Equine Sports Medicine

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- Conditioning Principles
- Rehabilitation Strategies
- Bisphosphonate Use
- Stifle Lameness
  - SI, Hip, Soft Tissue, Back

- Sports Medicine in Equine Practice
  - Conditioning guidelines
  - Rehabilitation of injury – modalities
  - Guidelines – tissue based

- Implementation of Rehabilitation Therapy for Injury and Post-Surgical Success.
  - Types of rehabilitation modalities, when to use, how to progress, what can you do if you don’t have the equipment
Conditioning Principles

• Why?
  • Improve Performance
  • Reduce Risk of Injury

Conditioning Principles

• Goals
  • What is the type of work the horse does or is going to do?
  • What level of training does the horse have?
  • What level of fitness is desired (realistic)?
  • When is the endpoint?
  • What amount of time can be committed by the owner/trainer?
  • What facilities and equipment are available?

Muscular Response to Exercise Training

• Aerobic production of ATP – Slow, Efficient
• Anaerobic production of ATP – Rapid, Inefficient
• Muscle Fiber Type
  • Type I/IIA → Endurance Capacity
  • Type II → Sprint Capacity
Muscular Response to Exercise Training

• Adaptation
  • Mediated by structural and functional plasticity of myofibers
  • Long-term adaptation occurs independently from short term physiologic responses to individual bouts of exercise

Muscular Adaptation

• Depends on stimulus (type, duration, intensity, frequency of exercise)
  • Hypertrophy
  • Remodeling without hypertrophy
  • Mixed

Tendon/Ligament Adaptation

• Age and exercise related effects
  • Stiffness
  • Crimp pattern
  • Collagen fibril diameter
    • Young
      • Large number of small fibrils
      • Small number of large fibrils
    • Old
      • Mostly small fibrils
  • GAG and COMP content
Bone Adaptation

• Strain-based
• Wolff’s Law – Repeated change in strain distribution leads to remodeling of architecture
• Gait transition – reduces strain
  • High speed trot vs. canter/lope (~42% reduction)

Respiratory Capacity

• Quick increase in O$_2$ uptake, VO$_{2\text{MAX}}$
• Mostly due to an improvement of cardiovascular function
  • Cardiac Output, Stroke Volume
• Improved alveolar extraction of O$_2$ (Hg affinity)
• 3 weeks detraining → return to pre-trained levels
• Pulmonary function is a limiting factor to performance

Body Fluids/Electrolytes

• Total Body Water (TBW) = 300L in 450 kg horse
  • TBW (300L) = Intracellular Fluid (200L) + Extracellular Fluid (100L)
  • ECF (100L) = Plasma Volume (22L) + Interstitial Fluid (36L) + Transcellular/GI Fluid (42L)
  • Blood Volume (36L) = Plasma Volume (22L) + Red Cell Volume (16L)
• Training induced hypervolemia
  • Plasma volume followed by a slow RCV increase
  • Enhance cardiovascular and thermoregulatory function
Acid/Base

- Sprint Training
  - Improved buffering capacity (non-bicarbonate)
  - Improved ability to utilize pyruvate

Rehabilitation

- Goals
  - Control pain
  - Continue healing process (tissue strengthening)
  - Reduce swelling
  - Restore function

- Injury type, tissue, severity, chronicity, intended use
When to Incorporate Rehabilitation

- Back
- Neck
- Joints
- Tendon/Ligament
- Muscle
- Neuro
- Non-MS Post-op – eg. abdominal surgery
- Cardiorespiratory – eg. illnesses, detrained → conditioning

Rehabilitation Modalities

- Rest
- Cold Water Hose
- Cold/Ice
- Compression
- Stretching
- Passive Range of Motion
- Treadmill
- Aquatread
- Swimming
- In-Hand/Walkers
- Under Saddle
- Salt Water Spa
- Vibration
- Laser
- Heat
- Magnetic Field/Pulsed Magnetic Flow
- Neuromotor Control (tape, proprioception)
- Electrotherapy (TENS)
- Chiropractic
- Massage
- Acupuncture
- Extracorporeal Shockwave
- Therapeutic Ultrasound
- Regenerative
- Cryotherapy
- Counter-irritation

