Lumbo-sacral syndrome: Myth versus reality

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Objectives

- Understand the physiopathology of the LS syndrome
- Recognize the clinical presentation
- Chose the best diagnostic tool
- Decision making on treatment options

Organization

- Refresh of spinal localization
- Understand the biomechanics
- Physiopathology
- Evaluation of the gait
- Recognizing the LS dog

- CLINICAL CASES

- Diagnostic tools
- Medical treatment
- Surgical treatment

The Lumbo-Sacral syndrome

Group of neurological SIGNS secondary to
-Congenital
-Adquire stenosis of the
-Lumbo-sacral canal
-Secondary radicular compression

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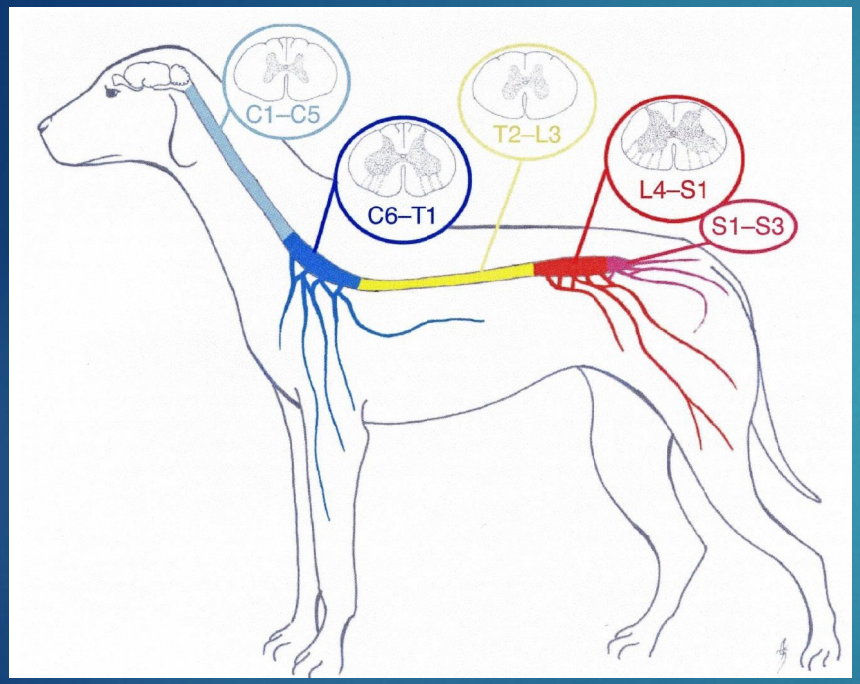
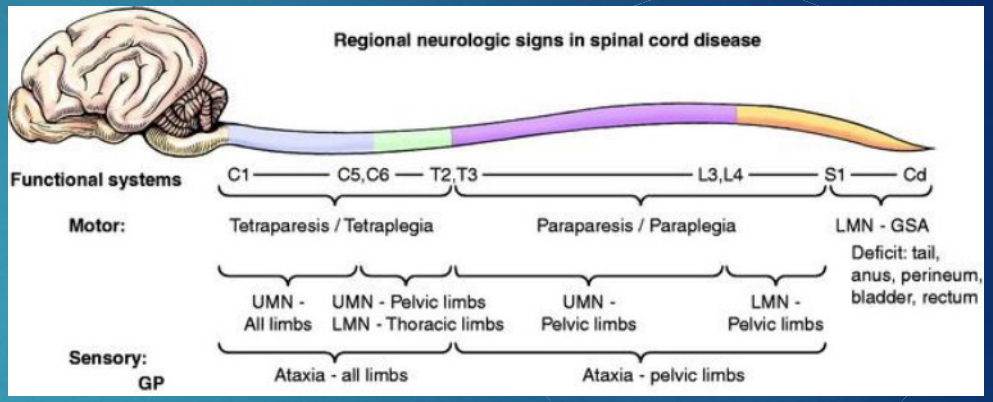
Spinal cord





The proprioceptive deficits with the spinal reflexes will help us localizing what part of the spinal cord is affected

Spinal cord

- Propioception is a RESPONSE so needs BRAIN
- Reflexes are LOCAL so need PLEXUS

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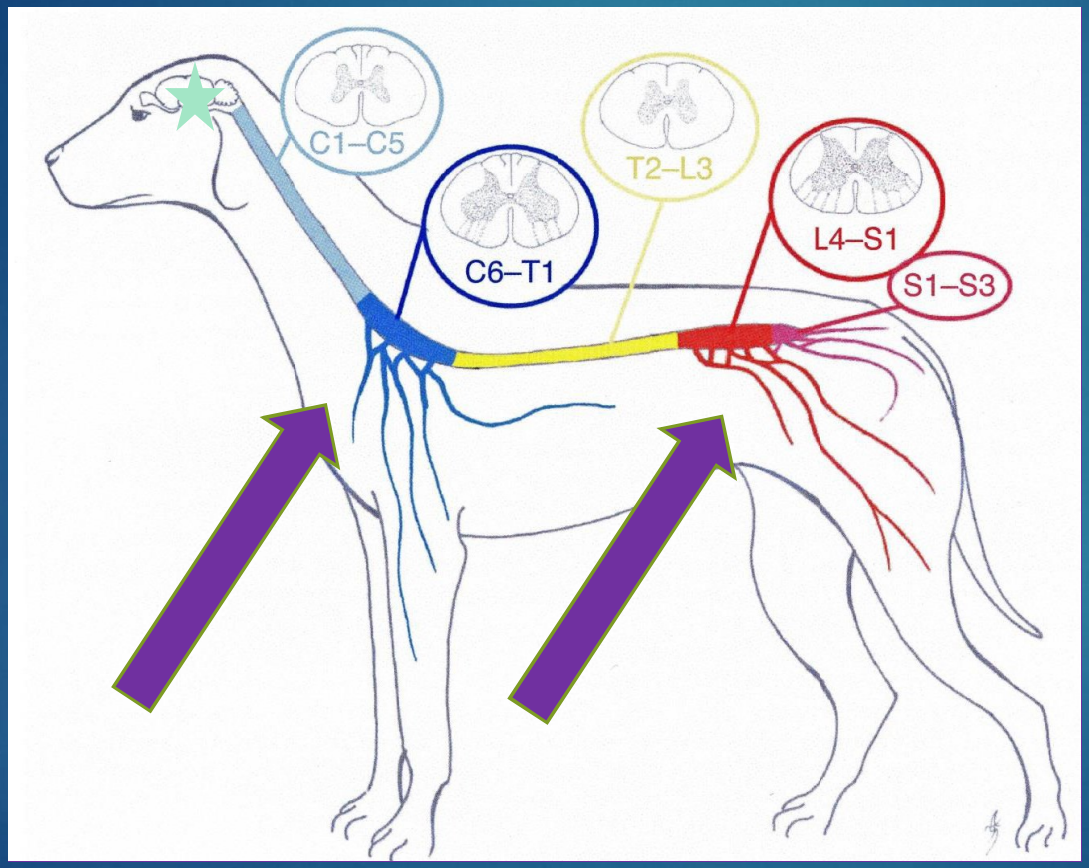
Spinal cord



PROPIOCEPTION needs the BRAIN

REFLEXES need the PLEXUS

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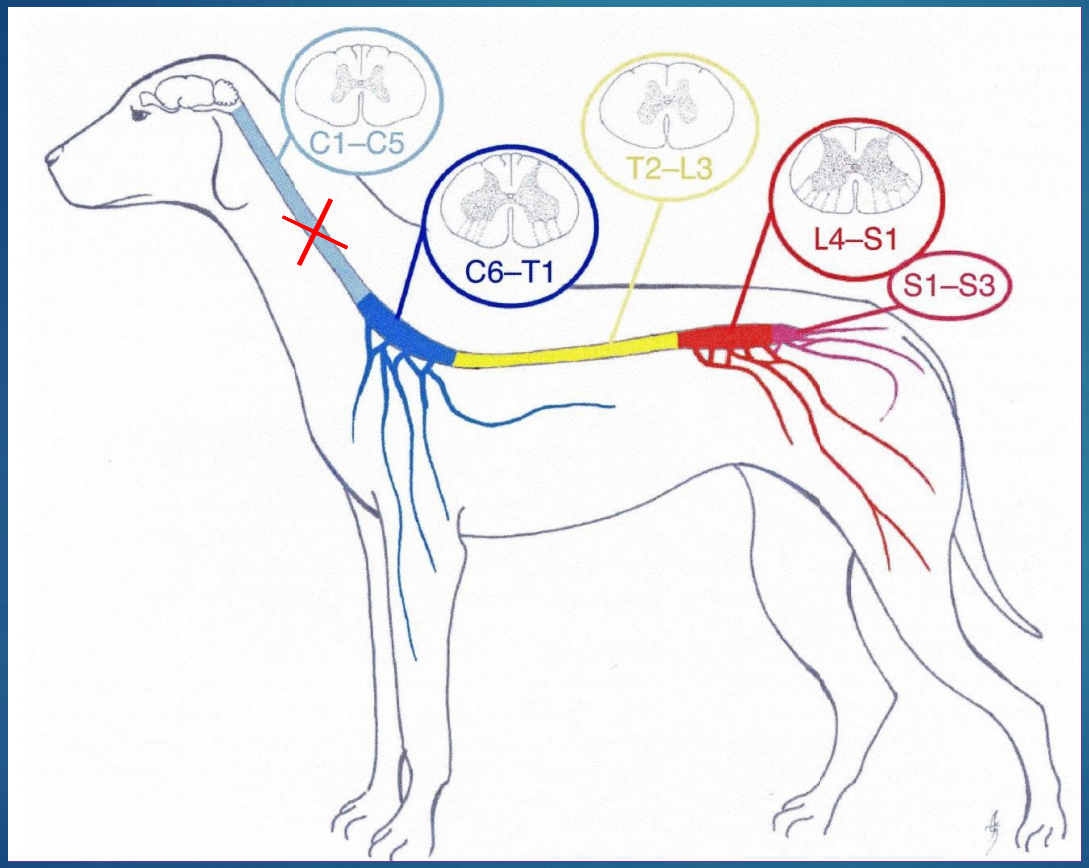
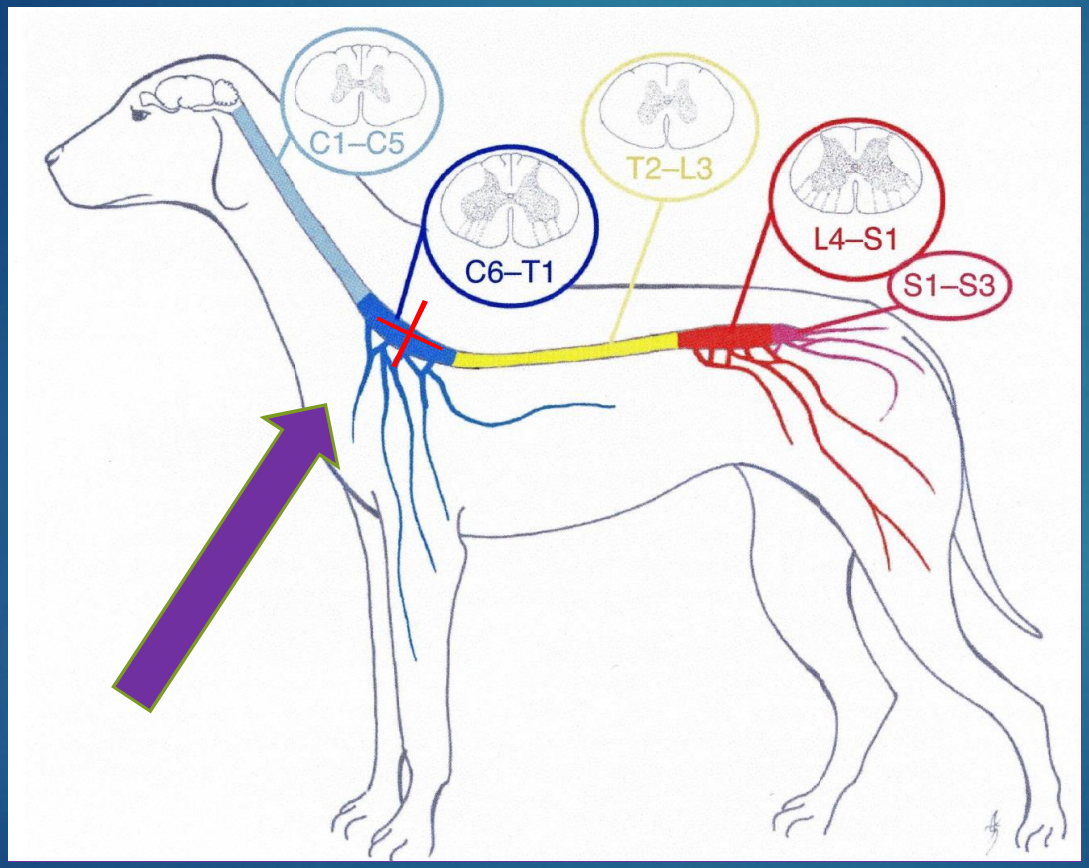
Spinal cord



