



NEUROLOGICAL CASES

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CASE 1: 7 YEAR OLD MN PUG

- Owners went to bed and dog was normal
- Got up ~8 hours later and dog has a head tilt, looks “drunk” at home
- Neurological exam:
 - Normal mentation, Left head tilt, Vertical nystagmus
 - Left sided hemiparesis and paw placement absent along the left side
 - Vestibulocerebellar ataxia (falling to either side, exaggerated limb movement)

LESION LOCALIZATION/ DIFFERENTIALS

- Left central vestibular disease- brainstem vs. cerebellum (due to the paw placement deficits)
- Ddx: Vascular (stroke), Inflammatory (immune- mediated vs. infectious), Neoplasia



INITIAL DIAGNOSTICS

- CBC/ Chemistry
- Consider thoracic +/- abdominal radiographs
- Blood pressure reading

INITIAL TREATMENT

- Anti-nauseant
 - Ondansetron – 0.5mg/kg IV q 8 to 12 hours; oral 0.2-1 mg/kg PO up to q 8 hours
 - Maropitant – 1 mg/kg IV q 24 hours
- Consider eye lubricant if facial nerve paresis and/ or “barrel rolling”
- Consider admit for IV fluids if not eating/ drinking vs. SQ fluids if admission not possible
- Well padded bed if recumbent; change sides q 4 to 6 hours



PUG PROGRESSION

- Next day appears improved and no longer has paw placement deficits although head tilt, improved nystagmus and ataxia still noted



CEREBROVASCULAR ACCIDENTS

- Cerebellum +/- brainstem most common location in dogs
- Ischemic > Hemorrhagic
- Per-acute onset; Possibility of quick improvement although can also take weeks to couple of months for recovery
- ~50% have an identifiable pre-disposing cause; 50% “idiopathic”

STROKE WORK UP



Hypothyroidism (T4/ fT4
+/- TSH)



Hypertension (Blood
pressure)



Systemic infection or
neoplasia (TXR, AUS)



Hyperadrenocorticism
(ACTH stim, LDDST** at
future visit)



Protein- losing
nephropathy or
enteropathy (UA +/-
UPCR; hx)



(Hypercoagulation (TEG,
VCM))



TREATMENT

- No specific treatment beyond supportive care
- Generally good prognosis (~90% recovery ambulation)
- Treat any underlying pre-disposing disease identified
- Consider clopidogrel (Plavix) especially if proven hypercoagulable

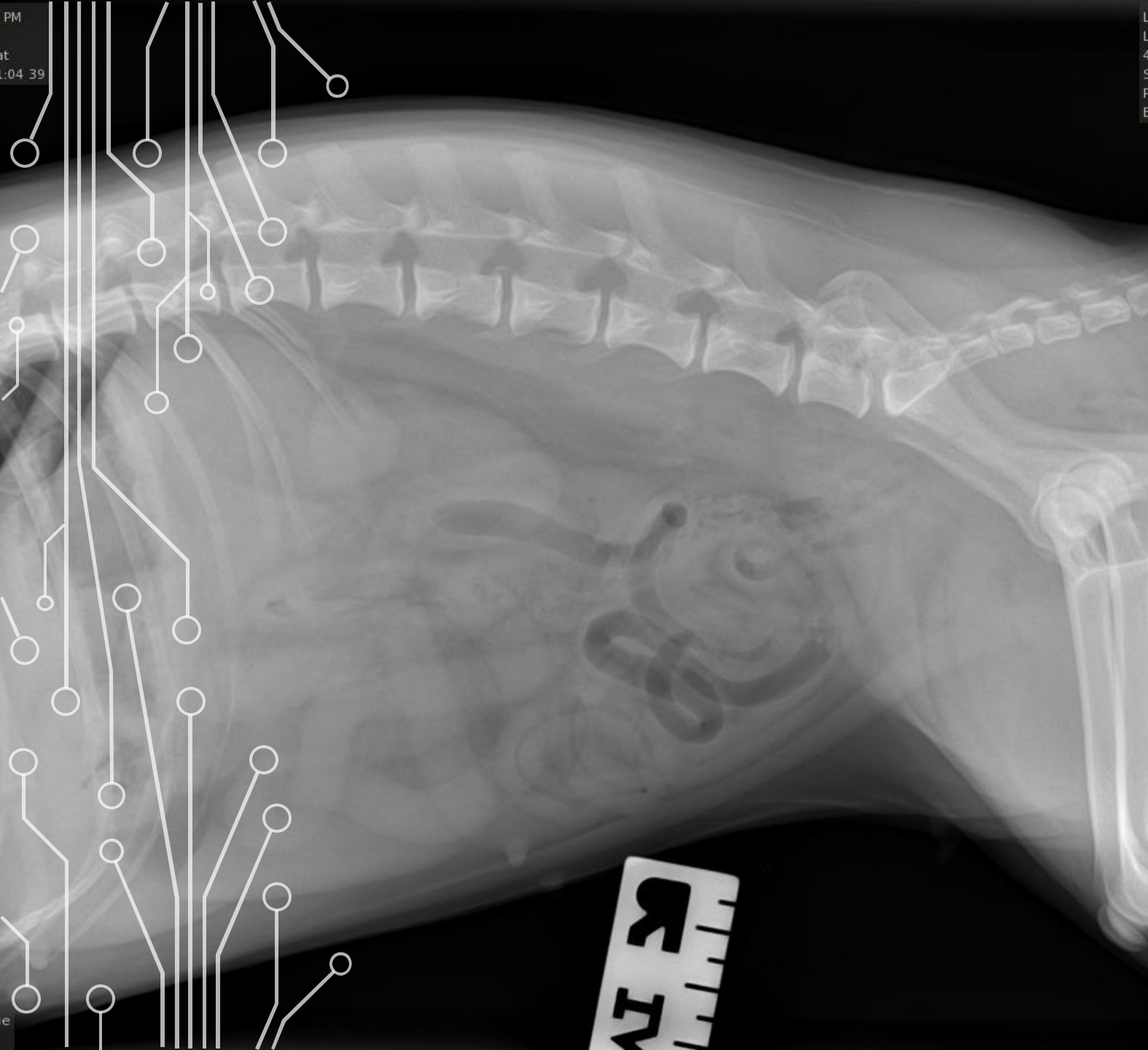


CASE 2: 6 YEAR OLD FS PITTIE

- Was at the park playing with owner
- Ran after a ball, suddenly yelped and quickly went from “limping” on the left hind leg to being unable to walk
- Neurological exam:
 - Mentation, Cranial Nerves and Thoracic limbs normal
 - Gait shows marked paresis left pelvic limb, absent paw placement; minimal paresis right pelvic limb, decreased paw placement; proprioceptive ataxia in PL
 - Cutaneous trunci cut off L2 on the left, L5 on the right (normal)
 - Not painful

