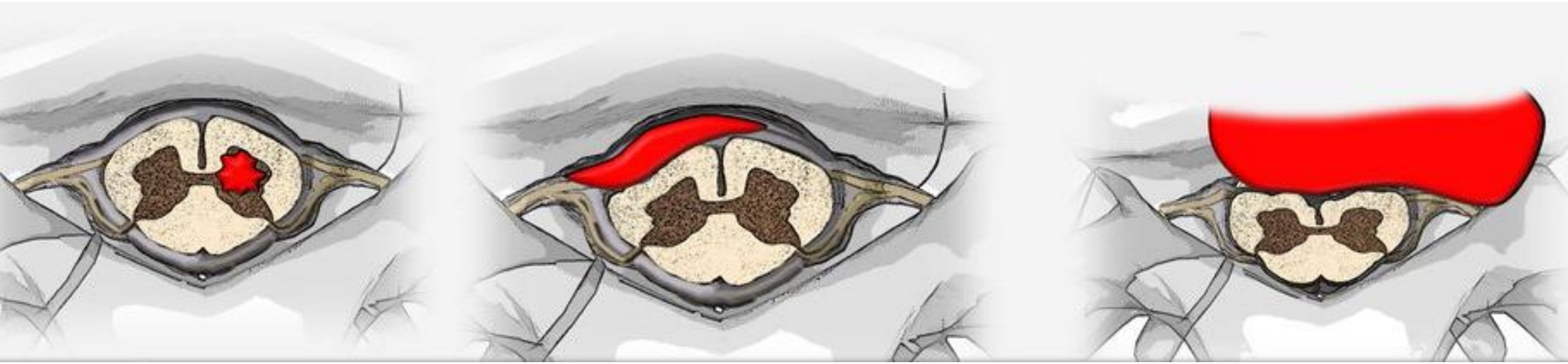
- Cervical vertebral compressive myelopathy
  - Static and/ or dynamic
- Cervical osteoarthritis +/- radiculopathy
- Equine neuroaxonal dystrophy/ Equine degenerative myelopathy
- Trauma
- Space- occupying mass
  - Disc extrusion
  - Neoplasia
  - Cyst
- Aberrant parasite migration
- EPM

Types of compression

Intradural intramedullary

Intradural extramedullary

Extradural



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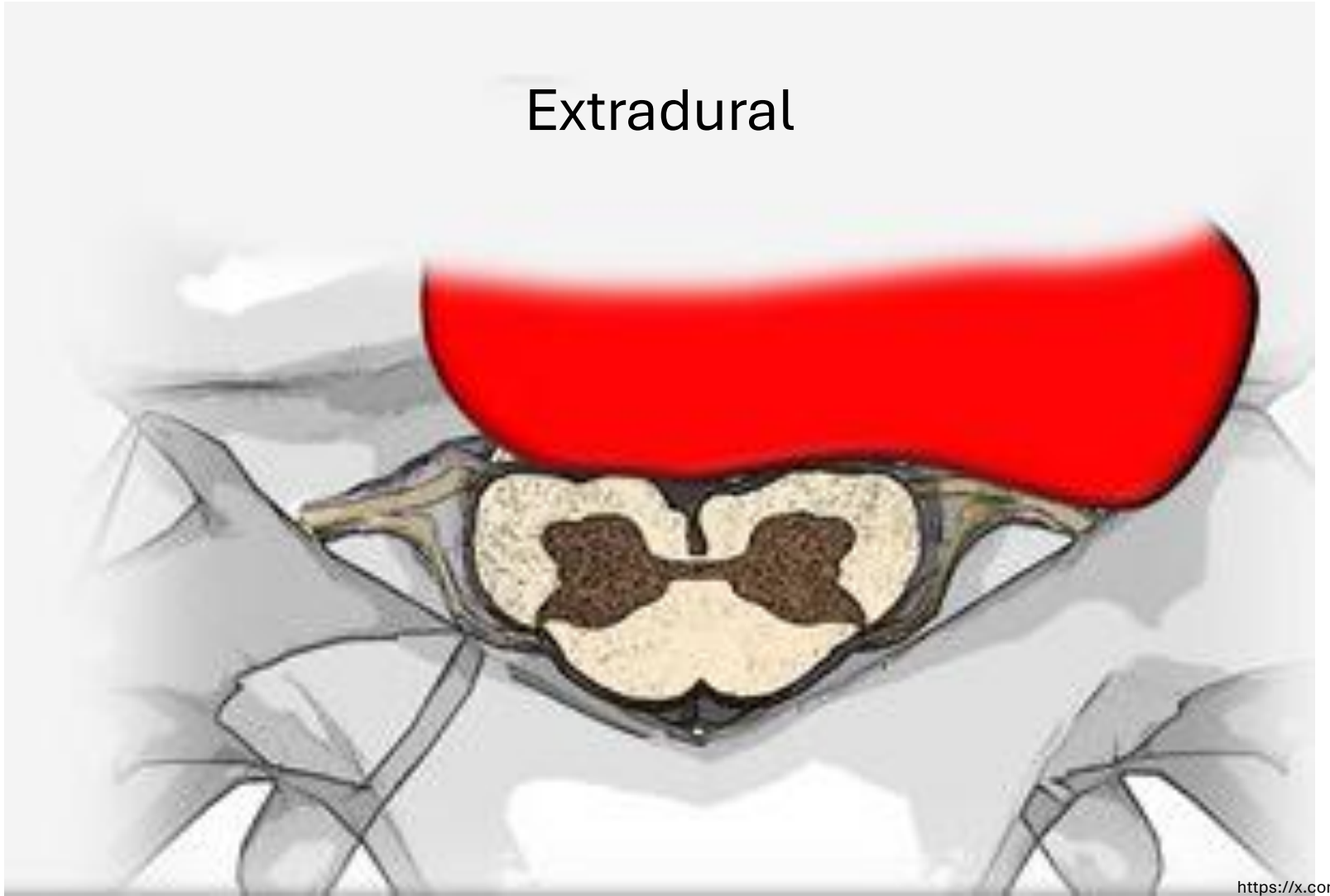
Types of compression



