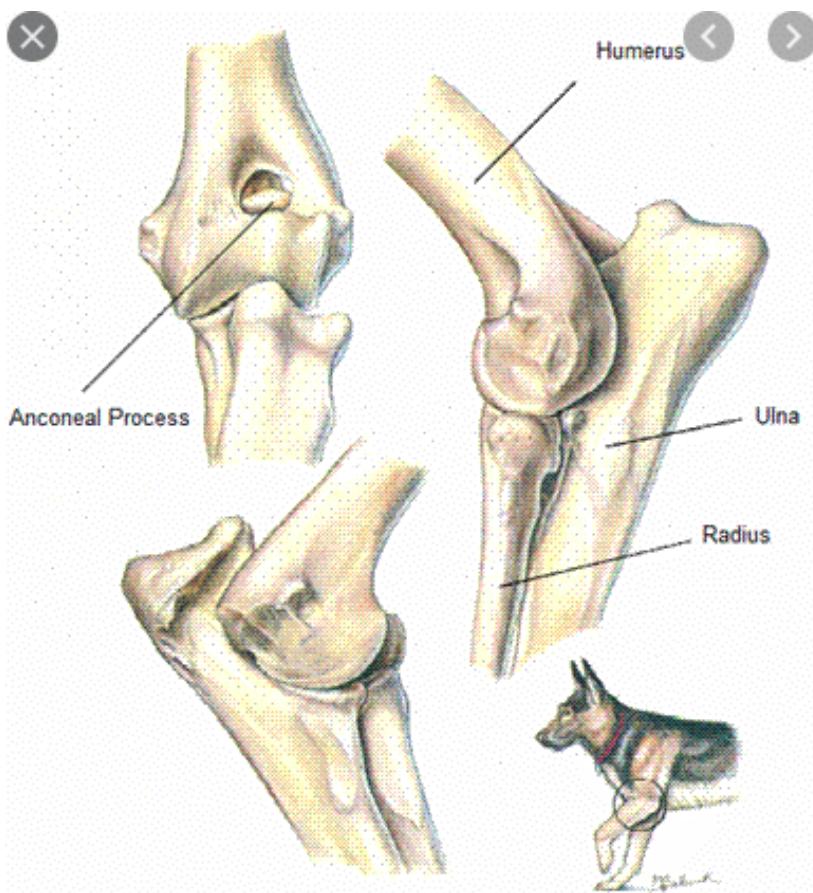


## Elbow dysplasia and related conditions

The elbow is a complex, tight fitting "hinged" joint made up by the end of the humerus and both the radius and ulna. It is controlled by a number of different muscle groups and its function is fundamental to gait.



### Problems affecting the canine elbow

Lameness caused by elbow problems is without doubt the single most common cause of lameness in the front leg in dogs of any breed but especially medium to larger breed dogs.

The majority of these cases are caused by a group of conditions called **Elbow Dysplasia**. This is not a very useful term however as elbow dysplasia covers a number of different conditions all of which are subtly different. The one thing in common is that they all have some genetic input and they all lead to some malformation of the elbow joint. The most common cause

of Elbow Dysplasia are: **Medial coronoid disease, osteochondrosis of the humeral condyle, incomplete ossification of the humeral condyle and humeral intracondylar fissures and Ununited Anconeal Process.**

Because the conditions have a genetic basis to some extent **dogs with Elbow Dysplasia should not be used to breed from.**

### **Osteo Arthritis**

Osteo Arthritis (OA) is the body's reaction to an abnormality in the joint, this cause can be as a result of instability in the joint (such as with a cruciate ligament rupture), a fracture through the joint or something as simple as unequal weight distribution. For this reason dog's with some form of elbow dysplasia will already have some degree of OA and will continue to develop OA. This is vitally important to consider because the more that is done for them from a young age to manage this the better, especially **not allowing them to become OVERWEIGHT**. A very good study performed in the States showed that Labradors just 10% over ideal body weight had significantly less life expectancy as a result of hip and elbow arthritis. For the majority of average sized Labradors (28 to 30kg) 10 % over body weight is 2.5 to 3kg.



Above is a picture of two Labradors, both are the same height and length and age. One weighs 26kg the other 36kg. They were from different households!