LESION LOCALIZATION/ DIFFERENTIALS

- T3-L3 myelopathy
- Ddx: Vascular (FCE > hemorrhage), “Traumatic disc” (AHNPE vs. ANNPE), IVDH; much less likely neoplasia or inflammatory



INITIAL DIAGNOSTICS

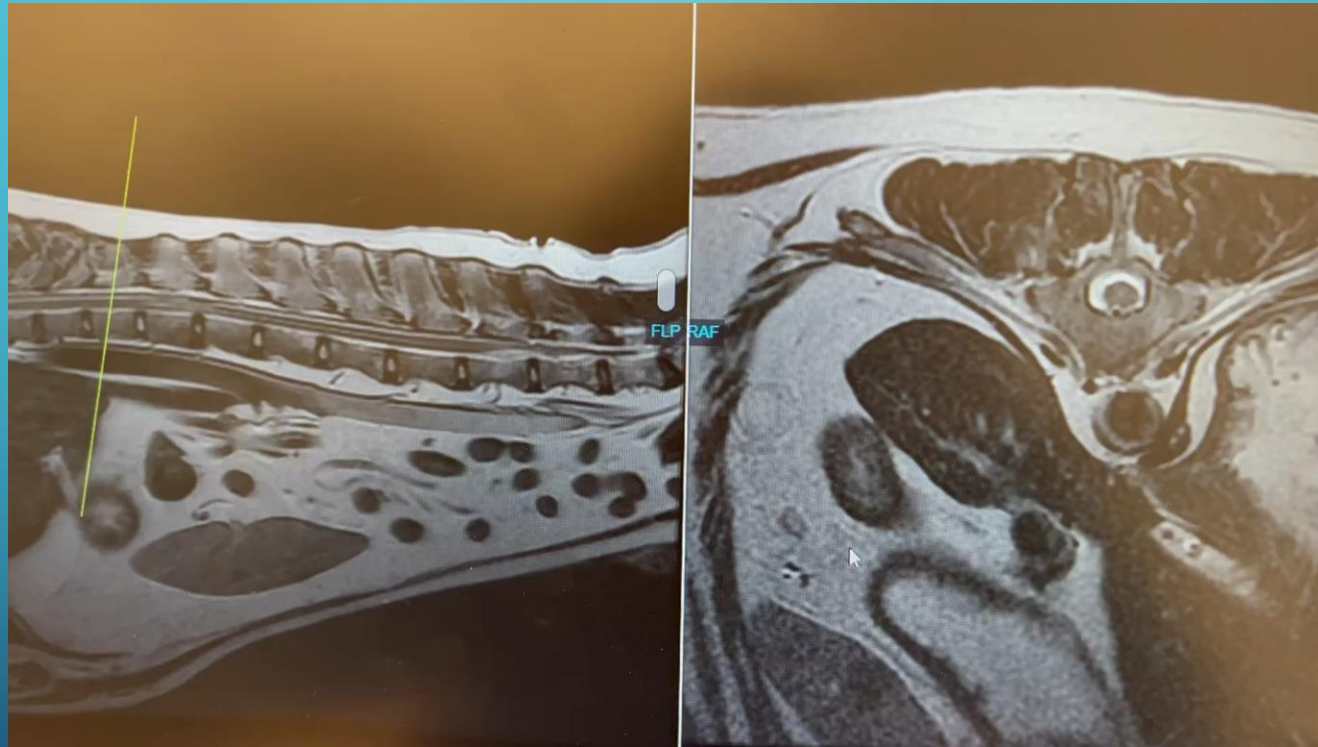
- CBC/ Chem
- (Spinal radiographs)



FCE/ AHNPE/ ANNPE VS. IVDH

- Less commonly painful (but can still be painful)
- More commonly lateralized (but can be symmetrical)
- More commonly large breed dogs (but can be chondrodystrophics, Pitties like having IVDH too)
- Peracute to acute onset (non-progressive past 24 hours typically)

AHNPE ADVANCED IMAGING



INITIAL TREATMENT

- NSAID

> [J Vet Intern Med.](#) 2019 Nov;33(6):2693-2700. doi: 10.1111/jvim.15626. Epub 2019 Oct 31.

Predictors of urinary or fecal incontinence in dogs with thoracolumbar acute non-compressive nucleus pulposus extrusion

Lorenzo Mari ¹, Sebastien Behr ², Anita Shea ¹, Elisabet Dominguez ³, Cristoforo Ricco ², Emili Alcoverro ⁴, Abel Ekiri ⁵, Daniel Sanchez-Masian ⁴, Luisa De Risio ¹

Affiliations + expand

PMID: 31674064 PMCID: [PMC6872617](#) DOI: [10.1111/jvim.15626](#)

FI was 3 times (95% CI = 1.41, 7.93) more likely in dogs that were not treated with nonsteroidal anti-inflammatory drugs (NSAIDs) after diagnosis compared to dogs administered NSAIDs (P = .006)



PITTIE PROGRESSION

- Improvement in FCE, ANNPE, AHNPE over weeks to months in ~80-95% of cases where nociception is intact at the ~24 hour mark after injury
- FCE should only worsen over the first 24 hours, then be static to improved
- If nociception negative $< 5-10\%$ chance nociception regained with time



