



# Juvenile Orthopedic Diseases

March 7, 2021

Lauren Reeves, DVM, Diplomate, ACVS-SA  
MedVet Cleveland West Surgery Service

# Topics

- Osteochondrosis
- Retained Cartilage Core
- Hypertrophic Osteodystrophy (HOD)
- Panosteitis
- Slipped Capital Femoral Epiphysis
- Legg-Calve-Perthes

# Osteochondrosis



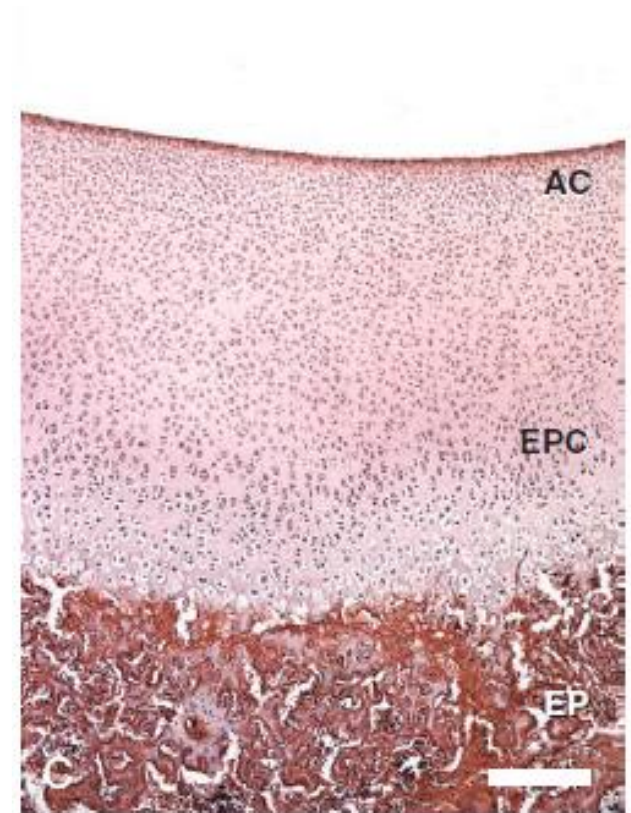
# Question 1

Osteochondrosis is best described as which of the following?

- A. Trauma to the subchondral bone
- B. Infection of the articular cartilage
- ★ C. Failure of endochondral ossification
- D. Failure of nutrient diffusion into articular cartilage