Propioception abnormal 4 limbs

Reflexes NORMAL (or hyper) 4 LIMBS

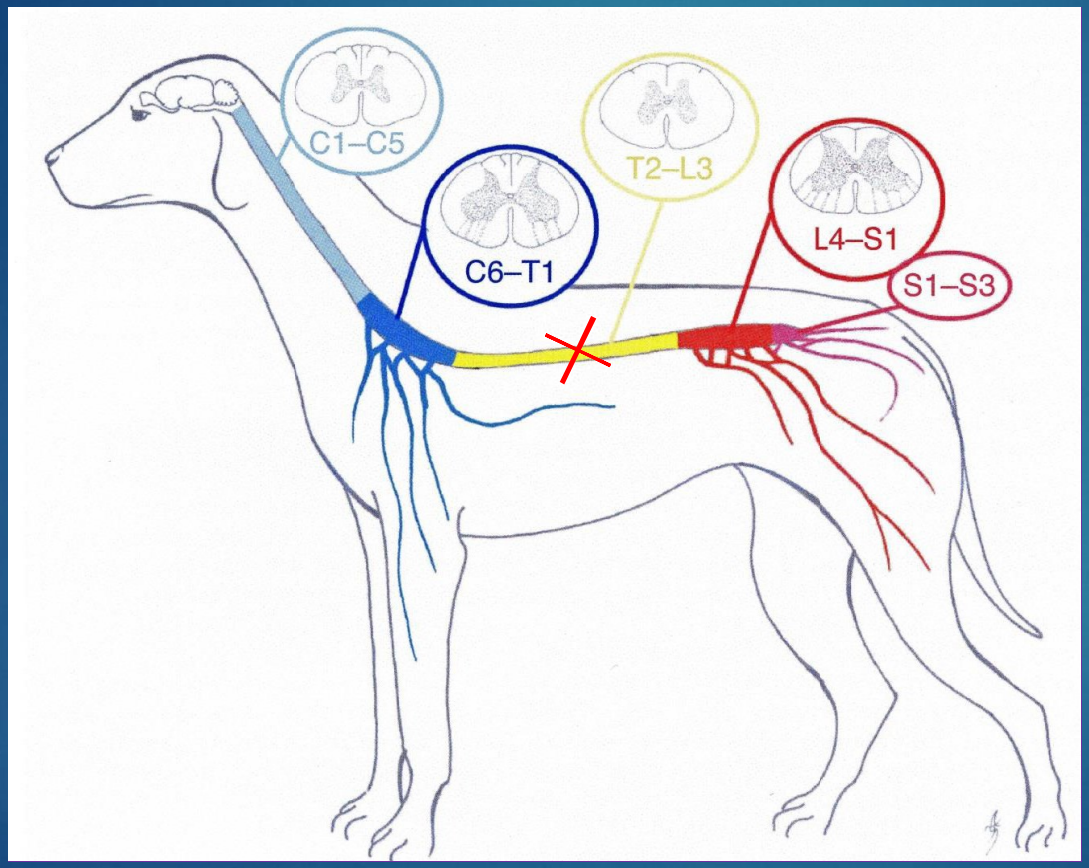
Spinal cord



Propioception abnormal 4 limbs

Reflexes decreased FRONT L
Normal (or hyper)HL

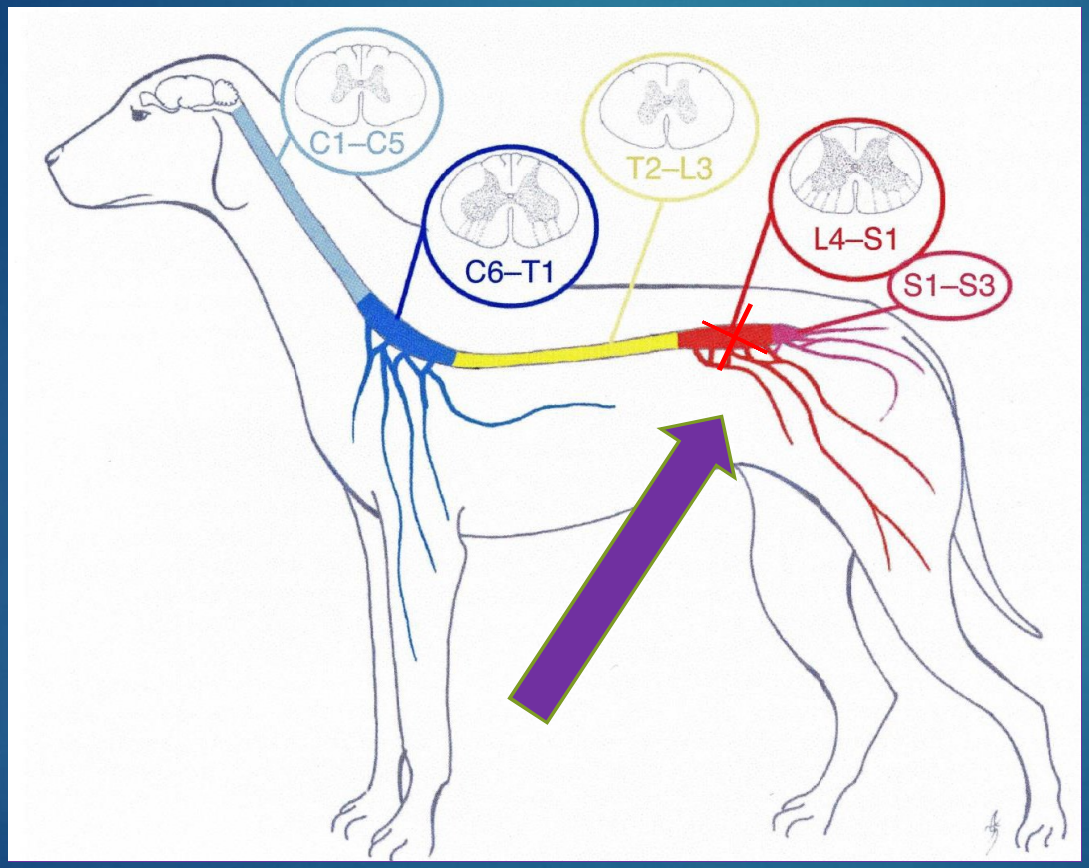
Spinal cord



Propioception
Normal front limbs
Abnormal HL

Reflexes Normal (or hyper)
4 LIMBS

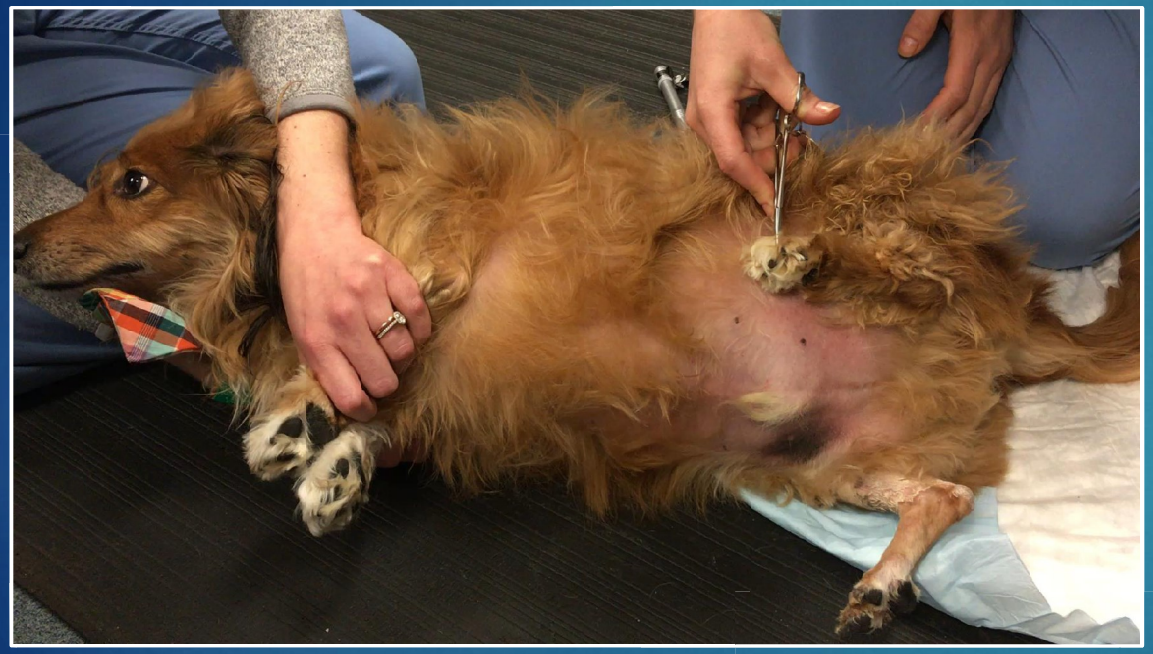
Spinal cord



Propioception
Normal front limbs
Abnormal HL

Reflexes
Normal (or hyper)front limbs
Decreased HL

What is the most common mistake



Wrong localization

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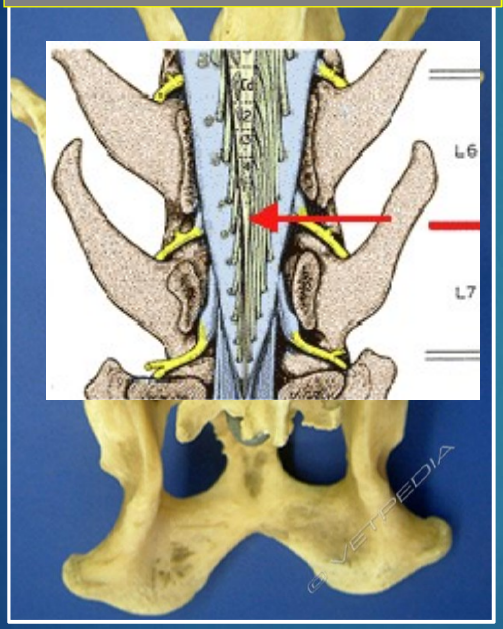
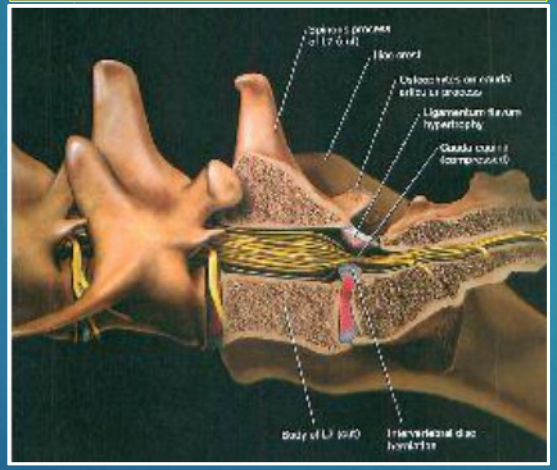
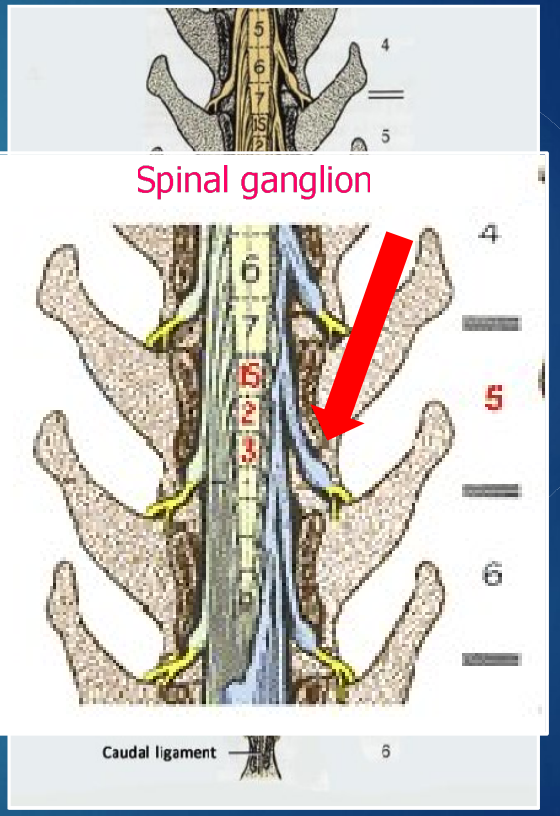
Anatomy

7 lumbar vertebras



Sacrum: 3 fused vertebraes (spinal process) and no intervertebral disc space



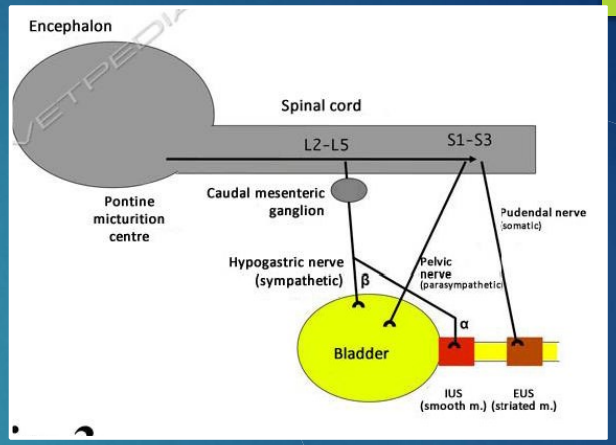


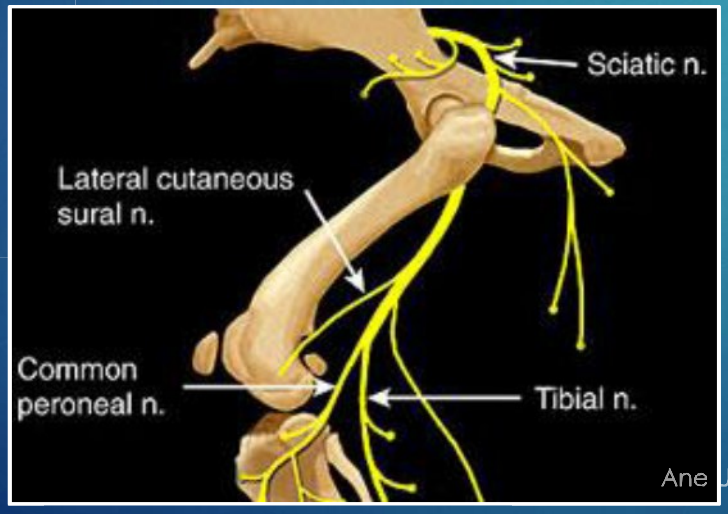
Biomechanics

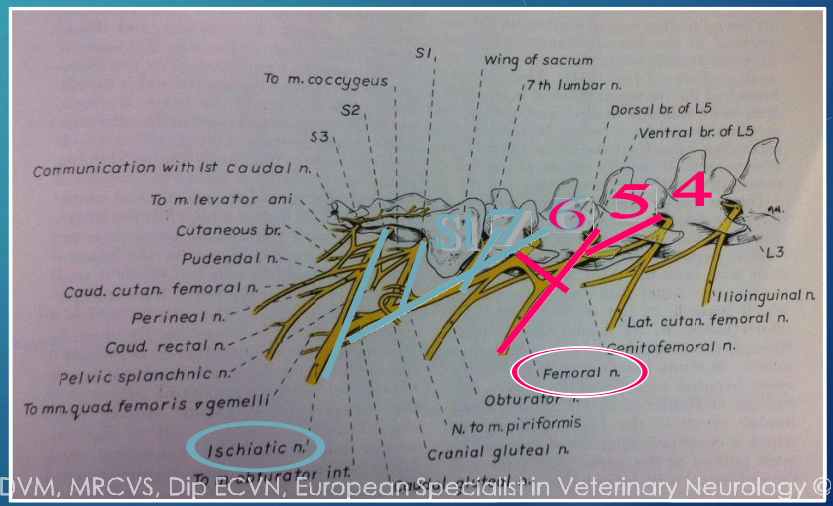
- Normal intervertebral disc between L7-S1
- Stiff to mobile articulation
- No contact between transverse process of L7 and sacrum or pelvis
- Transmissions of strength
- No rotation of the L7, sacrum or pelvis on sagittal or vertical axes

Physiology/Cauda equina

- The cauda equina is the group of spinal nerves and ganglions arranged around the terminal cone
- Will innervate
  - internal and external sphincter
  - perineum
  - parasympathetic innervation of the bladder







Lumbo-sacral syndrome: LS

Group of neurological signs secondary to a congenital or adquire stenosis of the Ls canal with secondary radicular compression

- Bone malformation
- Disc disease
- Discospondylitis
- Soft tissue malformation
- Tumours

LS: Physiopathology

It's a vicious circle

Instability L7-S1 *MALFORMATION*

Degeneration of the intervertebral disc-> dehydration

LS collapse with subluxation articular process L7S1

Proliferative changes, new bone formation and possibility of *DISCOSPONDYLITIS*

