What’s New in Osteochondrosis
Elizabeth M Santschi, DVM
Diplomate ACVS

Note blood supply in growth cartilage

Abbreviations
- OC, OD, OCD: osteochondrosis
- MM: medial malleolus
- LTR: lateral trochlear ridge
- MTR: medial trochlear ridge
- DIRT: distal intermediate ridge of the tibia
- MSC: mesenchymal stem cells
- MC/MT3: third metacarpus or metatarsus
- MSR: median sagittal ridge
- P1: first phalanx
- P2: second phalanx
- SBC: subchondral bone cyst
- MFC: medial femoral condyle

Endochondral ossification review
- Endochondral ossification is how limbs grow in length and joints get their shape
- Occurs in growth cartilage at metaphysis and epiphysis
- Growth cartilage ossifies synchronously
- OCD occurs when focal areas of cartilage persist and does not ossify leaving fragile cartilage voids in bone. These either remain as luencies or break off as fragments

Osteochondrosis
- A “family” of orthopedic diseases of the joint that occur in rapidly growing animals and is caused by a focal disturbance of endochondral ossification
- Characterized by an impairment of the blood supply to growing cartilage and bone; this interrupts the transition of growth cartilage to bone and results in retained areas of cartilage

Clinical Osteochondrosis
- Is the result of a focal failure of endochondral ossification at the chondro-osseus junction
- Cartilage canal blood supply failure
- This picture: Blood vessels in growth cartilage are filled with barium and cartilage is cleared with magic
- Note Extremely vascular growth cartilage and avascular articular cartilage
- Interruption of the blood supply inhibits bone formation and results in cartilage retention and thickening. Incomplete transection of supply to the flap or re-establishment of blood supply results in ossification of the flap

Osteochondrosis
- Originally described by König as a pathologic condition where epiphyseal cartilage formed loose bodies without primary arthritis or considerable trauma
- However, loose cartilage would not be radiographically detectable, so they must ossify somehow
LOTS of growth cartilage in young horses

Cartilage canals deliver blood supply

• Vascular failure of canals is believed to cause OCD
• Articular cartilage is thin strip at joint surface; no vessels

Clefts in chondro-osseus junction

• Retained cartilage is force concentrator (may already have mechanical damage)
• When cleft becomes unstable, motion causes fracture into joint and “loose bodies” are formed.
• Bone and cartilage particles from cleft contact joint fluid and incite inflammation, effusion and lameness

What is root cause?

• Lots of argument here
  • Genetic predisposition (breed and individual differences)
  • Large body size
  • Growth rate
  • Nutrition (high energy)
  • Hormonal imbalances
  • Biomechanics
  • TRAUMA?

Cause of the cause

• Lesions can be reproduced by interrupting blood supply to growth cartilage
• Horses grow fast: Thoroughbreds by 6 months are 46% of mature body weight and 83% of mature withers height
• High energy feeding does seem to increase OC incidence in pigs, broilers, bulls and dogs
• Fast growth was positively correlated with some lesions in horses, as was height
• Does fast growth (and weight gain) cause growth cartilage trauma?

Genetics

• For some types of OCD there is evidence of a genetic contribution
• Distal intermediate ridge fragments in hock: still only 20% or so
• Proximal plantar P1 fragments
• Others still think its primarily a failure of blood supply that may be affected by genetic factors such as fast growth, high body weight, aggressive locomotion
Clinical signs

• Some horses have both clinical (lameness, effusion) and radiographic signs
• Some have only radiographic signs
  • Osteochondral flaps
  • OC Fragments
  • Subchondral lucencies
• Some have clinical signs (effusion, lameness) but not radiographic signs; lesion cartilage only (diagnosed arthroscopically)

OCD Prevalence?

Locations

• Hock: DIRT, MM, LTR
• Stifle: trochlear ridges
• Stifle: medial femoral condyle
• Fetlock: dorsal MSR and condyles of MC/MT3, proximal palmar/plantar P1 fragments
• Pasterns: Lucencies, fragments
• Shoulder: Lucencies
• Neck: Cervical vertebral malformation

Commonly affected breeds

• STB, QH, TB, WrmB
• TB, QH, WrmB, Arabian
• STB, TB, WrmB
• TB

Shoulder (not common)

• Caudal aspect of humeral head is most common, can also occur on glenoid where are usually cysts
• Both primary lesions can induce secondary ones
• This joint location of OCD has probably the worst prognosis for soundness of all OCD
• Surgery is possible, prognosis fair-poor

Elbow (rare)

• Proximal medial radial lucencies (cysts) are the most common
• But humeral lucencies do occur

Carpus OCD is really rare

• Dessican-type flaps are very rare
• Clinically significant SCL lucencies do occur (also uncommon), usually proximal radial carpal bone or distal radius
• Ulnar carpal bone lucencies are very common and can have an axial fragment but usually not significant; believed to be avulsion fractures of lateral palmar intercarpal ligament

Fetlock OCD (ish): common

• MSR lucencies and proximal fragments (TB, Arabian)
• Proximal palmar/plantar P1 fragments (STB)
• Lucencies in distal MC/MT3 and proximal P1 (TB)
• Dorsal MC/MT3 osteochondral flaps and erosions (uncommon)
• Palmar/plantar MC/MT3 osteochondral fragments and lucencies (rare)
MSR and dorsal MC/MT3 lesions

- Decent evidence for a genetic contribution to MSR fragments

Fetlocks: proximal (palmar/plantar) P1 fragments

- Proximal palmar/plantar P1 fragments are two types:
  - Type 1 is articular and more axial
  - Type 2 are not usually articular and abaxial
  - Some disagreement if are OCD or fracture

