

**Canine Hip Dysplasia**  
Roberto E. Novo, DVM, DACVS  
University of Minnesota

**Definition**

Canine hip dysplasia is a deformity of the coxofemoral joint or joints which may be characterized by a shallow acetabulum, flattening of the femoral head, coxofemoral subluxation, or secondary degenerative joint disease.

These disease characteristics may or may not appear in a predictable or consistent manner, and any one or all of these characteristics, at different rates of progression, may be present at the time of radiographic examination.

The clinical manifestations of hip dysplasia may vary from severe crippling lameness to a condition without any perceivable signs of disease. The correlation between the radiographic signs of disease and the clinical manifestations seen in an individual dog is not predictable and the two frequently seem to be at variance.

Canine hip dysplasia is a disease process with varying degrees of progression and clinical signs. These characteristics give disease process of canine hip dysplasia a multitude of clinical presentations, treatment options, and preventative education.

**Etiology**

1. Inheritance - Polygenetic mode of inheritance.
2. The extent of expression of the disease genetically is subject to modification by a variety of environmental or nongenetic factors.
3. Nongenetic factors which influence the progression of hip dysplasia.
  - a) Rapid growth - especially between the 3rd to 8th month of life.
  - b) Overnutrition - This is related to rapid growth.
4. A dog with a genetic predisposition to canine hip dysplasia can be treated with measures that will prevent or limit the progression of clinical signs.

**Pathogenesis**

1. At birth, the hip joint is normal in dogs that are genetically predisposed to become dysplastic. The hip joint remains stable for the first 10-14 days of life. From then on joint laxity develops and progresses at a variable rate, depending on the individual animal and the factors responsible for the laxity to subluxation or, in severe cases, eventual luxation of the joint. Factors implicated in the manifestation of canine hip dysplasia include feeding high protein puppy chow, rapid rate of growth, exercise restrictions, and genetic lineage predisposition. Once joint laxity has become excessive, the congruous well balanced fit between the femoral head and the acetabulum is not maintained.

2. The order in which changes occur can be outlined as follows:
  - a) joint laxity
  - b) Synovitis
  - c) Subluxation of the femoral heads
  - d) Abnormal wear and erosion of the articular cartilage.
  - e) Thickening of the joint capsule
  - f) Formulation of periarticular osteophytes (which can develop during immaturity).
  - g) Acetabulum becomes more shallow than normal, and ultimately fills in with new bone.
  - h) Femoral heads can become somewhat flattened. (Take care not to call the capita fovea an abnormality.)
  - i) The femoral neck becomes wider due to periarticular osteophytes and new bone.
  - j) **\*Important\*** - Clinical signs will not always correlate with the degree of pathologic progression.

### History

1. Clinical signs generally first observed between 4 and 12 months of age.
2. Some dogs may be older before clinical signs are seen. Dogs are very good at masking discomfort in the hind limbs. They tend to throw their weight forward and mask the lameness with changes in gait, making it difficult for an uninformed client to recognize.
3. As the dog gets older, the history will be of a more persistent lameness, associated with the degenerative osteoarthritis of the hips.
4. A history of a patient may include one or more of the following observations by the owner -
  - a) Decreased exercise tolerance.
  - b) Inability to go up and down stairs or to get in or out of a motor vehicle.
  - c) Difficulty arising from a prone to a standing position.
  - d) All the above (a,b,c) can also be observed in dogs with thoracolumbar facet joint arthritis, lumbosacral stenosis, and also bilateral cruciate ligament tears.
  - e) In young dogs, often an audible click may be heard coming from one or both hips as they subluxate and reduce when the dog is walking.
  - f) A bunny hopping gait when running.
  - g) A change of disposition (aggressiveness) due to painful hips.
  - h) Inability to clear a jump in obedience training.
  - i) Lameness after strenuous exercise.
  - j) Wobbly gait in rear legs, especially in very young dogs (8-16 weeks of age).
  - k) Flat rump with wide hips.
  - l) Narrow stance in rear legs (hocks together and toes pointed outward).
  - m) Be cautious of the middle age and older dog with a history of a rear leg ataxia. It could be degenerative myelopathy, tumor, or intervertebral disc disease.

### **Clinical Signs**

1. They will vary widely from a dog with slight hip pain on manipulation, and no obvious lameness; to one with slight pain and some lameness; to one with acute pain and severe crippling effects of osteoarthritis.
2. Some dogs will be presented who are not currently lame but who were lame 2 or 3 days earlier.
3. The wobbly gait of some younger dogs is best seen as the dogs walk away from the clinician.
4. Some dogs will stand with a slightly arched back as weight is shifted from the rear to the front legs.
5. Rear legs abducted and toes rotated outward.