Canal stenosis, disc protrusion, compression of the cauda equina and radicular compression of the foramen

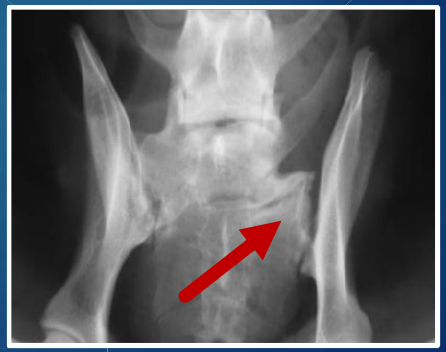
Degeneration ⟺ inflamation

Degeneration, inflamation and remodelation

- Anterograde, retrograde and transneuronal degeneration of the Ls segment --> can be irreversible
- Blood vessels trapped and changes seen in hypoxia
- The remodelation produces more compression→ inflammation→ PAIN
- Neuritis of the cauda equina could be a hidden pathology on dogs with clinical sings but not obvious sings of compression→ dynamic disease

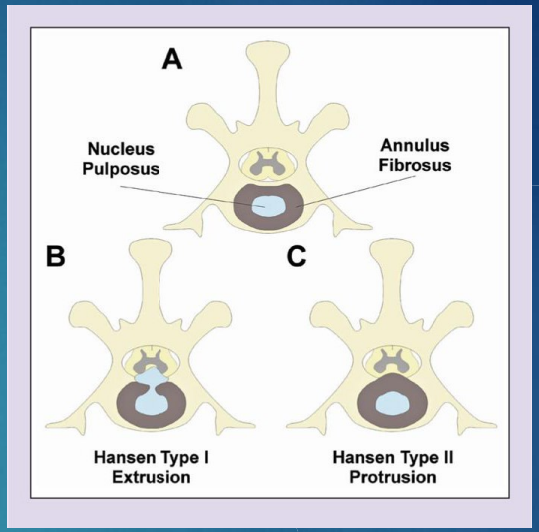
LS malformation

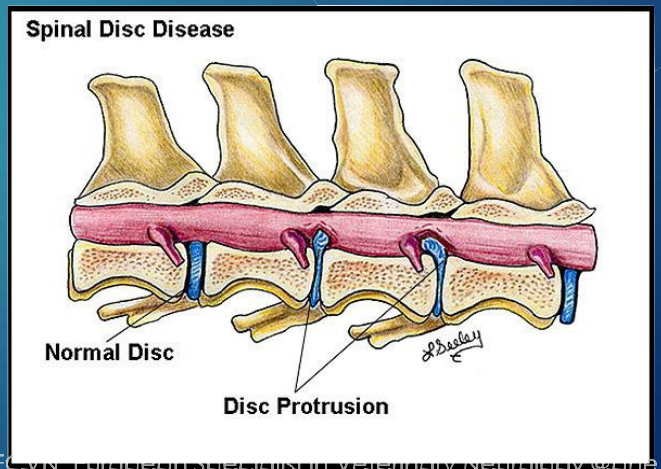
- 3.5% of 4000 dogs investigated for hip dysplasia
  1. lumbar
  2. intermediated
  3. Sacral
- Sacro-iliac junction→ pelvic rotation



Disc protrusion

- Hansen type I or chondroid degeneration
- Hansen II o fibroid degeneration:
  - Normal degeneration of the IV with age
  - Degeneration can be related to instability or mechanical factors
  - Compressive chronic spinal cord injury: Wallerian degeneration and gliosis





Discospondylitis

Hematogenous infectious of 1 or multiple intervertebral discs from

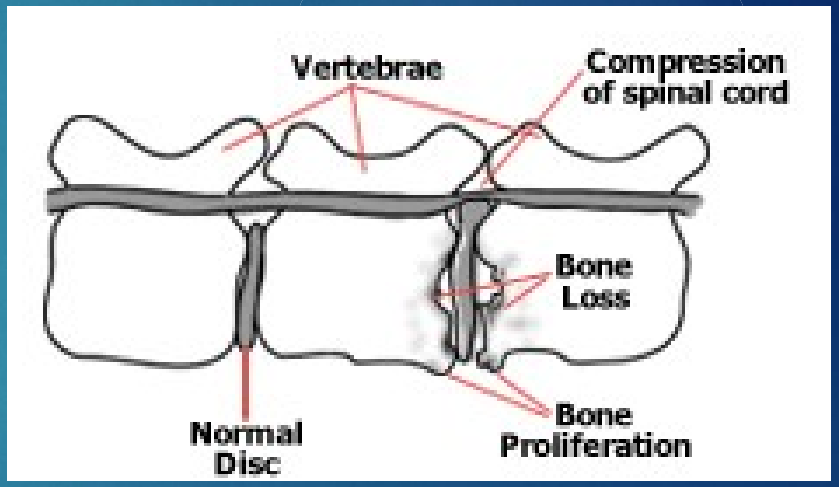
- ✓ Endocarditis
- ✓ Urinary infection/prostatitis
- ✓ Respiratory infection
- ✓ Subcutaneous abcess, oral or bone infection

Bacterial:

E. coli, *Staphylococcus aureus*, *S. intermediu*, *Pseudomonas aeruginosa*, *Streptococcus spp* Bordetella bronchispetica, Brucella canis,

Mycotic

Aspergillus terreus, Scedosporium apiospermum, Paecilomyces varioti



Soft tissue malformations

- Dermoid sinus

- Myelodisplasia

- Sacro caudal dysgenesia
- Spina bífida +/- meningocele
- Tethered cord syndrome

Physiopathology LS syndrome

- Anatomy:
  - The vertebral and spinal segments are not the same
  - Common bone malformations
- Biomechanics: LS hinge
- Pathology

  Degenerative stenosis

  +/- malformation->instability->degeneration->inflammation >compression>inflammation->degeneration->compression..