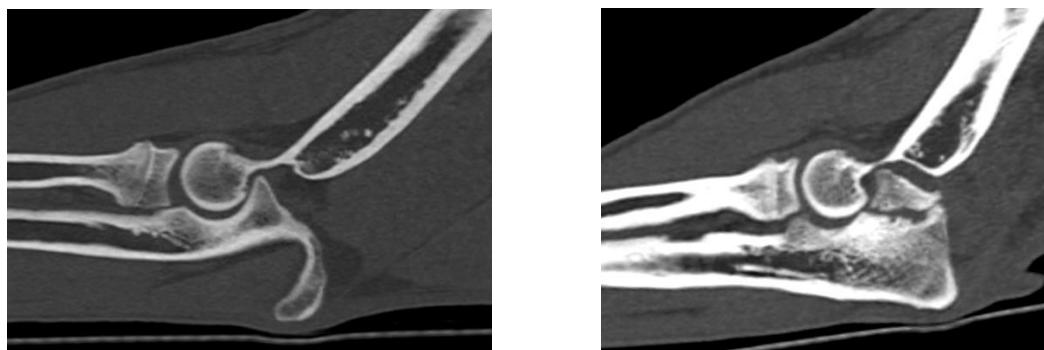
## **Investigation**

The first thing to do whatever the age of the dog is to get a diagnosis. It is important that we recognise the disease early as in some very early cases the long term outcome can be changed with appropriate treatment.

X rays may have been taken of both elbows and these help confirm the site, however because the elbow is so complex we usually perform a CT scan to confirm subtle changes and the information from the CT scan provides assistance in determining whether further surgery is required and if so to be able to accurately plan for that surgery.



CT is also very useful to determine if there is a significant incongruence, that is to say a poor fit of the elbow. Because the elbow is a tight fitting joint, if the fit is poor it will lead to localised increases in weight distribution that will be contributing to the underlying condition.



CT scans showing a short radius on the left and a short ulna on the right

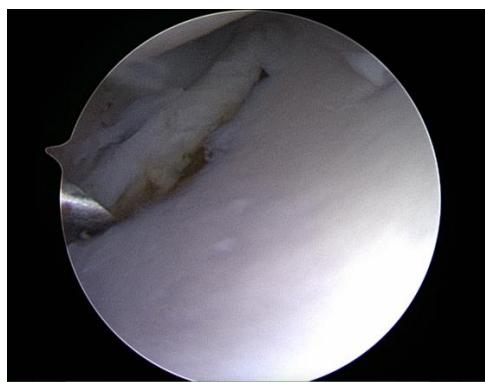
In most cases the condition will be bilateral ie it is present in both elbows, this can confuse the picture as the true extent of the discomfort caused by the problem may not be apparent and there is often some confusion as to which leg is causing a problem. We would always CT both elbows and because elbow and shoulder problems can mimic each other we often look at the shoulders as well.

Finally to provide a complete evaluation the cartilage of the joint can be examined by arthroscopy, this is usually done at the same time as addressing the condition directly but the arthroscopic procedure should be seen as both a final diagnostic procedure and hopefully a therapeutic procedure.



### Specific Conditions

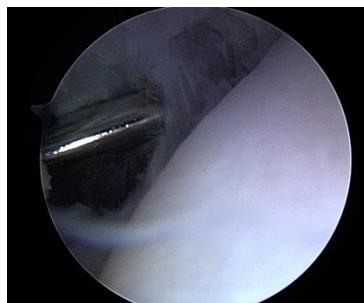
The most common cause of elbow pain is Medial coronoid disease. The true cause is as yet unknown and is likely to be a complex combination of biologic factors (collagen metabolism, cartilage metabolism, genetic control of bone growth) and mechanical factors which might include relative differences in the growth of the radius and ulna or in appropriate growth of the ulna or abnormalities of "fit" of the radial head into the ulna. What ever the basic cause the result is abnormal loading of the bone of the medial coronoid which results in the development of microcracks across the coronoid rather similar to the radiating shock waves coming out from an earthquake. With time these radiating cracks start to coalesce into a large fissure and eventually the fissure breaks free as a fragment.



