Early Diagnosis and Treatment of Canine Hip Dysplasia - PennHIP and JPS

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Providing the best quality care and service for the patient, the client, and the referring veterinarian.

Canine Hip Dysplasia

- Most common orthopedic condition of the dog
- Disease of complex inheritance/polygenic trait
  - Multiple genes
  - Environmental influences
  - Variable expression of disease phenotype
- Hip laxity - primary phenotypic factor in predicting susceptibility for developing DJD
- Diagnosis and treatment recommendations remain controversial

Hip Dysplasia Pathogenesis

- Hip joint laxity → subluxation → traumatic hip reduction during foot strike
- Increased forces crossing joint, decreased surface area to distribute forces
- Cartilage stress and wear
- Reactive fibroplasia of joint capsule
- Periarticular osteophyte formation
- Advanced joint remodeling
- Osteoarthritis

Hip Dysplasia - Radiographic Progression
Cartilage changes and joint remodeling

Biphasic Disease Process

- Linear progression of OA but clinically considered biphasic
- Juvenile dog (5-12 mo) - Acute
  - pain due to joint capsule stretching, synovitis, cartilage wear, exposure of pain fibers in subchondral bone, microfracture of dorsal acetabular rim
- Adult dog - Chronic
  - pain due to osteoarthritis

Hip Dysplasia - Contributing Factors

- Small thigh muscle mass
- Rapid growth
- Dietary excesses
  - calcium, vitamin D
- Increased body weight
  - Plays role in manifestation of disease phenotype in genetically susceptible dogs
  - Weight reduction highly effective in preventing or delaying the onset of OA
  - Slimmer Labs: delayed radiographic changes of OA by 6 years, treatment by 3 years

Benefit of dietary restriction on OA
Diagnosing Hip Dysplasia

- Signalment
- Clinical signs
- Orthopedic exam
- Palpation
  - Bardens, Barlow, Ortolani sign
- Imaging
  - Radiography
  - Subjective and objective assessment
  - CT

Clinical signs of hip dysplasia

- **Mild**
  - No obvious lameness or gait abnormality
  - Bunny hopping during extended play
  - Mild reduced exercise tolerance
  - Little to no muscle atrophy
  - Discomfort on palpation only during extremes of ROM
  - Owner considers dog functionally normal
- **Moderate**
  - No gait abnormality
  - Bunny hopping with activity
  - No difficulty rising
  - Notable discomfort on palpation, resists ROM
  - +/- owner recognition of functional abnormality

Clinical signs of hip dysplasia

- **Severe**
  - Obvious gait abnormality
  - Lameness and distinct exercise intolerance
  - Obvious hesitation or discomfort noted on rising
    - Particularly after rest
  - Hesitation or inability to climb stairs
  - +/- audible clicking when walking
  - Marked muscle atrophy
  - Marked pain on joint manipulation
  - Conscious or passive limitation of range of motion
  - Owners are very aware of functional disability

Clinical signs of hip dysplasia

- **Juvenile Dog = Laxity**
  - Lameness, bunny hopping, difficulty rising after rest, exercise intolerance
  - Reluctance to run, jump, use stairs
- **Adult Dog = DJD**
  - Chronic presentation but can be acute
  - Lameness, difficulty rising, prefers to sit
  - Stiff after rest or strenuous activity
  - Reluctant to walk, run, jump
- **Exercise intolerance = most common sign**
Early Diagnosis - Orthopedic Exam

- Wide based stance
- Hip or spinal sway
- Shift weight to thoracic limbs
  - Hyperextend tarsus and stifle
  - Increased muscle mass in thoracic limbs
  - Arched back
- Bunny-hopping gait
- Pelvic limb muscle atrophy

Early Diagnosis - Palpation

- Assess hip pain and range of motion
  - Hip extension/flexion, abduction/adduction, internal/external rotation
- Bardens sign
  - Lateral recumbency
  - One hand applies lateral force on femur, other hand palpates lateral movement of greater trochanter
  - Greater than 1/4 inch = laxity