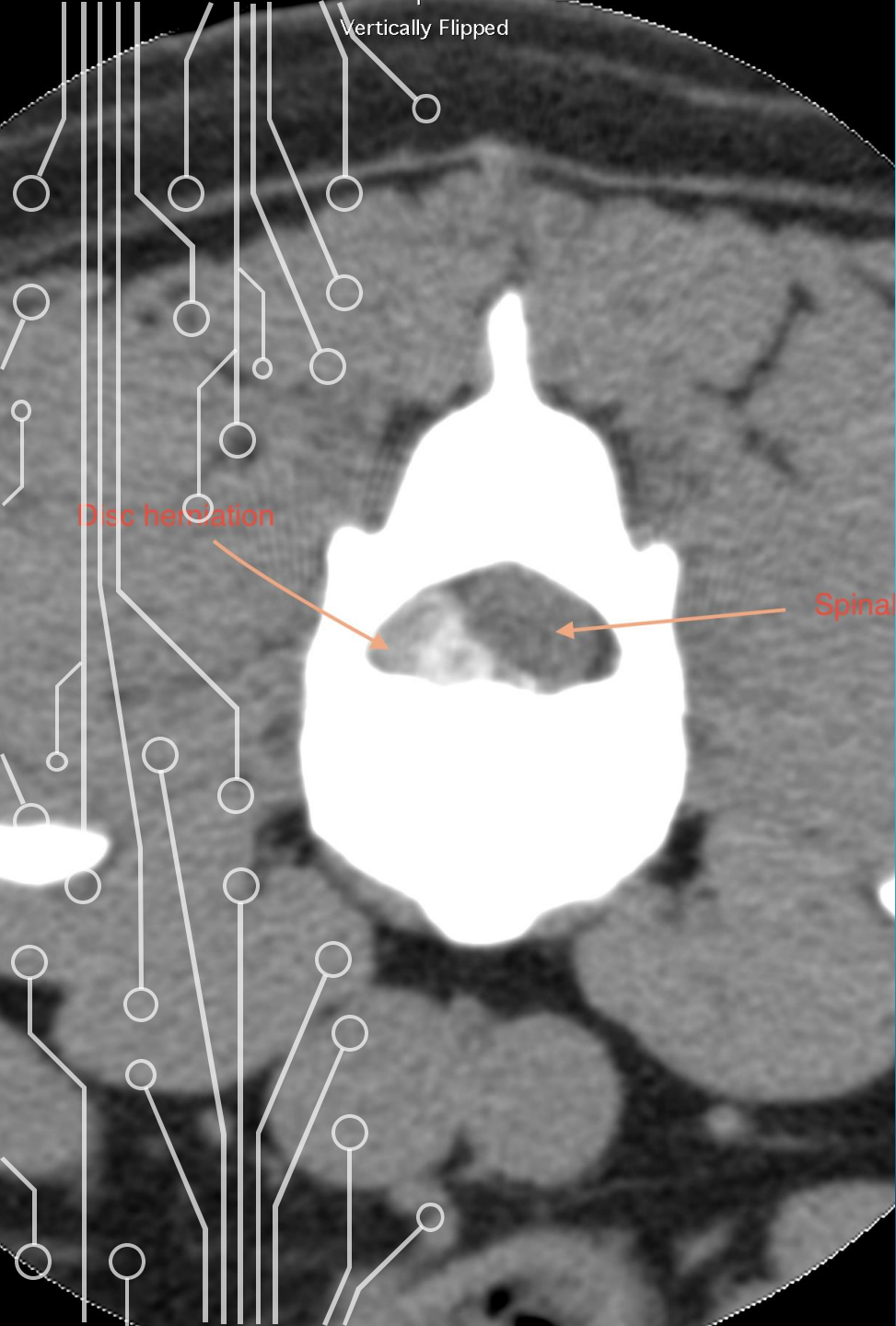
SUPPORTIVE CARE

- Alternate sides q 4 to 6 hours during the day
- Comfortable bedding
- Help 'Em Up harness, Figure of 8 sling (bandage material/ physio resistance band)
- Urinary care (more on later slides)
- PROM
- Booties



CASE 3: 3 YO MN FRENCHIE

- Started yelping and not wanting to use the stairs ~4 days ago, decreased appetite
- Owner notices a “hunched posture” at home
- Neurological Exam:
 - Mentation, Cranial Nerves, Thoracic Limbs Normal
 - Mild proprioceptive ataxia and paraparesis, delayed to absent paw placement bilaterally
 - Cutaneous trunci cut off L4 on the right; normal on left, Decreased patellar reflex on right
 - Painful mid- lumbar spine



LESION LOCALIZATION AND DIFFERENTIALS

- L4-L6 myelopathy
- Ddx: IVDH, Inflammatory (immune-mediated vs. infectious), Less likely vascular/ AHNPE/ ANNPE, or neoplasia



INITIAL DIAGNOSTICS

- CBC/ Chem
- (Spinal radiographs)

The background of the slide is a composite image. On the left, there is a close-up, shallow depth-of-field shot of a white pill bottle and several white, oval-shaped pills. Overlaid on the left side of the image is a white, stylized circuit board pattern with lines and small circles. The right side of the slide is a solid teal color.

INITIAL TREATMENT

- Pain control
 - Gabapentin 10-20mg/kg PO q 8 hours
 - NSAID > prednisone (for pain)
 - Amantadine 2-5mg/kg PO q 12-24 hours (diarrhea; start with q 24 hours)
 - Diazepam 0.2-0.5mg/kg PO q 8 hours
 - Injection of opioid in clinic; Fentanyl CRI or intermittent opioid injections if hospitalized



INITIAL TREATMENT

- Anti-anxiety medication(s):
 - Trazodone 2-5mg/kg PO q 8 hours
 - If in respiratory distress consider low dose acepromazine or dexmedetomidine; be prepared to intubate



TREATMENT OPTIONS

- Gold Standard: Referral → CT vs. MRI → Decompressive surgery; 95+% chance return of function if nociception is intact
- Conservative/ Medical management:
 - 4-6 weeks of STRICT rest (crated)
 - Ongoing pain medications during this time (taper starts ~2 weeks)
 - Gradual return to increased walking over an additional 4 weeks
 - This case ~70% chance recovery of function; 30% chance of deterioration or pain

The background of the slide is a dark blue gradient. On the left side, there is a complex graphic overlay. It features white circuit-like lines with circular nodes, some of which are connected to a grid of small circles. Overlaid on these are several financial-style charts. A prominent candlestick chart with green and red bars is visible, along with various colored moving average lines (blue, red, green) and a dashed red trend line. The overall aesthetic is high-tech and data-driven.

