


Ria Acciani, MPT
Advanced Canine Rehabilitation Center,
www.dogpt.com
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**SELECT MANUAL
THERAPY TECHNIQUES
FOR CANINE CERVICAL
SPINE DYSFUNCTION**



Background:



- Masters in Physical Therapy 1997 University of St. Augustine, FL
- Human PT Sports Ortho/Pediatrics 5yrs. Began Canine Rehab 2000 and completed U of T certification courses.
- Owner/Operator of Advanced Canine Rehabilitation since 2001
- Writer: Protocols, Research Papers and Articles
- Lecturing at International Rehab Symposium 2008 & 2011
- Teach Continuing Education since 2006, venues including STAAR, & Springfield University.
- Treat all levels of competition dogs including the World Teams from 2010-2016. Including: AWC, IFCS, WAO, & EO.

Learning Objectives

- 1. Identify and describe similarities and differences between normal and abnormal human and canine cervical anatomy and arthrokinematics.
- 2. Evaluate and assess a variety of biomechanical movement patterns of the canine cervical spine and differentiate between normal and abnormal motions.
- 3. Select and apply a variety of manual therapy techniques to the canine cervical spine including appropriate dosing of frequency, duration and grade of movements.

Learning Objectives

- ◎ 5. Evaluate the canine client through case study design with a focus on differential diagnoses, indications and contraindications, and determination of appropriate manual therapy interventions to restore normal function.
- ◎ 6. Select and apply additional hands-on techniques to the canine cervical spine including manual traction, neural glides and specific reflex testing.

Introduction

- ◎ Anatomy of the Canine Cervical Spine
 - Structure/Biomechanics
 - Musculature
 - Neurology
- ◎ Manual Therapies:
 - Testing / Mobilizations
 - Traction

Canine Cervical Spine

- ◎ Human vs. Canine: Important Differences
 1. Skeletal Configuration
 2. Center of Mass of the head and neck is located in front of the vertebral column
 - ACTIVE mm contraction is required to support weight
 - Human is over trunk PASSIVE weight bearing

Canine Cervical Spine

3. FL of the dog participates in locomotion & WB

- ie. Scapula orientation in canine is in sagittal plane and human in frontal plane.
- Changes impact on CS mm

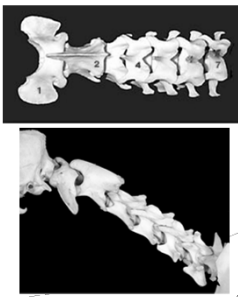
4. No Clavical in dogs (can have remnant)

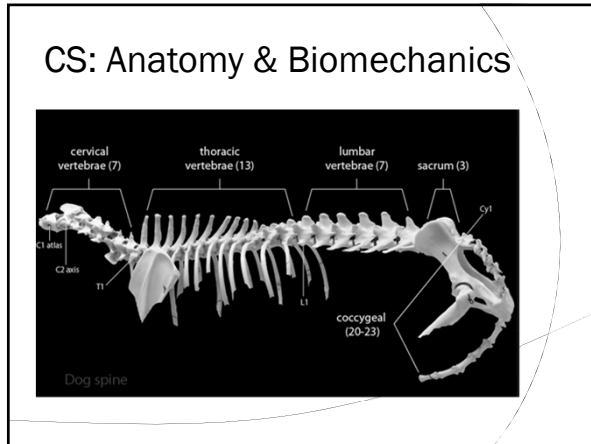
Canine Cervical Spine

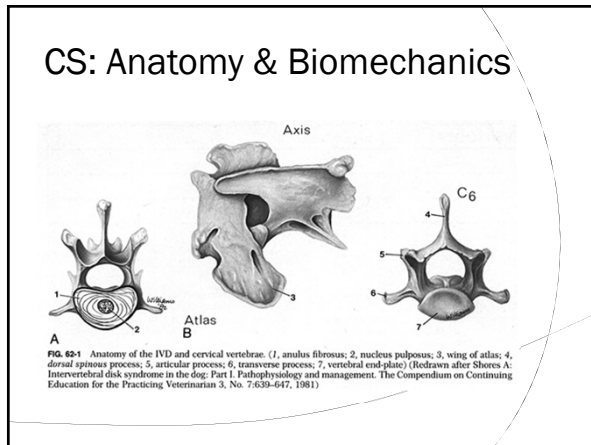
- Zygapophysial= Facet
 - Articular facet joint disease is common
- Cervical zygapophysial joint arthrosis=
 - Headache, occipital pain, ear pain, neck pain, crepitus, or rotational head-tilt deformity