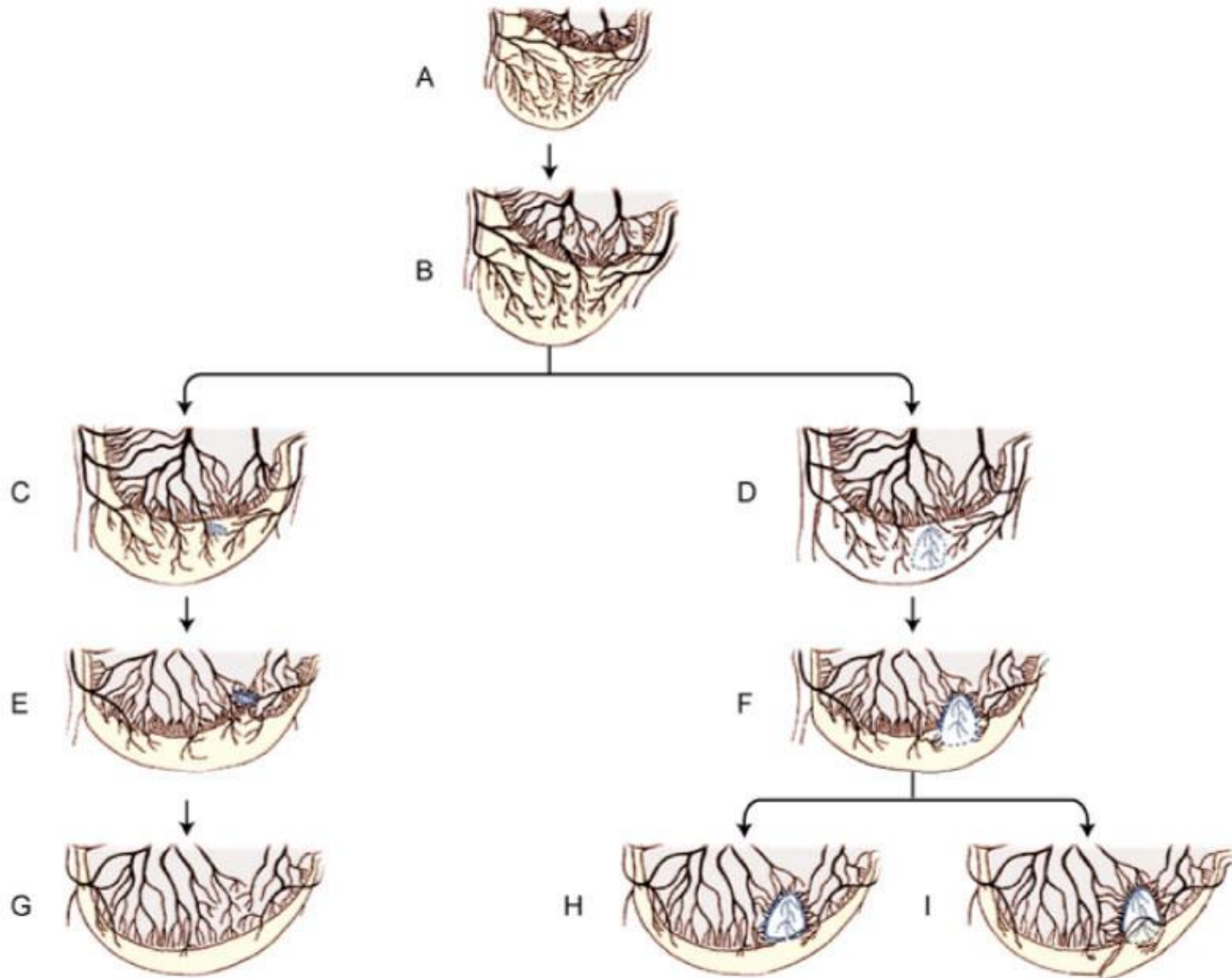
# Pathophysiology

- Failure of endochondral ossification
- Thickened area of cartilage
- Poor nutrient diffusion
- Chondronecrosis
- Abnormal stresses
- Osteochondrosis dissecans (OCD)



# Pathophysiology

- Unknown etiology
  - Heredity
  - Rapid growth
  - Diet
  - Trauma
- Stages
  - Osteochondrosis latens: early microscopic lesion
  - Osteochondrosis manifesta: subclinical, seen on radiographs
  - Osteochondrosis dissecans: clinical signs, cartilage flap



From Ytrehus B, Carlson CS, Ekman S. Etiology and pathogenesis of osteochondritis. *Vet Pathol* 44:429, 2007.  
 Tobias and Johnston: *Veterinary Surgery: Small Animal*  
 Copyright © 2012 by Saunders, an imprint of Elsevier Inc.

# Signalment and History

- Large/giant breed dogs
  - Very uncommon in cats
- 6-12 months old
- Males more common
- Unilateral/bilateral lameness
- Worsens after exercise
- Diet history





## Question 2

Which of the following is a common location for osteochondrosis?

- A. The bicipital groove of the humerus
- B. The lateral humeral condyle
- C. The medial femoral condyle
- ★ D. Medial trochlear ridge of the talus

# Orthopedic Exam

- Pain, joint effusion, muscle atrophy on palpation
- Unilateral or bilateral abnormalities
- Locations
  - Caudal aspect of humeral head
  - Medial aspect of humeral condyle
  - Lateral femoral condyle
  - Medial ridge of trochlea of talus