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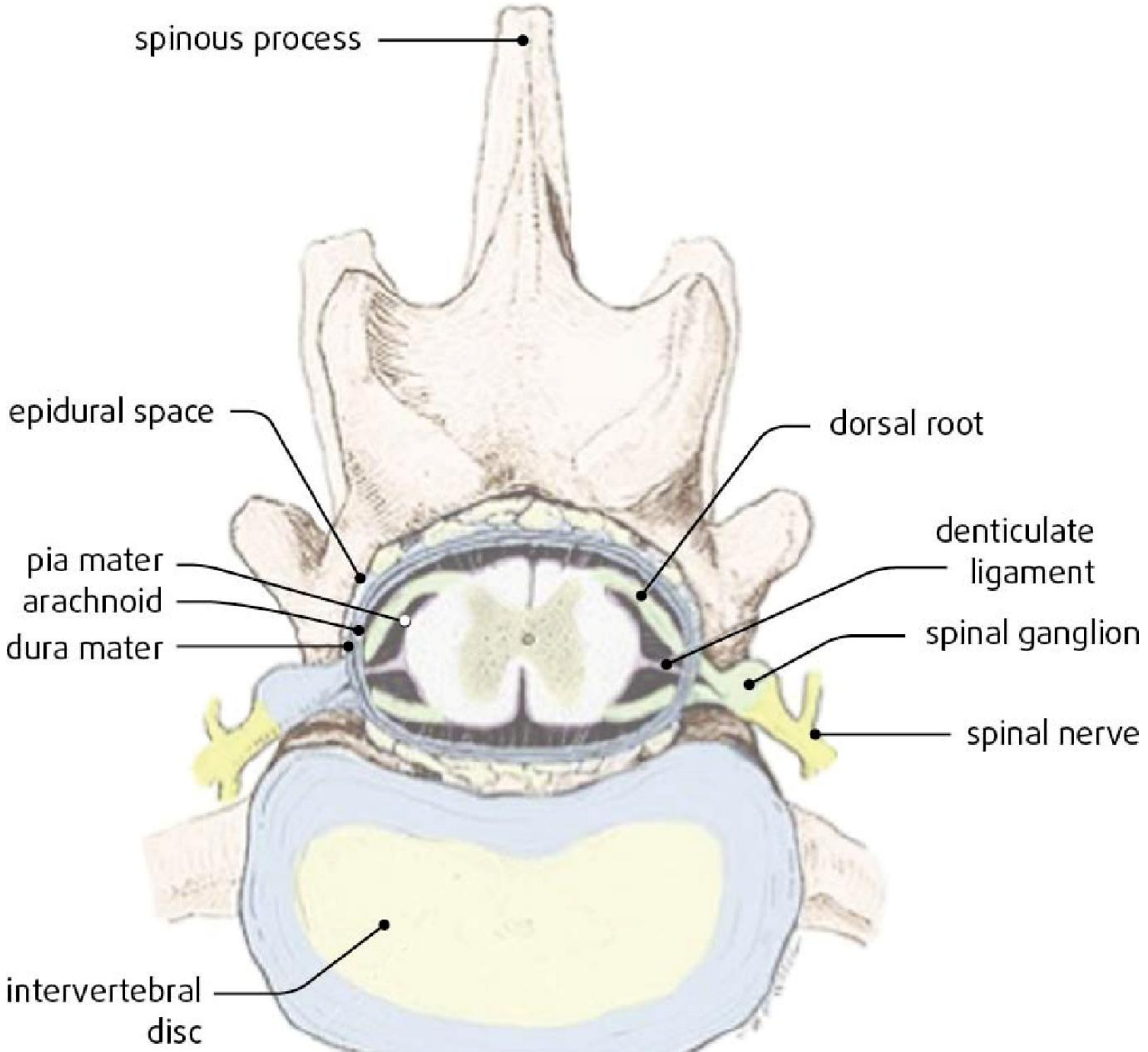
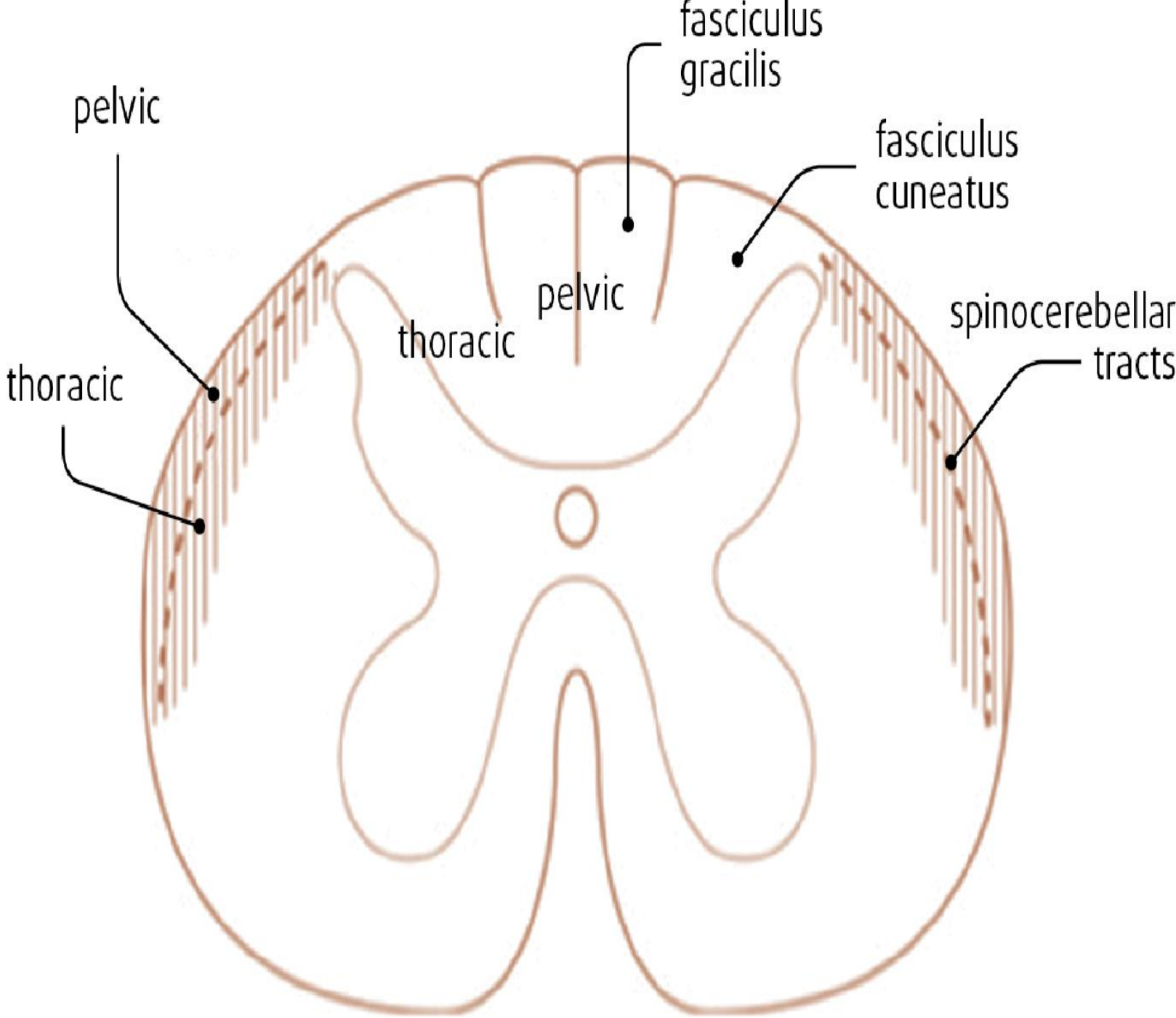
Spinal cord anatomy



Adapted from Nout YS and Reed SM [2003]. Cervical vertebral stenotic myelopathy, Equine Vet Educ 15[4]: 212-223).

Spinal cord anatomy



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CVCM- History and Presentation

- Recent growth/ weight gain
- Always clumsy
- Abnormal gait, lameness or head carriage
- Inability/ reluctance to turn head
- Tripping/ falling

CVCM

Type I

- Overrepresented breeds:
  - Thoroughbreds
  - Quarter Horses
  - Warmbloods
  - Tennessee Walking Horses
- Males 3x more likely
- 1-2 years old
- Mid-cervical spine

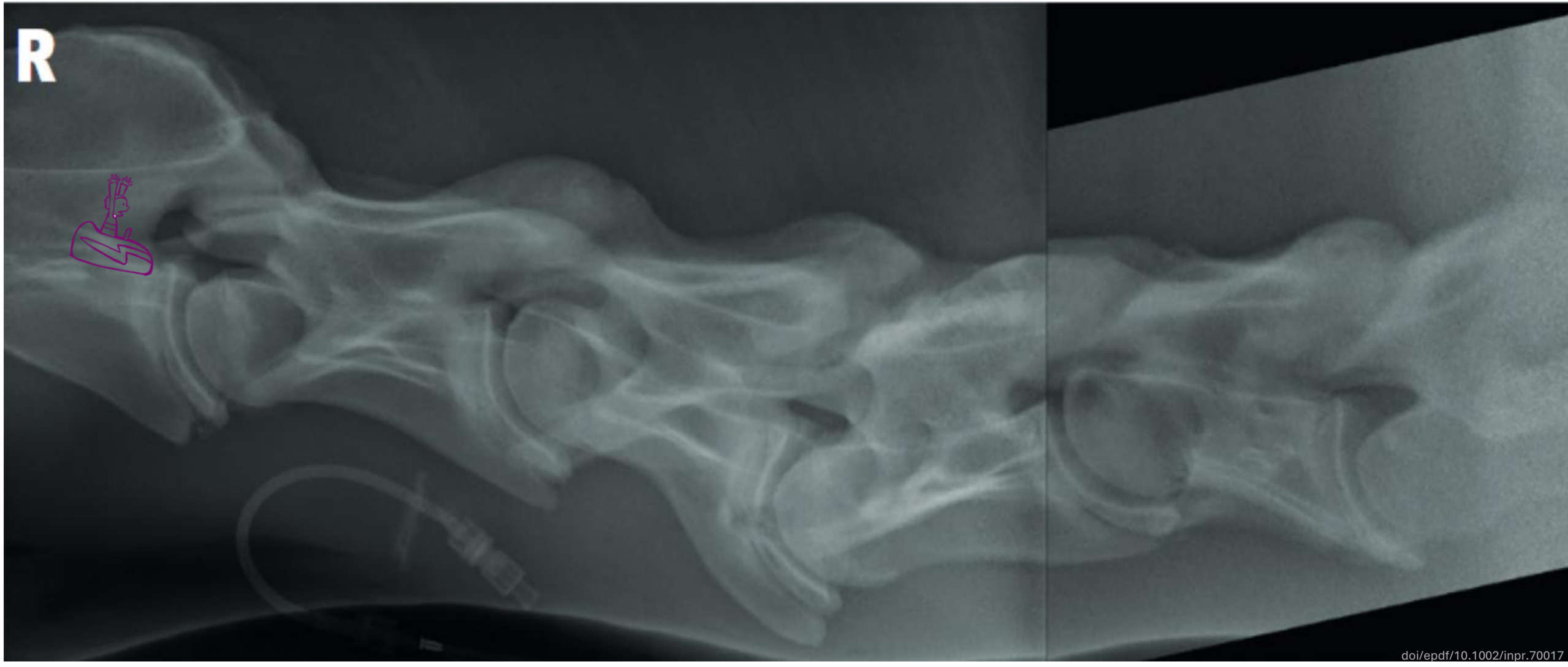
Type II

- All breeds
- Older horses
- Successful performance career
- Caudal cervical spine

