PROCEEDINGS

27th annual meeting of the

INTERNATIONAL ELBOW WORKING GROUP

April 11th 2012
ICC, hall 7b
Birmingham, UK

The International Elbow Working Group acknowledges the financial support by

HILL'S PET NUTRITION

WELCOME ADDRESS

Birmingham, April 2012

Dear IEWG-congress participant,

The International Elbow Working Group (IEWG) has been founded by a group of veterinarians and dog breeders in Davis, CA, U.S.A. in 1989 with the aim to increase the knowledge on and awareness of elbow disease in dogs, and to support all stakeholders in disseminating new knowledge in this field. The interest in hereditary aspects of elbow dysplasia (ED) has been increasing ever since both among breeders and veterinary surgeons and radiologists alike.
ED has been recognized as a cause of lameness in a large variety of dog breeds with an incidence as high as 50% of the screened dogs. Published data on prevalence vary depending on breed and country. These discrepancies can be a matter of screening bias (e.g. not including dogs suffering from the disease and treated at a young age, or not submitting films of affected dogs for official screening), of improvement gained by the implementation of breeding restrictions for affected dogs, or may be caused by different screening or grading modes. The latter emphasizes the necessity of uniform grading, preferably by the protocol introduced and refined by IEWG and in use in many countries for many years.

Some research groups are in a process of performing molecular genetic research in the field of canine elbow dysplasia, to use the results in the future for screening of potential breeding stock. This will help to identify and exclude the dogs at risk to pass ED to the next generation. At the same time, veterinarians are investigating methods how to recognize signs of different forms of ED at an early stage, be it with plain radiographs taking one or more views, or with more advanced imaging techniques such as planigraphy, computed tomography, magnetic resonance imaging, bone scintigraphy, and arthroscopy, each with its advantages, typical consequences and limitations. Since genetic research has to be based on proven cases and controls, i.e. dogs with and without the disease, it is obvious that geneticists need the input of clinicians, radiologists and others involved in the refinement and the performance of the screening technique.

The Board of the IEWG will continue to stimulate the development of methods for early ED detection in order to prevent the disease, and help to refine the diagnostic procedures to identify - on a phenotypic basis - the affected and the non-affected ones, realizing that this will be the fundament on which geneticists can build sensitive, easily accessible, and uniform screening techniques. The IEWG will serve as a platform not only for radiologists and geneticists but also for surgeons, practicing veterinarians, dog owners and members of breed clubs, both national and international, since the latter form the group with primary interest in the well-being of dogs and who pass the motivation to geneticists and imaging specialists to make progress in their special field of expertise.

Some breeders appreciate a simple screening method, not realizing the difficulty to declare a dog free of ED. The IEWG has developed a certificate form, where in addition to the identification of the dog, owner, radiologist-veterinarian, and screening panel, also the standardized IEWG-grading of the elbow joints and the underlying imaging techniques are listed (specimen included in these proceedings). This certificate makes the screening results as transparent as possible for (future) owners and geneticists, since the screening results are given together with the imaging techniques and number of projections, which formed the basis of the judgment. This makes it possible for all parties involved to use their own procedure scheme, based on the technical possibilities and professional skills available in their own country, the (e.g. financial) limitations of the breeders and owners, or the restrictions imposed by other breeding requirements.

Breeders are progressively interested in early recognition of any form of ED by a method, which is accurate, non-invasive, affordable, and widely available. The goal of veterinary surgeons is to diagnose ED with high precision before installing a treatment, to refine the diagnostic procedures and to install therapies, which hopefully will improve the prognosis for a lame dog. Both groups, breeders and veterinarians, can learn from each other, and the IEWG offers a platform for exchange of knowledge and ideas regarding ED.

The impact of the IEWG's efforts on many dog breeds is recognized by the Fédération Cynologique Internationale, the umbrella organization of breeder associations around the world, and the Board of the World Small Animal Veterinary Association (WSAVA) who invited the IEWG to affiliate to its organization. Recently the IEWG in conjunction with the FCI organized a specialist meeting in Amsterdam to discuss new insights in screening techniques with specialist originating from 22 different countries. In addition, well attended seminars for scrutinizers to study radiographs of elbow joints, have been organized in conjunction with WSAVA-world congresses in different countries and continents, as well as in conjunction with the European Society of Veterinary Orthopedics and Traumatology / Veterinary Orthopedic Society (ESVOT/VOS) in Munich (G) and Bologna (I).

The Board of the IEWG thanks the organizing committee of the WSAVA / FECAVA/ BSAVA World Congress in Birmingham, for offering the possibility to the IEWG and its congress participants to meet in a friendly and inspiring environment. The Board of IEWG is proud to offer a stimulating program dedicated to practical and scientific aspects of ED, presented by internationally respected experts in this field, including

- **Dr. Ruth Dennis** MA, VetMB, DVR, Dipl. ECVDI, MRCVS, Head of Diagnostic Imaging, Chief Scrutineer of the BVA Hip and Elbow Dysplasia Panel, and BVA representative on its group for Genetics and Health Screening
- **Prof. Dr. Mark Flückiger**, Dr. med. vet., Dr. habil., Dipl. ECVDI, Head of Dysplasia Committee Zürich, University of Zürich, Switzerland, Member of FCI-expert group for canine hip dysplasia
- **Prof. Dr. Ingrid Gielen**, DVM, PhD, Department of Medical Imaging and Small Animal Orthopaedics Veterinary Faculty, Ghent University, Belgium
- **Prof. Dr. Herman A.W. Hazewinkel**, DVM, PhD, Dipl. ECVS, Dipl. ECVCNutrition, head companion animal orthopedics, Dept Clinical Sciences of Companion Animals, Utrecht University, chairman HD and ED scrutineer of the Dutch Kennel Club, chairman IEWG.
- **Dr. Seng Fong Lau**, DVM, PhD-candidate, researcher in elbow dysplasia in dogs, Utrecht University, Division Veterinary Imaging (Head Prof. Dr. G. Voorhout, DVM, PhD)
- **Dr. Hege Kippenes Skogmo**, DVM, PhD, Dipl ECVDI & ACVR, Division of Veterinary Imaging, Norwegian School of Veterinary Science, Oslo, Norway.
- **Dr. Bernd Tellhelm**, Dr. Med. Vet., Dipl. ECVDI, Department for Companion Animal Surgery, Justus-Liebig-Universität Giessen, Germany. Chairman of the German Association for Radiological Diagnosis of Hereditary Skeletal Diseases (GRSK), and member of FCI-expert group for canine hip dysplasia

The IEWG will keep in contact with interested veterinarians via its website (http://www.vet-iewg.org/joomla), linked to the website interesting for all veterinary surgeons (http://www.orthovetsupersite.org) organized by Dr. A. Vezzoni, past-president of ESVOT.

The Board of the IEWG wishes you all a fruitful meeting and a pleasant stay in Birmingham.

Prof. dr. H.A.W. Hazewinkel
President IEWG

PROGRAMME IEWG 2012

April 11th 2012

ICC, Hall 7b

Birmingham, UK

9.00 - 9.10 uur	Opening & Welcome Prof. dr. H.A.W. Hazewinkel (NL)
9.10 – 9.40	Experiences in ED screening in the UK Dr. R Dennis (UK)
9.40 – 10.10	Results of screening studies including radiographs and CT Dr. B. Tellhelm (G)
10.10 – 10.30	Break
10.30 – 11.15	Results of screening studies including radiographs, bone scintigraphy, arthroscopy and CT. Dr. I. Gielen (B)
11.15 – 12.00	Results of screening studies in Labradors including radiographs, artroscopy and CT. Dr. S.F. Lau (NL)
12.00 – 12.45	Elbow screening in the Nordic countries - past, present and future. Dr. H.K. Skogmo (N)
12.45 – 14.00	Lunch
14.00 – 14.45	Radiographic Procedure and Scoring of Elbow Dysplasia (ED) in the Dog Prof. dr. M.Flückiger (CH)
14.45 – 15.15	General discussion for a proposal for a multi-center study chair Prof. dr. H.A.W. Hazewinkel (NL)
15.15 – 15.30	Break
15.30 – 16.15	Film reading session: a variety of casus will be graded according to IEWG including cases braught up by the participants Prof dr. M. Flückiger (CH) & Dr. B. Tellhelm (G)
16.15	Closing remarks Prof. dr. H.A.W. Hazewinkel (NL)

List of speakers

Dr. R. Dennis, MA, VetMB, DVR, Dipl. ECVDI, MRCVS,
Chief Scrutineer, HD and ED Schemes,
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The BVA/KC Elbow Dysplasia grading scheme

Dr. R. Dennis

Background to the BVA ED Scheme

Prior to the BVA ED Scheme, a less formal screening programme, mainly for BMDs, was run for several years during the early 1990s at the Royal Veterinary College, London, initially by Dr. Sue Guthrie (PhD) and later by Dr. Matthew Pead. It was supported by the BMD Breed Council and member clubs. This scheme required a single, flexed ML radiograph and followed IEWG grading. Submission initially cost £3.00, later rising to £5.00 and about 300-400 dogs were assessed each year. The recommendation was not to breed from grade 2 or 3 dogs or those which had undergone elbow surgery.