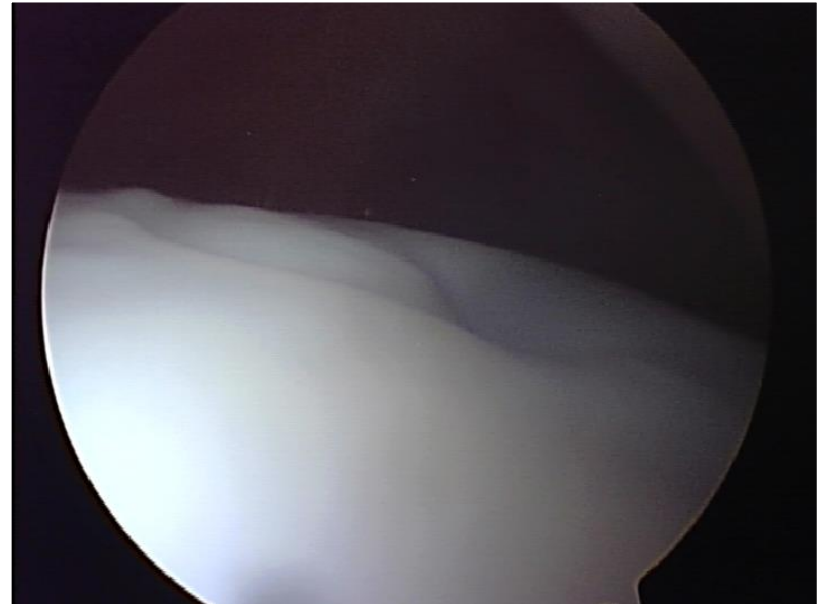
# Differentials

- Depend on joint
  - Shoulder
  - Elbow
  - Stifle
  - Hock
- Other juvenile diseases
- Trauma
- Soft tissue injury



# Diagnostics

- **Radiographs (Bilateral)**
  - Flattening of joint surface
  - Sclerosis
  - Effusion
  - Radiolucency
  - Joint mouse
- CT scan or MRI
- Arthroscopy

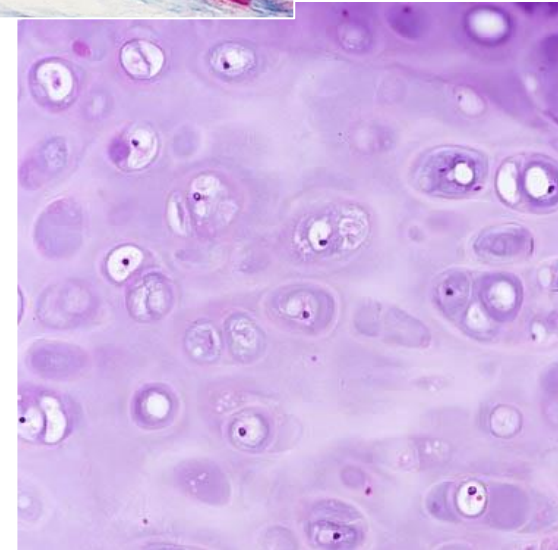
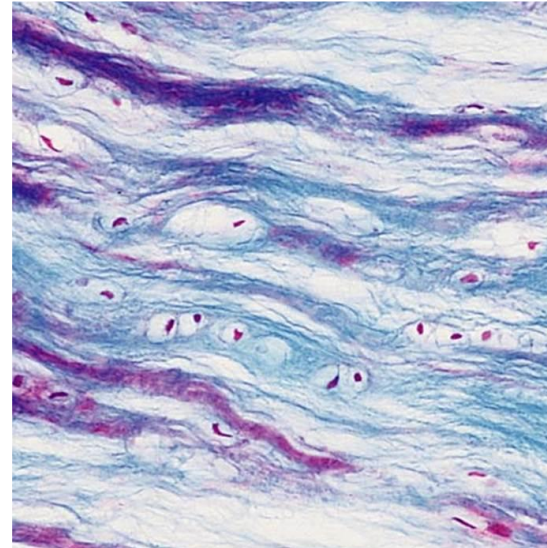






# Treatment Goals

- Eliminate pain & lameness
- Restore cartilage surface
  - Fibrocartilage
- Normalize biomechanics
- Prevent continued damage