Palmar or plantar lucency or fragment on condyle

- Can appear as lucency with sclerosis or as lucency with fragment
- Can cause lameness or effusion: is in a critical location
- Usually treat conservatively and hope it heals so there is not a big articular defect; but if does not heal, fragments should be removed

Median sagittal ridge: fetlock

- Flattening of mid-sagittal ridge in yearlings is common and not significant (delayed ossification): no treatment
- Proximal sagittal ridge can be irregular; no clinical significance
- Irregular mid-sagittal ridge also ok if no fragments
- Surgery only if fragments or extends abaxially

Fetlock fragments:
Type 2
Palmar/plantar aspect proximal P1

- As defined, not in joint. Usually not symptomatic and may heal, but are a radiologic blemish
- Uncommonly can have articular component (1.5?), generates more concern

MSR displaced fragments

- Usually not a clinical problem; probably a form of OCD
- However fragments are removed arthroscopically if effusion is present, or to eliminate radiographic blemish
Subchondral lucencies fetlock

- Some are small and do not have marginal sclerosis may either fill in, of never be an issue
- Larger lucencies (cysts) with reaction around them are potentially a problem
  - I worry more about distal MC/MT3; proximal p1 tend to heal
- If clinical problem, not many good solutions
  - Inject joint or cyst with corticosteroids, enucleate cyst if can reach it, or place transcondylar screw

Pastern OCD: not common. Occurs as: joint fragments and subchondral lucencies

- Prognosis depends on size and location
- Surgical removal can be difficult; lots of attachments, not a lot of room
- DJD lowers prognosis

Pastern lucencies

- Can be in distal P1 or proximal P2
- Central distal P1 are normal and due to silhouetting of condyles
- Lucencies on the condyle or its opposing surface can cause lameness
- When associated with periosteal reaction, suggests issues
  - Inject joint or cyst with corticosteroids, enucleate cyst if can reach it, or place transcondylar screw

Stifle OCD (ish): very common

- Lateral trochlear ridge (proximal): most common
- Medial trochlear ridge: less common
- Patella: usually with LTR OCD
- Medial femoral condyle: most often affected
- Lateral tibial plateau: rarely affected
- Combinations of lesions occur, particularly in the femoropatellar joint

Stifle OCD (lateral trochlear ridge): common

- Focal damage to blood supply at chondro-osseous junction slows endochondral ossification; flat spots are result
- In larger or deeper areas the undamaged growth cartilage around the injury continues to ossify leaving a defect. Some damaged cartilage canals repair and cartilage thickening and some ossification continues. Result is dessicans lesions of ossified flaps and fragments

Development and healing LTR OCD

This horse does not need surgery; just flat
Arthroscopic view of LTR OCD

- Typical cartilage flap appearance: not a bad one
- Longer and deeper lesions are thought to have a worse prognosis for lameness and effusion resolution
- Generally 30 mm or less are thought to do well with surgical removal

Tarso-crural OCD: The most common location of equine OCD

- Distal intermediate ridge of the tibia fragments: DIRT, very common #1!
- Lateral trochlear ridge (LTR) flaps and fragments: common #2-3
- Medial malleolar (MM) lucencies and fragments: common #2-3
- Medial trochlear ridge (MTR) flaps: uncommon #4
- Talar cysts: rare #8,000

Hocks: DIRT OCD

- Can be one piece, but commonly are multiple
- Most common clinical sign is effusion, lameness is rare
- Occasionally found in horses without any clinical signs
- Surgery is indicated for racing horses, or horses with effusion

LTR/MTR OCD

- Loose fragments with effusion should be removed.
- Attached without effusion should be monitored
- Bigger lesions are of a bit more concern for both effusion resolution and performance

Distal LTR OCD

- A is nothing (dewdrop), B looks like its healing (monitor only), C loose fragment, remove for racing or if effusion
Medial malleolar OCD

• Lesions are axial on med malleolus: radiographic angle critical, 10° lateral of DP
• Can be fragments or cystic: surgery is indicated, effusion result often can be difficult

Multiple sites of OCD

• Multiple sites of OCD in the tarsus do occur
• Both horses DIRT and LTR
• Medial malleolus and DIRT also common.
• Be sure to check all locations

Management of equine OD

• Age, clinical signs, radiographic appearance (size, loose fragments) are factors considered when designing a treatment plan
• Consider:
  • Early OCD lesion (5 months) will often heal by 8-10 months: if still there at 8 months, probably no
  • Nutrition not real factor except for the extreme cases; may indirectly impact via body weight
  • Exercise restrictions can promote healing, but they cannot live in the stall

Management of equine OD (cont.)

• Exercise restrictions generally means reducing either the size of pasture or hours in the pasture
• For example, for TB stifles, if small lesion, not clinical (yet)
  • Go from pasture to paddock
  • Reduce from 22 hours to 12
• If clinical (effusion and lameness) reduce both, and go to 8-12h in paddock (1 acre or less)

Healing of shoulder: rest and corticosteroid IA

OCD treatment

• Surgical treatment (usually removal) is indicated if there is lameness, effusion and fragments; prognosis is generally good, except for shoulders
• Prognosis is related to damage and amount of weight bearing structures affected
• Permanent loss of subchondral architecture is a problem
• Delay if possible to operate when not inflamed: I wait until at least 10 months for most forms of OCD to operate, and will use IA corticosteroids if inflammation severe.