

General Elbow Dysplasia Information

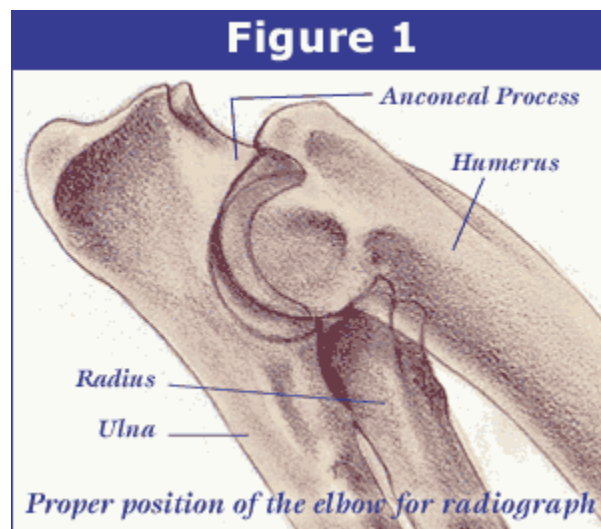
The Three Faces of Elbow Dysplasia

Elbow dysplasia is a general term used to identify an inherited polygenic disease in the elbow of dogs. Three specific etiologies make up this disease and they can occur independently or in conjunction with one another. These etiologies include:

1. Pathology involving the medial coronoid of the ulna (FCP)
2. Osteochondritis of the medial humeral condyle in the elbow joint (OCD)
3. Ununited anconeal process (UAP)

Studies have shown the inherited [polygenic](#) traits causing these etiologies are independent of one another. Clinical signs involve lameness which may remain subtle for long periods of time. No one can predict at what age lameness will occur in a dog due to a large number of genetic and environmental factors such as degree of severity of changes, rate of weight gain, amount of exercise, etc. Subtle changes in gait may be characterized by excessive inward deviation of the paw which raises the outside of the paw so that it receives less weight and distributes more mechanical weight on the outside (lateral) aspect of the elbow joint away from the lesions located on the inside of the joint. Range of motion in the elbow is also decreased.

Evaluating the Elbow

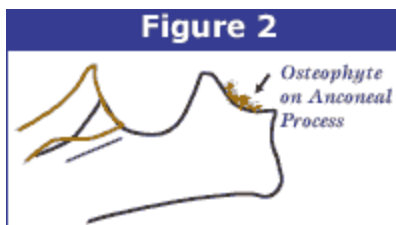


Schematic representation of the radius and ulna of a

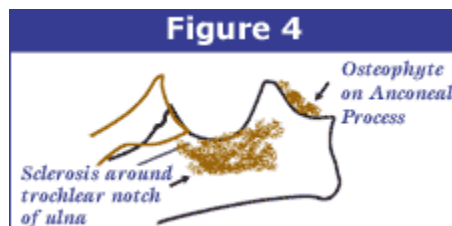
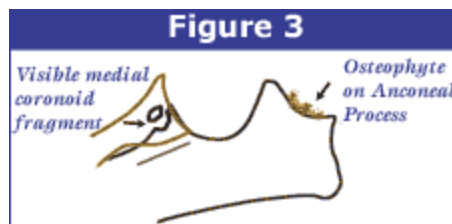
normal elbow joint. Note the smooth margin of the anconeal process of the ulna (angled line)

Elbow dysplasia has multiple inherited etiologies which may occur singularly or in combination. These etiologies include **fragmented medial coronoid (FCP) of the ulna**, **osteochondritis of the medial humeral condyle** and **united anconeal process (UAP)**. The most sensitive view used to diagnose secondary degenerative changes in the elbow joint is an extreme flexed medio-lateral view of the elbow (Figure 1) which is required by the OFA and recommended by the International Elbow Working Group. The veterinary radiologists are most interested in the appearance of the anconeal process of the ulna.

When there is instability of the elbow joint due to elbow dysplasia, one of the most sensitive radiographic findings is new bone proliferation (osteophytes) on the anconeal process of the ulna (Figure 2) associated with secondary developmental degenerative joint disease.



Bone proliferation can be very subtle to visualize in some dogs and may require the use of a special light source (hot light) rather than a traditional view box to diagnose it. Other arthritic findings such as sclerosis in the area of the trochlear notch of the ulna and bone spurs at joint edges are also reported. If fragmentation of the medial coronoid only involves the cartilage, it may not be seen radiographically but occasionally if the bone is also fragmented, it can be visualized as a separate calcific opacity superimposed over the radius (Figures 3 and 4).