Early Diagnosis - Palpation

- Barlow sign (subluxation maneuver)
  - First part of Ortolani test
  - Lateral recumbency, adduct femur, direct force through femur dorsally
  - Dorsal subluxation of femur = laxity
- Ortolani sign (reduction maneuver)
  - Abduct limb, maintain dorsal force up femur
  - Click or clunk (heard/palpated) = laxity

Ortolani Maneuver
Ortolani Maneuver

Ortolani - Angle of Reduction and Subluxation

Positive Ortolani test
- Consistent with joint laxity
- Correlates with distraction index (DI) if no OA present
- Not a definitive predictor of later clinical signs or OA

Negative Ortolani test
- Can still have joint laxity and be susceptible to OA
- One study: 50% Ortolani negative had ↑DI
- Can be false negative if acetabular remodeling
- Consider objective test (DI) before deciding treatment plan

Ortolani - Interpretation for juvenile dog
Early Diagnosis - Imaging

Radiography
- Hip extended view
  - OFA
  - % Femoral head coverage
  - Norberg angle
- Distraction index (DI) - PennHIP

CT
- Acetabular angle (AA)
- Dorsal acetabular rim angle (DARA)

Radiography - Hip Extended View

- Assessment of osteoarthritis
- Subjective or objective hip laxity historically accepted as earliest visible radiographic change associated with hip dysplasia
- Radiographic signs of OA and accuracy of diagnosis of hip dysplasia are age dependent
- Correct diagnosis: 6 months (32%), 1 year (69%), 2 years (92%)
- Not a sensitive early diagnostic test for hip dysplasia
- Unable to predict the susceptibility to develop DJD later in life

Canine Hip Dysplasia - Problems with hip extended view

- Insensitive diagnostic tool
- Poor precision and predictive accuracy for canine hip dysplasia
- Large variability in interpretation among highly skilled examiners
- Hip extended position masks laxity
  - “Winds up” soft tissues of joint capsule
  - Internally rotates femoral heads
- Distraction view reveals 2.5 times more laxity
Radiographic evidence of OA

- Femoral periarticular osteophyte production
- Subchondral sclerosis of craniodorsal acetabulum
- Osteophytes on the cranial or caudal acetabular margin
- Joint remodeling from chronic wear

% Femoral Head Coverage

- Measurement of femoral head displacement from acetabulum
- Normal %FHC ≥ 50%
- ↑ %FHC = less laxity

Norberg Angle

- Line connecting center of femoral heads
- Line to each craniodorsal acetabular rim
- Norberg Angle ≥ 105º is normal
- ↑ NA = less laxity
Distraction Index (DI)

- PennHiP method
- Measurement of maximal femoral head displacement from the acetabulum
- Legs placed in a neutral position and a distractive force is applied

Distraction Index

\[ DI = \frac{d}{r} \]

- \(d\) = distance between the geometric center of the femoral head and the geometric center of the acetabulum
- \(r\) = radius of the femoral head
- Range 0 to 1.
  - 0 = full congruency, 1 = complete luxation
  - Smaller DI = tighter hips

Acetabular Angle

- Transverse CT image
- Angle formed by lines extended from dorsolateral acetabular margin through ventrolateral margin of each hip
- Larger angle = better hip coverage
Acetabular Angle

Dorsal Acetabular Rim Angle (DARA)

- Transverse CT image
  - Central pelvic height line
  - Line 90º to pelvic height line
  - Intersecting line drawn superimposed on each dorsal acetabular subchondral articular surface
- Each hip measured separately
- Smaller angle = better hip coverage
Dorsal Acetabular Rim Angle (DARA)

Orthopedic Foundation for Animals (OFA)
- Primary hip screening body for the US
- 7-point scoring system:
  - Consensus of three radiologists
  - Excellent, good, fair, borderline, mild dysplasia, moderate dysplasia, severe dysplasia
  - ‘Normal’ = excellent, good or fair
- Dogs must be 2 years or older

Problems with OFA scoring system
- Subjective scoring system
- Does not objectively measure hip laxity
- Poor agreement among radiologists and by the same radiologists over time
- Voluntary film submission = selection bias
  - Normal appearing hips 8x more likely to be submitted
  - Disease prevalence? Rate of improvement of hip scores over time?