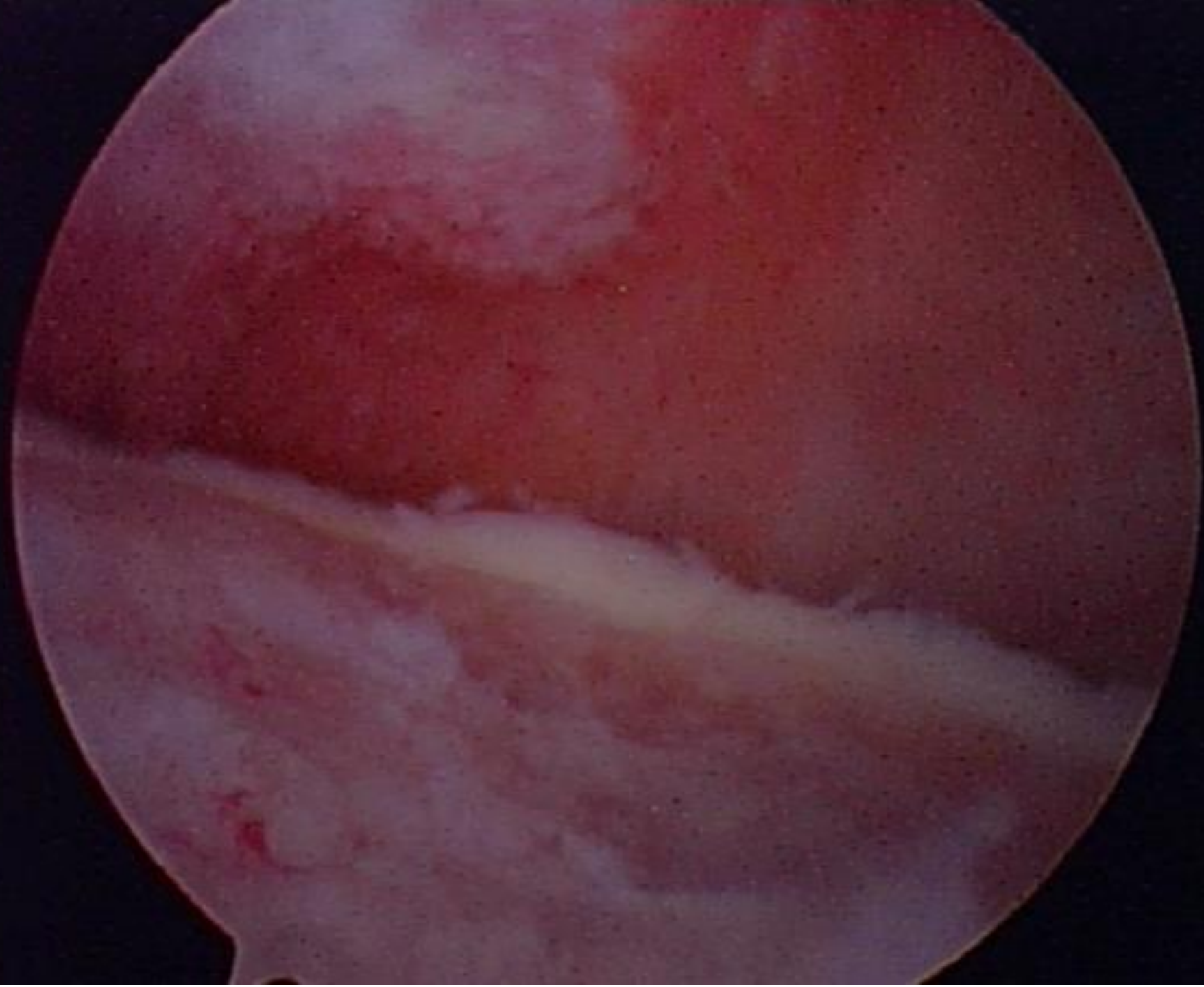
# Treatment Options

- Conservative
  - Weight management
  - Exercise modification
  - NSAIDs
  - Diet/Supplements
- Surgical
  - Subchondral bone debridement & flap removal
    - Heals with fibrocartilage
  - Cartilage grafting
    - Auto- or allograft
    - Stifle