Rest

- Reduce strain on injured tissue
  - Prevent further insult
  - Allow natural healing process
- Complete Immobilization – Cast, Splints, etc.
- Sling
- Stall Rest
- Paddock Rest
Cold water hose

- 15-20 min 2-3x/day
- Massage effect – increase lymphatic drainage
- Cold – mild vasoconstriction
- Reduce edema
- Reduce muscle spasm
- Cleansing (eg. Wounds)

Cold/Ice

- Vasoconstriction (4-6 minutes)
- Deep tissue vasodilation (>6 min → lasts for ≈12 min)
  - Then 15-30 min cycles of constriction/dilation
- Reduce muscle spasm
- Mild analgesia (except bone)
- Decrease cellular metabolism
- Decrease vascular permeability
- Ice water (15 min 2-3x/day)
  - Various boots
    - Some with addition of compression/massage/vibration

Compression

- Support healing tissue
- Reduce edema
- Limit joint range of motion
Stretching – Manual Therapy (Passive Mobilization)

• Reduce stiffness
• Increase flexibility and elasticity
• Strengthen tissue (+/-)
• Lengthening of muscle and connective tissue (+/-)
• Prevention of injury/re-injury
• Reduce pain apprehension

• 5-20 minutes/day

Passive Range of Motion

• Flexing and extending joint to or slightly past the point of resistance and discomfort
• Increase flexibility (↓stiffness) of a joint

• 10-20x once to twice daily

Treadmill (dry)

• Walk to high-speed
• Usually can incline
  • Increase workload without increasing speed and strain
• Core/Back strengthening
• Re-educate gait
  • Forces cadence and even stride length
Aquatread

- Altered by speed and water depth
- Increase stride length (deeper water)
- Increase range of motion (e.g. Carpus – water at mid-cannon)
- Core/back strengthening
- Increase buoyancy – Decrease weight force by as much as 60% (shoulder level)
- Hydrostatic pressure – decrease edema
- Viscosity – enhanced neuromuscular control
- Minimal effect on cardiovascular function

Swimming

- No weight force
- May have cardiovascular benefit
  - Or equivalent to ground exercise
- Caution in horses with neck or back pain
  - Arched back and elevated neck

In-Hand Exercise

- Easy to do and inexpensive
- Controlled walking
- Mobilizes tissue
- Neuromuscular activation and training
  - Incline
    - Engage core muscles
Under Saddle Exercise

- Natural progression back to work
- Increasing gait speed
  - Increase forces on bone and connective tissue
- Neuromuscular control

Salt Water Spa

- Temperature
  - Cold – ↓ metabolism, ↓ vascular permeability, vasoconstriction
  - Warm – Stimulate circulation
- Salt concentration – osmotic effect
  - Epsom salt – Mg, SO\(_4\)
  - Dead Sea salts – K, Ca, Cl, Br
- Aeration
  - Massaging effect
  - Hydrostatic pressure - depth

Vibration

- Induce reflex muscle tonic activity
- Neuromotor control
- Bone metabolism effects
- Circulation
- Cellular metabolism

- Evidence?
Laser

- Increase local circulation, reduce inflammation, pain reduction, promote healing
- Cellular signaling and metabolism
  - Frequency based
- Depth
  - Wavelength and power
- Chromophore stimulation (Photochemical reaction)
  - Wavelength
- Can be used to stimulate acupuncture trigger points
- Class IV – (K-Laser ™)

Heat

- Wraps - Back On Track®
- Heat packs
- Warm water
- Chronic or late acute phase injuries
- Reduce muscle spasm
- Alleviate pain
- Reduce stiffness/increase elasticity
- Causes vasodilation – not for acute injuries or infection

