Conservative Management of INTERVERTEBRAL DISC DISEASE (IVDD)

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Topics to be covered
- Types of Intervertebral Disc Disease (IVDD)
- NON-SURGICAL TREATMENTS

Just a little anatomy...
- The intervertebral Disc is composed of a central nucleus pulposus, an outer annulus fibrosus, the transition zone, and cartilaginous endplates.

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Intervertebral Disc Disease (IVDD) - Hansen type 1 IVDD - Chondroid degeneration

- Short legged long back dogs
- 3–7 years of age
- Cervical or thoracolumbar spine

Smolders et al. 2013

The transition zone (TZ) of newborn CD dogs is relatively wide, occupying most of the annulus fibrosus (AF), and its cells lack orientation.

The change from a gelatinous, semi-fluid Nucleus Pulposus to a drier NP can already be observed at 3-4 months of age.

Smolders et al. 2013
Conservative Management of IVDD

IVDD Conservative Management
- Intervertebral Disc Disease (IVDD)
  - Hansen type 1 IVDD – Chondroid degeneration
    - By 1 year of age 31.2% of cervical, 62.5% of thoracic, and 43.8% of lumbar Discs in CD dogs show macroscopic signs of disc calcification
    - Degeneration of the AF in CD dogs always occurs after NP degeneration

Smolders et al 2013

IVDD Conservative Management
- Intervertebral Disc Disease (IVDD)
  - Hansen type 1 IVDD – Chondroid degeneration
    - Spinal cord damage is related to the RATE of extrusion, duration of compression, & amount of extruded material
    - Mild to severe neurological deficits

Smolders et al 2013

IVDD Conservative Management
- Intervertebral Disc Disease (IVDD)
  - Hansen type 2: “Fibroid degeneration”
    - The German Shepherd, Doberman, Rottweiler, Labrador Retriever, Dalmatian
    - 6-8 years of age,
    - Caudal cervical or lumbosacral spine, although the thoracolumbar spine can also be affected

Smolders et al 2013
IVDD Conservative Management

- Intervertebral Disc Disease (IVDD)
  - Hansen type 2: "Fibroid degeneration"
    - Degeneration occurs as described...
    - A recent study has debunked the myth that Hansen type 2 discs are more fibroid.
    - No fibrocyte-like cells were identified in the NP in any of the Non-Chondrodystrophic and Chondrodystrophic dog samples. Rather...

Smolders et al 2013; Hansen et al 2017

- Intervertebral Disc Disease (IVDD)
  - Hansen type 2: "Fibroid degeneration"
    - The cell types in the Nucleus Pulposus (NP) were either (viable or apoptotic) notochordal cells or chondrocyte-like cells.
    - And lack of oxygen & blood flow could lead to failure of these cells to thrive...
    - Leading to disc degeneration

Hansen et al 2017; Risbud & Shapiro 2011

- (IVDD)
  - Hansen type 2:
    - As such...
      - The process of degeneration is the same (NCD vs CD)...
      - The degeneration process starts in the Nucleus Pulposus and progresses faster in CD dogs compared with NCD dogs.
    - "Fibroid degeneration"
      - BOTH Non-Chondrodystrophic & Chondrodystrophic dogs suffer from:
        - Chondroid metaplasia

Hansen et al 2017

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Intervertebral Disc Disease (IVDD)

- Hansen type 2:
  - Causes progressive signs of paraparesis, often with some degree of back pain, taking weeks, to months, or sometimes years in development.

ANNPE - Acute Non-compressive Nucleus Pulposus Extrusion

- High velocity extrusion resulting in contusion to the spinal cord without sustained compression
- Severe, sudden neurological deficits
- Affects any breed (Border Collie...)
- Reported only in dogs >1 year of age
  - Mean age of 7 years
- Associated with exercise or trauma
- Vocalization at time of incident

De Riso 2015; DeDecker & Fenn 2018

Henke et al, 2013 reviewed 31 medical records & MRI reports of dogs with traumatic disc extrusion.