Lateral cervical radiographs

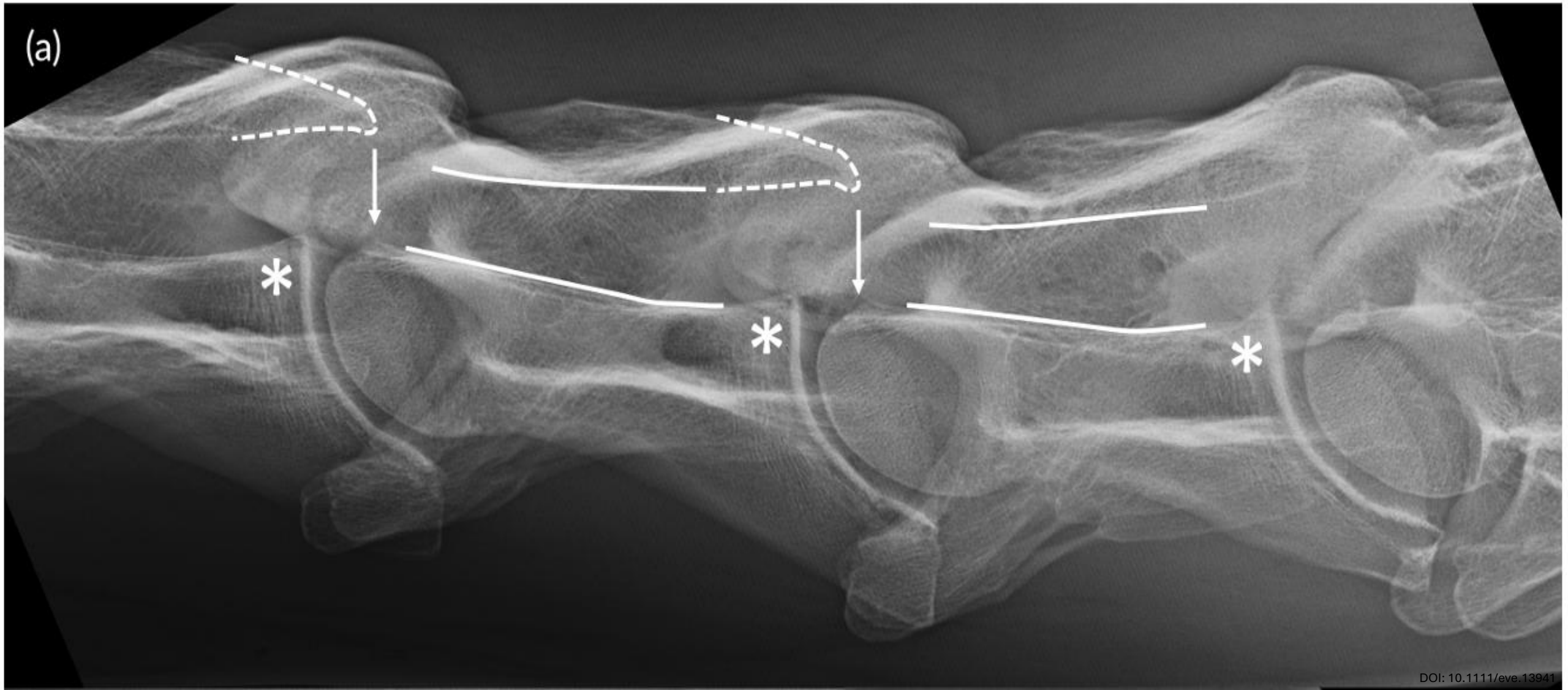
- General characteristics
  - Intervertebral malalignment
  - Caudal extension of the dorsal arch
  - Physitis of the caudal vertebral body
  - Stenosis/ funneling of vertebral canal
  - Osteochondrosis or osteoarthritis of the articular facets
- Measurements
  - Intravertebral sagittal ratio
  - Intervertebral sagittal ratio

