

PROCEEDINGS

**23rd annual meeting of the
INTERNATIONAL ELBOW WORKING GROUP**



**Wednesday August 20th, 2008
UCD Veterinary Sciences Centre
University College Dublin, Belfield, Dublin 4, Ireland**

WELCOME ADDRESS

Dear IEWG-congress participant,

The International Elbow Working Group (IEWG) has been founded by a group of veterinarians and dog breeders in the U.S.A., almost 20 years ago. The interest in elbow diseases, in particularly elbow dysplasias (ED), has been increasing ever since. ED is recognised in a large variety of breeds and in some breeds with an astonishing high incidence, making ED an important disease for the practicing veterinarian, surgeons, radiologists, geneticists and owners of breeds at risk for ED.

The importance of the disease is recognised by the Federation Cynologique International, the umbrella organisation 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 organisation. In addition to very well attended seminars for scrutineers of radiographs of elbow joints, organised by IEWG in conjunction with the European Society of Veterinary Orthopedics and Traumatology (ESVOT) in 2005 and 2007, the IEWG organises its annual meetings in conjunction with the WSAVA congress.

The Board of the IEWG thanks the organising committee of the WSAVA-FECAVA-VICAS congress, in particularly Dr B. Jones of the University College Dublin, for offering hospitality to the IEWG and its congress participants. The Board of IEWG is proud to offer a very interesting programme dedicated to practical and scientific aspects of ED, grace to the contribution of internationally known experts in this field, including

-Professor Van Bree who developed and refined at his department arthroscopy and combines this with imaging techniques, both plain radiographs and advanced CT and MRI.

-Dr Fitzpatrick who participated in a variety of research projects studying elbow dysplasia and practices advanced techniques in patients suffering from joint damage

-Professor Hedhammar who studies environmental and genetic influences on skeletal development at the highest level and is member of decision making bodies to improve dog breeding

-Dr Tellhelm who has great expertise in radiological investigation, both of patients and of elbow and hip joints referred for screening purposes and is a very well appreciated Board member of the IEWG

-Professor Remy, staff member of the Small Animal Surgery Department (head Prof Genevois) of the École Nationale Vétérinaire de Lyon and scrutineer of hip and elbow joints of dogs in France who will participate in the section free communications with a very interesting study in 520 German Shepherd dogs.

-Professor Innes, head of the Musculoskeletal Research Group of the Veterinary Faculty of the University of Liverpool, presents the results of a study in dogs with ED and compared with sound control dogs; he investigated both loading of the affected leg and range of motion of the affected joint by force plate and kinematic analysis.

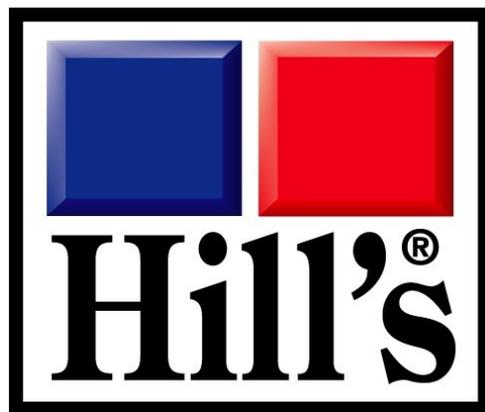
This programme predicts a lively discussion amount speakers and participants originating from sixteen different countries, not only from western and eastern Europe but also from Turkey, New Zealand, and the U.S.A..

I also like to draw your attention to the website of IEWG, taken care of by the secretary of IEWG, Dr K.L. How (<http://www.iewg-vet.org/>) which can also be found via a website interesting for all veterinarian surgeons (<http://www.orthovetsupersite.org/>) organised by Dr. A. Vezzoni, president of ESVOT.

We wish you all a fruitful meeting and a pleasant stay in Dublin.

Prof. Dr. H.A.W. Hazewinkel
President I.E.W.G.

The International Elbow Working Group
acknowledges the financial support by



HILL'S PET NUTRITION

PROGRAMME IEWG 2008

DUBLIN MEETING

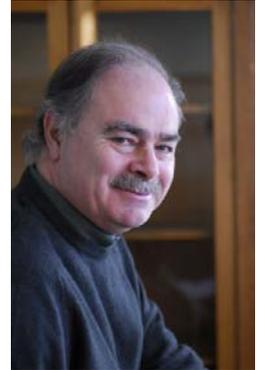
Wednesday 20th August 2008
UCD Veterinary Sciences Centre
University College Dublin, Belfield, Dublin 4, Ireland

08.00 – 08.30	Registration
08.30 – 09.30	Elbow Dysplasia; definitions and clinical diagnosis Prof. dr. H.A.W. Hazewinkel (NL)
09.30 – 10.30	Diagnostic imaging in Elbow Dysplasia: including scintigraphy, radiography, ultrasound, CT and MRI. Prof. dr. H. van Bree (B)
10.30 – 11.00	Coffee Break
11.00 – 12.00	Algorithm for treatment of developmental diseases of the medial elbow in dogs Dr. N. Fitzpatrick (UK)
12.00 – 12.30	General discussion
12.30 – 13.30	Lunch
13.30 – 14.30	Genetic aspects of Elbow Dysplasia and efficacy of breeding programmes Prof. dr. A.Hedhammar (S)
14.30 – 15.30	Primary lesion and OA-grading according to the IEWG protocol Dr. B. Tellhelm (D)
15.30 – 15.45	Break
15.45 – 17.00	X-ray cases & free communications Prof. dr. D. Remy [F] Prof.dr. J.F. Innes [UK]
17.00	Closure

List of speakers

Prof. Dr. H. van Bree, DVM, PhD, Dipl. ECVS, Dipl. ECVDI.
Department of Medical Imaging and Small Animal Orthopaedics
Veterinary Faculty, Ghent University, Belgium.

Graduated in 1974 at the Ghent University in Belgium.
Since 1991 full professor in medical imaging and orthopaedic surgery at the Department of Medical Imaging and Small Animal Orthopaedics, Faculty of Veterinary Medicine, University of Ghent, Belgium. PhD at the University of Utrecht, Holland, Department of Radiology on the "comparative imaging in the canine shoulder".
Since 2001 head of the Department of Medical Imaging and Small Animal Orthopaedics.
Is a Diplomate of both the European College of Veterinary Diagnostic Imaging (ECVDI) and the European College of Veterinary Surgeons (ECVS).
Author of about 250 publications on medical imaging and orthopaedics.
Invited speaker at about 150 international conferences on medical imaging and small animal arthroscopy.
Research topics: comparative imaging in small animal joint disease.



N. Fitzpatrick, MVB, CertSAO, CertVR, MRCVS.
Fitzpatrick Referrals,
Halfway Lane, Eashing, Surrey GU7 2QQ, United Kingdom.

Noel Fitzpatrick qualified from University College Dublin in 1990, having spent scholarship periods at The University of Pennsylvania and The University of Ghent. Following a short period in mixed practice, Noel worked in small animal practice whilst simultaneously spending periods at several Universities in the UK and USA, attaining certificates in small animal orthopaedics and radiology. For the past decade Noel has been working toward building a centre of excellence in small animal orthopaedics and neurosurgery in the South-East of England which marries his vision for compassionate 'bond-centered' care and a philosophy of 'one medicine' – i.e. symbiosis of technology and surgery for the benefit of all living creatures. His new centre – Fitzpatrick Referrals - opened in the Spring of 2008 and includes state of the art surgical facilities, closed-field 1.5T MRI, spiral CT, hyperbaric oxygen, long term rehabilitation kennels, physical therapy / hydrotherapy centre and a conference facility. His aspiration is that the new centre will become a nidus for the exchange of ideas between human and veterinary surgeons for the betterment of all and a key centre for training and clinical research.



Over the past decade Noel has been involved in collaborative research with several universities in the USA and he is actively involved in bioengineering and development of several new implant and operative systems in the fields of both human and veterinary surgery. Noel has lectured widely both nationally and internationally at ACVS, AVMA, VOS, ESVOT, BSAVA and BVOA. In 2005 and 2006 he won the Best Clinical Research paper at the VOS meeting and in 2007 he contributed to the paper winning the Best Basic research award at WVOC. He is scheduled to speak at VOS, AVMA, NAVC, and ACVS in 2008 as well as hosting several surgical training workshops in the USA and Europe. His special research interests presently include external skeletal fixation applied to bone regeneration, skeletal deformity, instrumented vertebral distraction fusion, elbow dysplasia, osteochondral transplantation, advanced imaging, bio-absorbable implant systems and endo-/exo-prostheses for limb sparing after severe trauma or cancer surgery.