In April 1996 an Elbow Dysplasia Working Party was convened by the BVA to plan the setting up of a larger, open ED grading scheme to complement the BVA's HD Scheme. The RVC were not in a position to expand their scheme and so SG and MP joined the BVA's working party as consultants to assist in this process, with the intention of discontinuing their scheme when the BVA's scheme was launched. Following several meetings of the BVA's Working Party and a training day for the seven proposed scrutineers (all existing members of the HD Panel), the new ED Scheme was launched formally at Crufts Dog Show in March 1998 together with extensive publicity in the veterinary and dog press. A full ED Panel Meeting was held in February 1999 and since September 1999 ED matters have been combined with the annual HD Panel meeting. Quality control exercises following blinded scoring / grading of hip and elbow radiographs are also reviewed at these meetings together with presentations and discussions about relevant issues, such as the 'double edge' sign on the anconeal process in which a normal feature mimics a small amount of new bone and can lead to mis-grading. Occasionally outside speakers, such as geneticists, also give presentations to the Panel.

Other BVA/KC Canine Health Schemes include the long-established Eye Scheme and a recently-launched MRI Scheme for assessment of Chiari-like malformation and syringomyelia.

Publicity and promotion

After the launch in March 1998, eight BVA Canine Health Schemes Roadshows for breeders were held around the country in late 1998 and early 1999, at which Panel members spoke. The Canine Health Schemes have a stand at Crufts every year, manned by CHS staff and with at least one HD/ED scrutineer in attendance each day to answer questions. Attendance at Discover Dogs, the London Vet Show and BSAVA Congress is also made and scrutineers regularly speak at dog health seminars for breeders. The BVA publish explanatory papers for the general public on hip dysplasia, elbow dysplasia, eye disease and CM/SM.

Procedure for radiography and grading

U.K. legislation requires non-manual restraint for elective radiography and so the Procedure Notes instruct that dogs should be sedated or anaesthetised for ED assessment. Evidence of hand-holding on the radiographs would generate a comment letter or rejection of the films, although it is likely that it occurs in some places without evidence on the images.

The minimum age for assessment is one year and there is no maximum permitted age. To date, the rules of the HD and ED Schemes have permitted each dog to be assessed only once during its lifetime. This was in order to prevent potential fraud, with similar-looking dogs with known good hips or elbows being presented on the second occasion under the identity of a dog which had previously received a poor hip score or elbow grade. This unfortunately meant that follow-up of degenerative change could not be made under the schemes. However, with the introduction of mandatory PID this issue can be reconsidered.

At the outset of the scheme, and after a great deal of discussion, three radiographs were required of each elbow, namely flexed and extended mediolateral and a craniocaudal (or caudocranial). This generated ill-feeling from BMD breeders who were concerned about safety from increased radiation dose and general anaesthesia and angry about the major increase in cost. However, it was felt that three views were required for the most accurate assessment.

The grading scheme is based on that of IEWG as follows:

Grade 0 = normal
Grade 1 = osteophytes at any site ≤2mm
Grade 2 = osteophytes 2-5mm **OR** a primary lesion (OCD, FCP, UAP) *with no* osteophytes.
Grade 3 = osteophytes >5mm **OR** a primary lesion (OCD, FCP, UAP) *with* osteophytes.

Joint incongruity and sclerosis are not graded as lesions, as it is felt that these are too subjective and dependent on image quality.
There is no borderline grade: there would probably be significant owner discontent at a grade requiring repeat radiography due to the requirement for chemical restraint for elbow radiography (cost and perceived risk to patient).
The certificate is completed with a numerical grade 0-3 for each elbow and the overall grade is the higher of the two. Breeding is not recommended from dogs graded 2 or 3.

During grading a separate, detailed, in-house recording form for lesions is completed. This records the presence of any changes in the elbow, whether part of the grading scheme or not. These have been used for the purposes of retrospective analysis and are also useful in appeal cases. Initially, they were completed for all elbows and they also included the question 'did the craniocaudal view change the grade'? After >3 years of running the scheme, analysis of these forms by the then Chief Scrutineer, John Houlton, suggested that in only 2% dogs did the CrCd view change the grade and after continued and endless debate at Panel meetings over several years the requirement for the CrCd view was dropped as of 1st January 2004. Since then, two ML views only have been required; a flexed view at about 45° and an extended view at about 110°. The Panel was not unanimous in its approval of this move but it was argued that it would probably increase take-up of the scheme by dog breeders, and that for a screening programme this was of paramount importance. Certainly, submissions to the scheme increased markedly after this move, although it remains a slightly contentious issue!

After this there was a suggestion to drop the extended / 'neutral' view as well and grade only using a flexed ML view. Breeders had become aware of a statement made by a radiologist in another country that only a single ML view was necessary for assessment. The in-house recording forms were changed to ask 'Did the neutral lateral view change the grade / influence your decision?', but this proposal was dropped in 2006 as the panellists felt that having two ML views increased confidence in diagnosis and made little difference to the time required for radiography.

Mechanics of the BVA ED Grading Scheme

There are currently ten ED Panel members; all are also members of the HD Panel, have Diplomas in Radiology and/or Orthopaedics and work actively in these areas.

Hip scoring / elbow grading sessions are held at BVA's London headquarters once or twice per week. On each occasion two scrutineers, paired randomly, examine several hundred sets of hip and elbow radiographs and reach a consensus score / grade for each. Radiographs are submitted by general practitioners together with a fee; there is a slightly reduced fee for combined hip and elbow submissions, which is currently £90.00. Radiographs deemed too poor for assessment may be rejected, together with an explanation of the reason(s) for rejection. Comment letters may also be sent with radiographs which can be assessed but which show significant faults.

Currently 44% of submissions are digital and are made on disc. Several years ago, there were major problems due to submission of printed digital images due (a) to poor quality of hard copy, and (b) not being exactly real size, making it impossible to perform accurate measurements for elbow arthrosis. However, the installation of a dedicated digital workstation with bespoke Norberg angle measuring software meant that digital hip and elbow submissions could be made from September 2010 in DICOM format. Assessing the radiographs on the digital workstation has greatly speeded up the process and the accuracy of measurements.

Detailed Procedure Notes are produced for both schemes by the BVA and are sent to the submitting vets as well as being downloadable from the BVA's website www.bva.co.uk.The radiographs are submitted together with part-completed certificates, which are provided by the BVA and are on thick yellow paper to reduce the chances of fraudulent reproduction. The owner and submitting veterinary surgeon complete the relevant declarations about the identity of the dog and the date of radiography. Since 1st January 2010, permanent identification (PID) in the form of a microchip or tattoo certified by the vet and shown on the images has been mandatory. The images must also be identified with the

dog's KC registration number (or other appropriate identification if not registered) and the date. Incorrect completion of certificates and identification of images is unfortunately very common and generates a great deal of work for the administrative staff, returning them for correction.