Problems
- Diagnostic accuracy for CHD only when obvious arthritic changes or laxity noted on radiograph
  - May take 2 years or longer
- Many dogs develop DJD after 2 years
  - Dogs diagnosed as “normal” returned to breeding pool. Not required to re-evaluate later in life.
  - 55% of “normal” dogs at 2 years developed radiographic DJD later in life
- False negatives
Problems with OFA scoring system

- Controlled selective breeding trials of ‘normal’ dogs still result in high rates of offspring with CHD
  - German Shepherd=78% dysplastic offspring
- Has not reduced the incidence of CHD in 40 years of OFA screening

PennHIP
University of Pennsylvania Hip Improvement Program

- Most evidence-based hip screening method available
- 3 radiographic views
  - VD hip-extended, compression, distraction
- Distraction device placed between the legs and acts as a fulcrum to lateralize the femoral heads when adduction force is applied
- Distraction radiograph allows quantification of femoral head displacement
- DI (0 to >1) is a continuous scale

PennHIP
Distraction Index

- DI < 0.30 = tightest hips
  - Very low likelihood of developing OA of CHD
  - Service dogs, dog breeders
- DI = 0.30-0.70 = mild to moderate laxity
  - “at risk” for developing OA of CHD
  - Consider preemptive surgery or other strategies for risk reduction
  - Recommend regular follow-up radiographic assessment for onset and progression of disease
  - Not all dogs in this group will develop evidence of DJD
- DI > 0.70 = severe laxity
  - Preventative measures may be ineffective
  - OA is expected
  - May benefit from THR or FHO surgery in future

Documented accuracy as early as 16 weeks of age
Assess the “risk” of a young dog developing the OA of hip dysplasia later in life
Increase in laxity associated with increase in probability of DJD
Dogs with ↑DI (looser hips) will develop radiographic and clinical signs earlier than dogs with ↓DI (tighter hips)
Potential for earlier and more accurate detection of susceptibility for CHD
PennHIP
University of Pennsylvania Hip Improvement Program

- **Primary objectives**
  - Reduce frequency of CHD in all breeds
  - Provide reliable, quantitative information to dog breeders to make breeding decisions that reduce incidence of CHD in their lines
  - Gradually shift breed-specific laxity profiles toward tighter hips without a loss in breed vigor
  - Breed dogs with DI tighter than the breed median for the preceding year
  - PennHIP does not make specific breeding recommendations
  - Recommendations regarding preemptive surgeries

PennHIP Referral Network

- Veterinarians trained and certified in PennHIP method
- Strict adherence to technique and principles
- Mandatory submission of radiographs
  - Including obviously dysplastic hips
  - Maintains accuracy of breed heritability indices and breed specific laxity profiles
- PennHIP radiographic views as diagnostic tools for the elimination of CHD through selective breeding
- Accrue data from large populations of dogs and dog breeds

PennHIP - Breed Specific Laxity Profiles

- Semiannual report
- Breed specific
  - Count
  - Distraction index
    - Minimum
    - Maximum
    - Mean
  - DI for each percentile (75th, 60th, 50th, 25th)
- Breeds commonly affected by CHD have higher mean DI

PennHIP Database

- Other data reporting
  - Incidence of CHD by breed
  - Breed heritability indices
  - Efficacy of selective breeding by breed or breeder
  - Influence of age, weight, sex, diet on expression of CHD
  - Probability of CHD based on risk factors - DI, breed, age
PennHIP - Limitations

- “At this time there is no scientific information that warrants the use of PennHIP, a specific distraction index score, or compression score as an indication for medical or surgical treatment. Until appropriate research is completed such decisions must continue to be based on other supporting signs of hip disease.”