Prof. Dr. Å. Hedhammar, DVM, MSc, PhD, Dipl. ECVIM-SA [active], Dipl. ECVCN [passive]
Departments of Clinical sciences and Animal breeding and genetics,
Swedish University of Agricultural Sciences, Uppsala Sweden.

Professor Åke Hedhammar graduated as veterinarian in Sweden 1970. He then took graduate studies at Cornell University 1971-1973 and in 1974 completed his PhD on *Overnutrition and Skeletal Diseases in Dogs* at the Royal Veterinary College in Stockholm. He held a postdoctoral position in nutritional physiology 1974-77 and thereafter has had various positions within Department of Small Animal Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden. At present he is Professor of Internal Medicine – Small Animals with a focus in teaching and research on population medicine including population genetics and clinical nutrition with reference to small animals. He is currently in charge of an interdisciplinary research project on the *Comparative value of Canine natural models of complex diseases*, bridging clinical research with epidemiology and molecular genetics.



Prof. Dr. Herman A.W. Hazewinkel, DVM, PhD, Dipl. ECVS, Dipl. ECVCN.
Department of Companion Animal Sciences,
Faculty of Veterinary Medicine, Utrecht University,
PO box 80.154, 3508 TD Utrecht, The Netherlands.

Prof. Dr. H.A.W. Hazewinkel works in the orthopedic group of the Department of Clinical Sciences of Companion Animals at Utrecht University in The Netherlands. He was assigned in 1998 on the chair dedicated to diseases of skeletal development in companion animals and is head of the section orthopaedics-neurosurgery and dentistry. His research group studies the influence of different aspects of nutrition on skeletal development and osteoarthritis, the molecular-genetic aspects of hereditary skeletal diseases including hip and elbow dysplasia, and tissue repair in cartilage, bone and teeth.

He is president of the International Elbow Working Group, past-president of the European Society for Veterinary Orthopedics and Traumatology, specialist in companion animal surgery as well as in veterinary and comparative nutrition, honorary member of the Netherlands Association of Companion Animal Medicine and recipient of the Saki Paatsama Award 2005 for his contributions to veterinary orthopedic medicine and surgery.



Prof. Dr. John F. Innes, BVSc PhD CertVR DSAS(Orth) MRCVS.
Faculty of Veterinary Science, University of Liverpool,
Leahurst Campus, Neston, Wirral, CH64 7TE, UK

John qualified from University of Liverpool in 1991. He was at the University of Bristol for 10 years and whilst there completed a PhD on canine osteoarthritis and the RCVS Diploma in small animal surgery (orthopaedics). He was appointed professor of small animal surgery at Liverpool in 2001 and he is head of the Small Animal Teaching Hospital. He is a registered RCVS Specialist in small animal orthopaedics. His current research projects are focussed around joint diseases, including "elbow dysplasia" and his clinical interests include all areas of small animal orthopaedics. In 2005, he was awarded the BSAVA Simon Award for "outstanding contributions to small animal surgery".



Prof. Dr. D. Remy,
Small Animal Surgery Department, Ecole Nationale Vétérinaire de Lyon,
membre de l'Université de Lyon, FRANCE



Dr. B. Tellhelm, Dr. Med. Vet., Dipl. ECVDI,
Justus-Liebig- Universität Giessen, Klinik für Kleintiere-
Chirurgie,
Frankfurterstrasse 108, D-35392 Giessen, Germany.

Dr. Bernd Tellhelm is diplomate of the ECVDI and since 1978 responsible for the radiology at the surgery department of the Clinic for Small Animals of the Justus-Liebig-University of Giessen, Germany.

The main focus of Dr. Tellhelm are skeletal diseases and he is an expert in hip- and elbow dysplasia.

Dr. Tellhelm is chairman of the German Association for Radiological Diagnosis of Hereditary Skeletal Diseases (GRSK), member of FCI-expert group for canine hip displasia and board member and treasurer of the International Elbow Working Group [IEWG] since 1998.



Elbow Dysplasia; definitions and clinical diagnoses

Prof. Dr. H.A.W. Hazewinkel, DVM, PhD, Dipl. ECVS, Dipl. ECVCN
Department of Clinical Sciences of Companion Animals, Utrecht University,
The Netherlands.

Introduction

Elbow dysplasias (ED) occur frequently in 4-6 months old dogs of medium and large body size, during the period of high growth velocity. Since developmental skeletal diseases, either due to genetic disease or due to nutritional influences or trauma, are frequently seen in this category of companion animals all three can be held responsible for the occurrence of ED. It is known that each form of ED will lead to osteoarthritis (OA) with possibly severe consequences for the well-being of the animal and its owner. Therefore great effort has been undertaken by different research groups to elucidate the aetiology of ED to come to guidelines how to prevent their occurrence. Here first definitions will be given of the primary entities of ED.

Definitions

Originally the term “elbow dysplasia” or “dysplasia articulationis cubiti” covered generalized osteoarthritis of the elbow joint with an ununited anconeal process (UAP) (Corley et al, 1968). Now UAP is just one of the different entities which are covered by the term “ED”, which is here defined as the group of elbow dysplasias including 1) ununited anconeal process (UAP), 2) fragmented medial coronoid process (FCP), 3) osteochondrosis (OC) or osteochondritis dissecans (OCD), and 4) incongruity (INC) of the elbow joint. These four entities have in common that they all occur in the elbow joint (although OCD occurs also in other joints), that they are all seen in young growing dogs (although they can be overlooked) of medium and large size, that they can cause lameness (but not in all cases and not for the first time only in young dogs), and that they will cause osteoarthritis (but that can vary per individual dog and perhaps even per breed).

Primary lesions

In the screening programme according to the International Elbow Working Group (IEWG) these lesions are graded as absent (ED grade 0), suspected-present (ED grade II) or present (ED grade III). We will distinguish the following primary lesions:

1. UAP: Separation in the cartilaginous bridge between the secondary ossification centre of the anconeal process and the olecranon, which can cause a partially or completely detached anconeal process, referred to as ununited anconeal process (UAP)

2. FCP or MCPD (= medial coronoid process disease): Fissuring of the medial coronoid process of the ulna with partial to complete separation (fragmentation) of the medial coronoid process from the ulna; primary a subchondral bone lesions with secondary cartilage changes (Guthrie et al, 1992), although also chondromalacia at the medial coronoid process is considered part of this entity.

3. OC or OCD: Local thickening of growing epiphyseal cartilage with delayed endochondral ossification, which may develop into OCD with a single or fragmented detached cartilage flap.

“Kissing lesion”: An abrasion of the articular cartilage, sometimes extending into the subchondral bone (radiologically often slightly more lateral than the OC-lesion), and here

caused by a fragmented coronoid process (Morgan et al, 2000). This finding is graded as a “OCD-like lesion”.

4. Elbow incongruity (EI, INC): The subchondral bone of the trochlear notch of the ulna and of the radial head are not parallel to the opposing humeral subchondral bone. There are different forms of EI:

The radius longer than the ulna with a narrowing of the joint space between the tip of the anconeal process and the humeral condyle, a distally gradual widening of the joint space between the ulnar semilunar notch and the humeral condyle and the radial head proximal of the coronoid process of the ulna

The longer ulna with a wider joint space between the proximal radius and the humeral condyle and the step between the more proximally located distal edge of the ulnar trochlear notch (i.e., the lateral coronoid process) and the radial head (and displacement of the distal humerus cranially). This can also be considered as an underdeveloped or too small trochlear notch.

