Coxofemoral Luxation

Diagnosis and Treatment Options

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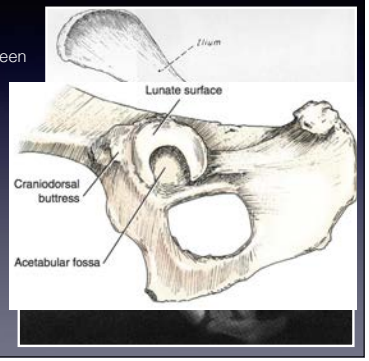
Outline

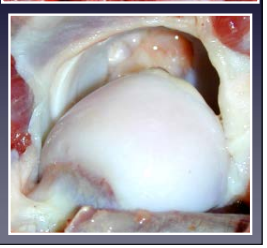
- Anatomy
- Etiology
- Diagnosis
- Treatment options
- Prognosis

Anatomy

- Ball and socket joint between the femoral head and acetabulum
- Acetabulum
  - Ilium, Ischium, Pubis, Acetabular Bone
  - Lunate surface
  - Acetabular fossa



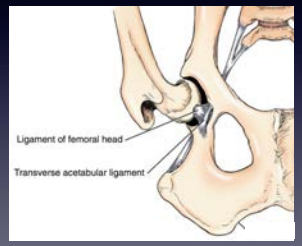
Anatomy



- Primary stabilizers:
  - Ligament of head of femur
  - The joint capsule
  - The dorsal acetabular rim
- Functional loss of 2 or more of these = luxation

Anatomy

- Secondary Stabilizers:
  - Acetabular labrum
  - Transverse acetabular ligament
  - Hydrostatic pressure
  - Periarticular soft tissues



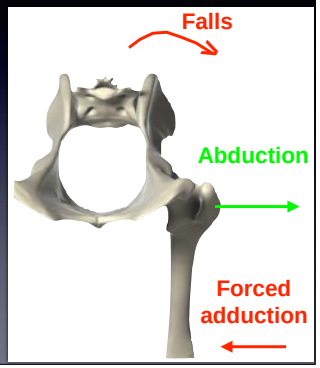
Tobias and Johnson, 2012

Coxofemoral Luxation

- Most common joint luxated in the dog
  - 90% of all luxations
- Traumatic etiology in ~80%
- 55% of cases will have thoracic and/or abdominal trauma
  - Triage and treat life threatening injuries first

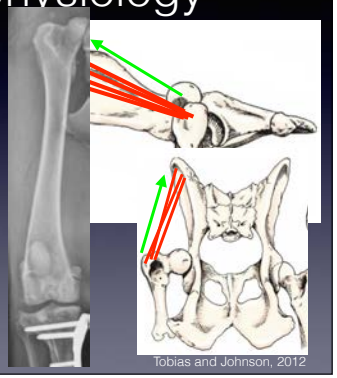
Etiology

- Type of luxation is named based on direction femoral head travels
- > 75% - Cranio dorsal
- Animal falls - distal femur is driven medially (adduction)
- Thus femoral head is thus displaced laterally
  - Tearing of ligament of head of femur and joint capsule
- Opposite for ventral luxations
  - Forced abduction



Pathophysiology

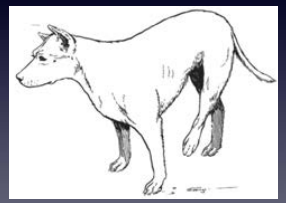
- Pull of the gluteal muscles
  - Femoral head -> cranial, dorsal and medial
- Damage to the articular cartilage on pelvis
- Tearing and contusions of periarticular muscles



Tobias and Johnson, 2012

Diagnosis

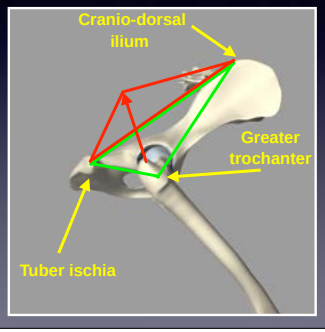
- Characteristic stance
  - External rotation and adduction
- Thorough orthopedic exam
- Look for other orthopedic co-morbidities
- Rectal palpation
  - Pelvic fractures
  - +/- rectal trauma (blood)



