

1. BMC Vet Res. 2015 Mar 18;11(1):68. doi: 10.1186/s12917-015-0383-z.

The effect of dorsal rim loss on the initial stability of the BioMedtrix cementless acetabular cup.

Montgomery ML(1), Kim SE(2), Dyce J(3), Pozzi A(4).

Author information:

(1)From the Comparative Orthopaedics Biomechanics Laboratory, College of Veterinary Medicine, University of Florida, Gainesville, FL, USA. mmontgomery@ufl.edu. (2)From the Comparative Orthopaedics Biomechanics Laboratory, College of Veterinary Medicine, University of Florida, Gainesville, FL, USA. stankim@ufl.edu. (3)The Ohio State University Veterinary Medical Center, Columbus, OH, USA. Jonathan.Dyce@cvm.osu.edu. (4)From the Comparative Orthopaedics Biomechanics Laboratory, College of Veterinary Medicine, University of Florida, Gainesville, FL, USA. pozzia@ufl.edu.

BACKGROUND: Loss of dorsal acetabular rim (DAR) is a common sequela to canine hip dysplasia. The purpose of this study is to evaluate the effect of DAR loss on the initial stability of the cementless (BFX) acetabular cup. BFX cups were implanted into foam blocks reamed to resemble acetabulae with simulated 0, 25, 50, and 75% DAR loss. Models were tested in edge loading of the lateral surface of the cup with an indenter, and in centered loading with an articulated femoral prosthesis. Additionally, cups were implanted into paired cadaveric canine hemipelvises with either no DAR depletion, or removal of 50% of the DAR, and acutely loaded to failure with an articulated femoral prosthesis.

RESULTS: Mean load measured at 1 mm cup displacement during edge loading was not significantly different in foam blocks with loss of 0, 25, 50, and 75% DAR (360 ± 124 N, 352 ± 42 N, 330 ± 81 N, 288 ± 43 N, respectively; $P = 0.425$). Mean load to failure with centered loads was greatest in blocks with 0% DAR loss (2828 ± 208 N; $P < 0.001$), but was not significantly different between 25, 50,

and 75% DAR loss (2270 ± 301 N, 1924 ± 157 N, 1745 ± 118 N). In cadaveric testing, neither mean load to failure ($P = 0.067$), stiffness ($P = 0.707$), nor energy ($P = 0.228$) were significantly different in control hemipelves and those with 50% depletion of the DAR. Failure in all acetabulae occurred due to acetabular bone fracture at forces in supraphysiologic ranges. CONCLUSIONS: BFX cup stability under normal physiologic loads does not appear to be compromised in acetabulae with up to 50% DAR loss.

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2. PLoS One. 2015 Apr 13;10(4):e0122558. doi: 10.1371/journal.pone.0122558.
eCollection 2015.

A Genetic Predictive Model for Canine Hip Dysplasia: Integration of Genome Wide Association Study (GWAS) and Candidate Gene Approaches.

Bartolomé N(1), Segarra S(2), Artieda M(1), Francino O(3), Sánchez E(3), Szczypiorska M(1), Casellas J(3), Tejedor D(1), Cerdeira J(4), Martínez A(1), Velasco A(2), Sánchez A(3).

Author information:

(1)Progenika Biopharma SA, a Grifols Company, Derio, Bizkaia, Spain. (2)Bioibérica SA, Barcelona, Spain. (3)Servei Veterinari de Genètica Molecular, Departament de Ciència Animal i dels Aliments, Facultat de Veterinària, Universitat Autònoma de Barcelona, Barcelona, Spain. (4)Centro Veterinario Aluche Las Águilas, Madrid, Spain.

Canine hip dysplasia is one of the most prevalent developmental orthopedic diseases in dogs worldwide. Unfortunately, the success of eradication programs against this disease based on radiographic diagnosis is low. Adding the use of diagnostic genetic tools to the current phenotype-based approach might be beneficial. The aim of this study was to develop a genetic prognostic

test for early diagnosis of hip dysplasia in Labrador Retrievers. To develop our DNA test, 775 Labrador Retrievers were recruited. For each dog, a blood sample and a ventrodorsal hip radiograph were taken. Dogs were divided into two groups according to their FCI hip score: control (A/B) and case (D/E). C dogs were not included in the sample. Genetic characterization combining a GWAS and a candidate gene strategy using SNPs allowed a case-control population association study. A mathematical model which included 7 SNPs was developed using logistic regression. The model showed a good accuracy (Area under the ROC curve = 0.85) and was validated in an independent population of 114 dogs. This prognostic genetic test represents a useful tool for choosing the most appropriate therapeutic approach once genetic predisposition to hip dysplasia is known. Therefore, it allows a more individualized management of the disease. It is also applicable during genetic selection processes, since breeders can benefit from the information given by this test as soon as a blood sample can be collected, and act accordingly. In the authors' opinion, a shift towards genomic screening might importantly contribute to reducing canine hip dysplasia in the future. In conclusion, based on genetic and radiographic information from Labrador Retrievers with hip dysplasia, we developed an accurate predictive genetic test for early diagnosis of hip dysplasia in Labrador Retrievers. However, further research is warranted in order to evaluate the validity of this genetic test in other dog breeds.

PMCID: PMC4395148

PMID: 25874693 [PubMed – in process]

3. Front Genet. 2015 Mar 13;6:97. doi: 10.3389/fgene.2015.00097. eCollection 2015.

Genomic prediction of traits related to canine hip dysplasia.

Sánchez-Molano E(1), Pong-Wong R(1), Clements DN(1), Blott SC(2), Wiener P(1), Woolliams JA(1).

Author information:

(1)The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh Edinburgh, UK. (2)Kennel Club Genetics Centre at the Animal Health Trust Newmarket, UK ; School of Veterinary Medicine and Science, University of Nottingham Sutton Bonington, UK.

Increased concern for the welfare of pedigree dogs has led to development of selection programs against inherited diseases. An example is canine hip dysplasia (CHD), which has a moderate heritability and a high prevalence in some large-sized breeds. To date, selection using phenotypes has led to only modest improvement, and alternative strategies such as genomic selection (GS) may prove more effective. The primary aims of this study were to compare the performance of pedigree- and genomic-based breeding against CHD in the UK Labrador retriever population and to evaluate the performance of different GS methods. A sample of 1179 Labrador Retrievers evaluated for CHD according to the UK scoring method (hip score, HS) was genotyped with the Illumina CanineHD BeadChip. Twelve functions of HS and its component traits were analyzed using different statistical methods (GBLUP, Bayes C and Single-Step methods), and results were compared with a pedigree-based approach (BLUP) using cross-validation. Genomic methods resulted in similar or higher accuracies than pedigree-based methods with training sets of 944 individuals for all but the untransformed HS, suggesting that GS is an effective strategy. GBLUP and Bayes C gave similar prediction accuracies for HS and related traits, indicating a polygenic architecture. This conclusion was also supported by the low accuracies obtained in additional GBLUP analyses performed using only the SNPs with highest test statistics, also

indicating that marker-assisted selection (MAS) would not be as effective as GS.
A Single-Step method that combines genomic and pedigree information also showed higher accuracy than GBLUP and Bayes C for the log-transformed HS, which is currently used for pedigree based evaluations in UK. In conclusion, GS is a promising alternative to pedigree-based selection against CHD, requiring more phenotypes with genomic data to improve further the accuracy of prediction.

PMCID: PMC4358223

PMID: 25821457 [PubMed]

4. Vet Rec. 2015 Apr 11;176(15):387. doi: 10.1136/vr.102886. Epub 2015 Mar 27.

Canine hip dysplasia in Tibetan terriers.

Humphreys HS(1), McEwan NR(1).

Author information:

(1)Institute of Biological, Environmental and Rural Sciences,
Aberystwyth
University, Edward Llwyd Building, Penglais Campus, Aberystwyth, Wales
SY23 3DA,
UK.

PMID: 25820325 [PubMed – in process]

5. Vet Surg. 2015 May;44(4):467–73. doi: 10.1111/j.1532–950X.
2014.12309.x. Epub 2014
Nov 20.

Intra- and interobserver agreement on radiographic phenotype in the
diagnosis of
canine hip dysplasia.

Fortrie RR(1), Verhoeven G, Broeckx B, Duchateau L, Janssens L, Samoy
Y, Schreurs
E, Saunders J, van Bree H, Vandekerckhove P, Coopman F.

Author information:

(1)Algemene Dierenkliniek Randstad, Borsbeek, Belgium.

OBJECTIVE: To investigate the repeatability and reproducibility of the

presence
of a circumferential femoral head osteophyte (CFH0), a curvilinear
caudolateral
osteophyte (CC0), osteosclerosis of the cranial acetabular edge (Scler
CrAE),
degenerative joint disease (DJD), and the diagnosis of suspected
canine hip
dysplasia (CHD) in different groups of experienced observers.
STUDY DESIGN: Cross-sectional study.
SAMPLE POPULATION: Standard hip extended radiographs (n = 50).
METHODS: Nine experienced observers were divided into 3 groups:
surgeons (DECVS),
radiologists (DECVDI), and non-board certified observers (NBC) and 2
subgroups
(academics and non-academics). Cohen's kappa (κ) was calculated for
CFH0, CC0,
Scler CrAE, DJD, and suspected CHD, and weighted κ was calculated for
DJD score
to determine inter- and intraobserver agreement.
RESULTS: Intraobserver agreement on CFH0, CC0, Scler CrAE, DJD, and
suspected CHD
ranged from slight to almost perfect, but was not significantly
different between
NBC, DECVS, and DECVDI. Radiologists and non-board certified observers
had a more
uniform scoring than surgeons on the overall DJD score, as did
academics versus
non-academics. Interobserver agreement for NBC was more uniform than
that of
radiologists and surgeons on CC0 and DJD. NBC and radiologists scored
more
uniformly than surgeons on CFH0, and radiologists scored more
uniformly than NBC
and surgeons on Scler CrAE. Academics scored more uniformly than non-
academics,
but only significantly for Scler CrAE.
CONCLUSIONS: Recognition of specific radiographic markers is only
fairly reliable
within and between experienced observers. Therefore, care must be
taken to apply
these traits in official screening, surgical decision-making and
scientific
research.

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PMID: 25414132 [PubMed – in process]

6. N Z Vet J. 2015 Mar;63(2):67–8. doi: 10.1080/00480169.2015.985562.

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27.

Canine hip dysplasia – towards more effective selection.

Wilson BJ(1), Nicholas FW.

Author information:

(1)a Faculty of Veterinary Science , University of Sydney , NSW 2006 ,
Australia.

Comment on

N Z Vet J. 2015 Mar;63(2):69–78.

N Z Vet J. 2015 Mar;63(2):79–85.

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7. Vet Comp Orthop Traumatol. 2014;27(6):461–9. doi: 10.3415/
VCOT-14-03-0051. Epub
2014 Oct 27.

Kinematic gait analysis of the canine thoracic limb using a six
degrees of
freedom marker set. Study in normal Labrador Retrievers and Labrador
Retrievers
with medial coronoid process disease.

Caron A, Caley A, Farrell M, Fitzpatrick N(1).

Author information:

(1)Prof. Noel Fitzpatrick, Fitzpatrick Referrals Ltd., Halfway lane,
Eashing,
Godalming, Surrey GU7 2QQ, United Kingdom, Phone: +44 1483 423 761,
Fax: +44 1483
527 590, E-mail: NoelF@fitzpatrickreferrals.co.uk.

OBJECTIVES: To determine if the use of a six degrees of freedom marker
set would
allow new kinematic data of the canine thoracic limbs to be
calculated. To
identify any significant differences in thoracic limb gait patterns in
all planes
of motion, between the normal canine population and patients with
confirmed
medial coronoid disease (MCD).
METHOD: Two groups of dogs were selected representing the normal
Labrador
Retriever population (n = 13) and Labrador Retrievers with confirmed
MCD (n =

13). Normal dogs had "normal" hip and elbow radiographic scores in line with the International Elbow Working Group and British Veterinary Association guidelines.

Medial coronoid disease was confirmed using arthroscopy after kinematic analysis

was performed with a six degrees of freedom marker set.

RESULTS: The diseased elbow was nine degrees more extended between 43%–55% of the gait cycle and 16° more supinated prior, early during and after foot strike. The

antebrachium was nine degrees more supinated during foot strike and three degrees

more abducted during early stance. None of the other parameters were significantly different.

CLINICAL SIGNIFICANCE: The use of a six degrees of freedom marker set made it

possible for the elbow and antebrachium to be reliably tracked in more than one

plane of motion. Significant differences were identified between the normal

canine population and those affected by MCD. These data may help elucidate

biomechanical factors contributing to aetiopathogenesis of MCD.

PMID: 25345466 [PubMed – in process]

8. J Child Orthop. 2014 Oct;8(5):375–9. doi: 10.1007/s11832-014-0615-y. Epub 2014 Oct 25.

A review of environmental factors implicated in human developmental dysplasia of the hip.

Rhodes AM(1), Clarke NM.

Author information:

(1)Trauma and Orthopaedics, University Hospital Southampton NHS Foundation Trust, Southampton, England, UK.

PURPOSE: Developmental dysplasia of the hip (DDH) is common, and the term encompasses a spectrum of anatomical abnormalities of the hip in which the femoral head displaces from the acetabulum. These abnormalities may be congenital or develop during infancy and/or childhood. Neither the prenatal and

postnatal factors that predispose to hip instability nor the determinants of its resolution or persistence are well characterised. A multifactorial pathogenesis of DDH is commonly accepted and identified risk factors include a family history, being first born, breech presentation, female gender, high birth weight and oligohydramnios 1. Further to genetic factors, a number of nutritional, hormonal and mechanical influences on ligament laxity have been hypothesised. METHODS: A comprehensive search was conducted using NICE Healthcare Databases Advanced Search and Google Scholar engines, and the terms "nutrition", "environmental", "risk factors", "CDH" and "DDH". Wherever possible, evidence from randomised controlled trials, systematic reviews and expert review articles published in the medical and veterinary literature was considered. RESULTS: The relationship between a number of hormones and biochemical markers of nutritional status and the development of DDH has been repeatedly hypothesised upon in the last 45 years. Of those most frequently cited are calcium, vitamins C and D, and relaxin hormone. The evidence for these potential risk factors is provided mainly by canine studies, with a paucity of consistent or strong evidence in humans. CONCLUSIONS: DDH is common and remains a leading cause of hip osteoarthritis in young adults. Neonatal clinical screening programmes for this condition have been in practice since the 1950s, albeit with varying levels of sensitivity. This review summarises current understanding of some of the most frequently cited nongenetic hypothesised risk factors, the significance of which remain to be determined.

PMCID: PMC4391055

PMID: 25344062 [PubMed]

9. BMC Genomics. 2014 Oct 1;15:833. doi: 10.1186/1471-2164-15-833.

Quantitative trait loci mapping for canine hip dysplasia and its related traits

in UK Labrador Retrievers.

Sánchez-Molano E, Woolliams JA, Pong-Wong R, Clements DN, Blott SC, Wiener P(1).

Author information:

(1)The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush, Midlothian EH25 9RG, Scotland, UK. pam.wiener@roslin.ed.ac.uk.

BACKGROUND: Canine hip dysplasia (CHD) is characterised by a malformation of the hip joint, leading to osteoarthritis and lameness. Current breeding schemes against CHD have resulted in measurable but moderate responses. The application of marker-assisted selection, incorporating specific markers associated with the disease, or genomic selection, incorporating genome-wide markers, has the potential to dramatically improve results of breeding schemes. Our aims were to identify regions associated with hip dysplasia or its related traits using genome and chromosome-wide analysis, study the linkage disequilibrium (LD) in these regions and provide plausible gene candidates. This study is focused on the UK Labrador Retriever population, which has a high prevalence of the disease and participates in a recording program led by the British Veterinary Association (BVA) and The Kennel Club (KC).

RESULTS: Two genome-wide and several chromosome-wide QTLs affecting CHD and its related traits were identified, indicating regions related to hip dysplasia.

CONCLUSION: Consistent with previous studies, the genetic architecture of CHD appears to be based on many genes with small or moderate effect, suggesting that genomic selection rather than marker-assisted selection may be an appropriate strategy for reducing this disease.

PMCID: PMC4190382

PMID: 25270232 [PubMed – in process]

10. N Z Vet J. 2015 Mar;63(2):79–85. doi:
10.1080/00480169.2014.961581. Epub 2015 Jan
27.

Genetic evaluation of the total hip score of four populous breeds of
dog, as
recorded by the New Zealand Veterinary Association Hip Dysplasia
Scheme
(1991–2011).

Soo M(1), Sneddon NW, Lopez-Villalobos N, Worth AJ.

Author information:

(1)a Massey University Veterinary Teaching Hospital, Institute of
Veterinary ,
Animal and Biomedical Sciences , Massey University, Private Bag 11222,
Palmerston
North 4442 , New Zealand.

Comment in

N Z Vet J. 2015 Mar;63(2):67–8.

AIM: To use estimated breeding value (EBV) analysis to investigate the
genetic
trend of the total hip score (to assess canine hip dysplasia) in four
populous
breeds of dogs using the records from the New Zealand Veterinary
Association
(NZVA) Canine Hip Dysplasia Scheme database (1991 to 2011).

METHODS: Estimates of heritability and EBV for the NZVA total hip
score of
individual dogs from the German Shepherd, Labrador Retriever, Golden
Retriever
and Rottweiler breeds were obtained using restricted maximum
likelihood
procedures with a within-breed linear animal model. The model included
the fixed
effects of gender, birth year, birth season, age at scoring and the
random effect
of animal. The pedigree file included animals recorded between 1990
and 2011. A
total of 2,983 NZVA hip score records, from a pedigree of 3,172
animals, were
available for genetic evaluation. Genetic trends of the NZVA total hip
score were
calculated as the regression coefficient of the EBV (weighted by
reliabilities)
on year of birth.

RESULTS: The estimates of heritability for hip score were 0.32 (SE
0.08) in

German Shepherd, 0.37 (SE 0.08) in Labrador Retriever, 0.29 (SE 0.08) in Golden Retriever and 0.52 (SE 0.18) in Rottweiler breeds. Genetic trend analysis revealed that only the German Shepherd breed exhibited a genetic trend towards better hip conformation over time, with a decline of 0.13 (SE 0.04) NZVA total hip score units per year ($p < 0.001$). The genetic trends of total hip score for the remaining three breeds were not significantly different from zero ($p > 0.1$).

CONCLUSIONS: Despite moderate heritability of the NZVA total hip score, there has not been substantial improvement of this trait for the four breeds analysed in the study period.

CLINICAL RELEVANCE: Greater improvement in reducing the prevalence of canine hip dysplasia may be possible if screening were to be compulsory as a requirement for registration of pedigree breeding stock, greater selection pressure were to be applied and selection of breeding stock made on the basis on an individual's EBV rather than the NZVA total hip score alone.

PMID: 25211093 [PubMed – indexed for MEDLINE]

11. Stem Cells Int. 2014;2014:391274. doi: 10.1155/2014/391274. Epub 2014 Aug 11.

Acupoint injection of autologous stromal vascular fraction and allogeneic adipose-derived stem cells to treat hip dysplasia in dogs.

Marx C(1), Silveira MD(1), Selbach I(2), da Silva AS(1), Braga LM(3), Camassola M(1), Nardi NB(1).

Author information:

(1)Laboratory of Stem Cells and Tissue Engineering, Universidade Luterana do Brasil, 92425-900 Canoas, RS, Brazil. (2)Clinivetis Clinica Veterinaria, 93310-500 Novo Hamburgo, RS, Brazil. (3)Center for Experimental Biological Models, Pontificia Universidade Catolica do Rio Grande do Sul, 90619-900 Porto

Alegre, RS, Brazil.

Stem cells isolated from adipose tissue show great therapeutic potential in veterinary medicine, but some points such as the use of fresh or cultured cells and route of administration need better knowledge. This study aimed to evaluate the effect of autologous stromal vascular fraction (SVF, n = 4) or allogeneic cultured adipose-derived stem cells (ASCs, n = 5) injected into acupuncture points in dogs with hip dysplasia and weak response to drug therapy. Canine ASCs have proliferation and differentiation potential similar to ASCs from other species. After the first week of treatment, clinical evaluation showed marked improvement compared with baseline results in all patients treated with autologous SVF and three of the dogs treated with allogeneic ASCs. On days 15 and 30, all dogs showed improvement in range of motion, lameness at trot, and pain on manipulation of the joints, except for one ASC-treated patient. Positive results were more clearly seen in the SVF-treated group. These results show that autologous SVF or allogeneic ASCs can be safely used in acupoint injection for treating hip dysplasia in dogs and represent an important therapeutic alternative for this type of pathology. Further studies are necessary to assess a possible advantage of SVF cells in treating joint diseases.

PMCID: PMC4144304

PMID: 25180040 [PubMed]

12. Vet Comp Orthop Traumatol. 2014;27(5):395–7. doi: 10.3415/VCOT-13-11-0140. Epub 2014 Jul 31.

Combined prevalence of inherited skeletal disorders in dog breeds in Belgium.

Coopman F(1), Broeckx B, Verelst E, Deforce D, Saunders J, Duchateau L, Verhoeven G.

Author information:

(1)Dr. Frank Coopman, Holbigenetics NV, Animal Genetics, Kere 103, Waarschoot, OVL B-9950, Belgium, Phone: +32 497 342 006, E-mail: Combigen@gmail.com.

Canine hip dysplasia (CHD), canine elbow dysplasia (CED), and humeral head osteochondrosis (HHOC) are inherited traits with uneven incidence in dog breeds. Knowledge of the combined prevalence of these three disorders is necessary to estimate the effect of the currently applied breeding strategies, in order to improve the genetic health of the population. Official screening results of the Belgian National Committee for Inherited Skeletal Disorders (NCSID) revealed that an average of 31.8% (CHD, CED, or both; n = 1273 dogs) and 47.2% (CHD, CED, HHOC, or a combination of these three diseases; n = 250 dogs) of dogs are mildly to severely affected by at least one skeletal disorder. According to the current breeding recommendations in some dog breeds in Belgium, these animals should be restricted (mild signs) or excluded (moderate to severe signs) from breeding. The introduction of genetic parameters, such as estimated breeding values, might create a better approach to gradually reduce the incidence of these complex inherited joint disorders, without compromising genetic population health.

PMID: 25078710 [PubMed – in process]

13. N Z Vet J. 2015 Mar;63(2):69–78. doi: 10.1080/00480169.2014.949893. Epub 2014 Dec 1.

Canine hip dysplasia: phenotypic scoring and the role of estimated breeding value analysis.

Soo M(1), Worth A.

Author information:

(1)a Massey University Veterinary Teaching Hospital, Institute of Veterinary,
Animal and Biomedical Sciences, Massey University , Private Bag 11222,
Palmerston
North 4442 , New Zealand.

Comment in
N Z Vet J. 2015 Mar;63(2):67–8.

Canine hip dysplasia (CHD) is a developmental orthopaedic disease of the coxofemoral joints with a multifactorial mode of inheritance. Multiple gene effects are influenced by environmental factors; therefore, it is unlikely that a simple genetic screening test with which to identify susceptible individuals will be developed in the near future. In the absence of feasible methods for objectively quantifying clinical CHD, radiographic techniques have been developed and widely used to identify dogs for breeding which are less affected by the disease. A hip-extended ventrodorsal view of the pelvis has been traditionally used to identify dogs with subluxation and/or osteoarthritis of the coxofemoral joints. More recently, there has been emphasis on the role of coxofemoral joint laxity as a determinant of CHD and methods have been developed to measure passive hip laxity. Though well-established worldwide, the effectiveness of traditional phenotypic scoring schemes in reducing the prevalence of CHD has been variable. The most successful implementation of traditional CHD scoring has occurred in countries or breeding colonies with mandatory scoring and open registries with access to pedigree records. Several commentators have recommended that for quantitative traits like CHD, selection of breeding stock should be based on estimated breeding values (EBV) rather than individual hip score/grade. The EBV is a reflection of the genetic superiority of an animal compared to its counterparts and is calculated from the phenotype of an individual and its relatives and their pedigree relationship. Selecting breeding stock on

the basis
of a dog's genetic merit, ideally based on a highly predictive
phenotype, will
confer the breeder with greater selection power, accelerate genetic
improvement
towards better hip conformation and thus more likely decrease the
prevalence of
CHD.

