Neonatal Orthopedic Conditions

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Learning Objectives

• Differentiate between the main equine pediatric orthopedic conditions
• Understand principles behind the treatment strategies for each condition

Main Pediatric Conditions

1) Tendon laxity = weak flexor tendons
2) Flexural deformities = contracted tendons
3) Angular limb deformities = limb deviations
Brief Anatomy Review

Tendon Laxity

• Typically newborn foals
  - Congenital more common than acquired

• Clinical signs
  - Not weight bearing on toes, walking on heel bulbs
  - Severe cases rest fetlocks on ground

• Hindlimbs most commonly affected

Congenital Tendon Laxity

• Etiology: musculotendinous weakness
  - Prematurity
  - Primary systemic illness
  - Lack of exercise
Acquired Tendon Laxity

- Etiology: induced weakness
  - Bandaging, splinting, or casting for extended periods
  - Hoof overgrowth

Tendon Laxity Treatment

- Trim heels flat → eliminate “rocker” effect
- Heel extension shoes (more severe cases):
  - Provide plantar/palmar support
  - Protect fetlocks and heel bulbs from trauma
- Exercise
- Prognosis: Favorable

Tendon Laxity Treatment

Before

After
Tendon Laxity Treatment

Presentation: Non-weightbearing
With shoes
2 months Post-discharge

Flexural Deformities

• "Contracted tendons"
• Persistent hyperflexion of joint
• Tendons functionally too short compared to bone
• Pain-myotactic reflex
• Forelimbs most commonly affected
  - Typically only one joint: DIP, fetlock, or carpus
• Congenital or acquired

Congenital Flexural Deformities

• Etiology: multifactorial
  - Uterine malpositioning
  - Genetics
  - Idiopathic
• Fetlock and carpal deformities most common
  - Fetlock: SDFT, DDFT
  - Carpus: SDFT, DDFT and carpal fascia
Congenital Flexural Deformities
Treatment

- Increase exercise
- Oxytetracycline (3g/foal)
- NSAIDs
- Splints during the day
- Toe extension shoes
- Surgery (severe cases)

*** MUST ASSIST TO STAND AND NURSE ***

- Prognosis: Better if shorter duration and if limb can be straightened manually

Congenital Flexural Deformities Treatment

24 hours old

1 week later:
Tx = exercise

72 hours old

3 days later:
Tx = oxytetracycline, NSAIDs, splints, exercise
Acquired Flexural Deformities

- Unilateral or bilateral: DIP or fetlock joint most common

- Etiology:
  - Chronic pain in affected limb
  - Rapid growth
    - Nutritional imbalance
    - Genetics

Acquired Flexural Deformity: DIP Joint

- Contracture of DDFT, “club foot”
- Most develop between 4 weeks to 4 months
- Stage 1: dorsal hoof wall less than vertical
- Stage 2: dorsal hoof wall over vertical

Acquired Flexural Deformities: DIP Joint

- Treatment:
  - Dietary changes
  - Exercise
  - Toe extension shoes
  - NSAIDs and sometimes oxytetracycline
  - Surgery: distal check ligament desmotomy; may need DDF tenotomy for stage 2

- Prognosis: Guarded for stage 2 cases
Acquired Flexural Deformities:
Coffin Joint: Ex

Pre-op
Distal check ligament desmotomy
Toe extension shoes

Post-op

Acquired Flexural Deformities:
Coffin Joint: Ex

Pre-op
Distal check ligament desmotomy
Heel wedge then toe extension shoes

Post-op

Acquired Flexural Deformities:
Fetlock Joint

• Contracture of SDFT
• Knuckle forward at the fetlock with the hoof in normal alignment
• Most develop between 9 months to 2 years
• Most often SDFT and DDFT both involved
Acquired Flexural Deformities: Fetlock Joint

- Treatment:
  - Dietary changes
  - Exercise
  - Toe extension shoes
  - NSAIDs and sometimes oxytetracycline
  - Surgery: proximal +/- distal check ligament desmotomy; rarely SDF tenotomy
  - Splinting of limb
- Prognosis: Variable - joint capsule fibrosis

Acquired Flexural Deformities: Fetlock Joint: Ex

1 year old 3 days post-op
Proximal check ligament desmotomy, toe extensions, splinting, oxytetracycline, NSAIDS

Angular Limb Deformities

- A lateral or medial deviation of a limb:
  - Varus: medial deviation of limb below a joint
  - Valgus: lateral deviation of limb below a joint
- Congenital or acquired (opposite limb pain)
Angular Limb Deformities

- Age: foals, usually quite young
- Breed: all, particularly those with rapid growth
- Limb: forelimb more common than hind
- Sites: carpus, fetlock, tarsus

★ Most common deformities:
  - carpal valgus, fetlock varus

Angular Limb Deformities Need To Know…

- Is a deformity present?
- Has the deformity changed over time?
- What is the deformity?
- What joint(s) are involved?
- What should you do, act or wait and see?
How to Examine Foals

1) Look at the foal from the front
2) Palpate the limb - can you correct it?
3) Examine the foot
4) Watch the foal walk
5) Know what is normal!