# Prognosis

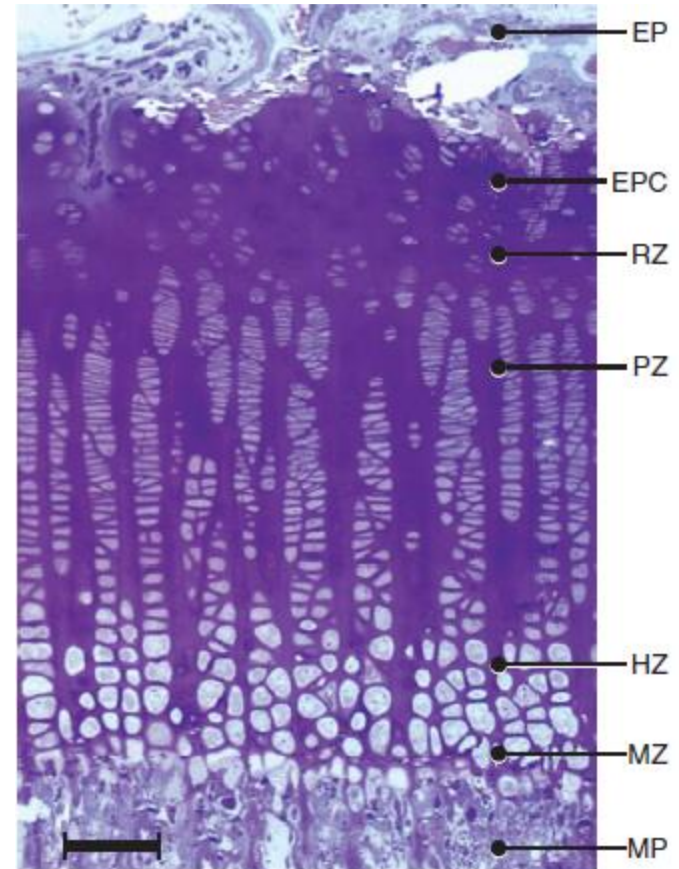
- Depends on joint
  - Best prognosis – shoulder
  - Worst prognosis – hock
- Depends on lesion
  - Location within joint
  - Size
- Depends on OA already established

# Retained Cartilage Core



# Pathophysiology

- Failure of growth plate cartilage to ossify
  - Physeal osteochondrosis?
- Hypertrophic chondrocytes
- Likely vascular etiology
  - Damaged blood supply



# Signalment, History, Exam

- Young, large/giant breed dogs
- Clinical signs
  - Lameness
  - Angular limb deformity
- Distal ulnar physis most common
  - Clinical consequences:
    - Procurvatum
    - Valgus
    - Elbow incongruity
  - Incidental on radiographs



# Differentials

- Premature closure of ulnar physis
- Congenital deformity
- Trauma
- Elbow dysplasia





# Diagnostics

- **Radiographs**
  - Radiolucent triangle extending proximally from physis
- Characterize deformity
- Evaluate elbow & carpal congruity



# Treatment

- If incidental finding, no treatment needed
- Angular limb deformity corrected surgically
  - Depends of severity
  - Ulnar ostectomy
  - Complicated correction



# Prognosis

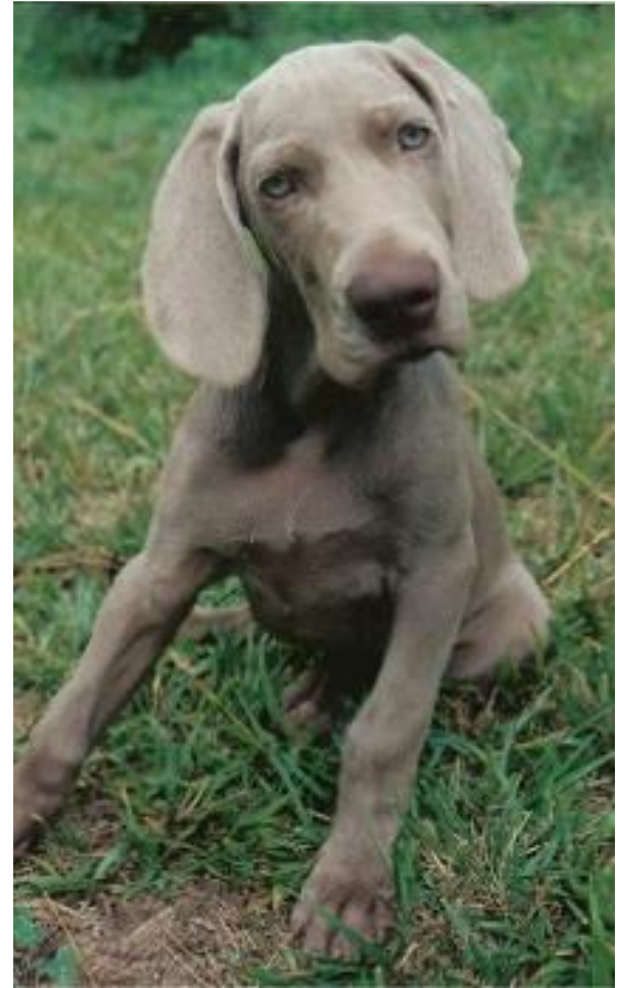
- Some spontaneously resolve
- Depend on severity of deformity
- Depend on pre-existing OA