### **Orthopedic Examination**

1. Manipulate hip joints for evidence of pain.
  - a) Flexion and Extension
  - b) Internal and External Rotation
  - c) Abduction
2. It's rare to have any pain in flexion in a dysplastic dog.
3. In all the above manipulations, the range of motion (ROM) may be decreased due to pain or arthritis. Record the ROM with a goniometer for future reference.
4. The restriction of abduction can be from pain or from extreme tightness of the pectineus muscle.
5. Most manipulations can be done in the exam room. If extreme pain is present or the dog overly excited, he will have to be sedated.
6. Crepitation may be felt on joint manipulation if the osteoarthritis is advanced enough.
7. All dogs, especially the younger ones, should be checked for the presence or absence of an Ortolani Sign.
  - a) Not all dysplastic dogs have enough joint laxity to cause an Ortolani Sign.
  - b) A negative Ortolani Sign can also be present in dysplastic joints where the joint capsule has become thickened and prevents the femoral head from extreme subluxation.
  - c) The method of palpating for an Ortolani Sign can be done with the dog in either dorsal or lateral recumbency.
  - d) The Ortolani Sign can be checked for during the orthopedic and physical examination and again when the dog is sedated for radiographs.
  - e) The hip exam should be done on all dogs who are prone to have hip dysplasia at the time of early health exams, especially around 3 months of age and older.