The alignment between the subchondral bone of the trochlear notch and the radial head is more elliptical than the circular contour of the humeral condyles described by Wind (1986) Developmental elbow luxation with lateral displacement of the (often hypoplastic) radial head with a comparative overgrowth of the radius (as seen in chondro-dysplasia in non-chondrodystrophic breeds)

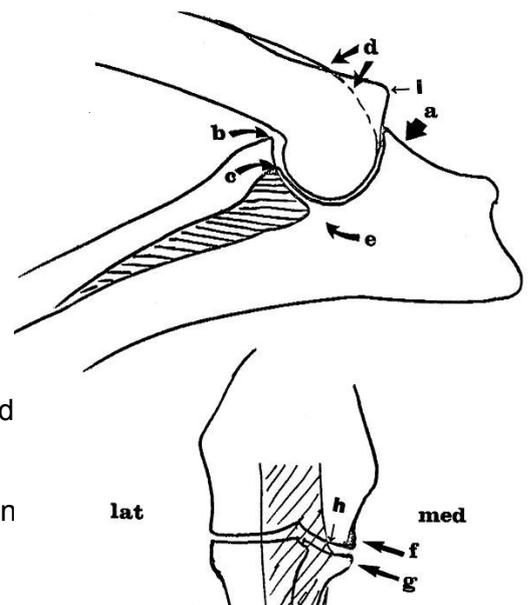
5. Osteoarthritis (OA) is radiologically characterized by new bone formation at the edges of the joint. In addition, enthesophytes (i.e. new bone formation at the sites of attachments of tendons, ligaments, and joint capsule, resulting from abnormal tension placed on the soft tissue attachments near the joint margins) can be formed.

Regardless of the primary cause, the pattern of OA is similar. The different locations where osteophytes and enthesophytes are visible in case of OA are given in Fig. 1.

6. Additional findings include periarticular mineralisation (mineralisation/avulsion of flexor tendons at the medial epicondyle), OA of unknown origin or any other abnormality noted should preferably be reported as well. These abnormalities might have various etiologies and variable relevance but should be registered for future research purposes.

Fig. 1 Locations for grading of elbow OA

- a. the proximal surface of the anconeal process
- b. the cranial aspect of the radial head
- c. the cranial edge of the medial coronoid process
- d. the caudal surface of the lateral condylar ridge
- e. sclerosis of the ulnar notch, at the base of the coronoid
- f. on the medial surface of the medial epicondyle
- g. at the medial edge of the medial coronoid process
- h. indentation of the subchondral bone: OCD (-like) lesion
- i. spur formation



Grading of Elbow Osteoarthritis (OA)

Grading definitions:

Grade 0 OA: no signs of osteophytosis or osteosclerosis

Grade I OA: When at any of the locations listed a – i. osteophytes are present of < 2 mm, or presence of osteosclerosis

Grade II OA: When at any of the locations listed a-i osteophytes are present of 2-5 mm.

Grade III OA: When at any of the locations listed a-i osteophytes are present of ≥5 mm.

Borderline OA can be defined as increased radiographic density (sclerosis) in the ulna caudal to the trochlear notch. In addition, minimal changes at the dorsal border of the anconeal process which is considered as a normal edge and grouped under border line. This can be scored separately or as Grade 1 (see table 1)

In several countries the presence of a primary lesion such as UAP, FCP, OCD, or INC of > 2 mm, automatically results in a ED score 3; the *suspicion* of primary lesions results in a ED score 2 (see table 2).

6. Sclerosis.

An alteration in normal bone architecture, i.e., a decrease in normal bone porosity, is depicted on a ML view of the elbow joint as an increase on bony opacity with loss of trabecular markings (a white area), in the trochlear notch just caudal to the lateral coronoid process. Osteosclerosis is considered as one of the first signs of ED in young dogs, especially when the primary cause can not be identified as in some cases of FCP. This area can be compared with a control radiograph of the non-affected elbow in case of unilateral ED. However, since FCP often occurs bilaterally, the use of the opposite elbow joint will not be of help. In a survey with 17 Labrador retrievers (6-16 months of age) with FCP and 17 without FCP as diagnosed by arthroscopy, radiographic density was objectivated and expressed as pixels: an extremely significant correlation between pixel intensity of the projection of the lateral coronoid process revealed in dogs with FCP (Burton et al, 2007). Microscopically, this area is characterised by reduced intertrabeculae spaces (Wolschijn et al, 2004), either due to mechanical overloading or influence of MMPs, enzymes which play a role in osteoarthritis.

Imaging techniques

Radiographs play a major role in the diagnosis of ED, both in a clinical setting, to determine the phenotype in case of (DNA-)research as well as in screening the population. "More views will give more insight" counts also true in case of radiological investigation, especially in case the primary lesion is of importance to know. According to a large study in 447 Bernese Mountain Dogs by Lang et al (1998), 12% of them had a primary ED without OA yet. Therefore, screening for ED in Bernese Mountain dogs should include at least two perpendicular views. This seems especially true in breeds where OCD is anticipated to be the primary cause of ED.

In case the secondary signs only are of importance, a limited number of views can be sufficient. In addition to the ML and AP views, other views have been developed including ML view with 15 degree supination (exorotation) of the antebrachium (Voorhout et al, 1987), distomedial-proximolateral oblique view (Haudiquet et al, 2002).

Correct views:



Perfect anteroposterior view allowing for inspection of joint for congruity or OCD lesions and osteophytes at the medial aspect of the joint.



Anteroposterior medialoblique view of the extended elbow joint with the lateral aspect of the olecranon just overlapping the lateral cortex of the humerus which gives the best view of the medial coronoid process and of the area of the osteochondrotic lesion or roughening due to erosion (i.e., kissing lesion).



Mediolateral flexed view with good contrast allows for inspection of the margins of the anconeal process and the radial head, as well as for congruity of the joint margins of the radius and ulna with the ulnar trochlea.



Mediolateral view of the extended and 15 degrees supinated radius and ulna with a clear outline of the medial coronoid process.

Elbow dysplasias (including UAP, FCP, OCD and INC) could spread among certain dog breeds, due to the (over)use of a limited number of breeding dogs affected with a disease allele which did not come to expression in all cases. Based on the heritability estimates as published in veterinary literature, environment may play a role in cases the genotype comes to expression. Since dietary intake of calcium and vitamin D may cause disturbances in endochondral ossification and thus may play a role in the occurrence of UAP, FCP, OCD and INC, unbalanced diets or excessive food (and thereby mineral)

intake should be avoided. Although trauma may play a role in the occurrence of FCP along the split lines in possibly young skeleton with delayed modelling, the preventive or causative influence of physical activity or over-use on elbow joint development in dogs is still largely unknown. When the animal is not genetic at-risk, these environmental factors (like diet and micro-trauma) will not play a significant role in the occurrence of ED.

Screening of elbow joints to decrease the incidence of ED in the breeding stock and its offspring, is advocated by many researchers, kennel clubs, as well as by the FCI, OFA, IEWG and other umbrella organisations (Swenson et al, 1997, Kirberger et al, 1998). The quality of the radiological investigation (radiographs and scrutineers) as well as breed, age and sex of the animal will influence the success of a breeding programme for ED (Mäki et al, 2000). Only supranational and open registration of well defined diseases entities and breeding measures based upon the findings of this screening will decrease the incidence of elbow dysplasias. In the future DNA-screening techniques may lower the incidence of ED even further.

Standardisation for ED screening within a country, in Europe or preferably within a breed world-wide, will facilitate comparisons of screening-certificates and the quality of the breeding stock. For that reason an Elbow Dysplasia Screening Certificate is made available by the IEWG for all official screening bodies and will be printed in the proceedings of the pre-congress of the WSAVA-2008 programme as organised by the IEWG.

Diagnostic imaging in Elbow Dysplasia: including scintigraphy, radiography, ultrasound, CT and MRI.

Prof. Dr. H. van Bree, DVM, PhD, Dipl. ECVS, Dipl. ECVDI & I. Gielen, DVM
Department of Medical Imaging and Small Animal Orthopaedics
Veterinary Faculty, Ghent University, Belgium
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Elbow dysplasia (ED) is characterized by varying degrees of elbow incongruity, bony fragments (bone chips), and ultimately, severe arthrotic change. In diagnosing ED there are 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 guarantees 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 its 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. 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 (figure 1).

