Coxofemoral luxation

Overview of surgical options and recent research

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Overview

• Anatomy
• Etiology and pathophysiology
• Diagnosis
• Treatment
  – Closed Reduction and stabilization
  – Open reduction and stabilization
• Recent research
Anatomy of the hip

- Diarthrodial articulation
- Primary stabilisers
  - Ligament of the head of the femur
  - Joint capsule
  - Dorsal acetabular rim
- Secondary stabilizers
  - Acetabular labrum
  - Joint fluid
  - Periarticular muscles
Etiology and pathophysiology

- Most common joint to be luxated
  - 90% all joint luxated in dogs and cats
  - Motor vehicle causes 80%
  - Craniodorsal ~75% all coxofemoral luxations
Diagnosis

• Clinical findings
  – Craniodorsal
    • Non weight bearing lameness (usually)
    • Pain on hip palpation
    • Holding limb in external rotation and adduction
    • Apparent shortening of effected limb
  – Caudoventral
    • Pain, lameness, abduction, apparent lengthening of limb
• **Palpation**
  
  – Inverted triangle
    • Cranial dorsal iliac spine
    • Ischiatic tuberosity
    • Femoral head
  
  – Displacement of the thumb on palpation of the ischial notch
Diagnosis continued

- Radiographs
  - Displacement of the femoral head out of the acetabulum
    - Craniodorsal
    - Caudoventral
Treatment options

• No treatment
  – Cats- can form a pseudoarthrosis that will allow movement and minimal pain

• All dogs should be treated
  – Golden period
    • Less then 72 hours post luxation

• When treating must consider
  – Open vs Closed techniques
Closed techniques

• Manually replacing
  – Craniodorsal
    • Holding the hock and the pelvis
      – Externally rotating
      – Pull distocaudally
      – Internally rotate and abduction
  • Reluxation due to
    – Inta-articular fracture
    – Muscle contracture
    – Soft tissue/ hematoma in acetabulum
    – Inflammation of the ligament of the head of the femur
    – Periarticular fibrosis
Augmentation of closed reduction

• **Ehmer sling**
  – Flexes the hips, abducts and internally rotates the femur
  – 10-14 days
    • Allows periarticular soft tissue to heal
  – Complications
    • Slipping
    • Foot swelling
    • Rubs and ulceration
    • Necrosis of distal extremity
    • Reluxation (15-71%) *

• Decreased with new Dogslegs “vest with Ehmer sling”
  – Allows removal and range of motion exercises

• **Hobbles**
  – Prevents limb abduction
  – 80% return to normal gait and function (Thacker et al. 1985)
  – Usually in place for minimum of 14 days

• **Ischioilial pinning (DeVita pin)**
  – In place 2-4 weeks
  – Then removed, further exercise restriction for 4-6 weeks
  – Complications ~ 32% **
    • Migration of pin
    • Reluxation ~ 25%
    • Sciatic nerve injury
    • Damage to femoral head
    • Joint sepsis


• **External fixators**
  - **Rigid**
  - **Flexible**
    - 2 pins placed in proximal femur and ilium that are connected by flexible band
    - Allows joint movement and weight bearing
    - In paced 2 weeks
      - Study performed in 4 dogs
        » Luxation did not occur in these 4 dogs
  - **Complications**
    - Rupture on bands
    - Distal migration of pins
    - Reluxation of femoral head
    - Septic arthritis
    - Sciatic nerve injury
    - Ulceration
Open reduction and stabilization

• Multiple techniques available
  – Main benefits
    • Allow exploration of joint
    • Removal of hematoma and soft tissue in the acetabulum
    • Application of internal fixation
    • Examination of cartilage damage to the femoral head, neck and acetabular rim - therefore better idea on future formation of arthritis
Open reduction and stabilization

1. Capsulorrhaphy
   – Large non absorbable monofilament suture
   – Horizontal mattress or cruciate patterns
   – Ehmer sling in placed post surgery for 1-2 weeks
     • Success
       – 83-90% of cases *
     • Problems
       – Insufficient joint capsule remaining to perform this procedure

*Fossum

Open reduction and stabilization

• **Prosthetic capsule techniques**
  – Two bone screws/ anchors (dorsal to acetabular rim)
  – Second anchor point in femur
    • Placement side dependent
  – Large suture material in figure 8 pattern
    • Success *
      – 66-100%
        » Excellent ~ 65%
        » Good ~ 67%
        » Mild lameness ~ 18%
        » Severe lameness ~ 18%
  • Complications
    – Damage to articular cartilage
    – Reluxation through the web
    – Transient lameness for 4-10 weeks post surgery

Open reduction and stabilization

- Transposition of the greater trochanter
  - Routine greater trochanteric osteotomy leaving gluteal musculature in tact and moving it more distally
  - Allows contraction of the gluteal muscle to abduct and internally rotate the femoral head to keep it seated in the acetabulum
    - Success rates
      » ~84% *