WHAT TO WATCH OUT FOR

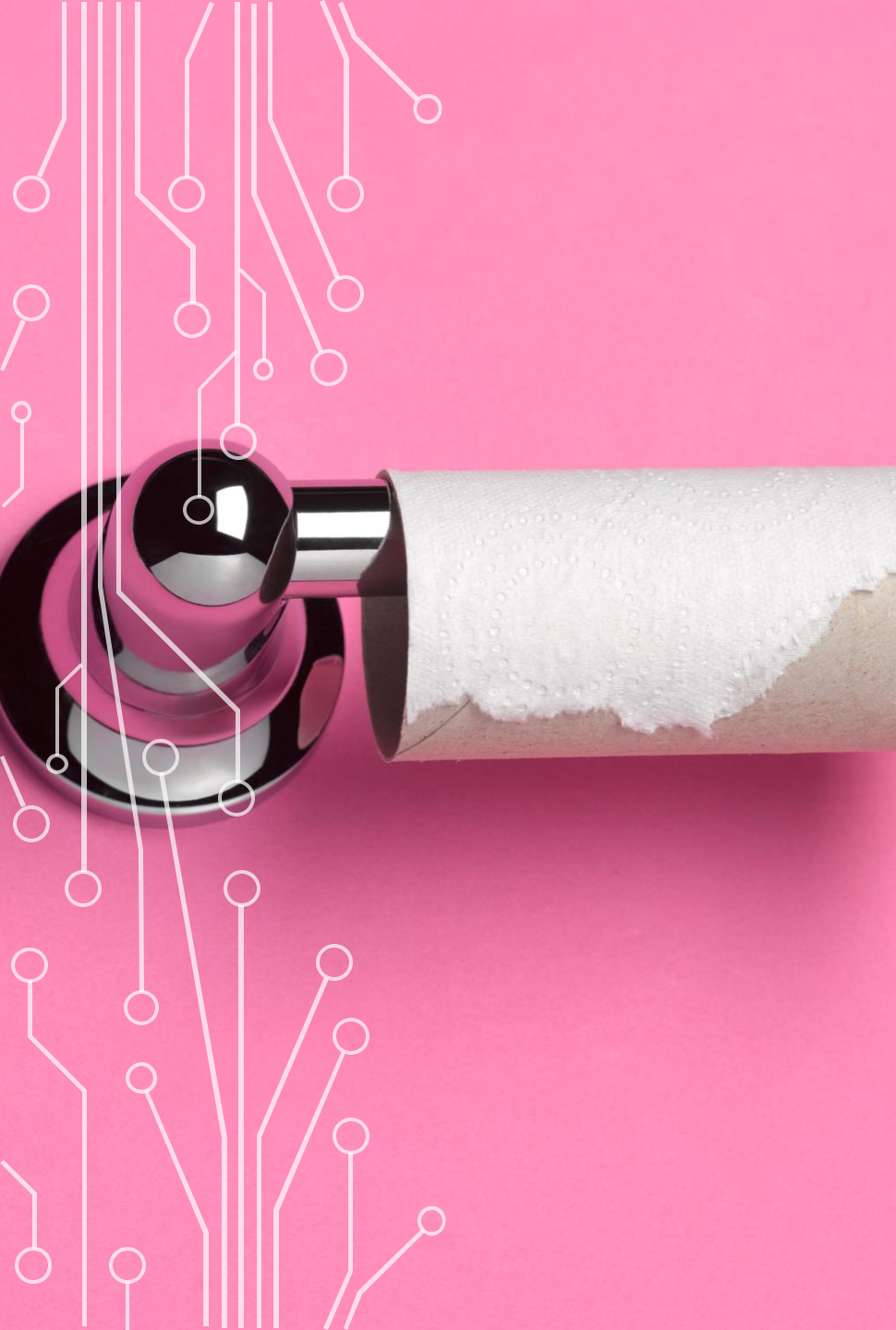
- Progressive paresis/ ataxia/ pain
- Loss of reflexes (myelomalacia)
- Urinary function

MYELOMALACIA

- ~10-20% risk in dogs that have lost nociception from IVDH
- “Domino effect” ascending/ descending the spinal cord causing ‘death’ to the cord
- If disc herniation was at L2-3: See loss of motor, nociception, later loss of PL reflexes and ascending CT
- No treatment → Euthanasia

NO CUTANEOUS TRUNCI





URINARY INCONTINENCE/ BLADDER DYSFUNCTION

- With loss of motor generally comes inappropriate urination
- UMN vs. LMN
- Expression/ Catheterization
- Medication Options

T3-L3 MYELOPATHIES

- UMN bladder
- Urethral sphincter is TIGHT
- Detrusor muscle is WEAK
- Bladder is going to fill and dog is going to have difficulties voiding
- May see dribbling from overflow → Bladder will be large and generally firm on palpation

MEDICATIONS


Prazosin- 1mg/15kg q 8-12 hours traditionally; up to 0.5mg/kg PO q 12 hrs



Diazepam- 0.2-0.5mg/kg PO q 8 to 12 hours



Bethanechol- 2.5 to 25mg/ DOG PO q 8 hours; typical small- medium dog 5mg q 8 hours to start



To aid with expression

L4-S2 MYELOPATHIES

- LMN bladder
- Urethral sphincter is normal to WEAK
- Detrusor muscle may have low tone/ FLACCID
- Bladder distended but flaccid, dribbling and bladder smaller in size compared to UMN bladder



MEDICATIONS

- Less options (thankfully less common)
- May not be able to stop dribbling
- Diapers (Human > Pet)
- Stilbesterol, proin can be trialed; limited success

BLADDER EXPRESSION VIDEOS

- Youtube:

- <https://www.youtube.com/watch?v=6k7chJbCS-g> male dog
- https://www.youtube.com/watch?v=QAixS_0ZfOU male dog
- <https://www.youtube.com/watch?v=zyQBxnagyBY&t=20s> female dog