CS: Anatomy & Biomechanics

- 7 vertebra
- Atlas: no spinous process, but wing-like lateral expansions
 - Atlanto-occipital joint: main movement of flexion and extension.
 - 90 degrees of flex/ext
 - 14 ± 15 degrees flex/ext in humans
 - 0-3.4 degrees axial rotation in humans (accompanied by flex/ext and side flexion)
 - 3.9 degrees side flexion in humans (accompanied with flex/ext and rotation)







CS: Anatomy & Biomechanics

- The AXIS= elongated dorsal spine, possesses the Dens (odontoid process)
 - Ligaments:
 - The transverse ligament; alar ligament
 - The atlato-axial joint permits rotary movement
 - No disc
 - ROM in humans:
 - 10 degrees flex//ext
 - 47-56 degrees of axial rotation
 - 5 degrees of lateral flexion
 - Axial rotation accompanied by flex or ext and contralateral side flexion

CS: Anatomy & Biomechanics

Cervical vertebrae:
 -1st vertebra is called atlas.
 -2nd vertebra is called axis
 -The last vertebra has articulation surface for 1st rib.

FIG. 88. A. ATLAS AND B. AXIS VERTEBRAE OF A DOG (Canis familiaris) (after VAN DERKAM).

1. transverse process of atlas.
 2. vertebral canal.
 3. spinous for each of spinal axis.
 4. neural spine.
 5. subcostal process.
 6. superior articulating surface of condyle.
 7. condyle.
 8. transverse process of atlas.
 9. postspinal process.

CS: Anatomy & Biomechanics

- ⊙ C3-C5: TvP's are 2-pronged
- ⊙ C6: plate-like TvP's, extending downward and outward
- ⊙ C7: Highest spinous process and single pronged TvP
 - A cervical rib (if present) will articulate with C7 TvP
 - A true rib 1 will sometimes articulate with C7-T1 disc
- ⊙ ROM
 - C2-T1= 100 degrees flex/ext in cats
 - 15-30 degrees at each segment

CS: Anatomy & Biomechanics

- ⊙ Cervical ligaments:

Fig. 2-84 Nuchal ligament.

CS: Anatomy & Biomechanics

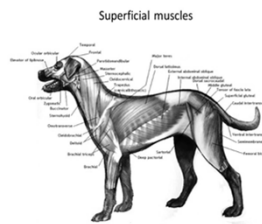
- ◎ Cervical Facet joints are oriented horizontally
 - Consistent with weight-bearing
- ◎ Caudal facet shapes: 4 variations
 - Plane, concave, convex, & sigmoid
 - More facet curvature in the caudal vertebrae
 - Larger breeds: may have risk for stenosis, instability, and DJD of facet and discs because of greater facet curvature.