- 71% of the dogs had disc extrusion without evidence of spinal cord compression.

Henke et al 2013
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IVDD Conservative Management

- Intervertebral Disc Disease (IVDD)
- **ANNPE**: Acute Non-compressive Nucleus Pulposus Extrusion
  - Localization: T3 – L3; particularly between T12 – L2
  - Cervical spine can occur (and does more so than FCEs)
  - Lateralization occurs in 62 – 65% of cases
  - Spinal Hyperalgesia is reported in 21 – 57% of dogs with ANNPE

De Riso 2015; DeDecker & Fenn 2018

IVDD Conservative Management

- Intervertebral Disc Disease (IVDD)
- **HNPE**: Hydrated Nucleus Pulposus Extrusion
  - Extrusion of hydrated nucleus pulposus through a single fissure in the dorsal annulus fibrosus secondary to sudden changes in IVD pressure and biomechanics.
  - More often in cervical spine
  - Older dogs (median age: 9 years)
  - Spontaneous onset
    - Rarely associated with exercise
    - Less hyperalgesia than other types

De Decker & Fenn 2018

IVDD Conservative Management

- Intervertebral Disc Disease (IVDD)
- **HNPE**: Hydrated Nucleus Pulposus Extrusion
  - Rapid improvements after initiation of medical treatment could suggest that spinal cord contusion plays a major role in the pathophysiology of HNPE
  - The need for surgical intervention is debatable

De Decker & Fenn 2018; Borda et al 2017
IVDD Conservative Management

- Intervertebral Disc Disease (not-IVDD)
- FCE - Fibrocartilaginous Embolism
  - Vascular disease of the spinal cord caused by embolization of spinal vasculature with fibrocartilaginous material histologically and histochemically identical to the nucleus pulposus of the intervertebral disk, resulting in ischemic necrosis of dependent regions of spinal cord parenchyma.

DeRiso 2015

IVDD Conservative Management

- Intervertebral Disc Disease (not-IVDD)
- FCE - Fibrocartilaginous Embolism
  - Generally large / giant breeds & mini Schnauzers
  - Any age
  - Lateralization of neuro dysfunction in 53 - 87%
  - Spinal hyperalgesia is uncommon

DeRiso 2015

IVDD Conservative Management

- Intervertebral Disc Disease (not-IVDD)
- FCE - Fibrocartilaginous Embolism
  - Treatment:
    - Conservative

DeRiso 2015
Okay... so it's an IVDD Case... Of some kind... Or an FCE... You need to manage it conservatively. What do you do?

**IVDD Conservative Management**

- Intervertebral Disc Disease (IVDD)
  - **CONSERVATIVE MANAGEMENT**
    - Physiotherapy / Rehabilitation – (plus Medication)
    - CAN give good results
    - For ANNEPE, HNPE, Hansen's Type 2, FCE's or
    - WHEN surgery is not an option for Hansen's Type 1 IVDD
    - (Finances, Age, Owner opinions, Medical conditions, etc.)

- Should be GOAL oriented
- Should address the underlying pathology
- Should address function
- Should include routine re-evaluation of the neurologic status of the animal by the therapy provider.
IVDD Non-Surgical Management

GOAL #1

Pain Management & Healing of the Disc / Spinal Cord & Reducing Inflammation

- Anti-inflammatory OR Corticosteroid
- PLUS Adjunctive Pain Medication
- Modalities
  - Laser, Microcurrent, TENS, Heat or Ice
  - Acupuncture
- Manual Therapies
  - Traction & Mobilizations

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Laser Therapy for Pain Management

Optimal dosages for pain relief...

- Optimum dose per point for an 820-830nm laser was 5.9 Joules
- Using a 904nm super-pulsed laser, it was 2.2 Joules.
- Number of reps and Rx/week were variable.
- Immediate positive effects that can last up to 3 months!