# Hypertrophic Osteodystrophy (HOD)



# Pathophysiology

- Unknown etiology
  - Infectious
  - Nutritional
  - Vascular abnormalities
  - Genetics
- Metaphyseal bone
- Histologic changes
  - Metaphyseal trabecular necrosis and hemorrhage



# Signalment and History

- Large/giant breed dogs
- 2-8 months old
- Males > females
- Lameness
  - Can be intermittent or shifting
  - One or multiple limbs
- Systemic Illness
- Focal limb swelling





# Physical Exam

- General physical exam
  - Hyperthermia
  - Lethargy
  - Diarrhea
- Orthopedic exam
  - Lameness
    - Single or multiple limb
  - Metaphyseal swelling
    - Often bilateral
    - Painful
  - Distal radius/ulna, tibia most common

# Differentials

- Panosteitis
- Trauma
- Hypertrophic osteopathy
- Soft tissue injury
- Polyarthropathy
- Secondary nutritional hyperparathyroidism



## Question 3

Which of the following is a radiographic finding for hypertrophic osteodystrophy?

- ★ A. Radiolucent metaphyseal line
- B. Increased opacity at the nutrient foramen
- C. Sclerosis of the physis
- D. Lysis and proliferation of the metaphyseal bone

# Diagnostics

- **Radiographs**

- Radiolucent metaphyseal line
- Increased opacity between radiolucent line and physis
- “Double physeal line”
- Metaphyseal enlargement



# Treatment

- Usually self-limiting
- Rest, NSAIDs
- Slow growth
  - Reduce caloric intake
  - Large breed puppy food
- Hospitalization
  - IV fluids
  - +/- antibiotics



# Prognosis

- Good with treatment
- Usually self-limiting
- Can recur
- Angular limb deformity
- Severe cases can result in euthanasia



# Panosteitis





# Pathophysiology

- Inflammatory disease of bone marrow
  - Long bones
- Histologic changes
  - Vascular proliferation & congestion
  - Bone formation around nutrient foramen
- Secondary periosteal reaction

# Signalment, History, Exam

- Large/giant breed dogs
- 5-12 month old
- Males > female
- Forelimbs > hind limbs
- Shifting leg lameness
  - Waxing & waning severity
- Pain on long bone palpation
- Bones affected
  - Ulna, radius, humerus, femur, tibia

# Differentials

- Hypertrophic osteodystrophy
- Trauma
- Soft tissue injury
- Polyarthropathy
- Hip or elbow dysplasia



# Diagnosics

- **Radiographs**
  - Increased medullary cavity opacity
  - Loss of trabecular pattern
  - Periosteal bone formation (smooth)
- May be normal early in disease
- Radiographic severity does not correlate well with severity of lameness



## Question 4

The most common treatment for panosteitis is which of the following?

- A. Surgical debridement of the medullary canal
- B. Hospitalization with aggressive IV fluid therapy and antibiotics
- C. No treatment is indicated
- ★ D. Activity restriction and nonsteroidal anti-inflammatory medications

# Treatment

- Generally self-limiting
- Rest
- NSAIDs
- Supportive care
  - IV fluids
  - Hospitalization
  - Opioids?



# Prognosis

- Usually self-limiting
- Can recur
  - Severity decreases
  - Time between bouts increases
- Generally good prognosis





# Slipped Capital Femoral Epiphysis



# Pathophysiology

- Slow, progressive displacement of femoral epiphysis
- Often bilateral
- Non-traumatic
- Different than Salter-Harris type I fracture

## Question 5

A slipped femoral capital physis is most likely to occur in which of the following animals?

