



HIP DYSPLASIA

Extended Version

Classic case: 7-month-old Labrador retriever with bilateral pelvic limb lameness, difficulty rising, and bunny hopping gait when running

Presentation: Developmental disease of large and giant breed dogs

- **Signalment and History**

- **Breeds**

- **Dogs: large and giant breeds:** German shepherd, Labrador retriever, golden retriever, Rottweiler, Newfoundland
 - Cats (less frequent): Maine coon

- **Juvenile animals** (usually between 3 and 10 mos):

- Bunny-hopping gait,
 - Unilateral or bilateral pelvic limb lameness,
 - Difficulty rising,
 - **Exercise intolerance**
 - Audible clicking when rising or walking,
 - Shifting of weight to thoracic limbs and extension of hocks

- **Adults:** Weight-bearing lameness, esp after exercise, pelvic musculature disuse atrophy

- **Clinical signs (juvenile animals)**

- **Pain** during manipulation of coxofemoral joint
 - Caudal extension, external rotation, abduction
 - **Positive Ortolani sign**
 - May require sedation / anesthesia to measure angles
 - Dorsal subluxation of femoral head with the limb adducted (angle of subluxation can be measured – this will increase as the acetabular rim is lost to wear)
 - Followed by a palpable click with reduction of the femoral head when the limb is abducted (angle of reduction can be measured – indication of degree of capsular laxity)

- Poor pelvic limb musculature
 - Tarsal hyperextension
 - Arched spine from shifting weight to thoracic limbs
 - Narrow pelvic limb stance

- **Clinical signs (mature animals)**

- Pain during extension, external rotation and abduction of hip
 - Decreased range of motion and crepitus
 - Loss of Ortolani signs (due to periarticular fibrosis)
 - Pelvic limb muscle atrophy
 - Exaggerate hip movement at a walk



*A Labrador retriever standing with pelvic limbs close together to compensate for weak hips.
Image courtesy Malinaccier*



A Labrador retriever puppy with bilateral hip dysplasia.



Normal canine hips.

Images courtesy Dr Joel Mills

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DDX:

- **Juvenile:** Panosteitis, osteochondrosis, physeal fracture of femoral head, hypertrophic osteodystrophy, muscle injury
- **Mature:** Cranial cruciate ligament injury, patella luxation, lumbosacral disease, polyarthritis, bone neoplasia, rickettsial and fungal disease, muscle injury

Test(s) of choice:

- **Pelvic radiographs**
 - Evaluate morphology
 - Subluxation: center of femoral head should lie medial to the dorsal acetabular rim on a VD radiograph, otherwise it is subluxated or luxated (medial femoral head lateral to dorsal acetabular rim)
 - Congruency: Contours of the cranial acetabulum and cranial femoral head should be parallel curves in a normal congruent joint
 - Norberg Angle: Used mainly in Europe to determine joint laxity. Typical range is from 55 to 115 degrees. Normal is around 105 degrees. Lower measurements are due to increased joint laxity. Correlation with OFA is poor.
 - Degenerative changes
 - **Morgan's line** – one of the earliest indicators of DJD (degenerative joint disease)
 - Radiodense line from base of femoral neck to trochanteric fossa
 - The result of new bone formation along the insertion of the joint capsule
 - Osteoproliferation and remodeling
 - Femoral neck and head
 - Osteophytes
 - Acetabular rims
 - Sclerosis
 - **OFA (Orthopedic Foundation for Animals)** (*subjective*): dogs over 2 years old
 - Sedation required
 - Dog on back with legs fully extended and patella facing upward
 - **PennHIP protocol** (compression/distraction method) or dorsolateral subluxation radiographic views (*objective* evaluation of joint laxity): dogs as young as 16 weeks
 - **Distraction index** is determined after taking a VD pelvis with femoral heads abducted from the acetabulae
 - **High correlation with the likelihood of clinical signs due to hip dysplasia**
- ± Arthroscopy to identify ligament and cartilage damage; and determine surgical protocol



Morgan's line (arrow).

