Melbourne Veterinary
Referral Centre

Questions and Answers about PennHIP

A New Scientific Method for Early Screening for Canine Hip Dysplasia

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Canine Hip Dysplasia (CHD) is the most common, heritable orthopedic problem seen in dogs. It affects virtually all breeds of dogs, but is especially problematic in large and giant breeds. Clinically, the disease manifests itself in one of two ways: 1) a severe form that typically afflicts the younger animal and is usually characterized by marked pain and lameness, or 2) a more chronic form with more gradual onset of clinical signs such as mild, intermittent pain, stiffness and restricted range of motion in the hips as the dog ages. In many cases, the chronic form may be clinically silent.

Breeders and veterinarians have long sought a reliable method to determine the likelihood of a dog developing CHD and passing that genetic trait to any offspring. It was generally recognized that the current diagnostic methods of hip evaluation were associated with disappointing progress in reducing the frequency of CHD. In 1983, Dr. Gail Smith, a veterinary orthopedic surgeon and bioengineer from the University of Pennsylvania School of Veterinary Medicine, began to actively research and develop a new scientific method for the early diagnosis of CHD. Research in his laboratory resulted in a diagnostic method capable of estimating CHD in populations of dogs as young as sixteen weeks. The method has shown distinct advantages over the standard CHD diagnostic method that evaluates dogs at two years or older. The University of Pennsylvania Hip Improvement Program (PennHIP) was founded as an extension of Dr. Smith's laboratory research.

What is PennHIP?
PennHIP is a scientific method to evaluate a dog for its susceptibility to develop Hip Dysplasia. The radiographic procedure involves special positioning of the dog so that the dog's "passive hip laxity" can be accurately measured. In simple terms, passive hip laxity refers to the degree of looseness of the hip ball in the hip socket when the dog's muscles are completely relaxed. Research has shown that the degree of passive hip laxity is an important factor in determining susceptibility to develop Degenerative Joint Disease (DJD) later in life. Radiographic evidence of DJD, also known as osteoarthritis, is the universally accepted confirmation of CHD.

How as PennHIP developed?
The development of PennHIP has involved multiple disciplines including biomechanics, orthopedics, clinical medicine, radiology, epidemiology and population genetics. The first phase of development involved sophisticated biomechanical testing to determine the optimal patient position for measuring hip laxity. By monitoring passive hip laxity in dogs as they matured, it was discovered that hip laxity was the primary factor in the

development of DJD characteristic of CHD. That is, the radiographic expression of DJD was statistically significantly correlated with the degree of measured passive hip laxity. In addition, the CHD prediction was shown to increase over the four-month figures when hips were evaluated at six months and twelve months of age. In the same studies, it was shown that there was no statistically significant correlation between laxity and DJD when the standard hip extended view was used (the OFA technique). In addition, no other method used to evaluate for CHD has undergone similar rigorous testing through controlled scientific studies to determine diagnostic accuracy.

How does PennHIP differ from evaluation methods which use the Hip Extended position (OFA technique)?

PennHIP differs in some very fundamental and important ways. First, PennHIP was developed and tested following strict scientific protocol and the results of these studies have been published (and continue to be) in peer-reviewed, scientific journals. More than a decade of research and analysis has produced a body of information in support of PennHIP's effectiveness. As with all diagnostic tests, PennHIP's accuracy is not 100 percent; but in direct comparisons, it is far superior to any other available diagnostic method.

Second, passive hip laxity is objectively measured and the resulting Hip Evaluation Report is not issued in a pass/fail framework. PennHIP specifically measures passive joint laxity and includes the quantitative measurement in its report. Based on the degree of laxity, the individual dog is then ranked relative to other members of the same breed. (Note: Breed specific rankings are given when there are twenty or more evaluations. If there are fewer than twenty evaluations, ranking is made to the general population.) For example, a dog receiving a ranking in the 70^{th} percentile means that thirty percent of its breed members have hips that are tighter. This allows breeders to easily identify those animals with tighter hips within each breed. As shown in our studies, dogs with tighter hips are less likely to develop CHD and pass the genetic tendency on to future generations.