PMID: 25072401 [PubMed – indexed for MEDLINE]

14. Vet J. 2014 Sep;201(3):378–84. doi: 10.1016/j.tvjl.2014.05.023.
Epub 2014 May 22.

The effects of positioning, reason for screening and the referring
veterinarian
on prevalence estimates of canine hip dysplasia.

Broeckx BJ(1), Verhoeven G(2), Coopman F(3), Van Haeringen W(4),
Bosmans T(5),
Gielen I(6), Henckens S(1), Saunders JH(6), van Bree H(6), Van Ryssen
B(6),
Verbeke V(1), Van Steendam K(1), Van Nieuwerburgh F(1), Deforce D(7).

Author information:

(1)Laboratory of Pharmaceutical Biotechnology, Faculty of
Pharmaceutical
Sciences, Ghent University, Harelbekestraat 72, 9000 Ghent, Belgium.

(2)Algemene
Dierenkliniek Randstad, Frans Beirenslaan 155, 2150 Borsbeek, Belgium;
Department
of Medical Imaging and Small Animal Orthopaedics, Faculty of
Veterinary Medicine,
Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium.

(3)Holbigenetics
NV, Kere 103, 9950 Waarschoot, Belgium. (4)Dr. Van Haeringen
Laboratorium b.v.,
AgroBusinessPark 100, 6708 Wageningen, The Netherlands. (5)Department
of Medicine
and Clinical Biology of Small Animals, Faculty of Veterinary Medicine,
Ghent
University, Salisburylaan 133, 9820 Merelbeke, Belgium. (6)Department
of Medical
Imaging and Small Animal Orthopaedics, Faculty of Veterinary Medicine,
Ghent
University, Salisburylaan 133, 9820 Merelbeke, Belgium. (7)Laboratory
of
Pharmaceutical Biotechnology, Faculty of Pharmaceutical Sciences,
Ghent

University, Harelbekestraat 72, 9000 Ghent, Belgium. Electronic address:
dieter.deforce@ugent.be.

Although the prevalence of canine hip dysplasia (HD) has been the subject of a number of published studies, estimates vary widely. This study evaluated several possible causes for these differences. Sixty Belgian, Dutch and German veterinarians were asked to submit all hip radiographs obtained for screening purposes (irrespective of HD status) over a 2-year period, resulting in a database of 583 dogs. Each set of radiographs was accompanied by information on the reason for screening (breeding soundness examination, clinical complaint, assistance dogs, or other reasons), and dog breed, date of birth and age. Dog positioning exerted an effect at multiple levels. The agreement among different observers regarding correct or incorrect positioning was limited and incorrect positioning itself reduced the inter-observer agreement for radiographic hip conformation. Dysplastic dogs were more commonly positioned incorrectly than non-dysplastic dogs. The clinical complaint population had a high prevalence of dysplastic dogs (>70%) compared with the breeding population (11%) and the assistance dogs (6%). There was a significantly lower prevalence of HD among cases referred by veterinarians who frequently submitted hip-extended radiographs for evaluation ($P = 0.002$) compared to those who refer less frequently. However, this was likely to be selection bias, as radiographs that were from dogs suspected to be dysplastic were not submitted by frequent senders. The prevalence of dysplastic dogs varied widely between breeds (16.7–71.4%). Dogs diagnosed with dysplasia were significantly older than dogs considered healthy ($P = 0.001$) and dogs classified as borderline dysplastic ($P = 0.035$). Inter-observer agreement for hip conformation was moderately low, resulting in >7% variation in prevalence estimates for dysplasia.

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PMID: 24986314 [PubMed – in process]

15. Vet Surg. 2014 Aug;43(6):715–25. doi: 10.1111/j.1532-950X.2014.12214.x. Epub 2014 Jun 24.

Cementless total hip replacement in 20 juveniles using BFX™ arthroplasty.

Fitzpatrick N(1), Law AY, Bielecki M, Girling S.

Author information:

(1)Fitzpatrick Referrals, Eashing, Surrey, United Kingdom.

OBJECTIVE: To describe outcome after a minimum of 1 year for total hip replacement (THR) using BioMedtrix BFX™ biologic fixation implants in skeletally

immature dogs (6–10 months of age).

STUDY DESIGN: Case series.

ANIMALS: Dogs (n = 20).

METHODS: Medical records (November 2007–June 2010) of 20 dogs, 6–10 months old

that had cementless THR were reviewed. Preoperative, immediate, 6-week and

>1-year postoperative radiographs were compared. Clinical examination was

performed at 6 weeks and >1 year postoperatively. Owner questionnaire was

obtained at final follow-up.

RESULTS: Cementless THR using BFX™ implants was performed because of debilitating

coxofemoral pain, resulting from canine hip dysplasia, after unsatisfactory

outcome with medical management. Radiographs taken immediately, 6 weeks and at a

mean of 29.8 months (range, 12–48 months) postoperatively revealed satisfactory

implant positioning and stability. Significant change in measured cranial–caudal

femoral stem fill and level ($P < .001$ and $P = .006$, respectively) were recorded

at 6 weeks postoperatively without clinical significance. No further change in

stem positioning occurred. Acetabular cup orientation remained unchanged

throughout follow-up. Complications requiring further surgical

intervention were not encountered. One minor superficial infection was recorded and treated. Lameness and pain on manipulation of the affected hip had greatly improved in all dogs by 6 weeks postoperatively. CONCLUSION: Cementless THR can safely be performed in skeletally immature dogs, providing satisfactory return to normal joint function and implant survivability for at least a mean of 29.8 months.

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PMID: 24962265 [PubMed – in process]

16. Vet Surg. 2014 Jul;43(5):501–6. doi: 10.1111/j.1532-950X.2014.12208.x. Epub 2014 May 19.

A systematic review of the literature describing the efficacy of surgical treatments for canine hip dysplasia (1948–2012).

Bergh MS(1), Budsberg SC.

Author information:

(1)Department of Veterinary Clinical Sciences, Iowa State University College of Veterinary Medicine, Ames, Iowa.

OBJECTIVE: To systematically evaluate the literature reporting outcome of surgical treatments for canine hip dysplasia (CHD) and to evaluate whether adequate evidence exists to support a procedure that will allow a consistent return to normal function.

STUDY DESIGN: Systematic literature review.

ANIMALS: Dogs with naturally occurring CHD.

METHODS: An a priori question was defined and a computer-based bibliographic search was performed on PubMed, Medline, CAB Abstracts, and Veterinary Information Network through November 2012. Studies were compared and evaluated with regard to surgical technique, study design, outcome measurements, evidence classification, and evidence quality. Unilateral surgeries with >6 months

postoperative follow-up were included.

RESULTS: Manuscripts (n = 477) were identified and reviewed; 17 met the inclusion criteria. One study provided level I evidence, 2 provided level II evidence, 3 provided level III evidence, and 11 provided level IV evidence relative to the study question. The most common outcome measurements were orthopedic examination (70.6%), owner interview (70.6%), and visual gait observation (64.7%). Three studies used objective kinetic gait assessment. Two studies with level III evidence (total hip replacement) and 1 study with level IV evidence (juvenile pubic symphysiodesis) documented a consistent return to normal function after surgery.

CONCLUSIONS: Despite a large number of publications describing clinical outcome after surgical treatments for CHD, few provided strong evidence to allow an adequate assessment of therapeutic efficacy.

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PMID: 24837650 [PubMed – in process]

17. PLoS One. 2014 May 6;9(5):e96618. doi: 10.1371/journal.pone.0096618. eCollection 2014.

Identification and validation of quantitative trait loci (QTL) for canine hip dysplasia (CHD) in German Shepherd Dogs.

Fels L(1), Distl O(1).

Author information:

(1)Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover, Hannover, Germany.

Canine hip dysplasia (CHD) is the most common hereditary skeletal disorder in dogs. To identify common alleles associated with CHD, we genotyped 96 German Shepherd Dogs affected by mild, moderate and severe CHD and 96 breed, sex, age

and birth year matched controls using the Affymetrix canine high density SNP chip. A mixed linear model analysis identified five SNPs associated with CHD scores on dog chromosomes (CFA) 19, 24, 26 and 34. These five SNPs were validated in a by sex, age, birth year and coancestry stratified sample of 843 German Shepherd Dogs including 277 unaffected dogs and 566 CHD-affected dogs. Mean coancestry coefficients among and within cases and controls were $<0.1\%$. Genotype effects of these SNPs explained 20–32% of the phenotypic variance of CHD in German Shepherd Dogs employed for validation. Genome-wide significance in the validation data set could be shown for each one CHD-associated SNP on CFA24, 26 and 34. These SNPs are located within or in close proximity of genes involved in bone formation and related through a joint network. The present study validated positional candidate genes within two previously known quantitative trait loci (QTL) and a novel QTL for CHD in German Shepherd Dogs.

PMCID: PMC4011879

PMID: 24802516 [PubMed – indexed for MEDLINE]

18. Mamm Genome. 2014 Jun;25(5–6):262–9. doi: 10.1007/s00335-014-9507-1. Epub 2014 Apr 2.

Multiple loci associated with canine hip dysplasia (CHD) in German shepherd dogs.

Fels L(1), Marschall Y, Philipp U, Distl O.

Author information:

(1)Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover, Bünteweg 17p, 30559, Hannover, Germany.

Canine hip dysplasia (CHD) is the most common hereditary skeletal disorder in dogs. To identify common alleles associated with CHD, we developed 37 informative single nucleotide polymorphisms (SNPs) within 13 quantitative trait loci (QTL)

previously identified for German shepherd dogs. These SNPs were genotyped in 95 German shepherd dogs affected by CHD and 95 breed, sex, and birth year-matched controls. A total of ten SNPs significant at a nominal P value of 0.05 were validated in 843 German shepherd dogs including 277 unaffected dogs and 566 CHD-affected dogs. Cases and controls were sampled from the whole German shepherd dog population in Germany in such a way that mean coancestry coefficients were below 0.1 % within cases and controls as well as among cases and controls. We identified nine SNPs significantly associated with CHD within five QTL on dog chromosomes (CFA) 3, 9, 26, 33, and 34. Genotype effects of these nine SNPs explained between 22 and 34 % of the phenotypic variance of hip dysplasia in German shepherd dogs. The strongest associated SNPs were located on CFA33 and 34 within the candidate genes PNCP, TRI0, and SLC6A3. Thus, the present study validated positional candidate genes within five QTL for CHD.

PMID: 24691653 [PubMed – indexed for MEDLINE]

19. PLoS One. 2014 Mar 24;9(3):e88926. doi: 10.1371/journal.pone.0088926. eCollection 2014.

Comparison of genome-wide association methods in analyses of admixed populations with complex familial relationships.

Kadri NK(1), Guldbrandtsen B(1), Sørensen P(1), Sahana G(1).

Author information:

(1)Centre for Quantitative genetics and Genomics, Department of Molecular Biology and Genetics, Aarhus University, Aarhus, Denmark.

Population structure is known to cause false-positive detection in association studies. We compared the power, precision, and type-I error rates of various association models in analyses of a simulated dataset with structure at the

population (admixture from two populations; P) and family (K) levels. We also compared type-I error rates among models in analyses of publicly available human and dog datasets. The models corrected for none, one, or both structure levels. Correction for K was performed with linear mixed models incorporating familial relationships estimated from pedigrees or genetic markers. Linear models that ignored K were also tested. Correction for P was performed using principal component or structured association analysis. In analyses of simulated and real data, linear mixed models that corrected for K were able to control for type-I error, regardless of whether they also corrected for P. In contrast, correction for P alone in linear models was insufficient. The power and precision of linear mixed models with and without correction for P were similar. Furthermore, power, precision, and type-I error rate were comparable in linear mixed models incorporating pedigree and genomic relationships. In summary, in association studies using samples with both P and K, ancestries estimated using principal components or structured assignment were not sufficient to correct type-I errors. In such cases type-I errors may be controlled by use of linear mixed models with relationships derived from either pedigree or from genetic markers.

PMCID: PMC3963841

PMID: 24662750 [PubMed – indexed for MEDLINE]

20. Prev Vet Med. 2014 May 1;114(2):114–22. doi: 10.1016/j.prevetmed.2014.02.001.
Epub 2014 Feb 13.

Prevalence and co-occurrence of hip dysplasia and elbow dysplasia in Dutch pure-bred dogs.

Lavrijsen IC(1), Heuven HC(2), Meij BP(1), Theyse LF(1), Nap RC(3), Leegwater PA(1), Hazewinkel HA(4).

Author information:

(1)Department of Clinical Sciences of Companion Animals, Faculty of Veterinary Medicine, Utrecht University, P.O. Box 80154, 3508 TD Utrecht, The Netherlands.

(2)Department of Clinical Sciences of Companion Animals, Faculty of Veterinary Medicine, Utrecht University, P.O. Box 80154, 3508 TD Utrecht, The Netherlands;

Animal Breeding and Genomics Centre, Wageningen University, P.O. Box 338, 6700 AH

Wageningen, The Netherlands. (3)Department of Clinical Sciences of Companion

Animals, Faculty of Veterinary Medicine, Utrecht University, P.O. Box 80154, 3508

TD Utrecht, The Netherlands; Uppertunity Consultants, Gaspar Campos 245, B1638

Vicente Lopez, Argentina. (4)Department of Clinical Sciences of Companion

Animals, Faculty of Veterinary Medicine, Utrecht University, P.O. Box 80154, 3508

TD Utrecht, The Netherlands. Electronic address:

h.a.w.hazewinkel@uu.nl.

Hip as well as elbow dysplasia (HD, ED) are developmental disorders leading to

malformation of their respective joints. For a long time both disorders have been

scored and targeted for improvement using selective breeding in several Dutch dog

populations. In this paper all scores for both HD and ED, given to pure bred dogs

in the Netherlands from 2002 to 2010, were analyzed. Heritabilities and

correlations between HD and ED were calculated for the 4 most frequently scored

breeds. Heritabilities ranged from 0.0 to 0.37 for HD related traits (FCI-score,

osteoarthritis, congruity, shape and laxity (Norberg angle); FCI: Fédération

Cynologique Internationale) and from 0.0 to 0.39 for ED related traits (IEWG

score, osteoarthritis, sclerosis and indentation; IEWG: International Elbow

Working Group). HD related traits showed high genetic and residual correlations

among each other but were only to a minor extent correlated with ED related

traits, which also showed high correlations among each other. Genetic correlations were higher than residual correlations. Phenotypic and

genetic trends since 2001 for the four most scored breeds were slightly positive but decreasing over time, indicating that selection over the past decade has not been effective.

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PMID: 24588976 [PubMed – indexed for MEDLINE]

21. PLoS One. 2014 Jan 30;9(1):e87735. doi: 10.1371/journal.pone.0087735. eCollection 2014.

Genome wide analysis indicates genes for basement membrane and cartilage matrix proteins as candidates for hip dysplasia in Labrador Retrievers.

Lavrijsen IC(1), Leegwater PA(1), Martin AJ(2), Harris SJ(2), Tryfonidou MA(1), Heuven HC(1), Hazewinkel HA(1).

Author information:

(1)Department of Clinical Sciences of Companion Animal, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands. (2)Waltham Centre for Pet Nutrition, Leicestershire, United Kingdom.

Hip dysplasia, an abnormal laxity of the hip joint, is seen in humans as well as dogs and is one of the most common skeletal disorders in dogs. Canine hip dysplasia is considered multifactorial and polygenic, and a variety of chromosomal regions have been associated with the disorder. We performed a genome-wide association study in Dutch Labrador Retrievers, comparing data of nearly 18,000 single nucleotide polymorphisms (SNPs) in 48 cases and 30 controls using two different statistical methods. An individual SNP analysis based on comparison of allele frequencies with a χ^2 statistic was used, as well as a simultaneous SNP analysis based on Bayesian variable selection. Significant association with canine hip dysplasia was observed on chromosome 8, as well as

suggestive association on chromosomes 1, 5, 15, 20, 25 and 32. Next-generation DNA sequencing of the exons of genes of seven regions identified multiple associated alleles on chromosome 1, 5, 8, 20, 25 and 32 ($p < 0.001$). Candidate genes located in the associated regions on chromosomes 1, 8 and 25 included LAMA2, LRR1 and COL6A3, respectively. The associated region on CFA20 contained candidate genes GDF15, COMP and CILP2. In conclusion, our study identified candidate genes that might affect susceptibility to canine hip dysplasia. These genes are involved in hypertrophic differentiation of chondrocytes and extracellular matrix integrity of basement membrane and cartilage. The functions of the genes are in agreement with the notion that disruptions in endochondral bone formation in combination with soft tissue defects are involved in the etiology of hip dysplasia.

PMCID: PMC3907504

PMID: 24498183 [PubMed – indexed for MEDLINE]

22. J Small Anim Pract. 2014 Mar;55(3):135–8. doi: 10.1111/jsap.12171.
Epub 2013 Dec 24.

Comparing Norberg angle, linear femoral overlap and surface femoral overlap in radiographic assessment of the canine hip joint.

Janssens L(1), De Ridder M, Verhoeven G, Gielen I, van Bree H.

Author information:

(1)Companion Animal Clinic KSD, Rotterdam, The Netherlands.

OBJECTIVES: The aim of this study was to compare Norberg angle, linear femoral overlap and surface femoral overlap in radiographs of hips accepted for official hip dysplasia screening.

METHODS: Radiographs of 100 dogs (200 hips) were reviewed. The three measurements were performed in each hip according to previously described methods and thereafter correlated.

RESULTS: Intra- and inter-observer reliability was very high (all >85%). The linear correlation between Norberg angle and linear femoral overlap or surface femoral overlap was 0.40 and 0.41, respectively. The linear correlation between linear femoral overlap and surface femoral overlap was 0.84. CLINICAL SIGNIFICANCE: Norberg angle cannot be compared with surface femoral overlap or linear femoral overlap, and a mathematical formula could not be computed for the comparison.

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PMID: 24372260 [PubMed – indexed for MEDLINE]

23. Vet Rec. 2013 Dec 21;173(24):614. doi: 10.1136/vr.f7565.

Hip dysplasia, and tibia and femur lengths in Newfoundland dogs.

Denham EM(1).

Author information:

(1)Sunnylea, Laceys Lane, Niton, Ventnor, Isle Of Wight PO38 2DN.

PMID: 24362809 [PubMed – indexed for MEDLINE]

24. PLoS One. 2013 Nov 7;8(11):e78929. doi: 10.1371/journal.pone.0078929. eCollection 2013.

Genetic correlations among canine hip dysplasia radiographic traits in a cohort of Australian German Shepherd Dogs, and implications for the design of a more effective genetic control program.

Wilson BJ(1), Nicholas FW, James JW, Wade CM, Raadsma HW, Thomson PC.

Author information:

(1)Faculty of Veterinary Science, The University of Sydney, Sydney, New South Wales, Australia.

Canine hip dysplasia (CHD) is a common musculoskeletal disease in pedigree dog populations. It can cause severe pain and dysfunction which may

require extensive medication and/or surgical treatment and often ultimately requires humane euthanasia. CHD has been found to be moderately heritable and, given its impact on welfare, should be considered an imperative breeding priority. The British Veterinary Association/Kennel Club scoring method is one of several measures used to assess the genetic propensity of potential breeding stock for dysplastic changes to the hips based on radiographic examination. It is a complex measure composed of nine ordinal traits, intended to evaluate both early and late dysplastic changes. It would be highly desirable if estimated breeding values (EBVs) for these nine traits were consolidated into a simpler, EBV-based, selection index more easily usable by breeders. A multivariate analysis on the phenotype scores from an Australian cohort of 13,124 German Shepherd Dogs (GSDs) returned genetic correlations between 0.48–0.97 for the nine traits which fell into two trait groups, Group 1 reflecting early changes ("laxity") and Group 2 reflecting late changes ("osteoarthritis"). Principal components analysis of the ordinal EBVs suggested the same pattern, with strong differentiation between "laxity" and "osteoarthritis" traits in the second component. Taking account of all results, we recommend interim use of two selection indexes: the first being the average of ordinal EBVs for "laxity" traits and the second being the average of ordinal EBVs for "osteoarthritis" traits. The correlation between these two selection indexes (0.771–0.774) is sufficiently less than unity enabling the selection of dogs with different genetic propensity for laxity and for osteoarthritic CHD changes in GSDs; this may also be applicable in other breeds. Dogs with low propensity for severe osteoarthritic change in the presence of laxity may be of interest both in molecular research and breeding programs.

PMID: 24244386 [PubMed – indexed for MEDLINE]

25. PLoS One. 2013 Oct 29;8(10):e77470. doi: 10.1371/journal.pone.0077470.
eCollection 2013.

Estimated breeding values for canine hip dysplasia radiographic traits in a cohort of Australian German Shepherd dogs.

Wilson BJ(1), Nicholas FW, James JW, Wade CM, Thomson PC.

Author information:

(1)Faculty of Veterinary Science, The University of Sydney, Sydney, New South Wales, Australia.

Canine hip dysplasia (CHD) is a serious and common musculoskeletal disease of pedigree dogs and therefore represents both an important welfare concern and an imperative breeding priority. The typical heritability estimates for radiographic CHD traits suggest that the accuracy of breeding dog selection could be substantially improved by the use of estimated breeding values (EBVs) in place of selection based on phenotypes of individuals. The British Veterinary Association/Kennel Club scoring method is a complex measure composed of nine bilateral ordinal traits, intended to evaluate both early and late dysplastic changes. However, the ordinal nature of the traits may represent a technical challenge for calculation of EBVs using linear methods. The purpose of the current study was to calculate EBVs of British Veterinary Association/Kennel Club traits in the Australian population of German Shepherd Dogs, using linear (both as individual traits and a summed phenotype), binary and ordinal methods to determine the optimal method for EBV calculation. Ordinal EBVs correlated well with linear EBVs ($r = 0.90\text{--}0.99$) and somewhat well with EBVs for the sum of the individual traits ($r = 0.58\text{--}0.92$). Correlation of ordinal and binary EBVs varied widely ($r = 0.24\text{--}0.99$) depending on the trait and cut-point

considered. The ordinal EBVs have increased accuracy (0.48–0.69) of selection compared with accuracies from individual phenotype-based selection (0.40–0.52). Despite the high correlations between linear and ordinal EBVs, the underlying relationship between EBVs calculated by the two methods was not always linear, leading us to suggest that ordinal models should be used wherever possible. As the population of German Shepherd Dogs which was studied was purportedly under selection for the traits studied, we examined the EBVs for evidence of a genetic trend in these traits and found substantial genetic improvement over time. This study suggests the use of ordinal EBVs could increase the rate of genetic improvement in this population.

PMCID: PMC3812223

PMID: 24204838 [PubMed – indexed for MEDLINE]

26. J Anim Breed Genet. 2014 Apr;131(2):134–45. doi: 10.1111/jbg.12056. Epub 2013 Oct 18.

Assessing the impact of genomic selection against hip dysplasia in the Labrador Retriever dog.

Sánchez-Molano E(1), Woolliams JA, Blott SC, Wiener P.

Author information:

(1)The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, Edinburgh, UK.