After agreement on the grade, the two scrutineers complete and sign the certificate, which is returned to the submitting vet to be passed on to the owner. The current turn-round time is two-three weeks. An Appeal Procedure exists by which the same radiographs are re-assessed by the Chief Scrutineer, whose decision is final. In recent years only 3-4 sets of elbow radiographs per year have been the subject of appeal, and in none has the overall grade changed. These are usually of dogs with obvious and severe arthrosis!

Submission numbers

The number of submissions made to the ED Scheme has risen as follows:

1998	436 (10 months only)	
1999	659	
2000	583	
2001	662	
2002	648	
2003	850	
2004	1,231	(CrCd dropped and joint HD:ED fee from 1/1/2004)
2005	1,470	
2006	1,798	
2007	1,997	
2008	2,521	
2009	2,937	
2010	3,291	(PID mandatory from 1/1/2010)
2011	3,678	

Submissions are made to the BVA's HD and ED Schemes from around the world.

Results and use of data

- Tables of numbers of dogs graded in specific breeds, and the results of grading, have been produced regularly for in-house use (see below).
- Several years ago the Kennel Club established 'The Kennel Club Genetics Centre' at the Animal Health Trust. As well as carrying out research and development into DNA tests, epidemiologists at the AHT have done considerable work on HD data and some on ED, resulting in publications:
  Woolliams, J.A., Lewis, T.W. and Blott, S.C. (2011) Canine hip and elbow dysplasia in UK Labrador retrievers. *The Veterinary Journal* **189** 169-176.
  Lewis, T.W., Ilska, J.J., Blott, S.C. and Woolliams, J.A. (2011) Genetic evaluation of elbow scores and the relationship with hip scores in UK Labrador retrievers. *The Veterinary Journal* **189** 227-233.
- Results of ED grading for KC registered dogs, together with other scheme results, have always been published by the KC and are now freely available via the KC's website, using the Health Test Results Finder. Estimated breeding values (EBVs) for individual dogs for various diseases including ED will also be produced.
- Ruth Dennis is the BVA's representative on the Kennel Club's Genetics and Health Screening sub-group, which was set up in May 2010 and which meets twice a year.
- A paper for *In Practice* explaining the use of scheme results is planned for the future, as a companion article to a recent paper about the HD Scheme (*In Practice* 2012 **34** 178-194).

Grades (all breeds)

Year	Grade 0	Grade 1	Grade 2	Grade 3	**Grades 2+3**
1998 (10m)	66%	18%	8%	8%	**16%**
1999	69%	17%	9%	5%	**14%**
2000	71%	14%	10%	5%	**15%**
2001	77%	10%	9%	4%	**13%**
2002	79%	10%	7%	4%	**11%**
2003	80%	8%	7%	5%	**12%**
CrCd view dropped					
2004	78%	11%	8%	3%	**11%**
2005	80%	10%	7%	3%	**10%**
2006	80%	10%	7%	3%	**10%**

The above table shows the most recent information which was produced by the KC's Geneticist which analysed the grades by year (and also by individual breed). This suggests that after dropping the requirement for the CrCd view slightly fewer primary lesions were identified hence fewer grades 2 and 3 were given, although the difference is not as marked as might be expected. The BVA scrutineers are generally cautious about identifying FCP on ML views alone unless there is obvious flattening of the bone.

Grading primary ED-Lesions and elbow osteoarthrosis according to the IEWG protocol

B. Tellhelm

The diagnosis of canine elbow dysplasia (ED) in screening programs is based on the evaluation of radiographs according to the protocol of the International Elbow Working Group (IEWG). The most recent update of this protocol is available on the IEWG web site (http://www.vet-iewg.org/joomla). A mediolateral flexed projection of each elbow joint is mandatory for interpretation and an additional craniocaudal view is highly recommended. The IEWG protocol registers signs of arthrosis and the presence of the major forms of primary lesions (FCP, OCD, UAP, Incongruity). The films are evaluated in a two-stage process: a) to assess the degree of secondary joint disease (arthrosis) and b) to check for signs of a primary lesion.
Any other abnormal finding should also be reported.

The status of the elbow joint regarding arthrosis is scored as either "normal" (Grade 0), mild (Grade 1, osteophytes less than 2 mm high anywhere in the joint), moderate (Grade 2, osteophytes 2 – 5 mm high) and severe (Grade 3, osteophytes higher than 5 mm). In the updated protocol the severity of joint incongruity has been included.
The primary lesions have been defined by the IEWG (for details see the IEWG website).

Scoring (updated 2010)

The elbow findings are scored according to the severity of the arthrosis (DJD) and/or the presence of a primary lesion

Elbow Dysplasia Scoring		Radiographic Findings
0	Normal elbow joint	Normal elbow joint, No evidence of incongruency, sclerosis or arthrosis
1	Mild arthrosis	Presence of osteophytes < 2 mm high, sclerosis of the base of the coronoid processes - trabecular pattern still visible
2	Moderate arthrosis or suspect primary lesion	Presence of osteophytes of 2 - 5 mm high Obvious sclerosis (no trabecular pattern) of the base of the coronoid processes Step of 3-5 mm between radius and ulna (INC) Indirect signs for a primary lesion (UAP, FCP/ Coronoid disease, OCD)
3	Severe arthrosis or evident primary lesion	Presence of osteophytes of > 5 mm high Step of > 5 mm between radius and ulna (obvious INC) Obvious presence of a primary lesion (UAP, FCP, OCD)

A Borderline (BL) score between ED 0 and ED 1 is allotted to dogs with minimal anconeal process modelling of undetermined aetiology in some countries.

How many projections?

The minimal requirement is a true ML projection of each elbow. Excessive pronation or supination should be avoided. In a maximally flexed position (as it is the standard view in many countries) the elbow is often markedly supinated, making correct interpretation of shape and structure of MCP, sclerosis caudal to MCP and spur formation cranially difficult.
An OC defect may easily be missed on the ML projection, but can usually be identified on a Cr Cd 15° pronated view. As scrutineers in many European countries (e.g. Scandinavia, UK) ask only for a maximally flexed ML view of the elbows, an OC lesion may not be recognized.
For many years a Cr15L-CdMO pronated view was considered mandatory for the diagnosis of FCP. However recent results of CT examinations and arthroscopy indicate that radiological findings typical for the presence of FCP can be identified on the ML view quite consistently. The ML projection may therefore be sufficient to diagnose or suspect the presence of a FCP reliably in a screening program. As reported before two ML-projections - flexed (30°-40°)and neutral (100° - 120°) position give the

best information concerning shape and structure of MCP and is also diagnostic for incongruity and osteophytes. On radiographs of good quality even many OC lesions are visible on the flexed ML.
The main problem from my point of view is not the number of radiographs but the intention of the expert to register all findings which can be detected even on one ML view if it is of good quality and the elbow positioned correctly.

How to score ED?

ED scoring on the basis of a combination of the severity of arthrosis (DJD) and radiographic findings indicative for a primary lesion or evidence of a primary lesion is not uniformly used in Europe and overseas. The Scandinavian countries for example started scoring in the early 80ies prior to the foundation of IEWG. Their classification is based on the degree of arthrosis, while of the primary lesions only UAP is recorded. This scoring system is used in Scandinavia and also in the UK and USA/Canada.
The most common primary elbow lesion is a FCP. Pertinent radiological findings on the ML projection are a blurred and deformed cranial edge of the medial coronoid process (MCP), a reduced opacity of its tip, an increased opacity of the ulnar notch at the level of the coronoid processes and an increased and/or incongruent joint space between humerus and radius. It is important to recognize that even minimal changes are usually pathognomonic for FCP qualifying an elbow for at least an ED grade 2 (moderate ED, Coronoid disease/ *FCP indicated*) according to the current IEWG protocol regardless of the height of osteophytic new bone formation. The severity of new bone formation is quite variable and some dogs may not show any new bone formation at all. If grading is based on the size of the osteophytes only, many elbows with FCP will be underscored and may even be considered free of ED.

Beware of conflicting data

As mentioned above the IEWG scoring system is a two-step procedure, a) assessing the degree of arthrosis and b) registering any signs indicative of a primary form of ED. Bear in mind that various countries in Europe and overseas only rely on step a). Both concepts have proven to be useful in reducing ED in a population. However problems arise when dogs are to be used for breeding in countries with differing scoring system. In such a case it is advised to re-score the dog again according to the local scoring mode. It will be the aim of IEWG to harmonize the scoring systems in the future.

