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# How do I diagnose hip dysplasia in growing dogs?

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Canine hip dysplasia (CHD) is a complex, multifactorial, progressive disease that develops during postnatal skeletal growth. CHD in the growing dog is clinically characterized by increased dorsal acetabular rim (DAR) slope and functional hip joint hyperlaxity that permit pathologic coxofemoral subluxation and the development of secondary joint remodeling and degeneration. Veterinarians are frequently challenged to diagnose CHD in growing dogs prior to the onset of these irreversible secondary changes. Early diagnosis and proper treatment can arrest the progression of the disease and alter its pathogenesis.

Passive hip joint laxity refers to laxity that can be demonstrated in puppies by means of external veterinary manipulations (Ortolani test, Barden test, PennHIP distraction index). Some degree of passive hip joint laxity is detectable via PennHIP in all dogs. Passive hip joint hyperlaxity has been shown to be a heritable phenotype of CHD as well as a breed-specific risk factor for the development of osteoarthritis (OA). Detectable passive hip joint laxity does not always relate directly to the development of CHD symptoms or OA. From a therapeutic standpoint, the challenge faced by veterinarians is to detect functional hip joint hyperlaxity in which dynamic subluxation occurs spontaneously during daily patient activities.

## Signalment

Most any large breed dog may develop CHD, but commonly presented breeds include Golden Retrievers, German Shepherds, Rottweilers, Labrador Retrievers, Chesapeake Bay Retrievers, Saint Bernards, and English Mastiffs. Puppies are seldom presented because of symptomatic concerns prior to 4 to 5 months of age.

## History

Puppies are most often presented to the veterinarian by the pet owner for vaguely expressed concerns such as pelvic limb weakness, reluctance to rise in hind end, reluctance to climb stairs, and intolerance of extended periods of exercise. Puppies are seldom presented for discrete pelvic limb lameness. Asymptomatic puppies are presented for screening evaluation in consideration of prophylaxis via juvenile pubic symphysiodesis (JPS) with increasing frequency.

## Gait Evaluation

Many growing dogs with functional hip joint hyperlaxity and dynamic subluxation display a unique “tight skirt” gait at a walk or trot in which they do not fully extending

their hips. Some puppies display a “bunny-hopping” gait at a walk or trot or when ascending stairs. Dynamic hip subluxation can be visualized and/or heard in some puppies while they walk.

## Hip Palpation

While an assistant leads the puppy at a walking gait, the examiner should walk behind the patient while resting his/her hands on the pup’s hips. Palpable dynamic hip subluxation and reduction is detected in some patients and is a definitive indicator of pathologic functional hip joint hyperlaxity. It is also helpful for the examiner to place his/her hands on the puppy’s hips and gently sway the hind end from side to side in order to detect palpable subluxation and reduction. Hip extension and hip abduction are often painful in puppies with early CHD. The Ortolani test can initially be performed in the unsexed standing or laterally recumbent puppy if it is cooperative. A negative Ortolani test is not a definitive finding in the unsexed animal.

Next, the puppy is heavily sedated or anesthetized for definitive hip palpation and radiography. The Ortolani test can be performed in lateral or dorsal recumbency or both. The Ortolani test is a palpation test for passive hip joint laxity and requires some inference to conclude that functional hip joint hyperlaxity is present. When performing the Ortolani test, the hip should be held in a neutral standing angle so that the joint capsule and periarticular tissues are in their passively relaxed state. Inadvertently holding the hip in extension, flexion, abduction, adduction, internal or external rotation may tighten the joint capsule and periarticular tissues and cause abnormal hip joint laxity to go undetected. A palpable reduction of the femoral head into the acetabulum during abduction of the femur is referred to as a “positive Ortolani sign”. In and of itself, a positive Ortolani sign is not an indication for Triple Pelvic Osteotomy (TPO). When a positive Ortolani sign is detected, the examiner should measure and record the angles of reduction and subluxation. Measurement of these angles with an electronic goniometer (Slocum Enterprises, Eugene, Oregon, USA) has been most repeatable in our hands. The angle of reduction is an indicator of hip joint laxity. The angle of subluxation is an indicator of the slope of the dorsal acetabular rim. Sensitive palpation of reduction and subluxation is also important. Indistinct reduction is suggestive of acetabular filling or remodeling. Indistinct subluxation or a biphasic subluxation is suggestive of dorsal acetabular rim erosion. The palpation findings are complemented by comprehensive radiographic evaluation of the hip.

## Radiographic Examination

A *ventro-dorsal hips extended* (“OFA-like”) radiograph is made to evaluate for degenerative changes such as osteophytosis, shallow acetabula, femoral head flattening and thickening of the femoral necks. Coxofemoral subluxation may also be detected on this view, but it is important to remember that the marked hip extension tends to artificially “tighten” the hip joints. Therefore, subluxation present on ventro-dorsal hips extended views is real, but the absence of subluxation on this view does not rule-out hip joint hyperlaxity. A standard *lateral radiographic view* is useful to evaluate for lumbosacral spinal pathology, femoral neck anteversion, coxofemoral subluxation and remodeling and regional anatomic relationships. A *femurs abducted* (“frog leg”) radiograph is helpful to assess acetabular depth. Acetabular filling or remodeling is easier to detect when the femoral heads are compressed into the acetabula with this view. A *dorsal acetabular rim (DAR) radiograph* is essentially a skyline view across the dorsal acetabular rims.

The normal dorsal acetabular rim has a “beak-shaped” contour and minimal slope. In the dysplastic puppy with advancing hip degeneration, there is blunting of the normal contour of the lateral margin of the dorsal acetabular rim and increased DAR slope. *PennHIP radiography* includes several of the views mentioned above and a passive distraction view. Other distraction radiography views have been described and each have their own advantages and disadvantages. For the PennHIP distraction view an adjustable, padded, radiolucent apparatus is placed between the thighs of the dorsally recumbent dog. The hips are placed in an approximate standing angle and gently adducted until the medial thigh surfaces are firmly in contact with the apparatus such that passive hip joint distraction occurs. The radiographs are sent to PennHIP for measurement of distraction index (DI) and for inclusion in their database.

## Other Examination Tools

Computed tomography (CT) can be used for high detail evaluation of dorsal acetabular rim integrity and acetabular depth. Studies have shown that consistency in patient positioning and scan landmarks are critical for consistent accuracy. Recently arthroscopic evaluation of the coxofemoral joint has been described and appears to be the most sensitive indicator of synovitis, round ligament tearing and chondromalacia.

## Case selection

*Juvenile Pubic Symphysiodesis (JPS)* must be performed prior to 20 weeks of age in large breed dogs in order to maximize its effectiveness. Many puppies are asymptomatic for CHD at this time making the efficacy of this procedure difficult to assess. However, the procedure’s relative simplicity, low cost, low morbidity have caused many pet owners to be proactive in seeking evaluation of their pet for JPS. JPS is considered when the combined findings are predictive of future CHD development: a positive Ortolani sign with angle of reduction of 20° to 40°, an angle of subluxation of 0° to 15°, and no palpable or radiographic degenerative changes.

*Triple Pelvic Osteotomy (TPO)* is indicated for young dogs (usually 4.5 to 10 months old) with symptoms of CHD, but minimal palpable or radiographic evidence of degeneration. Puppies have a positive Ortolani sign with an angle of reduction of 20° to 40°, an angle of subluxation of 5° to 20°, and distinct transitions between subluxation and reduction. The DAR view does not show significant blunting.

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