Recognizing the LS dog

Recognize the patient

- Book versus reality
- Evaluation of the gait
- Clinical presentation
  - Epidemiology
  - Behaviour/movement
  - Neurology examination
- CLINICAL CASES

LS syndrome

What the books say

What do you see

How the owners see the dog

How does he sees himself

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The neurological examination of a spine disorder

- Normal behavior and sensorium
- Difficulties walking
  - Ataxia versus paresis
  - Weight bearing lameness (exception is ONLY nerve root signature)
- Difficulties jumping

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Evaluation of Gait

Assessment coordination

- Ataxia: Uncoordinated gait
  - General propioceptive

Assessment strength to walk

- Paresis: Loss of ability to support weight (LMN) or inability to generate gait (UMN)
  - Tetraparesis/plegia
  - Paraparesis/plegia
  - Monoparesis/plegia
  - Hemiparesis/plegia

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  - Cerebellar

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Recognize the patient

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Epidemiology

- Medium to large dog
- 6-7 years-->as early as 17 months
- Male/female 5:1 a 1.3:1
- German Shepherd…Labrador

Degenerative myelopathy?

PAIN

Asymmetric

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Book: clinical description

- Weakness of the HL and tail
- Reduced reflexes and flaccid tail
- Amyotrophy
- CPD
- Dilated anus
- Reduced bulbocavernosus reflex
- Reduced sensation perineum, HL and tail
- Urine and faecal incontinence
- Root signature

Real life clinical description

Confusing

Non Specific!

Incidental Ls changes

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LS: Clinical presentation

- Less active, shorter walks, chronic progression
- No jumping: avoiding the car and the stairs
- Difficult to lay down (it's painful)
- Intermittent weight bearing lameness on the hind limbs

LS: Neurological examination

- Amyotrophy of semitendinoso/semimembranoso
- Generally No proprioceptive deficits
- Uncommon to see reduced sciatic or anal tone
- Reduced patellar reflex→ more related to age!
- PAIN on sciatic palpation

Sciatic nerve palpation

Ortho versus neuro

- Ortho signs:
  - OA better at the end of the day
  - Difficult to get up
  - No CPD
  - No weight bearing lameness
  - No ataxia
- Neuro signs:
  - Worst at end of the day
  - Difficult to lie down
  - Abnormal neuro exam
  - Weight bearing lameness/dragging
  - Ataxia/paresis

Kinematic differences between clinically normal dogs but with X-ray changes

Ortho or Neuro?

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Ortho or Neuro?

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CLINICAL CASES

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Beagle 9 years old

- Presentation: acute painful
- Progression: deterioration
- Response to medication: responding to NSAIDs

- Description: non weight bearing lameness and loss of balance

7 months old

- Presentation: Almost since adoption
- Progression: Chronic deteriorating
- Response to medication: Responding to NSAIDs

- Description: severe stiffness without ataxia

Rescued cat after car accident

- Presentation: Acute after surgery, painful
- Progression: Chronic, intermittent
- Response to medication: Not responding to NSAIDs

- Description: severe weakness/collapse

13 years old cat

- Presentation: Insidious, unable to jump
- Progression: Chronic, deteriorating
- Response to medication: Not responding to gabapentin

- Description: HL paraparesis

Organization

- Refresh of spinal localization
- Understand the biomechanics
- Physiopathology
- Evaluation of the gait
- Recognizing the LS dog
- CLINICAL CASES

- Diagnostic tools
- Medical treatment
- Surgical treatment

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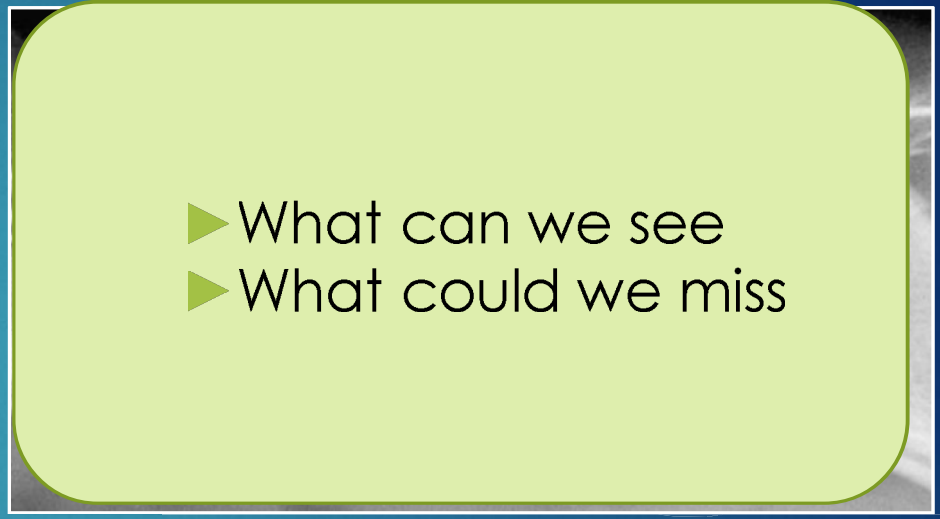
LS: Diagnosis

- Imaging:
  - X-rays
  - Computed tomography
  - Magnetic resonance imaging
- Electro diagnosis



- What can we see
- What could we miss

No myelography

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LS: X-rays

What can we see?

- LS step
- Telescoping
- Spondylosis with reduced foramen and canal
- Vacuum phenomenon
- Vertebral malformations
- Discospondylitis (it bad enough)

Bone lesions are common in healthy old dogs

- CANT'T SEE THE DISC
- Can't asses soft tissue->cauda equina or nerve root?
- Can miss early discospondylitis

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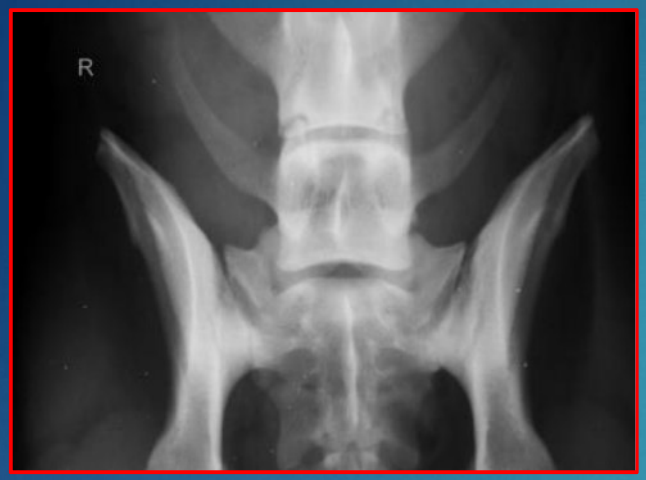
Bone malformation: transitional vertebra



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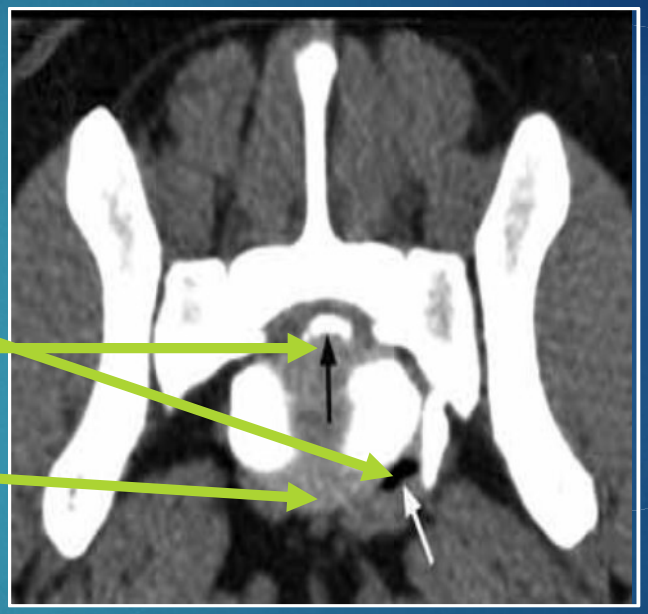
Computed tomography

What can we see?

- Discospondylitis
- Vacuum phenomenum
- Calcified disc
- Spondylosis



What can we miss?

- Can't asses soft tissue->real compression of the cauda equina or nerve root?

→ dorsal laminectomy or foraminotomy

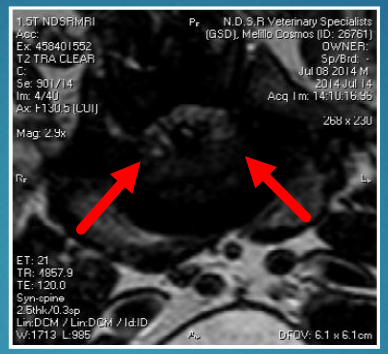
LS: MRI exam

- Soft tissue study (iliopsoas)
- Dorsal, transverse and sagittal plane
- Early diagnosis of discospondylitis
- Sciatic root
- Can differentiate between
  - foraminal stenosis or dorsal compression
- CAN SEE THE DISC

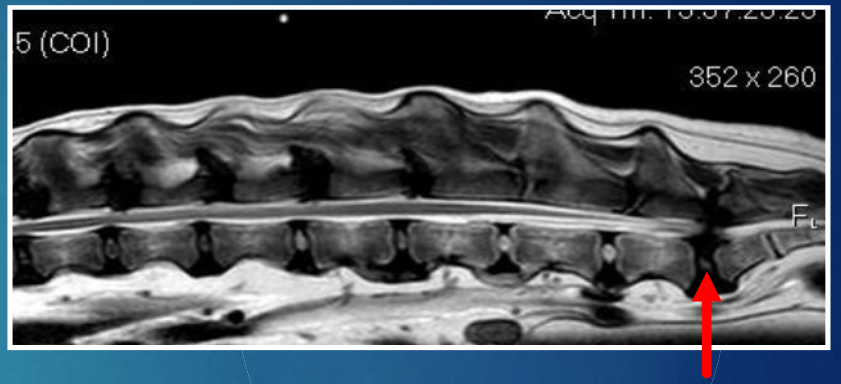
What can we miss?

- Early nerve root/meningeal Inflammation
- Overdiagnosis?