Many purebred dogs exhibit a higher prevalence of inherited diseases compared with non-purebred dogs. One of the most popular breeds in the UK is the Labrador Retriever, which has a high prevalence of hip dysplasia resulting in high costs for surgical operations and impaired animal welfare. Considering the many complications of highly managed populations, mainly due to breeder's conventions

and the resulting population structure, is of great importance for the proper development of a strategy against the disease. In this study, we have compared the utilities and performances of both genomic and phenotypic selection against hip dysplasia in a simulated population with the characteristics of the British Veterinary Association and Kennel Club (BV /KC) hip dysplasia scheme. The results confirm the potential benefits of genomic selection by showing a moderate increase of 1.15-fold (assuming a realistic accuracy of $r(2) = 0.5$) in response to selection due to the higher accuracy (between 0.96- and 1.32-fold, considering $0.35 \leq r(2) \leq 0.7$) and more than a threefold increase when all the offspring in each litter are tested (between 3.25- and 4.55-fold, again considering $0.35 \leq r(2) \leq 0.7$).

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PMCID: PMC4166706

PMID: 24134497 [PubMed – indexed for MEDLINE]

27. PLoS One. 2013 Oct 4;8(10):e76390. doi: 10.1371/journal.pone.0076390. eCollection 2013.

Monitoring Hip and Elbow Dysplasia achieved modest genetic improvement of 74 dog breeds over 40 years in USA.

Hou Y(1), Wang Y, Lu X, Zhang X, Zhao Q, Todhunter RJ, Zhang Z.

Author information:

(1)Key Laboratory of Agricultural Animal Genetics and Breeding, National Engineering Laboratory for Animal Breeding, College of Animal Science and Technology, China Agricultural University, Beijing, People's Republic of China ; Laboratory of Disease Genomics and Individualized Medicine, Beijing Institute of Genomics, Chinese Academy of Sciences, Beijing, People's Republic of

China.

Erratum in

PLoS One. 2013;8(10).

doi:10.1371/annotation/92e1aa00-169b-45dc-9866-61034e061f6d.

Hip (HD) and Elbow Dysplasia (ED) are two common complex developmental disorders of dogs. In order to decrease their prevalence and severity, the Orthopedic Foundation for Animals (OFA) has a voluntary registry of canine hip and elbow conformation certified by boarded radiologists. However, the voluntarily reports have been severely biased against exposing dogs with problems, especially at beginning period. Fluctuated by additional influential factors such as age, the published raw scores barely showed trends of improvement. In this study, we used multiple-trait mixed model to simultaneously adjust these factors and incorporate pedigree to derive Estimated Breeding Values (EBV). A total of 1,264,422 dogs from 74 breeds were evaluated for EBVs from 760,455 hip scores and 135,409 elbow scores. These EBVs have substantially recovered the reporting bias and the other influences. Clear and steady trends of genetic improvement were observed over the 40 years since 1970. The total genetic improvements were 16.4% and 1.1% of the phenotypic standard deviation for HD and ED, respectively. The incidences of dysplasia were 0.83% and 2.08%, and the heritabilities were estimated as 0.22 and 0.17 for hip and elbow scores, respectively. The genetic correlation between them was 0.12. We conclude that EBV is more effective than reporting raw phenotype. The weak genetic correlation suggested that selection based on hip scores would also slightly improve elbow scores but it is necessary to allocate effort toward improvement of elbow scores alone.

PMCID: PMC3790730

PMID: 24124555 [PubMed – indexed for MEDLINE]

28. Tierarztl Prax Ausg K Kleintiere Heimtiere. 2013;41(4):244–54.

[Use of gold implants as a treatment of pain related to canine hip dysplasia--a review. Part 2: Clinical trials and case reports].

[Article in German]

Deisenroth A(1), Nolte I, Wefstaedt P.

Author information:

(1)Dr. med. vet. Patrick Wefstaedt, Klinik für Kleintiere, Stiftung Tierärztliche Hochschule Hannover, Bünteweg 9, 30559 Hannover, E-Mail: Patrick.Wefstaedt@tiho-hannover.de.

Gold bead implantation/gold acupuncture is becoming increasingly used in veterinary medicine as a method of pain treatment in cases of osteoarthritic diseases. Part one of the overview dealing with the use of gold implants as a treatment of canine hip joint dysplasia (cHD) introduced the method of implanting gold in tissue and publications which investigated the subsequent effects of implantation. This article focuses on publications concerning the clinical effectiveness of gold implantation within the scope of pain therapy in cHD. Due to the study design, a classification using evidence-based levels (EbL) was carried out. Three double-blind, placebo-controlled randomised studies (EbL II) were considered together with three retrospective studies on own patients (EbL IV) and five case studies (EbL IV). While the case and retrospective studies reported impressive therapeutic success in treating cHD-incurred pain with gold implantation, a pain-reducing effect through gold implantation was only demonstrated in one of the three double-blind studies. The two remaining EbL II studies found no differences between the placebo-group and the group of dogs treated with gold implantation. In one of these two studies, kinematic and kinetic gait analyses were used for objective evaluation of the effects of the

treatment. Thus, the only study that carried out an objective evaluation of the therapeutic result of gold implantation came to the conclusion that the method is ineffective. For a concluding assessment of gold implantation in the case of cHD, gait analysis studies investigating the effects of gold implantation in comparison to a standard treatment with nonsteroidal anti-inflammatory drugs are currently lacking.

PMID: 23958708 [PubMed – in process]

29. Vet J. 2013 Sep;197(3):873–5. doi: 10.1016/j.tvjl.2013.04.025. Epub 2013 Aug 8.

Opportunities for international collaboration in dog breeding from the sharing of pedigree and health data.

Fikse WF(1), Malm S, Lewis TW.

Author information:

(1)SLU, Department of Animal Breeding and Genetics, Uppsala, Sweden. Electronic address: Freddy.Fikse@slu.se.

Pooling of pedigree and phenotype data from different countries may improve the accuracy of derived indicators of both genetic diversity and genetic merit of traits of interest. This study demonstrates significant migration of individuals of four pedigree dog breeds between Sweden and the United Kingdom. Correlations of estimates of genetic merit (estimated breeding values, EBVs) for the Fédération Cynologique Internationale and the British Veterinary Association and Kennel Club evaluations of hip dysplasia (HD) were strong and favourable, indicating that both scoring schemes capture substantially the same genetic trait. Therefore pooled use of phenotypic data on hip dysplasia would be expected to improve the accuracy of EBV for HD in both countries due to increased sample data.

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PMID: 23932651 [PubMed – indexed for MEDLINE]

30. Can Vet J. 2013 Jan;54(1):42–6.

The Ontario Veterinary College Hip Certification Program -- assessing inter- and intra-observer repeatability and comparison of findings to those of the Orthopedic Foundation for Animals.

Chalmers HJ(1), Nykamp S, Lerer A.

Author information:

(1)Department of Clinical Studies, Ontario Veterinary College, University of Guelph, Guelph, Ontario N1G 2W1. heather.chalmers@uoguelph.ca

In Canada, the Ontario Veterinary College (OVC) has offered radiographic screening for hip dysplasia for many years, but there are other options for this service including the Orthopedic Foundation for Animals (OFA). There are some differences between the OFA and the OVC methods, and this study compares the OVC and OFA hip certification results in 37 dogs. There was good agreement between the two programs but in some instances there was a difference in the pass/fail status of a dog. Neither the OFA nor the OVC was more likely to fail or pass a given dog. The repeatability of the OVC results was assessed by both inter- and intra-observer comparisons in 100 dogs. There was at least 86% agreement among and within radiologists, but in 5 cases the disagreement resulted in a difference in the pass/fail status of the dog. These results illustrate the inherent variation in radiographic hip evaluation and highlight the importance of consensus grading practices to improve the accuracy of hip evaluation.

Publisher: Abstract available from the publisher.

PMCID: PMC3524811

PMID: 23814300 [PubMed – indexed for MEDLINE]

31. Vet Rec. 2013 Jul 20;173(3):72. doi: 10.1136/vr.101152. Epub 2013 Jun 13.

Canine hip dysplasia in Irish water spaniels: two decades of gradual improvement.

Freeman B(1), Evans VB, McEwan NR.

Author information:

(1)Institute of Biological, Environmental and Rural Sciences,
Aberystwyth
University, Cledwyn Building, Penglais Campus, Aberystwyth, Wales SY23
3DD, UK.

PMID: 23764842 [PubMed – indexed for MEDLINE]

32. J Am Vet Med Assoc. 2013 Jun 1;242(11):1528–33. doi: 10.2460/javma.242.11.1528.

Associations among exercise duration, lameness severity, and hip joint range of motion in Labrador Retrievers with hip dysplasia.

Greene LM(1), Marcellin-Little DJ, Lascelles BD.

Author information:

(1)Department of Clinical Sciences and the Comparative Pain and Orthopedic Research Laboratories, College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27607, USA.

OBJECTIVE: To evaluate factors associated with lameness severity and hip joint range of motion in dogs with hip dysplasia and to assess the association between hip joint range of motion and degree of lameness.

DESIGN: Prospective case series.

ANIMALS: 60 client-owned Labrador Retrievers with hip dysplasia.

PROCEDURES: Owners completed a questionnaire regarding their dogs' daily exercise duration and type (i.e., low impact vs high impact) and lifestyle. Range of

motion of affected hip joints was measured with a transparent plastic goniometer.

The presence of subluxation or luxation of hip joints as a consequence of hip

dysplasia and the size of the largest osteophytes or enthesophytes of hip joints on ventrodorsal radiographic images of the pelvis were recorded. Multivariate analyses were performed to identify factors associated with lameness, loss of hip joint flexion, and loss of hip joint extension and to identify factors associated with the presence of large osteophytes.

RESULTS: Exercise was associated with a decrease in the severity of lameness in dogs with hip dysplasia. The strength of this inverse relationship increased with longer exercise duration. Lameness was more severe in dogs with hip joint luxation than in dogs without luxation. Hip joint extension was 1° lower for each year of age, and osteophyte or enthesophyte size was 1 mm larger with each 3-year increase in age.

CONCLUSIONS AND CLINICAL RELEVANCE: Longer daily exercise duration was associated with lower lameness scores in dogs with hip dysplasia. Dogs with hip joint luxation secondary to hip dysplasia had higher lameness scores than did dogs without hip joint luxation.

PMID: 23683017 [PubMed – indexed for MEDLINE]

33. Vet Comp Orthop Traumatol. 2013;26(3):218–25. doi: 10.3415/VCOT-12-06-0074. Epub 2013 Mar 22.

Radiographic changes of the pelvis in Labrador and Golden Retrievers after juvenile pubic symphysiodesis: objective and subjective evaluation.

Boiocchi S(1), Vezzoni L, Vezzoni A, Bronzo V, Rossi F.

Author information:

(1)Clinica Veterinaria Vezzoni srl, Cremona, Italy.

OBJECTIVES: The hypothesis of this study was that juvenile pubic symphysiodesis (JPS) results in pelvic changes that can be identified radiographically in adult dogs.

METHODS: The medical records at the Clinica Veterinaria Vezzoni were

searched for
standard ventro-dorsal views of the pelvis of adult Labrador and
Golden
Retrievers that had undergone JPS or had not undergone surgery. The
objective
assessment of radiographs included the analysis of various pelvic
measurements.
Subjective evaluation of radiographs was undertaken by 18 specialists
and 21
general practitioners and was based on five criteria relating to 1)
the
acetabular fossae, 2) the pubic symphysis, 3) the margin of the
cranial pubic
area, 4) the pubic rami, and 5) the obturator foramen.
RESULTS: The radiographs of 42 Labrador Retrievers and 16 Golden
Retrievers were
evaluated. The most useful criteria were the radiographic measurement
of the
shape of the obturator foramen and two different ratios of length to
width of the
pubic rami; these values were significantly smaller in dogs after JPS.
The pelvic
canal width was the same in both groups. All objective measurements
were
repeatable within and between evaluators. The most reliable subjective
criterion
was number 4, followed by number 5 in Golden Retrievers and by 2 in
Labrador
Retrievers.
CONCLUSION: Our objective and subjective evaluations were simple and
yielded
useful and repeatable results. There was no significant difference
between
general practitioners and specialists with regard to subjective
evaluation, which
indicates that these evaluation criteria can be used by small animal
clinicians
after minimal training.

PMID: 23677124 [PubMed – indexed for MEDLINE]

34. Tierarztl Prax Ausg K Kleintiere Heimtiere. 2013;41(2):107-16.

[Use of gold implants as a treatment of pain related to canine hip
dysplasia--a
review. Part 1: Background and current state of research regarding the
effects of
implanting gold in tissue].

[Article in German]

Deisenroth A(1), Nolte I, Wefstaedt P.

Author information:

(1)Klinik für Kleintiere, Stiftung Tierärztliche Hochschule Hannover,
Bünteweg 9,
Hannover. Patrick.Wefstaedt@tiho-hannover.de

Gold-bead implantation as a method of pain treatment in dogs suffering from osteoarthritic disease is receiving increasing attention in veterinary medicine. For the present article, publications from veterinary books and journals were collected and evaluated, together with related articles in human medicine. After providing an overview of the historical use of gold and gold compounds, the technique of implanting this noble metal is introduced. The reasons for establishing the terms gold acupuncture and gold (bead) implantation are described, considering the question whether and what kind of methodological differences exist behind these terms. Next, previous publications concerning the effects of gold implantation in tissue are summarised. In 2002 it was proven that gold ions are released from the surface of gold implants by a process termed dissolucytosis. Subsequent publications further investigated details about the interaction between gold ions and tissue as well as the distribution pattern of bio-released ions. Gold compounds were previously used for chrysotherapy in human medicine until medication with fewer side effects became established. The anti-inflammatory and immuno-modulatory properties of gold compounds were used to treat rheumatoid arthritis. Current research aims to ascertain whether the anti-inflammatory and immuno-modulating effects of gold compounds are imitated by gold ions released from gold implants at a local level. In conclusion, the present review summarises important findings about the effects of gold implanted in tissue. However, further research is necessary to estimate the

limitations and
benefits of this auromedication.

PMID: 23608966 [PubMed – in process]

35. Vet Rec. 2013 Mar 30;172(13):332–5. doi: 10.1136/vr.f1980.

Treating common articular disorders in dogs.

Innes J(1).

Author information:

(1)Department of Musculoskeletal Biology and Small Animal Teaching
Hospital,
University of Liverpool, Leahurst Campus, Neston, Cheshire CH64 7TE,
UK.
j.f.innes@liv.ac.uk

PMID: 23539653 [PubMed – indexed for MEDLINE]

36. J Anim Breed Genet. 2013 Apr;130(2):154–64. doi:
10.1111/j.1439-0388.2012.01013.x. Epub 2012 Jul 11.

Efficient selection against categorically scored hip dysplasia in dogs
is
possible using best linear unbiased prediction and optimum
contribution
selection: a simulation study.

Malm S(1), Sørensen AC, Fikse WF, Strandberg E.

Author information:

(1)Department of Animal Breeding and Genetics, Faculty of Veterinary
Medicine and
Animal Science, Swedish University of Agricultural Sciences, Uppsala,
Sweden.
sofia.malm@slu.se

Breeding to reduce the prevalence of categorically scored hip
dysplasia (HD),
based on phenotypic assessment of radiographic hip status, has had
limited
success. The aim of this study was to evaluate two selection
strategies for
improved hip status: truncation selection based on phenotypic record
versus best
linear unbiased prediction (BLUP), using stochastic simulation and
selection

scenarios resembling those in real dog populations. In addition, optimum contribution selection (OCS) was evaluated. Two traits were considered: HD (as a categorical trait with five classes and a heritability of 0.45 on the liability scale) and a continuous trait (with a heritability of 0.25) intended to represent other characteristics in the breeding goal. A population structure mimicking that in real dog populations was modelled. The categorical nature of HD caused a considerably lower genetic gain compared to simulating HD as a continuous trait. Genetic gain was larger for BLUP selection than for phenotypic selection in all scenarios. However, BLUP selection resulted in higher rates of inbreeding. By applying OCS, the rate of inbreeding was lowered to about the same level as phenotypic selection but with increased genetic improvement. For efficient selection against HD, use of BLUP breeding values should be prioritized. In small populations, BLUP should be used together with OCS or similar strategy to maintain genetic variation.

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PMID: 23496016 [PubMed – indexed for MEDLINE]

37. BMC Genet. 2013 Mar 2;14:16. doi: 10.1186/1471-2156-14-16.

Comparative analyses of genetic trends and prospects for selection against hip and elbow dysplasia in 15 UK dog breeds.

Lewis TW(1), Blott SC, Woolliams JA.

Author information:

(1)Kennel Club Genetics Centre at the Animal Health Trust, Lanwades Park,
Kentford, Newmarket, Suffolk CB8 7UU, UK. tom.lewis@aht.org.uk

BACKGROUND: Hip dysplasia remains one of the most serious hereditary diseases occurring in dogs despite long-standing evaluation schemes designed to aid

selection for healthy joints. Many researchers have recommended the use of estimated breeding values (EBV) to improve the rate of genetic progress from selection against hip and elbow dysplasia (another common developmental orthopaedic disorder), but few have empirically quantified the benefits of their use. This study aimed to both determine recent genetic trends in hip and elbow dysplasia, and evaluate the potential improvements in response to selection that publication of EBV for such diseases would provide, across a wide range of pure-bred dog breeds.

RESULTS: The genetic trend with respect to hip and elbow condition due to phenotypic selection had improved in all breeds, except the Siberian Husky.

However, derived selection intensities are extremely weak, equivalent to excluding less than a maximum of 18% of the highest risk animals from breeding.

EBV for hip and elbow score were predicted to be on average between 1.16 and 1.34

times more accurate than selection on individual or both parental phenotypes.

Additionally, compared to the proportion of juvenile animals with both parental

phenotypes, the proportion with EBV of a greater accuracy than selection on such

phenotypes increased by up to 3-fold for hip score and up to 13-fold for elbow score.

CONCLUSIONS: EBV are shown to be both more accurate and abundant than phenotype, providing more reliable information on the genetic risk of disease for a greater proportion of the population. Because the accuracy of selection is directly

related to genetic progress, use of EBV can be expected to benefit selection for

the improvement of canine health and welfare. Public availability of EBV for hip

score for the fifteen breeds included in this study will provide information on

the genetic risk of disease in nearly a third of all dogs annually registered by

the UK Kennel Club, with in excess of a quarter having an EBV for elbow score as

well.

PMCID: PMC3599011

PMID: 23452300 [PubMed – indexed for MEDLINE]

38. PLoS One. 2013;8(2):e55937. doi: 10.1371/journal.pone.0055937.
Epub 2013 Feb 13.

Neutering dogs: effects on joint disorders and cancers in golden retrievers.

Torres de la Riva G(1), Hart BL, Farver TB, Oberbauer AM, Messam LL, Willits N, Hart LA.

Author information:

(1)Department of Population Health and Reproduction, School of Veterinary Medicine, University of California–Davis, Davis, California, United States of America.

In contrast to European countries, the overwhelming majority of dogs in the U.S. are neutered (including spaying), usually done before one year of age. Given the importance of gonadal hormones in growth and development, this cultural contrast invites an analysis of the multiple organ systems that may be adversely affected by neutering. Using a single breed-specific dataset, the objective was to examine the variables of gender and age at the time of neutering versus leaving dogs gonadally intact, on all diseases occurring with sufficient frequency for statistical analyses. Given its popularity and vulnerability to various cancers and joint disorders, the Golden Retriever was chosen for this study. Veterinary hospital records of 759 client-owned, intact and neutered female and male dogs, 1–8 years old, were examined for diagnoses of hip dysplasia (HD), cranial cruciate ligament tear (CCL), lymphosarcoma (LSA), hemangiosarcoma (HSA), and mast cell tumor (MCT). Patients were classified as intact, or neutered early (<12 mo) or late (≥12 mo). Statistical analyses involved survival analyses

and incidence rate comparisons. Outcomes at the 5 percent level of significance are reported. Of early-neutered males, 10 percent were diagnosed with HD, double the occurrence in intact males. There were no cases of CCL diagnosed in intact males or females, but in early-neutered males and females the occurrences were 5 percent and 8 percent, respectively. Almost 10 percent of early-neutered males were diagnosed with LSA, 3 times more than intact males. The percentage of HSA cases in late-neutered females (about 8 percent) was 4 times more than intact and early-neutered females. There were no cases of MCT in intact females, but the occurrence was nearly 6 percent in late-neutered females. The results have health implications for Golden Retriever companion and service dogs, and for oncologists using dogs as models of cancers that occur in humans.

PMCID: PMC3572183

PMID: 23418479 [PubMed – indexed for MEDLINE]

39. Vet Surg. 2012 Jan;41(1):130–5. doi: 10.1111/j.1532–950X.2011.00939.x.

Nano total hip replacement in 12 dogs.

Ireifej S(1), Marino D, Loughin C.

Author information:

(1)Department of Surgery, Long Island Veterinary Specialists,
Plainview, NY
11803, USA. DMarino@LIVS.org

OBJECTIVE: To determine the short-term clinical outcome of nano total hip

replacement (NanoTHR) in dogs.

STUDY DESIGN: Retrospective case series.

ANIMALS: Dogs (n = 12).

METHODS: Medical records (2009–2011) of dogs that had nano-THR were reviewed for

signalment, weight, clinical signs, side, age, prosthesis sizes, concurrent

surgeries performed, complications, operative time, 3-month postoperative pelvic

radiograph results, and lameness scores.

RESULTS: Breeds were Yorkshire Terriers (n = 6), Toy Poodles (2), with 1 each of

Maltese, Pomeranian, Cavalier King Charles Spaniel, and Shih-Tzu.

Median body was

4.87 kg (range, 2.5–5.90 kg) and median age, 35.75 months (range, 12–144 months).

Radiographs were taken in 4 dogs at 12 days (n = 2), 14 days (1), and 30 days (1)

after surgery because of presentation for an acute grade 5 lameness.

Three dogs

had femoral fractures distal to the femoral implant tip and 1 dog displaced the

acetabular implant medially. After revision surgery, all femoral fractures were

assessed as healed with intact plate fixation. The dog with the medially

displaced acetabular component responded to conservative management including

strict confinement and analgesic administration. Eight dogs (58%) were assigned a

grade 1 lameness and 4 dogs were grade 2 (33%) at 12-week examination.

The 3 dogs

with grade 5 lameness scores found to have femoral fractures within 1 month after

surgery, subsequently improved to grade 1 (n = 1) and 2 (2) 12 weeks after

revision surgery. The dog with medial acetabular displacement improved to a grade

2 lameness 12 weeks after conservative management.

CONCLUSIONS: Although all 12 dogs had good-to-excellent outcomes, 33% experienced

significant complications associated with the technique. As

improvements in

instrumentation and refinements in the technique are developed,

NanoTHR can be

considered an alternative to the femoral head and neck ostectomy (FH0) or medical

management of coxofemoral disease for toy breed dogs. Further studies with a

larger number of dogs and longer follow-up times are required.

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PMID: 23253038 [PubMed – indexed for MEDLINE]

40. Vet Surg. 2012 Jan;41(1):34–41. doi: 10.1111/j.1532-950X.2011.00938.x.

Radiographic hip joint phenotype of the Pembroke Welsh Corgi.

Karbe GT(1), Biery DN, Gregor TP, Giger U, Smith GK.

Author information:

(1)Department of Clinical Studies, School of Veterinary Medicine,
University of
Pennsylvania, Philadelphia, PA 19104-6010, USA.

OBJECTIVE: To investigate the radiographic hip joint phenotype of the
Pembroke
Welsh Corgi.

STUDY DESIGN: Prospective and retrospective cross-sectional study.

ANIMALS: Pembroke Welsh Corgis (n = 399).

METHODS: Ventrodorsal, hip-extended radiographs were evaluated for
subluxation,
osteoarthritis (OA), caudolateral curvilinear osteophytes (CCO), and
circumferential femoral head osteophytes (CFHO) of PennHIP evaluated
Corgis.