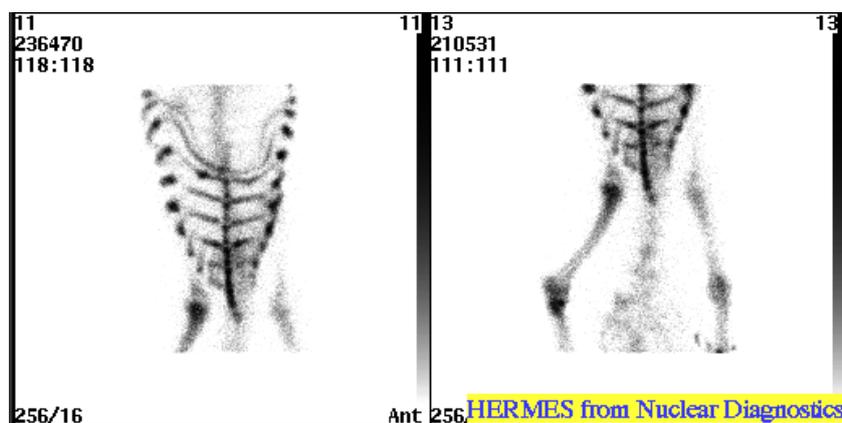


Figure 1. Scintigraphic image of a dog with obscure elbow lameness. A hot spot in the elbow region is visible. Notice the poor resolution of the musculoskeletal structures.

Radiography is still the standard technique for the diagnosis of elbow disorders in the dog. It is readily available, cost effective and has excellent spatial resolution. Correct radiograph technique is critical for making the diagnosis and multiple views of the leg 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).

UAP is easily detected with radiographs; the anconeal process, in most dogs unites normally at approximately five months of age. Radiographic screening can be done at five to six months of age.

In most cases, a diagnosis of OCD can be made with radiographs as well, although a distinction with “kissing lesions” is not always possible.

FCP can be diagnosed with radiographs, but can be a challenge in many cases. 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. Unfortunately, the radiographic findings may not be conclusive and in the great 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 they do not appear until the dog is about seven to eight months old. 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 greatly 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, a CT scan can typically help significantly in establishing a firm diagnosis. Abnormalities in the area of the medial coronoid process include: fragmentation (displaced or non-displaced), fissure, abnormal shape, sclerosis, osteophytes, and lucencies. These abnormalities can be evaluated on the transverse and reconstructed images (Figure 2).

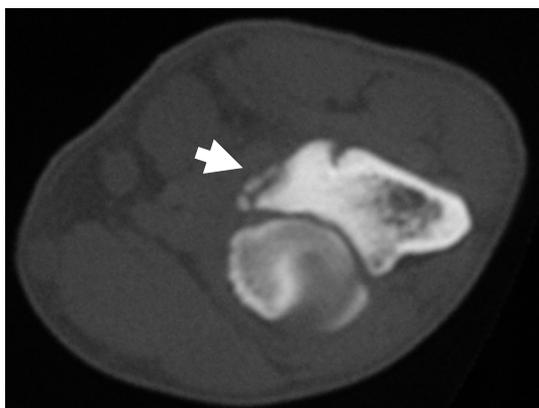


Figure 2. Transverse image through the area of the medial coronoid process showing fragmentation (3 fragments) of the medial coronoid process (arrow).

In several cases CT findings were useful for decision making in the arthroscopic treatment of these lesions. Ununited anconeal process with or without humeroulnar incongruity can be appreciated. 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 (Figure 3).



Figure 3. Transverse CT image through the area of the medial humeral condyle showing a typical OCD lesion (arrow).

Incongruities of the humeroradial, humeroulnar, and/or radioulnar joints can be accurately evaluated. 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 evaluated (Figure 4). 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 (Figure 4).

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. All MRI planes, dorsal, sagittal, and axial/transverse, are potentially useful for diagnosis of elbow disorders. Although rapid progress is being made in the use of MRI for diagnosis of disorders of the canine shoulder and stifle, elbow MRI is still in its infancy and is not yet routinely performed in veterinary medicine.

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.

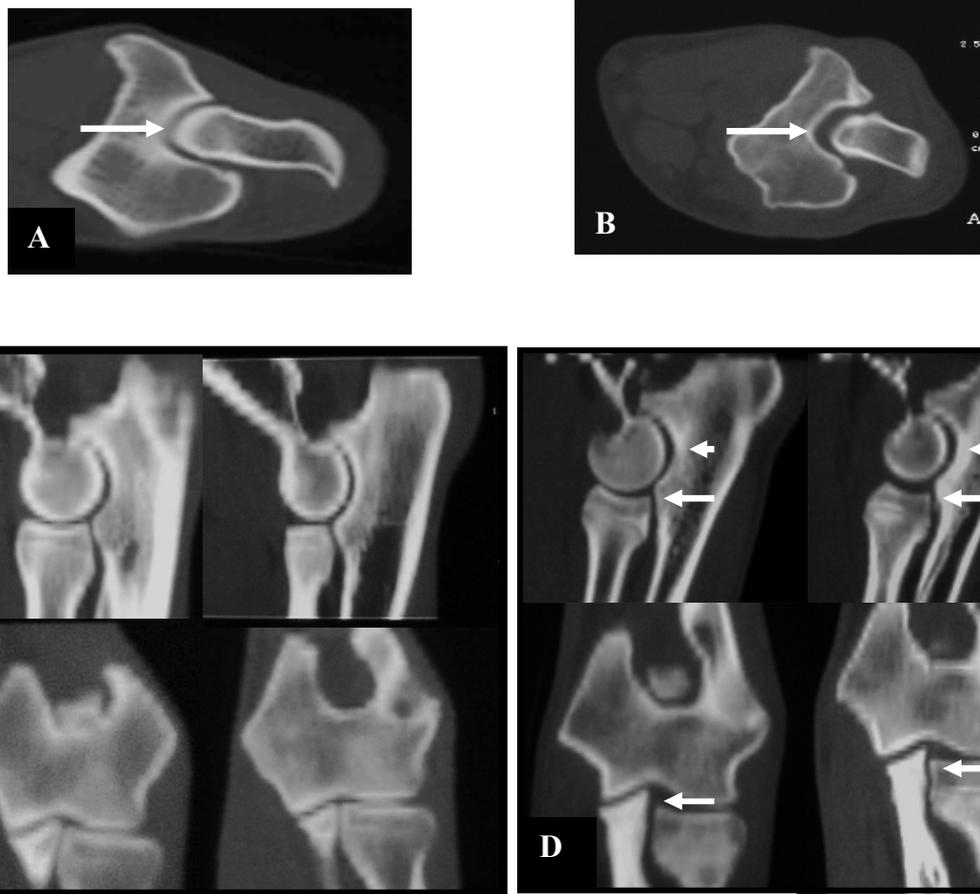


Figure 4. Transverse images (A, B) at the level of the trochlear notch and dorsal and sagittal reconstructions (C, D) of a normal (A, C) and incongruent (B, D) elbow. Notice the widened poorly fitting joint space (white arrow) on the transverse image (B). Notice the step between the radius and ulna (white long arrows) as well as the abnormal shape of the trochlear notch of the ulna (short white arrows) in the incongruent joint on the reconstructions (D).

Exploratory arthroscopy can be an option and is used more and more in referral clinics. Arthroscopy is an excellent technique to visualise articular structures not visible on radiographs. The magnification factor of the arthroscope allows the inspection in detail of articular cartilage, the synovial membrane and intra-articular ligaments and structures. Another advantage is that diagnosis and treatment can be combined. It is very useful in the diagnosis of FCP even when the radiographic and CT findings are negative (Figure 5).

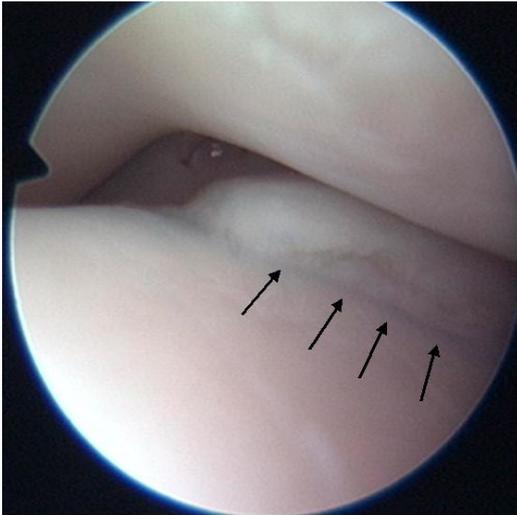


Figure5. Arthroscopic image of the medial compartment of a left elbow: a fragmented coronoid process can be appreciated (arrows).