Transverse T2WI



Sagittal T2WI



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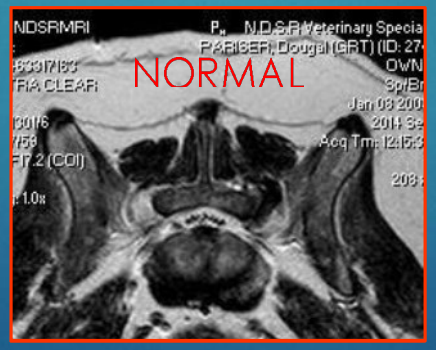

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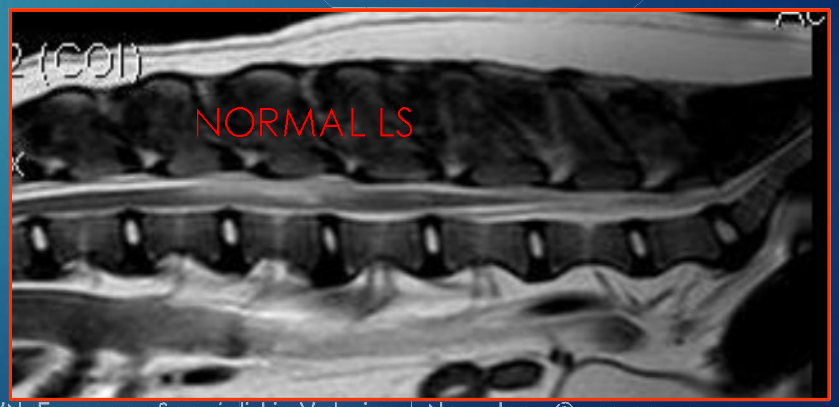
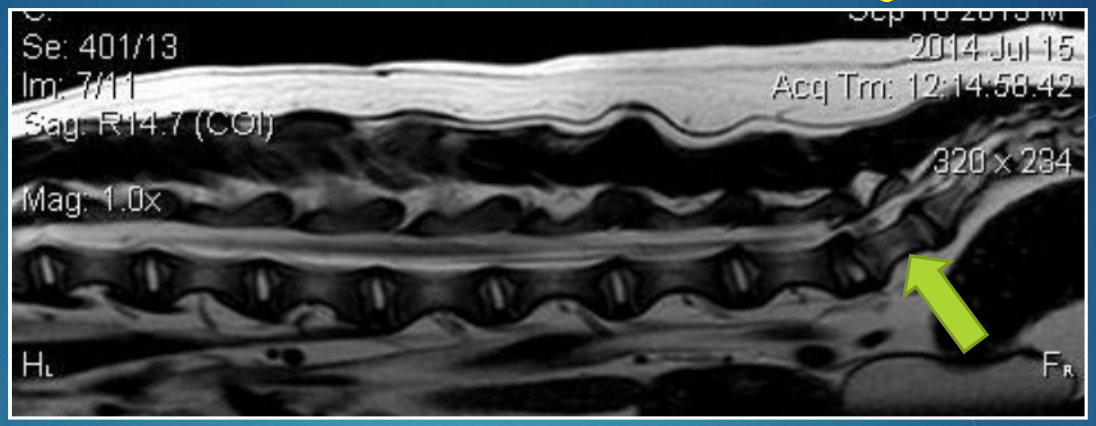


LS: MRI and malformation

Sagittal T2WI



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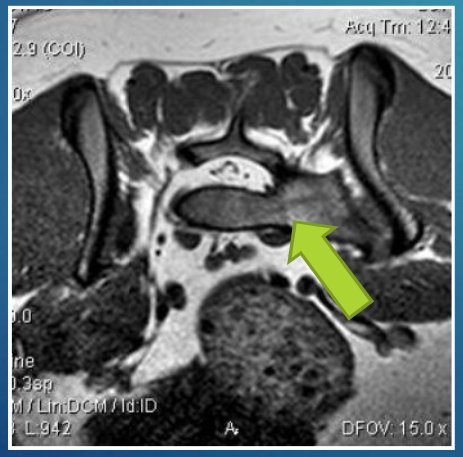
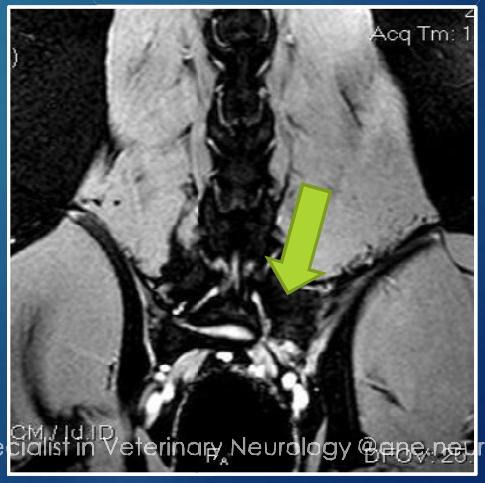


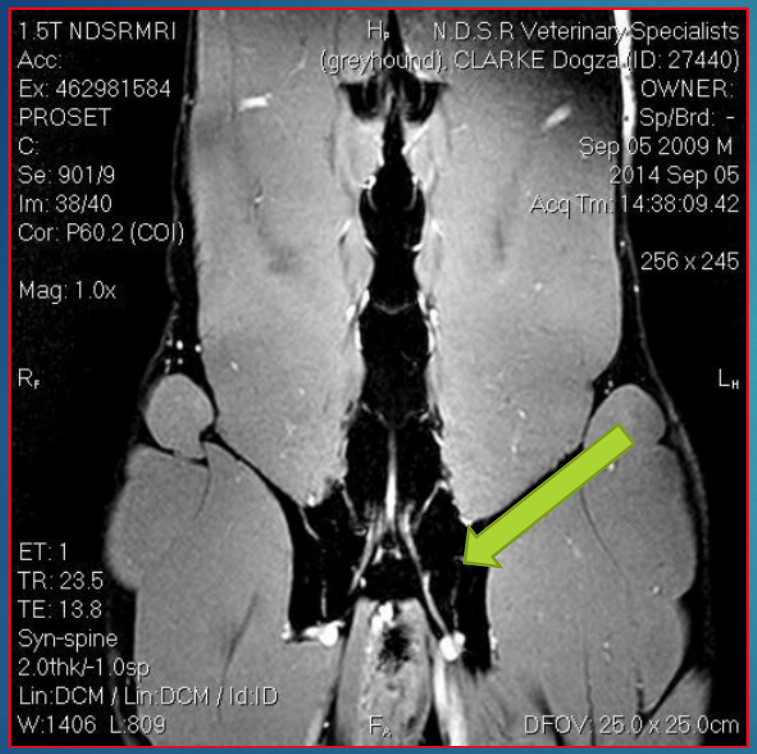
Lumbarization of the sacrum

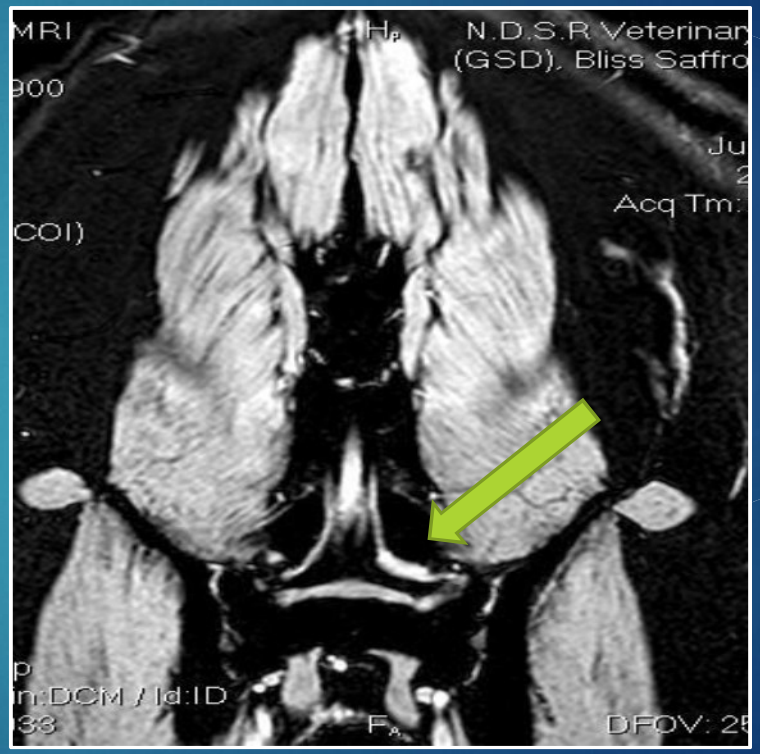
Dorsal PROSET



MRI: PROSET

Principle Of Selective Excitation Technique





How to chose a treatment

- A diagnosis:
  - Clinical presentation
  - Diagnostic test
- A good candidate
  - Medical
  - Surgical
- Expectations
- The money honey

The right candidate
medical versus surgical

- Choosing the patient
- Limitations
- Prognosis

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Medical treatment :When?

- Breed: Giant and overweight
- Age>10 years
- Clinical history: Acute, recent, mild, no previous tt
- Progression: Intermittent
- Diagnosis:
  - Dyscospondylitis
  - Multiple disc disease
  - Underlying disease
- Money: No money honey!

Expectations/limitations

- Complete resolution of the pain without drugs and normal physical activity
  - 1-2 relapses a year acceptable?
  - Active/young dog versus older dog
- Improvement of the weakness and resolution of the pain with long term drugs
  - Continuous physical therapy
  - Drug side effects

How: Drugs, rest and rock&roll!

CHANGE ONE THING AT THE TIME

- Pain relief
  - Gabapentina: 10mg/kg TID 3 weeks
  - NSAIDs: 10 days
  - Amantidine 4mg/kg SID long term
  - Tramadol: 2mg/kg BID short term
  - Codeine: 1-2 mg/kg TID short term
- Cage rest for 2 weeks
- Physiotherapy hydrotherapy after 3 weeks
- Discospondylitis
  - Antibiotics mínimum 8 weeks, can go upt to 8 months

Medical treatment prognosis

There is no specific studies with reliable results with medical treatment

- Compression/inflamation
  - 99% improvement without steroids
  - 50% of dogs can avoid surgery
  - Relapse possible
- Intradiscal treatment:
  - 53% without symptoms after treatment
  - The trial of epidural steroid in dogs (Janssens et al., 2009) specifically excluded cases with severe clinical signs

Surgical treatment :When?

- Breed: mid size/fit
- Age: < 12
- Clinical history
  - > 1 month
  - Motor weakness
  - Progression
  - No response to medical treatment
- Diagnosis:
  - Disc protrusion/extrusion
  - Foraminal stenosis
  - Malformation