Joint laxity was measured by distraction index (DI).

RESULTS: All Corgis had DI > 0.30 (mean, 0.66), 6.8% had OA, 18% had
subluxation,

22.3% had CCO, and 74.4% had CFHO. Higher DI increased the odds for
subluxation

and canine hip dysplasia (CHD) but not for OA, CCO, or CFHO. The
presence of CCO

increased the odds for OA by 4.6 times (P = .002) and 2.2 times (P = .
01) for hip

dysplasia. All dogs with OA had CFHO. The presence of CFHO increased
the odds for

subluxation by 8.7 times (p < .001) and 8.9 times (P < .001) for hip
dysplasia.

Subluxation increased the odds for OA by 15.4 times (P < .001).

CONCLUSION: Corgis had a low frequency of conventional OA despite
having hip

laxity that has been shown to correlate with hip OA and hip dysplasia
in

large-breed dogs. The relationship between CCO and OA was similar to
published

findings in nonchondrodystrophic large-breed dogs and the CFHO was
significantly

associated with subluxation. Both CCO and CFHO are associated with hip
dysplasia

in this small chondrodystrophic breed.

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PMCID: PMC3842694

PMID: 23253037 [PubMed – indexed for MEDLINE]

41. Vet Surg. 2012 Jan;41(1):20–33. doi: 10.1111/j.1532–950X.2011.00935.x.

Chronology of hip dysplasia development in a cohort of 48 Labrador retrievers followed for life.

Smith GK(1), Lawler DF, Biery DN, Powers MY, Shofer F, Gregor TP, Karbe GT, McDonald–Lynch MB, Evans RH, Kealy RD.

Author information:

(1)Department of Clinical Studies, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104–6010, USA. smithgk@vet.upenn.edu

OBJECTIVE: To determine the chronology of radiographic signs of canine hip dysplasia (CHD), specifically joint laxity and secondary osteoarthritis (OA).

STUDY DESIGN: Longitudinal cohort study.

ANIMALS: Paired littermates, 48 Labrador retrievers.

METHODS: Conventional, ventrodorsal, hip–extended (HE) radiographs were evaluated

yearly for CHD according to the subjective criteria of the Orthopedic Foundation

for Animals (OFA). PennHIP screening was performed at 2 years of age to assess

joint laxity by distraction index (DI). Histopathologic evaluation of coxofemoral

joints was performed at the dogs' natural end of life.

RESULTS: Coxofemoral subluxation, as identified on the HE radiograph occurred by

2 years of age and not thereafter. Accuracy of OFA–criteria scoring was poor: 55%

of dogs scored "normal" at 2 years of age became radiographically dysplastic by

the end of life (45% negative predictive value, NPV); 92% of the dogs scored as

normal at 2 years of age had histopathologic OA of CHD (8% NPV). The DI predicted

all 48 dogs to be susceptible to OA of CHD and 98% had radiographic or histopathologic OA by the end of life.

CONCLUSION: OFA–criteria score was profoundly influenced by environmental

factors, such as diet restriction and age, reducing its value as a selection

criterion. DI measurements were not influenced by dietary treatment suggesting

higher trait heritability.

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PMID: 23253036 [PubMed – indexed for MEDLINE]

42. Vet Surg. 2012 Jan;41(1):10–9. doi: 10.1111/j.1532–950X.2011.00929.x.

Worldwide screening for canine hip dysplasia: where are we now?

Verhoeven G(1), Fortrie R, Van Ryssen B, Coopman F.

Author information:

(1)Europees Specialist Chirurgie Gezelschapsdieren, Ghent University, Medical

Imaging and Orthopedics, Salisburylaan 133, Merelbeke, Belgium.
geertverhoeven@hotmail.com

OBJECTIVE: To critically review the different screening systems used for canine

hip dysplasia (CHD) and their impact on the prevalence of the disease.

STUDY DESIGN: Critical literature review.

METHODS: Literature search through PubMed (November 1959–October 2011) and the

Orthopedic Foundation for Animals (OFA), Fédération Cynologique Internationale

(FCI), British Veterinary Association/Kennel Club (BVA/KC), and Pennsylvania Hip

Improvement Program (PennHIP) websites.

RESULTS: The OFA, FCI, and BVA/KC screening methods, which use the hip-extended radiographic projection, have had relatively minor success on CHD prevalence.

These screening approaches are prone to conflicting data regarding interobserver

agreement. The PennHIP and Dorsolateral Subluxation (DLS) systems, both

distraction methods, have not reported on prevalence but seem to be important

heritable traits in genomic screening of dysplastic dogs.

CONCLUSION: A shift towards genome screening yields a promising future combating

CHD, although further investigation towards fine-mapping in the search for genes,

responsible for CHD, is necessary.

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PMID: 23253035 [PubMed – indexed for MEDLINE]

43. Vet Surg. 2012 Jan;41(1):1. doi: 10.1111/j.1532-950X.2011.00941.x.

Advances in hip dysplasia.

Lopez MJ.

PMID: 23253034 [PubMed – indexed for MEDLINE]

44. PLoS One. 2012;7(11):e49782. doi: 10.1371/journal.pone.0049782.
Epub 2012 Nov 26.

Identification of quantitative trait loci (QTL) for canine hip dysplasia and canine elbow dysplasia in Bernese mountain dogs.

Pfahler S(1), Distl O.

Author information:

(1)Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover, Hannover, Germany.

A genome-wide association study for canine hip dysplasia (CHD) and canine elbow dysplasia (CED) using the Illumina canine high density bead chip had been performed for 174 Bernese mountain dogs. General and mixed linear model analysis identified two different regions with single nucleotide polymorphisms (SNPs) on dog chromosome (CFA) 14 significantly associated with CHD and a further significantly CHD-associated region on CFA37. For CED, four SNPs on CFA11 and 27 were significantly associated. The identified SNPs of four associated regions included nearby candidate genes. These possible positional candidates were the genes PON2 on CFA14 and FN1 on CFA37 for CHD and the genes LMNB1 on CFA11 and WNT10B on CFA27 for CED.

PMCID: PMC3506637

PMID: 23189162 [PubMed – indexed for MEDLINE]

45. Berl Munch Tierarztl Wochenschr. 2012 Sep-Oct;125(9-10):432-40.

[Multivariate prediction of breeding values for canine hip and elbow dysplasia as well as humeral osteochondrosis in the Bernese mountain dog].

[Article in German]

Hartmann P(1), Stock KF, Distl O.

Author information:

(1)Institut für Tierzucht und Vererbungsforschung, Stiftung Tierärztliche Hochschule Hannover.

The aim of this study was the multivariate prediction of breeding values for canine hip dysplasia (CHD), elbow dysplasia (ED) and humeral osteochondrosis (OCD) for Bernese mountain dogs of the Schweizer Sennenhund-Verein für Deutschland e. V. (SSV). For the analysis the pedigrees of eight generations and radiographic screening results of the birth cohorts from 1995-2008 were used. The number of dogs with scores for CHD was 5513, for ED 5175 and OCD 1240. Breeding values were multivariately predicted using a mixed linear model for CHD, ED and OCD as well as for the occurrence of a fragmented coronoid process of the medial ulna (FCP) and the ED-score without FCP. The pedigree breeding value (eRZWp) which is used as the selection criterion reached a reliability to predict the phenotype of the offspring at 2.8-2.9% for CHD, 2.9% for ED, 1.1% for ED without FCP, 1.8% for FCP and 0.8-1.3% for OCD. The reason for the low predictive value of the eRZW(P) is caused by the very high influence of the own performance of the animal and the very uniform distribution of contributions of the breeding values of the relatives. These results indicate that even a multivariate prediction of breeding values does not lead to a faster progress in breeding against CHD and ED, however, does allow breeding against OCD in the Bernese mountain dog. In comparison to phenotypic selection, there is some improvement in the selection

response when using breeding values. Due to the general low predictive power of breeding values better approaches for selection of future breeding animals are urgently warranted to achieve improvements in breeding Bernese mountain dogs.

PMID: 23045807 [PubMed – indexed for MEDLINE]

46. Vet Comp Orthop Traumatol. 2012;25(6):511–7. doi: 10.3415/VCOT-11-08-0116. Epub 2012 Jul 27.

Outcome and complications after dual mobility total hip replacement: fifty cases with a minimum of six months clinical and radiographic follow-up.

Guillaumot P(1), Autefage A, Dembour T, Chancrin JL.

Author information:

(1)Clinique Vétérinaire Ololiolis, Ololioules, France.
guillaumot@ololiolis.com

OBJECTIVES: To report the clinical and radiographic outcome of a canine total hip prosthesis with a dual mobility acetabular component, with a minimum of six months follow-up.

METHODS: The outcome of dogs that underwent primary cemented unilateral dual mobility hip prosthesis surgery by one of the authors for hip dysplasia or trauma, and which had a minimum of six months clinical and radiologic follow-up, was evaluated.

RESULTS: Fifty dogs were included in the study. Follow-up ranged from six to 38 months (mean 14.4 months). Perioperative complications were acetabular collapse (n = 1) and greater trochanter fracture (n = 1), both of which were successfully managed perioperatively. Postoperative complications were aseptic loosening of the acetabular component (n = 2; both surgically revised), implant sepsis (n = 3; all explanted), acetabular fracture (n = 1; conservatively managed), greater trochanter fracture (n = 1; conservatively managed) and sciatic neurapraxia (n =

1). No cases of postoperative luxation or femoral implant aseptic loosening were encountered. Outcome was poor for three cases (3 implant sepsis), fair for three cases (including 1 acetabular component loosening and 1 acetabular fracture), and good or excellent for 44 cases (88%).

CLINICAL SIGNIFICANCE: There were not any cases of postoperative coxofemoral luxation observed in this series of 50 dogs with dual mobility hip prosthesis. Studies with more patients and longer follow-up are needed to confirm the satisfactory results observed to date with this implant.

PMID: 22836138 [PubMed – indexed for MEDLINE]

47. Vet Comp Orthop Traumatol. 2012;25(5):375–84. doi: 10.3415/VCOT-10-02-0026. Epub 2012 Jul 25.

Computer-based gait analysis of dogs: evaluation of kinetic and kinematic parameters after cemented and cementless total hip replacement.

Drüen S(1), Böddeker J, Meyer-Lindenberg A, Fehr M, Nolte I, Wefstaedt P.

Author information:

(1)Small Animal Clinic, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany.

Erratum in

Vet Comp Orthop Traumatol. 2014;27(1):89.

To date it is unclear whether cementless total hip replacement (THR) in dogs is of clinical advantage in comparison to cemented THR with regard to lameness improvement. Thus the aim of this study was to compare objectively the development of the gait pattern after cemented and cementless THR in dogs. For this purpose, 18 adult dogs with hip dysplasia underwent computer-based gait analysis on an instrumented treadmill prior to unilateral THR and then again ten days, four weeks and four months after surgery. Analysed kinetic parameters were

symmetry indices (SI) of vertical ground reaction forces (GRF), which included peak vertical forces (PFz), mean vertical forces (MFz), vertical impulse (IFz), and vertical ground reaction forces of the arthroplasty limbs only. Analysed kinematic parameters were range-of-motion and the flexion and extension angles of hip, stifle and hock joints. The symmetry indice for PVF, MFz and IFz decreased to a value less than six in both THR groups four months after surgery, which is defined as not lame. Improvement in lameness of the arthroplasty limbs during the examination period of four months was not significantly different between the cemented and cementless groups. The results suggest that within a short-term observation period of four months after surgery, neither cementless nor cemented THR have a greater advantage with regard to lameness improvement. Additional studies with larger pools of subjects and longer time periods for follow-up examinations are necessary to verify these findings.

PMID: 22828804 [PubMed – indexed for MEDLINE]

48. Vet J. 2013 Feb;195(2):210–5. doi: 10.1016/j.tvjl.2012.06.021. Epub 2012 Jul 17.

Kinematic analysis in healthy and hip-dysplastic German Shepherd dogs.

Miqueleto NS(1), Rahal SC, Agostinho FS, Siqueira EG, Araújo FA, El-Warrak AO.

Author information:

(1)Department of Veterinary Surgery and Anaesthesiology, School of Veterinary Medicine and Animal Science, Universidade Estadual Paulista UNESP, Botucatu, SP, Brazil.

This study investigated kinematic patterns in clinically normal German Shepherd dogs (GSDs) compared to those with hip dysplasia and with no clinical signs of lameness. Two groups of GSDs, including 10 clinically healthy dogs (G1) and 10

with hip dysplasia (G2), were trotted on a treadmill at a constant speed. Kinematic data were collected by a 3-camera system and analysed by a motion-analysis program. Flexion and extension joint angles and angular velocities were determined for the shoulder, elbow, carpal, hip, stifle, and tarsal joints. Within each group, the differences between the right and left limbs in all kinematic variables were not significant. Minimum angle, angular displacement and minimum angular velocity did not differ between groups. Significant differences were observed in the maximum angular velocity and maximum angle of the hip joint (dysplastic>healthy), and in the maximum angular velocity of the carpal joint (healthy>dysplastic). It was concluded that, when trotting on a treadmill, dysplastic dogs with no signs of lameness may present joint kinematic alterations in the hind as well as the forelimbs.

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PMID: 22809462 [PubMed – indexed for MEDLINE]

49. PLoS One. 2012;7(6):e39620. doi: 10.1371/journal.pone.0039620. Epub 2012 Jun 27.

Heritability and phenotypic variation of canine hip dysplasia radiographic traits in a cohort of Australian German shepherd dogs.

Wilson BJ(1), Nicholas FW, James JW, Wade CM, Tammen I, Raadsma HW, Castle K, Thomson PC.

Author information:

(1)Faculty of Veterinary Science, The University of Sydney, Sydney, New South Wales, Australia. bethany.wilson@sydney.edu.au

Canine Hip Dysplasia (CHD) is a common, painful and debilitating orthopaedic disorder of dogs with a partly genetic, multifactorial aetiology. Worldwide, potential breeding dogs are evaluated for CHD using radiographically based

screening schemes such as the nine ordinally-scored British Veterinary Association Hip Traits (BVAHTs). The effectiveness of selective breeding based on screening results requires that a significant proportion of the phenotypic variation is caused by the presence of favourable alleles segregating in the population. This proportion, heritability, was measured in a cohort of 13,124 Australian German Shepherd Dogs born between 1976 and 2005, displaying phenotypic variation for BVAHTs, using ordinal, linear and binary mixed models fitted by a Restricted Maximum Likelihood method. Heritability estimates for the nine BVAHTs ranged from 0.14–0.24 (ordinal models), 0.14–0.25 (linear models) and 0.12–0.40 (binary models). Heritability for the summed BVAHT phenotype was 0.30 ± 0.02 . The presence of heritable variation demonstrates that selection based on BVAHTs has the potential to improve BVAHT scores in the population. Assuming a genetic correlation between BVAHT scores and CHD-related pain and dysfunction, the welfare of Australian German Shepherds can be improved by continuing to consider BVAHT scores in the selection of breeding dogs, but that as heritability values are only moderate in magnitude the accuracy, and effectiveness, of selection could be improved by the use of Estimated Breeding Values in preference to solely phenotype based selection of breeding animals.

PMCID: PMC3384595

PMID: 22761846 [PubMed – indexed for MEDLINE]

50. Vet Surg. 2012 Jul;41(5):545–50. doi: 10.1111/j.1532-950X.2012.01015.x. Epub 2012 Jun 25.

Complications and owner assessment of canine total hip replacement: a multicenter internet based survey.

Forster KE(1), Wills A, Torrington AM, Moores AP, Thomson D, Arthurs G, Brown G, Denny HR, Scott HW, MacQueen I, Dunne J, Onyett J, Walker JD, Prior J,

Owen MR,
Burton N, Whitelock R, Girling S, Morrison S, Gilbert S, Langley-Hobbs
SJ,
Gemmell TJ, Innes JF.

Author information:

(1)Small Animal Teaching Hospital, School of Veterinary Science,
University of
Liverpool, Neston, UK.

OBJECTIVE: To assess the variables associated with the complications
of total hip
replacement (THR) and report owner-assessed outcomes, through surgeon-
based
registration of cases via an online database, informed owner consent,
and
prospective outcomes assessment using a client-administered clinical
metrology
instrument.

STUDY DESIGN: Prospective case series

ANIMALS: Dogs (n = 170)

METHODS: Entries into the British Veterinary Orthopaedic Association-
Canine Hip

Registry (BVOA-CHR) between January 2010 and August 2011 were
reviewed. Variables

evaluated included dog age, body weight, breed, and indication for THR
and

prosthesis. Associations between each variable and the incidence of
complications

were assessed using logistic regression. Additionally, an on-line,
owner-administered outcomes assessment questionnaire (modified from
the Liverpool

Osteoarthritis in Dogs (LOAD) questionnaire) was used to collect data
from

owners.

RESULTS: One hundred and seventy cases met the inclusion criteria.

Surgical

indications included hip dysplasia and coxofemoral osteoarthritis (n =
150),

Legg-Calves-Perthes disease (7), coxofemoral luxation (6), fracture
(4), slipped

capital physis (2), and femoral head and neck ostectomy revision (1).

Surgical

implants were from 4 systems. The incidence of surgeon-reported
complication was

9.4%. No significant association was identified between weight, age,
sex, breed,

indication for THR, surgical technique and prosthesis, and the
incidence of

complications. In 82% of the cases, owners described their

satisfaction with the outcome of THR as "very good" and a total of 20% complication rate was reported.

There was a statistically significant improvement in owner-assessed questionnaire score before and after THR ($P < .001$).

CONCLUSIONS: The BVOA-CHR offers a novel framework for the prospective studies on THR and on a national/international scale. Initial complication rates from the BVOA-CHR are similar to previous studies.

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PMID: 22731937 [PubMed – indexed for MEDLINE]

51. Am J Vet Res. 2012 Jun;73(6):838–46. doi: 10.2460/ajvr.73.6.838.

Housing- and exercise-related risk factors associated with the development of hip dysplasia as determined by radiographic evaluation in a prospective cohort of Newfoundlands, Labrador Retrievers, Leonbergers, and Irish Wolfhounds in Norway.

Krontveit RI(1), Nødtvedt A, Sævik BK, Ropstad E, Trangerud C.

Author information:

(1)Department of Companion Animal Clinical Sciences, Norwegian School of Veterinary Science, N-0033 Oslo, Norway. randi.krontveit@nvh.no

OBJECTIVE: To identify housing- and exercise-related risk factors associated with the development of hip dysplasia (HD) as determined by radiographic evaluation in Newfoundlands, Labrador Retrievers, Leonbergers, and Irish Wolfhounds in Norway.

ANIMALS: 501 client-owned dogs from 103 litters.

PROCEDURES: Dogs were assessed from birth until official radiographic screening

for HD at 12 (Labrador Retriever [$n = 133$] and Irish Wolfhound [63]) or 18

(Newfoundland [125] and Leonberger [180]) months of age. Information regarding

housing and exercise conditions during the preweaning and postweaning periods was

obtained with questionnaires. Multivariable random effects logistic regression

models were used to identify housing- and exercise-related risk factors associated with the development of radiographically detectable HD. RESULTS: Puppies walking on stairs from birth to 3 months of age had an increased risk of developing HD. Factors associated with a decreased risk of developing HD included off-leash exercise from birth to 3 months of age, birth during the spring and summer, and birth on a farm. Significant clustering of dogs with HD was detected within litters. CONCLUSIONS AND CLINICAL RELEVANCE: Results indicated that puppies $\leq$ 3 months old should not be allowed access to stairs, but should be allowed outdoor exercise on soft ground in moderately rough terrain to decrease the risk for developing radiographically detectable HD. These findings could be used as practical recommendations for the prevention of HD in Newfoundlands, Labrador Retrievers, Leonbergers, and Irish Wolfhounds.

PMID: 22620698 [PubMed – indexed for MEDLINE]

52. Vet Surg. 2012 May;41(4):443-7. doi: 10.1111/j.1532-950X.2012.00957.x. Epub 2012 Apr 30.

Comparison of body weight distribution, peak vertical force, and vertical impulse as measures of hip joint pain and efficacy of total hip replacement.

Seibert R(1), Marcellin-Little DJ, Roe SC, DePuy V, Lascelles BD.

Author information:

(1)Comparative Pain Research Laboratory, Department of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC, USA.

OBJECTIVE: To determine whether there is a difference between the ability of peak vertical force (PVF), vertical impulse (VI), and percentage body weight distribution (%BW(dist)) in differentiating which leg is most affected by hip joint pain before total hip replacement (THR) surgery, and for

measuring changes
in limb use after THR surgery.
STUDY DESIGN: Prospective clinical study.
ANIMALS: Dogs (n = 47).
METHODS: Ground reaction force (GRF) data were collected using a pressure-sensitive walkway the day before THR surgery and at ~3, 6, and 12 months postoperatively. PVF and VI expressed as a percentage of body weight (%PVF, %VI), and %BW(dist) were recorded. Regression models performed separately for each outcome were used for statistical analysis.
RESULTS: When comparing limb use between the affected limb (AP) and the nonaffected limb (NP) preoperatively, differences between limbs were statistically significant when evaluated using PVF (P = .023), VI (P = .010), and %BW(dist) (P = .012). When evaluating the magnitude of absolute and percentage change difference in AP limb use preoperatively versus postoperatively, differences were statistically significant when evaluated using PVF (P < .001 and P = .001, respectively), VI (P = .001 and P < .001) and %BW(dist) (P < .001 and P < .001).
CONCLUSION: There appeared to be no difference in the sensitivity of VI, PVF, and %BW(dist) for evaluating limb use before and after THR.

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PMID: 22548436 [PubMed – indexed for MEDLINE]

53. Nat Rev Rheumatol. 2012 Jan 10;8(2):77–89. doi: 10.1038/nrrheum.2011.199.

Etiology of osteoarthritis: genetics and synovial joint development.

Sandell LJ(1).

Author information:

(1)Department of Orthopedic Surgery, Washington University School of Medicine,
660 S. Euclid Avenue, St Louis, MO 63108, USA. sandelll@wustl.edu

Osteoarthritis (OA) has a considerable hereditary component and is considered to be a polygenic disease. Data derived from genetic analyses and genome-

wide screening of individuals with this disease have revealed a surprising trend: genes associated with OA tend to be related to the process of synovial joint development. Mutations in these genes might directly cause OA. In addition, they could also determine the age at which OA becomes apparent, the joint sites involved, the severity of the disease and how rapidly it progresses. In this Review, I propose that genetic mutations associated with OA can be placed on a continuum. Early-onset OA is caused by mutations in matrix molecules often associated with chondrodysplasias, whereas less destructive structural abnormalities or mutations confer increased susceptibility to injury or malalignment that can result in middle-age onset. Finally, mutations in molecules that regulate subtle aspects of joint development and structure lead to late-onset OA. In this Review, I discuss the genetics of OA in general, but focus on the potential effect of genetic mutations associated with OA on joint structure, the role of joint structure in the development of OA--using hip abnormalities as a model--and how understanding the etiology of the disease could influence treatment.

PMID: 22231237 [PubMed - indexed for MEDLINE]

54. J Anim Breed Genet. 2012 Feb;129(1):60-9. doi: 10.1111/j.1439-0388.2011.00946.x. Epub 2011 Jul 18.

Estimation of genetic parameters for hip dysplasia in Czech Labrador Retrievers.

Vostrý L(1), Capková Z, Sebková N, Příbyl J.