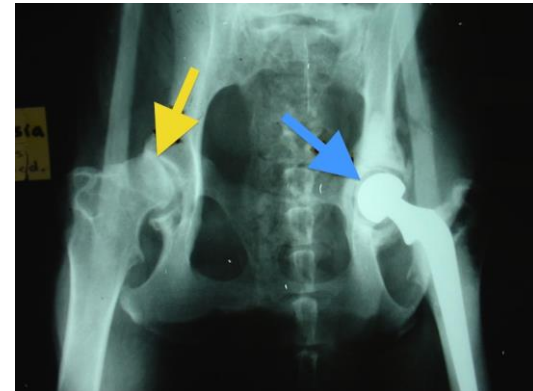
Image courtesy Dr Uwe Gille

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Rx of choice:

- Medical
 - **Pain control**
 - **Acute: NSAIDS:** carprofen, etodolac, deracoxib, meloxicam, tepoxalin, firocoxib
 - Chronic: Amantadine, gabapentin, tramadol, codeine, buprenorphine (cats)
 - Prevent obesity
 - Joint fluid modifiers
 - Energy restricted diet high in omega-3 fatty acids
 - Limit high impact exercise: jogging and rough housing
 - Physical therapy
 - Low impact activities: underwater treadmill, swimming, walking
 - Heat therapy, massage, electrical stimulation, cryotherapy
- Surgical
 - Juvenile pubic symphysiodesis (JPS)
 - Immature patients (14-20 weeks) with laxity and no DJD
 - Usually spayed or neutered at the same time
 - Growth plate of pubis is cauterized
 - As the remainder of pelvis grows, the acetabulae will rotate over the femoral head
 - Increases acetabular coverage of femoral head and prevents DJD
 - Not recommended for cases with severe subluxation
 - Low risk
 - **Triple pelvic osteotomy (TPO)**
 - Young dogs with laxity and no DJD
 - Based on previously determined angles of reduction and subluxation
 - Three cuts are made: ischium, pecten of the pubis, body of ilium
 - 20-30 degrees of acetabular rotation is usually effective
 - Increase acetabular coverage and prevent DJD
 - Not recommended for cases with severe subluxation
 - **Total hip replacement (THR) – gold standard**
 - Mature dogs with or without DJD
 - Prosthetic replacement – cemented or cementless
 - Highly advanced technique, expensive
 - Excellent prognosis, but can have serious complications
 - Femoral head and neck ostectomy (FHO)
 - Young to mature dogs
 - Reduce DJD bony contact and form a pseudoarthrosis (fibrous false joint)
 - May not be good for giant breeds
 - Requires intense post-op physical therapy
 - Makes future THR difficult and complicated



Total hip replacement at blue arrow, DJD secondary to hip dysplasia at yellow arrow.

Image courtesy Dr Joel Mills



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Prognosis:

- Fair to good: most will have some improvement with medical and surgical intervention.
- 60-75% of puppies who are lame due to hip joint laxity and medically managed may return to adequate clinical function at adulthood.

Prevention:

- **OFA** – breed only excellent or good evaluated dogs
- **PennHIP** – breed only those in the top 50% (less joint laxity)
- Avoid high-energy diets in young, rapidly growing large or giant breed dogs
- Low impact exercises only

Pearls:

- Hip joint **laxity** is responsible for early clinical signs and joint changes
 - Results in synovitis causing increased volume of joint fluid
 - Increased joint laxity and subluxation
 - Stretching of the fibrous joint capsule causing pain and lameness
 - Deformation of acetabular cancellous bone and tilting of the acetabular articular surface
 - Premature wear of articular cartilage and exposure of subchondral pain fibers
- Risk factors: breed, nutrient excess, rapid growth
- **Treat the dog, not the radiograph!** A severely lame dog may have minimal radiographic changes and a clinically normal dog may have severe radiographic changes.

Refs: Côté, Clinical Veterinary Advisor 2nd ed, pp 531-533; Fossum's Small Animal Surgery 3rd ed, pp 1233-1246; VetGrad: Hip Dysplasia; American College of Veterinary Surgeons online: Hip Dysplasia, Triple Pelvic Osteotomy, Total Hip Replacement; Orthopedic Foundation for Animals; and Merck Manual, 10th ed (online): Hip Dysplasia in Small Animals