PennHIP - Radiographic method

- Deep sedation or anesthesia
  - Relaxed musculature, no movement, no response to toe pinch
  - Deoxtomidet/butorphanol
  - Ketamine/vaum/acepromazine

- Radiographic views
  - Hip extended - assess existent DJD, compare to DI
  - Compression - measures the congruency of the femoral head and acetabulum, acetabular depth, cartilage thickness
  - Distraction - measures amount of passive laxity

PennHIP - Compression View

- 439 dogs ≥ 2 years receiving PennHIP and OFA screening for CHD
  - DI ≥ 0.30 in:
    - 52% of OFA ‘excellent’
    - 82% of OFA ‘good’
    - 94% of OFA ‘fair’
    - 80% of OFA normal

- Dogs judged as phenotypically normal by OFA had clinically important passive laxity
- OFA and HE view underestimates susceptibility to OA, which may impede progress in reducing or eliminating CHD through breeding
Distraction procedure lowers intracapsular pressure of the coxofemoral joint.

Cavitation = void formation in the synovial fluid caused by pressure differential.

Appears as nitrogen bubbles (lucent areas) in joint space.

Occurs in 4%.

No adverse effects to joint.

May artificially elevate measured joint laxity.

Repeat in a 24 hours if bilateral.
Treatment Options for Canine Hip Dysplasia

- **Early Intervention - Juvenile**
  - Juvenile Pubic Symphysiodesis (12-20 weeks)
  - Medical Management

- **Late Intervention - Adult**
  - Femoral Head Osteotomy
  - Total Hip Replacement
  - Medical Management
Juvenile Pubic Symphysiodesis (JPS)

- Preventative, minimally invasive surgical intervention for dogs 12-20 weeks of age that are at risk for the development of hip dysplasia
- Monopolar electrocautery applied to pubic symphyseal growth plate causing thermal destruction and premature bony fusion
- Results in an increase in ventromedial rotation of the acetabulum (ventroversion) during continued growth of the pelvis
- Increases coverage of the femoral heads improving hip conformation

JPS Goals

- Achieve a more horizontal weight bearing surface
- Cover femoral head with acetabular hyaline cartilage
- Enlarge weight bearing surface
- Distribute load over a greater area
- Decrease resultant force across joint
- Improve joint congruency
JPS Surgery - Approach

- Midline approach to the cranial half of the pelvic symphysis = pubic symphysis
- Sharp and blunt elevation of gracilis, adductor and external obturator muscles
- Palpate bony prominence at junction of pubic and ischial symphysis

JPS Surgery - Approach

- Protect urethra and rectum
  - Transrectal reflection (double gloving) technique
  - Prepubic tendon incision technique
- Castration/OVH
  - Recommended at time of surgery
  - Ethical reasons

JPS Surgery - Symphysis Ablation

- Monopolar electrocautery induces thermal necrosis of germinal chondrocytes
  - Spatula or needle electrode
- Palpate depth of electrode insertion
- 40 Watts for 10-20 seconds
  - Tissue necrosis is time dependent
  - Longer for larger dogs
- Every 2-3mm along pubic symphysis
JPS Surgery - Symphysis Ablation

JPS Surgery - Alternative Techniques

- Sharp excision of pubic symphysis
- Compress symphysis with cerclage wire
- Faster fusion?
- Technically more difficult?