Author information:

(1)Faculty of Agrobiolgy, Food and Nature Resources, Czech University of Life Science Prague, Czech Republic. vostry@af.czu.cz

The objective of this study was to estimate the genetic parameters,

genetic trends and breeding values using linear model (LM) and threshold model (TM) for the development of hip dysplasia (HD) in Labrador Retrievers in the Czech Republic (n = 3151). The right and left hip joints were evaluated separately using the Fédération Cynologique Internationale scoring system. Four linear and four TMs were tested for the correct estimation of genetic parameters. All the tested models utilized fixed effects of sex, assessor, year of birth, regression of age at evaluation, random direct genetic effects and the effect of the animals' permanent environments. The models differed in the inclusion of the following effects: fixed effects of regression of inbreeding coefficient, random maternal effect and random effect of the maternal permanent environment. Compared to the TM, the LM provided lower coefficients of direct (0.25–0.29 versus 0.26–0.35) and maternal heritability (0.01–0.02 versus 0.03–0.05), repeatability (0.76–0.77 versus 0.78–0.83) and of the correlation between direct and maternal effects (–0.55 to –0.21 versus –0.80 to –0.27). In the tested models, no statistical significance was found for fixed regression of inbreeding coefficients or for the random effect of the permanent maternal environment. In spite of the similarity of the LM and TM results, the TM is recommended as the more suitable model for estimating genetic parameters and subsequent breeding values for HD in Labrador Retrievers in the Czech Republic.

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PMID: 22225585 [PubMed – indexed for MEDLINE]

55. N Z Vet J. 2012 Mar;60(2):110–4. doi: 10.1080/00480169.2011.636730. Epub 2011 Dec 23.

Seasonal variation in the hip score of dogs as assessed by the New Zealand Veterinary Association hip dysplasia scheme.

Worth AJ(1), Bridges JP, Cave NJ, Jones G.

Author information:

(1)Massey University Veterinary Teaching Hospital, Institute of Veterinary,
Animal and Biomedical Sciences, Massey University, Private Bag 11222,
Palmerston
North 4442, New Zealand. a.j.worth@massey.ac.nz

AIM: To determine whether there is a seasonal variation in the phenotypic hip score of dogs born in New Zealand as assessed by the New Zealand Veterinary Association (NZVA) canine hip dysplasia (CHD) scheme.

METHODS: Data from dogs born in New Zealand between 1988 and 2009 that have been scored for CHD were retrospectively evaluated for the effect of month of birth on radiographic phenotype. Data included both the total score and the subtotal score, comprising Norberg's angle, the subluxation score and changes to the cranial acetabular edge, for each dog. Datasets were created for all breeds combined and for the four most populous breeds using the scheme (German Shepherd dog, Labrador Retriever, Golden Retriever and Rottweiler) and stratified according to month of birth and season. Due to the skewed nature of the data, a Kruskal-Wallis Rank Sum test was used to test for statistical significance. Additionally, χ^2 analysis was performed using the median of each dataset (proportion above/below the median). The null hypothesis was that there would be no effect of month of birth, and hence seasonality, on hip phenotype for dogs born and scored in New Zealand by the NZVA.

RESULTS: For all breeds combined, month of birth had an effect on total and subtotal NZVA CHD scores ($p < 0.001$) with a lower total hip score in the autumn months of March and April than other months. When individual large breed data were analysed, there was an effect of month of birth on total and subtotal scores for the Labrador Retriever and the Rottweiler ($p \leq 0.05$), but not the German

Shepherd dog or Golden Retriever breeds.

CONCLUSIONS: Being born in the autumn was associated with a protective effect on hip phenotype in some breeds. These results suggest that weather and/or another seasonal factor may have a significant environmental effect on the phenotype of the coxofemoral joint.

CLINICAL RELEVANCE: The protective effect of being born in autumn suggests that a decreased level of exercise during subsequent development over winter may positively impact on final coxofemoral joint conformation. Whilst statistically significant, the magnitude of the sparing effect is not likely to be clinically relevant. However, this study, in concert with other studies, may suggest that the effects of exercise can be manipulated to improve hip phenotype.

PMID: 22191435 [PubMed – indexed for MEDLINE]

56. Vet Surg. 2012 Jan;41(1):156–62. doi: 10.1111/j.1532-950X.2011.00930.x. Epub 2011 Dec 20.

Effect of a locking triple pelvic osteotomy plate on screw loosening in 26 dogs.

Rose SA(1), Peck JN, Tano CA, Uddin N, de Haan JJ.

Author information:

(1)Affiliated Veterinary Specialists, Maitland, FL, USA.
drrose@uga.edu

OBJECTIVE: To evaluate the complication rate of the double (DP0) and triple pelvic osteotomy (TP0) procedure (unilateral and bilateral) with a locking purpose-specific plate.

STUDY DESIGN: Retrospective case series

ANIMALS: Dogs (n = 26; 38 hips)

MATERIALS: Medical records (January 2007–January 2011) of dogs that had unilateral or bilateral DP0 or TP0 were evaluated. Signalment, age, body weight, estimated preoperative subluxation and reduction angles, lameness, and complications were evaluated. Follow-up radiographs were evaluated for implant

loosening or failure, femoral head coverage (FCH), pelvic dimensions, and radiographic evidence of healing.

RESULTS: Screw loosening occurred in 1 of 266 (0.4%) screws placed and in 1 of 38

hips (2.6%). The rate of screw loosening was significantly lower than previously

reported. Only 1 hip (2.6%) developed a major complication. Minor complications

involving implants occurred in 2 hips (5.3%). Three to 5 locking screws were used

per plate. There was a significant increase in FCH and Norberg angle (NA)

compared with preoperative values. No clinically significant change in pelvic

canal dimensions measured at 3 locations was identified.

CONCLUSION: Locking 7-hole TPO plates with 3-5 locking screws resulted in a lower

rate of major and minor implant associated complications than the reported

complication rate for conventional 6-hole plates. En bloc pullout of the caudal

aspect of the plate is an infrequent but repeatable complication associated with

the locking TPO implant.

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PMID: 22188217 [PubMed – indexed for MEDLINE]

57. Vet Surg. 2012 Jan;41(1):42-53. doi: 10.1111/j.1532-950X.

2011.00926.x. Epub 2011

Dec 20.

Palpation and dorsal acetabular rim radiographic projection for early detection

of canine hip dysplasia: a prospective study.

Gatineau M(1), Dupuis J, Beauregard G, Charette B, Breton L, Beauchamp G, d'Anjou

MA.

Author information:

(1)Centre Vétérinaire DMV, Montréal (Lachine), Québec, Canada.

gatineaumatthieu@hotmail.com

OBJECTIVE: To determine the value of 2 diagnostic methods: (1) the reduction

angle (RA) using the Ortolani maneuver and (2) the dorsal acetabular

slope (DAS)
from the dorsal acetabular rim (DAR) radiographic projection, to
predict
osteoarthritis (OA) in dogs with hip dysplasia.
STUDY DESIGN: Prospective study.
SAMPLE POPULATION: Dogs (n = 73).
METHODS: Hip-extended ventrodorsal (VD) radiographic projections, RA,
and DAS
were evaluated when dogs were 6, 12, and 24 months of age. VD
projections were
qualitatively scored for OA. RA was determined using the Ortolani
maneuver in
dorsal recumbency and DAS using the DAR projection. Distraction index
(DI)
measurements from the compression-distraction radiographic projections
(PennHIP
method) were also performed at 6 months of age. Statistical analyses
were used to
establish the range of values of normal and abnormal RA and DAS, to
document the
temporal variation in RA and DAS, to compare the ability of the
different methods
to predict coxofemoral OA, to determine the influence of pure passive
laxity and
of the DAS on the occurrence of an Ortolani sign and on the magnitude
of the RA,
to establish the relationship between the DAS and subsequent
development of
passive laxity and coxofemoral OA, and to evaluate the influence of
the DAS and
RA on the occurrence of coxofemoral OA with severe, moderate, and
minimal
coxofemoral passive joint laxity, respectively.
RESULTS: VD, RA, DAS, and DI methods of coxofemoral joint evaluation
correlated
significantly with the status of the coxofemoral joints at 2 years of
age. The
risk of occurrence of coxofemoral OA increased, as the RA, DAS, or DI
increased.
There was a significant positive linear relationship between RA and DI
($P = .015$,
 $r(2) = 0.32$), RA and DAS ($P = .0078$, $r(2) = 0.38$), and DAS and DI (P
 $= .015$, $r(2)$
 $= 0.33$). A negative Ortolani sign was at all times significantly
predictive of
absence of coxofemoral OA at 2 years of age. DAS best predicted
coxofemoral OA
for $DI \geq 0.7$, whereas RA best predicted coxofemoral OA for $0.3 < DI <$
 0.7 ;
however, RA proved to be the best overall predictor of coxofemoral OA.

CONCLUSION: RA measured at 6 months of age in dorsal recumbency was the best predictor of coxofemoral OA at 2 years of age.

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PMID: 22188178 [PubMed – indexed for MEDLINE]

58. Vet Surg. 2012 Jan;41(1):2–9. doi: 10.1111/j.1532-950X.2011.00928.x. Epub 2011 Dec 8.

Canine hip dysplasia: reviewing the evidence for nonsurgical management.

Kirkby KA(1), Lewis DD.

Author information:

(1)Seattle Veterinary Specialists, Kirkland, WA 98034, USA.
kakirkby@hotmail.com

OBJECTIVE: To systematically review the evidence available for nonsurgical management of hip dysplasia (HD).

STUDY DESIGN: Literature review.

METHODS: Databases (Pubmed, Veterinary Information Network) were searched for clinical studies on nonsurgical management of HD in dogs. The evidence in each study was reviewed and assigned a score (I–IV) based on previously reported levels of evidence.

RESULTS: Fourteen articles were identified that met the inclusion criteria, including 3 Level IV, 4 Level III, and 7 Level II studies. Methods of nonsurgical management reviewed included: activity restrictions, weight management, acupuncture, modulation of joint disease by polysulfated glycosaminoglycans, mesenchymal stem cell therapy, and extra corporeal shock wave therapy.

CONCLUSION: Weight management is an effective and important component of managing dogs with HD and associated osteoarthritis. Techniques that modulate the progression of joint disease may also be beneficial for treating dogs with HD. Further studies are needed to investigate other methods of managing HD such as

hydrotherapy and physical rehabilitation.

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PMID: 22150604 [PubMed – indexed for MEDLINE]

59. Vet Surg. 2012 Jan;41(1):114–20. doi: 10.1111/j.1532-950X.2011.00927.x. Epub 2011 Dec 8.

Use of locking plate and screws for triple pelvic osteotomy.

Rose SA(1), Bruecker KA, Petersen SW, Uddin N.

Author information:

(1)Affiliated Veterinary Specialists, Orlando, FL, USA.

OBJECTIVE: To evaluate the efficacy and complication rate associated with use of

a purpose-specific locking triple pelvic osteotomy (LTP0) plate.

STUDY DESIGN: Prospective study.

ANIMALS: Dogs (n = 9; 15 hips).

METHODS: Physical examination, plain film radiography, computed tomography (CT)

of the pelvis, and coxofemoral arthroscopy were performed before unilateral

triple pelvic osteotomy (TP0) or staged bilateral TP0. Radiographs were taken

after each procedure and 3–5, 6–8, and ≥12 weeks postoperatively.

Pelvic width

was measured at 3 locations to evaluate pelvic canal narrowing.

RESULTS: No screw loosening occurred. Complications occurred in only 1 hip (7%)

where pullout of the locking plate–screw construct from the caudal iliac segment

occurred because of a fracture of the cis–cortex; the dog made a full recovery

after a salvage procedure. There was no significant reduction in the cranial

pelvic width but a small reduction at the level of the acetabuli and ischiatic

tuberosities was noted 3–5 weeks after the 2nd TP0.

CONCLUSIONS: The LTP0 plate was associated with a lower complication rate than

previously reported for TP0s using Slocum canine pelvic osteotomy plates (CPOP)

and warrants further investigation. Pullout of the caudal plate–screw construct

is a complication specific to LTP0 implants. Bicortical screw purchase

is
recommended to prevent fracture of the cis-cortex and implant pullout.

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PMID: 22150566 [PubMed – indexed for MEDLINE]

60. Vet J. 2012 Jul;193(1):206–11. doi: 10.1016/j.tvjl.2011.10.015.
Epub 2011 Nov 16.

The effect of radiological hip dysplasia and breed on survival in a
prospective
cohort study of four large dog breeds followed over a 10 year period.

Krontveit RI(1), Trangerud C, Nødtvedt A, Dohoo I, Moe L, Sævik BK.

Author information:

(1)Department of Companion Animal Clinical Sciences, Norwegian School
of
Veterinary Science, P.O. Box 8146 Dep., N-0033 Oslo, Norway.
randi.krontveit@nvh.no

The aim of the study was to measure the effect of radiological hip and
elbow
dysplasia status and breed on overall survival in a cohort of four
large dog
breeds in Norway. Privately owned dogs of the Newfoundland (NF),
Labrador
Retriever (LR), Leonberger (LE0), and Irish Wolfhound (IW) breeds were
followed
prospectively from birth to 10 years of age. The age of death/
euthanasia was
registered. A total of 501 dogs from 103 litters were enrolled.
Kaplan–Meier
survival curves were used to describe breed differences in survival
times. The
effects of radiological hip and elbow dysplasia status as well as
breed were
assessed using a Cox proportional hazards model. The variables 'sex'
and 'living
region' were explored as potential confounders. Among LRs, 60.2% of
the dogs were
still alive at 10 years of age, and the corresponding figures for NFs,
LE0s, and
IW were 28.8%, 16.11%, and 6.4%, respectively. Radiological hip
dysplasia status
and breed were found to influence overall survival. Two different
time-varying
effects were observed in that with the IW the hazard of death

increased linearly through time, while the effect of severe radiological hip dysplasia decreased logarithmically with time. Location influenced the death hazard and dogs living in suburban areas or cities had longer mean time to death and a lower hazard compared to dogs living in the countryside. Radiological elbow dysplasia status was not found to have an effect on overall survival.

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PMID: 22093911 [PubMed – indexed for MEDLINE]

61. Vet Surg. 2012 Jan;41(1):78–85. doi: 10.1111/j.1532-950X.2011.00874.x. Epub 2011 Sep 14.

The S-measurement in the diagnosis of canine hip dysplasia.

Ogden DM(1), Scrivani PV, Dykes N, Lust G, Friedenberg SG, Todhunter RJ.

Author information:

(1)Department of Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA 70810, USA. dogden@vetmed.lsu.edu

OBJECTIVE: To propose a direct measure of subluxation of the femoral head (S) in

the assessment of hip joint laxity and evaluate it for clinical use. **STUDY DESIGN:** Method comparison study.

ANIMALS: Dogs (n = 51).

METHODS: Dogs were sedated or anesthetized for a dorsolateral subluxation (DLS)

examination. Two sets of radiographs were acquired, 1 each by a different technologist. A calibrated measuring bar was included on the image at the height

of the hip to assess magnification. The DLS was calculated for each hip and

different persons unaware of these details measured the "S"-value. One person

measured the S-value 3 times over 3 days. Box plots were used to determine a

cut-off for the empiric (8 mm) and corrected (4 mm) S-value.

RESULTS: Of 51 dogs, 33 were dysplastic based on a DLS score <55%. Magnification

and body weight were strongly correlated ($r = 0.4922$, $P = .0006$). Both empiric and corrected S measurements showed good agreement with the DLS score ($\kappa = 0.688$ and $\kappa = 0.681$, respectively). The corrected S measurement produced more false negatives. Bland–Altman analysis showed interobserver and technician variance acceptable for clinical use (limits of agreement $< \pm 3$ mm). Intraobserver repeatability was acceptable for the right hip (95% of differences were ≤ 1.3 mm and $100\% \leq 1.9$) but not for the left hip. CONCLUSION: Using a cut-off value of 5 mm, the empirical S measurement can be used to exclude hip dysplasia in young dogs of various body proportions.

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PMID: 22091931 [PubMed – indexed for MEDLINE]

62. J Anim Sci. 2012 Apr;90(4):1088–96. doi: 10.2527/jas.2011–3855. Epub 2011 Oct 7.

Selection for conformation and conformational homogeneity of litters in the German shepherd dog.

Stock KF(1), Dammann M, Distl O.

Author information:

(1)Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover, Bünteweg 17p, 30559 Hannover, Germany.

Breeding standards of most dog breeds specify tolerable ranges of certain conformation traits. In the German shepherd dog (GSD), current means for withers height (WH) and BW are close to the upper breed limits. Therefore, strategies to avoid a further increase in size and to maximize the proportion of dogs fitting the breeding standard with respect to WH and BW should be compared. Body measurements were available for 14,416 male and 21,612 female GSD from 26,155 litters. Withers height and body mass index (BMI; i.e., $BW/WH(2)$) were

considered
direct selection traits. Using information on 17,154 GSD from litters
with at
least 2 dogs with conformation data, we defined within-litter
variances of WH
(vWH) and BMI (vBMI) as traits to select for the conformational
homogeneity of
litters. Officially recorded scores for canine hip dysplasia (CHD) of
all dogs
were used to monitor possible side effects of conformation selection
on CHD.
Genetic parameters were estimated multivariately in linear animal
models by using
Gibbs sampling. Heritabilities ranged between 0.19 and 0.34 for all
traits, and
additive genetic correlations between WH and vWH were -0.11 and those
between BMI
and vBMI were 0.11. The expected selection response was studied using
the
relative breeding values (RBV) of parents, assuming exclusion of
sires, dams, or
both with RBV larger than 120 and comparing means of WH, BMI, and CHD
scores
between offspring of all and selected parents. Concurrent selection
for small WH
and vWH was found to reduce the mean WH in males and females most
efficiently
while having little effect on CHD distributions. Multiple-trait
selection for WH,
vWH, BMI, and vBMI was hindered by the negative genetic correlations
between the
traits, and it tended to interfere with improvement of CHD status. Use
of the RBV
for WH and vWH for conformation selection is therefore recommended to
maximize
breeding success with regard to conformation and conformational
homogeneity in
the GSD.

PMID: 21984716 [PubMed – indexed for MEDLINE]

63. Prev Vet Med. 2012 Feb 1;103(2-3):219-27. doi: 10.1016/
j.prevetmed.2011.09.018.
Epub 2011 Oct 6.

Risk factors for hip-related clinical signs in a prospective cohort
study of four
large dog breeds in Norway.

Krontveit RI(1), Trangerud C, Sævik BK, Skogmo HK, Nødtvedt A.

Author information:

(1)Department of Companion Animal Clinical Sciences, Norwegian School of Veterinary Science, Oslo, Norway. randi.krontveit@nvh.no

We conducted a prospective cohort study including privately owned dogs from the breeds Newfoundland (NF), Labrador Retriever (LR), Leonberger (LEO), and Irish Wolfhound (IW) followed from birth until age 9 yrs. We wanted to investigate whether radiological hip dysplasia status given at approximately age 12–18 mos and other factors during growth influenced development of clinical signs due to hip-joint disease necessitating veterinary consultation. Whether or not such signs occurred due to hip dysplasia or due to secondary or primary DJD could not be distinguished, and we therefore used the term "owner-reported veterinary-diagnosed hip-related clinical signs" ("the event"). The included dogs were followed from birth to the event or until a maximum of 9 yrs of age. Our objectives were to describe breed differences in time to incidence and to evaluate potential risk factors for the time to event. We used Kaplan-Meier curves to describe time to incidence, and potential risk factors were assessed by use of a Cox proportional-hazards model. We enrolled 494 dogs from 103 litters, and 46 dogs were reported as having had the event during the observation period. We observed a significant time-varying effect (TVE): LR and LEO developed clinical signs later in life than NF. If the radiological hip status was either mild, moderate, or severe the hazard of experiencing the event was significantly increased. Access to off-leash exercise at age 12 mos decreased the hazard of the event, and the hazard varied by litter. The findings supported the hypothesis that radiological hip status at screening and exercise conditions during growth influenced the time to incidence of the event and that there were breed

differences in time to the event.

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PMID: 21982689 [PubMed – indexed for MEDLINE]

64. J Small Anim Pract. 2011 Oct;52(10):536–42. doi:
10.1111/j.1748-5827.2011.01105.x.

Canine hip dysplasia: the significance of the Norberg angle for healthy breeding.

Comhaire FH(1), Schoonjans FA.

Author information:

(1)Royal Cynological Society Saint Hubert, Albert Giraudlaan, 98, B
1030
Brussels, Belgium.

OBJECTIVES: To assess the reproducibility of the Fédération
Cynologique
Internationale (FCI) classification over time, and between assessors
and to
evaluate the benefit of computer-assisted measurement of the Norberg
angle and of
its percentile ranking by breed for the diagnosis of canine hip
dysplasia, and
for the selection of couples for breeding.

METHODS: During the time period of 2006 to 2010, 5094 hip radiographs
were
evaluated according to the FCI rules, and 4400 have been submitted for
statistical analysis. A system of computer-assisted image analysis
(Digimizer®
, MedCalc Software Ltd, Mariakerke, Belgium) was used to measure the
Norberg
angle. The Norberg angle value of individual dogs was expressed as
percentile
rank by breed.

RESULTS: The agreement between individual assessors was highly
significant
($P < 0.001$), but there were important variations over time of the ratio
of classes
A or B. The Norberg angle and the percentile rank accurately
discriminated
between dogs with or without canine hip dysplasia, with positive and
negative
likelihood ratios of 6.31 and 0.21, respectively, for the Norberg
angle at
criterion value of 102.2° , and 4.21 and 0.18 for the percentile rank

at criterion
value of the 25th percentile.

CLINICAL SIGNIFICANCE: The percentile rank of the Norberg angle may be
a valuable
tool for breeding selection.

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PMID: 21967100 [PubMed – indexed for MEDLINE]

65. Vet Comp Orthop Traumatol. 2012;25(1):67–70. doi: 10.3415/
VCOT-11-03-0039. Epub
2011 Sep 21.

Obturator nerve impingement as a severe late complication of bilateral
triple
pelvic osteotomy.

Tong K(1), Hayashi K.

Author information:

(1)Veterinary Medical Teaching Hospital, School of Veterinary
Medicine,
University of California Davis, Davis, California 95616, USA.

Erratum in

Vet Comp Orthop Traumatol. 2012;25(2):171.

A four-year-old female spayed Labrador Retriever, which had undergone
bilateral
triple pelvic osteotomy (TPO) at the age of eight months, was
presented with
severe progressive shifting pelvic limb lameness for a duration of
three months
prior to presentation. The dog had multiple episodes of showing signs
of
excruciating pain, as well as an inability to rise or ambulate,
inappetance, and
lethargy. Orthopaedic examination revealed severe bilateral pelvic
limb muscular
atrophy, and signs of severe pain on abduction of the pelvic limbs, on
rectal
palpation ventrally, and on palpation of the region of the iliopsoas
and
pectineus muscles bilaterally. Surgery was indicated to explore the
region and to
release the pectineus and iliopsoas muscles. During surgery, callus
tissue and
the free section of pubic bone were found to be impinging on the

obturator nerve
at the previous TPO pubic osteotomy site bilaterally. On both sides, a
1 to 2 cm
segment of pubis and fibrous callus tissue were excised and the
obturator nerves
were freed from the impingement. Immediately after the surgery, the
patient's
stance and gait were dramatically improved. The dog could maintain a
much broader
based stance and make longer strides with the pelvic limbs. At the two
month
follow-up examination, there were not any signs of lameness noted.
Obturator
nerve impingement can be a serious potential complication of TPO and
may manifest
clinically as marked pelvic limb lameness years after surgery.

PMID: 21938311 [PubMed – indexed for MEDLINE]

66. Ann Biomed Eng. 2011 Dec;39(12):2955–63. doi: 10.1007/
s10439-011-0393-3. Epub
2011 Sep 10.

Femoral head shape differences during development may identify hips at
risk of
degeneration.

Vanden Berg-Foels WS(1), Schwager SJ, Todhunter RJ, Reeves AP.