Static Magnetic / Pulsed Electromagnetic Field

- Transmitted through low impedance tissues
  - High fluid content – soft tissue (muscle and nerve) – esp. injured
- Restore damage cellular membrane potential and ionic transport mechanisms
- Reduces edema
- Speed collagen fiber maturation
Neuromotor Control

- Injury of connective tissue may limit sensory pathways
  - Joint capsules, ligament, muscle, tendon
- Improve Proprioception
- Retrain Movements
- Kinesio Tape
  - Muscle timing
  - Proprioception
- Weighted Boots
- Tactile Stimulants
- Obstacles

Electrotherapy

- TENS – Transcutaneous Electrical Nerve Stimulation
  - Relieve pain
    - Inhibit muscle spasm
  - Depolarization of pain fibers (gate) 110Hz – acute
  - Release of opioid mediators 2-5Hz – chronic
  - Stimulate healing – via increase in local circulation
- NMES – Neuromuscular Electrical Stimulation
  - Activate and strengthen muscles

Chiropractic

- Restore normal joint function
- High-velocity, Low-amplitude movements
  - Manual
  - Activator – Reflex based
- Mechanoreceptor limit joint motion → Reset
- Reduce pain and muscle hypertonicity
- Stimulation of nociceptive reflexes
Massage

- Petrissage – Firm kneading
- Effleurage – Stroking parallel to fibers
- Tapotement – Rhythmic percussion
- Friction – Deep, specific and local
- Increased muscle compliance - relaxation
- Change circulation
- Hormone and psychophysiologic changes – endorphin release
- Mobilization of scar tissue

Acupuncture

- Stimulation of predetermined points to achieve a therapeutic or homeostatic effect
- Descending pain inhibitory system
- Acupoints – microtubules containing free nerve endings, arterioles and venules that penetrate fascia.
- Stimulate nerves
- Increase local microcirculation
- Relieve muscle spasms
- Release various neurotransmitters.

Herbal/Homeopathic

- Traumeel
- Zeel
- Sarapin
- P-Bloc
- Poultices
- Etc., etc., etc.,
Extra-corpeal Shockwave

- Pressure wave – Rapid rise, high peak pressure, gradual decrease in pressure. (Often with negative pressure component).
- Focused vs. Radial
- Dose dependent effect – Energy density and Pulse number
- Release energy at tissue interfaces – Changes in acoustic impedances
- Bone, connective tissue
- Osteoarthritis, navicular disease, tendonitis, desmitis
- Back pain

Therapeutic Ultrasound

- Tendinitis, desmitis, myositis, joint disease
- Can cause overheating and inflammation if used improperly
- Thermal effect
  - Increase circulation
  - Prolonged nerve transmission velocity
- Non-thermal effect
  - Micro-massage – increase cell membrane potential, permeability, and transport mechanisms
  - Acceleration of inflammatory phase
  - Decreased pain
- Frequency determines depth
- Intensity and time \( \rightarrow \) dose

Regenerative Therapies

- Stem Cell
- IRAP/ACS
- PRP
- Concentrated Bone Marrow
Mesotherapy

- Intra-dermal injection – multi-injector
  - At level of lesion and caudal to it
  - Varying medication – (Ross, 2011) Lidocaine, dexamethasone, muscle relaxant
- Gate-control pain relief
  - Type I and II nerves – collateral inhibitory fibers
- Back pain

Cryotherapy

- Freeze-firing
  - Bucked shins and splints, etc.
  - Soon after inflammatory phase has subsided
  - Local periosteal nerve analgesia
    - Type C pain fibers
    - Fibrosis and thickening of connective tissue