Chow et al 2009
IVDD Non-Surgical Management

- Laser Therapy for Spinal Cord Healing
  - It helps!
    - Laser: 810nm x 150mW x 1589 J/cm² daily (administering LLLT for 2997 seconds/day) x 14 days – Byrnes & Wu studies
    - Speculated only 6% power penetration to the spinal cord
    - Laser: 780nm x 250mW x 30 min/day x 14 days
  - Significantly increased axonal number and distance regrowth.
  - Suppressed immune cell activation and cytokine/chemokine expression.
  - Increased the length & number of axons & better functional recovery
  - Return of some aspects of function to baseline levels

Byrnes et al 2005; Wu et al 2009, Rochkind et al 2002

IVDD Non-Surgical Management

- Laser Therapy for Spinal Cord Healing
  - Decisions about dosing
    - Only 2.45% of 980nm laser light will reach a deeper nerve when lasering from the surface.
    - So, laser with HIGH doses!!

Anders et al 2014

IVDD Non-Surgical Management

- Laser Therapy for Spinal Cord Healing
  - Dog Study! LLLT after hemilaminectomy for a thoracolumbar disc herniation
    - 200mW, 810nm x 1 minute per area (5 diode cluster probe) = 12 J/cm²
    - Median time to walking was 3.5 days in the LLLT group and 14 in the control group

Draper et al 2012
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IVDD Non-Surgical Management

- Microcurrent – Cranial Electrical Stimulation for PAIN Management
  - Decreases pain intensity for persons with chronic pain secondary to spinal cord injury.

  Tan et al 2006

IVDD Non-Surgical Management

- Healing
  - Pulsed Electromagnetic Field Therapy
    - Sparse literature...
    - Enhances motor recovery in cats after spinal cord injury.

  Crowe et al 2003

IVDD Non-Surgical Management

- TENS for PAIN Management
  - Different frequencies of TENS produce analgesia via different mechanisms
    - High Frequency TENS (>80Hz)
      - Stimulates large diameter nerves & blocks nociceptive activity in smaller nerves
      - Increases β-endorphins & methionine-enkephalins
    - Low Frequency TENS (<10Hz)
      - Stimulates release of endogenous opiates
      - Reduces dorsal horn neuron activity, nociception and the consequent pain

  Watson & Lawrence 2016
IVDD Non-Surgical Management

- Hot & Cold for PAIN Management
- Heat decreases pain by:
  - Removal of chemical irritants from nociceptors (reducing pain input to the CNS)
- Cold affects the body by:
  - Decreasing the conduction velocity of primary afferent fibres and simultaneously increasing pain threshold and pain tolerance
  - Reduce muscle tone & spasticity & Vasoconstriction of blood vessels

IVDD Non-Surgical Management

- Acupuncture PAIN Management & RECOVERY
  - Electro-Acupuncture might provide some mild benefit in regard to severity of postoperative pain in dogs undergoing hemilaminectomy because of acute thoracolumbar intervertebral disk disease.
  - A combination of electroacupuncture and acupuncture with conventional medicine is more effective than conventional medicine alone in recovering ambulation, relieving back pain, and decreasing muscle spasm.

Lai et al 2009; Han et al 2010

IVDD Non-Surgical Management

- Acupuncture PAIN Management & RECOVERY
  - Electroacupuncture combined with standard Western medical treatment was effective and resulted in shorter time to recover ambulation and deep pain perception than did use of Western treatment alone in dogs with signs of thoracolumbar intervertebral disk disease.
  - Electroacupuncture was more effective than decompression surgery for recovery of ambulation and improvement in neurologic deficits in dogs with long-standing severe deficits attributable to thoracolumbar IVDD.