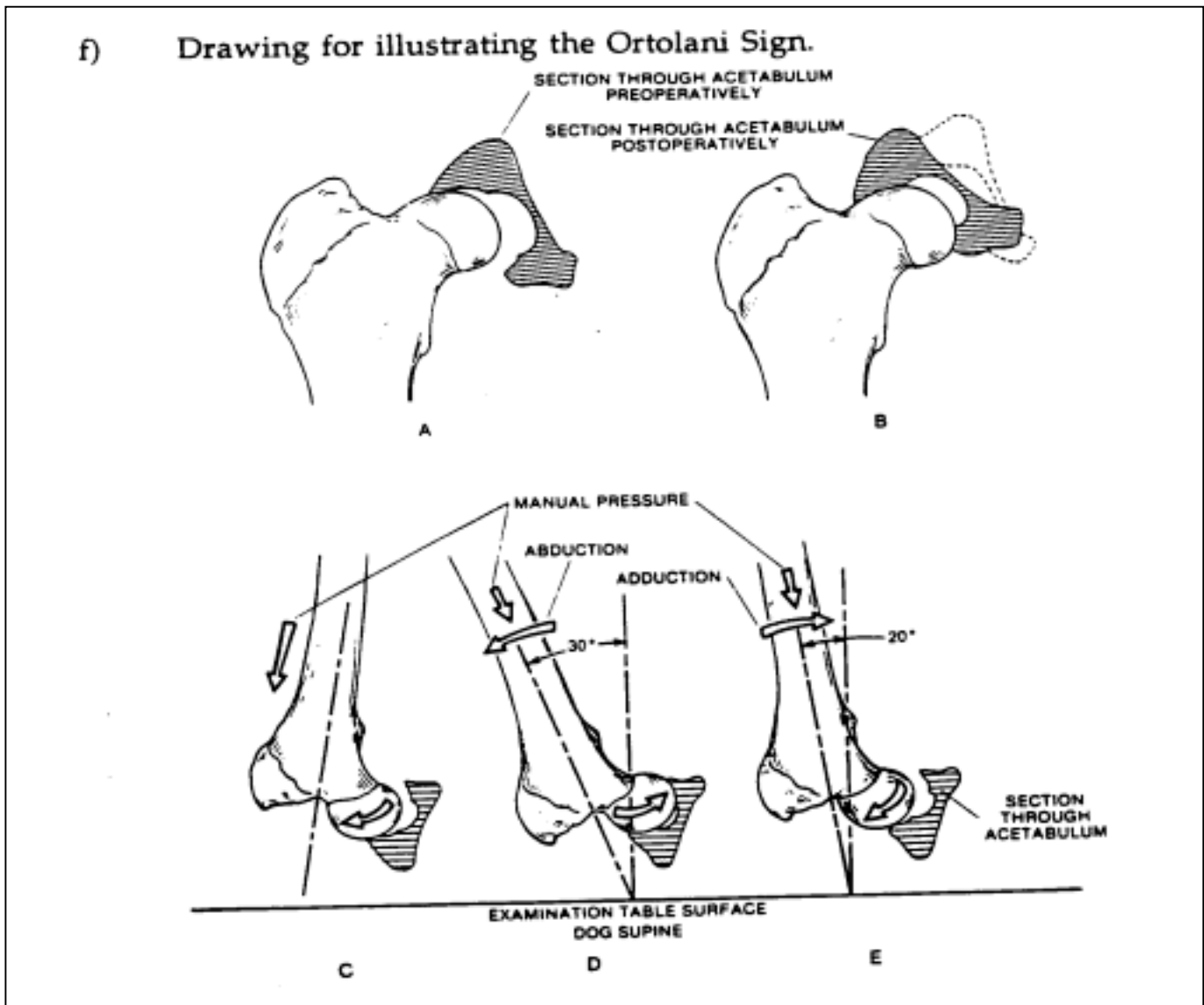
### Orthopedic Examination

1. Manipulate hip joints for evidence of pain.
  - a) Flexion and Extension
  - b) Internal and External Rotation
  - c) Abduction
2. It's rare to have any pain in flexion in a dysplastic dog.
3. In all the above manipulations, the range of motion (ROM) may be decreased due to pain or arthritis. Record the ROM with a goniometer for future reference.
4. The restriction of abduction can be from pain or from extreme tightness of the pectineus muscle.
5. Most manipulations can be done in the exam room. If extreme pain is present or the dog overly excited, he will have to be sedated.
6. Crepitation may be felt on joint manipulation if the osteoarthritis is advanced enough.
7. All dogs, especially the younger ones, should be checked for the presence or absence of an

### Ortolani Sign.

- a) Not all dysplastic dogs have enough joint laxity to cause an Ortolani Sign.
- b) A negative Ortolani Sign can also be present in dysplastic joints where the joint capsule has become thickened and prevents the femoral head from extreme subluxation.
- c) The method of palpating for an Ortolani Sign can be done with the dog in either dorsal or lateral recumbency.
- d) The Ortolani Sign can be checked for during the orthopedic and physical examination and again when the dog is sedated for radiographs.
- e) The hip exam should be done on all dogs who are prone to have hip dysplasia at the time of early health exams, especially around 3 months of age and older.





Triple pelvic osteotomy. (A) Preoperatively the femoral head is riding loosely in the acetabulum and contacting only a small area of the dorsal acetabular rim, setting the stage for the structural changes we identify as hip dysplasia. (B) Following osteotomy the acetabular portion of the pelvis has been rotated laterally over the femoral head, greatly increasing the contact area between head and acetabulum and thus decreasing local bone and cartilage loads. (C, D, and E) Finding the acetabular rotation angle. w "

(C) With the dog supine, the Ortolani sign (subluxation of the femoral head) is elicited by adduction and pressure on the femur directed toward the table. This is most easily done bilaterally, which eliminates the problem of the dog rotating when pressure is applied. (D) While continuing to apply pressure to the femur, the femur is slowly abducted. At some point a distinct click or popping sensation will be felt and perhaps heard as the femur reduces into the acetabulum. In addition, a visible motion will be seen in the inguinal region as the femur returns medially. The angle of the femur relative to the sagittal plane (i.e., the plane 90 degrees to the table top) is identified as