Counter-irritation

- Pin-firing – currently has limited use and ethical question
  - Still being used in some areas (with success)
- Blister – external
  - Desmitis, tendinitis, splints, curbs, etc.
  - Acceptance as therapy has declined (depending on discipline)
- Blister – internal
  - 2% Iodine in almond oil
  - Patellar ligaments (among others)
Prolotherapy

• Form of counter-irritation (less severe)
• Dextrose, Glycerin, Phenol, Lidocaine
• B12
• Muscle, tendon, and ligament

Other Points

• Client misinformation
• Testimonial “evidence”
• Empty and unproven promises

• Adjunctive therapies to help healing speed and quality along with improvement of comfort during the recovery and rehabilitation time

• The most important player in the game is the individual’s normal physiology and natural progression of healing
  • “Heal in spite of, Not because of what we do”

Rehabilitation Guidelines

• What is the injury? Tissue type? Stage? Severity?
• What modalities are accessible?
• What are the clients restrictions? Financial, physical, philosophical?
Tendonitis/Desmitis

- Injury Assessment
- Acute Phase
  - Stall rest with early hand-walking or passive motion (depending on severity)
  - Ice – 30 min 2x/day 2-3 weeks
  - Compression
  - Anti-inflammatory – NSAIDs
  - PSGAGs
  - +/- Splitting
  - Ultrasound 2-4 weeks post-injury (every 3-6 weeks thereafter)
- Sub-acute Phase
  - Lesional treatment – MSCs, PRP, Shockwave, etc.

Tendonitis/Desmitis

- Rehabilitation
  - Aquatread (Mid-body water level) – slowly progressive (5 min. +)
  - Laser/therapeutic ultrasound
  - Shockwave
  - Over-ground exercise
    - Hand-walking > increase time > ridden walk > increase time > Add trot > increase time > Add lope > increase time > begin athletic training
    - Re-evaluate and monitor – especially before progressing (keep logs)
Arthroscopy (Osteochondral Fragment Debridement)
- Stall rest with passive range of motion and hand-walking
- NSAIDs
- Ice
- Compression
- Hand-walking
- IRAP/APS
- HA/PSGAGs
- Small paddock turnout – or stall rest with aquatread
- Ridden walk ➔ Progressive

Back Pain
- First ➔ accurate diagnosis - imperative
- Generally
  - NSAIDs
  - Muscle Relaxants
  - Rest – stall/hand-walk or small turnout – depending on severity
  - Ice (initially if acute)
  - Heat
  - Chiropractor
  - +/- Acupuncture
  - Laser
  - Massage +/- Linaments
  - Stretching

Back Pain
- Mesotherapy (chronic and uncontrollable)
- Prolotherapy
- Aquatread
  - Strengthen back, neuromuscular activation, inhibit spasm, increase flexibility
- Check saddle/pad fit
Bisphosphonate Use in Equine Practice - Navicular Disease and Beyond

- Experience with Clodronate Injection.

Clodronate - Bisphosphonates

- During times of chronic bone disease or stress (navicular disease) bone remodeling is accelerated
  - *Increased bone resorption* compared to bone formation

- Bisphosphonates regulate bone metabolism
  - *Inhibition of bone resorption*
  - Balance osteoclast vs. osteoblast activity
    - Reducing the number of active osteoclasts
Treatment

- Bone is made of mineral, osteoid, cells, & water
  - Bone mineral is composed of calcium phosphate crystals
  - Bisphosphonates bind to CaP crystals
  - Inhibits their formation and dissolution

- Clodronate
  - Bisphosphate

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Bone Remodeling
- determined mostly by osteoclasts and osteoblasts

1. Activation: abnormal stress to bone sensed by osteocytes, who send signals to osteoclasts
2. Resorption: osteoclasts dissolve bone mineral and digest the osteoid
   - Osteoclasts use ATPase proton pumps to acidify the bone matrix, causing calcium phosphate to dissolve
   - Release of degradative enzymes to digest the remaining osteoid
   *This process causes bone inflammation & pain*
3. Reversal: during this phase bone resorption transitions to bone formation
4. Bone formation: osteoblasts make new bone (osteoid) until the resorption cavity is filled
5. Mineralization: osteoblasts promote calcification of osteoid & mineralized bone is created