No underlying disease

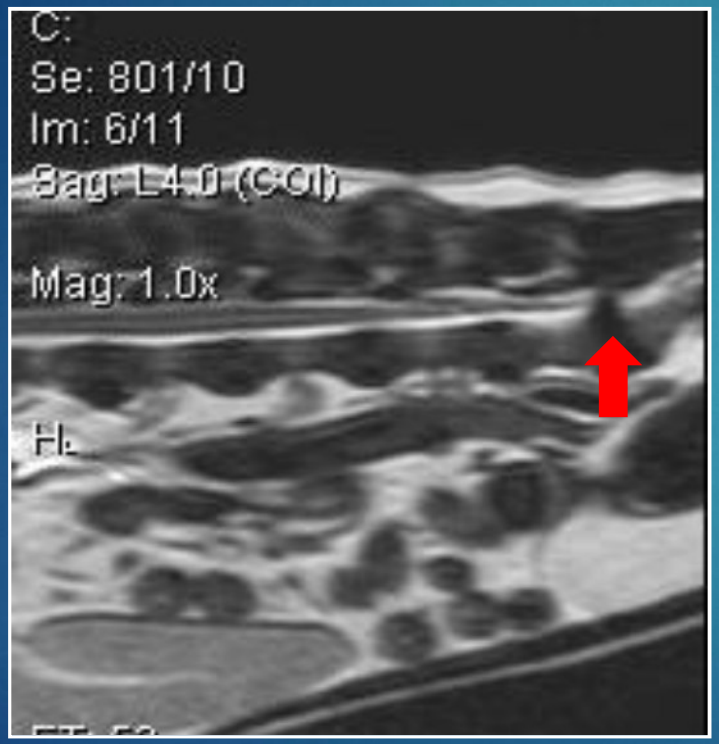
Expectations/limitations

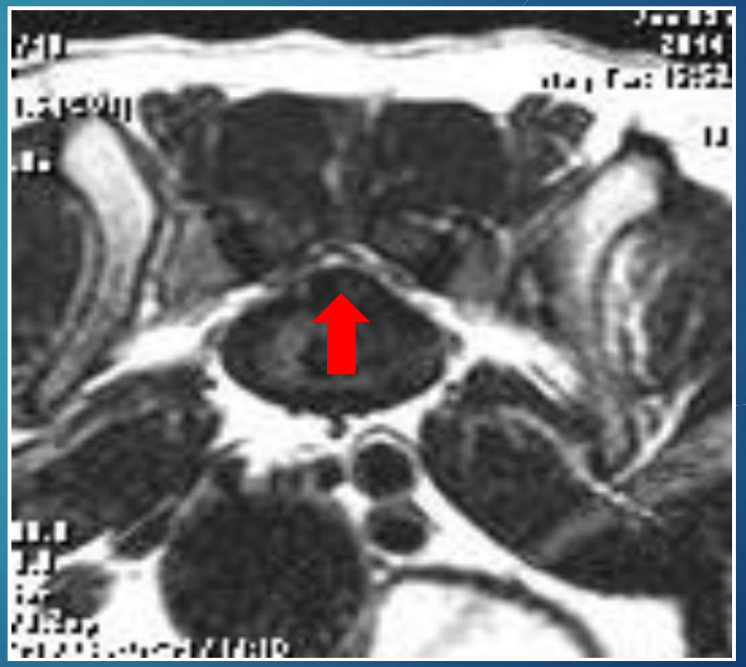
- Owners committed to the cost and post-op care
- Complete resolution of the pain without medical treatment and normal physical activity
  - Might not be able to be a working dog again
  - Might be the last resort if discospondylitis
- Might only stop progression if it's a chronic disease
- Urinary incontinence might not resolve

Surgical treatment: How?

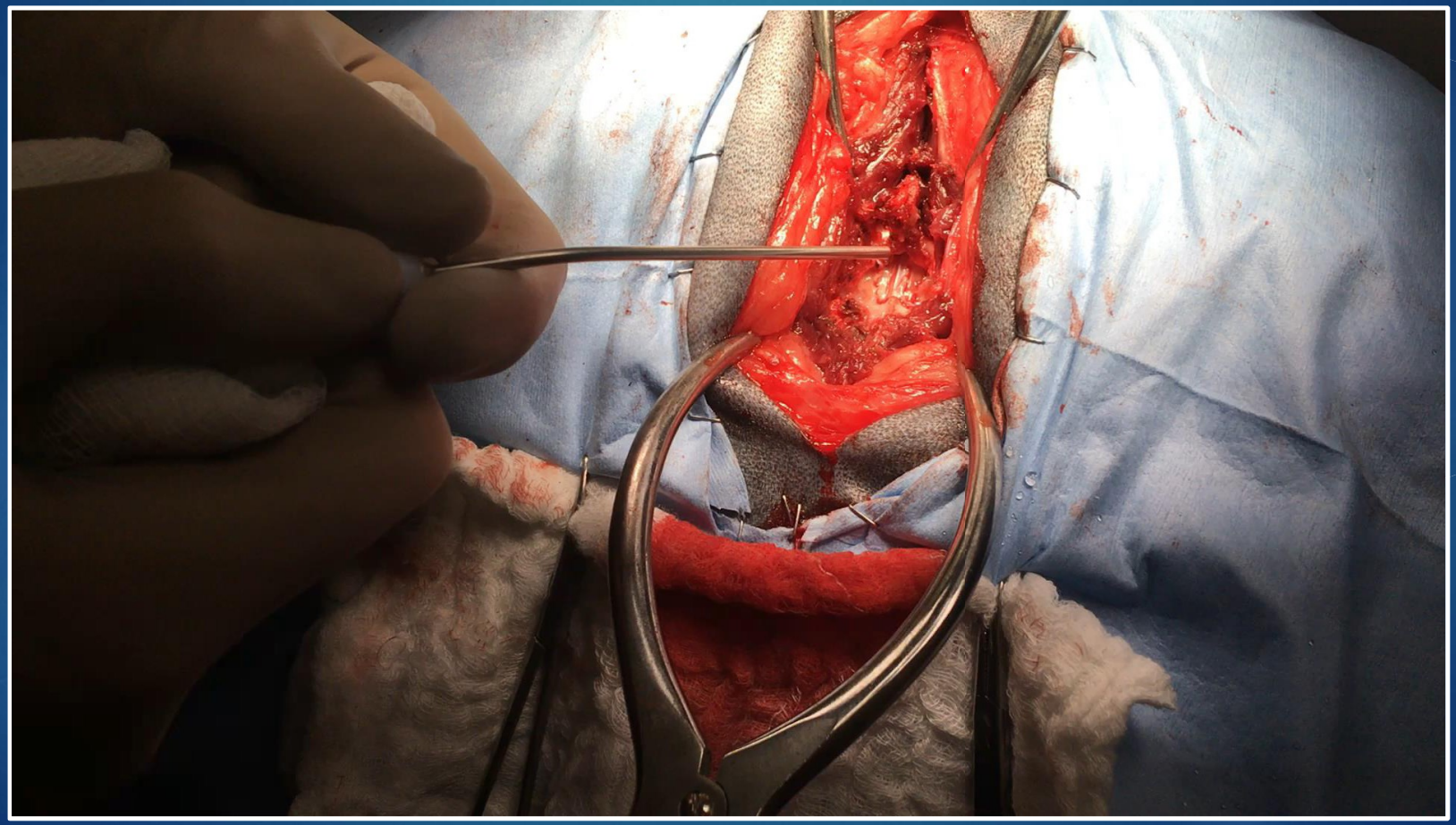
- Bone malformation/Foraminal stenosis
- Disc disease
- Instability
- Discospondylitis

Dorsal laminectoy: when?





Dorsal laminectomy



Dorsal laminectomy: Results

- From a retrospective study with 115 dogs CT and 34 MRI
  - -Dorsal laminectomy in156
  - -Discectomy in 50% facectomy in 6.4% y foraminotomy in 5.1%
- -79% with urinary incontinence had worst results
- -Worse prognosis if extended the dorsal laminectomy and discetomy
- -54.5% didn't go back to normal activity

- Recent study
- -41% complete recovery, 38%improve, 20% not active live back
- -Relapse in16.7% from the complete recovery and 54.4% from the improved

- The propulsive force was reinstored 6 months after surgery

Dorsal laminectomy: Limitations

- If we access the foramen from the dorsal laminectomy
    - Limited access to the foramen
    - Instability if destroying the articular process
    - Fracture of the contralateral articular process

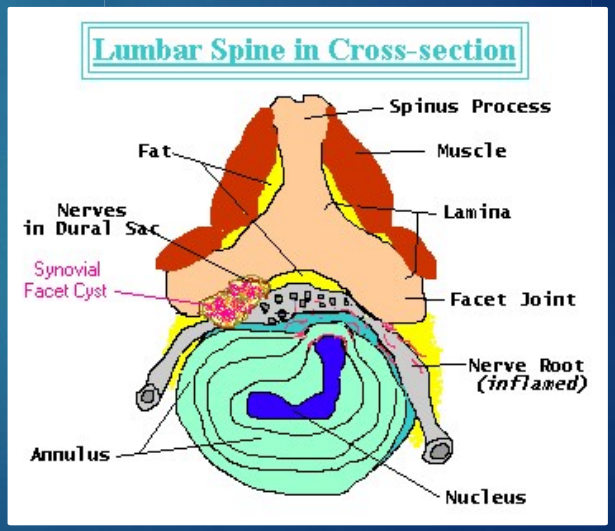
- Dorsal laminectomy alone no changes on the LS dorsiflexion or ventroflexion
- If combined with facectomy and discectomy reduced 47.9% on dorsiflexion and 56,4% on ventroflexion (cadavers)
- On a recent cadaver study dorsal laminectomy and discectomy relevant Ls instability
- Decompressive dorsal laminectomy and partial discectomy can cause spinal instability and worsen foraminal stenosis

Dorsal laminectomy: Limitations

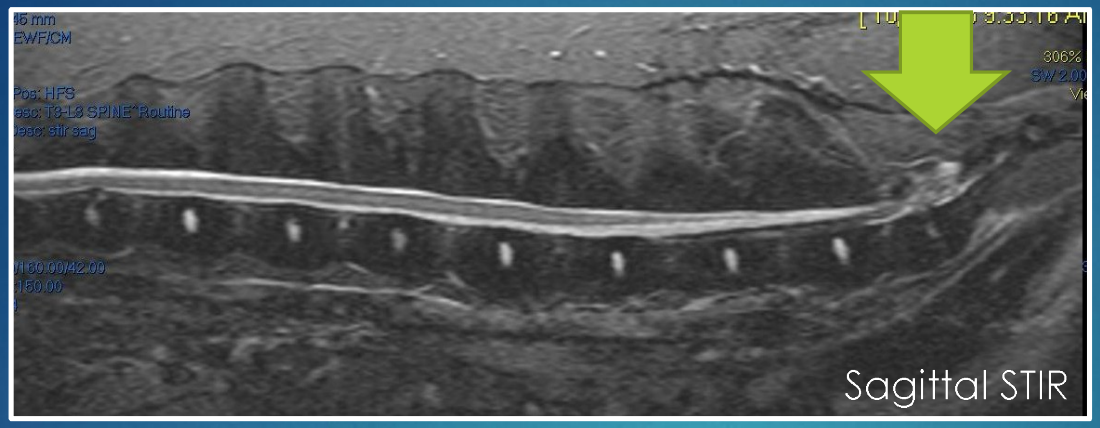
Synovial cyst

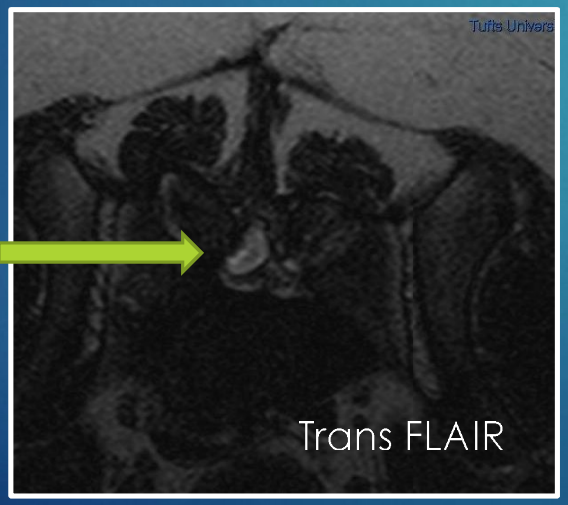
- Extradural degenerative lesion in relationship with the articular process

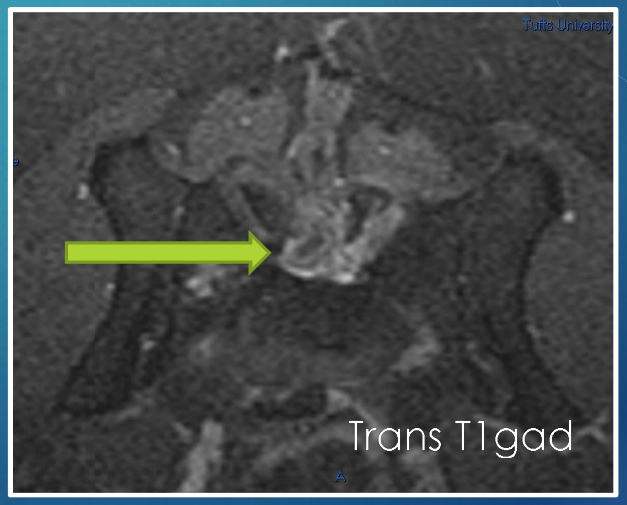
- Factors:
  - Sport and micro-trauma
  - Old trauma
  - Late complication after spinal surgery
  - Unlikely but possible relationship with OA
  - Degenerative disease of the articular process
  - Degenerative stenosis
  - Without a reason