Intervertebral malalignment



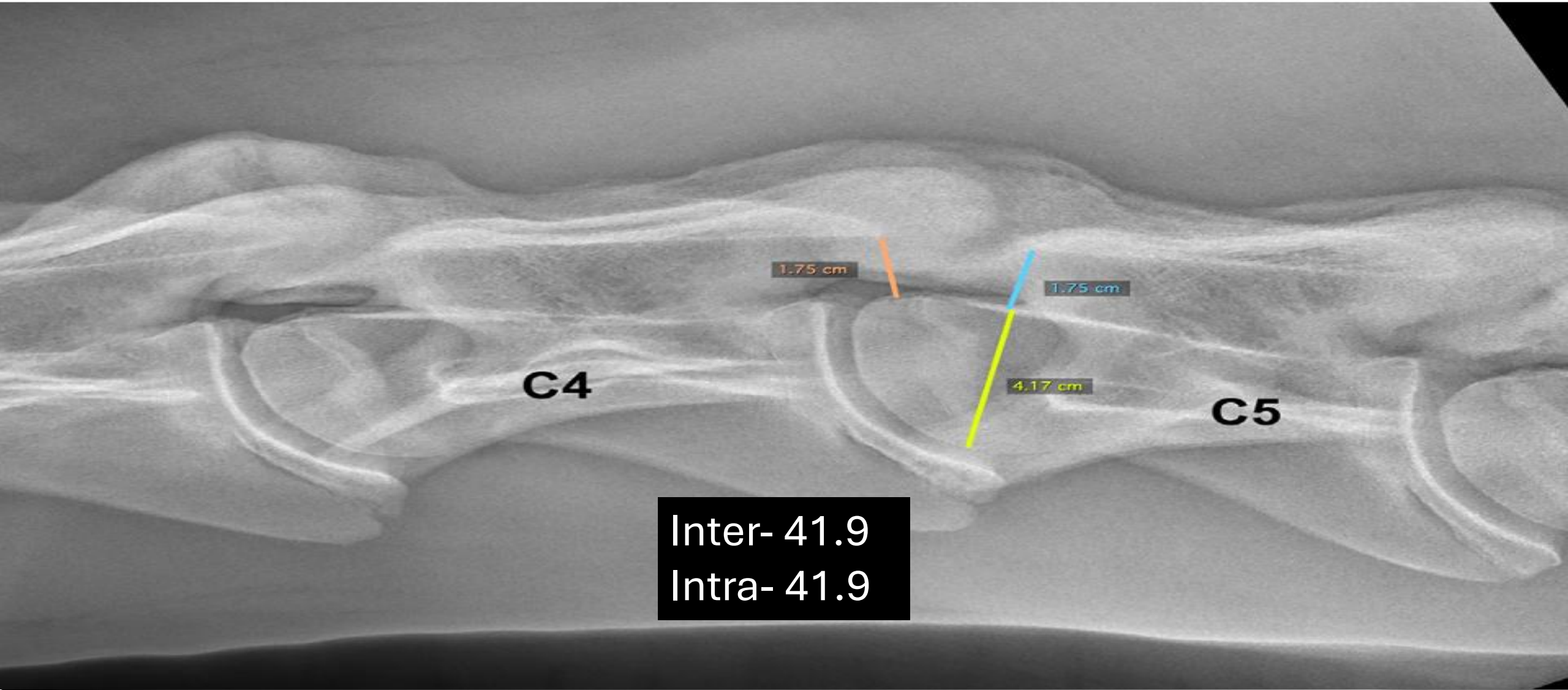
doi/epdf/10.1002/inpr.70017

Radiographic abnormalities



DOI: 10.1111/eve.13941

Intra and Intervertebral sagittal ratios



Caudal cervical vertebral anatomy

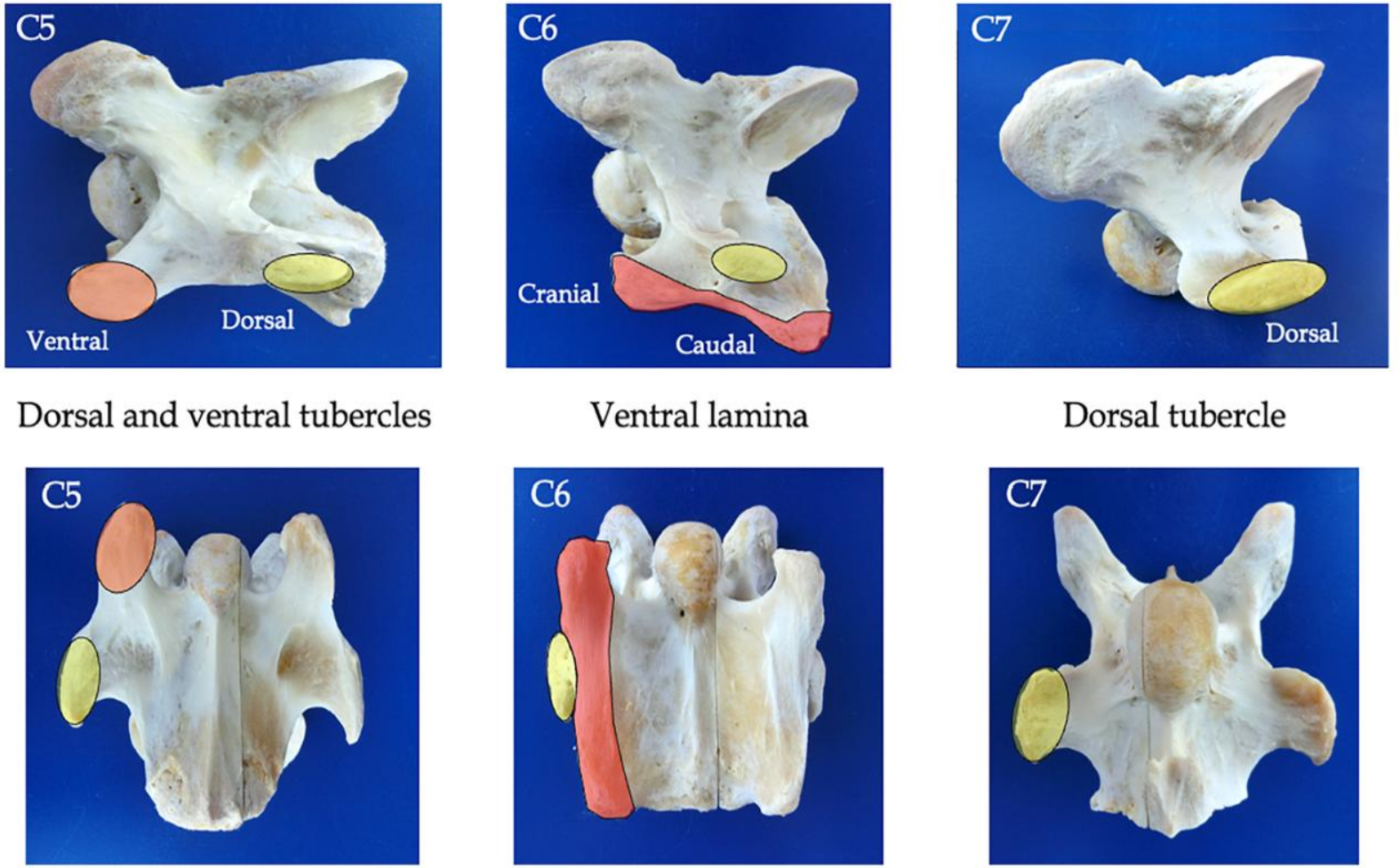


Fig. 7. Cervical transverse processes (C5-C7) with associated dorsal and ventral tubercles and the C6 ventral lamina.

doi.org/10.1016/j.cveq.2025.12.005

Caudal cervical vertebral anatomy

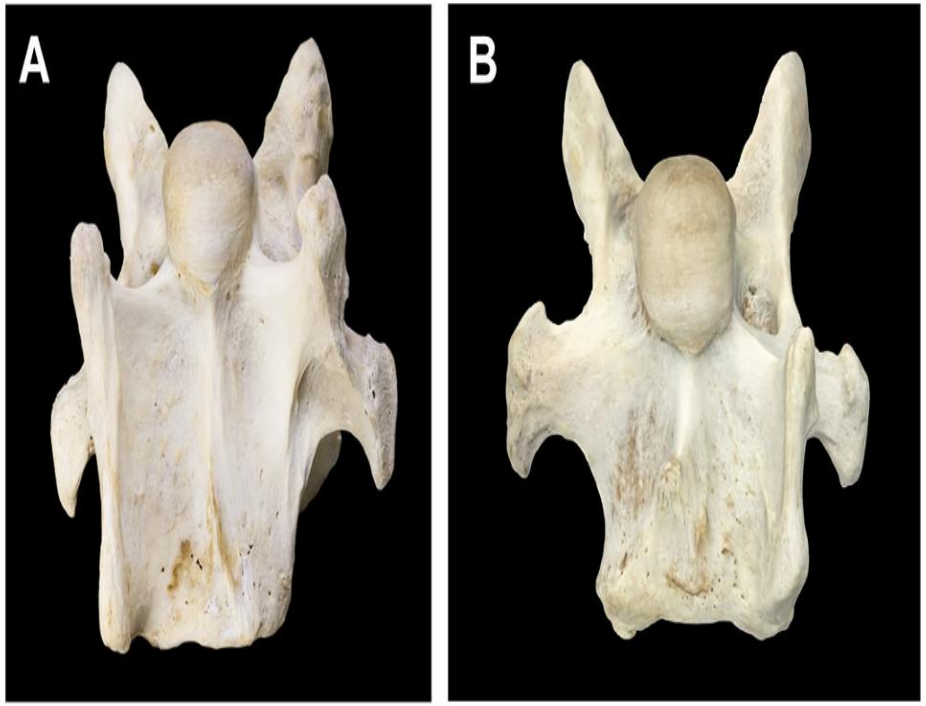


Fig. 8. (*A, B*) Unilateral transposed ventral lamina of C6 to the C7 vertebral body. Rev (www equus-soma.com).

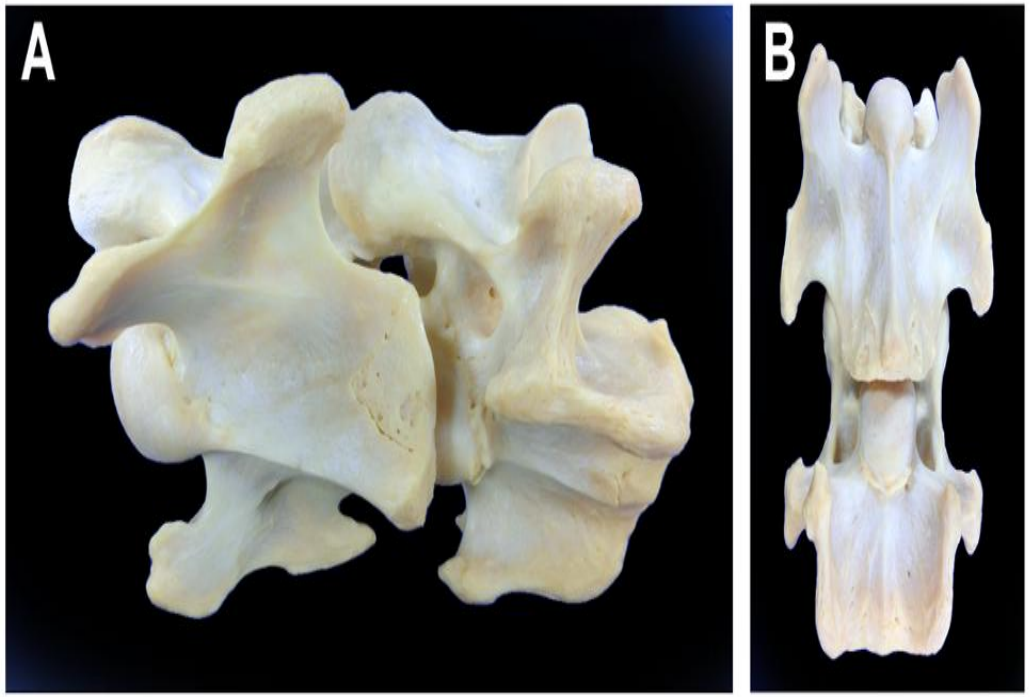
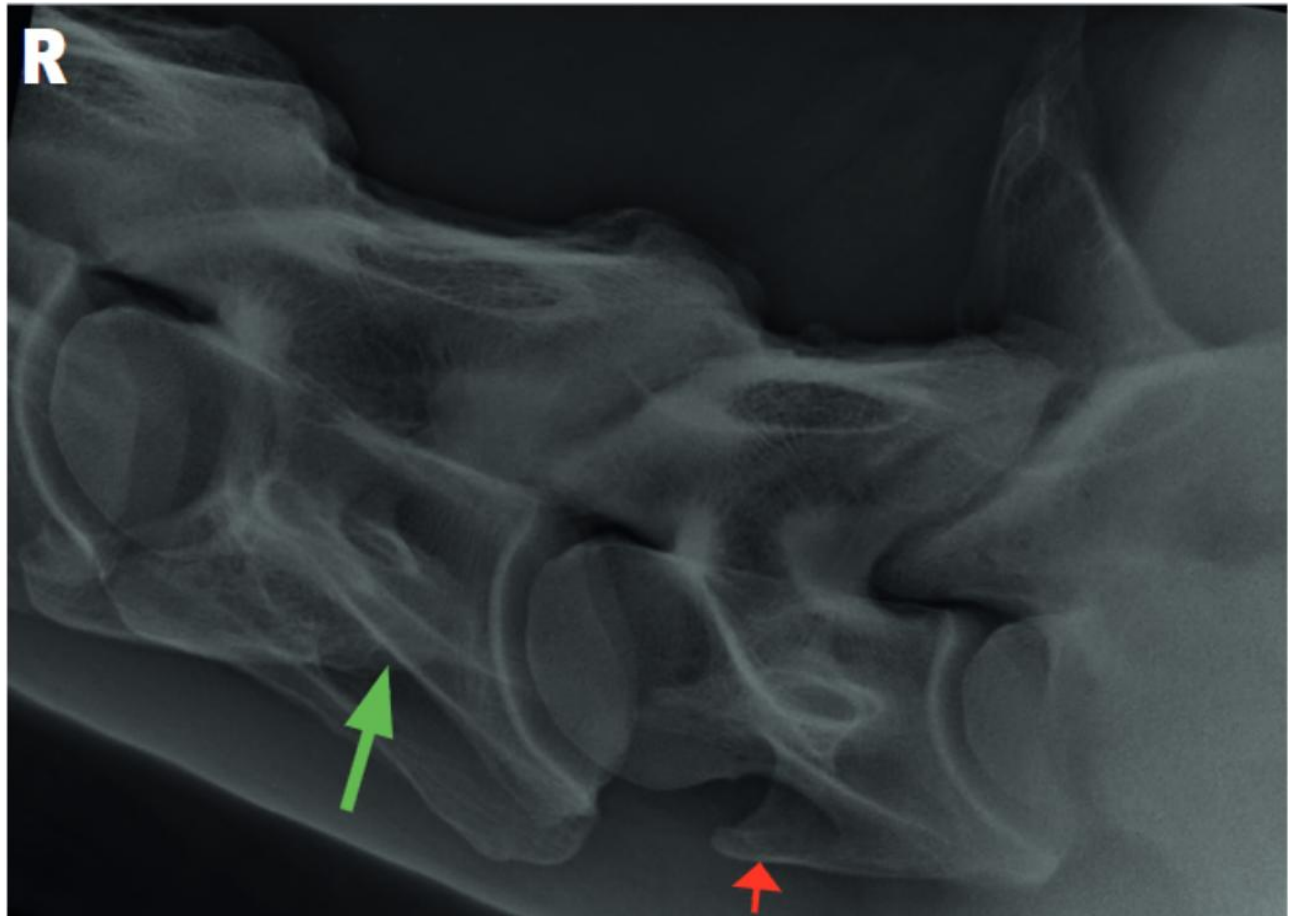