Different types of lesions in the area of the coronoid process can be distinguished arthroscopically: chondromalacia-like lesions, fissures of the articular cartilage, non-displaced and displaced fragments containing subchondral bone. In the area of the medial humeral condyle, kissing lesions and OCD-lesions can be visualised. An UAP appears as a large displaced fragment in the most proximal part of the joint. The fracture line is easy to visualize, often apparent as a large gap. Exceptionally, the cartilage layer is not interrupted. Joints with UAP should be checked for concomitant lesions of the coronoid process and cartilage destruction. In each diseased joint, inflammation of the synovial membrane and arthrosis can be evaluated at different locations in the joint (lateral part, trochlear notch, region of the medial collateral ligament) The surface of the radial head is often irregular, eroded or fibrillated in chronically inflamed joints.

Elbow incongruity can be appreciated arthroscopically as well. Several arthroscopic features can be seen in incongruent joints: a lower level of the radial head at the end of the trochlear notch and in the lateral compartment, an irregular cartilage border between the ulna and radius, discoloured, irregular or loose cartilage on the radial head and the trochlear notch. By some complete eburnation of the medial compartment, sometimes observed in older animals, is also a sign of incongruity. In practically all cases where incongruity is associated with lameness it is accompanied by fragmentation of the medial coronoid process (Figure 6).

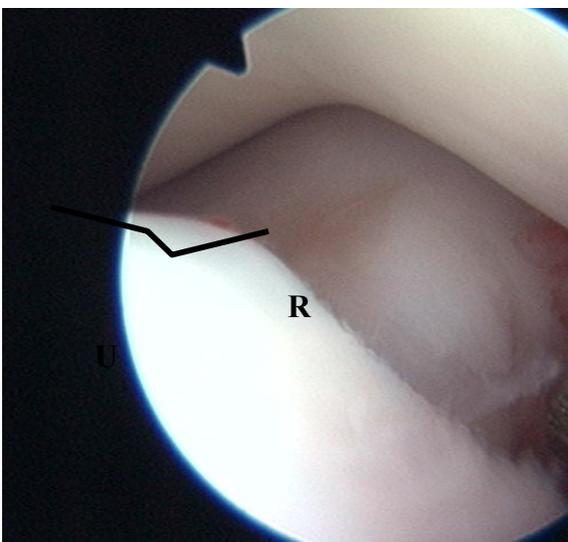


Figure 6. Arthroscopic image of an incongruent left elbow after removal of the fragmented coronoid process. Notice the step between ulna (U) and radius (R) (black line).

Algorithm for treatment of developmental diseases of the medial elbow in dogs

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Introduction

The most commonly recognized manifestations of elbow dysplasia (particularly Medial Coronoid Disease (MCD) with or without osteochondritis dissecans (OCD)) result in disease of the medial compartment of the elbow joint and widely varied patterns and severities of pathology may be identified. Clearly, no single therapeutic technique can be expected to maximize outcome across the full spectrum of disease commonly identified. A range of potential treatment options have therefore been developed, and are at varying stages of study regarding their efficacy.

Disease of the medial aspect of the coronoid process

It is well recognized that both surgical and non-surgical management of MCD can generally be expected to provide short- to medium-term amelioration of clinical signs, but that long term progression of osteoarthritis is inevitable. Conventional surgical treatments have involved removal of the either free osteochondral fragments alone, or including a portion of intact coronoid process immediately adjacent to the site of overt cartilage pathology. Both arthroscopic techniques and arthrotomy have been reported.

It is reported that pathology affects subchondral bone initially with formation of microcracks, characteristic of local fatigue failure (Danielson et al, 2006). This may subsequently progress to development of overt fragmentation (Figure 1) or other cartilage pathology. However, microcracks have been documented across a wider area of the coronoid process than simply the regions most commonly affected by gross pathology. On this basis, the authors' preference for local treatment of MCD is performance of "Subtotal Coronoid Osteotomy" (Figures 2 and 3) – removal of a pyramidal portion of the medial aspect of the coronoid process extending to include the entirety of the articular portion cranio-distal to the level of the radial incisure (Figure 4).

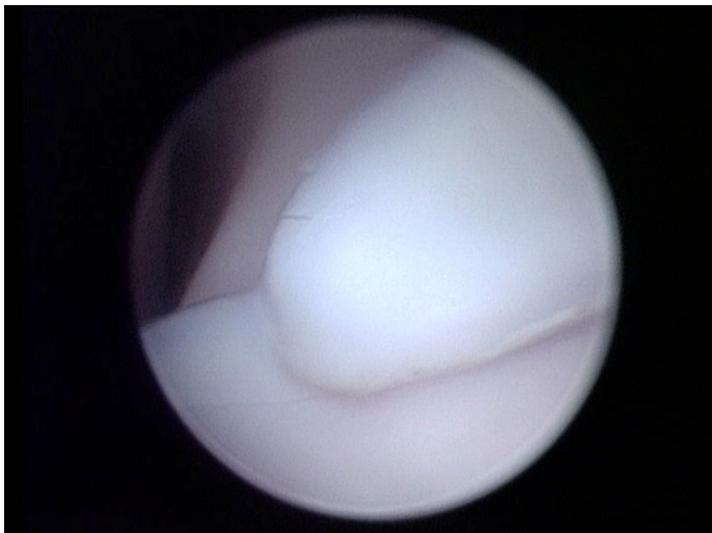


Figure 1 – Arthroscopic image showing large fragment at radial incisure of medial aspect of coronoid process (centre and right of image)

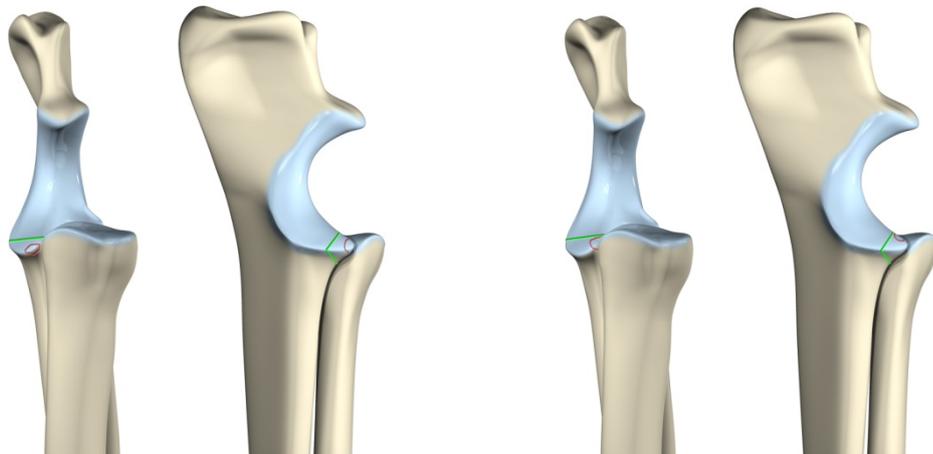


Figure 2 and 3 – Typical configuration of Subtotal Coronoid Osteotomy (SCO) depicted by green lines. Red line depicts typical location of fragment at tip (Figure 2) and at radial incisure (Figure 3) of medial aspect of coronoid process

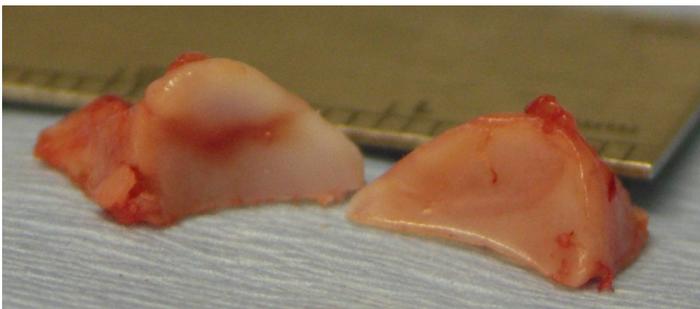


Figure 4 – Typical appearance of osteotomised fragments following SCO. Fissure / fragmentation lines are apparent at cartilage surface

Corrective ulnar osteotomy has been proposed to address perceived incongruity within the aetiopathogenesis of MCD. However, it remains unclear what configuration of procedure might be most beneficial, or to which patients. Ulnar osteotomy is inevitably associated with lameness of several weeks duration, which is typically more severe than that at initial presentation or than that experienced after intra-articular procedures alone, therefore counterbalancing any potential benefits to be gained for treatment of MCD without overt humeral condylar cartilage disease.