Slice imaging and appeal procedure

Diagnosing FCP radiographically may be based on subtle findings which may be difficult to convey to the dog owner. As a consequence an increasing number of appeals are filed and owners ask for a CT study to be included in the re-evaluation process. No standardized protocol for CT examination of the canine elbow have been proposed. IEWG plans to install a standardised protocol for appeal procedures, the use of CT and/or MRI examinations and the technical requirements of such studies.

Update on diagnostic imaging in elbow disease.

I. Gielen, K. Kromhout, W. Dingemanse, H. van Bree

Elbow dysplasia (ED) is characterized by varying degrees of elbow incongruity, bony fragments (bone chips), and ultimately, severe arthrotic change. The term was introduced to describe generalized osteoarthrosis (arthrosis) of the elbow joint in which the anconeal process may be ununited (UAP), the medial coronoid of the ulna may be fragmented (FCP), and osteochondrosis of the humeral condyle (OCD) may be present. These three aetiologies resulting in ED can be present individually, but it is important to note that there can be considerable overlapping in their presence.

In diagnosing ED there a two different issues: there is the need for selecting ED free breeding stock and there is the diagnosis of the condition in the individual patient presented for forelimb lameness. For selection purposes, most of the time the secondary degenerative joint (DJD) changes are scrutinised by means of radiographs and mostly the individuals are not suffering lameness. For the individual patient the early diagnosis of the primary lesion is very important because an early treatment guaranties a better prognosis.

The diagnosis of elbow dysplasia in lame dogs is made from a combination of clinical signs, palpation (manipulation) of the joints, and medical imaging. A wide range of imaging options is now available but the “perfect” imaging protocol does not exist because each modality has his strengths and limitations. Economic considerations will also have to be taken into account.

In case where the clinical examination is not providing a clear localisation or in case of uncertain radiographic findings, **scintigraphy** is a useful technique to localise the cause of lameness. Although it is very sensitive, it is not very specific and the spatial resolution offered, is not well enough to specify anatomic structures. Recently a micro-single photon emission tomography (µ-SPECT) technique has been described. HiSPECT has a much higher resolution and allows better differentiation of the anatomical areas in the elbow joint. A major drawback to joint imaging by scintigraphy is the normal uptake at the end of long bones, especially in immature animals. In some instances it is difficult to determine whether a difference in counts between two joints represents a meaningful finding. Comparison of bilateral images, acquired over the same time, and quantitative analysis of joint images by computer can provide diagnostic guidelines.

Radiography is still the standard technique for diagnosing elbow disorders in the dog. It is readily available, cost effective and has excellent spatial resolution. Correct radiographic technique is critical for making the diagnosis and multiple views should be taken, and if ED is evident, radiographs of the other elbow are appropriate given the possibility of this problem occurring in both elbows. Three recommended views are a mediolateral, flexed and extended view and an oblique craniomedial-caudolateral view (for better evaluation of the medial elbow compartment). The radiographs taken must be of excellent quality, since changes in the bone/joint structure can be sophisticated. UAP is easily detected with radiographs and in most cases, a diagnosis of OCD can be made with radiographs as well, although a distinction with “kissing lesions” is not always possible. It is a challenge to base the diagnosis of FCP on survey radiographs alone. Unfortunately, the radiographic findings may not be conclusive and in the majority of cases, these lesions can only be indirectly diagnosed by the appearance of secondary osteophytes. These osteophytes are signs of a secondary DJD and may have other cause than only FCP. Also, they do not appear until the dog is about seven to eight months old. The problem is that the coronoid process is a relatively small piece of bone that on the radiographic views is superimposed on the other bony structures within the elbow. Given that superimposition, if the lesion is small, it may be difficult, if not impossible, to see. In many of the cases in which the coronoid process cannot be visualized there will be bony changes in other areas of the joint that will strongly suggest FCP. Sclerosis (increased bone density) of the ulnar notch is mostly evident but the visual assessment of sclerosis is rather subjective and may not only be used in the individual patient for the diagnosis of FCP. Additional characteristic radiographic features consistent with the diagnosis of FCP also include loss of detail in the delineation of the medial coronoid process and a blunted or indistinct form of the medial coronoid process. Also evaluating these features is somewhat subjective and can be hindered in immature animals due to superimposition of the open epiphysis of the proximal radius. The ideal situation, however, would be that FCP and/or OCD within the elbow joint could be directly diagnosed before the radiographic appearance of DJD changes, being signs of joint damage. For these reasons, imaging techniques that provide direct visualisation of the medial coronoid process and other joint structures would improve the accuracy of preoperative diagnosis of FCP and would contribute to the early diagnosis of this condition.

Radiographs will reveal incongruity of the joint if the step is large enough.

If the information from the radiographs is equivocal, **CT scan** can typically help significantly in establishing a firm diagnosis. As with any technique, the performance of the computed tomography study needs to be done on a technically good manner. The positioning of the patient is very important

and CT of both elbow joints extended with the head pulled back outside the gantry results is better quality images and less artefacts. The scan parameters kV and mA should be high and thin slices eventually with an overlap are preferred. Images should be obtained in bone algorithm and proper windowing during the evaluation of a study is a necessity. The modality of multiplanar reconstructions in different planes is useful in order to evaluate the complete joint surface. Abnormalities in the area of the medial coronoid process include: fragmentation (displaced or non-displaced), fissure, abnormal shape, sclerosis, osteophytes, and lucencies. In the area of the medial humeral condyle sclerosis, lucency, and/or flattening can be evaluated and a differential diagnosis between kissing lesions and real OCD lesions can be made All these abnormalities can be diagnosed on the transverse and reconstructed images. In several cases CT findings, like fissures at medial coronoid process and subchondral luscencies at medial humeral condyl, were useful for decision making in the arthroscopic treatment of these lesions. Ununited anconeal process with or without humeroulnar incongruity can be appreciated and the incidence of incongruities of the humeroradial, humeroulnar, and/or radioulnar joints can be accurately appreciated. On transverse CT slices, at the level of the trochlear notch of the ulna and the humerus, the fitting of the joint space can be noticed. On the reconstructions in the sagittal and dorsal plane, at the level of the trochlea humeri and the lateral compartment the incidence of a step between the ulna and radial head, the shape of the trochlear notch and the fitting of the humeral condyle in the trochlear notch can be evaluated.

MRI has limitations for imaging the canine elbow based on the relatively small size of the joint and complex articulations in conjunction with the thin articular cartilage surfaces of the humerus, radius, and ulna. These limitations depend also of the field strength of the MR device. All MRI planes, dorsal, sagittal, and axial/transverse, are potentially useful for diagnosis of elbow disorders. This technique offers a great visualisation of the soft tissues around the elbow joint and in cases of pathology within the flexor tendons its application can be very useful. The incidence of subchondral bone pathology and oedema can be diagnosed.

Ultrasound (US) is a potential valuable imaging technique of the musculoskeletal system in small animals. Linear transducers with frequencies higher than 7.5 MHz are used because of their flat application surface and high resolution power. Accurate examination of joints requires substantial ultrasonographic experience and a standardised examination procedure. In most of the joints even small amounts of fluid accumulation (hypo- to anechoic) can be easily demonstrated in the area of the joint pouches. Although a thorough US study of the normal elbow joint has been conducted US is only of limited use in the diagnosis of a fragmented coronoid process. Only large displaced fragments can be diagnosed with certainty. Also US is helpful in diagnosing flexor tendon pathology.

A study of 180 elbow joints of clinical patients will be presented. The findings on the flexed lateral radiograph, a set of lateral flexed, lateral extended and cranial views, the corresponding CT examination and the arthroscopic findings are compared.