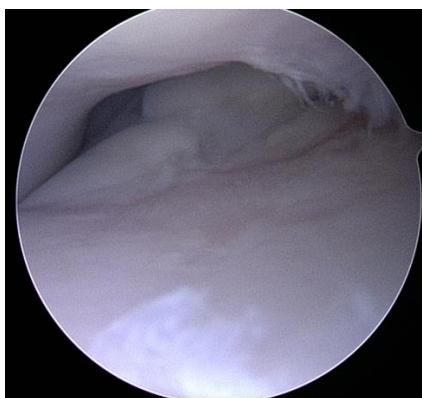
These fragments can occur anywhere on and in the medial coronoid but the most common site is the coronoid tip and radial incisure of the coronoid, it is very important to remember though that the cracks will extend across much of the coronoid and so simply removing the fragment alone will leave these at risk areas prone to further fragmentation. On top of the primary bone problems the overlying cartilage can also be variably damaged and worn although generally it is rare for early subchondral bone disease to have extensive cartilage loss. Only arthroscopy can demonstrate the extent of cartilage loss. Coronoid disease is therefore essentially a disease of the bone but one that has a detrimental effect on the cartilage and addressing the primary disease will usually require that some cartilage is sacrificed, making the judgement as to how much cartilage is sacrificed is key to success and we always err on the side of caution.

### **Medial coronoid, spectrum of disease**

- The disease has a huge spectrum of injury ranging from very early coronoid disease to extensive fragmentation with significant loss of cartilage around the medial coronoid and humeral condyle therefore it is critical to try and assess where on this wide scale your dog is so that we can treat the condition most appropriately bearing in mind that in most cases there will be some advancement in time.
- **For very early medial coronoid disease** where the CT scan just shows some loss of normal bone structure but no clear fissuring and the lameness is a persistent feature then arthroscopy to examine the cartilage is important, in some cases we can relieve some of the medial compartment pressure and avoid having to remove any bone or cartilage by releasing the Bicep Tendon of insertion onto the ulna (BURP). These cases can be challenging however, 50% show improvement and 50% progress to fissuring and require further surgery. The BURP was a technique first described by Noel Fitzpatrick (The Supervet).



- There are some cases where the CT scan only shows early changes and persevering with a conservative approach may be appropriate. This should include controlled exercise, achieving a LEAN body weight and condition and giving anti inflammatory pain killers.
- **For cases of early coronoid disease** and fissuring without a true fragment having broken out it may be necessary to remove the diseased portion of bone arthroscopically. The extent of how much bone is removed is based on evidence from the CT scan and the appearance at arthroscopy. This is why a CT scan is so vitally useful in these cases as it helps us to guide the arthroscopic surgery. If there are extensive signs of subchondral bone damage we may elect to perform a subtotal medial coronoid osteotomy where we remove most of the medial coronoid tip and base if the extent is less then we remove the diseased portion alone, this is a fine judgement call to be made and we tend to err on the side of caution.



- **For cases of fragmentation but with little cartilage damage** the fragments are removed arthroscopically and the diseased underlying bone is debrided, this provides some immediate reduction in pain and fibrocartilage fills into the defect.
- **For cases where there is more extensive articular cartilage disease** and the problem is not just confined to fragmentation a more extensive removal of diseased bone may be performed arthroscopically. This is called a subtotal medial coronoid osteotomy. We generally reserve this for older dogs to improve their quality of life rather than return them to active function. We will often combine this with intra articular injections of steroids and hyaluronic acid.