Grading Elbows

For elbow evaluations, there are **no grades for a radiographically normal elbow**. The only grades involved are for abnormal elbows with radiographic changes associated with secondary degenerative joint disease. Like the hip certification, the OFA will not certify a normal elbow until the dog is 2 years of age. The OFA also accepts preliminary elbow radiographs. To date, there are no long term studies for preliminary elbow examinations like there are for hips, however, preliminary screening for elbows along with hips can also provide valuable information to the breeder.

Grade I Elbow Dysplasia

Minimal bone change along anconeal process of ulna (less than 3mm).

Grade II Elbow Dysplasia

Additional bone proliferation along anconeal process (3-5 mm) and subchondral bone changes (trochlear notch sclerosis).

Grade III Elbow Dysplasia

Well developed degenerative joint disease with bone proliferation along anconeal process being greater than 5 mm.

The OFA Answers Questions and Concerns Regarding Elbow Dysplasia

In 1990, following a conference of the International Elbow Working Group, the OFA began its Elbow Dysplasia (ED) Database. The purposes of the database are to provide a standardized evaluation of elbow joints for canine elbow dysplasia, and to serve as a database to assist breeders in the control of elbow dysplasia through selective breeding.

The number of OFA elbow evaluations continues to increase significantly each year. The increase in screening is a positive sign that there is growing awareness regarding ED and that breeders are seriously interested in reducing the incidence of this disease. With increased discussion taking place, it is only natural that questions will arise. We are pleased to respond to some of the more frequently asked questions and areas of concern below.

While addressing the most common questions and concerns, the answers are not meant as an all encompassing review of elbow dysplasia, including its inheritance, etiology, manifestation, development, diagnosis, and treatment. Breeders and owners are encouraged to review the OFA material already published on the OFA website and in the recently revised OFA monograph, [*The Use Of Health Databases And Selective Breeding – A Guide For Dog And Cat Breeders And Owners*](#) for a more complete description of this disease.

Is there a new way of reading elbows by the OFA? Is this in direct correlation for what appears to be MORE failing ratings?

OFA has followed the same reading and grading protocol since it began issuing elbow clearances in 1990. Although the sheer number of dogs reported by the OFA as having elbow dysplasia is technically increasing, this is a natural result of the increase in submissions. Examination of the OFA ED data for the four breeds with the largest number of submissions actually reveals a promising trend in which the dysplastic rate appears to be declining. However, because most breeders are not evaluating elbows on all of their dogs, it is premature to conclude from this data whether this reflects an actual decrease in the rate of ED in these breeds.

Labrador Retrievers (By Birth Year)

1990 thru 1993 3,492 Labradors evaluated, 11.5% ED
1994 thru 1997 8,915 Labradors evaluated, 12.3% ED
1998 thru 2001 10,703 Labradors evaluated, 10.1% ED

Golden Retrievers (By Birth Year)

1990 thru 1993 1,033 Goldens evaluated, 11.8% ED
1994 thru 1997 3,018 Goldens evaluated, 11.1% ED
1998 thru 2001 5,247 Goldens evaluated, 10.1% ED

German Shepherds (By Birth Year)

1990 thru 1993 5,447 German Shepherds evaluated, 19.8% ED
1994 thru 1997 6,866 German Shepherds evaluated, 18.7% ED
1998 thru 2001 4,974 German Shepherds evaluated, 17.2% ED

Rottweilers (By Birth Year)

1990 thru 1993 2,349 Rottweilers evaluated, 40.0% ED
1994 thru 1997 2,660 Rottweilers evaluated, 42.0% ED
1998 thru 2001 2,125 Rottweilers evaluated, 38.4% ED

We should investigate the protocol from other countries. Several have chosen to use Grade 1's with great success. Should we consider that?

The OFA does not participate in the decision process whether or not to breed an animal. However, the OFA strongly believes it is extremely important that breeders know and disclose the status of dogs' elbows regardless of whether the final decision is to breed or

not. Only through complete and openly discussed knowledge of disease status will breeders have the information they need to make good breeding decisions.