Author information:

(1)Department of Biomedical Engineering, Cornell University, Ithaca,
NY, USA.
wendyvff@clemson.edu

Developmental dysplasia of the hip (DDH) is a common cause of elevated
contact
stress and early onset osteoarthritis (OA). We hypothesized that
adaptation to
focal loading during postnatal development would result in signature
changes to
the shape of the femoral head secondary center of ossification (SCO).
SCO shape
was evaluated in a canine model of DDH at ages 14 and 32 weeks. The
evolving 3D
morphology of the SCO was captured using serial quantitative computed
tomography.
A discrete medial representation shape model was fit to each SCO and
served as
the basis for quantitative thickness and bending measurements. Shape

measurements
were tested for associations with hip subluxation and degeneration. At
32 weeks,
the SCO was thinner (flatter) in the perifoveal region, the site of
focal
loading; a greater bend to the SCO was present lateral to the site of
thinning;
SCO thinning and bending were associated with less femoral head
coverage and with
a higher probability of degeneration. Shape changes were not detected
at 14
weeks. Measurement and visualization of SCO shape changes due to
altered loading
may provide a basis for identifying hips at risk of early onset OA and
a tool for
surgical planning of hip restructuring.

PMID: 21909817 [PubMed – indexed for MEDLINE]

67. J Small Anim Pract. 2011 Apr;52(4):182–9. doi: 10.1111/j.
1748–5827.2011.01049.x.

Treatment of hip dysplasia.

Anderson A(1).

Author information:

(1)Anderson Abercromby Veterinary Referrals, 1870 Building, Jayes Park
Courtyard,
Forest Green Road, Ockley, Surrey RH5 5RR.

Comment in

J Small Anim Pract. 2011 Apr;52(4):179–80.

Hip dysplasia is a common orthopaedic developmental disorder of dogs.
This paper
reviews the treatment options available for management of the
condition in the
skeletal immature and adult dog.

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PMID: 21906059 [PubMed – indexed for MEDLINE]

68. J Small Anim Pract. 2011 Apr;52(4):179–80. doi: 10.1111/j.
1748–5827.2011.01056.x.

Hip dysplasia.

Clayton-Jones G.

Comment on

J Small Anim Pract. 2011 Apr;52(4):182-9.

PMID: 21906058 [PubMed – indexed for MEDLINE]

69. Vet Surg. 2012 Jan;41(1):180-8. doi: 10.1111/j.1532-950X.2011.00870.x. Epub 2011 Sep 7.

String-of-pearls locking plate and cerclage wire stabilization of periprosthetic femoral fractures after total hip replacement in six dogs.

Fitzpatrick N(1), Nikolaou C, Yeadon R, Hamilton M.

Author information:

(1)Fitzpatrick Referrals, Eashing, Surrey, UK.
noelF@fitzpatrickreferrals.co.uk

OBJECTIVE: To report use of, and outcome after, string-of-pearls (SOP™) plate and multiple cerclage wire fixation for treatment of periprosthetic femoral fractures (PFF) associated with total hip replacement (THR) in dogs.

STUDY DESIGN: Case series.

ANIMALS: Dogs (n=6) with PFF after THR.

METHODS: Clinical records (2005–2010) and radiographic evaluations of dogs that had PFF associated with THR, treated with a SOP™ plate and cerclage wires were retrospectively reviewed. Clinical and radiographic postoperative assessments were performed 4, 12, and 24 weeks postoperatively. Telephone follow-up was performed >12 months postoperatively.

RESULTS: Three fractures occurred intraoperatively and 3 occurred postoperatively. One SOP™ failed at 2 weeks necessitating revision using 2 parallel SOP™ implants. One dog was euthanatized because of quadriceps muscle tie-down at 6 weeks. Other dogs were free of lameness with full range of motion of the stifle and hip joints at final clinical examination, and positive outcomes were maintained at >12 month telephone questionnaire. There was no evidence of

implant failure and positive evidence of fracture healing at final radiographic follow-up.

CONCLUSIONS: Stabilization resulted in bone healing in 5 dogs; failure in 1 dog may be attributable to technical error. Optimal technical guidelines for use of the SOP™ in this circumstance are unknown, particularly where fracture configuration varies.

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PMID: 21899577 [PubMed – indexed for MEDLINE]

70. Vet Surg. 2012 Jan;41(1):168–79. doi: 10.1111/j.1532-950X.2011.00869.x. Epub 2011 Sep 7.

Total hip replacement with dorsal acetabular rim augmentation using the SOP(TM) implant and polymethylmethacrylate cement in seven dogs with dorsal acetabular rim deficiency.

Fitzpatrick N(1), Bielecki M, Yeadon R, Hamilton M.

Author information:

(1)Fitzpatrick Referrals, Eashing, Surrey, UK.
noel@fitzpatrickreferrals.co.uk

OBJECTIVE: To describe a surgical technique for reinforced augmentation of the dorsal acetabular rim (DAR) using a string-of-pearls (SOP™) locking plate and polymethylmethacrylate (PMMA) bone cement, and to report clinical outcome in 7 dogs.

STUDY DESIGN: Case series.

ANIMALS: Dogs (n=7).

METHODS: Medical records (November 2009–April 2010) of 7 dogs with large DAR deficits, that had total hip replacement (THR) with reinforced augmentation of the DAR using a SOP™ plate and PMMA were evaluated retrospectively. Reinforced augmentation of the DAR involved anchorage of a precontoured 2.0 or 2.7 mm SOP™ plate dorsal to the acetabulum followed by application of PMMA cement to cover

the reamed acetabulum and plate. Cemented acetabular components were used.

Implant associated complications were recorded and ≥ 6 -month follow-up obtained.

RESULTS: In all dogs, lameness improved at medium-term reassessment (median, 8 months; range, 6–11 months). Complications included transient sciatic neurapraxia in 2 dogs, which resolved by 3 months.

CONCLUSIONS: Reinforced augmentation of the DAR using a SOP™ plate and PMMA

cement may facilitate placement of acetabular THR component implantation in dogs with severe DAR insufficiency.

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PMID: 21899576 [PubMed – indexed for MEDLINE]

71. Vet J. 2011 Aug;189(2):141–6. doi: 10.1016/j.tvjl.2011.06.011. Epub 2011 Jul 14.

Rules, regulations, strategies and activities within the Fédération Cynologique Internationale (FCI) to promote canine genetic health.

Hedhammar ÅA(1), Indrebø A.

Author information:

(1)Department of Clinical Sciences, Swedish University of Agricultural Sciences, SE-750 07 Uppsala, Sweden. ake.hedhammar@slu.se

The structure and aims of the Fédération Cynologique Internationale (FCI) are outlined, with a focus on the rules and regulations that are relevant to breeding and genetic health of dogs. Recently adopted strategies to enhance canine genetic health and activities to counteract exaggerated anatomical features are highlighted. Actions by the FCI regarding recognition of breeds and doping rules, under direct control by cynological organisations, are included, based on their relevance to canine health.

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PMID: 21757380 [PubMed – indexed for MEDLINE]

72. Vet J. 2011 Aug;189(2):197–202. doi: 10.1016/j.tvjl.2011.06.019.
Epub 2011 Jul 8.

How the Orthopedic Foundation for Animals (OFA) is tackling inherited disorders
in the USA: using hip and elbow dysplasia as examples.

Keller GG(1), Dziuk E, Bell JS.

Author information:

(1)Orthopedic Foundation for Animals, Columbia, MO 65201–3806, USA.
ofa@offa.org

The Orthopedic Foundation for Animals (OFA) maintains an on-line health pedigree database for inherited disorders of animals. With the American Kennel Club Canine Health Foundation, the OFA maintains the Canine Health Information Center (CHIC) for parent breed clubs to identify breed-specific required health tests. Analysis of the results of OFA evaluations in the hip and elbow registries show that selection based on phenotype improves conformation. Disorders with complex inheritance respond best to selection based on depth (ancestors) and breadth (siblings) of pedigree health test results. This information can be derived from vertical pedigrees generated on the OFA website.

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PMID: 21741865 [PubMed – indexed for MEDLINE]

73. Vet J. 2011 Aug;189(2):227–33. doi: 10.1016/j.tvjl.2011.06.024.
Epub 2011 Jul 6.

Genetic evaluation of elbow scores and the relationship with hip scores in UK Labrador retrievers.

Lewis TW(1), Ilska JJ, Blott SC, Woolliams JA.

Author information:

(1)Kennel Club Genetics Centre, Animal Health Trust, Newmarket,

Suffolk CB8 7UU,
UK. tom.lewis@aht.org.uk

A linear mixed model analysis of elbow and hip score data from UK Labrador retrievers was used to estimate the heritability of elbow score (0.16–0.19) and to determine a moderate and beneficial genetic correlation with hip score (0.40). A small improvement in the genetic trend of elbow score was observed during the years 2000–2008, equivalent to avoiding only the worst 3–4% of scored dogs for breeding, but close to what may have been anticipated if the current British Veterinary Association–approved guidelines were followed. Calculations suggested that a correlated response to indirect selection on hip score may elicit a greater response than direct selection on elbow score and that the genetic trend in elbow score may be explained as a consequence of the stronger selection pressure that has been placed on hip score. Increases in the accuracy of estimated breeding values for elbow score of 4–7% for dogs with elbow data only and 7–11% for dogs with both hip and elbow score were observed from bivariate analysis of elbow and hip data. A selection index confirmed the benefits of bivariate analysis of elbow and hip score data by identifying increases in accuracy (directly related to the response to selection) of 14% from the use of optimum coefficients compared to use of hip data only. The quantified genetic correlation means that hip score effectively acts as a 'secondary indicator' of elbow score in this breed and the preponderance of hip data means that it acts as a major source of information that may be used to improve the accuracy of estimates of genetic risk for elbow dysplasia.

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PMID: 21737324 [PubMed – indexed for MEDLINE]

74. Vet J. 2011 Aug;189(2):169–76. doi: 10.1016/j.tvjl.2011.06.015.
Epub 2011 Jul 6.

Canine hip and elbow dysplasia in UK Labrador retrievers.

Woolliams JA(1), Lewis TW, Blott SC.

Author information:

(1)Roslin Institute and Royal (Dick) School of Veterinary Studies,
University of
Edinburgh, Easter Bush, Midlothian EH25 9RG, UK.
john.woolliams@roslin.ed.ac.uk

This paper examines the outcomes from recent genetic analyses of hip and elbow scores from British Veterinary Association (BVA)/UK Kennel Club (KC) screening programmes targeted at reducing the prevalence of hip dysplasia (HD) and elbow dysplasia in UK Labrador retrievers. The analyses made use of 25,243 hip scores and 3613 elbow scores. Heritabilities ($\pm$ standard error) for hip score, analysed on a log scale, and for elbow score were 0.35 ± 0.02 and 0.19 ± 0.04 , respectively, with a genetic correlation of 0.41 ± 0.09 . For both hip and elbow scores, there was a near perfect genetic correlation between the left and right joint; analysis of hip score showed a predictive benefit of using the total of left and right scores rather than worst score and the benefit of using all component scores rather than their aggregate score. Downward genetic trends were observed in both hip and elbow scores, although the latter was consistent with it being correlated to response to genetic change in hip score. Estimated breeding values (EBVs) offered substantial benefits in accuracy and hence genetic progress when compared to the use of phenotypes for both hip and elbow scores. There are major opportunities for improving selection against elbow dysplasia through the use of bivariate evaluations, although progress against dysplasia would be improved by more widespread elbow scoring. The studies highlighted a number of ways in which data recording for addressing complex traits may be improved in the future.

Ongoing

advances in genomic technology may be utilised for increasing the rate of genetic progress in selection against HD and for complex diseases in general, through the use of genomic evaluations.

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PMID: 21737322 [PubMed – indexed for MEDLINE]

75. Acta Vet Scand. 2011 Jul 7;53:46. doi: 10.1186/1751-0147-53-46.

Modular hybrid total hip arthroplasty. Experimental study in dogs.

Minto BW(1), Brandão CV, Pereira GJ, Campagnol D, Mamprim MJ, Padovani CR, Ranzani JJ.

Author information:

(1)Department of Veterinary Surgery and Anesthesiology, São Paulo State University (UNESP), School of Veterinary Medicine and Animal Science, Botucatu, PO Box 560, Rubião Júnior s/n Botucatu (SP) 18618-000, Brazil. brunobtu@yahoo.com.br

BACKGROUND: This prospective experimental study evaluated the surgical procedure

and results of modular hybrid total hip arthroplasty in dogs.

METHODS: Ten skeletally mature healthy mongrel dogs with weights varying between

19 and 27 kg were used. Cemented modular femoral stems and uncemented porous-coated acetabular cups were employed. Clinical and radiographic evaluations were performed before surgery and at 30, 60, 90, 120, 180 and 360

days post-operation.

RESULTS: Excellent weight bearing was noticed in the operated limb in seven dogs.

Dislocation followed by loosening of the prosthesis was noticed in two dogs,

which were therefore properly treated with a femoral head osteotomy.

Femoral

fracture occurred in one dog, which was promptly treated with full implant

removal and femoral osteosynthesis.

CONCLUSIONS: The canine modular hybrid total hip arthroplasty provided excellent

functionality of the operated limb.

PMCID: PMC3142221

PMID: 21736758 [PubMed – indexed for MEDLINE]

76. Vet J. 2011 Aug;189(2):160–8. doi: 10.1016/j.tvjl.2011.06.014.
Epub 2011 Jul 2.

Selection against canine hip dysplasia: success or failure?

Wilson B(1), Nicholas FW, Thomson PC.

Author information:

(1)Faculty of Veterinary Science, University of Sydney, NSW 2006,
Australia.

bethany.wilson@sydney.edu.au

Canine hip dysplasia (CHD) is a multifactorial skeletal disorder which is very common in pedigree dogs and represents a huge concern for canine welfare. Control schemes based on selective breeding have been in operation for decades. The aim of these schemes is to reduce the impact of CHD on canine welfare by selecting for reduced radiographic evidence of CHD pathology as assessed by a variety of phenotypes. There is less information regarding the genotypic correlation between these phenotypes and the impact of CHD on canine welfare. Although the phenotypes chosen as the basis for these control schemes have displayed heritable phenotypic variation in many studies, success in achieving improvement in the phenotypes has been mixed. There is significant room for improvement in the current schemes through the use of estimated breeding values (EBVs), which can combine a dog's CHD phenotype with CHD phenotypes of relatives, other phenotypes as they are proven to be genetically correlated with CHD (especially elbow dysplasia phenotypes), and information from genetic tests for population-relevant DNA markers, as such tests become available. Additionally, breed clubs should be encouraged and assisted to formulate rational, evidenced-based breeding recommendations for CHD which suit their individual circumstances and

dynamically
to adjust the breeding recommendations based on continuous tracking of
CHD
genetic trends. These improvements can assist in safely and
effectively reducing
the impact of CHD on pedigree dog welfare.

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PMID: 21727013 [PubMed – indexed for MEDLINE]

77. J Anim Breed Genet. 2011 Jun;128(3):230–43. doi:
10.1111/j.1439-0388.2010.00903.x. Epub 2011 Apr 13.

Symmetry of hip dysplasia traits in the German Shepherd Dog in
Australia.

Wilson BJ(1), Nicholas FW, James JW, Wade CM, Tammen I, Raadsma HW,
Castle K,
Thomson PC.

Author information:

(1)The University of Sydney, Camperdown, NSW, Australia.
bethany.wilson@sydney.edu.au

Canine hip dysplasia (CHD) is a common and debilitating developmental
condition
of the canine coxofemoral (hip) joint, exhibiting a multifactorial
pattern of
inheritance. British Veterinary Association hip traits (BVAHTs) are
nine
radiographic features of hips used in several countries to ordinally
score both
the right and left hip of potential breeding candidates to assess
their
suitability for breeding. The objective of this study was to examine
some aspects
of the relationship between contralateral scores for each BVAHT in a
cohort of
13 124 Australian-registered German Shepherd Dogs. Goodman and Kruskal
gamma
coefficients of 0.48–0.95 and correlation coefficients of 0.50–0.74
demonstrate
that the association between right and left hip scores varies between
moderate
and strong for BVAHTs. Principal component analysis of scores detected
a sizeable
left-versus-right effect, a finding supported by symmetry and quasi-
symmetry

analyses which found that seven of the nine BVAHTs display significant marginal asymmetry. Dogs showing asymmetry for one BVAHT are significantly more likely to display asymmetry at other BVAHTs. When asymmetry is expressed as a binary trait (either symmetrical or asymmetrical), it displays low to moderate heritability. Estimates of genetic correlations between right and left scores are very high for all BVAHTs (>0.945), suggesting right and left scores for each BVAHT are largely determined by the same set of genes. The marginal asymmetries are therefore more likely to be of environmental and non-additive genetic origin. In breeding programmes for CHD, we recommend that scores from both hips be used to estimate breeding values, with a term for side-of-hip included in the model to account for score variation owing to asymmetry.

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PMID: 21554417 [PubMed – indexed for MEDLINE]

78. J Anim Breed Genet. 2011 Jun;128(3):219–29. doi: 10.1111/j.1439-0388.2010.00901.x. Epub 2011 Jan 12.

Genetic analyses of elbow and hip dysplasia in the German shepherd dog.

Stock KF(1), Klein S, Tellhelm B, Distl O.

Author information:

(1)Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover (Foundation), Germany. Kathrin-Friederike.Stock@tiho-hannover.de

Results from radiographic screening for canine hip dysplasia (CHD) and elbow dysplasia (CED) of 48 367 German shepherd dogs born in 2001–07 were used for the population genetic analyses. Available information included CHD scores for 47 730 dogs, CED scores for 28 011 dogs and detailed veterinary diagnoses of primary ED lesions for a subsample of 18 899 dogs. Quasi-continuous traits were

CHD, CED and cases of CED without radiographically visible primary lesion (CED-ARTH). Binary coding was used for fragmented medial coronoid process of the ulna (FCP), borderline findings and mild to severe signs of dysplasia in hip and elbow joints. Genetic parameters were estimated in univariate threshold and multivariate linear and mixed linear-threshold models using Gibbs sampling. Correlations between univariately predicted breeding values (BV) indicated genetic differences between borderline and affected disease status for both CHD ($r(BV) = 0.5$) and CED ($r(BV) = 0.3$). Multivariate genetic analyses with separate consideration of borderline findings revealed moderate heritabilities of 0.2–0.3 for the quasi-continuous traits with positive additive genetic correlation of 0.3 between CHD and both CED and CED-ARTH. For FCP, heritability of 0.6 and additive genetic correlations of +0.1 to CHD and –0.1 to CED-ARTH were estimated. Results supported the relevant genetic determination of CHD and CED, argued for both diseases against interpretation of borderline findings as healthy and implied genetic heterogeneity of CED. Accordingly, future breeding strategies to reduce the prevalences of CHD and CED in the German shepherd dog should be most efficient when based on BV from multivariate genetic evaluation for CHD, CED-ARTH and FCP with use of the whole scale of categories for classification of CHD and CED.

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PMID: 21554416 [PubMed – indexed for MEDLINE]

79. Vet Surg. 2011 Jul;40(5):621–30. doi: 10.1111/j.1532-950X.2011.00827.x. Epub 2011 Apr 26.

Hybrid cemented/cementless total hip replacement in dogs: seventy-eight consecutive joint replacements.

Gemmill TJ(1), Pink J, Renwick A, Oxley B, Downes C, Roch S, McKee WM.

Author information:

(1)Willows Referral Service, Solihull, UK. toby.gemmill@btinternet.com

OBJECTIVE: To evaluate the use of hybrid total hip replacement (THR), using a

cementless acetabular component and a cemented femoral component.

STUDY DESIGN: Prospective case series.

SAMPLE POPULATION: Client-owned dogs (n = 71).

MATERIALS AND METHODS: Consecutive clinical cases that had hybrid THR were

studied. Radiographic features, pain scores, and lameness scores were recorded

pre- and postoperatively. Longer term outcome was assessed by owner questionnaire.

RESULTS: Hybrid THRs (n = 78) were performed in 71 dogs. Four cases (5%) had

major postoperative complications; 3 were resolved after revision surgery, and 1

owner requested an explantation. No other major complications were identified on

follow-up radiographs (67 THR) at 12 weeks. On clinical follow up (77 THR) at 4

weeks, lameness had improved in 68, was unchanged in 8, and was worse in 1. Pain

had decreased in 72, was unchanged in 4, and was worse in 1. At 12 weeks (69 THR)

compared with preoperative status, lameness had improved in 67 and was unchanged

in 2. Pain had improved in 68 and was unchanged in 1. Longer term follow-up

(mean, 16 months) was available for all hips. No further complications were

reported. Owner satisfaction was good for 76 THRs and reasonable for 2.

CONCLUSIONS: Hybrid THR can be performed successfully with a low complication

rate and represents an alternative to either entirely cemented or cementless

implantation.

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PMID: 21521239 [PubMed – indexed for MEDLINE]

80. Vet Rec. 2011 Feb 12;168(6):147. doi: 10.1136/vr.d883.

Developing a new diagnostic test for hip and elbow dysplasia.

[No authors listed]

PMID: 21493503 [PubMed – indexed for MEDLINE]

81. Vet Rec. 2011 Apr 16;168(15):407. doi: 10.1136/vr.c6842. Epub 2011 Apr 11.

Evaluation of the status of canine hydrotherapy in the UK.

Wainman M(1), Young IS, Williams SB.

Author information:

(1)School of Veterinary Science, University of Liverpool, Crown Street, Liverpool L69 7ZJ.

Comment in

Vet Rec. 2011 Apr 16;168(15):405-6.

To establish the current status of canine hydrotherapy in the UK and to ascertain information regarding the current use of hydrotherapy, a questionnaire was sent to 152 hydrotherapy centres throughout the UK, from which 89 responded. Hydrotherapy was found to be a rapidly growing business. Stand-alone centres were in existence; however, many centres were connected to other businesses, including boarding kennels and general practice veterinary surgeries. The dogs using the facility were mainly pedigree breeds, particularly labrador retrievers (30 per cent), and the most commonly encountered conditions were rupture of the cranial cruciate ligament (25 per cent), hip dysplasia (24 per cent) and osteoarthritis (18 per cent). The proportion of qualified versus unqualified staff varied between centres, highlighting a need for improved regulation of this aspect of the industry. However, all the dogs treated by the hydrotherapy centres surveyed were direct veterinary referrals, suggesting a good degree of professionalism in the field and a high regard for the benefits of hydrotherapy.

PMID: 21493454 [PubMed – indexed for MEDLINE]

82. Am J Vet Res. 2011 Apr;72(4):530–40. doi: 10.2460/ajvr.72.4.530.

Evaluation of a fibrillin 2 gene haplotype associated with hip dysplasia and incipient osteoarthritis in dogs.

Friedenberg SG(1), Zhu L, Zhang Z, Foels Wv, Schweitzer PA, Wang W, Fisher PJ, Dykes NL, Corey E, Vernier-Singer M, Jung SW, Sheng X, Hunter LS, McDonough SP, Lust G, Bliss SP, Krotscheck U, Gunn TM, Todhunter RJ.

Author information:

(1)Department of Clinical Sciences, College of Arts and Sciences, Oklahoma State University, Stillwater, OK 74078, USA.

OBJECTIVE: To determine whether a mutation in the fibrillin 2 gene (FBN2) is associated with canine hip dysplasia (CHD) and osteoarthritis in dogs.

ANIMALS: 1,551 dogs. Procedures—Hip conformation was measured radiographically.

The FBN2 was sequenced from genomic DNA of 21 Labrador Retrievers and 2

Greyhounds, and a haplotype in intron 30 of FBN2 was sequenced in 90 additional

Labrador Retrievers and 143 dogs of 6 other breeds. Steady-state values of FBN2

mRNA and control genes were measured in hip joint tissues of fourteen 8-month-old

Labrador Retriever–Greyhound crossbreeds.