## **Advanced Surgeries for Coronoid Disease and Medial Compartment Syndrome**

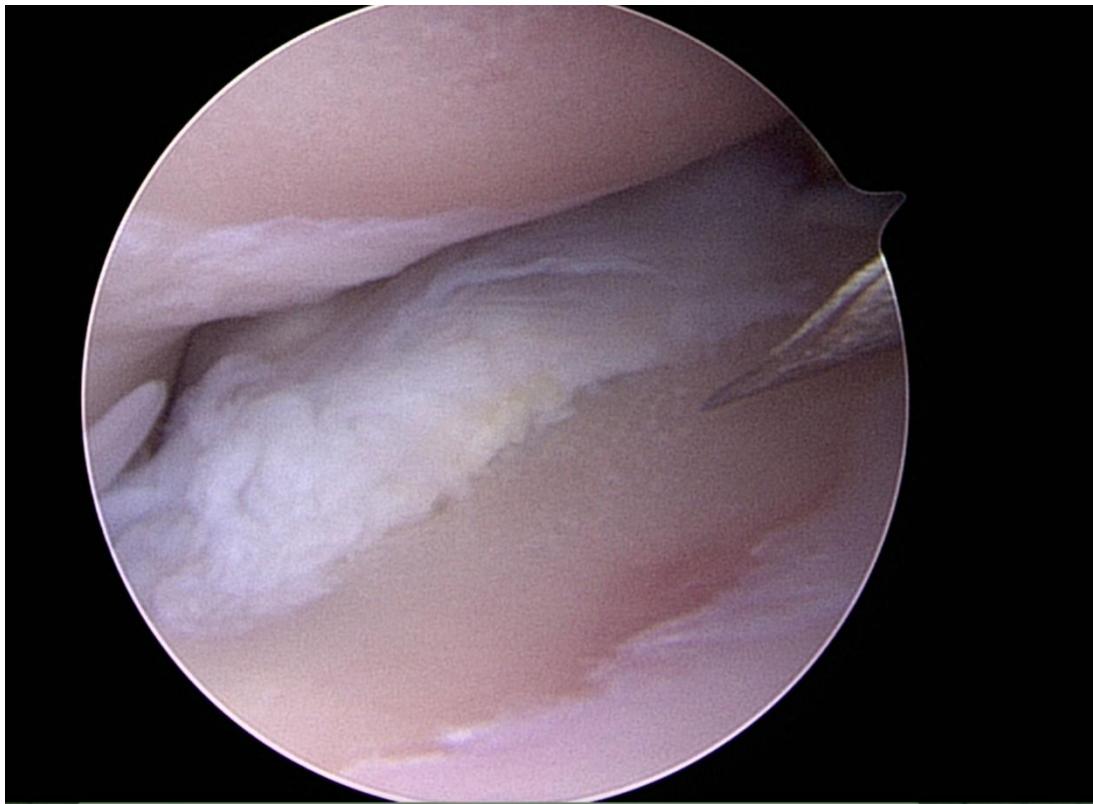
Some cases that present with just early disease (fissures or fragments without significant cartilage loss) seem to respond poorly to debridement alone and in these cases there has often been a rapid advancement of cartilage wear and loss, some cases present at this stage in the first instance. For these cases we have more advanced surgeries to try and improve outcome as arthroscopic surgery alone will provide little benefit, these surgeries are significantly more invasive than an arthroscopic surgery however and the post operative requirements are considerable and the risks of complication higher.

### **Canine Unicompartamental Elbow resurfacing**

This is a procedure designed to relieve the pain associated with medial coronoid fragmentation where there is extensive loss of cartilage (we call this medial compartment syndrome). In these cases the problem has progressed far beyond simple fragmentation of the coronoid and the bone on bone wear caused by the cartilage destruction is a major source of pain and will only otherwise worsen.

The procedure is extremely invasive as it requires that we place a metal implant in the end of the humerus and a plastic implant into the medial coronoid so that there is metal on plastic articulation. These implants have to be placed very accurately.





The surgery is only allowed to be performed by surgeons that have attended a course to learn the technique safely and we are currently only one of a few centres in the UK that can offer the technique.

### **Ulna osteotomies**

The ulna can be cut in order to try and restore more normal mechanics to the elbow joint. The ulna is not a weight bearing bone and so by cutting it and encouraging weight bearing through the leg the muscles acting on it will allow it to move slightly. The issue with this procedure is that it is a high morbidity operation, that is to say there is a fair bit of pain associated with it until the ulna heals. If it does not heal it can move too much.