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Radiographic, computed tomographic and surgical findings in 34 Labrador Retrievers with medial coronoid disease (MCD)

S.F.Lau, L.F.H.Theyse, H.A.W.Hazewinkel, A.J.M van den Belt, G.Voorhout

Introduction

Medial coronoid disease (MCD), encompasses the entire lesions found at the medial coronoid process (MCP) on both articular cartilage surface and subchondral bone layer [1, 2]. Screening of the elbow joints is traditionally performed radiographically by using one to four views per elbow, with a sensitivity estimated to range from 10 to 62% [3-6]. Computed tomography (CT) appears to be superior to radiography since the images can be interpreted in different reconstructive views and slices [7-11], with a sensitivity of 88.2% in detecting MCD [6]. Both arthroscopy and arthrotomy allow the direct visualization of the medial compartment of elbow joint as well as assessment of cartilage lesions [12]. Arthroscopy was claimed to have higher diagnostic value than radiography and CT in detecting experimental joint incongruity (INC) [11]. The aim of this study was to report radiographic, CT and surgical findings in thirty four Labrador Retrievers and its cross with complaints of forelimb lameness and to further investigate the correlations between the diagnostic variables and surgical findings.

Material and methods

Patient medical records from the University Clinic for Companion Animals at Utrecht University from year 2008 until early 2012 were retrieved for review. Thirty four Labrador Retrievers and Labrador Retrievers cross (n = 43 elbows) with complete radiographic, CT and surgical records were included in the study. Elbow status of all dogs was assessed based on four radiographic views; mediolateral (ML), extended mediolateral, craniocaudal (CrCd) and craniolateral-caudomedial oblique (CrL-CdMO) views. Radiographs were graded according to the IEWG protocol [13] by a panel of three; two experienced board certified surgeons (H.A.W.H., L.F.H.T.) and a board certified radiologist (A.J.M.B.). CT scanning was performed before the surgery was done. Arthroscopic or arthrotomy findings were used as gold standard to provide the definitive diagnosis, as well as treatment purposes. Lesions at the cartilage surface of the medial coronoid process (MCP) and of the medial aspect of humeral condyle were graded by using a 6-point ordinal scale based on the Modified Outerbridge Scores [14].

Results

The mean age of the dogs at investigation and treatment was 29 months with a range from 5 to 97 months. Dogs younger than 12 months of age were over-presented with incidence of 50%, and males were more prominent than female with a ratio of 2:1. Of 34 dogs, 9 dogs (26.5%) were operated bilaterally and 19 dogs (55.9%) were operated unilaterally on the right elbow joint and 6 dogs (17.6%) on the left elbow joint.

Of 43 elbow joints from clinical patients, ulnar subtrochlear sclerosis was the most common finding radiographically ("e" on IEWG score), and present in 72.1% of the elbow joints, followed by 65.1% with an alteration of MCP contour which are both detected on the ML and extended ML view ("c" on IEWG score). Fragmented medial coronoid process (FMCP) as primary lesion was observed in 30.2% of the elbow joints. Different degrees of osteophytes formation (“a”, “b”, “d”, “f”, and “g” on IEWG score) were found in 58.2% of the elbow joints. OCD-like lesion ("h" on IEWG score) was identified in 11.6% at the medial aspect of humeral condyle on CrCd and CrL-CdMO views and similar percentage was applied to INC as well. Of 43 elbow joints, 16.3% were scored as elbow dysplasia (ED) grade 0, 11.6% as ED grade 1, 25.6% and 46.5% were scored as grade 2 and 3, respectively.

In our study, CT evaluation was mainly based on the detection of primary lesions in comparison to radiography. Fragmentation or fissure lines in the subchondral bone were observed in 86.0% of the elbow joints. Different grades of osteophytosis were found in 67.4% of the elbow joints. In contrast with the radiographic interpretation, there was only 32.6% and 11.6% of the elbow joints interpreted as having sclerotic lesions and alteration of MCP contour, respectively. OCD-like lesion and INC were observed in 37.2% and 11.6% of the elbow joints.

All the clinical patients were diagnosed with different features of MCD surgically; lesions involved only the cartilage surface, non-displaced fragment and displaced fragment. Displaced fragment appeared to have the highest incidence (48.8%), followed by non-displaced fragment and lesions on the

cartilage surface which was found in 39.5% and 11.6% of the elbow joints, respectively. Median for Modified Outerbridge score of the MCP was 1 and for the medial aspect of humeral condyle was 4. Correlations between both radiographic and CT findings with different features of MCD were assessed by using Spearman's rank correlation coefficient and result showed generally negligible or weak correlations (r_s, 0.024-0.299, p>0.05). Among the wide range of diagnostic variables, ulnar subtrochlear sclerosis detected radiographically appeared to have the "strongest" correlation (r_s = 0.299, p>0.05) and ED grades had the "weakest" correlation (r_s = 0.024, p>0.05) with different features of MCD.

Conclusions

Our results indicate for Labrador Retrievers and its cross, diagnostic variables obtained from radiograph and CT are relatively negligible or weak correlated with the different features of MCD, and statistically not significant (p>0.05). However, this study was only performed on the clinical patients with MCD and lack of a disease-free control group limits the result interpretation.

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Elbow screening in the Nordic countries
– past, present and future.

H.K.Skogmo

Past and present

The elbow screening programs was initiated in the 1980's in Norway, by professor Jorun Grøndalen. Rottweilers, Bernese mountain dogs and New Foundland dogs were the first breeds to participate. By the late 1980's more breeds were included. In the 1990's the scrutinizers in the Nordic countries formed a working group to ensure uniformity in procedures, regulations and radiographic evaluation.

The Nordic scrutinizers have close collaboration. We mail radiographs of 20 cases around for everyone to review every 6 months, and meet up every 6 months for discussions of scientific aspects, protocols, procedures and discussion of the diagnosis of the cases we all have viewed. All together, we viewed a total of 26 648 cases in 2011, which is a representative number for what we have each year. The Nordic scrutinizers have the same diagnostic criteria for diagnosis of elbow dysplasia (ED), and the same procedures. We evaluate one lateral 45-60 degrees flexed radiograph. We grade periosteal proliferations with a scale of 1 (less than 2 mm), 2 (between 2 and 5 mm) and 3 (more than 5 mm, or known primary diagnosis).

We have rules to prevent owners, breeders and even veterinarians from selecting which dogs to be registered with an ED diagnosis. All puppies in a litter have to be registered in the kennelclub, with an ID chip. These formalities ensure that we will not first screen a purebred "unregistered dog" which later will register in the kennelclub if the right diagnosis is made. All forms and requisitions for official screening of the dog has to be signed by the owner and the veterinarian **before** the radiographs are made, and most owners have already registered and paid for the screening before the radiographs are made (this version is cheaper, and in some countries the only option). This ensures that **all** radiographs are mailed to the scrutinizers for registration of the results, regardless of the severity of the findings on the radiographs.

The diagnosis for each individual dog is published through a web-based service, for everyone to see. The breeding clubs have their own rules for breeding dogs with screening diagnosis of ED. The criteria for selection of breeding animals have evolved since the beginning, with increasing knowledge and increasing population of dogs free of radiographic ED. Most breeding clubs would now accept grade 1 in one of the parents, but since all diagnosis are known publically, the breeders tend to only use dogs free of ED. Some clubs have even demands of a certain percentage of relatives and offspring to be free of radiographic ED.

Owners and veterinarians can appeal the initial diagnosis, and the radiographs are then mailed around to the entire Nordic group. The median diagnosis of the group is the final diagnosis. An owner can also submit new radiographs taken at least 6 months later for a new review.

Five breeds – German shepherd dogs, Bernese mountain dogs, Rottweiler, Labrador retriever and Golden retriever have been evaluated more closely. The percent of the registered dogs that are radiographed vary somewhat between breeds and between countries. Bernese mountain dogs are the breed with the highest percent radiographed dogs - in 2011 73 percent of all Bernese mountain dogs were radiographed in Sweden, whereas Labradors in Denmark and Golden retrievers in Norway were on the low end of the scale with only 23 percent of registered dogs being radiographed the same year. On average, 44 percent of the dogs of these breeds were radiographed in the Nordic countries in 2011.

Figure 1 is a display of the percent of dogs radiographed in the five different breeds, in the different countries.