the reduction angle and represents the maximum angle the acetabulum would need to be rotated to stabilize the femur. In this example the angle measured 30 degrees. The optimal angle of rotation is about 5 to 10 degrees less than the angle of reduction. (E) With the femur in the reduced position, it is slowly adducted while maintaining pressure toward the table. Again a distinct point will be appreciated visually, audibly, and by palpation that represents the femur luxating from the acetabulum. This is measured as in D and is called the angle of luxation. 20 degrees here, and represents the minimum angle of rotation of the acetabulum.

- g) If the patient is not properly positioned, one can obtain false positive or negative Ortolani signs.
- h) Hip palpation using the Bardens Technique has been shown to be statistically significant for palpating 8 week old puppies for predicting which pups will become dysplastic due to excess joint laxity. At that age, the pups require deep sedation or light anesthesia. A statistical correlation using the Ortolani Sign has not been published for dogs of the same age. I have found the Ortolani Sign to be very useful and accurate when positive in unsedated dogs at 3 or 4 months of age. A lot depends on the quality of the Ortolani Sign. The Penn Hip method, used for evaluation of hip laxity as a method of diagnosing animals predisposed to develop progression of hip dysplasia, is based on this technique.
8. Some dogs with unilateral foreleg lameness may have hip dysplasia. Lameness is due to the extra weight being shifted forward. In many cases, there will be no history of a rear leg lameness.
9. Dogs presented with a rear leg lameness that are diagnosed as having hip dysplasia must be very thoroughly examined from their toes to their hips, pelvis and spine (especially lumbar and lumbosacral levels) for other problems that may be responsible for the lameness or weakness.
- a) Examples of such problems in young and older dogs, other than infections, fractures, and luxations include, but are not limited to:
- Panosteitis
  - Ligament Injuries (\*CCL\*, MCL) or osteochondritis dissecans of the stifle or hock joints.
  - Tendon or muscle injuries
  - Vertebral facet joint arthritis
  - Lumbosacral stenosis
  - Neuromuscular disease (degenerative myelopathy)
10. If a patient has facet joint osteoarthritis at the L-7 S-1 level or lumbosacral stenosis, a pain response may be elicited when the rear legs are hyperextended.
- Make sure you localize the pain.
  - Evaluate the patient standing and on its side to truly isolate hip or LS movement.
  - Look for neurologic deficits (scuffed nails, shuffling, ataxia, sciatic nerve hyporeflexia, and/or urinary/fecal incontinence).





