

## **Hips and Hormones**

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The Orthopedic Foundation for Animals is a not-for-animal profit foundation that was established in 1966 with the following objectives: 1) to collate and disseminate information concerning orthopedic and genetic diseases of animal. 2. To advise, encourage and establish control programs to lower the incidence of orthopedic and genetic disease. 3. To encourage and finance research in orthopedic and genetic disease in animals. 4. To receive funds and to make grants to carry out these objectives.

The Dysplasia control registry functions as a voluntary diagnostic service and as a data bank for the hip status for dogs and cats of all breeds. Any dog 24 months of age or older at the time of radiography may be issued an OFA number provided it has pelvic conformation appropriate for its breed and age. All radiographs are evaluated independently by three board-certified radiologists who only are given information regarding the application number, the breed, sex and age of the dog or cat. Preliminary evaluations are available for any juvenile animal between sixteen weeks and twenty-four months of age. Because of screening by the practicing veterinarian, many radiographs of animals that appear to be dysplastic are never submitted to the database thereby creating a bias toward normal data. It is prudent for each practitioner to encourage the submission of abnormal radiographs so that a more complete database results.

Data compiled at The Orthopedic Foundation for Animals would support the idea that canine hip dysplasia does not have a sex predilection. While more radiographs of female dogs are submitted to the OFA than are radiographs of male dogs, it does not appear that there is statistical difference in the occurrence of CHD between the sexes. As of July 2001, the number of radiographs submitted on male animals numbered 281,166 with 235,128 rated normal (83.6%) - radiographs of females submitted number 461,121 with 382,353 rated normal (82.9%). Total number of canines evaluated totals 742,287 not including preliminary radiographs of animals less than twenty-four months of age.

Radiography has limitations as the diagnostic method of choice for canine hip dysplasia (CHD). Some of these factors include: 1) Joint laxity- how much is acceptable at a given age? 2) Age of the dog influences the reliability of preliminary data, i.e. in the German Shepherd Dog reliability is 16% at 6 months, 68.9% at 12 months, 82.7% at 18 months and 95.4% at 24 months. 3) Anesthesia – data indicates that chemical restraint does influence some radiographic evidence of subluxation. 4) Estrus – may or may not affect the degree of subluxation 5) Periods of prolonged inactivity may result in subluxation not apparent in the same dog when well exercised.

What effect do hormones have on hips? As early as the 1960's, Scandinavian researchers found higher urinary estrogen levels in the first few days of life in human infants with congenital hip dislocation than in an age matched group of infants with normal joints. The same group found a higher estrogen excretion in newborns with congenital

dislocation following administration of estradiol. Additional investigators were unable to confirm the original study. A study by Belig et al investigated whether or not spontaneously occurring hip dysplasia in the dog develops as a result of overexposure of the fetus to estradiol. Theoretically, the overexposure could occur if a dysplastic pregnant bitch did not properly metabolize estradiol. The study concluded that accumulation of estradiol does not take place on the maternal side during pregnancy in dogs with hip dysplasia.

In 1993, a paper by Gregory Keller, DVM, Guy Bouchard, DVM et al investigated the influence of the heat cycle on hip joint subluxation. A retrospective study of OFA data from 1988, identified a group of female dogs who changed from dysplastic based on subluxation without degenerative joint disease on the initial submission to normal evaluation when resubmitted. The majority of these changes were due to improved positioning or due to change in the use of chemical restraint on the first study but not on the second. However, 11% of these females were initially radiographed while in estrus and subsequently reradiographed in anestrus. The difference was due to reversible subluxation that was hypothesized to be related to hormonal fluctuation occurring during estrus. The purpose of the paper was to demonstrate whether or not estradiol fluctuation during the estrous cycle in female dogs influenced the radiographic appearance of the hip joint. Using 10 mixed breed bitches, comparisons were made using Norberg angle measurements and subjective evaluations by radiologists. Seventy per cent of this small group demonstrated a decrease in the Norberg angle from 1 to 4.5 degrees during estrus. The correlation between the change in Norberg angle (degree of subluxation) was not significant at the 5% confidence level but was significant at the 10% level. It should be noted that while the phenotypic evidence was noted by the radiologists, none of the consensus ratings changed from normal to dysplastic. However, some of the ratings did change based on anestrus versus estrus evaluation (i.e. good in anestrus to fair in estrus).

In 1997, a paper by K.A. Hassinger, G.K. Smith et al evaluated the effects of both estrogen and progesterone throughout the estrus cycle on hip joint laxity in nine bitches. In addition to the standard hip-extended radiographic technique, the hip evaluations were performed using the compression-distraction radiographic technique. All of the dogs in this study were radiographed under sedation and were positioned by a single person to minimize variability. By subjective scoring, six dogs were considered normal and three dysplastic. When comparing anestrus radiographs with proestrus radiographs, one dog changed from normal to dysplastic and two from dysplastic to normal. The intraclass correlation for hip laxity was used to determine whether hip laxity scores remained significantly the same throughout the estrus cycle. The statistical tests applied in this study demonstrated little if any hormone-related variation in hip laxity (less than 7% for distraction index and less than 18% for the Norberg angle. Thus concluding that the estrus has minimal effect, if any, on coxofemoral subluxation in bitches.

Given this information, do hormones affect hips? What other issues should be considered? Prepubertal gonadectomy delays physeal closure allowing for an extended growth period in both dogs and cats. This delay likely occurs because gonadal hormones facilitate physeal cartilage maturation. If in fact prepubertal gonadectomy results in

increased levels of cortisol as it appears to cause in the ferret, are we likely to see bone loss as can occur with long term cortisol excess? With bone loss are we likely to observe degenerative changes? One would expect some changes in hip laxity during late term pregnancy due to a rise in relaxin. Experienced practitioners and dog breeders generally avoid pelvic radiographs during this time so controlled studies are unavailable.

In summary, the hormonal fluctuations that occur during the estrus cycle may potentially result in changes in the phenotypic evaluation of the canine pelvis. These changes may be statistically insignificant but could result in a bitch being graded a borderline rather than a fair. It is highly unlikely that a bitch rated an excellent in anestrus would change to less than a good rating.

As requested, references are available by request to the author.