From: Piermattei, Flo and DeCamp 2006

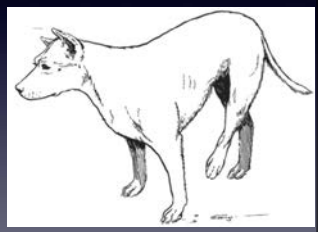
Palpable Landmarks - Hip

Cranio-dorsal hip luxation



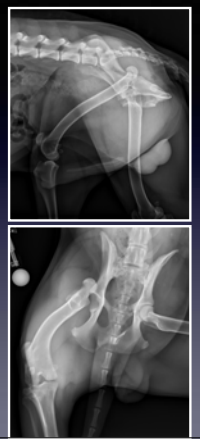
Orthopedic Exam

- Pain and crepitus on palpation
- Palpable increase in distance between greater trochanter and ischiatic tuberosity
- "Thumb test"
  - Thumb in ischiatic notch
  - External hip rotation displaces thumb in normal hip
  - Not in luxated hip
- Shorter limb - dorsal luxation
- Longer limb - ventral luxation



Radiographs

- Orthogonal pelvic views
- Direct dorsal or ventral luxations may be missed on a singular VD projection
- Close assessment for signs of hip osteoarthritis
- Also: Fractures, physeal damage, trochanteric integrity

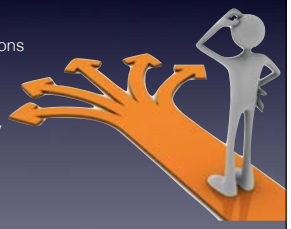


Radiographic Positioning

- Pelvis needs to be well positioned to evaluate femoral head coverage
- Pelvic tilt causes an artifactual change in apparent acetabular conformation/ femoral head coverage
  - Side with **larger** obturator foramen - artifactual **increase** in femoral head **coverage**

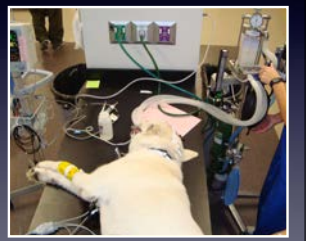
Treatment Options

- Closed reduction
- Open reduction ⟶ Multiple options
- Total Hip Arthroplasty
- Femoral head and neck ostectomy



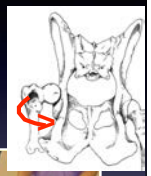
Closed Reduction

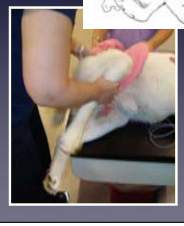
- Should be attempted in all cases except
  - **Signs of hip dysplasia**
  - Articular fractures
  - Avascular necrosis of femoral head
- More successful if performed early
  - <5 days and ideally within 24 hours of luxation
- General anestesia
  - Relaxes muscles and mitigates pain
  - Deep sedation with epidural?



Closed Reduction

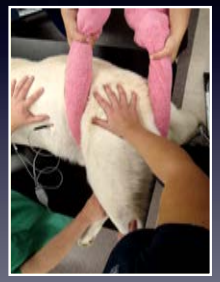
- Lateral recumbency
- Affected femur uppermost
- Externally rotate and distract limb
  - Counter-traction with rope towel
  - Disengages femoral head from pelvis
- Gentle internal rotation
  - Manipulate gr. trochanter to help reduce





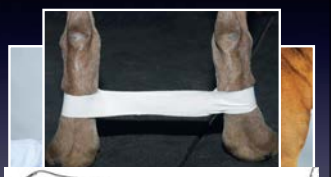
Closed Reduction

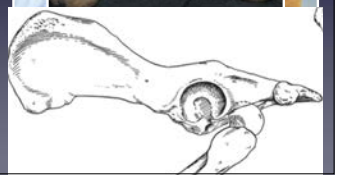
- Once reduced
- Medially directed force is directed through the greater trochanter
  - The limb is put through a full range of motion
    - Displaces blood clots, tissue etc
- Success ~50%



Augmentation of Closed Reduction

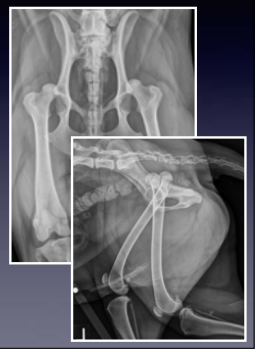
- Augment cranio-dorsal luxation with an Ehmer sling
  - Flexes, internally rotates and abducts
  - Maximizes acetabular coverage of femoral head
  - Place appropriately or not at all
- Augment ventral luxation with Hobbles
  - Can be used to prevent abduction and therefore re-luxation