JPS Surgery - Postoperative Care

- Perioperative medications
  - Cefazolin
  - NSAID
  - Opioid
- Operating time typically 30 minutes
- Discharge within 6-24 hours
- Monitor for tenesmus, dysuria, diarrhea
- Exercise restriction
  - Leash walking for 14 days then unrestricted activity

JPS Surgery - Complications

- Rare!
  - Loose or mucoid stool x 1-3 days
  - Electrocautery burns
  - Asymmetrical fusion
- Not reported
  - Fusion failure
  - Rectal or urethral damage
**JPS - Radiographic Changes**

- Complete fusion of pubic portion of pelvic symphysis
- Shorter, wider pubic rami*
- Irregular margin of the cranial pubis
- Rounder, wider obturator foramen*
- More prominent acetabular fossa
- +/- decrease in diameter of pelvic inlet

*most reliable criterion

- Importance in recognizing previous JPS procedure and to exclude these dogs from breeding

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**JPS - Advantages**

- Both hips treated simultaneously
- Not technically demanding
- No special instrumentation or orthopedic implants
- Inexpensive
- Shorter recovery period, less exercise restriction
- Quick procedure
- Few complications
- Can perform TPO, FHO, THR later if necessary
**JPS - Evidence**

- Canine hip dysplasia treated by juvenile pubic symphysiodesis. Part I: Two year results of computed tomography and distraction index.
- Canine hip dysplasia treated by juvenile pubic symphysiodesis. Part II: Two year clinical results.
- Comparison of conservative management and juvenile pubic symphysiodesis in the early treatment of canine hip dysplasia.

**Inclusion criteria**
- Unilateral or bilateral disease
- Mean DI ≥ 0.40
- Ortolani sign positive
- If Ortolani negative, then each hip DI ≥ 0.40
- 12-24 weeks of age

**Objective criteria**
- DARA (dorsal acetabular rim angle)
- AA (acetabular angle)
- DI (PennHIP distraction index)

**Early group (12-16 months), late group (19-24 weeks)**

**JPS - Acetabular Angle**

- Increased 26% and 31% vs. controls 5% and 3%
- Early group significantly improved vs. pre-op, controls and late group
- Late group significantly improved vs. pre-op and controls but not as much as early group
- 12% AA improvement lost with each week delay in sx

**Pre-op JPS**

**1 year post-op JPS**
**JPS - DARA**

- Mean DARA improved over controls by
  - 21% (1 year)
  - 24% (2 years)

- Change vs. pre-op
  - Controls no significant change
  - Early group 11° improvement (45%)
  - Late group 2.5° improvement (14%) vs. pre-op (not significant)

- Mean loss of DARA improvement for each delay of surgery week = 1.5°

**JPS - Distraction Index**

- Mean DI decrease vs. pre-op
  - 16% (1 year)
  - 41% (2 years)
  - Response to ventroversion

- Control DI decrease vs. pre-op
  - 1% (1 year)
  - 20% (2 years)
  - Pathological response to OA

- Mild, moderate, severe laxity vs. pre-op
  - JPS - all improved

**JPS - Osteoarthritis**

- Increased OA score vs. pre-op
  - JPS: 3% (1 year), 11% (2 year) - not significant increase
  - Control: 23% (1 year), 55% (2 year)

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**Canine hip dysplasia treated by juvenile pubic symphysiodesis.**

Part II: Two year clinical results.


- Subjective criteria
  - Ortolani
  - Hip reduction angle
  - Osteoarthritis
  - Gait evaluation
    - force platform, clinical, owner assessment
    - Hip pain
JPS - Results

- OA
  - JPS and control dogs with severe laxity (DI≥0.70) had progressive arthritis
  - JPS dogs with mild to moderate laxity (DI=0.40-0.69) had no significant arthritis progression

- Ortolani - conversion to negative
  - JPS: 77% (2 year)
  - Control: 8% (2 year)

- Hip reduction angle
  - Correlated well with DI
  - Good subjective test for laxity
  - 2 year decrease from pre-op: JPS=↓88%, control=↓55%

Pain
- JPS: 7 painful hips at 2 years
  - Mean pre-op DI=0.91 - severe laxity
  - Mean age of surgery = 20 weeks
  - Both are known to ↓ JPS success