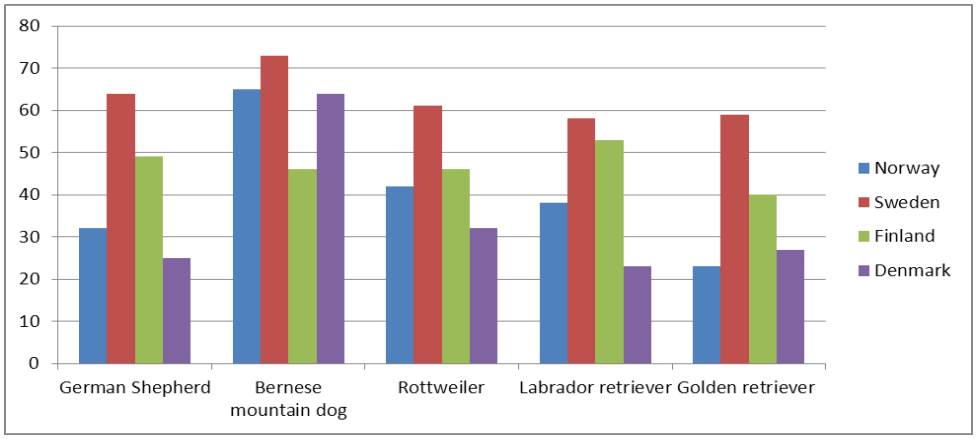

Figure 1. *The precent of dogs radiographed in 2011*

The percent of dogs with a positive diagnosis (1, 2 or 3) has decreased since screening and selective breeding was initiated, but the response varies somewhat between the breeds. The Norwegian breeders of Bernese mountain dog have mostly bred dogs with AD free elbows, and does also have requirements of less than 35% ED of all siblings and offspring, and dogs without a radiographic diagnosis is considered dysplastic. Figure 2 displays the improvement in the breed, and the numbers are also supported by clinical experience. Bernese mountain dogs are no longer a typical dog for clinical elbow disease.

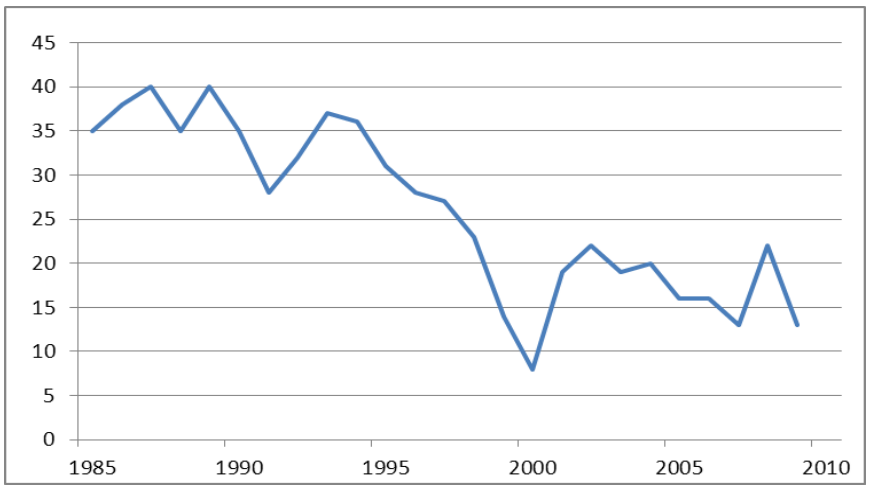

Figure 2. *Percent of Norwegian Berner sennen dogs with ED*

All the Nordic countries have a relatively similar percent of dogs with a radiographical ED diagnosis. Figure 3 shows the percent of dogs within these five breeds with a positive ED diagnosis on screening radiographs in 2011.

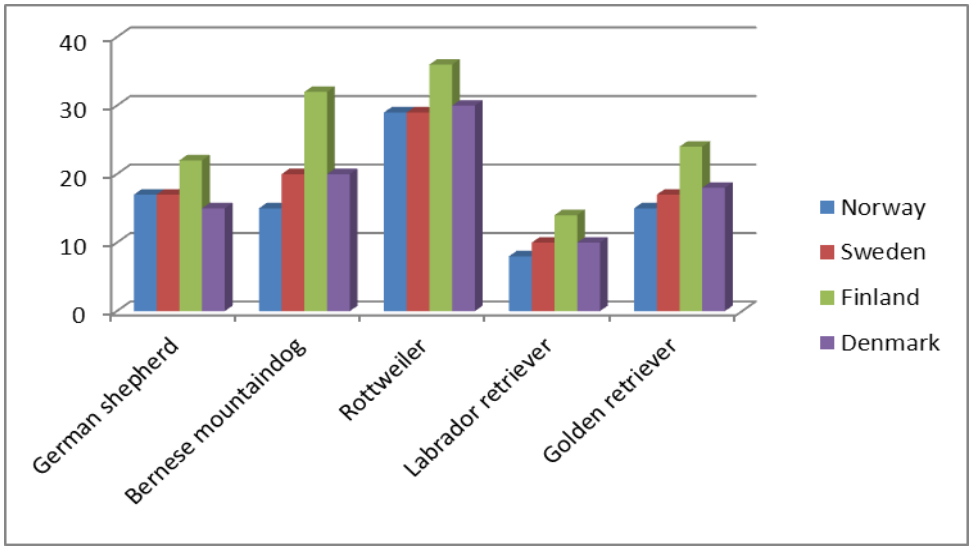

Figure 3. *Percent of dogs with a positive ED diagnosis in 2011*

The trend to get improved radiographical ED diagnosis is clear for these breeds. Figure 4 shows the decrease in percent of dogs with a radiographical diagnosis of ED in screening programs from 1995 until 2011, when the results from the different Nordic countries are grouped together.

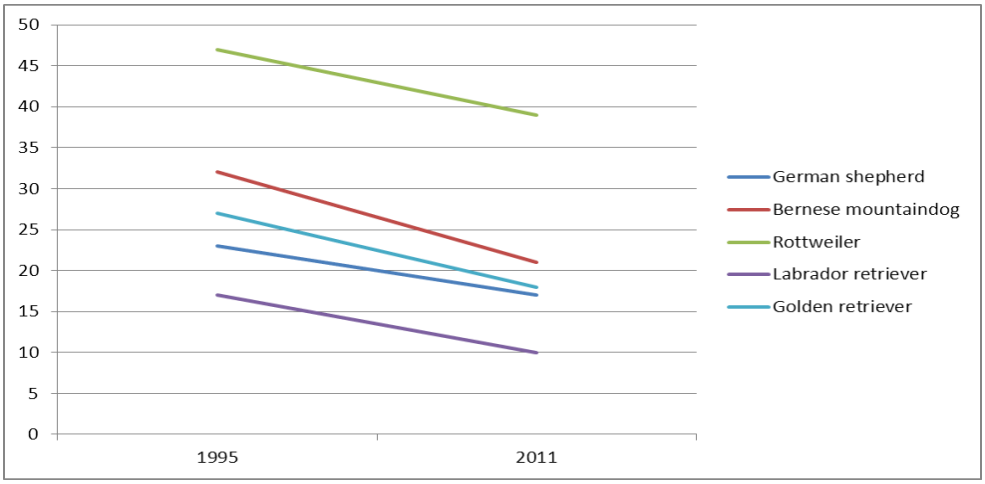

Figure 4. *The percent of dogs with a radiographic ED diagnosis in 1995 og 2011.*

The trend of fewer and fewer dogs with a radiographical screening diagnosis of ED is also supported by the impresison of less dogs with clinical manifestations. But the insidence of clinical elbow disease is however much more difficult to get correct numbers of, and the clincial impression has not been verified yet.

Future

Although the screening program and breeding selection is effective, there is still need for further improvement. There are two methods we are implementing now which we believe will bring even further reduction in the incidence of this disease.

1) Ensure that dogs with clinically significant elbow disease are registered. We have close collaboration with the main insurance companies which now denies payment of diagnostic workup or surgery unless the diagnosis is registered in the kennel club. We are reminding and encouraging all the veterinarians who do surgery to report their findings. We will demand that the owner and veterinarian have to sign that the dog has never been operated before radiographed for official screening of ED. Dogs with an ulnectomy will be considered dysplastic. These dogs with a clinically significant disease represents the most important animals to be registered in order to registered represents all these dogs registered , this group of dogs is still considered to represent an important source for continued improvement in the screening program.