There are many factors to consider when evaluating the progress of countries that permit breeding Grade I elbows. There may indeed be reasons to consider using Grade I elbows in breeding programs for the purpose of maintaining a broader gene pool, especially in countries where the breed specific rate of ED is approximately 25% or higher (as appears to be the case in some European countries). One must balance the potential consequences as they pertain both to the entire gene pool, and to elbow disease as a part of the gene pool. With a lower rate of ED in many breeds in the U.S., the genetic pressures to include Grade I ED's in most US breeding programs may not be the same as in other countries. Below are two sets of data which may help provide a basis for making a more informed decision whether to breed a dog affected with Grade I ED.

Example 1:

Examination of the OFA database reveals the following mating probability results for 13,151 breeding pairs of dogs with known elbow status:

Normal Elbows x Normal Elbows = 12.2% offspring affected with ED

Normal Elbows x Dysplastic Elbows = 26.1% - 31.3% offspring affected with ED

Dysplastic Elbows x Dysplastic Elbows = 41.5% offspring affected with ED

In this very large breeding study (primarily Labrador Retrievers, Golden Retrievers, Rottweilers, and German Shepherd Dogs), the rate of ED more than doubled when one parent was affected, and more than tripled when both parents were affected. In any breed where the overall percentage of affected dogs is already lower than the percentage that can be expected when a dog affected with ED is bred to a normal dog (26.1% - 31.3%), one would find few circumstances in which progress can be made by breeding a dog affected with ED.

Example 2:

Below are some comparative elbow statistics on Golden Retrievers from the BVA (UK) scheme and the OFA.

Of the total of 577 Golden Retrievers evaluated by the BVA (through 2003):

434 are normal (75%)

87 are Grade I (15%)

40 are Grade II (7%)

16 are Grade III (3%)

Total of 143 affected (25%)

Of the total of 9630 Golden Retrievers evaluated by the OFA (through 2003):

8484 are normal (88.1%)
856 are Grade I (8.9%)
187 are Grade II (1.9%)
72 are Grade III (0.7%)
Total of 1115 affected (11.6%)

Comparing that data, it would appear that when the overall percentage of ED in the breed is higher, so also is the overall percentage of Grade II's and Grade III's – the potentially clinically affected dogs. It is also possible that this percentage may increase even more rapidly than the overall breed percentage. Note that while the total percentage of Golden Retrievers affected with ED in the UK is approximately double that of the US (25% compared to 11.6%), the percentage of higher grades in the UK is more than triple that of the US (10% compared to 2.6%). Although it is not certain that US Golden Retrievers would follow this exact trend if the percentage of ED began to increase, the data is compelling enough to warrant close vigilance and caution regarding potentially breeding dogs with Grade I ED.

Is the OFA part of the International Elbow Working Group? Why are they reading different than other countries?

The OFA elbow protocol is based on the IEWG recommendations. The IEWG reported that ED can be evaluated by using 3 radiographic views at approximately 1 year of age to look for actual disease processes. OFA employs a modification of this protocol by requiring a single flexed lateral view at two years of age, which is more cost-effective for mass screening and more accurately detects the secondary degenerative joint disease/osteoarthritis. It is believed that there are fewer false positives (dogs incorrectly diagnosed with ED) when the diagnostic criteria includes these secondary changes.

A recent study **(1)** noted the increased accuracy of evaluating ED at 24 months of age as compared to 12 months of age: *"The value of increased precision in the diagnosis of elbow arthrosis with increasing age at examination should be balanced against the possibility that with a higher minimum age for evaluation, a lower percentage of dogs would be evaluated."* The decision to set the minimum age for final ED certification at 24 months is consistent with OFA's hip dysplasia protocol, and provides a good balance of the above considerations.

Other countries have more data on elbows that may be helpful to us. As an example, Sweden has been doing elbows for many years and they have an open registry where all of the results that were checked are posted. Might it be in the OFA's interest to see what progress they have made? They breed both normals and Grade I's. The data they have for several generations may be very useful.

A comprehensive published study **(1)** using data provided by the Swedish Kennel Club included the following results: *"There was a positive relationship between the prevalence of elbow arthrosis of any grade and the percentage of affected dogs with moderate or severe (grade 2 or 3) elbow arthrosis (i.e., matings of affected parents resulted not only in more affected progeny, but also in progeny with more severe grades of elbow arthrosis)."* (The term elbow arthrosis used in this study refers to arthritic changes in the elbow joint regardless of the underlying cause.)