- A. 7 year old, female spayed, domestic short hair cat
- ★ B. 2 year old, male castrated cat, Siamese cat
- C. 4 year old, male castrated, Chihuahua
- D. 2 year old, female intact, Toy Poodle

# Signalment and History

- **Cats** >> dogs (Siamese)
- Young, overweight, castrated males
  - Delayed physal closure
- Lameness
- Not jumping up/down
- Decreased activity

# Orthopedic Exam

- Weight bearing pelvic limb lameness
- Pain on hip ROM
- Crepitus
- Muscle atrophy



# Differentials

- Hip dysplasia
- Trauma
- Avascular necrosis of the femoral head



# Diagnosics

- **Radiographs**
  - Widening of growth plate, lateral displacement
  - Obvious displacement and sclerosis
  - Resorption of femoral neck
- **Ultrasound**
  - May be useful early in disease





# Treatment

- **Surgery**
  - Femoral and neck excision (FHO)
  - Total hip replacement
- Stabilization
  - Not usually an option



# Prognosis

- Excellent with surgery

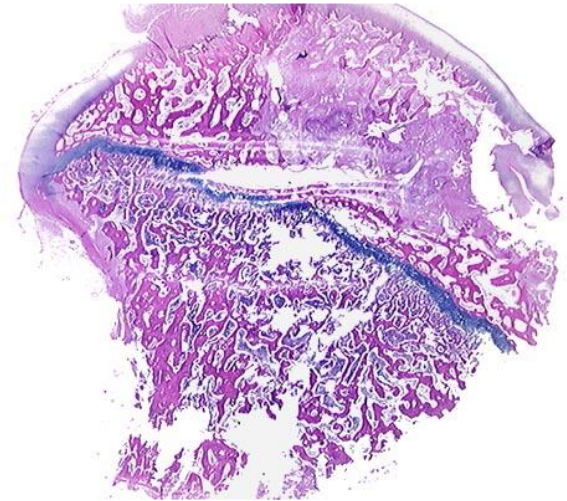


# Legg-Calvé-Perthes Disease



# Pathophysiology

- Avascular necrosis of femoral head
- Non-inflammatory ischemia
- Deformation of femoral head & neck



# Signalment, History, Exam

- Small breeds dogs
- 4-11 months old
- Lameness
  - Usually unilateral
  - No trauma
  - Non-weight bearing lame
- Pain with hip extension
- Crepitus
- Muscle atrophy