Gait
- JPS: No lameness at 2 years
  - Control: 2 dogs at 2 years

JPS - Study conclusions

- Best results
  - Mild to moderate laxity (DI=0.40-0.69)
  - Young age (12-16 weeks)

- Improved clinical criteria
  - Ortolani, hip reduction angle, hip pain

- For mild to moderate laxity
  - Improvements in AA and DARA
  - Insignificant OA at 2 years

- Safe and effective pre-emptive, bilateral surgical treatment for mild to moderate hip dysplasia

- OA not prevented when initial laxity is severe (DI≥0.70)

JPS - Case Selection

- Best candidates
  - Mild to moderate laxity determined by distraction index
  - +/- mild joint incongruency
  - 12-16 weeks of age

- Degree of Laxity
  - Less beneficial for severe laxity, severe joint incongruency
  - DJD is expected in the future for severe laxity

- Age
  - Less beneficial with increasing age
  - 82% of pelvic growth has occurred by 17 weeks of age
  - Not recommended after 22 weeks of age

Giant breeds?
JPS - Treatment Guidelines - 12 week exam  
Dueland et al., VCOT 5/2010

- Often no clinical signs of hip dysplasia at this age
- Severe Laxity
  - DI ≥ 0.70 and Ortolani positive
  - JPS performed by 12-16 weeks of age
  - Some degree of arthritis is expected
- Moderate Laxity
  - DI = 0.50-0.69 and Ortolani positive
  - JPS performed by 14-16 weeks of age
- Mild Laxity
  - DI = 0.40-0.49 and Ortolani positive
  - JPS optional but re-evaluate at 16 weeks for progression
- Relationship between DI and benefits of JPS remains investigational

Triple Pelvic Osteotomy (TPO)

- Prophylactic surgical intervention
- Axial rotation and lateralization of the acetabulum
- Goals:
  - Increase dorsal acetabular coverage of the femoral head
  - Normalize articular stresses
  - Improve joint congruity
  - Maintain continuous hip reduction through a normal range of motion
  - Decrease abnormal hip joint laxity

Triple Pelvic Osteotomy (TPO) - Ideal candidate

- Immature dog clinically affected by hip dysplasia
- Evidence of hip joint laxity
  - radiographic and palpable
- No radiographic signs of secondary DJD
- Angle of reduction less than 30-45 degrees
- Angle of subluxation less than 10 degrees
- Solid feeling of reduction of femoral head - “clunk”
- 6-12 months of age

Triple Pelvic Osteotomy (TPO) - Poor candidate

- Radiographic evidence of DJD
- Large angle of reduction
  - Increased laxity
- Crepitation on reduction
- Indistinct reduction
- Severe laxity
  - No acetabular capture
Triple Pelvic Osteotomy (TPO) - Surgical Procedure

- Triple osteotomy
  - Pubic
  - Ischial
  - Ilial

- Pelvic osteotomy plate
  - 20, 30 or 40 degree
  - Locking vs. standard

- Palpation
  - Hip stability
  - Joint range of motion

Triple Pelvic Osteotomy (TPO) - Surgical Procedure

- Standard plate
- Locking plate

Triple Pelvic Osteotomy (TPO) - Aftercare

- Tramadol x 7 days
- NSAIDs x 14 days
- Exercise restriction x 6-8 weeks
- Follow up radiographs at 6 weeks

Triple Pelvic Osteotomy (TPO) - Surgical Complications

- Screw loosening
  - Engage sacrum
  - Locking screws

- Sciatic or obturator neurapraxia

- Dysuria
  - Avoid bilateral TPO

- Femoral neck impingement in abduction
  - Avoid overrotation
Triple Pelvic Osteotomy (TPO) - Evidence

- Subjective clinical improvement
  - 93% satisfactory limb function post-op
- Kinetic gait analysis
  - High rate of positive outcomes
- Peak vertical force
  - Increases as early as 8 weeks post-op
  - Normal by 28 weeks post-op
- High rate of successful functional recovery but secondary osteoarthritis may still develop