Third, because PennHIP is measuring maximal passive hip laxity, the position of the patient is very different from the hip-extended position. The hip-extended position has been used for more than thirty years to screen hips for either DJD, laxity or both. Laboratory studies, however, have indicated wide diagnostic variability among radiologists in interpreting this view. Further, through biomechanical testing, the hip-extended view was found to mask the underlying true joint laxity and through direct comparison, the predictive value for CHD was shown to be inferior to the PennHIP procedure. Most importantly, the heritability of the diseased phenotype scored in the hip-extended view has not been studied in most breeds of dogs. A knowledge of heritability is critical to determine whether selection pressure will produce genetic change. Estimates for the heritability of passive hip laxity drawn from analysis of full pedigrees for the breeds examined thus far in the studies show high values (for German Shepherd Dogs, heritability = .61).

Fourth, the PennHIP method is based on strict quality control. To take PennHIP radiographs, veterinarians must undergo training and a certification process to demonstrate competency. The data generated from PennHIP undergoes regular review and statistical analysis so that useful information, by breed, is available to judge progress toward reducing CHD. For optimal validity, it is mandatory that all PennHIP radiographs be submitted for analysis and inclusion in the PennHIP database. This policy eliminates the practice of prescreening radiographs and sending only the best for evaluation resulting in biased hip data for any given breed.

What happens to my dog during a PennHIP evaluation?
To obtain diagnostic radiographs, it is important that the patient and the surrounding hip musculature be completely relaxed. For the comfort and safety of the animal, this requires heavy sedation or anesthesia. Typically, three separate radiographs are made during an evaluation. The first is a compression view where the femurs are positioned in a neutral, stance-phase orientation and the femoral heads are pushed fully into the sockets. This helps show the true depth of the hip socket and gives an indication of the "fit" of the ball in the socket. The second radiograph is the distraction view. Again, the hips are positioned in a neutral orientation and a special position device is used to apply a harmless force to cause the hips to displace laterally. This position is the most accurate and sensitive for showing the degree of passive laxity. Passive laxity has been shown to correlate with the susceptibility to develop DJD. A hip extended view is also included for the sole purpose of examining for any existing joint disease such as osteoarthritis. The PennHIP procedure has been safely performed on thousands of patients.

Is PennHIP going to replace other currently available systems?
As technology advances the veterinary professional community will offer and utilize improved methods of disease diagnosis. The dog breeding community will also endorse those methods that help them achieve their goals of reducing the frequency of hip dysplasia in dogs while maintaining other desirable traits and features. The PennHIP technology and research have been, and will continue to be, fully presented to the veterinary medical community for its review. PennHIP has been received enthusiastically as a major step toward reducing the frequency of CHD. We encourage and welcome continued scientific examination and comparison of PennHIP to any available or new methods of canine hip dysplasia diagnosis.

Will AKC and other breed registration organizations "recognize" PennHIP?
AKC does recognize PennHIP. In addition, the staff at PennHIP are working with many organizations to present the PennHIP technology and the positive impact it holds for reducing Canine Hip Dysplasia. It is conceivable that at some point a PennHIP reference may be accepted as a worldwide standard. However, all hip evaluation reports are considered confidential medical information and are released only to the PennHIP veterinarian and the owner of the dog (unless the owner requests otherwise).

How does this benefit me, as an owner or breeder of dogs?
Scientific data confirms that the PennHIP method surpasses other diagnostic methods in the ability to accurately predict susceptibility to developing CHD. The method can be

performed on dogs as young as sixteen weeks of age compared with two years using the standard (OFA) technique. The ability to receive an early estimate of a dog's hip integrity is important whether the dog's intended purpose will be for breeding, for working or as a family pet. The data generated by PennHIP will allow breeders to confidentially identify the members of their breeding stock with the tightest hips. The PennHIP interpretation will also permit breeders to assess the progress they are making with their breeding program as they strive to reduce the amount of hip laxity in their dogs. Pet owners are able to assess their pet's risk of developing CHD and make lifestyle adjustments for their dog, if necessary, to enhance the quality of their pet's life.