RESULTS: The Labrador Retrievers homozygous for a 10-bp deletion haplotype in

intron 30 of FBN2 had significantly worse CHD as measured via higher distraction

index and extended-hip joint radiograph score and a lower Norberg angle and

dorsolateral subluxation score. Among 143 dogs of 6 other breeds, those

homozygous for the same deletion haplotype also had significantly worse

radiographic CHD. Among the 14 crossbred dogs, as the dorsolateral subluxation

score decreased, the capsular FBN2 mRNA increased significantly. Those dogs with

incipient hip joint osteoarthritis had significantly increased capsular FBN2

mRNA, compared with those dogs without osteoarthritis. Dogs homozygous for the FBN2 deletion haplotype had significantly less FBN2 mRNA in their femoral head articular cartilage.

CONCLUSIONS AND CLINICAL RELEVANCE: The FBN2 deletion haplotype was associated with CHD. Capsular gene expression of FBN2 was confounded by incipient secondary osteoarthritis in dysplastic hip joints. Genes influencing complex traits in dogs can be identified by genome-wide screening, fine mapping, and candidate gene screening.

PMID: 21453155 [PubMed – indexed for MEDLINE]

83. N Z Vet J. 2011 Mar;59(2):67–74. doi: 10.1080/00480169.2011.552854.

Trends in the phenotypic hip status of selected breeds of dog as measured by the New Zealand Veterinary Association Hip Dysplasia scheme (1990–2008).

Worth AJ(1), Bridges JP, Jones G.

Author information:

(1)Centre for Service and Working Dog Health, Massey University, Private Bag 11222, Palmerston North, New Zealand. a.j.worth@massey.ac.nz

AIM: To determine whether there has been improvement in the phenotypic hip dysplasia status in four susceptible dog breeds as measured by the New Zealand

Veterinary Association (NZVA) Canine Hip Dysplasia (CHD) scheme.

METHODS: A retrospective analysis of the NZVA CHD database was performed using records of all German Shepherd dogs, Labrador Retrievers, Golden Retrievers and Rottweilers that had undergone evaluation for hip dysplasia between 1990 and 2008. The effect of date of birth on the total hip score was analysed using linear regression, including the covariates of age and gender. When a significant effect of date of birth on total score was noted, ordinal logistic regression was performed to determine the probability of different grades of the

Norberg angle
and subluxation scores by year of birth; these categories being most
indicative
of laxity of the coxofemoral joint. Given the known heritability of
hip
phenotype, determined using radiological measurements, the hypothesis
was that if
sufficient selection pressure has been applied there would have been a
trend
towards a lower total score over time.
RESULTS: For Labrador Retrievers (n=1,451), Golden Retrievers (n=896)
and
Rottweilers (n=313), there was no effect of date of birth on total
score over the
period of the study ($p>0.1$). For German Shepherd dogs (n=1,087), there
was a
significant trend to a lower total score over time ($p=0.0003$). However
the actual
size of the effect was small. Ordinal logistic regression on the
Norberg angle
and subluxation scores for German Shepherd dogs demonstrated a
significant
lowering of grade in both of these measures of hip laxity.
CONCLUSIONS: This study failed to show significant improvement in the
phenotypic
hip status of three out of the four most populous large-dog breeds in
the NZVA
CHD database. Even in the German Shepherd dog, the trend towards a
lower total
score did not represent a substantial change. Lack of evidence of
phenotypic
improvement may be due to insufficient selection pressure over the
course of the
study, selective usage of the scheme (and thus a biased sample), or
deficiencies
within the NZVA CHD scoring method itself.
CLINICAL RELEVANCE: Greater improvement might be possible if use of
the scheme
(or an equivalent) is made a compulsory requirement for registration
of pedigree
breeding stock, if greater selection pressure is applied and/or if
pedigree data
are included to enable estimations of breeding value.

PMID: 21409732 [PubMed – indexed for MEDLINE]

84. Am J Vet Res. 2011 Mar;72(3):376–83. doi: 10.2460/ajvr.72.3.376.

Relationships of hip joint volume ratios with degrees of joint laxity

and
degenerative disease from youth to maturity in a canine population
predisposed to
hip joint osteoarthritis.

D'Amico LL(1), Xie L, Abell LK, Brown KT, Lopez MJ.

Author information:

(1)Laboratory for Equine and Comparative Orthopedic Research,
Department of
Veterinary Clinical Sciences, School of Veterinary Medicine, Louisiana
State
University, Baton Rouge, LA 70803, USA.

OBJECTIVE: To assess relationships of acetabular volume (AV), femoral
head volume
(FV), and portion of the femoral head within in the acetabulum (FVIA)
with each
other and with degrees of hip joint laxity and degenerative joint
disease from
youth to maturity in dogs predisposed to developing hip joint
osteoarthritis
(OA).

ANIMALS: 46 mixed-breed half- or full-sibling hound-type dogs.

PROCEDURES: The distraction index (DI), AV, FV, FVIA, and degree of
osteoarthritis (OA score) were quantified in 1 hip joint at 16, 32,
and 104 weeks

of age. Relationships among variables were evaluated within and
between ages.

Ratios corresponding to OA scores were compared within ages.

Differences among

16-week ratios corresponding to 32-week OA scores and among 16- and
32-week

ratios corresponding to 104-week OA scores were evaluated.

RESULTS: Significant positive relationships existed between FV and AV
across ages

as well as between FVIA/FV and FVIA/AV and between DI and OA score
across and

within most ages. Such relationships also existed within these
variables across

most ages. Negative relationships of DI and OA scores with FVIA/FV and
FVIA/AV

within and among all ages were significant. Sixteen-week AVs, FVs, and
FVIAs were

greater and FV/AVs and OA scores were less than 32- and 104-week
values. The

32-week FVIA/FV was less than 16- and 104-week values, and the 32-week
FVIA/AV

was less than the 104-week value. The FVIA/FV and FVIA/AV were lower
and the DI

was higher with higher OA scores within and among most ages.
CONCLUSIONS AND CLINICAL RELEVANCE: Structural volumes in lax canine hip joints changed predictably relative to each other during growth, despite degenerative changes. Measures developed in this study may augment current diagnosis and treatment strategies for hip dysplasia in dogs.

PMCID: PMC3711502

PMID: 21355741 [PubMed – indexed for MEDLINE]

85. J Am Vet Med Assoc. 2011 Feb 15;238(4):440–2. doi: 10.2460/javma.238.4.440.

What is the evidence? Surgical treatment of large dogs with hip joint osteoarthritis.

Franklin SP(1), Cook JL.

Author information:

(1)Comparative Orthopaedic Laboratory College of Veterinary Medicine, University of Missouri, Columbia, MO 65211, USA. franklinsa@missouri.edu

PMID: 21320011 [PubMed – indexed for MEDLINE]

86. Osteoarthritis Cartilage. 2011 Apr;19(4):420–9. doi: 10.1016/j.joca.2010.12.011.
Epub 2011 Jan 5.

Canine hip dysplasia is predictable by genotyping.

Guo G(1), Zhou Z, Wang Y, Zhao K, Zhu L, Lust G, Hunter L, Friedenbergs, Li J, Zhang Y, Harris S, Jones P, Sandler J, Krotscheck U, Todhunter R, Zhang Z.

Author information:

(1)Department of Animal Science, China Agricultural University, Beijing, China.

OBJECTIVE: To establish a predictive method using whole genome genotyping for early intervention in canine hip dysplasia (CHD) risk management, for the prevention of the progression of secondary osteoarthritis (OA), and for selective

breeding.

DESIGN: Two sets of dogs (six breeds) were genotyped with dense SNPs covering the entire canine genome. The first set contained 359 dogs upon which a predictive formula for genomic breeding value (GBV) was derived by using their estimated breeding value (EBV) of the Norberg angle (a measure of CHD) and their genotypes. To investigate how well the formula would work for an individual dog with genotype only (without using EBV), a cross validation was performed by masking the EBV of one dog at a time. The genomic data and the EBV of the remaining dogs were used to predict the GBV for the single dog that was left out. The second set of dogs included 38 new Labrador retriever dogs, which had no pedigree relationship to the dogs in the first set.

RESULTS: The cross validation showed a strong correlation ($R > 0.7$) between the EBV and the GBV. The independent validation showed a moderate correlation ($R = 0.5$) between GBV for the Norberg angle and the observed Norberg angle (no EBV was available for the new 38 dogs). Sensitivity, specificity, positive and negative predictive values of the genomic data were all above 70%.

CONCLUSIONS: Prediction of CHD from genomic data is feasible, and can be applied for risk management of CHD and early selection for genetic improvement to reduce the prevalence of CHD in breeding programs. The prediction can be implemented before maturity, at which age current radiographic screening programs are traditionally applied, and as soon as DNA is available.

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Elsevier Ltd. All rights reserved.

PMCID: PMC3065507

PMID: 21215318 [PubMed – indexed for MEDLINE]

87. Res Vet Sci. 2012 Feb;92(1):142–6. doi: 10.1016/j.rvsc.2010.11.003. Epub 2010 Dec 21.

Effect of triple pelvic osteotomy on the proximal femoral geometry in dysplastic dogs.

Sarıerler M(1), Yıldırım IG, Ocal MK.

Author information:

(1)Department of Surgery, Adnan Menderes University, Aydın, Turkey.
msarıerler@adu.edu.tr

Triple pelvic osteotomy (TPO) is one of the surgical procedures for use to try to reduce subsequent degenerative joint disease or modify the progress of hip dysplasia in young dogs. Joint force and pressure distribution were changed by this procedure. Therefore, the aim of this study was to find out whether the remodeling of proximal femur exists or not after TPO in dysplastic dogs. Ten femora from five young dysplastic mongrel dogs, treated unilaterally with TPO using 20° canine pelvic osteotomy plates, were used. One year after TPO, neck-proximal shaft angle, femoral head, neck, diaphyseal and mid-shaft diameters, total femoral, femoral neck axis, and intertrochanteric, femoral head offset lengths as well as the lengths from head center to lateral margin of greater trochanter and to proximal femoral axis were measured from the bone. The significant differences between treatment and control side were determined in Norberg angle, neck-proximal shaft angle, neck diameter, diaphyseal diameter, mid-shaft diameter, length from head center to proximal femoral axis and femoral head offset length. In conclusion, although small number of cases was used, it was determined that the aforementioned variables are affected by TPO. So, these variables may be supply additional information about the changes to the joint following TPO in dysplastic dogs.

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PMID: 21176929 [PubMed – indexed for MEDLINE]

88. Berl Munch Tierarztl Wochenschr. 2010 Nov-Dec;123(11-12):488-95.

[Multivariate genetic analysis of canine hip and elbow dysplasia as well as humeral osteochondrosis in the Bernese mountain dog].

[Article in German]

Hartmann P(1), Stock KF, Distl O.

Author information:

(1)Institut für Tierzucht und Vererbungsforschung, Stiftung Tierärztliche Hochschule Hannover.

In the present study genetic parameters for canine hip dysplasia (CHD), canine elbow dysplasia (CED) and osteochondrosis dissecans of the humeral head (OCD) were analysed in Bernese mountain dogs. The data set included the official scores for CHD and CED from 5534 Bernese mountain dogs born in the years 1995–2008. A multivariate linear animal model was employed to estimate heritabilities, additive genetic and residual correlations using residual maximum likelihood (REML). Heritability estimates were $h^2 = 0.26$ for CHD, $h^2 = 0.22$ for CED and $h^2 = 0.40$ for OCD. The additive genetic correlation between CHD and CED was 0.31, between CHD and OCD 0.25, and between CED und OCD -0.49 . A further multivariate analysis of the prevalence of the FCP (fragmented coronoid process), CHD and OCD revealed a heritability of $h^2 = 0.59$ for FCP. The additive genetic correlations among FCP and CHD as well CED except FCP were positive, but negative with OCD. Multivariately estimated breeding values will lead to higher genetic progress because the correlation structure of the traits can be taken into account and possible genetic antagonisms among traits are better reflected in the breeding values.

PMID: 21141279 [PubMed – indexed for MEDLINE]

89. Vet Surg. 2011 Jan;40(1):6-13. doi: 10.1111/j.1532-950X.2010.00754.x. Epub 2010 Nov 11.

Does the degree of preoperative subluxation or soft tissue tension affect the incidence of postoperative luxation in dogs after total hip replacement?

Hayes GM(1), Ramirez J, Langley Hobbs SJ.

Author information:

(1)Department of Veterinary Medicine, University of Cambridge, Cambridge, UK.
gh327@cam.ac.uk

OBJECTIVE: To investigate whether preexisting coxofemoral subluxation/luxation

predisposes to postoperative total hip replacement (THR) luxation.

STUDY DESIGN: Case series.

ANIMALS: Dogs (n=100) that had cemented THR (n=109); 23 normal controls.

METHODS: A preliminary study was performed to validate our methods of assessing

luxation and laxity by comparing dogs with severe hip dysplasia with a control

population of normal dogs. For the main study, the records and radiographs of all

dogs that had primary THR were reviewed. Measurements taken from preoperative

radiographs to quantify hip subluxation/laxity included the Norberg angle,

subluxation index, and 2 new measures: acetabular depth ratio (ADR) and dorsal

acetabular rim ratio (DARR). Differences between groups that had luxation within

8 weeks and those that did not were investigated.

RESULTS: Postoperative luxation occurred in 13 dogs (12%) within 8 weeks of

surgery. Luxation was significantly associated with various measurements

(including Norberg angle, ADR, DARR) thought to reflect degree of subluxation/soft tissue tension.

CONCLUSION: Luxation after canine THR is a multifactorial problem but preexisting

subluxation/soft tissue laxity is a significant risk factor for this complication.

© Copyright 2010 by The American College of Veterinary Surgeons.

PMID: 21070265 [PubMed – indexed for MEDLINE]

90. PLoS One. 2010 Oct 22;5(10):e12797. doi: 10.1371/journal.pone.0012797.

Genetic evaluation of hip score in UK Labrador Retrievers.

Lewis TW(1), Blott SC, Woolliams JA.

Author information:

(1)Kennel Club Genetics Centre at the Animal Health Trust, Animal Health Trust, Newmarket, United Kingdom. tom.lewis@aht.org.uk

Hip dysplasia is an important and complex genetic disease in dogs with both genetic and environmental influences. Since the osteoarthritis that develops is irreversible the only way to improve welfare, through reducing the prevalence, is through genetic selection. This study aimed to evaluate the progress of selection against hip dysplasia, to quantify potential improvements in the response to selection via use of genetic information and increases in selection intensity, and to prepare for public provision of estimated breeding values (EBV) for hip dysplasia in the UK. Data consisted of 25,243 single records of hip scores of Labrador Retrievers between one and four years old, from radiographs evaluated between 2000 and 2007 as part of the British Veterinary Association (BVA) hip score scheme. A natural logarithm transformation was applied to improve normality and linear mixed models were evaluated using ASREML. Genetic correlations between left and right scores, and total hip scores at one, two and three years of age were found to be close to one, endorsing analysis of total hip score in dogs aged one to three as an appropriate approach. A heritability of 0.35 ± 0.016 and small but significant litter effect (0.07 ± 0.009) were estimated. The observed trends in both mean hip score and mean EBV over year of birth indicate that a small genetic improvement has been taking place, approximately equivalent to

avoiding those dogs with the worst 15% of scores. Deterministic analysis supported by simulations showed that a 19% greater response could be achieved using EBV compared to phenotype through increases in accuracy alone. This study establishes that consistent but slow genetic improvement in the hip score of UK Labrador Retrievers has been achieved over the previous decade, and demonstrates that progress may be easily enhanced through the use of EBVs and more intense selection.

PMCID: PMC2962628

PMID: 21042573 [PubMed – indexed for MEDLINE]

91. J Small Anim Pract. 2010 Nov;51(11):582–8. doi: 10.1111/j.1748–5827.2010.00995.x.

Static and dynamic ultrasonography for the early diagnosis of canine hip dysplasia.

Fischer A(1), Flöck A, Tellhelm B, Failing K, Kramer M, Thiel C.

Author information:

(1)Department of Veterinary Clinical Sciences, Small Animal Clinic, Justus-Liebig-University, Frankfurter Straße 108, 35392 Giessen, Germany.

OBJECTIVE: To determine the feasibility of sonographical examination of hip joints in non-sedated puppies and to assess the value of static and dynamic ultrasonography for the early diagnosis of canine hip dysplasia (CHD). **METHODS:** Prospective study was carried out. Five hundred and sixty-six puppies between the ages of 16 and 49 days underwent sonographical determination of the α -angle, joint laxity and distraction value (DV). Sonographical parameters were correlated to conventional radiographic CHD classification in the adult dogs. **RESULTS:** α -Angles between 74° and 89° ($X \pm sd = 82.8^\circ \pm 2.31^\circ$) were measured. Despite the feasibility of sonographical hip assessment in puppies, no statistically significant correlation was found between sonographical determinations

of the
 α -angle, joint laxity, DV and conventional radiographic hip joint
classification
at the age of 12 to 24 months.
CLINICAL SIGNIFICANCE: Results of our study suggest that static and
dynamic
ultrasonography of hip joints in puppies between 16 and 49 days of age
is
technically feasible but cannot be recommended for detecting puppies
that will
develop CHD between the ages of 12 and 24 months.

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PMID: 20973786 [PubMed – indexed for MEDLINE]

92. Vet Radiol Ultrasound. 2010 Sep-Oct;51(5):498–503.

The effect of a technical quality assessment of hip-extended
radiographs on
interobserver agreement in the diagnosis of canine hip dysplasia.

Verhoeven GE(1), Fortrie RR, Duchateau L, Saunders JH, Van Ryssen B,
Van Bree H,
Coopman F.

Author information:

(1)Department of Medical Imaging, Faculty of Veterinary Medicine,
Ghent
University, Salisburylaan 133, 9820 Merelbeke, Belgium.
geertverhoeven@hotmail.com

Experienced and inexperienced observers evaluated the assessability of
50
radiographs (25 dogs) and determined the hip status (dysplasia/
nondysplasia and
final scoring according Fédération Cynologique Internationale [FCI]-
criteria)
individually. A radiographic technical quality assessment was
performed in a
separate reading session. Interobserver agreement in determining
dysplasia/nondysplasia and FCI-scoring did not significantly increase
with the
increasing quality of a radiograph, irrespective whether these
observers are
experienced or not. There was a significant agreement between the
technical
quality assessment and assessability ($P < 0.0005$). Despite the effort
to

objectify radiographic quality and to present high-quality radiographs to observers, interobserver agreement on dysplasia/nondysplasia and final scoring, remains low, even in the experienced group. Although increased radiographic quality narrows the range of scoring, the range remains unacceptably high.

PMID: 20973381 [PubMed – indexed for MEDLINE]

93. J Am Vet Med Assoc. 2010 Oct 15;237(8):899; author reply 899–900.

Sensitivity versus specificity of PennHIP as a screening test for osteoarthritis.

Sondel JA.

Comment on

J Am Vet Med Assoc. 2010 Sep 1;237(5):532–41.

PMID: 20960695 [PubMed – indexed for MEDLINE]

94. Prev Vet Med. 2010 Dec 1;97(3–4):252–63. doi: 10.1016/j.prevetmed.2010.09.015.

Epub 2010 Oct 16.

A prospective study on canine hip dysplasia and growth in a cohort of four large breeds in Norway (1998–2001).

Krontveit RI(1), Nødtvedt A, Sævik BK, Ropstad E, Skogmo HK, Trangerud C.

Author information:

(1)Department of Companion Animal Clinical Sciences, Norwegian School of Veterinary Science, P.O. Box 8146 Dep., N-0033 Oslo, Norway.
randi.krontveit@nvh.no

The study-objective was to measure the effect of weight and growth related parameters on the risk of development of Canine Hip Dysplasia (CHD). The hypothesis was that heavy and fast growing dogs of large sized breeds were at increased risk of development of CHD compared to lighter and slower growing dogs.

A prospective cohort study was conducted among dogs of four large breeds: Newfoundland (NF), Leonberger (LEO), Labrador retriever (LR), and Irish wolfhound (IW). The dogs were privately owned with individualized nutrition and environment, and they were followed from birth and throughout the growth period until the official screening for CHD was performed. The study sample consisted of 501 dogs from 103 litters, with the breed distribution 125 NF, 180 LEO, 133 LR, and 63 IW. Because the dogs were clustered in litters a multivariable random effects logistic regression model was used to assess statistically significant growth-related risk factors for CHD. The estimated incidence risk of CHD was 36% in NF, 25% in LEO, 20% in LR, and 10% in IW. Based upon the final multilevel model it appears that the odds of CHD among both LR and IW (odds ratio (OR) 0.22) are about one-fifth of the odds for NF. The odds for LEO (OR 0.60) are not significantly different from NF. There appeared to be an inverse relationship between body weight at 3 months of age and odds of CHD, with an OR of 0.89 ($P=0.044$). The degree of clustering at the litter-level was high (22.6%) and highly significant ($P<0.001$). Findings failed to support the hypothesis that heavy and fast growing dogs from four large sized breeds were at increased risk for development of CHD. There might be other unmeasured environmental risk factors for CHD in this cohort of dogs, although the contribution of the genetic variance to the litter-level clustering also needs further investigation.

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PMID: 20956024 [PubMed – indexed for MEDLINE]

95. PLoS One. 2010 Oct 11;5(10):e13219. doi: 10.1371/journal.pone.0013219.

Differential genetic regulation of canine hip dysplasia and osteoarthritis.

Zhou Z(1), Sheng X, Zhang Z, Zhao K, Zhu L, Guo G, FriedenberG SG, Hunter LS, Vandenberg-Foels WS, Hornbuckle WE, Krotscheck U, Corey E, Moise NS, Dykes NL, Li J, Xu S, Du L, Wang Y, Sandler J, Acland GM, Lust G, Todhunter RJ.

Author information:

(1)College of Animal Science and Technology, Northwest A&F University, Yangling, China.

BACKGROUND: Canine hip dysplasia (HD) is a common polygenic trait characterized by hip malformation that results in osteoarthritis (OA). The condition in dogs is very similar to developmental dysplasia of the human hip which also leads to OA.

METHODOLOGY/PRINCIPAL FINDINGS: A total of 721 dogs, including both an association and linkage population, were genotyped. The association population included 8 pure breeds (Labrador retriever, Greyhounds, German Shepherd, Newfoundland, Golden retriever, Rottweiler, Border Collie and Bernese Mountain Dog). The linkage population included Labrador retrievers, Greyhounds, and their crosses. Of these, 366 dogs were genotyped at ~22,000 single nucleotide polymorphism (SNP) loci and a targeted screen across 8 chromosomes with ~3,300 SNPs was performed on 551 dogs (196 dogs were common to both sets). A mixed linear model approach was used to perform an association study on this combined association and linkage population. The study identified 4 susceptibility SNPs associated with HD and 2 SNPs associated with hip OA.

CONCLUSION/SIGNIFICANCE: The identified SNPs included those near known genes (PTPRD, PARD3B, and COL15A1) reported to be associated with, or expressed in, OA in humans. This suggested that the canine model could provide a unique opportunity to identify genes underlying natural HD and hip OA, which are common and debilitating conditions in both dogs and humans.

PMCID: PMC2952589

PMID: 20949002 [PubMed – indexed for MEDLINE]

96. Vet Pathol. 2011 Nov;48(6):1118–24. doi: 10.1177/0300985810381910.
Epub 2010 Sep
22.

Inflammatory response to therapeutic gold bead implantation in canine
hip joint
osteoarthritis.

Lie KI(1), Jæger G, Nordstoga K, Moe L.