Fig. 9. (*A, B*) Bilaterally transposed ventral lamina of C6 to the C7 vertebral body.

Caudal cervical vertebral anatomy



Caudal cervical vertebral anatomy

Table 2
Reported unilateral or bilateral prevalence of congenital vertebral anomalies affecting the C6 ventral lamina, with or without transposition to C7, and ribs 1-2 anomalies

		C6 Caudal Lamina Aplasia			C7 Lamina Transposition			Ribs 1–2 Malformation		
Author	**Horses**	**Normal**	**Unilateral**	**Bilateral**	**Normal**	**Unilateral**	**Bilateral**	**Normal**	**Unilateral**	**Bilateral**
Beccati,[19] 2020	n = 116	79%	21%		–	–	–	–	–	–
Crijns,[21] 2021	n = 664	72%	16%	12%	–	–	–	–	–	–
Henderson,[29] 2024	n = 135	–	–	–	80%	20%		–	–	–
Santinelli,[5] 2016	n = 270	–	–	–	87%	13%		–	–	–
Dyson,[20] 2024	n = 223	76%	8%	16%	76%	24%		–	–	–
DeRouen,[30] 2016	n = 100	76%	6%	4%	86%	9%	5%	–	–	–
Gerlach,[31] 2021	n = 129	79%	12%	8%	81%	11%	8%	–	–	–
Veraa,[8] 2020	n = 377	71%	13%	15%	71%	13%	15%	–	–	–
May-Davis,[26] 2017	n = 151	81%	13%	6%	91%	7%	2%	96%	2%	2%
Veraa,[15] 2016	n = 78	54%	33%	13%	66%	21%	13%	96%	–	4%
Sum/Average	n = 2,243	74%	14%	11%	81%	12%	9%	96%	2%	3%

https://doi.org/10.1016/j.cveq.2025.12.005

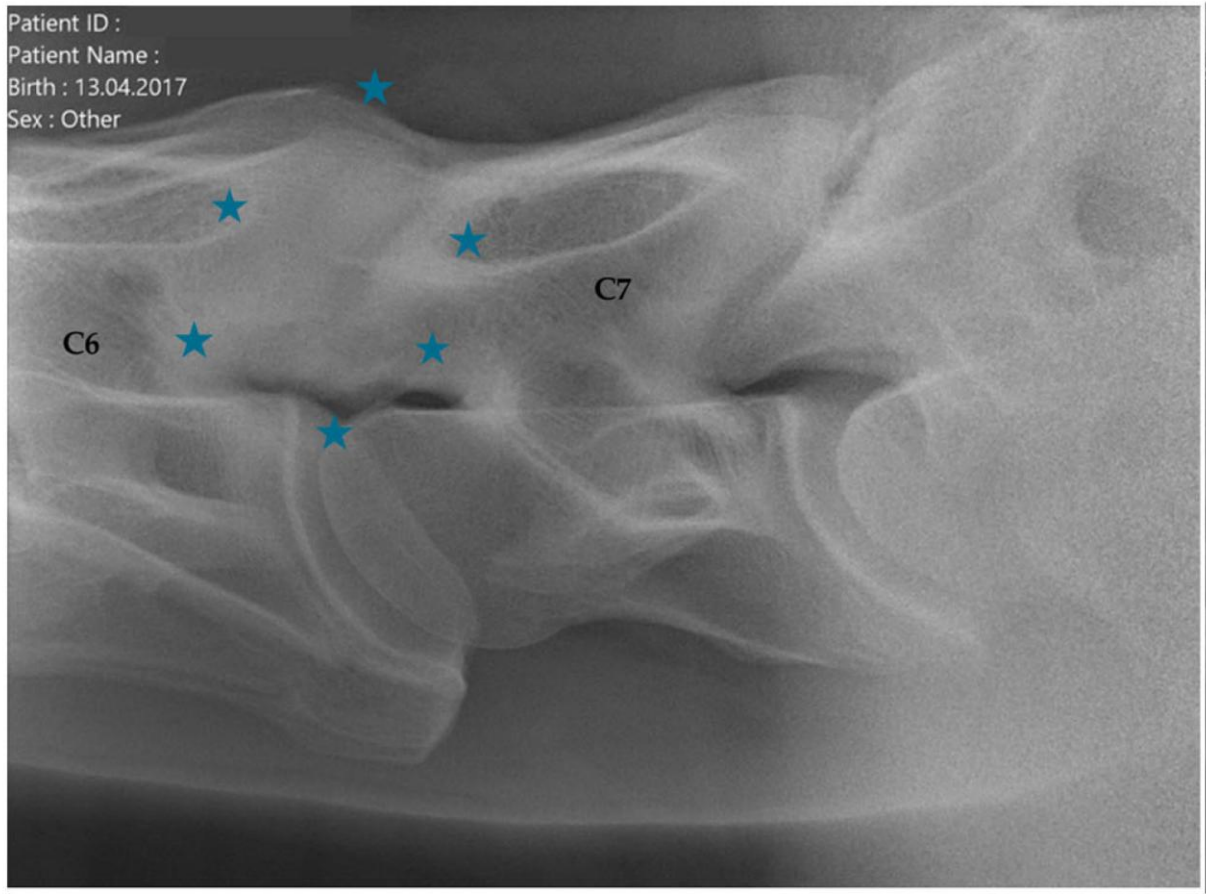
Clinical relevance?

Table 3
Clinical signs in horses with or without C6 ventral lamina anomalies

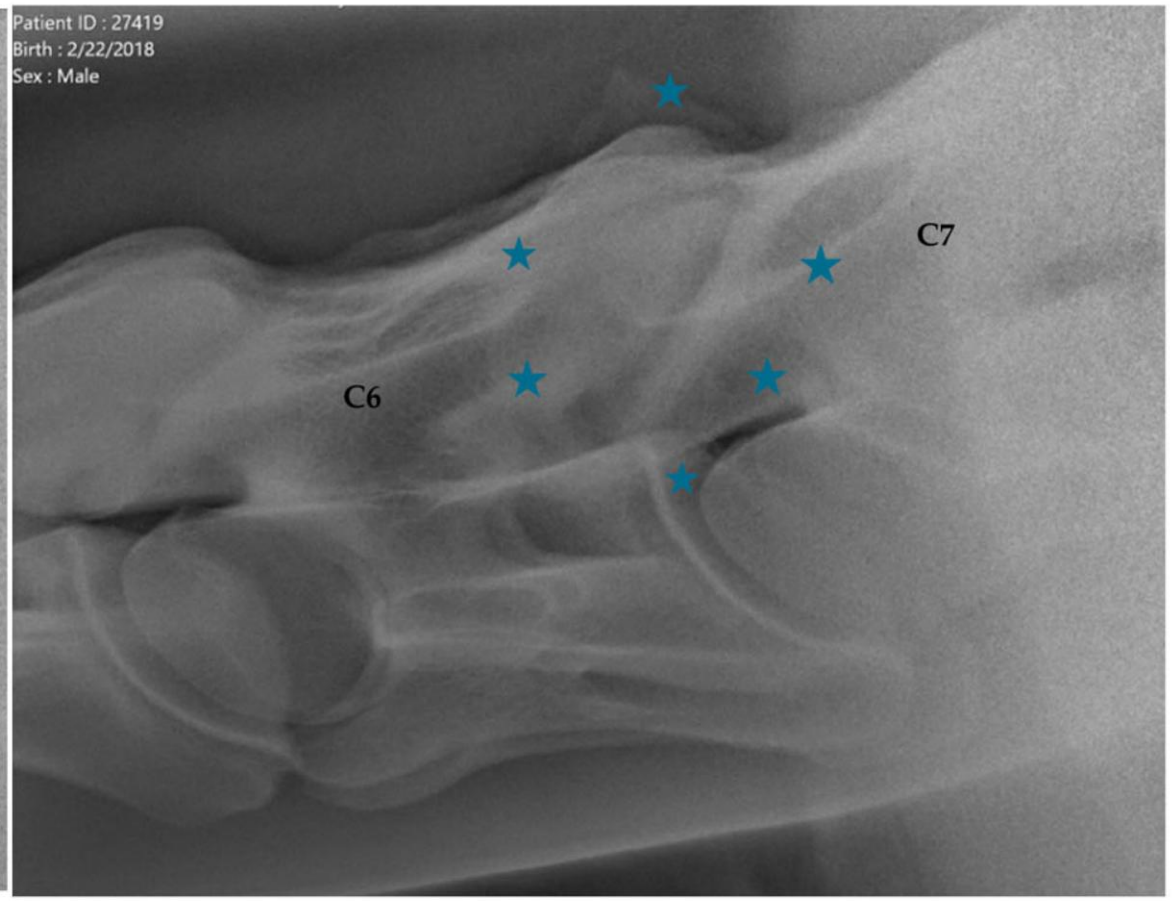
		Clinical Signs				C6 Anomaly		
Author	**Horses**	**Ataxia**	**Pain**	**Behavior**	**Lameness**	**Control**	**Affected**	**Total C6 Anomalies**
DeRouen,[30] 2016	n = 100	51%	10%	–	32%	–	24%	24%
Henderson,[29] 2024	n = 135	44%	10%	19%	36%	–	20%	20%
Beccati,[19] 2020	n = 116	9%	12%	–	–	7%	21%	28%
Dyson,[20] 2024	n = 223	49%	18%	–	32%	29%	17%	24%
Veraa,[8] 2020	n = 377	50%	43%	15%	11%	13%	15%	29%