2) Implement an index for ED. Index based breeding can be used when we have knowledge about close relatives of the animal, and particularly beneficial for traits with a relatively low heritability. We are lucky enough to have knowledge about almost all relatives of our breeding animals of the important ED breeds, and the index method will ensure that we can use all this information to gain as much knowledge about the breeding animal as possible. Index values are already implemented for HD for many breeds in the Nordic countries, and also implemented in some breeds for ED in Finland. The remaining Nordic countries are planning to implement index for ED for selected breeds soon.

The screening method we use will not diagnose all dogs with coronoid disease and osteochondrosis of the medial humeral condyle. We are discussing implementing more sensitive screening methods, including more views and stronger weight on sclerosis and coronoid process evaluation. We do however have to be careful to maintain our strong support in the owner and breeder community. We believe having objective methods with high inter-reader agreement, and low number of false positive diagnosis is crucial to maintain the high support of our screening program.

Radiographic Procedure and Scoring of Elbow Dysplasia (ED) in the Dog

(Requirements for the IEWG standardized screening procedure, updated version 2011)
M. Flückiger.

Radiographic technique

1. Minimal age for official scoring "sound" is 12 months. Some breed clubs have issued specific requirements. Earlier scoring "dysplastic" is possible in dogs with obvious primary lesions. **Dogs showing an elbow lameness should get radiographed at any age.**
2. Both elbows are radiographed.
3. Rare Earth screens with a speed of 200 or less are recommended in film-screen systems.
4. The elbow is placed directly on the cassette, no grid is needed.
5. The beam is collimated to improve image quality (does not apply in digital systems).
6. For the mediolateral projection the elbow is flexed (45-60° opening angle between humerus and radius), resulting in concentric superimposition of the humeral condyles. The medial coronoid process (MCP) itself is best identified on a mediolateral view with the limb extended and 15° supinated. Good results are achieved with a 50 – 60 kV-setting.
7. A craniocaudal 15° pronated view is strongly recommended to identify OC lesions.
8. Radiographs are permanently marked with a) the date of the examination, b) the identity of the dog, c) the identity of the owner of the dog and d) the clinic making the study.

Film interpretation procedure

9. Radiographs are screened for elbow disease by competent and qualified persons, preferably ECVDI/ECVS or ACVR/ACVS diplomates. An open list of qualified persons has been filed at the FCI office by the advisory panel of the scientific committee of the FCI.
10. If equivocal findings make a final scoring impossible, a second radiographic examination is indicated after 3-6 months.
11. A possibility for appeal prior to release of the results is provided.
12. Results of the evaluation are open to researchers, dog owners and breeders.
13. Radiographs will be archived at an appropriate location for 10 years.

Film Interpretation

Radiographic findings vary depending on breed, etiology, severity, and duration of ED. The radiographic diagnosis of ED is based on presence of arthrosis and/or a primary lesion such as

- medial coronoid disease (malformed or fragmented medial coronoid process)
- osteochondrosis of the medial humeral condyle,
- ununited anconeal process, both partially or completely,
- marked incongruity of the articular surfaces suggesting radio-ulnar length discrepancy, and humero-ulnar incongruity (step formation, subluxation).

Futher findings (of unknown etiology and relevance) may be

- mineralisation of periarticular soft tissue (flexor tendons originating at medial humeral epicondyle),
- DJD resulting from unknown origin,
- any other abnormality noted.

Normal elbow joint, radiographs

Mediolateral view, 45 ° flexed

Cranio-15°lateral-caudomedial view
(i.e. craniocaudal projection, 15° pronation)

Primary ED-Lesions (IEWG)

- Medial coronoid disease (MCD), fragmented medial coronoid process (FCP),
- Osteochondrondritis (dissecans) medial humeral condyle (OCD)
- Ununited Anconeal process (UAP)
- Severe Incongruity/step between radius and ulna (Inc)

Radiographic findings in cases of FCP, MCD

Mediolateral radiograph (not all features may be noted!):

- Indistinct and/or deformed contour of the medial coronoid process.
- Irregular / reduce bone opacity of the medial coronoid process
- Note: A fragment is rarely seen!
- Increased subchondral bony opacity (sclerosis) in distal part of semilunar notch, and loss of trabecular pattern. (Sclerosis is rarely noted in German Shepherds with FCP!)
- Step formation between radius and ulna
- New bone formation dorsally and laterally on the anconeal process, on the cranial border of the radius, on the medial humeral condyle, on the lateral humeral epicondyle
- Uneven joint space width between humerus and radius.

Cranio-caudal radiograph (not all features may be noted!):

- New bone formation on the medial articular border of humerus and ulna
- Visualisation of a bony fragments is uncommon
- Step formation between radial and ulnar subchondral bone plate, particularly medially
- Humeroradial joint space medial wider than lateral, particularly in Bernese Mnt dogs
- Occasionally a subchondral bone defect is seen in the medial humeral condyle (OCD or kissing lesion) with or without subchondral sclerosis, while a bony flap is rare.

Beware of artifact: The sagittally running radiolucent line within the MCP usually represents the edge of the ulna and not a fissured PCM!

Findings in cases of OC/OCD (Osteochondrosis, Osteochondritis dissecans) or contact (kissing) lesions

DJD similar to FCP, but usually less pronounced. Typical findings are

- Defect in articular surface of medial humeral condyle, best seen either on the craniocaudal or mediolateral extended view
- A detached bony fragment is rarely present
- The defect may be missed with suboptimal positioning and a ml projection alone!

Findings in cases of UAP (ununited anconeal process)

- Irregular radiolucent vertical line between anconeal process and ulna after 18 weeks of age
- Incomplete fusion results in a patchy irregularly mineralized AP
- Irregular subchondral sclerosis
- Progressive DJD depending on duration of process

Scoring of ED according to IEWG (updated 2012)

The elbow findings are scored according to severity of the arthrosis (DJD) and/or other signs indicating presence of a primary lesion

Elbow Dysplasia Scoring		**Radiographic Findings**
0	Normal elbow joint	Normal elbow joint, No evidence of incongruency, sclerosis or arthrosis
1	Mild arthrosis	Presence of osteophytes < 2 mm high anywhere Sclerosis of the base of the coronoid process, trabecular pattern still visible.
2	Moderate arthrosis or indication for a primary lesion	Presence of osteophytes of 2 - 5 mm high Sclerosis of the base of the coronoid process, loss of trabecular pattern Step of 2 - 5 mm between radius and ulna (suspect INC) Other signs indicating presence of a primary lesion (UAP, FCP, OCD)
3	Severe arthrosis or evidence of a primary lesion	Presence of osteophytes of > 5 mm high Step of > 5 mm between radius and ulna (obvious INC) Evident presence of a primary lesion (UAP, FCP, OCD)

A borderline (BL) subscoring between ED 0 aund ED1 is used in some countries. It is defined as minimal modelling of the anconeal process of undetermined etiology.