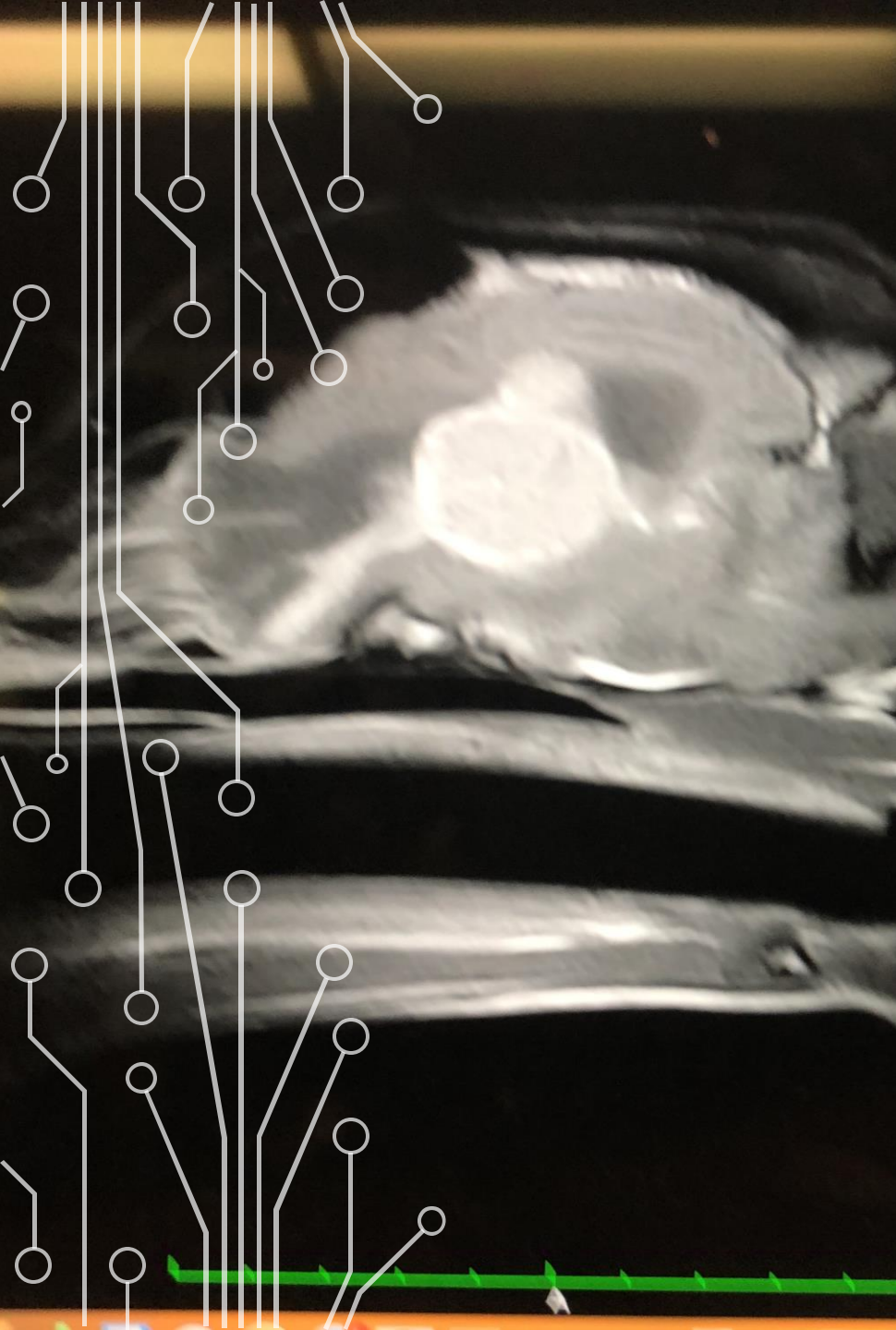
CASE 4: 10 YO FS GOLDEN RETRIEVER

- Owner reports ~2 months ago getting a bit confused, stuck in corners
- One month ago had 2- generalized, tonic clonic seizures and was placed on phenobarbital by ER clinic; no seizures since
- Progressively bumping into objects, circling to the right at home
- Neurological exam:
 - Mildly obtunded, cranial nerves show intermittent menace OS, decreased paw placement L TL and PL, circles right



LESION LOCALIZATION/ DIFFERENTIALS

- Forebrain (worse on the right)
- Differentials: Neoplasia (primary vs. metastatic), inflammatory (immune-mediated vs. infectious)



SUSPECT BRAIN TUMOUR

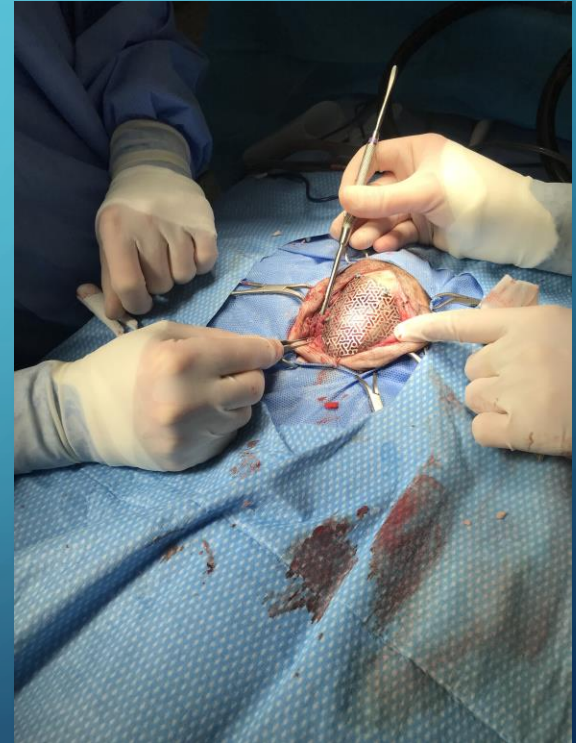
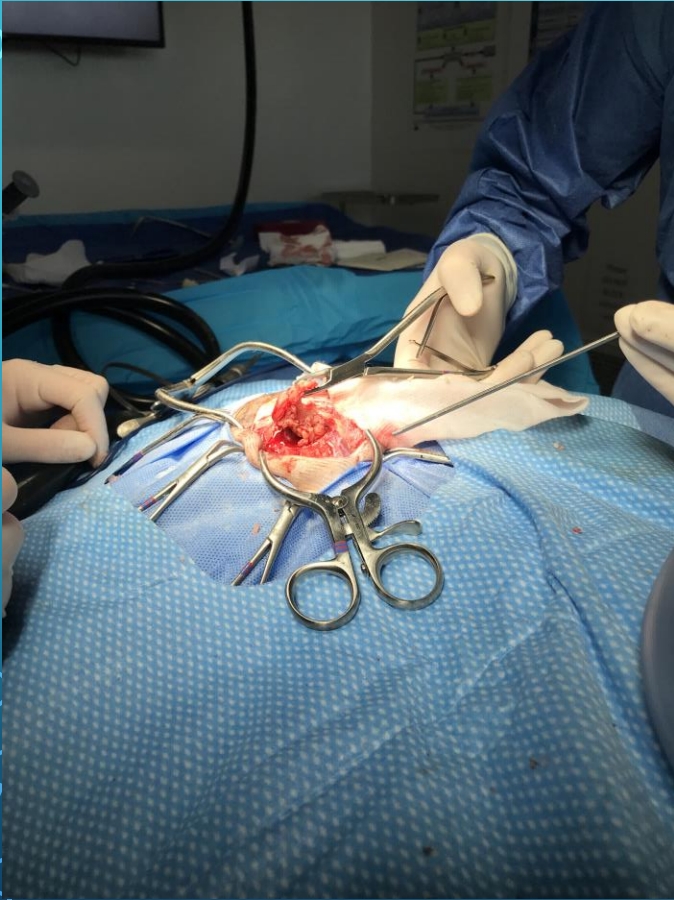
- Gold Standard: MRI of the brain +/- CSF tap to determine location and suspect tumour type
- With this knowledge have the ability to consider treatment such as surgical resection and/ or radiation therapy → Median survival time of ~12-24 mo depending on location and type
- Exception: Meningiomas in cats- median survival time with surgery= 3 years

MENINGIOMAS IN CATS

- Low invasion tendency
- ~10% peri-operative mortality
- Can have signs “out of nowhere”
- Palliative care can work longer (have seen ~1 year with prednisone alone)



MENINGIOMAS IN CATS



PALLIATIVE CARE

- Steroids
 - Prednisone: Generally 1mg/kg/day to start and try to taper to 0.5mg/kg/day ongoing if tolerated
 - Median survival time ~2-3 months



CASE 5: 1 YO YORKIE X CHIHUAHUA

- Periods of yelping over the last few weeks
- Now carrying head low, slightly “off balance”
- Neurological exam:
 - Mentation, Cranial Nerves NAF
 - Mild proprioceptive to vestibular ataxia x 4
 - Mildly decreased paw placement
 - Neck pain