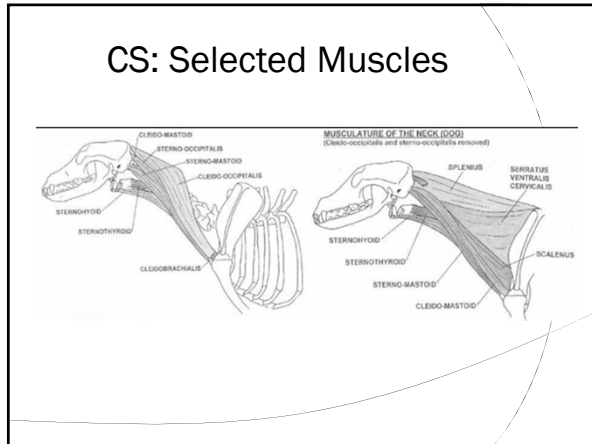
CS: Anatomy & Biomechanics

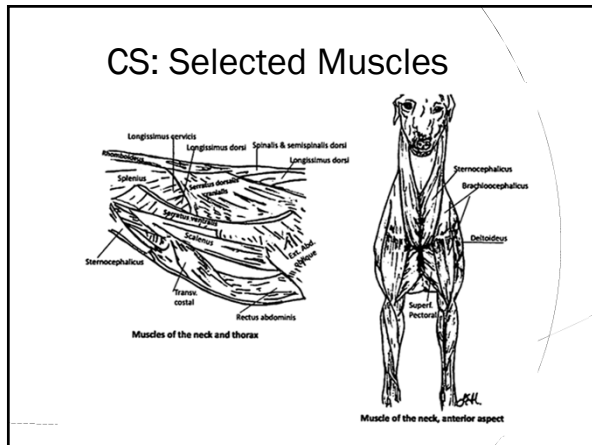
- ◎ Facet Joints:
 - Large Breeds: Higher ROM in flex/ext & side bending
 - Maximum ROM for lateral bending at C5/6
 - Small Breeds: Maximum ROM for lateral bending at C3/4
- ◎ Stress on annulus are maximal with lateral bending:
 - So disc degeneration risk is highest in large breeds and increases at the caudal cervical spine

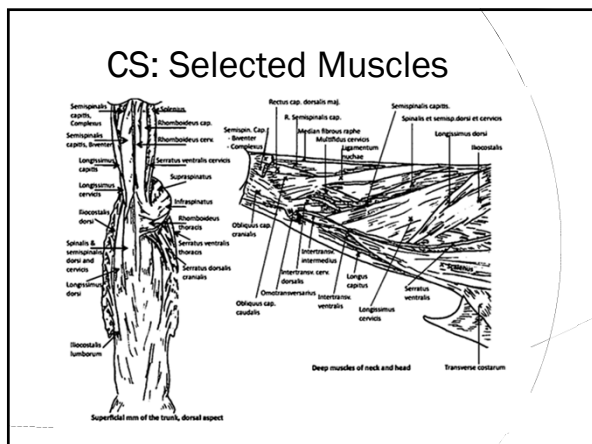
CS: Selected Muscles

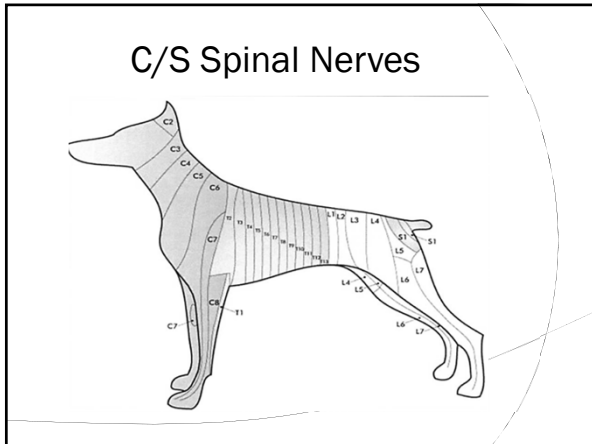
- ◎ Muscles of the Neck:
 - Brachiocephalicus
 - Cleidocervicalis
 - Cleidobrachialis
 - Sternoccephalicus
 - Omotransversarius
 - Splenius
 - Longissimus
 - Semispinalis
 - Suboccipital Muscles
 - Cervical Rhomboids
 - Multifidus
 - And the list goes on...











C/S Spinal Nerves

Table 2.2. Segmental Nerve Roots, Peripheral Nerves and Thoracic Limb Muscle Innervation (Messonnier 2000; Oliver & Lorenz 1999; Evan 1993)

Nerve	Nerve Roots	Muscles
Suprascapular N.	(C5), C6, C7	Supraspinatus, Infraspinatus
Subscapular N.	C6, C7	Subscapularis
Axillary N.	(C6), C7, C8	Teres Major, Teres Minor, Deltoides, (Subscapularis)
Pectoral N.	C7, C8	Superficial and Deep Pectorals
Musculocutaneous N.	C6, C7, (C8)	Biceps Brachii, Brachialis, Coracobrachialis
Radial N.	C7, C8, T1, (T2)	Triceps brachii, Extensor carpi radialis, Ulnaris lateralis, Common digital extensor, Lateral digital extensor
Median N.	C8, T1, (T2)	Flexor carpi radialis, Superficial digital flexor, (Deep digital flexor)
Ulnar N.	C8, T1, (T2)	Flexor carpi ulnaris, Deep digital flexor
Thoracodorsal N.	(C7), C8, (T1)	Latissimus Dorsi

- ### Mobilization
- ⊙ Passive & Active Movements
 - Preservation of full ROM
 - Preservation of strength and flexibility of particular tissue
 - ⊙ Physiological Movements
 - Active or passive FUNCTIONAL movements
 - ⊙ Accessory Movements
 - Conjunct movements
 - ⊙ BOTH are used to mobilize joints

Mobilization

- Selection of techniques
 - To **Open** a facet joint
 - Rotate or side bend AWAY from the side of pain
 - Dorso-Ventral Pressure is ON the side of pain
 - Transverse Pressures TOWARDS the side of pain
 - To **Close** a facet joint
 - Opposite of above, if D-V pressure direct pressure medial
- Always try OPENING first!!