Non-surgical management remains the major alternative where focal surgical treatment is considered inappropriate (and where unsuccessful focal surgical treatment has already been performed). The basis of any successful non-surgical management plan is based on simultaneous establishment of a moderated exercise routine, body weight control, judicious use of NSAIDs or alternative prescription analgesic agents, and provision of “nutraceuticals” or “disease modifying compounds” (such as glucosamine, chondroitin sulfate and pentosan polysulphate).

Disease of the medial humeral condyle

Medial humeral condylar OCD (Figure 5) is well recognized and concomitance with MCD is frequent. “Kissing lesions” are also commonly identified, associated with MCD, recognized as clusters of axially-orientated, linear abrasion tracts ranging from narrow regions of superficial cartilage fibrillation to full thickness cartilage eburnation with exposure of subchondral bone across almost the entire medial articular surface.



Figure 5 – Typical appearance of elliptical OCD lesion of medial humeral condyle at arthrotomy

OCD without MCD

Conventional treatments (including curettage and microfracture) aimed at stimulation of fibrocartilage ingrowth are applicable for small, shallow or abaxial lesions, and can be achieved by arthroscopic techniques where available.

For treatment of more substantial lesions, regeneration of fibrocartilage by conventional methods may be unlikely to be adequate for appropriate reconstruction of the articular contour or to be adequately durable in the persistent load-bearing frictional environment of the medial elbow compartment. Osteochondral Autograft Transfer (OAT) procedures adapted from a human surgical technique allow resurfacing with hyaline or hyaline-like cartilage and allow accurate reconstruction of articular contour. These involve harvesting of a cylindrical core of bone with an intact cap of healthy cartilage (Figure 6) from a non-contact surface of one of the patient's other joints (typically stifle), and implanting this core into a socket created at the site of the osteochondral defect (Figure 7).



Figure 6 - Osteochondral core following ejection from cylindrical harvesting chisel. Core is trimmed to pre-measured length to match recipient socket.



Figure 7 - Final appearance of two cores in situ used to maximally cover elliptical osteochondral defect. Note that second core overlaps position of first

OCD and MCD

OCD has been most commonly identified in conjunction with MCD of the same joint. In this circumstance, selection of treatment modality is based on the severity of cartilage pathology present, affecting both the coronoid process and the medial humeral condyle around or adjacent to the OCD lesion. MCD should be locally treated such as by SCO. OAT procedures may remain applicable for treatment of the OCD lesion, but ulnar osteotomy may be required to achieve reproducible positive outcomes. We recommend an oblique proximal ulnar osteotomy directed both caudo-proximal to cranio-distal, and proximo-lateral to disto-medial to counteract potential deleterious forces that may affect osteotomy healing or cause deformity at the osteotomy. Intramedullary stabilisation is considered unnecessary for this osteotomy configuration.

MCD and focal medial humeral condylar "kissing lesion"

Where focal, partial thickness (modified Outerbridge grades I-III) cartilage lesions are observed in association with MCD, we consider SCO alone to provide adequate reduction in persistent frictional abrasion or humero-ulnar conflict to support positive clinical outcomes. In selected cases ulnar osteotomy may be applicable in association with SCO for amelioration of medial joint attrition. Where focal partial-thickness cartilage lesions are recognized in the same joint as an OCD lesion, treatment of the OCD lesion by OAT procedures are still considered appropriate, but ancillary SCO and proximal ulnar osteotomy are critical to achieving a positive outcome.

Where focal, deeper (modified Outerbridge grades III-V) cartilage lesions are identified on the surface of the medial aspect of the humeral condyle (Figure 8), SCO is unlikely to significantly ameliorate persistent humero-ulnar conflict. In this circumstance, adjunctive proximal oblique ulnar osteotomy may be beneficial. While treatment of concomitant OCD lesions by OAT procedures should be considered, it may be difficult to adequately resurface the affected medial aspect of the humeral condyle as the lesions do not have discreet edge-margins, unlike definitive lesions of OCD.



Figure 8 – Typical appearance of focal modified Outerbridge grade III-IV “kissing lesion” of medial humeral condyle demonstrating linear abrasion tracks.

MCD and extensive medial humeral condylar “kissing lesion”

MCD may be associated with severe lesions associated with “humero-ulnar conflict”. The typical appearance is of full thickness (modified Outerbridge grade V) cartilage pathology across the major portion of the medial joint compartment, affecting both the medial humeral condyle and the corresponding disto-medial ulnar contact area (Figure 9). Long-term prognosis is considered to be severely guarded following local treatment.

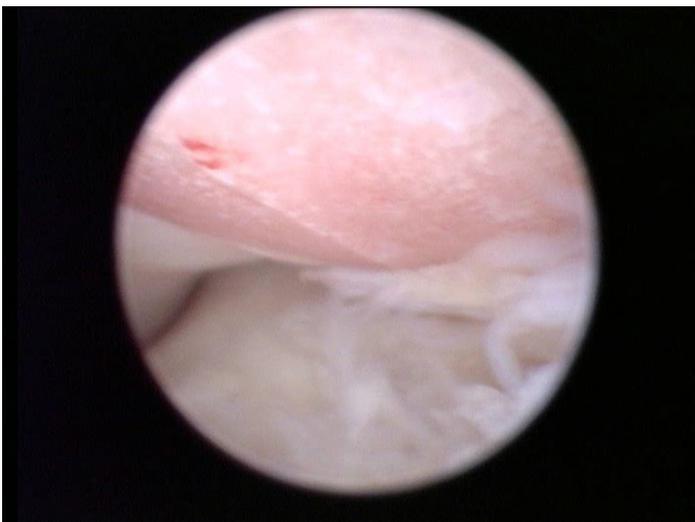


Figure 9 – Full thickness (modified Outerbridge grade V) cartilage pathology throughout medial joint compartment with extensive exposure of

In this circumstance, we advocate use of Sliding Humeral Osteotomy (SHO) (Figures 10 and 11). In vitro studies have demonstrated the efficacy of humeral osteotomies at transferring load bearing forces toward the relatively healthy lateral joint compartment, and specialized implants and technique of application have been developed. Outcomes of clinical application in 59 elbows to date have been positive.



Figures 10 and 11 – Radiographs of 7 year old Labrador retriever with medial compartment syndrome treated by Sliding Humeral Osteotomy immediate postoperatively and 6 months later.

“Global elbow arthrosis”

Salvage procedures such as Total Elbow Arthroplasty (TEA) (Figure 12) or joint arthrodesis (Figure 13) may represent the only viable options for restoration of comfortable limb function where severe pathology of both medial and lateral joint compartments is identified. TEA is widely considered preferable compared with arthrodesis. However, high incidence of major morbidity and prolonged recovery periods reported to date have provided significant concern. Novel implant systems, such as the TATE system may lessen these concerns and early results are very encouraging.



Figure 12 – Medio-lateral radiograph showing typical post-operative appearance following TEA

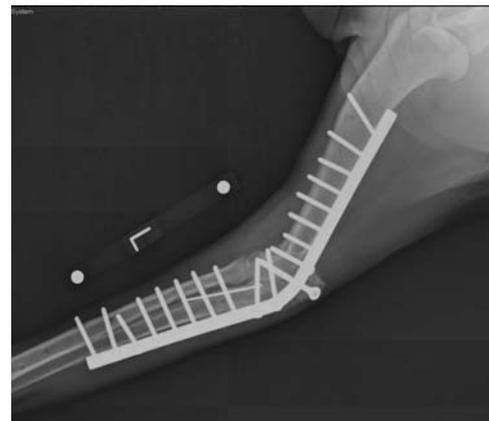


Figure 13 – Medio-lateral radiograph showing typical post-operative appearance following elbow arthrodesis

REFERENCE

Danielson KC, Fitzpatrick N, Muir P, et al: Histomorphometry of fragmented medial coronoid process in dogs: A comparison of affected and normal coronoid processes. Vet Surg 35:501-509, 2006.