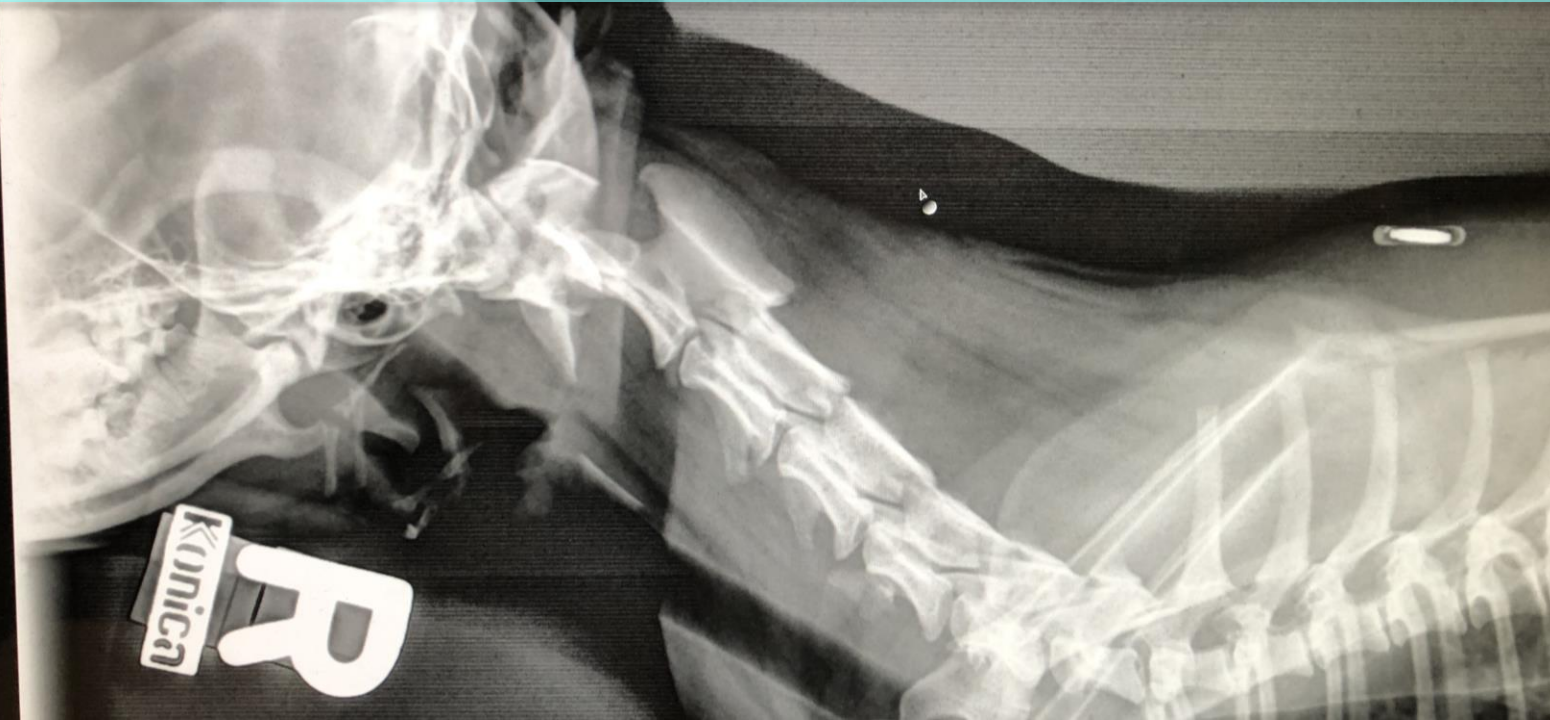
LESION LOCALIZATION/ DIFFERENTIALS

- C1-C5 myelopathy +/- brainstem?
- Differentials:
 - A bit young for IVDH in this breed
 - Anomalous (i.e. atlantoaxial instability/ luxation), Inflammatory (immune - mediated vs. infectious), Trauma (fracture/ luxation), Neoplasia



INITIAL DIAGNOSTICS

- CBC/ Chem
- Cervical spinal radiographs



ATLANTOAXIAL INSTABILITY OR "AA LUX"

- Toy breeds
- Young to middle aged
- Congenital +/- Traumatic
- Neck pain to sudden death

TREATMENT OPTIONS

- Gold Standard: Referral for surgical fixation
- Conservative management:
 - Placement of soft padded bandage (think Robert Jones but for the head and neck)
 - Pain management
 - Removable brace fitted
 - Strict activity restriction for 6-8 weeks
 - Lifelong risk of sudden death
 - ~70-90% can improve initially with medical management

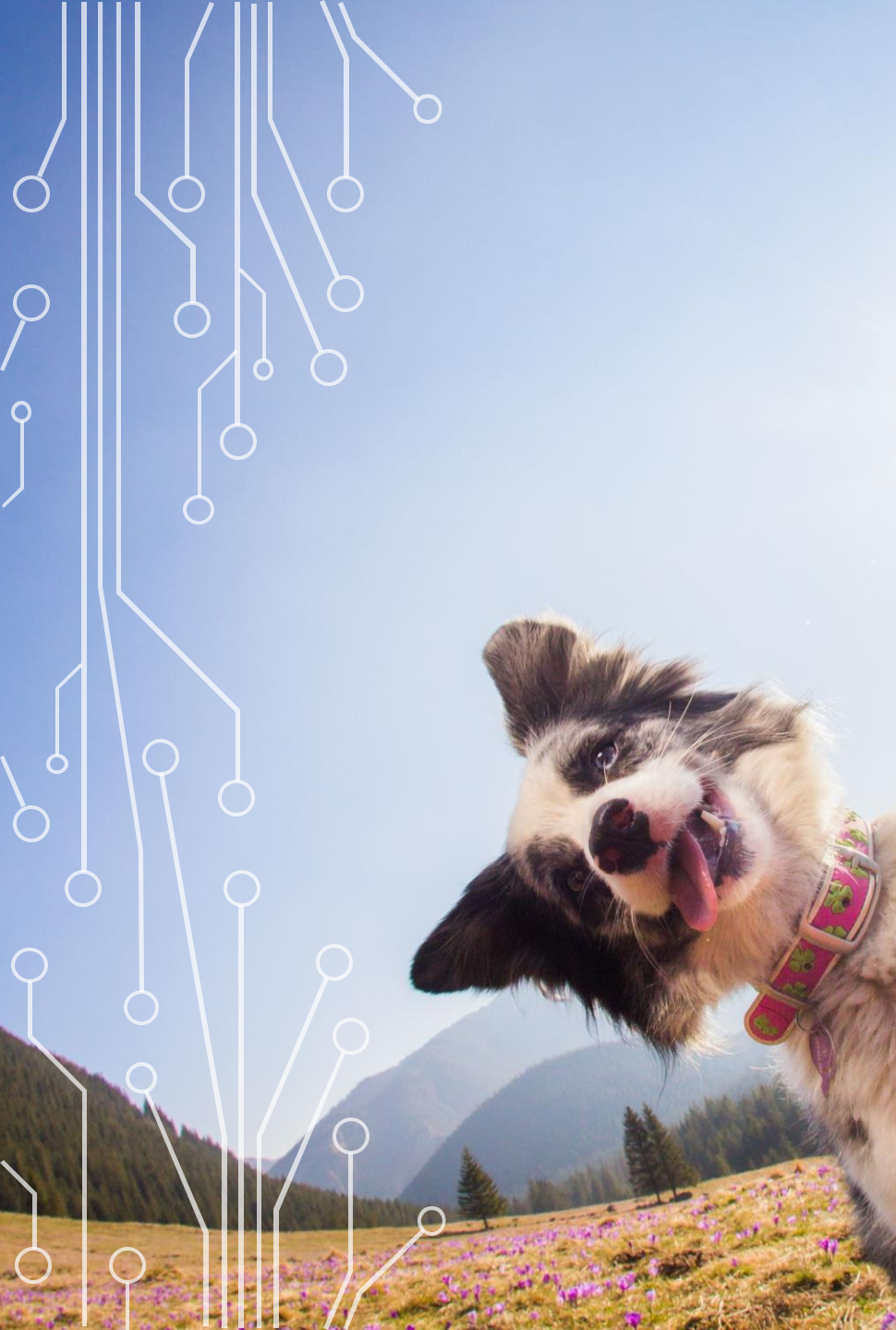
AA BRACE





AA BRACE COMPLICATIONS

- Respiratory compromise
- Wounds
- Ventroflexion/ spinal cord trauma during placement
- Recheck/ bandage change every week