Mobilization

- Selection of Techniques based on PATHOLOGY
 - Acute Pain or Nerve Root Symptoms
 - Static Traction- gentle
 - Chronic Nerve Root Symptoms
 - Central D-V pressure, rotations, traction
 - Discogenic signs
 - Generalized rotation
 - Facet Joint signs
 - Localized rotation
 - Osteoarthritis
 - Large movements throughout range (accessory and physiologic)

Effects of Joint Mobilization

- **Neurophysiological effects –**
 - Stimulates mechanoreceptors to ↓ pain
 - Affect muscle spasm & muscle guarding
 - nociceptive stimulation
 - Increase in awareness of position & motion because of afferent nerve impulses
- **Nutritional effects –**
 - Distraction or small gliding movements –
 - Cause synovial fluid movement
 - Movement can improve nutrient exchange due to joint swelling & immobilization

Effects of Joint Mobilization

- **Mechanical effects –**
- Improve mobility of hypomobile joints (adhesions & thickened CT from immobilization – loosens)
- Maintains extensibility & tensile strength of articular tissues
- Improved Circulation
- Restoration of passive/active movement

Contraindications

- Malignancy/ Bone metastasis
- Fractures and/or Dislocations
- Active bone infection (osteomyelitis/Tuberculosis)
- Osteoporosis
- CNS disease or injury
- Multiple/bilateral nerve root involvement
- Vascular disease

Precautions

- Inflammatory diseases
- Connective tissue instability- post trauma
- Disc lesions
- Medications-Corticosteroids, anticoagulants
- **CONTRAINDICATIONS specific to the canine patient**
- Patient's Temperament/ability to relax
- Fearful, aggressive
- Owner anxiety or lack of comprehension of the treatment to be administered

Maitland Joint Mobilization Grading Scale

- Grading based on amplitude of movement & where within available ROM the force is applied.
- Grade I
 - Small amplitude rhythmic oscillating movement at the **beginning** of range of movement
 - Manage pain and spasm
- Grade II
 - Large amplitude rhythmic oscillating movement within **midrange** of movement
 - Manage pain and spasm
- Grades I & II – often used before & after treatment with grades III & IV

Maitland Joint Mobilization Grading Scale

- **Grade III**
 - Large amplitude rhythmic oscillating movement **up to point of limitation** (PL) in range of movement
 - Used to gain motion within the joint
 - Stretches capsule & CT structures
- **Grade IV**
 - Small amplitude rhythmic oscillating movement at very **end** range of movement
 - Used to gain motion within the joint (Used when resistance limits movement in absence of pain)
- **Grade V – (thrust technique) - Manipulation**
 - Small amplitude, quick thrust at end of range
 - Accompanied by popping sound (manipulation)
 - Velocity vs. force
 - Requires Training

Indications for Mobilization

- **Grades I and II** - primarily used for pain
 - Pain must be treated prior to stiffness
 - Painful conditions can be treated daily
 - Small amplitude oscillations stimulate mechanoreceptors - limit pain perception
- **Grades III and IV** - primarily used to increase motion
 - Stiff or hypomobile joints should be treated 3-4 times per week – alternate with active motion exercises

Examine Prior to Treatment

- ⦿ If limited or painful ROM, examine & decide which tissues are limiting function
- ⦿ Determine whether treatment will be directed primarily toward **relieving pain** or **stretching a joint or soft tissue limitation**
- ⦿ Quality of pain when testing ROM helps determine stage of recovery & dosage of techniques

Examine Prior to Treatment: cont.