Genetic aspects of Elbow Dysplasia and efficacy of breeding programmes

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Over 30 years have elapsed since conditions affecting the elbow were recognised as clinical entities affecting large sized breeds of Dogs to great extent. Although we have agreed on the term Elbow Dysplasia, it must be remembered that it is made up by several different entities, eventually resulting in elbow arthrosis. As the different entities most likely have different genetic background and probably each influenced by many genes the genetic background is more complex than i.e. for hip dysplasia

The prevalence of entities making up Elbow Dysplasia varies by breed, calling for more breed specific measures. Crude measures suitable to handle elbow arthrosis in Bernese Mountain Dogs and Rottweilers does not necessarily serve the same purpose in the Retrievers.

In German Shepherd the prevalence of Ununited Processus Anconeus calls for specific measures.

Efforts to reduce the prevalence of ED have been made in many countries. Most programmes aiming at reducing the frequency of ED implemented so far have been based on mass selection, and in many breeds the improvement has been disappointing. The situation in countries with extensive screening of the entire population is in a different situation than those where barely the breeding stock is screened to any greater extent

In Sweden, standardised evaluation and recording of elbow status, referred to as screening programmes, have been organised by the Swedish Kennel Club (SKC) for several years. In addition, several breeds are included in a genetic control programme for ED, implying that elbow status of both the sire and the dam should be known if the progeny is to be registered by the SKC. Extensive recording of ED was first started in Rottweilers and Bernese Mountain Dogs around 1984 and since 1990 known elbow status of parents is required for registration of these breeds. Currently, 15 breeds are currently included in a genetic control programme for ED.

With a system based mainly on scoring for Elbow Arthrosis (EA), great success has been achieved in Rottweilers and Bernese Mountain Dogs. With a complex inheritance as for ED, an individual Dog who is perfectly normal even in "several" projections and who remains "normal" also late in life, may still produce affected progeny. It is therefore of great importance to get hold of information on as many relatives as possible, in order to get a better prediction of its genotype (breeding value for ED). Such data are preferably computerised and expressed as predicted breeding values, using the Best Linear Unbiased Prediction (BLUP) method. Prediction of breeding values also requires pedigree information.

A recent study of genetic variation and genetic trends in hip and elbow dysplasia in Swedish Rottweiler and Bernese Mountain Dog shows phenotypic and genetic improvement in both breeds during a period from 1984-2002 (Malm et al. 2008). The heritabilities of ED in this study were 0.34-0.38. Thus, some genetic improvement is

possible based on mass selection alone. However, prediction of breeding values enables a more accurate genetic evaluation and further and even faster genetic progress.

The value of a screening program for traits with a multifactorial background as Elbow Dysplasia (ED) is not only based on genetic parameters, such as the heritability. The value is also directly related to accessibility and how the information is used in the selection of breeding stock.

There are two problems related to screening for ED as compared to Hip Dysplasia (HD). As already mentioned the entity ED is made up of several primary lesions and resulting EA, each of these with a complex inheritance. In addition, the clinical course of ED more commonly results in clinical signs at an early age and an operation before the age of screening. These Dogs are likely not to be screened and included in any registries. Arrangements to include data on these Dogs are even more valuable than recording of primary lesions revealed at conventional screening!

To make it possible to evaluate potential breeding stock from abroad, a uniform and comparable screening procedure and recording of results is necessary. This would also make it easier to include screening results from abroad in the calculation of breeding indexes. Federation Cynologique Internationale (FCI) together with IEWG and WSAVA has worked together on an international certificate to be used for exchange of ED screening results. The IEWG protocol is the basis of such a certificate.

References

Malm, S., Fikse, W.F., Danell, B., Strandberg, E. 2008. Genetic variation and genetic trends in hip and elbow dysplasia in Swedish Rottweiler and Bernese Mountain Dog. *J. Anim. Breed. Genet.* Published online: 21 May 2008

IEWG or WSAVA

Certificate of radiological Elbow
Dysplasia examination
Examination based on International
Elbow Working Group Standards

Logo Kennel Club

Archive 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 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 of dog, radiologic views)

Veterinarian

Name

Address

Country, Zip Town

Identification of 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-caudal) CC-15° pronated (Cranio-caudal-15°pronated)
 ML-neutral (Medio-Lateral 90°-ext.) ML-extended (Medio-Lateral >120°ext.) Other: (specify)

The undersigned agrees that the examination is performed 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 archived by the National Kennel Club

Signature veterinarian

Results evaluation by National ED-panel

Veterinarian

Name

Address

Country, Zip Town

Radiographic evaluation

Date panel evaluation day month year

Primary lesion	Left elbow					Right elbow					
	UAP	FCP	OC	INC	Other	UAP	FCP	OC	INC	Other	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	← Affected →										
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	← Suspected →										
	<input type="checkbox"/>	(No definite proof of a primary lesion) Free				<input type="checkbox"/>					<input type="checkbox"/>
	<input type="checkbox"/>	(No sign of secondary arthrosis) Grade 0				<input type="checkbox"/>					<input type="checkbox"/>
Secondary arthrosis	<input type="checkbox"/>										Borderline <input type="checkbox"/>
	<input type="checkbox"/>										Grade I <input type="checkbox"/>
	<input type="checkbox"/>										Grade II <input type="checkbox"/>
	<input type="checkbox"/>										Grade III <input type="checkbox"/>

The undersigned agrees that the radiographic evaluation is performed 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 World Small Animal Veterinary Association (WSAVA)

Primary Lesions
UAP Ununited Anconeal Process
FCP Fragmented Coronoid Process
OC Osteochondrosis or Osteochondritis dissecans of the medial humeral condyle
INC Incongruity 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 © IEWG e.V.
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 recommend breeding of arthrotic animals or animals displaying a primary lesion!

Space for sponsors !!!

Primary lesions and OA-grading according to the IEWG protocol

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Klinik für Kleintiere – Surgery, University of Giessen, Germany

The diagnosis of elbow dysplasia (ED) in screening of dog breeds 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.iewg-vet.org/>).

This protocol defines the radiological findings in “abnormal” elbows : the presence of the major forms of primary lesions (FCP, OCD, UAP, Incongruity) and/or osteoarthritis (OA). Any other abnormal findings should also be reported. So we should make a point of finding radiographic changes which are typical for these primary lesions and then looking for signs of OA. The degree of OA graded as either “normal” (Grade 0), mild (Grade 1, osteophytes less than 2 mm high), moderate (Grade 2, osteophytes 2 – 5 mm) and severe (Grade 3, osteophytes higher than 5 mm). The primary lesions have to be mentioned (for details see web site IEWG).

Frequently there are elbows with only minimal changes at only one site of the joint (mostly the dorsal border of the anconeal process). In many cases one can even not be sure that these findings are osteophytes representing signs of arthrosis or enthesiophytes at the insertion of the humero-anconeal ligament. These joints are not “normal” and have to be scored as arthrosis grade 1. That may exclude those dogs from breeding. Therefore a “borderline grade” has been introduced by IEWG in 2003, analogous to the screening of canine hip dysplasia. IEWG has set the radiological criteria for a borderline grade: *minimal changes at the dorsal border of the anconeal process, (which could not definitively defined as signs for OA) or only mild sclerosis of the distal part of the ulnar notch*. It is in the decision of the scrutineer to use this grade or not.

Incongruity (INC) also is a finding that requires more precise definition since it is to be used for the classification of elbows. The absence of strict grading criteria and the rather big inter-reader differences in cases of steps lower than 2-3 mm makes this finding less valuable in cases of screened dogs, from which no clinical information is available. According to the IEWG protocol an INC is a primary lesion like FCP, OCD or UAP. That means, that **all** dogs showing this radiological finding have to be excluded from breeding. As a suggestion for the discussion: elbows showing no other radiological changes but a step below 2 mm should be scored as “borderline”.