Hayashi et al 2007; Joaquim et al 2010

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IVDD Non-Surgical Management

- Acupuncture for PAIN Management & RECOVERY

  - POINTS USED
    - Two points on the bladder meridian rostral and caudal to the incision, ST36, SP6, and BL60; Alternate Session - GV14, Bai Hui, BL11, BL40, GB34, and UV3
    - Bladder meridian points adjacent to the lesion and bilaterally distantly at GB30, GB34, and ST36.
    - SI3, BL62, BL23, ST36, KI3, BL60, GV1, lumbar Bai Hui, & in some dogs L4 (lumbar intervertebral) instead of SI3, BL25 (instead of BL20, a local point); and GB30 only for dogs with grade 1 and 2 dysfunction without severe paresis
    - BL18, 24, 40, KI3, GB34, ST36

Laim et al 2009; Han et al 2010; Hayashi et al 2007; Joaquim et al 2010

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IVDD Non-Surgical Management

- Acupuncture for PAIN Management & RECOVERY

  - WHY might it work / help to heal?
    - Pain reduction (PNS, CNS, ANS, & Endocrine Systems)
    - Local increase in circulation
    - Mechanotransduction - i.e. Mechanical or electrical force causes biochemical signals
      - Cell migration (bringing in fibroblasts or mast cells)
      - Mast Cell degranulation
      - Fascial system transport of O2, nutrients, & waste

So... you can still have these effects even if you don't do acupuncture!

Fung 2009

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IVDD Non-Surgical Management

- Traction for HEALING & PAIN

  - Goals: Increase blood flow to the disc & spinal cord

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IVDD Non-Surgical Management

- Traction for HEALING & PAIN
  - Traction therapy might play an important role in the treatment of acute Neck or Back Pain caused by Lumbar Disc Herniation.
  - (5X / week for 3 weeks, plus conventional physiotherapy)
  - Reduced herniation
  - Reduced pain
  - Reduced Disability
  - Improved ROM (lumbar flexion)
  - No change for back extensor endurance

Karimi et al 2017; Fritz et al 2014

IVDD Non-Surgical Management

- Traction for HEALING & PAIN
  - Exposure of herniated disc material to vascular environment (i.e. epidural space)
    - Resorption and/or regression
  - Large extruded discs regress more rapidly
  - Early intervention is most favourable

Constantoyannis et al 2002; Malanga & Nadler 1999

IVDD Non-Surgical Management

- Traction for HEALING & PAIN... Animal Models!
  - Traction treatment is effective in enhancing nutrition supply and promoting disc cell proliferation of the degraded discs.
  - Porcine study - In Vivo
  - Gentle traction helped maintain disc height of degenerated discs, and it might be a potential intervention to slow down the process of degeneration
  - Rat study In Vivo

Kuo et al 2014; Lai & Chow 2010
IVDD Non-Surgical Management
- Traction for HEALING & PAIN
  - In clinic & home program (with detailed instruction)
  - Neck traction in sternal recumbency
  
- Side lying neck traction

- Traction of neck and skin

- Tail traction
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IVDD Non-Surgical Management

- Traction for HEALING & PAIN
  - In clinic & home program (with detailed instruction)

Traction for HEALING & PAIN

- In clinic & home program (with detailed instruction)

IVDD Non-Surgical Management

- Traction for HEALING & PAIN
  - In clinic & home program (with detailed instruction)

Mobilizations – for HEALING & PAIN

- NEUROPHYSIOLOGICAL effects:
  - Reduce pain
  - Inhibition of reflex muscle contractions
  - Hysteresis effect...
    - Reduce nociceptor activity
    - Reduce pressure in the joint(s)
    - Reduces nerve firing to/from joints

Zusman 1986; Katavic 1998; Bjornsdottir & Kumar 1997; Zelle et al 2005; Conroy & Hayes 1998; Sterling et al 2001

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**IVDD Non-Surgical Management**

- Mobilizations – for HEALING & PAIN
  - Manual therapy using joint mobilization techniques and flexion-distraction techniques
  - Improves low back pain
  - Improves disc height

Choi et al 2014

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- Mobilizations – for HEALING & PAIN
  - In humans... we always incorporate some rotation (Maitland et al 2005)
    - Benefits may be due to the oblique orientation of the annular rings of the disc.
    - Rotation would impart a gentle ‘stretch’ on these structure...

