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

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
Congenital Flexural Deformities

Treatment

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 Deformities: 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

Proximal check ligament desmotomy, toe extensions, splinting, oxytetracycline, NSAIDS

3 days post-op
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

Varus
Medial deviation

VaLgus
Lateral deviation
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
4) Watch the Foal Walk

the crooked foal...
5) Know what is normal

- Toe out
- Carpal valgus
  - 5-7° by 4 months
  - <2° by 8-10 months
Congenital Angular Limb Deformities

• Present at birth, many correct without treatment

• If severe (≥15°) 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)
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
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

DP Projections
Incomplete Ossification

- Premature/dysmature foals
- Usually severe deformity:
  - Carpus valgus
  - Sickle hocked
Incomplete Ossification: Treatment

- 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)
Incomplete Ossification: Treatment

- 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
## Review: Physeal growth

<table>
<thead>
<tr>
<th>Joint</th>
<th>Physis</th>
<th>Radiographic closure</th>
<th>Physiologic closure</th>
<th>Majority growth completed by</th>
<th>Recommended treatment time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetlock MC/MT III</td>
<td>Distal</td>
<td>8-10 months</td>
<td>4 months</td>
<td>3 months</td>
<td>&lt;1 month</td>
</tr>
<tr>
<td></td>
<td>radial</td>
<td>22-28 months</td>
<td>18 months</td>
<td>12 months</td>
<td>&lt;4 months</td>
</tr>
<tr>
<td>Tarsus</td>
<td>Distal</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
Other Angular Limb Deformities: Conservative Treatment: Ex

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

Treatment 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
Other Angular Limb Deformities: Surgery - Transphyseal Bridging

- 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 vs. bridging

- 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