Author information:

(1)Department of Basic Sciences and Aquatic Medicine, Norwegian School
of
Veterinary Science, POB 8146 Dep, 0033 Oslo, Norway. kai.lie@veths.no

Inflammatory changes associated with periarticular pure gold bead
implants were
studied in dogs involved in a clinical trial investigating motor
dysfunction and
chronic pain owing to hip joint dysplasia and osteoarthritis. Gold
beads were
percutaneously implanted via a needle into different locations
surrounding the
greater trochanter of the femur. Nine dogs with implants were
necropsied. In all
examined animals, characteristic histologic lesions were observed in
the tissue
surrounding the gold implants--namely, a fibrous capsule composed of
concentric
fibroblasts intermixed with a variable number of inflammatory cells
and a
paucicellular innermost layer of collagen with a few fibrocyte-like
cells in
empty lacunae. Lymphocytes dominated the inflammatory infiltrate, with
rarely
observed macrophages present in close proximity to the implant site.
No giant
cells were observed. Immunohistochemistry showed mixed populations of
lymphocytes, both CD3 positive (T cells) and CD79a positive (B cells),
which in
some cases formed lymphoid follicles. Diffuse inflammatory changes
were present
to a minor extent in the perimysium and surrounding fascia. The
inflammation
observed in dogs is similar to that observed with gold implants in
humans. It is
possible that the clinically beneficial effect of gold beads for
chronic
osteoarthritis depends on sustained localized inflammation with

localized release
of soluble mediators. The encapsulation of the implant by a
paucicellular and
poorly vascularized fibrous capsule may help prevent an exaggerated
inflammatory
reaction by sequestering the gold bead from the surrounding tissue.

PMID: 20861497 [PubMed – indexed for MEDLINE]

97. Ann Biomed Eng. 2011 Jan;39(1):75–84. doi: 10.1007/
s10439-010-0150-z. Epub 2010
Sep 16.

Femoral head bone mineral density patterns may identify hips at risk
of
degeneration.

Vanden Berg-Foels WS(1), Schwager SJ, Todhunter RJ, Reeves AP.

Author information:

(1)Department of Biomedical Engineering, Cornell University, Ithaca,
NY, USA.
wendyvtf@clemson.edu

Developmental dysplasia of the hip (DDH) is a common abnormality that
causes
elevated contact stress and early onset osteoarthritis (OA). We
hypothesized that
adaptation of femoral head bone mineral density (BMD) patterns to
focal loading
during postnatal development could be used to identify hips at risk of
degeneration. Evolving BMD patterns of the femoral head secondary
center of
ossification (SCO) were quantified and tested for differences with hip
subluxation and degeneration. BMD was measured using quantitative
computed
tomography of hips in a canine model of DDH from 4 weeks to early
skeletal
maturity at 32 weeks. During body weight and SCO volumetric growth
deceleration,
SCO mean BMD increased rapidly and local regions of high BMD formed.
Greater
subluxation was associated with a lower mean BMD up to 14 weeks. At
32 weeks,
greater subluxation was associated with a larger area of high BMD that
was more
laterally located and had a greater maximum BMD. BMD differences were
associated
with a higher probability of cartilage degeneration. Measurement and

visualization of BMD pattern changes due to altered mechanical loading provide a basis for identifying hips at risk of early onset OA and a tool for surgical planning of contact stress reduction procedures.

PMID: 20845071 [PubMed – indexed for MEDLINE]

98. Vet Comp Orthop Traumatol. 2010;23(6):453–8. doi: 10.3415/VCOT-09-08-0085. Epub 2010 Sep 9.

Triple pelvic osteotomy in dogs less than 12 kg in weight. Technical feasibility and short-term radiographic and clinical complications in fourteen hips.

Janssens LA(1), Béosier YM, Daems R.

Author information:

(1)Companion Animal Clinic ANUBIS, Kontichsesteenweg 46, 2630 Aartselaar-Antwerp, Belgium. coati@telenet.be

Triple pelvic osteotomy (TP0) was used to treat a selected group of young dogs with clinical and radiographic signs of hip dysplasia. Good clinical outcomes have been reported in dogs between 17–85 kg body weight. Hip dysplasia however is also encountered in smaller dogs. If surgery is performed in smaller dogs, femoral head and neck ostectomy is the main treatment method used. We wanted to determine if TP0 could also be used in dogs under 12 kg bodyweight. Our study showed that it is technically possible to perform TP0 surgery in dogs less than 12 kg of weight (down to 4.6 kg) with a good clinical outcome even in hips with high angles of reduction and subluxation.

PMID: 20830457 [PubMed – indexed for MEDLINE]

99. Vet Comp Orthop Traumatol. 2010;23(6):444–52. doi: 10.3415/VCOT-10-03-0034. Epub 2010 Sep 9.

Double pelvic osteotomy for the treatment of hip dysplasia in young dogs.

Vezzoni A(1), Boiocchi S, Vezzoni L, Vanelli AB, Bronzo V.

Author information:

(1)Clinica Veterinaria Vezzoni srl, via Massarotti 60/A, 26100
Cremona, Italy.
aldo@vezzoni.it

The aim of this study was to evaluate the feasibility of the double pelvic osteotomy (DPO) (osteotomy of the ilium and pubis) to treat clinical cases of hip dysplasia in young dogs instead of performing a triple pelvic osteotomy (TPO) (osteotomy of the ilium, pubis, and ischium). Candidates for DPO were 4.5- to nine-month-old dogs with coxofemoral joint subluxation and laxity, indicative of susceptibility to future development of severe hip dysplasia. The angle of reduction (AR) and angle of subluxation (AS) with Ortolani's sign, Norberg angle (NA), percentage of femoral head (PC) covered by the acetabulum, and the pelvic diameters and their relationships were measured clinically and radiographically before and after surgery. The surgical technique was similar to the TPO technique, but excluded ischiatic osteotomy. A DPO was carried out in 53 joints of 34 dogs; AR and AS values immediately postoperatively and at the one- and two-month follow-up examinations were significantly lower than the preoperative values ($p < 0.01$). The complications encountered were mainly represented by implant failure (3.5%), partial plate pull-out (9.4%), and incomplete fracture of the ischial table (7.5%). Changes in PC and NA values obtained immediately after surgery and at the first and second follow-up examinations were significantly greater ($p < 0.01$ both) than values obtained before surgery. Sufficient acetabular ventroversion was achieved to counteract joint subluxation and the modifications of AR and AS. The NA and PC direct postoperative values reflected a significant

improvement in the dorsal acetabular coverage. CLINICAL RELEVANCE: Restoration of normal joint congruity (PC from 50 to 72%) and maintenance of the pelvic geometry without pelvic narrowing were the most intriguing features of DP0. The complications observed were greatly reduced when using dedicated DP0 plates. Based on our experience, the morbidity after unilateral and bilateral DP0 was lower than after TP0 because elimination of the ischiatic osteotomy allowed for increased stability of the pelvis. The surgical technique of DP0 was a little more demanding than TP0 because of the difficulty in handling and rotating the acetabular iliac segment, but this difficulty was offset by elimination of ischial osteotomy.

PMID: 20830453 [PubMed – indexed for MEDLINE]

100. Vet Comp Orthop Traumatol. 2010;23(6):433–8. doi: 10.3415/VCOT-10-02-0019. Epub 2010 Sep 9.

Relation of the Norberg angle and position of the femoral head centre to the dorsal acetabular edge in evaluation of canine hip dysplasia.

Skurková L(1), Hluchý M, Lacková M, Mihaľová M, Ledecký V.

Author information:

(1)Small Animal Clinic, Department of Surgery, Orthopaedics and Radiology, University of Veterinary Medicine and Pharmacy, Komenského 73, 041 81 Košice, Slovakia.

Canine hip dysplasia (CHD) is a locomotive-system disease in dogs, which in many countries is the target of screening programs aimed at reducing the prevalence of CHD among descendants of predisposed dog breeds. Despite the efforts to apply genetic testing or ultrasound diagnostics in diagnosing CHD (as is common in human medicine), the main diagnostic process in veterinary medicine is by radiographic examination. The main two parameters which are used in

diagnosing HD
are the Norberg angle (NA) and the position of femoral head centre to the dorsal acetabular edge (FHC/DAE). We examined the relationship between these two parameters in the process of the determination of CHD degree by evaluating 225 randomly selected radiographs which were made during the period from 1993 to 2008. The aim of our study was to examine the validity of these two parameters in CHD classification as used in three different classification programs. Using Pearson's correlation coefficient, the value of which was 0.85 ($p < 0.05$), we observed a positive correlation. Comparing the three scoring systems for CHD evaluation, we found that the final degree of CHD was similar for 78% to 85% of cases using Flückiger's scoring system versus a modified scoring system of 5 parameters without FHC/DAE. Results were significant.

PMID: 20830451 [PubMed – indexed for MEDLINE]

101. J Am Vet Med Assoc. 2010 Sep 1;237(5):532–41. doi: 10.2460/javma.237.5.532.

Evaluation of the relationship between Orthopedic Foundation for Animals' hip joint scores and PennHIP distraction index values in dogs.

Powers MY(1), Karbe GT, Gregor TP, McKelvie P, Culp WT, Fordyce HH, Smith GK.

Author information:

(1)Department of Clinical Studies–Philadelphia, School of Veterinary Medicine,
University of Pennsylvania, Philadelphia, PA 19104, USA.

Comment in

J Am Vet Med Assoc. 2010 Oct 15;237(8):899; author reply 899–900.

OBJECTIVE: To compare 2 screening methods for detecting evidence of hip dysplasia

(Orthopedic Foundation for Animals [OFA] and PennHIP) in dogs.

DESIGN: Diagnostic test evaluation study. Animals–439 dogs $\geq$ 24 months of age

that received routine hip joint screening from June 1987 through July

2008.

PROCEDURES: Dogs were sedated, and PennHIP radiography was performed (hip joint-extended [HE], compression, and distraction radiographic views). The HE radiographic view was submitted for OFA evaluation. A copy of the HE radiographic view plus the compression and distraction radiographic views were submitted for routine PennHIP evaluation, including quantification of hip joint laxity via the distraction index (DI).

RESULTS: 14% (60/439) of dogs had hip joints scored as excellent by OFA standards; however, 52% (31/60) of those had a DI ≥ 0.30 (range, 0.14 to 0.61). Eighty-two percent of (183/223) dogs with OFA-rated good hip joints had a DI ≥ 0.30 (range, 0.10 to 0.77), and 94% (79/84) of dogs with OFA-rated fair hip joints had a DI ≥ 0.30 (range, 0.14 to 0.77). Of all dogs with fair to excellent hip joints by OFA standards, 80% (293/367) had a DI ≥ 0.30 . All dogs with OFA-rated borderline hip joints or mild, moderate, or severe hip dysplasia had a DI ≥ 0.30 (range, 0.30 to 0.83).

CONCLUSION AND CLINICAL RELEVANCE: Dogs judged as phenotypically normal by the OFA harbored clinically important passive hip joint laxity as determined via distraction radiography. Results suggested that OFA scoring of HE radiographs underestimated susceptibility to osteoarthritis in dogs, which may impede progress in reducing or eliminating hip dysplasia through breeding.

PMID: 20807130 [PubMed – indexed for MEDLINE]

102. Vet Comp Orthop Traumatol. 2010;23(5):326–31. doi: 10.3415/VCOT-09-08-0086. Epub 2010 Aug 25.

Morphometric assessment of the canine hip joint using the acetabular angle of retrotorsion.

Doskarova B(1), Kyllar M, Paral V.

Author information:

(1)Institute of Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Sciences Brno, Palackeho 1-3, CZ – 612 42 Brno, Czech Republic. barka.dosk@seznam.cz

Morphometric assessment of the canine hip joint using acetabular angle of retrotorsion was used in this study. The aim of our study was to compare the acetabular angle of retrotorsion (AAR) with values of the Norberg angle (NA) and the hip score (HS) in the Leonberger dog breed and to determine the cut-off point of AAR that distinguish between normal and dysplastic hip status on the basis of Fédération Cynologique Internationale (FCI) hip evaluation. Retrospective analysis of NA and AAR was measured from standard ventrodorsal pelvic radiographs with extended femurs in 387 Leonberger dogs (141 males and 246 females) from 18 to 63 months of age, which were then divided into five age-groups. Through analysis of these radiographs, it was determined that the cut-off point for NA was 105°, AAR was 15°, and the acetabular angle of retrotorsion was positively correlated with Norberg angle and negatively correlated with hip score. The results of our study indicate that the acetabular angle of retrotorsion may represent a reliable morphometric assessment tool in evaluating acetabular cup conformation, and values of AAR may help to assess the FCI grade of canine hip dysplasia.

PMID: 20740259 [PubMed – indexed for MEDLINE]

103. Vet Comp Orthop Traumatol. 2010;23(5):306–17. doi: 10.3415/VCOT-09-04-0045. Epub 2010 Aug 25.

Canine hip dysplasia treated by juvenile pubic symphysiodesis. Part I: two year results of computed tomography and distraction index.

Dueland RT(1), Adams WM, Patricelli AJ, Linn KA, Crump PM.

Author information:

(1)Department of Surgical Sciences, University of Wisconsin, Madison, Wisconsin, USA. duelandt@svm.vetmed.wisc.edu

Erratum in

Vet Comp Orthop Traumatol. 2010;23(6):472.

OBJECTIVES: To measure one and two year effects of juvenile pubic symphysiodesis (JPS) in puppies defined as 'at-risk' for canine hip dysplasia (CHD) using the following objective hip conformation criteria: Acetabular angle (AA), dorsal acetabular rim angle (DARA) and hip laxity (PennHIP® distraction index (DI)).

DESIGN: Controlled clinical case study.

ANIMALS: Thirty-nine dysplastic puppies (six controls).

PROCEDURES: The dogs were anaesthetised and acetabular angle, DARA, and DI values were obtained by computed tomography and radiography preoperatively. Electro-cautery fusion of the pubic symphysis was performed between 12 – 24 weeks of age. The imaging was repeated at one and two years of age.

RESULTS: Significant hip improvements were seen at the two-year follow-up appointments for: AA (JPS dogs 31% increase, control 3%), DARA (JPS 38% decrease, control 15%) and DI (JPS 41% decrease in laxity, controls 20%) for all postoperative versus preoperative values. Pubic fusion occurred with minor morbidity.

CONCLUSION: Juvenile pubic symphysiodesis resulted in significant improvements in hip conformation (AA and DARA), especially in mild to moderately lax hips (DI = 0.40–0.69). Most dogs with $DI \geq 0.70$ increased in osteoarthritis grade by two years of age.

CLINICAL RELEVANCE: Juvenile pubic symphysiodesis surgery at 12–24 weeks of age significantly improved hip conformation and decreased laxity in at-risk CHD dogs. Early-age (12 to 16 week) recognition of hip laxity offered greater JPS benefits than surgery performed at 19– to 24-weeks-old. Dogs with severe laxity ($DI \geq 0.70$) continued to increase in osteoarthritis. An early (12–16 weeks)

positive laxity
test (Ortolani) should alert one to obtain objective laxity
determinations
(PennHIP© DI).

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104. Vet Comp Orthop Traumatol. 2010;23(5):318–25. doi: 10.3415/
VCOT-09-04-0040. Epub
2010 Aug 25.

Canine hip dysplasia treated by juvenile pubic symphysiodesis. Part
II: two year
clinical results.

Dueland RT(1), Patricelli AJ, Adams WM, Linn KA, Crump PM.

Author information:

(1)Department of Surgical Sciences, University of Wisconsin, Madison,
Wisconsin,
USA. duelandt@svm.vetmed.wisc.edu

Erratum in

Vet Comp Orthop Traumatol.2010;23(6):472.

OBJECTIVES: To determine the clinical effects of juvenile pubic
symphysiodesis
(JPS) treatment in hip dysplasia-prone puppies with comparison to
similar
untreated control puppies.
DESIGN: Controlled clinical case study.
ANIMALS: Thirty-nine dysplastic puppies, of which six were part of the
control
group, with a positive Ortolani or hip distraction index (DI)≥0.40.
PROCEDURES: The following eight clinical tests were evaluated
preoperatively, and
at one and two years postoperatively: Ortolani, hip reduction angle
(HRA), gait
evaluation, osteoarthritis, hip pain, and three Norberg angles (angle-
extended
mode [N-OFA], angle-compression mode [N-COM], and angle-distracted
mode [N-DIS]).
Juvenile pubic fusion (JPS) was performed by unipolar electro-cautery
at 12 to 24
weeks of age; the control puppies received a sham operation.
RESULTS: For the JPS puppies, the mean osteoarthritis level did not
significantly
increase (11%). There was a 74% reversal of preoperative positive
Ortolani signs.

Hip reduction angle, DI and N-DIS also improved significantly. Only N-DIS fully detected Norberg angle laxity. Within the control group, osteoarthritis increased significantly (55%) with no improvement in Ortolani incidence, N-OFA or N-COM angles. A decrease in HRA and DI was associated with increased osteoarthritis levels. Signs of hip pain increased by 33%, which was not significant. Dogs with initial severe hip laxity ($DI \geq 0.70$) experienced progressive osteoarthritis.

CONCLUSIONS AND CLINICAL RELEVANCE: In JPS dogs with preoperative mild to moderate hip laxity ($DI = 0.40-0.69$), insignificant osteoarthritis occurred at two years. Juvenile pubic symphysiodesis surgery also improved other clinical criteria (Ortolani, HRA, hip pain, N-DIS). Osteoarthritis was generally not prevented by JPS in dogs with initial severely lax hips ($DI \geq 0.70$). Juvenile pubic symphysiodesis surgery at 12 to 24 weeks of age was an effective and safe pre-emptive bilateral treatment for mild to moderate hip dysplasia.

PMID: 20740257 [PubMed – indexed for MEDLINE]

105. Berl Munch Tierarztl Wochenschr. 2010 Jul-Aug;123(7-8):325-38.

Current developments in canine genetics.

Marschall Y(1), Distl O.

Author information:

(1)Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover.

In recent years, canine genetics had made huge progress. In 1999 the first complete karyotype and ideogram of the dog was published. Several linkage and RH maps followed. Using these maps, sets of microsatellite markers for whole genome scans were compiled. In 2003 the sequencing of the DNA of a female Boxer began. Now the second version of the dog genome assembly has been put online, and

recently, a microchip SNP array became available. Parallel to these developments, some causal mutations for different traits have been identified. Most of the identified mutations were responsible for monogenic canine hereditary diseases. With the tools available now, it is possible to use the advantages of the population structure of the various dog breeds to unravel complex genetic traits. Furthermore, the dog is a suitable model for the research of a large number of human hereditary diseases and particularly for cancer genetics, heart and neurodegenerative diseases. There are some examples where it was possible to benefit from the knowledge of canine genetics for human research. The search for quantitative trait loci (QTL), the testing of candidate genes and genome-wide association studies can now be performed in dogs. QTL for skeletal size variations and for canine hip dysplasia have been already identified and for these complex traits the responsible genes and their possible interactions can now be identified.

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106. Vet Comp Orthop Traumatol. 2010;23(4):245–9. doi: 10.3415/VCOT-10-01-0004. Epub 2010 Jun 21.

Description of the type of chemical restraint used by French veterinarians to perform hip dysplasia screening radiographs. A retrospective study based on 3302 radiographs.

Maitre P(1), Genevois JP, Remy D, Carozzo C, Arnault F, Buttin P, Viguier E, Fau D.

Author information:

(1)School of Veterinary Medicine of Lyon, Small Animal Department, Surgery, Marcy L'Etoile, France.

The objective of this study was to investigate the type of chemical restraint used by French practitioners to perform official hip screening radiographs, to determine the proportion of dogs under general anesthesia versus dogs under sedation, and to search for a difference in hip dysplasia (HD) prevalence between the two groups. From September 2005 to August 2008, 3302 conventional ventrodorsal hip extended radiographs sent for official scoring to the same panellist were selected because information related to the type of chemical restraint had been provided. There were 2825 dogs under general anesthesia and 477 were sedated. Chemical restraint used by French veterinarians to perform HD screening radiographs is mainly based on general intra-venous anesthesia with an alpha2 agonist associated with ketamine. A single injection of alpha2 agonist is also mostly used for dogs which are radiographed while under sedation. A very low (1.7%) difference in HD prevalence was noted between the anesthetized and the sedated group. Except for acepromazine, which has been demonstrated to provide insufficient muscle relaxation to show evidence of hip laxity, the protocols seem acceptable as regards the Federation Cynologique Internationale requirements for HD screening.

PMID: 20585709 [PubMed – indexed for MEDLINE]

107. J Small Anim Pract. 2010 May;51(5):264–9. doi: 10.1111/j.1748–5827.2010.00937.x.

Distraction index as a risk factor for osteoarthritis associated with hip dysplasia in four large dog breeds.

Runge JJ(1), Kelly SP, Gregor TP, Kotwal S, Smith GK.

Author information:

(1)Department of Clinical Studies, Matthew J. Ryan Veterinary Hospital at the University of Pennsylvania, Philadelphia, PA, USA.

OBJECTIVE: To determine if age, breed, gender, weight or distraction index (DI) influenced the risk of radiographic osteoarthritis (OA) of canine hip dysplasia (CHD) in four common dog breeds; the American bulldog, Bernese mountain dog, Newfoundland and standard poodle.

MATERIALS AND METHODS: This was a cross sectional prevalence study with 4349 dogs. Canine hips were evaluated using 3 radiographic projections: the hip-extended view, the compression view and the distraction view. The hip-extended view was examined for the presence of OA. The PennHIP distraction view was utilized to calculate the DI. For all breeds, a multiple logistic regression model incorporating age, weight, gender, and DI was created. For each breed, disease-susceptibility curves grouping dogs on the basis of age were constructed. Receiver-operating characteristic (ROC) curves were developed for each breed regardless of age.

RESULTS: For all breeds, DI was the most significant risk factor for the development of OA associated with CHD. Weight and age were also significant risk factors in all four breeds, but gender was not.

CLINICAL SIGNIFICANCE: Results from this study support previous findings, that irrespective of breed, the probability of radiographic OA increases with hip joint laxity as measured by the DI. Breed-specific differences in this relationship, however, warrant investigation of all breeds affected by CHD to determine inherent dependency of hip OA on joint laxity. Such findings guide veterinarians in helping dog breeders to make evidence-based breeding decisions and in informing dog owners to implement preventative treatments for CHD for dogs found to be at risk.

PMID: 20536696 [PubMed – indexed for MEDLINE]

108. Vet J. 2010 Jun;184(3):269–76. doi: 10.1016/j.tvjl.2009.04.009. Epub 2009 May 9.

Diagnosis, genetic control and preventive management of canine hip dysplasia: a

review.

Ginja MM(1), Silvestre AM, Gonzalo-Orden JM, Ferreira AJ.

Author information:

(1)Department of Veterinary Science – CITAB, University of Trás-os-Montes e Alto Douro, 5001-801 Vila Real, Portugal. mginja@utad.pt

Despite expensive screening and breeding programmes, hip dysplasia (HD) continues to be one of the most common orthopaedic diseases in dogs. The vast majority of dogs afflicted with HD show minimal to no clinical signs, but it can also be a highly debilitating condition for both working and pet dogs. Hip joint laxity is considered a major risk factor for the development of degenerative joint disease and a definitive diagnosis is made if characteristic signs are evident on a ventrodorsal view of the pelvis. Early prediction of the condition can be made using stress radiographic techniques to evaluate the passive hip laxity. The diagnosis of HD may be used for the purpose of selecting breeding stock or to decide on the best treatment approach. Breeding programmes based on individual dog phenotypes have been ineffective and a selection procedure based on breeding value (BV) estimation is recommended. Traditional conservative and surgical treatment approaches are reserved for dogs with overt clinical signs of the disease but such treatments can be expensive and aggressive, and are often ineffective in eliminating clinical signs or subluxation and in preventing the development of degenerative joint disease. The implementation of breeding programmes based on BVs and further research into early prediction/diagnosis of HD and effective preventive treatment approaches are essential.

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