Differential diagnoses (a selection)

Common

- Panosteitis (Enostosis)

Less common

- Premature closure of a growth plate (usually distal ulna, traumatic in origin)
- Non-traumatic short ulna syndrome or elbow malformation in chondrodysplasic dogs
- Avulsion of flexor muscle origin at medial epicondyle
- Mineralisation (metaplasia) of flexor origins
- Trauma induced elbow arthrosis

Rare

- Osteomyelitis
- Septic arthritis
- Hypertrophic osteodystrophy
- Incomplete ossification of the humeral condyle (IOHC)
- Mineralisation of extensor muscle origin at lateral epicondyle
- Congenital elbow luxation with lateral displacement of the radial head

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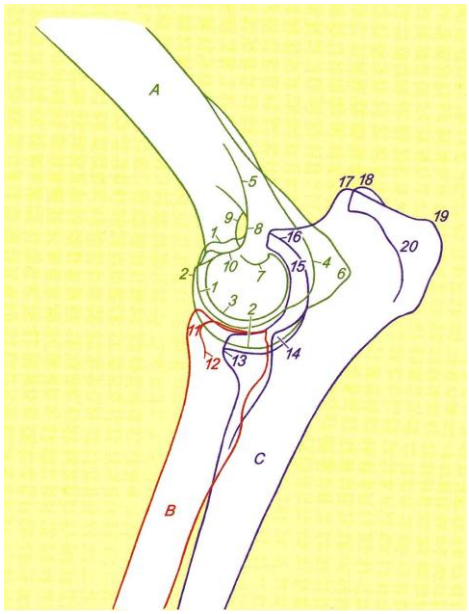
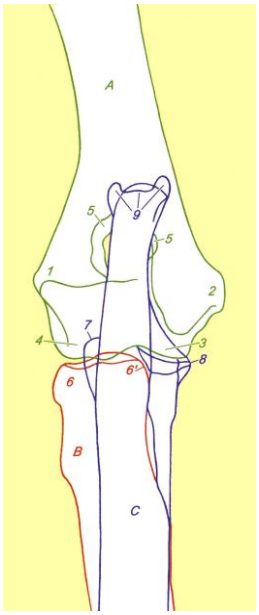
- Morgan JP, Wind A, Davidson A: Hereditary bone and joint diseases in the dog, schlütersche 2000.

Normal Elbow Joint (from Waibl et al.: Atlas of Radiographic Anatomy of the Dog, Parey 2003)

mediolateral view



craniocaudal view

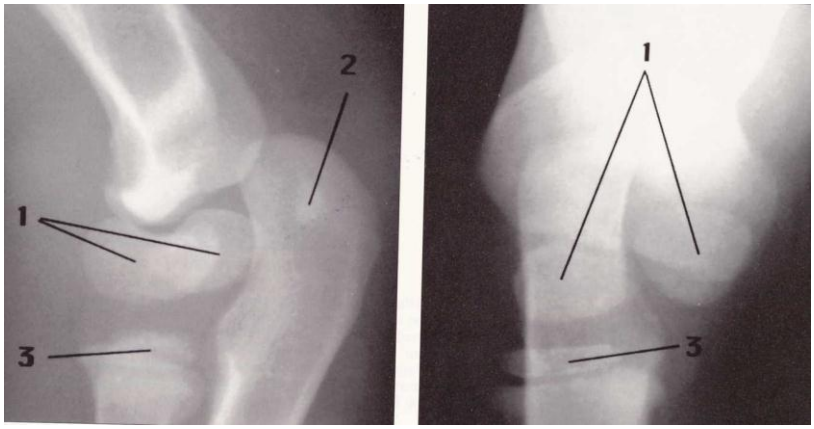


Legend

A Humerus, B Radius C Ulna

2	medial humeral condyle	3	medial humeralconyle
4	lateral epicondyle	7	lateral coronoid process
6	medial epicondyle	8	medial coronoid process
13	medial coronoid process		
14	lateral coronoid process		
16	ancoeal process		

Ossification centers in the elbow joint of a puppy



Ossification centers of 1 humeral condyle, 2 medial epicondyle (anconeal process not yet visible!), 3 proximal radial epiphysis.

IEWG or WSAVA

Certificate of radiological Elbow Dysplasia examination

Examination based on International Elbow Working Group Standards

Logo Kennel Club

Archieve and Registration for Great Britain

Etc..Etc..

Registration .nr. Examination

ED-GB

National reg.veterinarian reg.nr. examiner

Animal

Name

Breed

Registration nr

Tattoo

Microchip nr

Date of birth (day - month - year)

Sex: F (female intact) Fs (female spayed) M (male intact) Mc (male castrated)

Owner/agent

Name

Address

Country, Zip (country, ZIP code)

Town

The undersigned agrees to the WSAVA/IEWG examination protocol, the rules of the national scheme and confirms that the dog submitted for examination is the one described above. Signature also means that the results are available for official publication.

Signature owner / agent

Examination (veterinarian, age o/t dog, radiologic views)

Veterinarian

Name

Address

Country, Zip (country, ZIP code)

Town

Identification o/t dog

Check tattoo: Correct Partly /unreadable Incorrect Absent

Check microchip: Correct Incorrect Absent

Radiologic examination

Date radiologic examination (day - month - year)

Age (Year - Months)

Number of radiographs per elbow: 1 2 3 4 5

Radiologic projections: ML-flexed (Medio-Lateral 45°-flexed); CC (Cranio-caudaal); CC-15°pronated (Cranio-caudaal-15°pronated); ML-neutral (Medio-Lateral 90°-ext.); ML-extended (Medio-Lateral >120°ext.); Other: (specify)

The undersigned agrees that the examination is performend according to protocols of the WSAVA (World Small Animal Veterinary Association) and her affiliate, IEWG (International Elbow Working Group).

Furthermore the undersigned states that the dog, submitted for IEWG-elbow-examination is the above mentioned dog. The results will be registered and archieved by the National Kennel Club

Signature veterinarian

Results evaluation by National ED-panel

Veterinarian

Name

Address

Country, Zip (country, ZIP code)

Town

Radiographic evaluation

Date panel evaluation (day - month - year)

	Left elbow						Right elbow				
Primary lesion	UAP	FCP	OC	INC	Other	← Affected →	UAP	FCP	OC	INC	Other
						← Suspected →					
						← (No definite proof of a primary lesion) **Free** →					
						← (No sign of secondary arthrosis) **Grade 0** →					
Secondary arthrosis						**Borderline**					
						Grade I					
						Grade II					
						Grade III					

The undersigned agrees that the **radiographic evaluation** is performend according to protocols of the WSAVA (World Small Animal Veterinary Association) and her affiliate, IEWG (International Elbow Working Group).

Signature authorized examiner

Interpretation

Interpretation based on the current recommendations of the International Elbow Working Group (IEWG), an affiliate of the Wold Small Animal Veterinary Association (WSAVA)

Primary Lesions
- UAP Ununited Anconeal Process
- FCP Freagmented Coronoid Process
- OC Osteochondrosis or Osteochondritis dissecans of the medial humeral condyle
- INC Incongruency of more than 2mm between articular surface of Radius and Ulna
- Other Lesions Avulsion medial humeral epicondyle; Mineralisation medial collateral ligament/origin flexor muscles; Other: .

ED grade, based on the secondary arthrosis
- **Grade 0** No signs of arthrosis
- **BL** Border Line: Undetermined changes
- **Grade 1** Osteophyte formation of less than 2 mm anywhere in the elbow joint
- **Grade 2** Osteophyte formation of 2-5 mm anywhere in the elbow joint
- **Grade 3** Osteophyte formation of more than 5 mm anywhere in the elbow joint

Note: The classification Grade 0 (or no detected primary lesion) does not imply that the animal is genetically sound. Based on the current scientific knowledge IEWG does not recomment breeding of arthrotic animals or animals displaying a primary leasion!.

Space for sponsors !!!

International Elbow Working Group

The International Elbow Working Group [IEWG] was founded in 1989 by a small group of canine elbow experts from the USA and Europe to provide for dissemination of elbow information and to develop a protocol for screening that would be acceptable to the international scientific community and breeders.
The annual meeting is organized for the purpose of exchanging information and reviewing the Protocol. All interested persons are invited to attend the meeting and to participate in its activities.
The IEWG is an affiliate of the WSAVA.

IEWG meetings were held in

1989	Davis
1990	San Francisco
1991	Vienna
1992	Rome
1993	Berlin
1994	Philadelphia
1995	Konstanz
1996	Jeruzalem [cancelled]
1997	Birmingham
1998	Bologna
1999	Orlando
2000	Amsterdam
2001	Vancouver
2002	Granada
2003	Estoril
	Bangkok
2004	Rhodes
2005	Amsterdam
	Mexico
	Munich
2006	Prague
2007	Munich
2008	Dublin
2009	Sao Paulo
2010	Bologna
2011	Amsterdam
2012	Birmingham

IEWG 2012

president	Herman Hazewinkel	H.A.W.Hazewinkel@uu.nl
treasurer	Bernd Tellhelm	Bernd.Tellhelm@vetmed.uni-giessen.de
secretary	Thijs How	How@wxs.nl

website**:** **www.vet-iewg.org/joomla**