1. If pain is experienced **BEFORE** tissue limitation, gentle pain- inhibiting joint techniques may be used
 - Stretching under these circumstances is contraindicated
2. If pain is experienced **CONCURRENTLY** with tissue limitation (e.g. pain & limitation that occur when damaged tissue begins to heal) the limitation is treated cautiously – **gentle** stretching techniques used
- ⦿ 3) If pain is experienced **AFTER** tissue limitation is met because of stretching of tight capsular tissue, the joint can be stretched **aggressively**

Rhythm and Duration

- ⦿ Joint mobilization sessions usually involve:
 - If non-irritable
 - 3-6 sets of oscillations
 - Lasting 1 minute
- ⦿ If irritable
- ⦿ Perform 1 or 2 sets of oscillations
- ⦿ Lasting 20-30 seconds
- ⦿ Apply smooth, regular oscillations

Rhythm and Duration: cont.

- Vary speed of oscillations for different effects
 - For painful joints, apply intermittent distraction for 7-10 seconds with a few seconds of rest in between for several cycles
 - For restricted joints, apply a minimum of a 6-second stretch force, followed by partial release then repeat with slow, intermittent stretches at 3-4 second intervals

Traction

- May be effective in reducing pain caused by:
 - Herniated discs
 - Nerve root entrapment
 - Adjacent muscle guarding
 - Foraminal narrowing
- Contraindications:
 - Malignancy in the spine region
 - Infection
 - Osteoporosis
 - Spinal Deformities
 - Ligamentous Instability
 - Grade 2 or higher spondylolisthesis
 - Fractures/ spinal instrumentation

Kaltenborn Traction Grading

- Grade I (loosen)
 - Neutralizes pressure in joint without actual surface separation
 - Produce pain relief by reducing compressive forces
- Grade II (tighten or take up slack)
 - Separates articulating surfaces, taking up slack or eliminating play within joint capsule
 - Used initially to determine joint sensitivity
 - Vascular effect
- Grade III (stretch)
 - Involves stretching of soft tissue surrounding joint
 - Increase mobility in hypomobile joint

Traction Technique

- ⦿ Grade I traction should be used initially to reduce chance of painful reaction
- ⦿ 10 second intermittent grade I & II traction can be use
- ⦿ Distracting joint surface up to a grade III & releasing allows for return to resting position
- ⦿ Grade III traction may be used in conjunction with mobilization glides for hypomobile joints
- ⦿ Application of grade III traction oscillations within pain limitation to decrease hypomobility

S/S of Cervical Spinal Dysfunction

- ⦿ Disorders of upper CS:
 - Headaches, pain and stiffness or dizziness
 - Suboccipital pain, warmth on head
- ⦿ Disorders of the lower CS:
 - Suprascapular pain
- ⦿ **Dog CS S/S:** (clinical obsevation as noted by author)
 - Yelping with head movements/ head tilt
 - Front leg lameness

Dog Cervical Spine Symptoms: cont.


- ⦿ Palpable pain, muscle guarding and/or stiffness
- ⦿ Noted change in attitude/spirit
- ⦿ Inability to head shake (or constant head shaking)
- ⦿ Restricted head movements (can be in a capsular pattern)
- ⦿ Head down Posture
- ⦿ Avoidance to turn in a certain direction

Cervical Palpation Possible Findings

- Muscle Guarding along one or both sides of the C/ S
- Thickening of the musculature in the mid laminar area
- Thickening adjacent to one or more spinous processes
- Boney prominence over the lateral/posterior lateral of the articular process
- Thickening over the posterior articular process at one or multiple intervertebral level.


Cervical Palpation

- With head straight
- Assess the difference between the wings of the atlas and the mastoid process



Cervical Palpation

- Dog's head straight
- Palpate C2-C6- lateral side for vertebral bodies, transverse processes, extensor musculature
- C7 may need to be palpated from the ventral surface



Cervical Palpation

- ◎ Determine:
 - Temperature changes
 - Increase could be inflammation or increased sympathetic outflow
 - Quality and Texture
 - Thicker & tighter = older
 - Spongier = newer

Cervical AROM Testing

- ◎ Active/Functional assessment-willingness of the dog to move
- ◎ Muscles, tendons
- ◎ Cookie stretches in all planes
 - Flexion
 - Extension
 - Side bending/Lateral flexion

Cervical AROM Testing

- ◎ ROM testing of upper C/S:
 - Flexion (O-C1): Nose to upper chest
 - Extension (O-C1): Nose moved in a forward direction first then up toward ceiling
 - Rotation (C1-2): Nose 'pivots' around the estimated longitudinal axis of the dens of C2
- ◎ ROM testing in the caudal C/S:
 - Flexion: Nose to lower chest
 - Extension: Nose to ceiling (90°) to remainder of vertebral column
 - Sideflexion/rotation: Nose to lateral chest wall