0 1. Radiology

- a) Always at least VD and Lat. views.
- b) Must be properly positioned.
- c) Proper positioning
  - 1) Proper positioning of the pelvis requires inclusion of both the pelvis, femurs and stifles.
  - 2) The pelvis should be symmetrically positioned as illustrated in

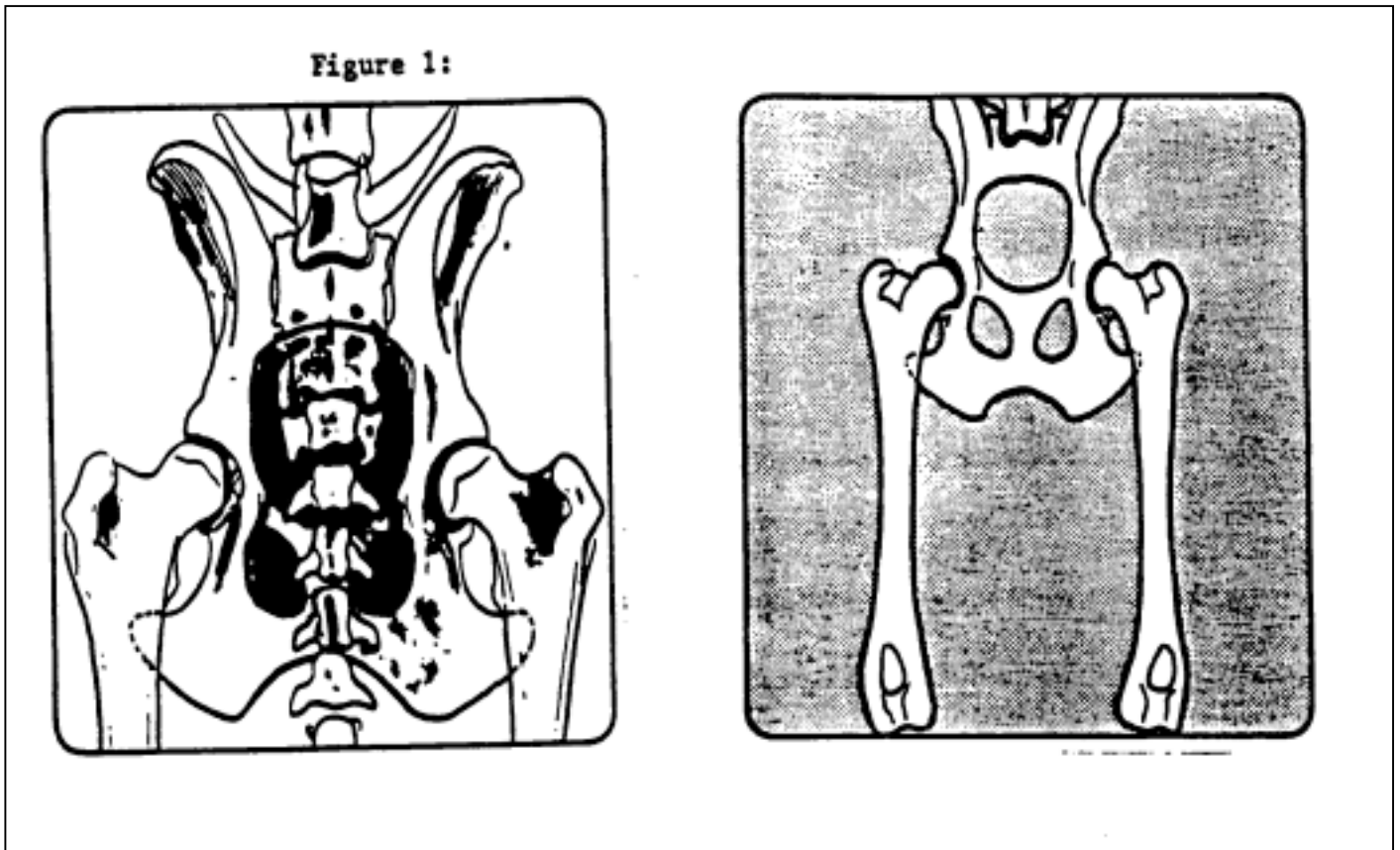


Figure 1. Normal canine pelvis (ventro-dorsal projection). Proper positioning of the pelvis and femur on the midline of the distal femurs and the patellae positioned on the midline of the distal femurs also Small Animal Clinician. Ralston Purina Company, St. Louis, Missouri, 1982, p. 40, 41.)

### **Advice to Owners of Dogs with Hip Dysplasia**

1. Inherited disease
2. Generally two phases
  - a. Acute - Usually appears between 4-9 months of age.
  - b. Chronic - Arthritis - usually occurs later in life, occasionally seen in younger dogs.
3. Signs of the disease vary; some dogs may have the disease and show no clinical signs.
4. Signs that may be observed in dogs:
  - a. May sit a great deal
  - b. Difficulty in rising, especially on slippery floors
  - c. Slight swaying gait
  - d. Bunny hop with rear legs when running
  - e. Joint pain from hips when handled - especially when the hind legs are pulled away from the body.
  - f. Positional changes - lowering of head to take weight off rear legs and carry more weight on front legs.
5. Allow dogs to choose their own level of exercise.
6. Sudden forced exercise is to be discouraged.
7. Encourage moderate exercise if necessary.
8. Obedience training is encouraged, but advanced training with jumping - is not recommended.
9. Provide warm day-quarters.
10. Avoid over-feeding and obesity.
11. Don't use affected dogs for breeding purposes.
12. Medical or surgical treatment may be necessary, owners should consult with their veterinarians concerning treatment.

### **Control Programs for Canine Hip Dysplasia**

1. Inherited disease
2. Polygenetic mode of inheritance
3. The extent of the expression of the disease is subject to modification by a variety of environmental factors.
4. Progress in control of hip dysplasia based on individual selection has not been as rapid as hoped for, however there has been an overall decrease in incidence of hip dysplasia in the overall population. Ancestors of normal dogs and dysplasia-affected dogs have a strong influence on the frequency of hip dysplasia in their pregnancy.
5. Certain dogs with a pre-potency for producing normal offspring or dysplasia-affected offspring cannot be identified on the basis of a single clinical examination.
6. There are some dogs that defy classification by any present method of examination.
7. Control of C.H.D. should be based on:
  - a. Individual selection (mass selection)
  - b. Individual performance (progeny testing)
  - c. Family performance (sibling evaluation and pedigree depth)



## **Treatment**

### **A. Medical Management**

1. In this case the treatment is to alleviate the pain related to the synovitis early in the disease and the OA as the disease progresses.
2. Bufferin or Ascriptin (regular strength) 1 tablet per 25-30 lbs. body weight every 8-12 hours as needed.
3. If long term medication is needed, Arquel is recommended at a dose of 0.5-1.0 mg/pound body weight. Start at low dose and increase if needed. \*Give once daily, at the same time each day after a full meal. If illness develops, stop the medication and put patient on Kaopectate. The illness is generally diarrhea. About 5% of the patients will develop diarrhea on the 3rd to 5th day after treatment starts. The diarrhea usually stops within 48 hours. Those patients who must stay on this drug for months or years should have a hemogram done to check for anemia every four months. Do not place the patient on high doses of corticosteroids while they are on Arquel.
4. If obese, put them on a weight reduction program.
5. Strenuous or forced exercise is to be avoided.

### **B. Surgeries**

1. Triple Pelvic Osteotomy
2. Acetabuloplasty
3. Intertrochanteric Osteotomy
4. Excision Arthroplasty
5. Pectineus Tendonectomy
6. Total Hip Replacement

## REFERENCES

1. Wallace, LJ: Canine hip dysplasia, past and present. *Seminars in Vet. Med. and Surgery*. Vol. 2 (1987): 92-106.
2. Brinker, W.O., Piermattei, D and Flo, G: *Handbook of Small Animal Orthopedics and Fracture Treatment*. W.B. Saunders Co. 2nd. Edit. (1990) 355-375.
3. **Canine Hip Dysplasia**  
*The Veterinary Clinics of North America*. W.B. Saunders Co. Vol. 22, No. 3, May, 1992.