CASE 6: 4 MONTH OLD BORDER COLLIE CROSS

- Playing with another dog at the park
- Other dog jumped playfully on his back and now can not walk in the pelvic limbs; owner concerned for disc herniation
- Exam shows ambulatory paraparesis, normal paw placement and the following videos:

BORDER COLLIE PUPPY



BORDER COLLIE PUPPY



LESION LOCALIZATION/ DIFFERENTIALS

- Unsure if neurological?
 - Pain seems to be associated with withdrawal; Direct spinal palpation in lateral recumbency was okay
 - Consider other causes: Orthopedic trauma, Immune- mediated polyarthritis, hip dysplasia, older dog- bilateral cruciate tears

PELVIC LIMB RADIOGRAPHS

- Bilateral tibial tuberosity avulsions not originally noted prior to neurological consultation
- When no ataxia, normal paw placement – need to consider neuromuscular OR it may not be neurology
- Always palpate joints and limbs





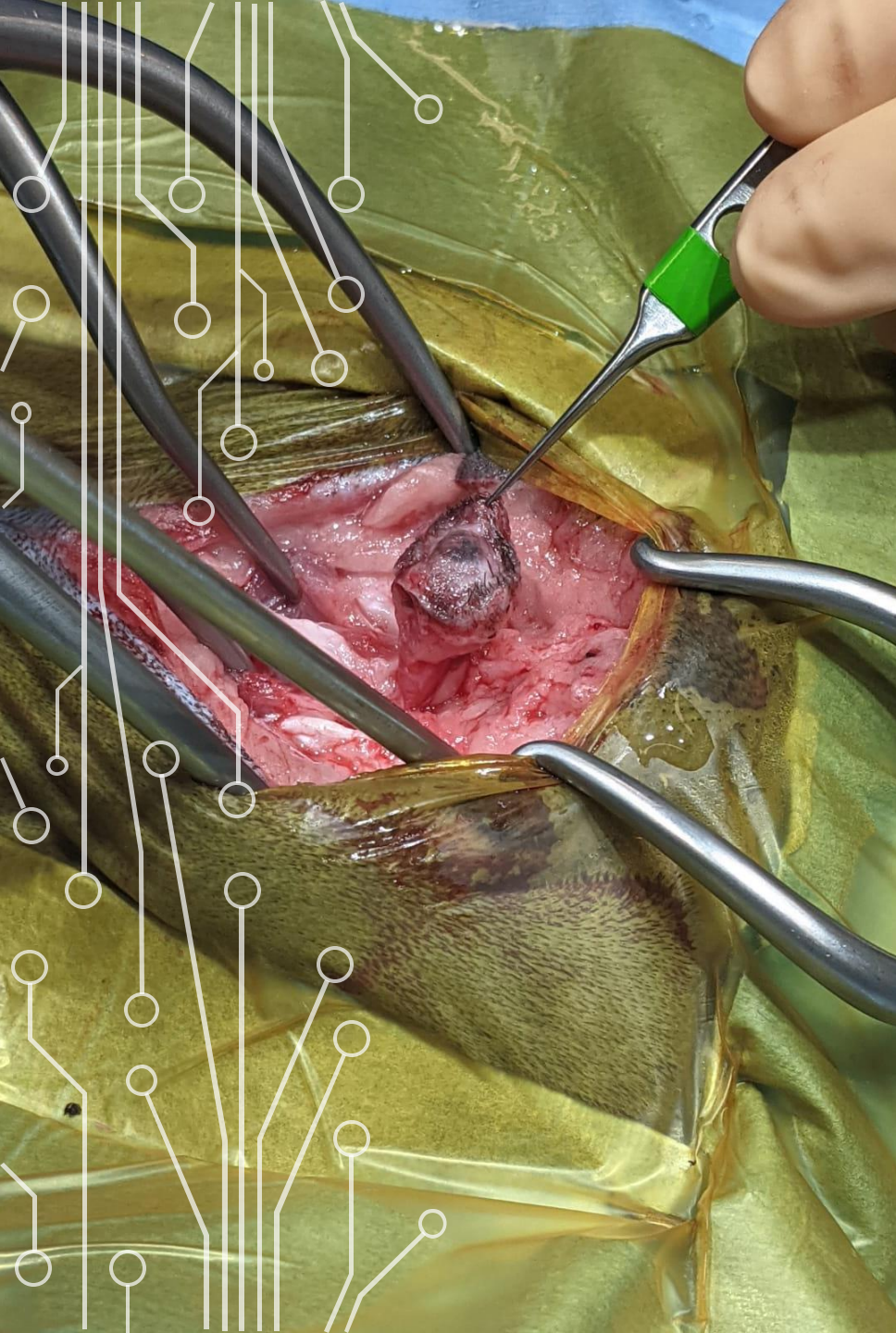
NEUROLOGY “QUICK FACTS”

- Diskospondylitis:
 - Most commonly strep, or E. coli infection in dogs
 - Minimum 6-12 months broad spectrum Abx therapy
 - Radiographic changes lag behind
 - Generally fair to good prognosis
 - BUT !! Remember Brucella canis especially if intact OR travel history; zoonotic risk; poor longterm prognosis to clear organism
 - Consider RSAT/ AGID testing for Brucella in dogs diagnosed w/ diskospondylitis



NEUROLOGY “QUICK FACTS”

- Current approximate referral costs (Vancouver Island):
 - Consult ~\$300-350
 - CT scan ~\$2500-4000
 - MRI ~\$4000-6000
 - Surgery (hemilaminectomy or ventral slot) ~\$8000-12000



NEUROLOGY “QUICK FACTS”

- Tethered Cord Syndrome
 - Relatively rare but seeing more cases recently
 - “Too tight” filum terminale
 - Range of signs- pelvic limb or spinal pain, “attacking” or chewing at feet, no evidence of hip dysplasia on radiographs but resent extension of the hips, +/- abnormal gait, +/- spinal reflex deficits, +/- urinary incontinence
 - Can do very well with surgery to “untether”
 - Pain management → Steroid trial if NSAID ineffective