https://doi.org/10.1016/j.cveq.2025.12.005

Cervical articular process joint enlargement



(a)



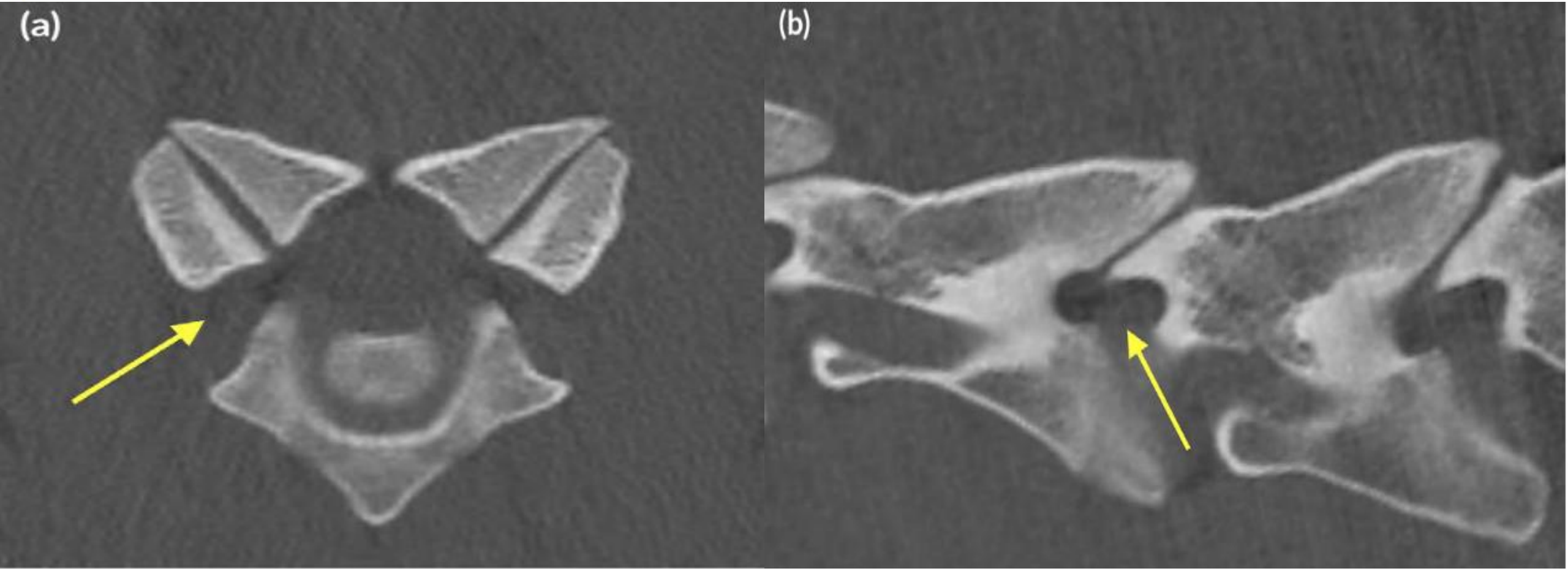
(b)

doi/epdf/10.1002/inpr.70017

Grading cAPJ size ?