# Differentials

- Infection
- Neoplasia
- Cruciate disease
- Hip dysplasia
- Patellar Luxation



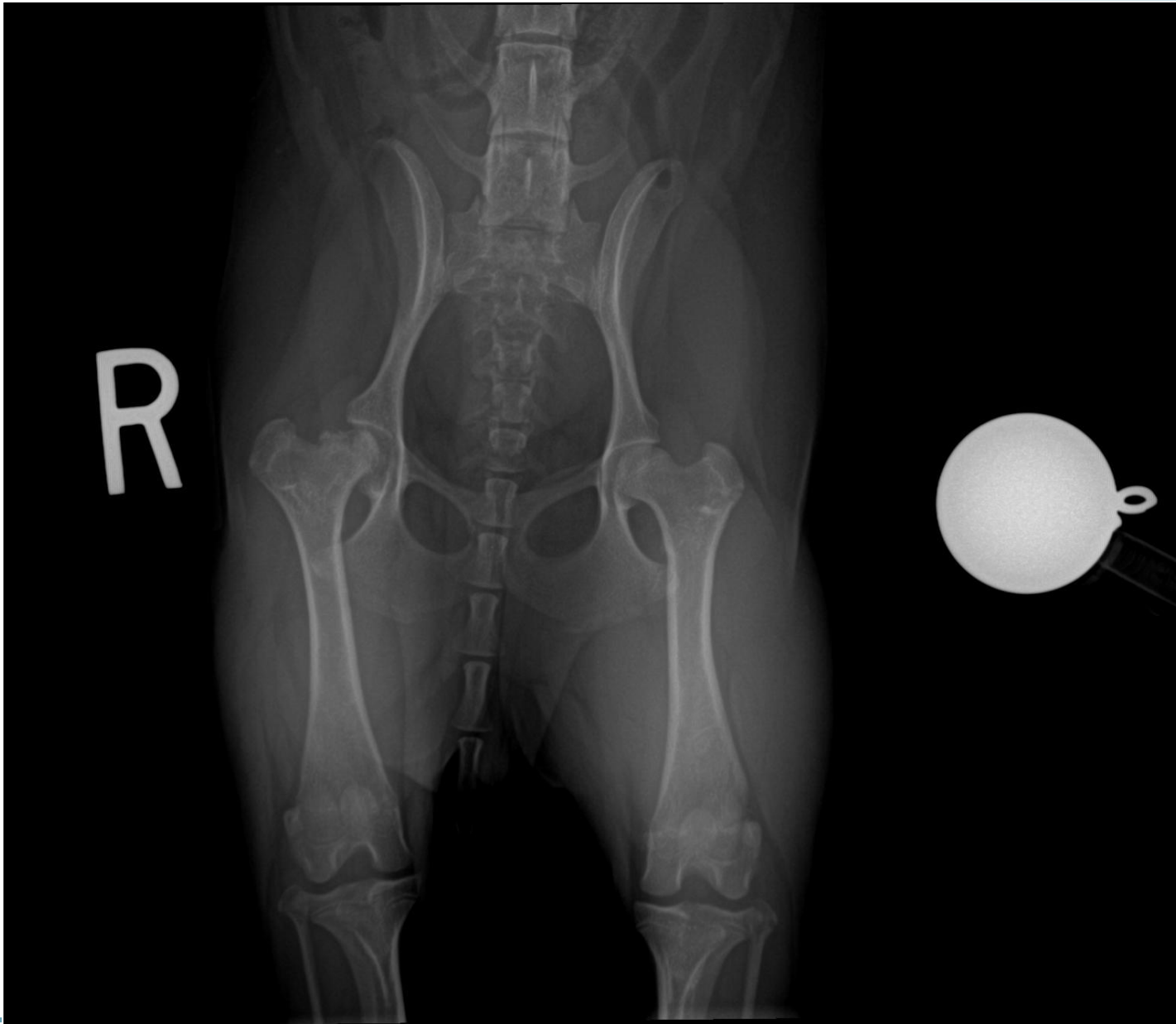
# Diagnosics

- **Radiographs**

- Malformed femoral head
- “Apple core”
- Flat femoral head
- Femoral neck fractures

- **CT**

- May be more sensitive early on
- Similar lesions as radiographs



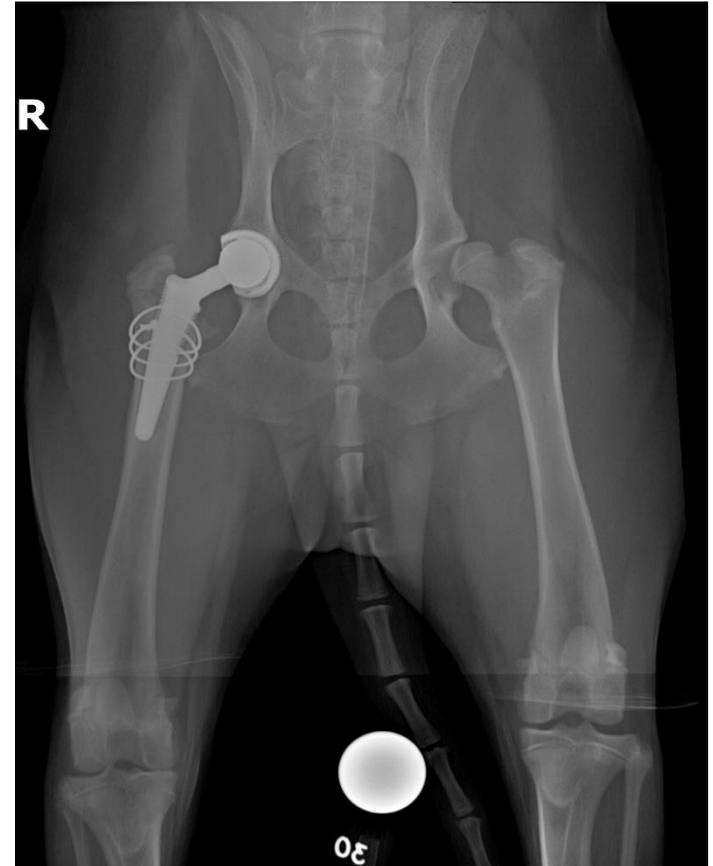


# Treatment

- Conservative management
  - Successful <25%
- **Surgery**
  - Femoral head & neck ostectomy
  - Total hip replacement

# Prognosis

- Excellent with surgery
- Lameness resolved 84-100% of cases



**Questions?**