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Bone Remodeling & Bisphosphonates

- Bone resorption process complete within ≈ 3 weeks
- Bone formation process (including mineralization) takes ≈ 3 months
- During times of chronic bone disease or stress (navicular syndrome) bone remodeling is accelerated
  - Increased bone resorption compared to bone formation
- Bisphosphonates regulate bone metabolism through inhibition of bone resorption & balance osteoclast vs. osteoblast activity by reducing the activity of the osteoclasts.
Bisphosphonate Therapy

- Human medicine for ~40 years for treatment of various diseases of abnormal bone metabolism by inhibiting bone resorption.
  - Bone Neoplasia
  - Osteoporosis
- Applicable to treatment of equine navicular syndrome to decrease excessive bone remodeling.

Bone is made of mineral, osteoid, cells, & water
- Bone mineral is composed of calcium phosphate crystals
- Bisphosphonates bind to CaP crystals
  - Inhibits their formation and dissolution
- Structural cells of bone include osteoblasts, osteocytes, and osteoclasts.
  - Osteoblasts - secrete osteoid which mineralizes to bone
  - Osteocytes - trigger bone remodeling cascade in response to mechanical influences
  - Osteoclasts - responsible for bone resorption
- Bisphosphonates inhibit osteoclast function
  - Reduces the number of active osteoclasts

Osteoclast Inhibition

- Clodronate bound to CaP/Hydroxyapatite
  - Osteoclasts take up clodronate
  - Cytotoxic → Apoptosis
- Does not readily enter other cells
  - Liposomal encapsulation
    - Intra-articular
Non-Nitrogenous Bisphosphonates

- Metabolized in cell \( \rightarrow \) replace terminal pyrophosphate moiety of ATP
- Forms non-functional molecule that competes with ATP used in cellular metabolism
- Osteoclast \( \rightarrow \) Apoptosis/cell death

Nitrogenous (aminobisphosphonates) inhibit mevalonate pathway involved in lipid and protein production responsible for complex cell signaling. Higher affinity for bone. Eg: Zoledronate

Bisphosphonate Effects

- Anti-inflammatory
- Increased inflammatory mediators (non-nitrogenous)
- Cartilage protective
- Anti-neoplastic
- Anti-resorptive
- Decrease biomarkers of resorption
- Increased bone mineral density
- Directly related to inhibition of osteoclasts
- Analgesic
  - Independent of anti-resorptive effect
  - Neuron interaction (K\(^+\)-ATP channel)

Anti-Inflammatory and Chondroprotective

- IA tx - \( \downarrow \) synovial macrophages and adhesion molecules (clodronate)

- \( \downarrow \) cartilage degeneration and \( \uparrow \) Extracellular matrix production (clodronate)
  - Rosa et al. Osteoarth Cartilage, 2014
Anti-Inflammatory and Chondroprotective

- ↓ loss of COMP in induced arthritis (clodronate)
- ↓ inflammation and cartilage destruction via ↓ phagocytic synovial lining cells (clodronate)

Anti-Inflammatory and Chondroprotective

- ↓ inflammation and ↓ bone loss associated with arthritis (clodronate)
  - Osterman et al. J Pharmacol Exp Ther, 1996
- ↓ joint swelling, inflammation, and cartilage destruction in chronic arthritis (clodronate)
  - Deltzer et al. Inflamm Res, 2000

Anti-Inflammatory and Chondroprotective

- Slight ↓ in Nitric Oxide production by inflammatory activated chondrocytes (clodronate, pamidronate, risedronate)
- ↓ TNF-α, ↓ IL-6, ↓ MMP-9 in OA synovial fluid of horses (pamidronate)
Anti-Inflammatory and Anti-Neoplastic