This study also noted: *"the decreasing prevalence in arthrosis in these 2 breeds can be attributed mainly to the use of unaffected sires. There is still a lot of opportunity for improvement among dams, because a large number of affected females are still used for breeding."*

Why is it that most veterinarians cannot predict the outcome, with a certain measure of success, of elbow readings? These are experienced veterinarians.

This is a common source of misunderstanding and confusion. It might be useful to consider the analogy of human general practitioners as compared to human radiologists; and veterinary general practitioners as compared to veterinary radiologists. The additional training required to become Board certified in a specialty is expected to result in a greater level of skill and expertise as compared to the general practitioner. On a difficult case, most people would prefer to have their own radiographs evaluated by a Board certified radiologist rather than their general practitioner because they know their general practitioner cannot be an expert in everything. The same is true in veterinary medicine.

Breeders have become accustomed to their veterinarians (and often the breeders themselves) being able to see and diagnose HD prior to sending the films to OFA, but this is typically not the case with ED. While the higher grades are often diagnosed by the radiographing veterinarian, most do not have the training or equipment to reliably diagnose Grade I's.

Although it is understandable that clients want an immediate opinion on the radiographs from the veterinarian prior to submitting to OFA (and the veterinarian often tries to comply with this request), it is not reasonable to expect a degree of expertise that general practitioner veterinarians usually do not have. It is usually more satisfactory and less confusing for the owner and radiographing veterinarian to defer to board certified radiologists without trying to "prescreen" the x-ray.

One of the biggest issues is the inability of vets and fanciers to understand why X-rays that look the same may or may not clear. Some breeders say that they have submitted the same X-ray, and the first time it failed to clear, but then it did clear when they resubmitted. If there

is so much inconsistency in the reading of these X-rays, then how can we trust whether the DJD they see is really there? Just how accurate are these readings?

As discussed above, general practitioner veterinarians and fanciers usually do not have the expertise to accurately evaluate elbow radiographs. Films that may appear the same to the untrained eye may actually have differences as evaluated by board certified radiologists. These subtle but significant differences may result in different evaluations, even when the radiographs appear the same to others.

The OFA systems automatically reject applications in which the radiograph has the same date as a prior submission. Thus, the same radiograph (or an identical copy) is never evaluated twice. Breeders do sometimes resubmit the same dog using a different set of radiographs, and this can occasionally result in a different evaluation. The evaluation can be influenced by a number of factors, such as density, contrast, and positioning (similar to the effects that focus, lighting, and camera angle might have on a photograph). Correct positioning and good radiographic technique will result in the most accurate evaluation.

OFA quality control statistics show a remarkable degree of consistency among the readings of the three board certified radiologists who evaluate each elbow radiograph, each one evaluating the radiograph without knowledge of other readings. There is 98% agreement between all 3 radiologists as to whether the elbow is normal or dysplastic. This high level of consistency should offer reassurance that the findings as reported are actually present.

OFA statistics for German Shepherd Dogs provide an excellent example of the actual consistency and reliability because the OFA has performed more than 19,000 GSD elbow evaluations. Of these, 1326 dogs were resubmitted for a second evaluation, and another 40 dogs were submitted for a third evaluation. In 87% of the resubmissions, there was no change from the initial evaluation. In 10% of the resubmissions, the change was from normal to dysplastic. The majority of the initial evaluations in these cases were preliminary reports, with the change most likely due to the onset of DJD as the dog matured. Development of these secondary arthritic changes contributes to greater accuracy in evaluation of dogs over 24 months of age as compared to preliminary reports. The remaining 3% (less than 50 cases) were evaluations that went from dysplastic to normal. Possible explanations for the change from dysplastic to normal include a) single reading on preliminary reports versus three readings on of age evaluations, b) differences in radiographic positioning and technique, c) differences in radiologists' opinions, and d) discrepancy in dog identity.

Can panosteitis be misdiagnosed as Grade I ED?

Radiographically, panosteitis is diagnosed when lesions are present in the medullary cavities of the tubular long bones (humerus, radius, ulna, femur, tibia). ED is only diagnosed when DJD is evident in the elbow joint itself. Both panosteitis and ED, in some cases, can cause forelimb lameness that is transient. However, these are two different diseases, and it is

extremely unlikely that board certified radiologist would incorrectly diagnose a dog with Grade I ED because of a previous case of panosteitis.