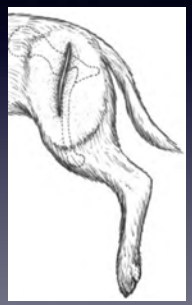
Open Reduction and Stabilization

- Recommended:
  - Chronic luxations
  - Recurrent luxations following closed reduction
  - Multiple orthopedic injuries
  - Bilateral coxofemoral luxations



Open Reduction and Stabilization

- Overall success rate ~ 85%
- For dorsal luxations
  - Usually make a standard cranio-lateral approach to hip
- Ventral luxations
  - Depends on the repair method
  - Cranio-lateral approach or dorsal



Johnson K: Piermattei's Surgical Approaches to the Bones and Joints

Open Reduction and Stabilization

- Remove hematoma, torn ligament/other tissues from acetabulum
- **Assess femoral head for cartilage damage**
  - Significant damage and/or fracture to articular surface may dictate THR or FHO
- Assess ability to reconstruct the joint capsule

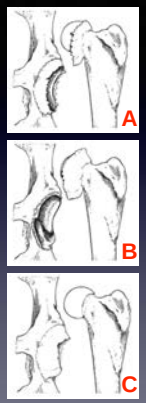
Open Stabilization Options

- Capsulorrhaphy
- Prosthetic capsule
- Ilio-Femoral suture
- Toggle rod stabilization
- Transposition of sacrotuberous ligament
- Transarticular pinning
- Triple pelvic osteotomy
- FHO
- THR
- etc....

- Decision based on:
  - Presence of fractures, hip dysplasia or OA
  - Extent of cartilage injury
  - Body weight
  - Concurrent injuries
  - Economics
  - Surgeon's preference

Capsulorrhaphy

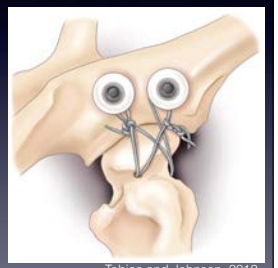
- Surgical repair of the torn capsule
- Large monofilament suture
  - Long lasting absorbable (PDS, Maxon, Dexon) or non-absorbable suture
- Horizontal mattress or cruciate pattern
- Suture with hip internally rotated and abducted
- Success = 83 - 90% when possible … (**A**)



From: Piermattei, Flo and DeCamp 2006

Prosthetic Capsule Technique

- Irreparable capsule or capsule is avulsed from acetabulum
- Left: 10 and 1 o'clock positions
- Right: 12 and 2 o'clock positions
- Flat or spiked washer to prevent suture slippage
- Drill cranial - caudal in femoral neck
- Large non-absorbable suture
  - Figure of 8 to create "web"
- Prevents reluxation in 66 -100% cases



Tobias and Johnson, 2012

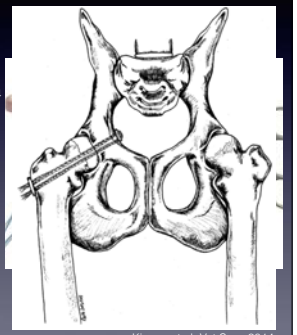
Toggle-Rod Stabilization

- Goal: Replace ligament of head of femur with a synthetic prosthesis
  - Hold femoral head in reduction
  - Allows joint capsule and soft tissue to heal
- Non absorbable suture
  - Woven polyester, Nylon, Fiberwire, FiberTape
  - One or two strands

Kieves et al. Vet Surg 2014

Toggle-Rod Stabilization

- Drill from third trochanter to foveal capitis
- Drill through center of acetabular fossa -> pelvic canal
- Suture passed through femoral head/ neck
- "Toggle" passed through acetabulum
  - Engages the medial acetabular wall
- Secured to button laterally



Kieves et al. Vet Surg 2014

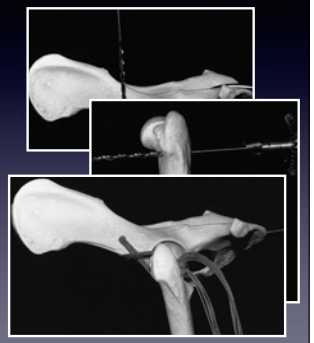
Toggle-Rod Stabilization

- Custom implants available
  - Arthrex
- Can combine with capsulorrhaphy or prosthetic capsule
- Toggle can be custom made from k-wire
- Allows early use of limb post-operatively
- Reluxation rate in one study - 6%
- ~90% owner satisfaction
- No Ehmer sling