- ↓ IL-6 and TNF-α
  - Monkonen et al. Life Sci, 1994 (cladronate)
- Anti-inflammatory and anti-neoplastic activity
  - Santini, Biodrugs, 2004 (most BPs)
- ↓ Bone metastasis
  - Erdogan. Asian Pac J Cancer Prev, 2014 (most BPs)
  - Kanis. Bone, 1996 (cladronate)

Anti-Neoplastic and Anti-Resorptive

- ↓ Bone metastasis, ↓ Bone resorption (↓ NTX) (pamidronate)
- ↓ Bone Resorption, ↓ NTX, ↓ CTX, ↓ urinary Ca** (cladronate)
  - Tsai et al. Calcified Tissue Int, 1999
  - Brown et al. Calcified Tissue Int, 2007

Analgesic

- Analgesia independent of anti-resorptive activity (cladronate)
- Analgesia related to ATP-sensitive K+ channel effect (etidronate)
  - Kawabata et al. Neurupharmacology, 2006
- ↓ pain related to equine vertebral OA (tiludronate)
- ↓ lameness associated with navicular disease (tiludronate)
OSPHOS® (clodronate injection)

**Indication:**
For the control of clinical signs associated with navicular syndrome in horses

**Route of administration:**
Intramuscular (IM)

**Dosage:**
Administer 1.8mg/kg IM up to a maximum dose of 900 mg (15ml) per horse. Divide the total volume equally into 3 separate injection sites.

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

OSPHOS® Clinical Field Study

- Multi-site, double masked, placebo-controlled
- Study Animals:
  - 4-22 years
  - 49% of enrolled horses were American Quarter Horses
  - Remaining were various breeds with a predominance of Warmbloods
  - Horses were enrolled at a 3:1 ratio of drug : control

OSPHOS® Clinical Field Study

- **Inclusion Criteria:**
  - Unilateral/Bilateral Forelimb lameness ≥ Grade 2 (AAEP 0-5)
  - Positive response to palmar digital nerve block
  - **Radiographic** evidence of degenerative bony changes in the navicular bone
OSPHOS® Clinical Field Study

• Exclusion Criteria:
  • Hindlimb lameness
  • < 4 yrs old
  • Neurectomy
  • Concurrent Treatments (NSAIDs, Steroids, HA, Pentoxifylline, Shockwave, etc.)
  • Change in shoeing within 2 weeks. Required to remain consistent for study.

OSPHOS® Clinical Field Study

• Radiographic Exclusion Criteria
  • Distal border fragments
  • Collateral ligament mineralization
  • DDFT calcification
  • Severe flexor surface erosions
  • Cystoid lesions in NB, P3, P2
  • Bony proliferation in P2 or NB flexor cortex
  • P3 extensor changes
  • P3 rotation
  • Fractures
  • Bipartate NB

OSPHOS® Clinical Field Study

Results Day 56 Effectiveness:

• 114 horses (OSPHOS n=86, Saline n=28)
• Difference in success rates significant at P=0.0028

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<th>OSPHOS</th>
<th>Saline</th>
<th>P Value*</th>
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<tr>
<td>74.7%</td>
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<td>3.3%</td>
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<td>84/86 horses</td>
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<td>1/28 horses</td>
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OSPHOS® Clinical Field Study

Summary of Adverse Events

- Mild and self-limiting
- Clinical signs related to mild agitation
  - Nervousness
  - Yawning
  - Lip licking
  - Head-bobbing
- Mild colic observed in 10 horses
  - 8 resolved with hand walking (~15 min)
  - 1 resolved with no treatment
  - 1 was treated for colic and hives
- Swelling at injection site occurred at 2/248 clodronate injection sites (0.8%)

Behavior After Injection

- Monitor for signs of colic for the next 2-3 hours
- Water intake and urination
  - Don’t give to horses with previous renal disease
My Expectations