NEUROLOGY “QUICK FACTS”

- Degenerative Myelopathy
 - Most common breeds: German Shepherds, Bernese Mountain Dogs, Boxers, Corgis, (Cavaliers)
 - Chronic, slowly progressive, non-painful T3-L3 myelopathy
 - DM Genetic Test through University of Missouri- Remember GENETIC test; if labeled “At Risk” does not necessarily mean they have or will even develop DM in lifetime; need to rule out other T3-L3 myelopathy causes
 - Physiotherapy most effective delay to being unable to walk



NEUROLOGY “QUICK FACTS”

- Inflammatory disorders in this part of North America generally ~90% auto- immune (i.e. meningoencephalitis of unknown etiology- MUE, SRMA, etc.) and a 10% risk an infection (see common ones on next slide)
- Going to require immunosuppressive steroid + 1 or more other meds for better longterm outcome
- ~70% chance they initially respond to medications; ~3 year median survival time if they are doing well at ~3 months post-diagnosis
- Referral recommended



NEUROLOGY “QUICK FACTS”

- Infectious disease testing:
 - Neospora IFA on serum
 - Toxoplasma IgM and IgG on serum
 - SNAP 4Dx
 - Cryptococcus Antigen Titre
 - Blood and urine cultures (for diskospondylitis)
 - Neuro PCR panel less helpful (false negatives risk)

NEUROLOGY “QUICK FACTS”



Flea and Tick Medications

Isoxazoline drug class likely the most “risky” for seizure patients; in effect no appreciable cases coming in that we think this is the cause of the patients breakthrough seizures

Generally advise to keep epileptic patients on the same meds they did well on before



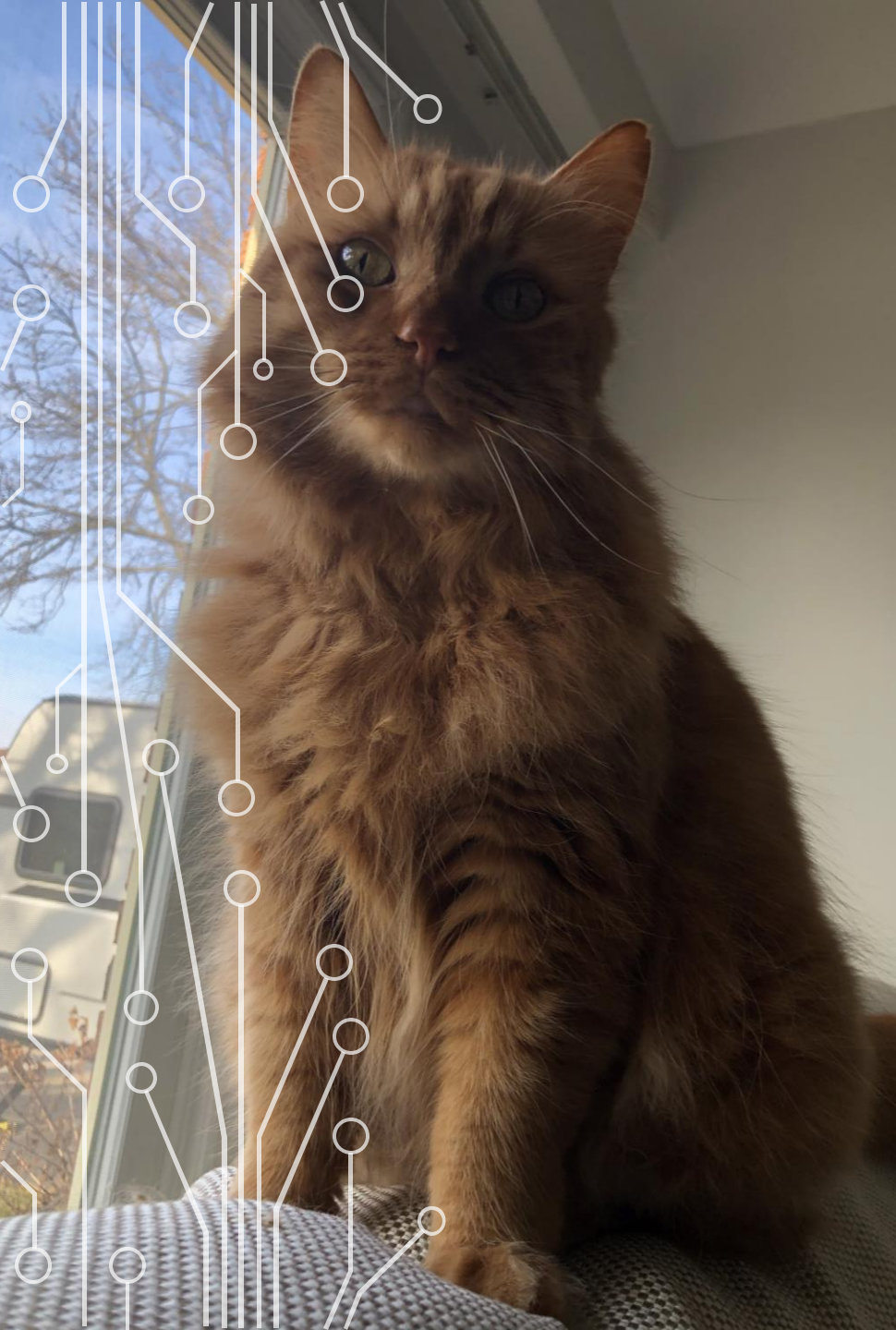
Sedation/ Anesthesia for Neurology Patients

Avoid dexmedetomidine for “brain” cases and nociception negative dogs



NEUROLOGY “QUICK FACTS”

- Head trauma cases
 - Cushing’s reflex (HIGH blood pressure, LOW heart rate), pupil size change, mentally altered
 - Hypertonic saline 2-4ml/kg IV over 15 minutes
 - Mannitol 0.5-2G/kg IV over 15 minutes; watch out for crystals
 - Can repeat either treatment once
 - Monitor electrolytes
 - Flow by oxygen
 - Elevate head ~30-45 degrees (do not pinch jugulars)



NEUROLOGY “QUICK FACTS”

- Tail pull injury in cats
 - DIFFERENT prognosis compared to myelopathies, or other neuropathies
 - Can have return of urinary and fecal continence up to ~2 months after the initial injury EVEN IF LOSS OF NOCICEPTION IN TAIL/ abnormal perineal reflex
 - Consider supportive care (pain management, bladder management) if no other concurrent injuries to see if recovery possible
 - Tail amputation option



QUESTIONS?

- Email: laura.barnard@vca.com or laura.barnard@wavesvet.com
- Please contact either VCA CVVH or WAVES Neurology Services directly for urgent or emergency neurological questions