Cervical PROM

- ◎ Passive Range of motion
 - Testing the structures- bone, ligament and nerve
 - End Feel
 - Flexion- OPENS facet joints
 - Extension- CLOSES facet joints
 - Lateral Flexion- opens jts and soft tissue on contralateral side
 - Closes together the joints/tissue on ipsilateral side

Movement Awareness

- ◎ Assess the quality (i.e. sensation throughout motion with the endfeel)
- ◎ Assess the quantity (i.e. ROM)
- ◎ Assess for symptoms (i.e. pain response)


Cervical Assessment

- ◎ Lateral glide:
- ◎ Assess side to side motion
- ◎ Using fingertips on both side of vertebra, gently press on it from side to side from C2 down to C7
 - May have to move cranial border of the scapula caudal to feel C7




Cervical Assessment

- Ventral Glides:
- Dog can be sitting, standing, or lying sternal.
- Using fingertips, push vertebra from the dorsal surface ventrally
- Opposite hand over/under muzzle to support head
- Continue from C2 down to C7




Cervical Assessment

- Dorsal Glides:
- Locate the ventral surface of the vertebra, (avoid direct pressure on the esophagus or trachea)
- Gently press up on the ventral surface causing a dorsal glide
- Opposite hand can apply light pressure on the head




Cervical Assessment

- Rotation Glides:
- With one hand over dogs muzzle, place head into slight flexion
- Opposite hand can palpate the dorsal or ventral surface of C2-C7 to assess motion at these segments




C/S Treatment Techniques

- ◉ Side Glides in Flexion and Extension:
- ◉ Use side of hand to medially glide the transverse process of one vertebra, and side bend the dogs head over your hand
- ◉ Move from C2-C7
- ◉ Attempt in both flexion and slight extension




C/S Treatment Techniques

- ◉ Side Glide with Rotation:
- ◉ Perform side glide as previously shown but adding a dorsal motion, creating an ipsilateral side bend
- ◉ Move from C2-C7
- ◉ May perform in flexion and extension




C/S Treatment Techniques

- ◉ Specific Facet mobilization
- ◉ With fingertips, apply pressure to stabilize the lateral side of one vertebra
- ◉ Opposite fingertips apply pressure to the lateral side of the other vertebra cranial to open or push caudally to close




Cervical Traction

- With dog in sternal recumbency, place your thumbs on both sides of occiput and gently push away
- With slow gentle pressure, the dogs will relax and lower head
- Maintain steady pressure Start at 5-10 lbs
- If tolerated well, hold for 30-60 seconds and slowly release
- Repeat 3-5 times




Cervical Traction

- With head supported.
- Grasp behind the skull and push away.
- Other hand anchors on the dogs shoulders/ scapula



Cervical Traction

- Traction with the neck in slight flexion decreases the pressure in the subarachnoid space and may be beneficial for dogs with Wobbler's Syndrome
- Lesions in the lower cervical spine- place neck in slight flexion
- Lesions in mid-cervical spine- place neck in a neutral position



Case Study #1 Smidgen Capsular Restriction

- ⦿ **Hx:**
- ⦿ 18m/o intact female Border Collie
- ⦿ Owner c/o concerns about her agility dog who jumped off the top of the A-Frame 2 days ago.
- ⦿ Trip to vet reveals no significant findings
- ⦿ Dog landed on all 4's from 6ft high. No obvious signs of lameness after incident.
- ⦿ No medication given

Case Study #1 Smidgen

- ⦿ **Initial Observation:**
- ⦿ Dog is happy bright, jumping up to kiss and say hello.
- ⦿ Head is in alignment and is held in normal upright position.
- ⦿ Eyes are open, and face is relaxed
- ⦿ Dog shakes head without restriction and is rolling on back to entice me to say hello.