- Lameness improvements
- Possibly no change in diagnostic imaging
  - Radiographs
  - CT
  - MRI
  - Shouldn't worsen – IE. “Stabilize”

12 yr old QH F – Barrels – Bilateral forelimb 2/5. Blocks 80% to PDN.
Tx: wedge PLR, Rigid sole pack, OsPhos. “70% improved”

14 yr old QH F – Western Pleasure – 2/5 bilaterally – blocks to PDN. Originally severely broken back hoof pastern axis. U/S tendon sheath effusion and possibly thinned medial aspect of suspensory ligament of the navicular bone.
Tx: Wedge heel, Coffin joint and bursa injections, OsPhos. Noticed “release” during bursa injection
Showing well.
Repeat OsPhos at 7 months
4 yr old QH Gelding – Reining – Previous SDFT strain.
U/S now normal. LF 2/5 Blocks to PDN 75% Hoof test 2+ over frog. “Good horse and don’t want to take chances.” Tx: OsPhos and continue work at 50% with gradual increase and close monitoring. Made it to about 90% sound.

9 yr old QH mare – Barrels. LF 2/5 PDN: switches to RF.
Moderately under-run heels and contracted.
Tx: Shoe rocker toe with 3 degree wedge pad. OsPhos 3 months later: LF 2/5. Hoof test 1+ on frog. No structurally sound heel. Steel shoe, impression material 3 degree wedge pad. Float heels. Improved to less than 1/5 within 2 weeks.

19 yr old QH mare – Team Roping. LF 3/5 PDN: Switched.

12 yr old QH mare – Barrels. RF 2/5. 2+ hoof test over frog. PDN: 70% improvement. Basilar sesamoid 90% over baseline. PFR wedges Rigid Sole Pack. OsPhos.
6 yr old reining horse – Bilateral 2/5. PDN: 80%+ Shoe with pads and reduced breakover. OsPhos, Iloprost.

18 yr old Paint Gelding – Team Roping. LF 3/5. PDN: Switches to RF 3/5. Tx: 3 degree wedge pad, impression material, Avant shoe, OsPhos. @3 weeks – 1/5 LF.

9 yr old QH mare – Penning. RF 3/5. PDN: 90% Tx: OsPhos, Coffin joint and bursa injections, wedge heel pad, PF. Guarded prognosis. 60 days RF 2/5, 120 days RF 3/5. Repeat OsPhos and bursa injection. 30 days later RF 2/5.
10 yr old QH Gelding - Trail/4-H - RF palmar digital neurectomy 6 years previously. Currently has skin sensation at heel bulbs. 4/5 RF lameness. Wants to make comfortable. Tx: OsPhos, barefoot, small pen, Firocoxib (no coffin joint injection)

8 yr old QH mare – LF 3/5 Hoof test 3+ over lateral heel (no abscess). 1+ LFF. Lateral PDN: 60% better. Medial PDN: 90% over baseline. Tx: Transition rocker, rolled heel and impression material. OsPhos

10 yr old QH Gelding - Ranch
Warmblood Mare. RF 3/5. P3 cyst – confirmed on MRI. Treated with tiludronate.

4 yr old QH G – Reining

4 yr old QH F – Reining. LF 2+/5 (mildly worse on outside of circle). IRU prox. MC3. Ultrasound: Proximal edema, min. increase in thickness, size, etc. Moderate roughening of caudal cortex. Tx: OsPhos, 30 days rest / barb2right. LF 1/5. IA mid-carpal. Continue rest/controlled limited exercise for an additional 30 days. Follow-up images (esp. nuc. scint.) would have been interesting (moved out of country).