Some breeders believe that Grade I elbows are within the “normal” range, much like Fair hips are considered to be within the normal range. What is the OFA’s position on this?

The OFA’s distinction between normal and abnormal elbows is actually more clearly defined than are the differences between fair and borderline hips. Elbows are diagnosed as dysplastic when evidence of Degenerative Joint Disease (DJD) is present as evidenced by osteophytes or sclerosis. It is not a gradual continuum from normal to abnormal, in which minor differences might be interpreted as normal by one reader and abnormal by another. The degree of DJD present is the determining factor in the grade of dysplasia.

The term “degenerative joint disease” is often misunderstood and misinterpreted. “Degenerative” is defined as some distinct change from a normal state to a diseased state. It does not imply a continuing process in which the disease will progress and worsen continuously over time, and it is incorrect to assume that a dog with Grade I ED will eventually develop Grade II or III ED.

It is also important to understand that DJD is a finding which aids in the diagnosis of elbow dysplasia, but the DJD itself is the secondary result of one or more of three distinct etiologies that make up the generalized description of elbow dysplasia. These are united anconeal process (UAP), fragmented coronoid process (FCP), and osteochondrosis (OCD) which may appear singularly or in combination.

My dog has never limped. How can it have elbow dysplasia?

The radiographic evidence of ED, the presence of secondary DJD, and the clinical presentation do not correlate directly. Grondalen **(6)** reported on a population of 207 Rottweilers of which 141 were not lame. Yet 68% of the non-lame dogs had DJD of the elbow. Another study by Read **(7)** reported on serial radiographic and physical examination of 55 Rottweilers at 6 and 12 months of age. At 6 months of age the majority of lame dogs did not have radiographic evidence of ED; however, by 12 months of age the radiographic changes were apparent. But the majority of dogs remained sound.

Like hip dysplasia, many dogs affected with Grade I ED do not exhibit lameness; and like hip dysplasia, breeders cannot depend on using clinical signs to diagnose the disease. Dogs with minimal pathology involving the medial coronoid process may not always present clinical lameness, as the DJD and fibrosis of soft tissues may actually help to stabilize the joint. It is very likely that using lameness as a guideline to accept the diagnosis of ED would permit an increased incidence of disease genes to proliferate in the breeding population.

Most elbow reports seem to only have DJD marked as the finding. How do we know whether the dog has UAP, OCD, or FCP? Don't we need to know this to make breeding decisions?

Ununited anconeal process (UAP), osteochondrosis (OCD) and fragmented medial coronoid process (FCP) have all been identified as part of the degenerative joint disease (DJD) complex referred to as elbow dysplasia. In most cases, when only DJD is marked on the OFA report, it can be assumed that lesions associated with coronoid process disease are present. This accounts for the majority of ED.

There are several theories about the genetics of ED. Some research has suggested that there may be a single underlying cause for all three forms of ED **(2, 3)**, but other research suggests that the diseases may be inherited separately **(4)**.

Breeders have often misinterpreted the OFA's statement that DJD is not an inherited disease to mean that ED is not inherited. To clarify, DJD results from ED, but DJD itself is not inherited. However, multiple current studies **(1, 4, 5)** have all concluded that the heritability of ED (defined as UAP, FCP, or OCD) is moderate to high. This means that breeding selections can have a significant impact on the rate of ED in a breed. As referenced in an earlier question, studies **(1)** have shown that as the frequency of ED increases in a breed population, there is a corresponding percentage increase of dogs affected with more moderate to severe (Grades II and III) cases of ED **(1)**.

Conclusion

The OFA acknowledges that breeding decisions are personal. It does not regulate breeding practices or impose testing requirements. The OFA's function remains to provide breeders with the tools and information to make more informed breeding decisions; and OFA's purpose remains to assist breeders in reducing the incidence of genetic disease including elbow dysplasia. The OFA strongly recommends that dogs from the at risk breeds being considered for a breeding program, as well as their siblings, be radiographed to determine their elbow status. This information should be an important and carefully considered part of breeding decisions.

Breed	Rank	Number of Evaluations	Percent Normal	Percent Dysplastic	Percent Grade I	Percent Grade II	Percent Grade III
BELGIAN SHEEPDOG	44	1254	95.2	4.6	3.7	0.9	0.1