Toggle-Rod Stabilization

Ilio-Femoral Suture

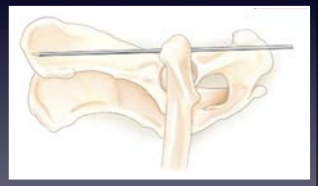
- Hole drilled in pelvis immediately cranial to acetabulum
- Cranio-caudal hold distal to gr. trochanter
- Extra-articular multifilament suture
  - Figure-of-8
- One study - 0% re-luxation



Martini et al. Vet Surg 2001

De-Vita Pin

- Steinmann pin
  - Insert ventral to ischium -> over femoral head -> seated in ilium
  - Remove after 2-4 weeks
- Complications in ~33% of cases
  - Pin migration, sciatic nerve damage, damage to femoral head (OA) and septic arthritis
- Not commonly employed now…



Tobias and Johnson, 2012

Options?

4 year old German Shepherd

Post-Op

Hybrid THR

Options?

11 year old Airedale Terrier

Post-Op

Femoral Head and Neck Ostectomy

Options?

6 month old German SH Pointer

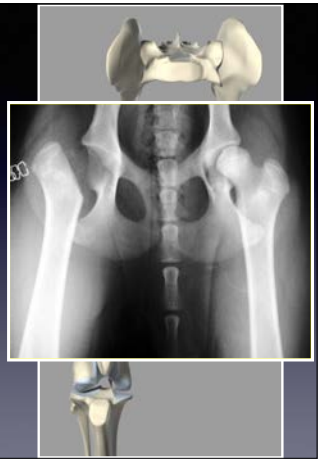
FHO or THR

Femoral Head and Neck Ostectomy

- Removal of femoral head and neck
- Development of a fibrous pseudoarthrosis
- Removes “bone on bone” pain

FHO

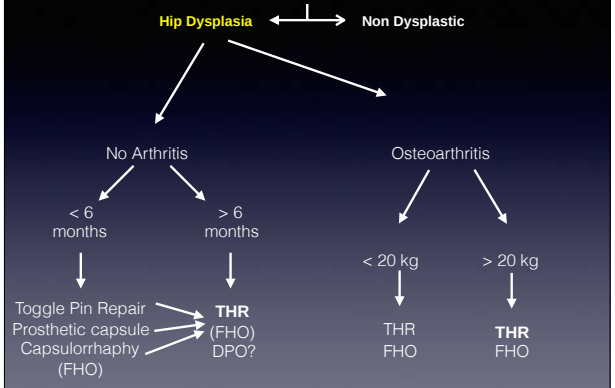
- Cut:
  - Medial to the greater trochanter
  - Immediately proximal to the lesser trochanter
    - Iliopsoas inserts here- major hip flexor
    - NEED to remove neck



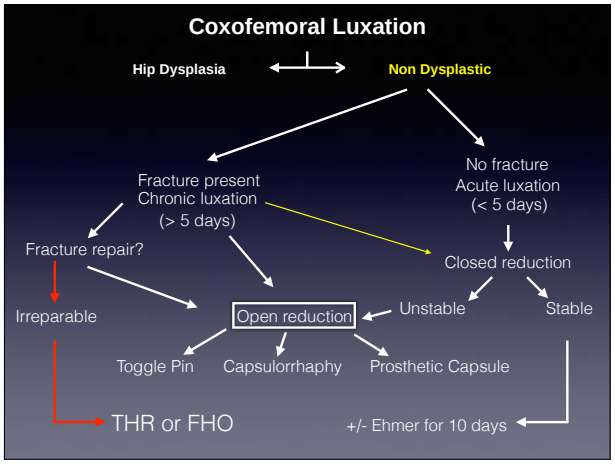
FHO or Total Hip

FHO	THR
• Better results <20 kg	• Size limitations?
• Limited range of motion (extension)	• Normal range of motion
• Abnormal gait	• Normal or near-normal gait
• Persistent muscle atrophy	• Complete restoration of muscle mass
• Cheaper!!	• Expensive!!

Coxofemoral Luxation



Coxofemoral Luxation



Questions?

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