Long term Outcome of JPS and TPO in dogs with hip dysplasia


- 9 JPS dogs (16-22 weeks), 9 TPO dogs (5-12 months)
- At 2 year follow-up:
  - Compared to pre-op, only TPO dogs had significantly ↑AA and ↓DARA
  - All dogs subjectively doing well
  - No significant difference in DJD scores between groups
- Conclusions:
  - JPS and TPO have similar clinical outcome and effects on hip conformation for moderate to severe hip dysplasia.
  - TPO may be more effective at altering acetabular coverage.
  - Neither fully eliminates joint laxity or DJD progression.

Medical Management of Hip Dysplasia

- Non-steroidal anti-inflammatories (NSAIDs)
- Analgesics
  - Tramadol
  - Gabapentin, amantadine - neuropathic pain
- Structure modifying agents
  - Polysulfated glycosaminoglycans
    - Adequan - available spring 2014
- Nutraceuticals
  - Glucosamine and chondroitin
  - Omega-3 fatty acids
- Activity: exercise moderation, physical therapy
- Body weight management
- Joint specific diets

Treatment Options for Canine Hip Dysplasia

- Early Intervention - Juvenile
  - Juvenile Pubic Symphysiodesis (12-20 weeks)
  - Triple Pelvic Osteotomy (6-12 months)
  - Medical Management
- Late Intervention - Adult
  - Femoral Head Osteotomy
  - Total Hip Replacement
  - Medical Management
Femoral Head Ostectomy (FHO)

- Salvage procedure
- Eliminates pain from laxity (young), OA (adult)
- Eliminates bone-on-bone contact
- Allows formation of a pseudoarthrosis
- Better outcomes:
  - Dogs <20 kg
  - Immediate post-op physical therapy
  - Younger
  - Shorter duration of clinical signs
  - Less severe disease
  - Less muscle atrophy

Femoral Head Ostectomy (FHO) Candidate

- Clinical signs of lameness and pain not effectively treated with medical management
- TPO or total hip replacement surgery is not an option due to age, size or economics

Femoral Head Ostectomy (FHO) Surgery and Aftercare

- Complete excision of femoral head and neck
- Postop opioids, NSAIDs
- Encourage early weight bearing
- Physical therapy
- Reported complications
  - Decreased ROM
  - Limb shortening
  - Continued lameness
  - Muscle atrophy

Total Hip Arthroplasty

- Salvage procedure
- Replace diseased femoral head and acetabulum
- Chronically lame dog, non-responsive to medical management
- Medium-sized to giant breed
- Skeletally mature dog
- Usually performed late in life
- Goal - Return to normal or near-normal function including athletic, working and sporting dogs.
Total Hip Arthroplasty Implants

- Various systems
  - Kyon - Zurich hip
  - Biomedtrix - BFX, CFX
  - MedicatechVET - Helica
- Cemented
- Non-cemented
  - Press-fit ingrowth
  - Screw-in ingrowth

Total Hip Arthroplasty Complications

- Aseptic loosening
- Luxation
- Infection
- Femoral fracture
- Subsidence
- Sciatic neurapraxia

Early Diagnosis and Treatment of Canine Hip Dysplasia - Recommendations

- Early recognition of hip laxity
  - During initial office visits for vaccinations, wellness exam, etc.
- Routine Ortolani maneuver performed by 12 weeks of age
  - Especially for susceptible breeds
  - Sedation as needed
- PennHIP analysis performed if Ortolani positive
  - Consider PennHIP for susceptible Ortolani negative dogs
Conclusions

- Hip laxity is a reliable predictor of degenerative joint disease
- PennHIP analysis is the most evidence-based screening method to assess the "risk" of a young dog developing osteoarthritis of hip dysplasia later in life
- With improved ability to identify dogs at risk for DJD, early prophylactic surgical intervention is now more feasible
- The JPS technique can prevent, delay or ameliorate the potentially debilitating effects of DJD

Questions??

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