See video next slide

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- Mobilizations – for HEALING & PAIN
  - Rotations

Lift the pelvis via the legs – at or above the stifle(s)
IVDD Non-Surgical Management

- Mobilizations – for HEALING & PAIN

  - Use the side of one hand (at the 2nd phalanx) to medially glide the side (transverse process) of one vertebra and then side bend the animal's head "over" your hand and the vertebra.
  - Mobilize by rhythmically pushing medially
  - Pain free motion only – on either side

IVDD Non-Surgical Management

- Mobilizations – for HEALING & PAIN
  - Thoracic mobilizations – Chest Lifts
  - Lumbar mobilizations – Abdominal Lifts

IVDD Non-Surgical Management

- Mobilizations – for HEALING & PAIN
  - Thoracolumbar or Lumbar FLEXION mobilizations
    - With the dog in standing over your knee or leg, or in side lying with your knee placed into the abdomen.
    - Passively flex and extend the spine.
    - Always within tolerance

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IVDD Non-Surgical Management

- Mobilizations – for HEALING & PAIN
- Myofascial Techniques (Stimulating Nerves, Muscles, & Fascia)

Dog these instead of 'Massage'

IVDD Non-Surgical Management

- GOAL #2 – RETRAINING FUNCTION
- Neuro Rehab
- Strength Training
- Coordination Training
- Movement

There is no "Crate-Rest-Fairy"...
Get your patients moving!

IVDD Non-Surgical Management

- RETRAINING FUNCTION
- Neuro Rehab
- To re-establish neural pathways & motor control
  - Active spinal movement
  - PNF (Proprioceptive Neuromuscular Facilitation)
  - Neuro-Developmental Techniques (NDT)
  - Sensimotor Techniques
  - Postural Reactions
  - Gait training

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**IVDD Non-Surgical Management**

- **RETRAINING FUNCTION**
- Non-painful Active Range of Motion
  - Cookie exercises

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**IVDD Non-Surgical Management**

- Functional Training - Neuro Rehab (i.e. PNF)

  **PNF Patterning:**
  Do this instead of Passive Range of Motion!

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**IVDD Non-Surgical Management**

- Functional Training - Neuro Rehab (i.e. PNF)

  Compressions & Distractions
IVDD Non-Surgical Management

- Functional Training - Neuro Rehab - Neurodevelopmental

Volitional movements in different positions
Retrain proper movement patterns (how to get from position to position)

IVDD Non-Surgical Management

- Functional Training - Neuro Rehab - Neurodevelopmental
  - "Kick backs" – for foot placement training

IVDD Non-Surgical Management

- Functional Training - Neuro Rehab - Neurodevelopmental

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**IVDD Non-Surgical Management**
- Functional Training - Neuro Rehab (Sensorimotor)
  - Use of reflexes
  - Use of sensory stimulation

**IVDD Non-Surgical Management**
- Functional Training - Neuro Rehab (Sensorimotor)
  - Whole body shake

**IVDD Non-Surgical Management**
- Functional Training - Neuro Rehab (Sensorimotor)
  - Whole body vibration increases blood flow & limb muscles

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IVDD Non-Surgical Management
- Functional Training - Standing Practice
- Electrical Muscle Stimulation

IVDD Non-Surgical Management
- Functional Training - Standing Practice
  - REPETITIVE LOCOMOTION has been shown to improve Brain Derived Neurrophic Factor
  - This helps with pain and function
  - Aids in reducing neuroinflammation

REPETITIVE LOCOMOTION has been shown to improve Brain Derived Neurrophic Factor
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IVDD Non-Surgical Management
- Functional Training - Walking Practice

IVDD Non-Surgical Management
- Functional Training - Walking Practice

IVDD Non-Surgical Management
- Functional Training - Walking Practice
Conservative Management of IVDD

IVDD Non-Surgical Management

- Functional Training - Walking Practice

Conclusion
- Conservative management of Hansen's Disc lesions 1 & 2, ANNEPE, HNPE, & (FCE's) is possible...
- Further research is needed...
- But now you have a plan!

Thank you for listening!

www.FourLeg.com
Conservative IVDD

References:


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