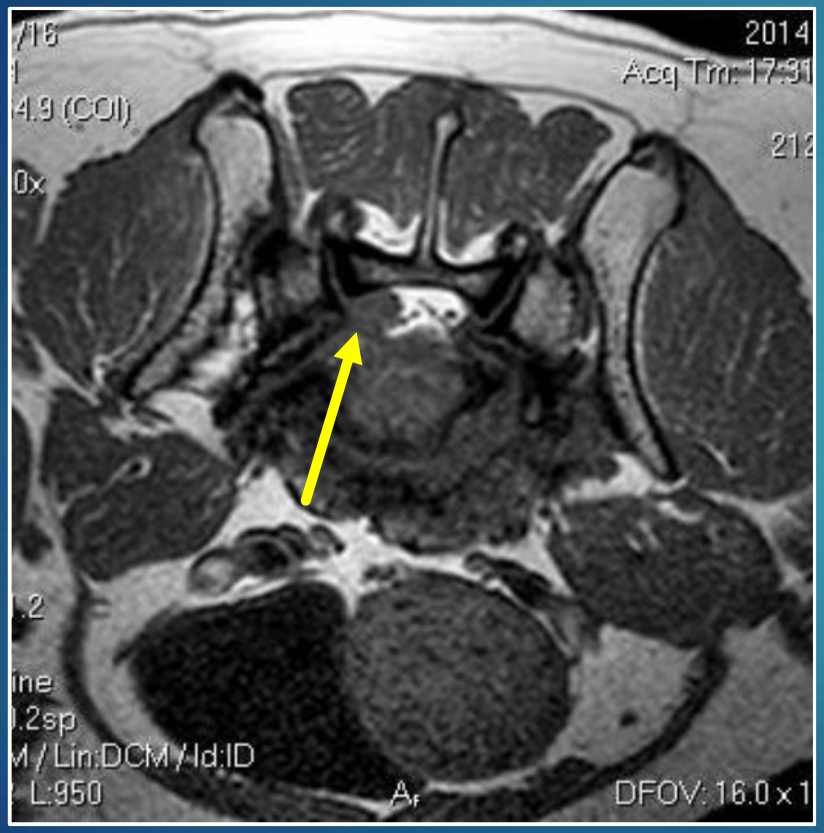
Dorsal laminectomy: Limitations







Foraminotomy: when?



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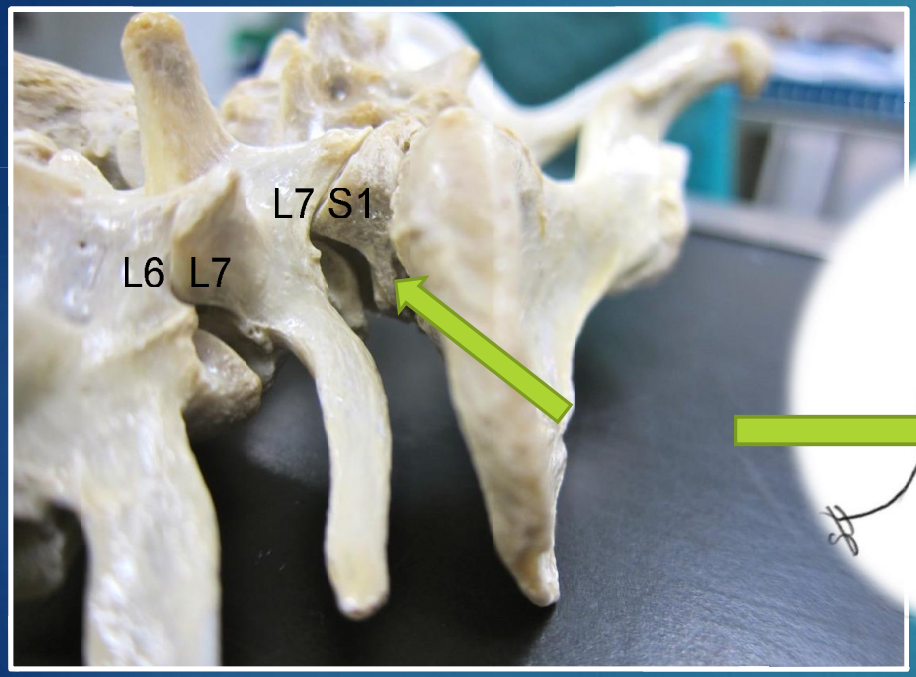
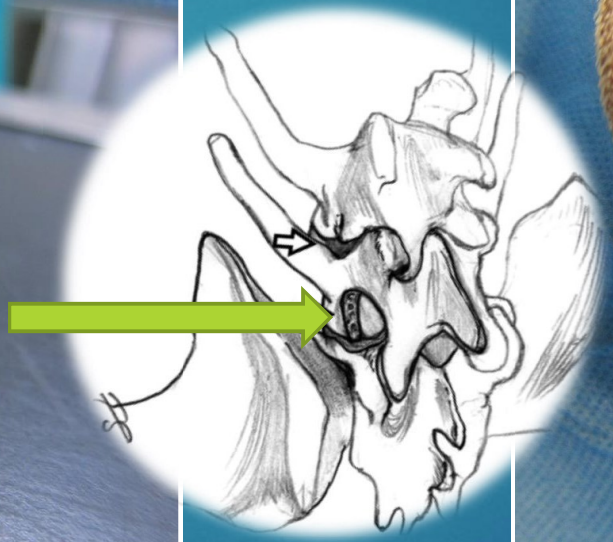
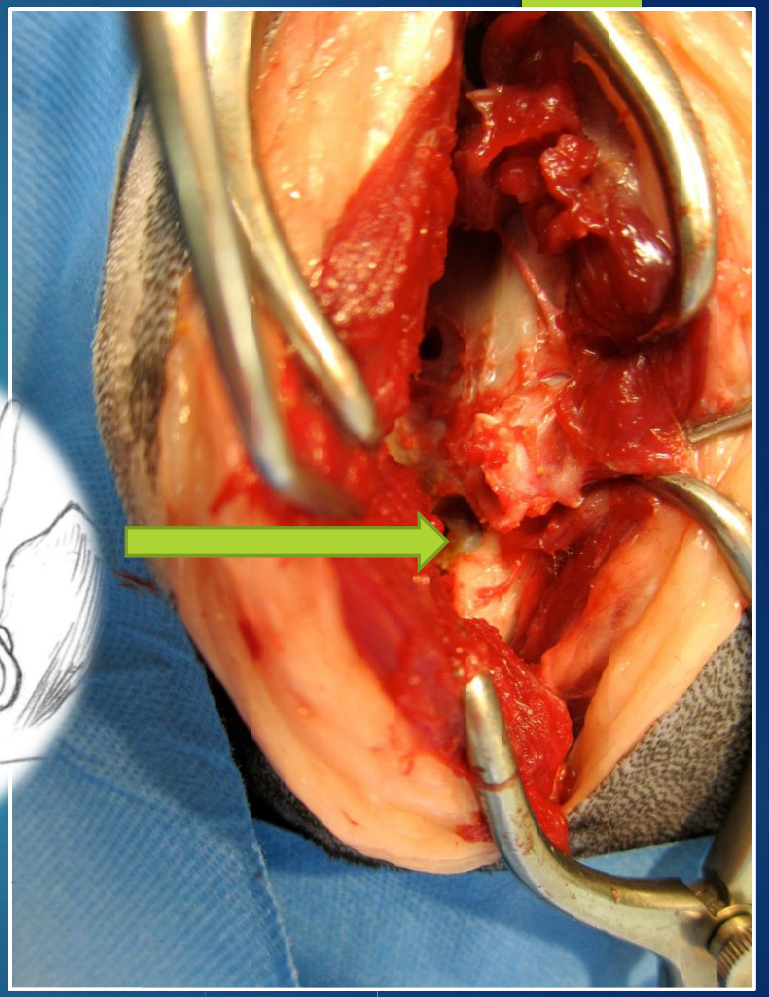
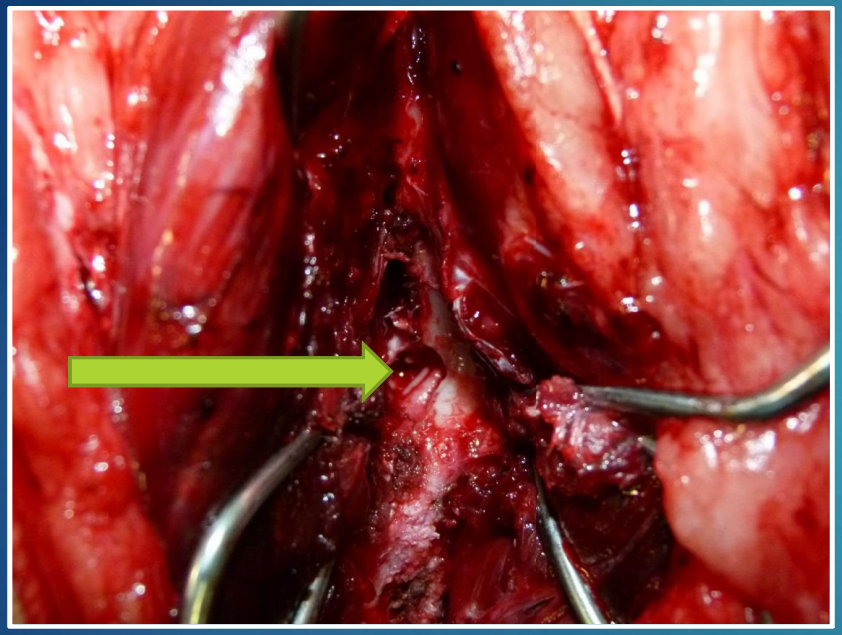
Foraminotomy