1) Look at Foal From the Front
• Align yourself with the toe of foot
• Ask where is knee and rest of limb?

2) Palpate the Limb
• Joint laxity
• Can the deformity be manually corrected?
• Any heat, pain, swelling?
  - Check opposite limb
3) Examine the Foot

- Is the hoof worn more on one side?

4) Watch the Foal Walk

- Watch the foal travel
- Look for:
  - Multiple limb involvement
  - Lameness in opposite limb
  - Similar deformities in mare
5) Know what is normal

- Toe out
- Carpal valgus
  - $-5-7^\circ$ by 4 months
  - $<-2^\circ$ by 8-10 months

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Congenital Angular Limb Deformities

- Present at birth, many correct without treatment
- If severe ($\geq15^\circ$) or not improving within 5-7 days, treatment indicated
- Etiologies:
  - Intrauterine malpositioning
  - Joint laxity (prematurity)
  - Incomplete ossification of cuboidal bones (normally 300 days of gestation)

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Congenital Angular Limb Deformities

- Premature "Windswept" foals in which:
  - Both hindlimbs curve in the SAME direction
  - Ligament/tendon laxity
  - Self-correct in couple weeks
  - Tx: Controlled exercise
Acquired Angular Limb Deformities

• Born straight, go crooked within weeks or months of birth
• Etiologies:
  - Asymmetric physeal growth
  - Growth plate injury or physitis
  - Lame in contralateral limb
  - Overnutrition leading to rapid growth
  - Genetic predisposition to rapid growth

Physeal Asymmetry

Varus

Valgus

Angular Limb Deformities Diagnosis

• Visual and physical exam:
  - Lameness in opposite limb
  - Mare’s legs
• Radiographic exam:
  - Long plates: 7x17
  - DP and lateral
  - Determine degree and pivot point
Diagnosis: Radiographic Evaluation

Incomplete Ossification
- Premature/dysmature foals
- Usually severe deformity:
  - Carpus valgus
  - Sickle hocked
- Strict limitation of exercise
- Splints
- Radiographic monitoring of ossification
Incomplete Ossification: Treatment

- Sleeve (tube) cast:
  - Ends at fetlock (i.e. doesn’t not include foot)
  - Side effect is tendon laxity (max 14 days)

EARLY treatment essential before abnormal ossification pattern occurs
Other Angular Limb Deformities: Treatment

- **Conservative:**
  - Mild cases (5-10°) or early in physeal growth
    - Rest, trimming, shoes
  - Surgery:
    - Moderate to severe cases or at end of physeal growth
    - Periosteal transection, transphyseal bridging, single transphyseal screw, wedge osteotomy

<table>
<thead>
<tr>
<th>Joint</th>
<th>Physeal closure</th>
<th>Physiologic closure</th>
<th>Majority growth completed by</th>
<th>Recommended treatment time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetlock Distal MC/MT III</td>
<td>8-10 months</td>
<td>4 months</td>
<td>3 months</td>
<td>&lt;1 month</td>
</tr>
<tr>
<td>Carpus Distal radial</td>
<td>22-26 months</td>
<td>18 months</td>
<td>12 months</td>
<td>&lt;4 months</td>
</tr>
<tr>
<td>Tarsus Distal tibial</td>
<td>17-24 months</td>
<td>9 months</td>
<td>8 months</td>
<td>&lt;4 months</td>
</tr>
</tbody>
</table>

Other Angular Limb Deformities: Conservative Treatment

- Corrective trimming: lower the wall toward which hoof is deviating
  - Ex: Turned out → Trim outside wall
- Shoeing: place extension on side of hoof that is wearing the most
  - Ex: Turned out → Inside (medial) extension

Review: Physeal growth
Other Angular Limb Deformities: Conservative Treatment: Ex

- Fetlock varus (turned in)
- Trim inside
- Outside extension

10 days later

Other Angular Limb Deformities: Surgery - Periosteal Transection

- Performed to stimulate growth:
  - On CONCAVE side, proximal to physis
- Radius - ulnar ostectomy
- +/- transphyseal bridging on opposite side
- Slow growth on CONVEX side of deformity
- Screws proximal and distal to physis
- Figure of 8 wires around screws

REMOVE IMPLANTS WHEN STRAIGHT
Other Angular Limb Deformities: Surgery - Transphyseal Screw

- Performed to slow growth:
  - On CONVEX side of deformity
  - Single lag screw across physis
  - Improved cosmetic appearance
- REMOVE IMPLANTS WHEN STRAIGHT

Severe Angular Limb Deformities: Surgery – Ostectomy

A) Closing Wedge Ostectomy
B) Step Ostectomy
C) Derotational Ostectomy
D) Step Osteotomy

Angular Limb Deformities: Alpacas!

- Normal carpal valgus - surgery ONLY if true deformity!
Angular Limb Deformities: Prognosis

- Incomplete ossification:
  - Good if treated early
  - Guarded if treated late/crush injuries

- Other angular limb deformities:
  - Severe (>15°) = fair if early
  - Lower joint = fair if early, generally less success due to short time for correction
  - End of physeal growth = less success

Questions?