Open reduction and stabilization

- Transarticular pinning
  - Pin inserted through femoral head and neck into the acetabulum
    - Pin placed to penetrate the medial wall of the acetabulum
  - Ehmer sling 2-4 weeks
  - Pin removed 2-3 weeks
  - Further 4 weeks restriction
    - Success
      - ~80% *
      - Worse in larger dogs
    - Complications
      - Cartilage damage
      - Sciatic nerve damage
      - Pin migration
      - Perforation of rectum
      - Pin bending or breakage
      - Osteoarthritis

Open reduction and stabilization

- **Toggle rod stabilization**
  - Two holes drilled to allow placement of a toggle and suture
    - Acetabulum - allows placement of toggle attached to suture
    - Neck and head of femur - allows placement of suture which is secured to the lateral aspect of the femur
  - Suture tied with the hip reduced
    - Multiple ways to attach the suture
      - Button, tied, crimped etc
    - Success
      - 89%*
        » With a 11% reluxation rate (70% of these occurred when presented > 7 days post injury)
      - 85-88% owners reported satisfactory results
  - Multiple types of toggle and sutures that are recommended

Open reduction and stabilization

- **Fascia lata loop stabilization**
  - Use of a harvested strip of fascia lata
  - Attached to the femur
  - Success *
    - 1 retrospective paper showed good results in 10 dogs and 2 cats

- **Transposition of the sacrotuberous ligament**
  - Ischial insertion of the sacrotuberous ligament is cut to include a piece of ischial bone
    - Two small holes are drilled in the small section of bone to allow suture to pass through them
    - Ligament is passed from medial to lateral through the acetabular tunnel
    - Then passed through a bone tunnel in femoral head and neck and secured below the grater trochanter
  - Complications
    » Similar to that of toggle rod stabilization


Open reduction and stabilization

• Extra articular iliofemoral suture
  – 1 hole placed lateral and medial in the ilium (just cranial to the acetabulum), a right angle is used to grab the suture from under the ventral aspect of the ilial body
  – 1 hole from caudal to cranial through the femur just distal to the insertion of the gluteal muscles
  • Non weight bearing sling placed for 7-10 days
  • Exercise restriction for up to 8 weeks
  • Success *
    – Report with 14 patients
    – No relaxations or complication noted at this stage
    – No reduction in range of motion

• Femoral head and neck excision arthroplasty

• Total hip replacement

Recent research

- Mechanical analysis of 12 toggle suture constructs for stabilization of coxofemoral luxations
  - Tested
    - 3 toggles
      - Piermattei toggle- 3/32" Steinmann pin
      - (A), modified Piermattei- 0.045" Kirschner wire
      - (B) and Securos (C)
    - 4 different sutures
      - OrthoFibre, Ethibond, Nylon and FiberWire
  - Testing showed
    - Modified Piermattei failed by toggle deformation
    - Piermattei and Securos failed by suture breakage at the eyelet
  - Piermaterri- #5 OrthoFiber had significantly higher failure load then Piermatterri #5 Ethibond and both of these constructs were more superior to all other toggle suture constructs
Recent research

- Modified Knowles toggle pin technique with monofilament suture for treatment of 2 caudoventral hip luxations
  - 1 dog and 1 cat
  - Cat had a successful outcome
  - Dog developed femoral neck fracture 2 month post surgery
    - Suspected to be due to erosion of the neck in conjunction with the tunnel of the femoral neck could have led to weakness of the neck
Recent research

• Combined intra-extra-articular techniques for stabilisation of coxofemoral luxation
  – Nylon tape tied in a clove hitch around the femoral neck-placed as a bridge over the ischial spine to create acetabular roof
    • 2 mature dogs
    • Both sound and no reluxations occurred
Recent research

- Stabilization of coxo-femoral luxation using tendonesis of the deep gluteal muscle- 65 dogs and cats
  - Screw and washer placed through the deep gluteal tendon and fixed in a hole drilled dorsal to the rectus femoris origin.
    - Capsulorrhaphy was performed in 15/66 cases
    - No reported complications noted in the operative and post operative period
    - 2 weeks post surgery lameness was noted in 47/65 patients
    - No reluxation in 26 dogs and 8 cats between 8-13 weeks post surgery
      - Success
        » Excellent outcome in 32/34 cases
        » Good outcome in 2/34 cases
    - All but 2 dogs had normal range of motion and were sound
      - Complications
        » Length of screw
          • Too long- protrudes into pelvic cannel and can cause damage to descending colon
          • Too short/ over tightening- these were left in place and caused no noted problems in the study
Recent research

- Correction of craniodorsal coxofemoral luxation in cats and small breed dogs with modified Knowles technique and braided polyblend TightRope system
  - 4 cats and 5 small dogs
  - All weight bearing day 1 post surgery
  - Median lameness score out of 0-5 at 6 weeks was 0
  - All returned to normal levels of exercise according to phone convocation with owners ~16 weeks post surgery
  - Minor complication in one animal with post operative swelling of the surgery site