Foraminotomy



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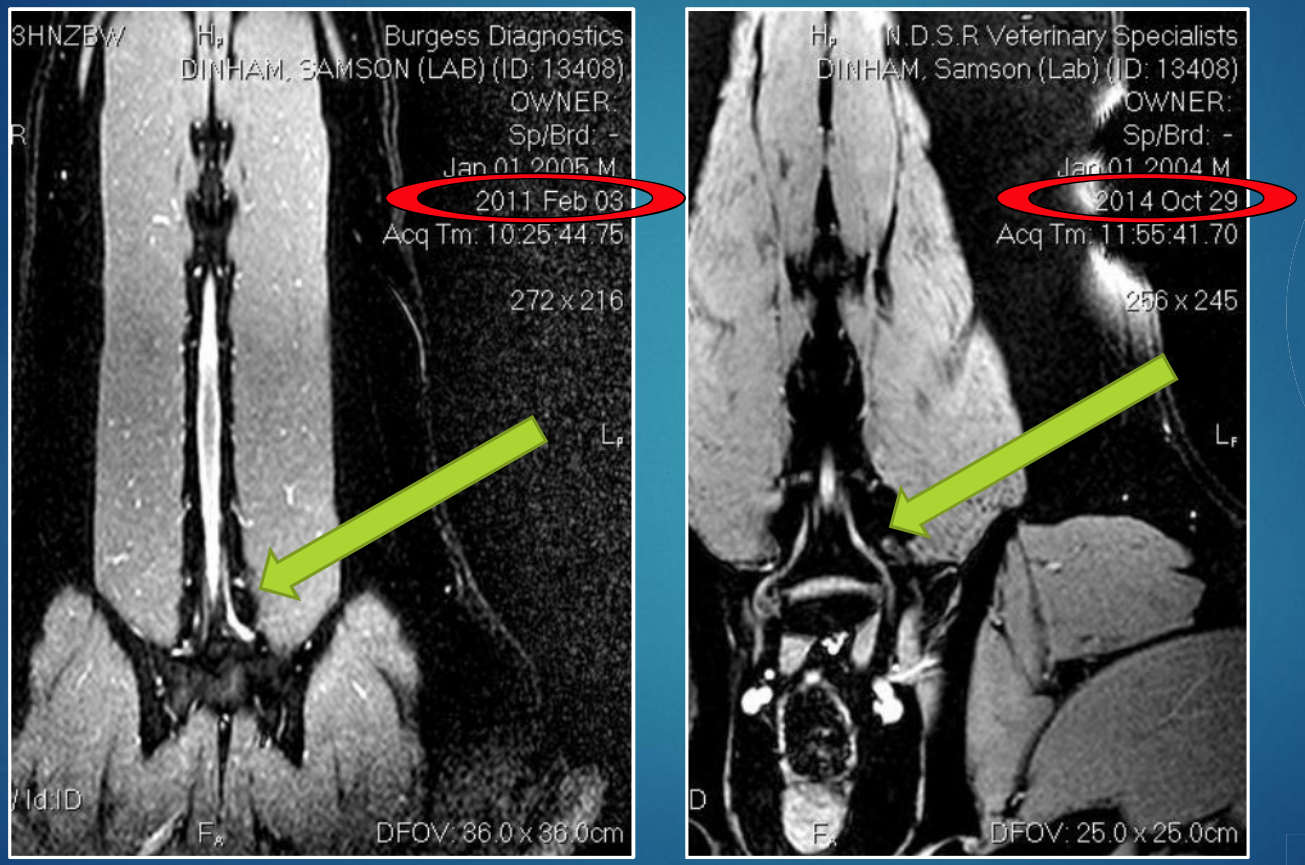
Foraminotomy: Results



Foraminotomy: Results

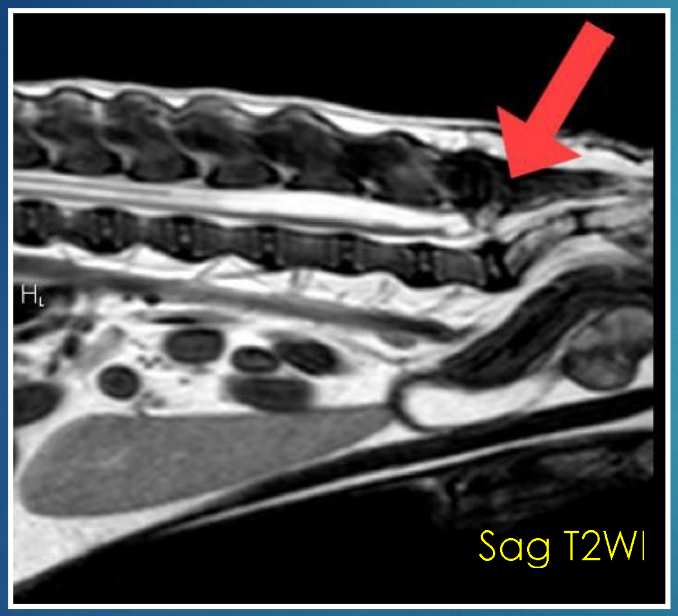
Foraminotomy: Limitations

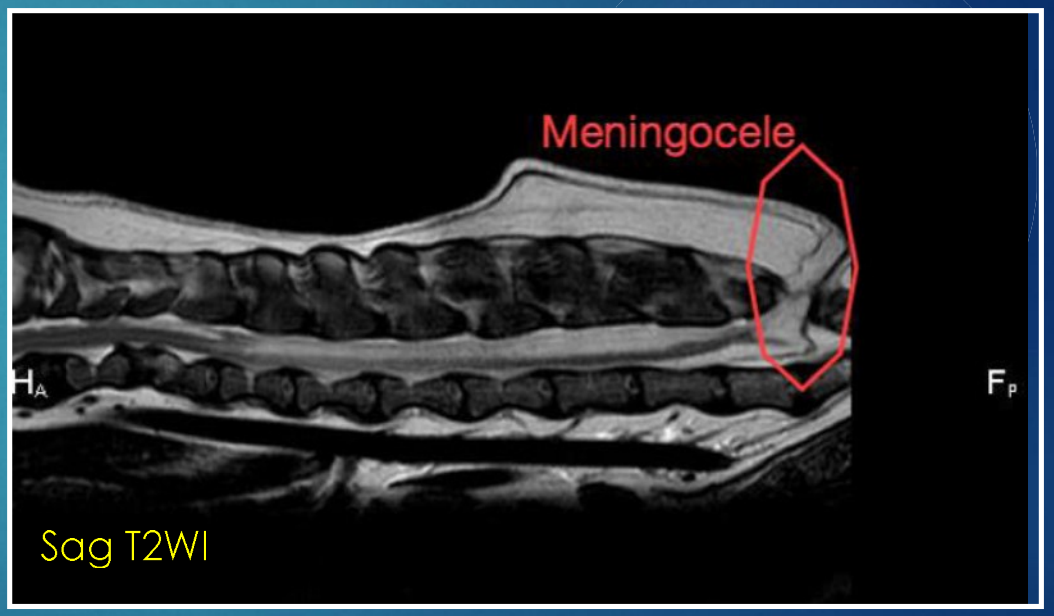
- Difficult approach and surgery due to the anatomical variations
- Sciatic damage
- Difficult approach in obese dogs
- Long surgery if combined with bilateral and or dorsal laminectomy

Spina bifida: When

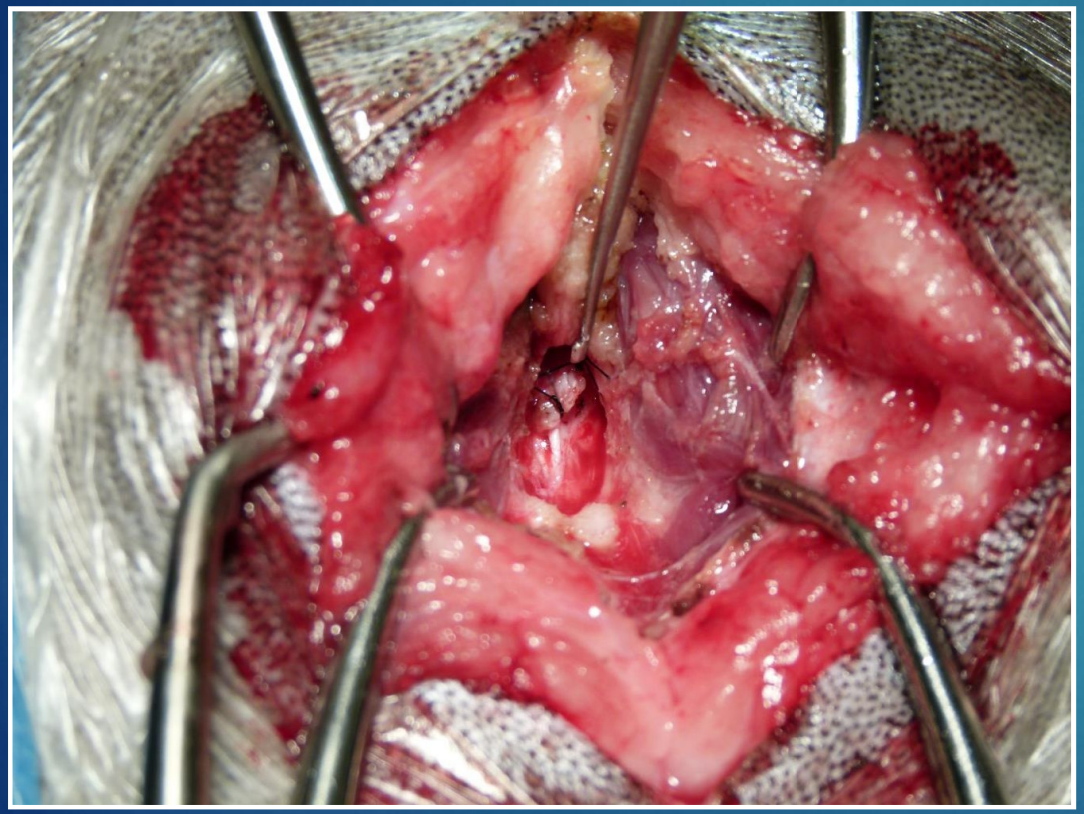
- Urinary incontinence
- Paraparesis
- Ataxia

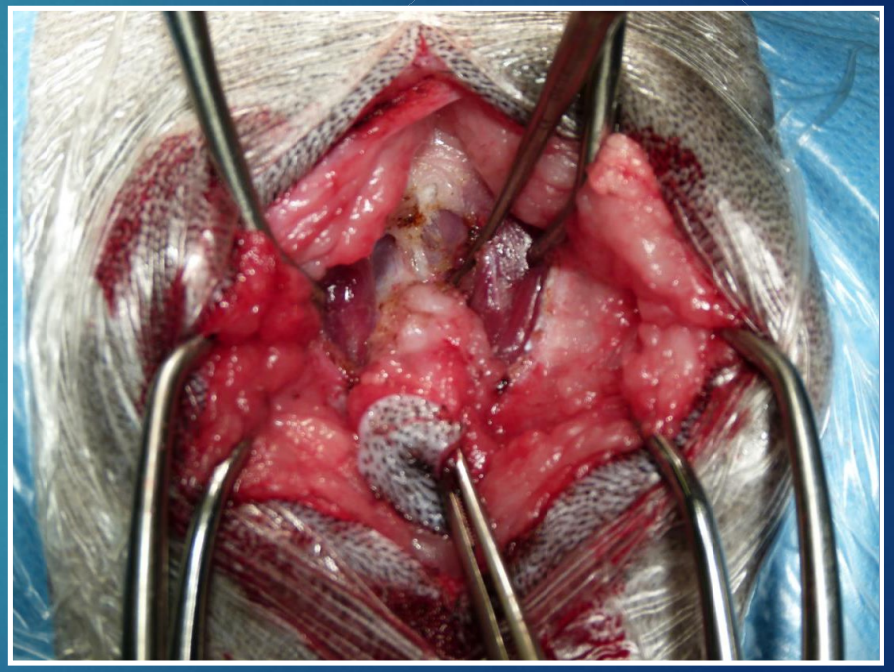
Spina bifida: When





Spina bifida: How





Spina bifida: Results/limitations

- Good results if mild neurological signs
- Urinary incontinence unlikely to resolve if chronic
- All depends on the stage of the nervous tissue→MRI

Approach to LS syndrome

Degenerative stenosis

+/- malformation->instability->degeneration->inflammation >compression>inflammation->degeneration->compression..

Book versus reality:

- Urine and faecal incontinence uncommon

Clinical presentation:

- Large dogs>6 years
- Chronic, progressive, insidious
- Painful dog, crying
- Difficult with stairs and lying down
- Sciatic pain and localised muscle lost

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Medical versus surgical

When to choose medical or surgical treatment

- Obese and old dogs
- Intermittent pain
- No previous treatment
- Discospondylitis
- Very likely to respond to medical treatment
- Very likely to relapse too
- Weight loss and hydrotherapy can help

- Young and active
- Continuous pain
- Relapse with medical tt
- Acute disc extrusion
- Very good in relieving the pain
- Very good overall success and recovery
- Can be a challenging surgery

Take home message

- LS is a clinically challenge disease:

BE WISE WITH YOUR DIAGNOSIS

- You can live without steroids

- A chance to cut it might

or might not a chance to cure

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