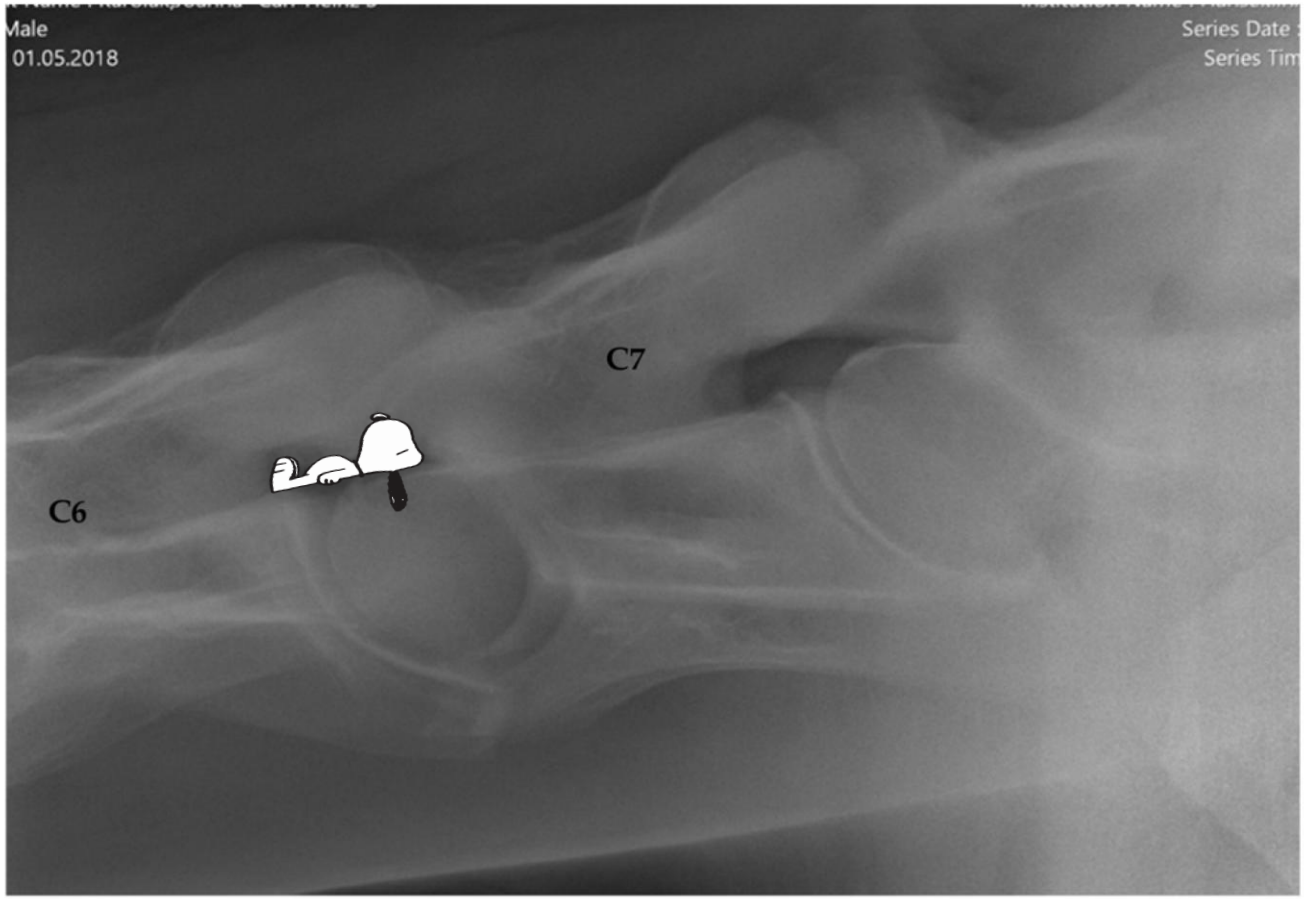
doi: 10.1111/eve.13375

Intervertebral foramen anatomy



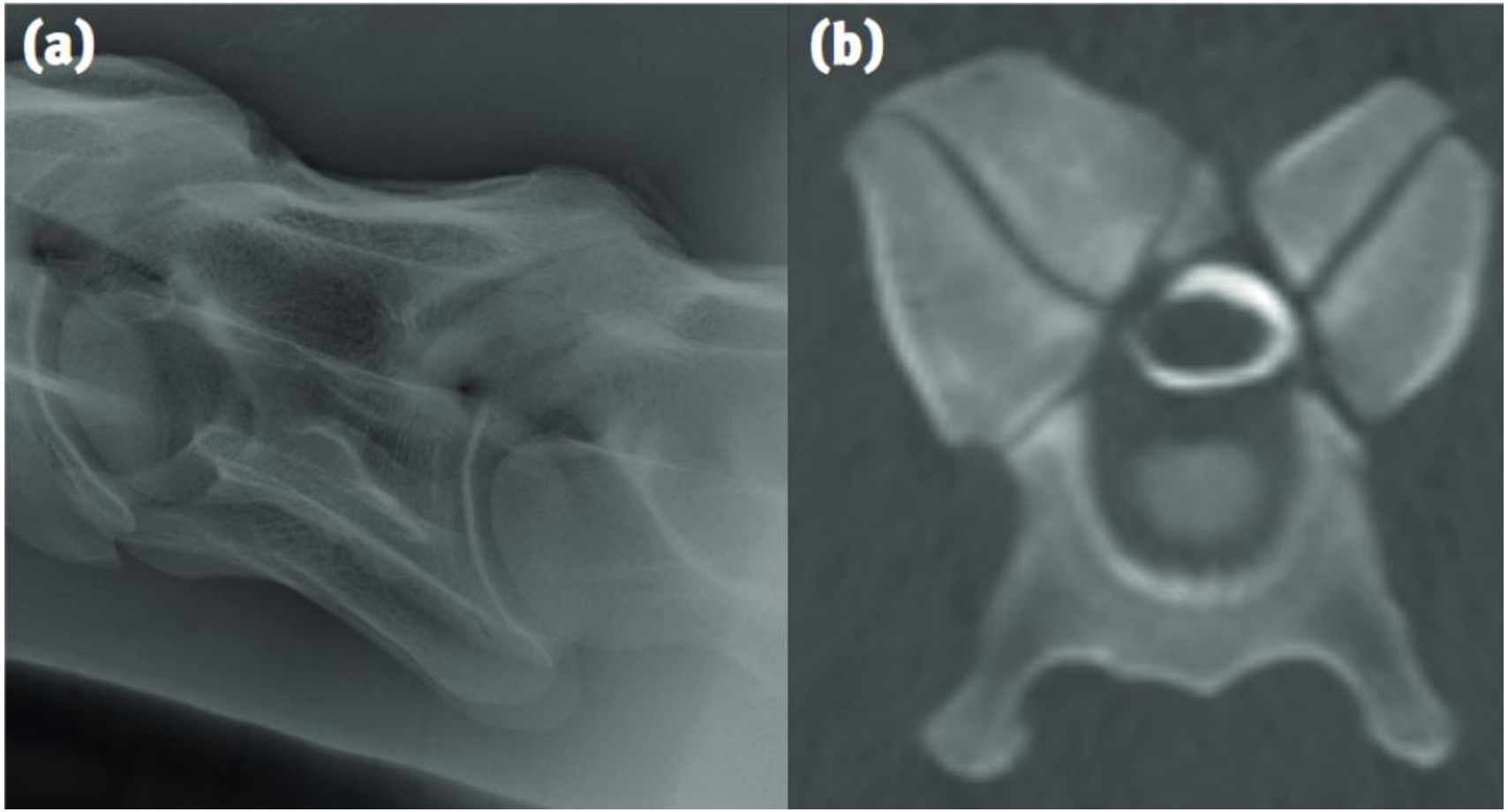
doi/epdf/10.1111/eve.14216, https://doi.org/10.1016/j.cveq.2025.12.005

Intervertebral foramen anatomy



doi/epdf/10.1111/eve.14216, https://doi.org/10.1016/j.cveq.2025.12.005

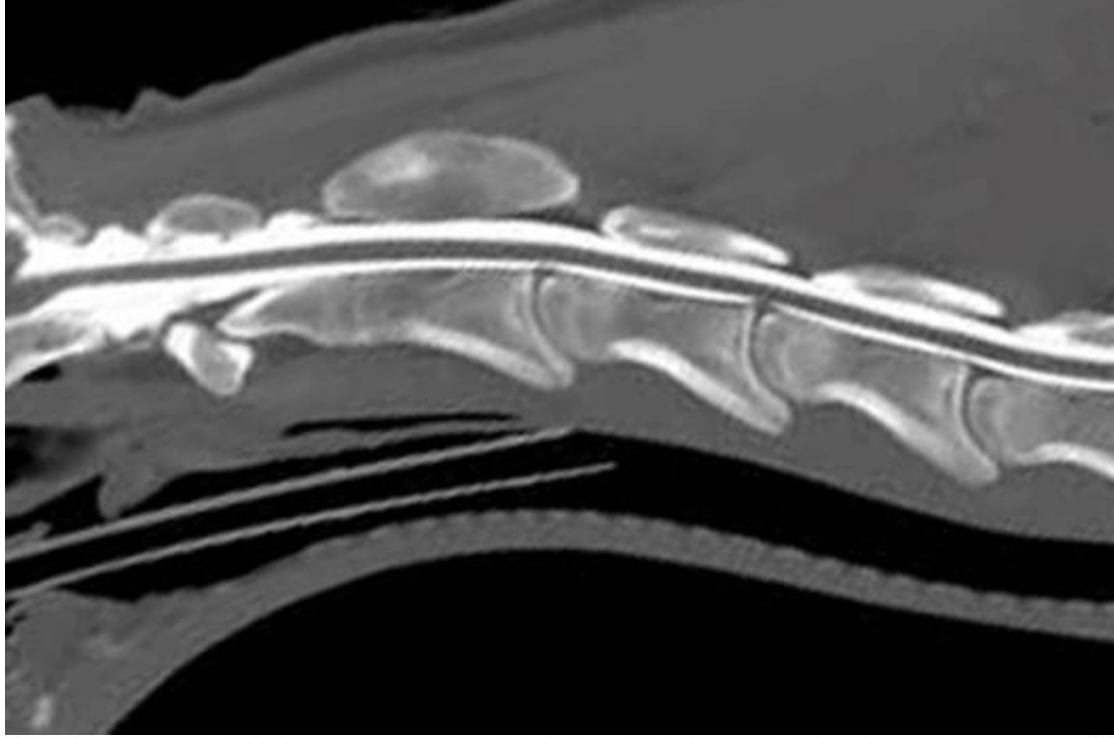
Intervertebral foramen stenosis

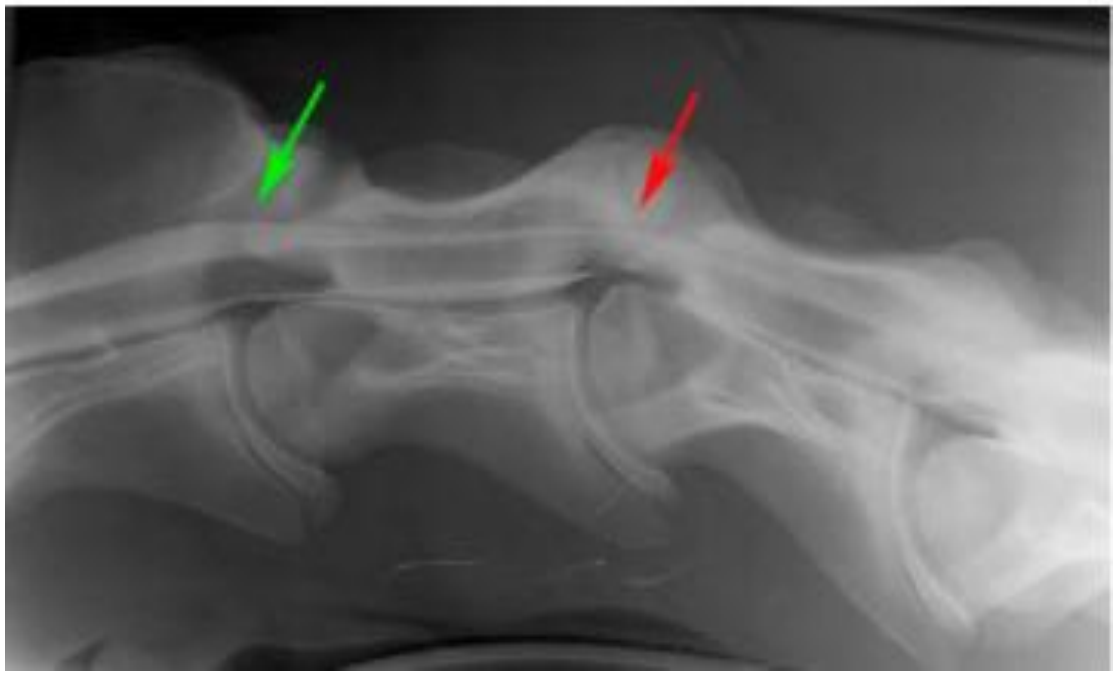


doi/epdf/10.1002/inpr.70017

Myelogram

- Most common sites of compression:
  - Dynamic: C3-4 and C4-5
  - Static: C5-6 and C6-7
- General anesthesia required
  - Radiograph
  - Computed Tomography
- Adverse effects
  - 1/3 of horses
  - 2% necessitating euthanasia