In general, the IEWG screening protocol allows classification in different grades of diseased elbows based on the degree of OA. The term “ED” includes arthrosis **and** primary lesions. So IEWG makes a proposal for ED-grading.

But using an “ED-grading”, other problems arise. There are many elbows showing radiological signs from which we know, that they are frequently accompanied with FCP, even when a fragment is not visible. Typical criteria for this are a blurred and deformed medial coronoid process (MCP) often together with reduced density of the apex of the MCP, increased density of the ulnar notch caudal to the MCP and in some breeds also a short radius.

Not all of the x-raying veterinarians are familiar with the typical findings in cases of FCP, in case obvious osteophytic reactions are absent; therefore one focal point of this presentation at the IEWG-meeting will be the radiological findings in these cases.

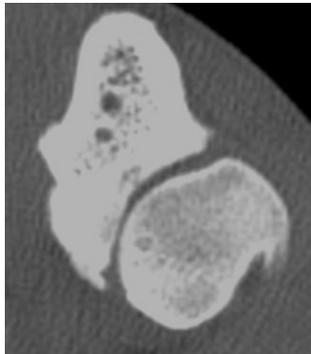
Those elbows were scored as “FCP suspected” in ED 2 although there are only osteophytes less than 2 mm or no detectable osteophytes.

Dog owners misinterpret the term “suspected” as “near normal” or as a very questionable change of the joint and will not accept the grading “ED 2”. An other term therefore could be “MCP disease”.

Case 1



Left elbow mediolateral view, Labrador Retriever, 3 years. Typical radiographic findings together with FCP: osteophytic lesions up to 2 mm cranial at the humeral condyle and dorsal at the anconeal process, between 2-5 mm at the cranial contour of the radius. Mild incongruity, reduced density and blurred cranial contour of medial coronoid process, increased density caudal of the process



FCP confirmed by CT, transverse plane. Small fragment at the top of the medial coronoid process which shows generally an increased

Case 2



Left elbow mediolateral view, Labrador Retriever, 7 mo. Radiographic findings together with FCP in juvenile dogs: only minor osteophytic lesions at the dorsal aspect of the anconeal process (contour doubled) reduced density and blurred cranial contour at the medial coronoid process with increased density caudal of the process.



Same elbow craniocaudal view with the elbow joint **pronated: no fragment visible. Only mild increased density** of subchondral bone of the humeral trochlea.

FREE COMMUNICATIONS

Elbow Dysplasia in German Shepherds: Sex-related differences, characteristics of unilateral and bilateral dysplasia, associated osteoarthritis.

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Summary

This retrospective study was conducted on 520 German Shepherds screened for elbow dysplasia with three excellent quality X-rays per elbow (medio-lateral flexed, medio-lateral extended, cranio-lateral caudo-medial oblique).

This study had two purposes. The first one concerned epidemiology: sex-related differences in the prevalence of elbow dysplasia and in the frequency of its primary lesions (154 dysplastic elbows) were investigated; so was the prevalence of unilateral and bilateral dysplasia; dogs with unilateral dysplasia (48 dogs) were compared with dogs having bilateral dysplasia (53 dogs) as regards the primary lesions they were afflicted by. The second purpose concerned elbow dysplasia secondary arthritic lesions, which are often considered the diagnosis sign of dysplasia: their importance and location were studied in relation to the primary lesions and to the dogs' age.

Elbow dysplasia affected males statistically significantly more than females (23% vs 16%, $p < 0.05$) but the distribution of primary lesions was comparable in both sexes. Bilateral dysplasia occurred as frequently as unilateral dysplasia (10% vs 9.2%, $p > 0.05$), with no statistically significant difference between males and females. Elbow incongruity and combinations of lesions were more frequent in animals with bilateral dysplasia than in dogs with unilateral dysplasia ($p < 0.001$).

Table 1 presents the importance of arthritic lesions in relation to the primary lesions. When a primary lesion was diagnosed, arthrosis was always present, though sometimes very limited. No arthritic elbow without any primary lesion was found. Importance of arthritic lesions was not correlated with the age of the dogs. Joint incongruity alone always led to minimal arthrosis; associations of lesions induced more severe osteoarthritis. When the medial coronoid process appeared fractured, arthrosis was more important than when it appeared simply abnormal. Osteophytes on the cranio-dorsal part of the anconeus were found in 91.6% of the dysplastic elbows.

The results are discussed in the light of the recent literature data. The fact that males are more affected than females is in accordance with other authors' results. The fact that

animals with bilateral dysplasia present with more primary lesions than animals with unilateral dysplasia was, to our knowledge, not published before. As for arthritic lesions, it can be stated that the dysplastic German Shepherds studied have rather mild arthritic lesions.

			Importance of osteoarthritic lesions		
			MILD OA	MODERATE OA	SEVERE OA
% (Number) of dysplastic elbows	INC alone	42.8% (66)	100% (66)	0	0
	INC associated with other lesion(s)	42.2% (65)	44.6% (29)	52.3% (35)	3.1% (2)
	FCP _D	19.5% (30)	20% (6)	76.6% (23)	3.4% (1)
	FCP _S	30.4% (47)	78.7% (37)	19.1% (9)	2.2% (1)
	MCPD alone	11% (17)	88.2% (15)	11.8% (2)	0
	MCPD associated	38.9% (60)	46.6% (28)	50% (30)	3.4% (2)
	OCD alone	1.2% (2)	100% (2)	0	0
	OCD associated	5.8% (9)	22.2% (2)	66.7% (6)	11.1% (1)
	UAP alone	2.6% (4)	25% (1)	50% (2)	25% (1)
	UAP associated	1.9% (3)	0	100% (3)	0
	only one primary lesion	57.8% (89)	94.4% (84)	4.5% (4)	1.1% (1)
	more than one primary lesion	42.2% (65)	44.6% (29)	52.3% (34)	3.1% (2)

Table 1: Primary lesions and importance of osteoarthritic lesions observed in the 154 dysplastic elbows: INC = incongruity, FCP_D = Fragmented Coronoid Process diagnosed, FCP_S = Fragmented Coronoid Process suspected, MCPD = Medial Coronoid Process Disease, OCD = Osteochondrosis, UAP = Ununited Anconeal Process, OA = Osteoarthritis.

Kinematics and force data in a cohort of young dogs with elbow dysplasia

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Elbow dysplasia is a common disease of medium and large breed dogs, most commonly involving osteochondral pathology of the medial coronoid process of the ulna but which evolves in to osteoarthritis of the elbow joint. Information on the natural history of this disease is lacking but it appears that young dogs presenting with elbow pain tend to improve following various medical or surgical interventions. However, large numbers of dogs present to veterinary clinics in later life with clinical signs of osteoarthritis of the elbow joint and thus it would appear that remission of elbow pain in young dogs is often temporary. Evaluation of musculoskeletal function in dogs has progressed in the past two decades with the availability of non-invasive instruments to evaluate both the forces of movement using force and pressure platforms and the movement of limbs in space using two- and three-dimensional motion capture systems. It is well-recognised that these systems are able to detect alterations in canine gait that are undetectable to the human eye. Modern motion capture systems allow accurate tracking of retroreflective markers within a calibrated volume of space at high frequency.

In this study we examined 20 dogs with ED, including 9 Labradors, together with 7 healthy Labrador control subjects. All dogs were examined on a 10m walkway with a Kistler (Switzerland) force platform in the middle. Retroreflective markers were placed at standard anatomical landmarks at the shoulder, elbow and carpus of both forelimbs. Four infra-red motion capture cameras (Qualisys, Sweden) were used at 500Hz to capture motion data using Qualisys QTM software. A synchronized video file of each trial was also collected. Three valid trials for each forelimb were collected.

From this study we could conclude that index elbows (the elbow associated with lameness as defined by reduced peak vertical force[PVF]) had reduced negative stance angular velocity and a decreased range of motion compared to contralateral joints. Affected animals had reduced PVFs compared to control animals and also reduced range of motion through the gait cycle. It is likely that pain in the affected elbow reduces negative stance velocity as the affected elbow experiences an increase in load during the early part of stance phase. Range of motion is also likely decreased due to pain at the extremes of joint motion, as is often noted on a clinical examination.

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	eruzalem [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

IEWG 2008

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.iewg-vet.org**