4 yr old QH F – Reining. UF 2+/5 (mildly worse on outside of circle). IRU prox. MC3. Ultrasound: Proximal edema, min. increase in thickness, size, etc. Moderate roughening of caudal cortex. Tx: OsPhos, 30 days rest. UF 3/5. IA mid-carpal. Continue rest/controlled limited exercise for an additional 30 days. Follow-up images (esp. nuc. scint.) would have been interesting (moved out of country).
4 yr old QH F – Reining. LF 2+/5 (mildly worse on outside of circle). IRU prox. MC3. U/S. Proximal edema, min. increase in thickness, size, etc. Moderate roughening of caudal cortex. Tx: OsPhos, 30 days rest 1/2 LF 1/2. IA mid-carpal. Continue rest/controlled limited exercise for an additional 30 days. Follow-up images (esp. nuc. scint.) would have been interesting (moved out of country).

17 yr old QH Gelding – Swelling on right mandible. Debrided. Osteosarcoma. Not painful. 406/7 are solid. Tx with OsPhos

8 yr old QH Mare. 4/5 effusion of L stifle. 3/5 LH. Tx with OsPhos. Adequan. IA/SCL injection planned in 2 months. (Want to see what effect we get). Guarded prognosis. (Debridement not an option for owner).

2 months later. 2/5 LH. 2/5 effusion 4 months later. 1/5 LH. 2/5 effusion
19 yr old QH Gelding – Barrel (Top 25). Coffins, Pasterns, Fetlocks, Hocks. Reduced breakover shoe. Injections – steroids, IRAP, etc. Trying to get through season for past 2 years.


Other Applications

• Palmar/Plantar Condylar Lesions
• Cervical Facet Disease
Stifle Lameness

- Stifle diagnostics
  - Needlescope
    - What we can see and do.
- Diagnostic Cascade
  - Localization of stifle lameness and pinpointing the problem(s). Localization, Imaging techniques, Standing Needle Arthroscopy.

Stifle Conditions

- >40% of injuries in sport horses and similar in western performance (Singer, 2008; Frisbie, 2014)
  - Osteoarthritis
  - Synovitis
  - Cartilage
  - Subchondral bone
  - Menisci
  - Meniscotibial ligaments
  - Cruciate ligaments
  - Collateral ligaments
  - Patellar ligaments
  - Sepsis

Stifle Diagnostics

- Physical exam and tests – effusion, pain, heat, caudal extension, adduction, full limb flexion, drawer
- Regional diagnostic anesthesia – rule out lower limb – up to peroneal-tibial nerve block
- Intra-articular anesthesia
  - 3 compartments
    - MFT, LFT, FP
  - Cranial approach – single 3.5” spinal needle
  - Individual approaches
Stifle Diagnostics

- Radiography (78% detected that had pathology – Barr, 2006)
- Ultrasound (58% detected that had pathology – Barr, 2006)
  - 80% sens/spec for meniscus
  - 79/56% sens/spec slight to moderate lesions (Cohen, 2009)
- Nuclear Scintigraphy
- MRI/CT?
- Exploratory arthroscopy
  - General anesthesia → standard → can debride
  - Standing – needleoscopy
- Sensitivity esp. for cartilage, cruciate ligament, and cranial horn of meniscus/meniscotibial ligament lesions

Standing Stifle Needleoscopy

- Pain localized to stifle – intra-articular anesthesia
- Lack of definitive radiographic diagnosis
- Ultrasound diagnosis unclear or absent
- Owner unwilling for general anesthesia without absolute diagnosis

- 18 gauge arthroscope
- Weight bearing and flexed positions
- Cranial MFT – lateral, cranial approaches (sometimes medial)
  - Nickels, 1982; Cohen, 2009; Watts, 2006
- Caudal MFT – caudomedial approach
  - Trumble, 1994
- Cranial LFT – cranial (medial to LFT) approach; standing, flexed
  - Mustafa, 1987
- Caudal LFT – caudolateral; flexed
  - Wattsley, 2002
- Femoropatellar – Cranial; standing
  - McIlwraith, 2015

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