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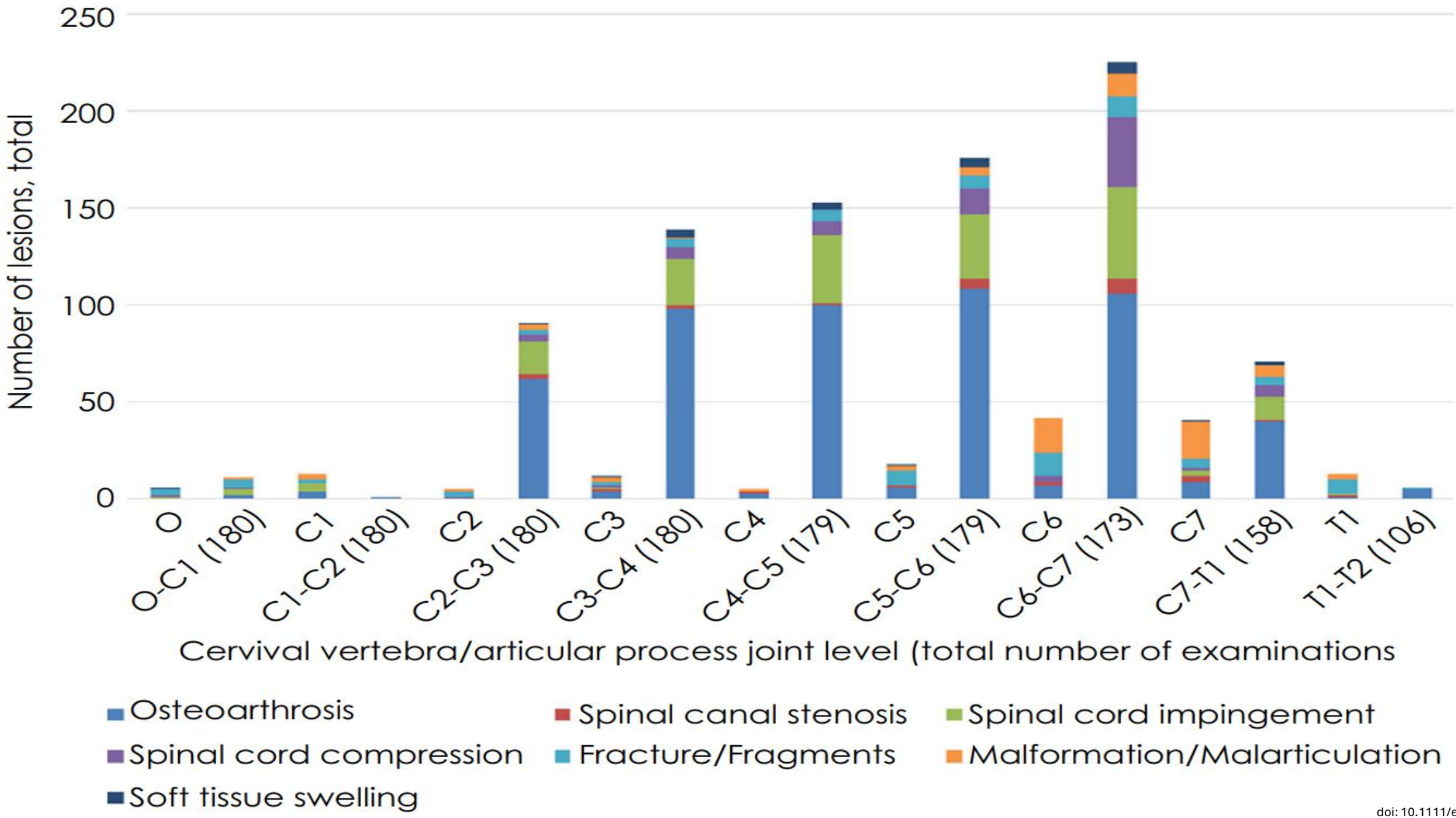
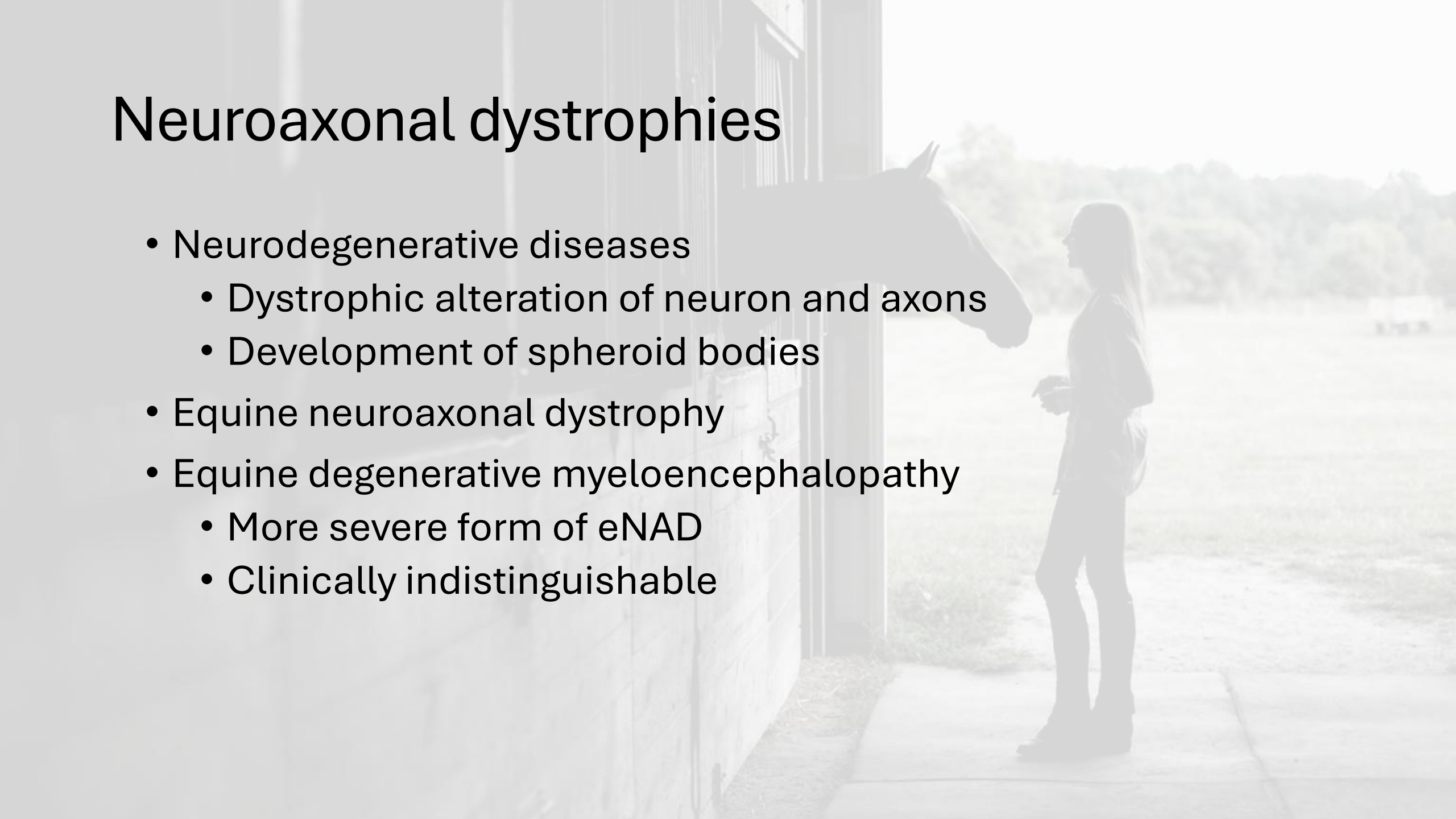


doi: 10.1111/eve.13350

What if they are not a “Wobbler” but are wobbly?

Neuroaxonal dystrophies

- Neurodegenerative diseases
  - Dystrophic alteration of neuron and axons
  - Development of spheroid bodies
- Equine neuroaxonal dystrophy
- Equine degenerative myeloencephalopathy
  - More severe form of eNAD
  - Clinically indistinguishable



eNAD/ EDM

- Signalment
  - All breeds
    - Familial/ hereditary risk factors
  - No sex predilection
- Genetic basis
  - Complex trait
- Risk factors
  - Marginal/ low vitamin E
  - Lack of pasture access
  - Familial history

eNAD/ EDM

- Classic clinical signs
  - Onset
    - Acute or insidious
    - < 3 years of age
  - Symmetric ataxia
    - Thoracic limbs may be normal
  - Wide based gate
  - Decreased/ absent spinal reflexes
- Progression
  - Variable

eNAD/EDM

- Alternative clinical presentation
  - Older sport horses
  - Median age 8 years old
  - Abnormal behavior (68%)
  - Spinal ataxia (100%)
    - Median pelvic limb grade (2/5)
    - Median thoracic limb grade (1.75/5)
- 10% abnormal serum Vitamin E
- No consistent antemortem diagnostics

eNAD/ EDM

- Treatment
  - No known treatment
  - Vitamin E supplementation
    - Minimal improvement
- Prognosis
  - Poor for performance
  - Don’t recommend breeding