Case Study #1 Smidgen

- ⦿ **Structural Observation:**
 - Sitting/Standing/Lying: Normal
- ⦿ **Objective Findings:**
 - Quick screen done of Bilat. Forelimb/ TS/LS and Neuro. No significant findings.
 - **Gait:** WNL
 - **CS AROM:**
 - upper CS Rot/Flexion/Extension WNL
 - Lower CS Rot: decreased RR end range
 - Lower CS flexion/extension WNL

Case Study #1 Smidgen

Objective Findings (cont.):

- **PROM:** Dog not cooperative
- **Palpation:**
 - Tender mid-cervical along paraspinals and over facet joints C3/4, 4/5 on the L.
- **Palpation for Position:**
 - Atlas position = relative to mastoid process
 - Otherwise WNL

Case Study #1 Smidgen

◎ **Mobility Testing:**

- Done in sitting:
 - SBR restricted C3/4 4/5
 - 1st Rib WNL
- Done in Lying:
 - RR restricted C3/4 4/5
 - D/V no restriction
- Flexibility WNL

Case Study #1 Smidgen

◎ **Significant Findings:**

1. Tenderness along paraspinals / Facet Jts. L C3/4 & 4/5
2. SBR restricted C3/4 & 4/5
3. RR restricted C3/4 & 4/5
4. Decreased ROM RR

◎ **Treatment Plan:**

- Laser Facet jts. & paraspinals
- Mobilization of L facet jts. With RR grd 3-4 (overpressure on L TvP with RR passive or active), SBR grd 3-4 (lateral glide, push R TvP L with passive/active SB).
- Soft tissue release tech to reduce paraspinal guarding
- Teach owner chin tucks x10 3x's/day, cookie stretches to shoulder and elbow and chest 2-3x's for 15-30sec hold use peanut butter or baby food for the hold.

Case Study #2 Klymer Facet Capsular Entrapment

- **Hx:**
 - 6y/o Golden presents with acute onset of yelping and crying when playing in yard and turning right during obedience training. He is reluctant to play with other dogs in the house and has been moving slowly with his head down.
 - Intermittent R FL lameness for a couple of steps after rest
 - Occurred 3 days ago and is worse.
 - Visit to vet with x-rays, no findings. Given Robaxin and Rimadyl, with suggestion for PT

Case Study #2 Klymer

- **Initial & Structural Observation:**
 - Head slightly rotated to L with low head posture. Bilateral elbow flexed and scapula elevated. Eyes and demeanor is tense with slight panting noted.
- **Gait:**
 - Walk: No visible lameness, head deviated to Left and low head posture.
 - Trot: Reluctant to trot, once in trot R FL limited flex/extension.

Case Study #2 Klymer

- **AROM/PROM:**
 - Upper rot: painful RR and limited
 - Lower rot: severe limitation and yelp
 - Lower ext: Muzzle deviation L with restriction and yelping.
- **Flexibility:** decreased R sh. flexion
- **Neuro screen:** neg
- **Palpation:** Severe mm guarding CS paraspinals and suboccipital region. R>L. TvP and facet jt. Tenderness. R masseter, sternocephalicus and omotransversarius mm tender and guarded.

Case Study #2 Klymer

- ◉ Palpation for position: R 1st rib elevated CS WNL
- ◉ Mobility:
 - Sitting: D/V, RSB, & RR @ C4/5, limited by pain
- ◉ Significant Findings:
 1. Increased Pain & mm guarding
 2. Decreased ROM/Poor posture
 3. Tender to palpation R parasp/facet jt., TvP and Omo/sterno
 4. R 1st rib elevation
 5. Painful D/V, RR, RSB @ C4/5

Case Study #2 Klymer

- ◉ Treatment Plan:
 1. Tx, manual rx, and Laser to reduce pain and mm guarding
 2. Mobilization tech to C4/5 LR & LSB grd 2-3
 3. Mobilization to 1st rib depression grd 3-4
 4. Teach owner heat x 15 min, cookie stretch to elbow B, LR with R scap stabilized 2x15-30 sec hold 1-2x's/day. Start chin tucks x10 3-4x's/day on day 2-3 or if no pain with chin tuck. Single leg stand 5x10sec hold B, shoulder flexion stretch 2X30sec.

C/S: Conditions

- ◉ A note about Disc Lesions, Nerve Root Compression, Wobblers (caudal cervical spondylomyelopathy)
 - Nerve root compression may be accompanied by a root signature stance, lameness, or excessive licking or chewing of a forelimb.
- ◉ The Therapist should try to OPEN the suspected nerve root foramen using a technique that opens the facet joint. (contralateral side glides, traction and specific facet opening)

Conclusion:

- Many of these techniques are very helpful on their own and may seem adequate as a treatment. Remember: when used in conjunction with other complimentary treatment techniques the effectiveness is even greater.

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