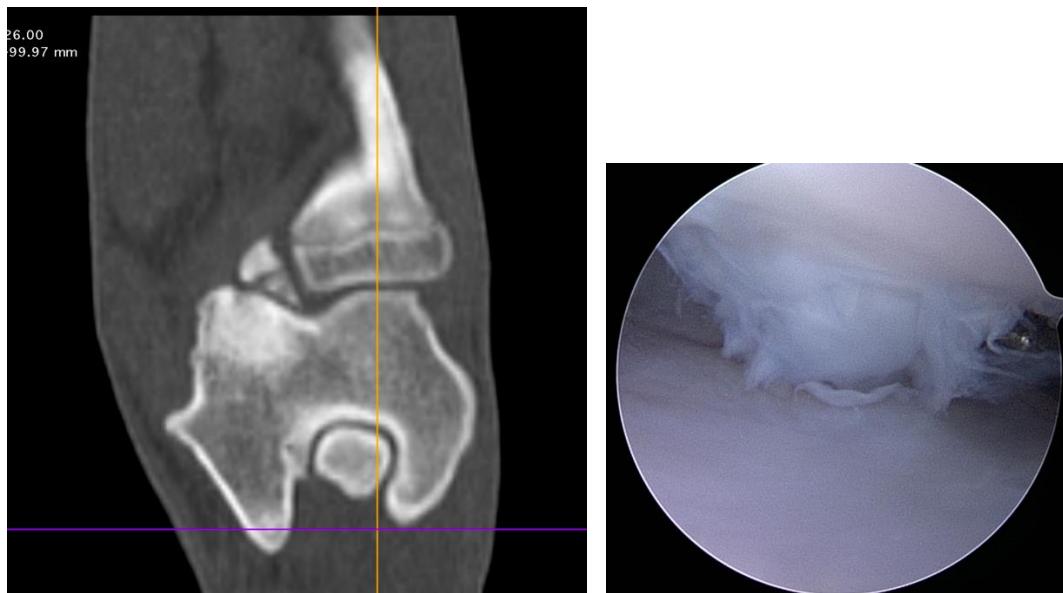
For this reason we avoid cutting the ulna in dogs less than 12 months of age and preferably before they are 10 months old.



## **Osteochondrosis Dissecans (OCD) of the Humeral Condyle**

OCD is the malformation of the articular surface of the humeral condyle. This is a different condition to medial coronoid disease but in most cases of OCD there is also medial coronoid disease present. It will usually present earlier in young large breed dogs. The condition results in a flap of cartilage coming adrift from the humeral condyle exposing the underlying subchondral bone. This causes pain because of the unstable flap but also because of changes to the joint surface shape and because it exposes the bone to the joint fluid. The size of the flap is critical to prognosis but because it usually manifests itself along with medial coronoid disease most cases should be considered as effective Medial Compartment Syndrome from the outset.

CT is essential to make the diagnosis and appreciate the lesion size and the extent of coronoid fragmentation can also be seen.



- In most cases arthroscopic removal of the loose flap of cartilage is usually all that is needed and this is done arthroscopically.
- If there is extensive medial coronoid disease and OCD present we will discuss whether consideration should be given the Canine Unicompartmental Elbow Resurfacing (CUE)

- In cases where there is just OCD and the defect is large we can discuss whether it may be worth filling the cartilage defect with a synthetic surface to improve loading and function. This is a procedure called SynACART.

### **Ununited Anconeal Process**

This is the least common cause of Elbow Dysplasia. In this condition the abnormal growth of the radius and ulna leads to increased pressure being exerted in the back of the elbow. Certain breeds are predisposed including the German Shephard Dog. The increased pressure in the back of the elbow stops the anconeus from growing normally and then fails to ossify thus becoming a loose body. Osteo arthritis will develop because of the abnormal loading through the elbow caused by the abnormal weight distribution. CT and arthroscopy are extremely useful to determine the stage of disease.



### **Treatment of UAP**

Treatment depends on the stage at which the joint has developed

- Early stage 1. Minimal displacement of the anconeus and minimal osteoarthritic changes. Reattachment of the anconeus is possible with a screw and the abnormal joint mechanics can be overcome by proximal ulna osteotomy, the prognosis is reasonably good.
- Mid stage 2. The anconeus is unstable but osteoarthritis is only mild (assessed by arthroscopy). The anconeus can be re attached with a

screw and some debridement and the abnormal mechanics overcome by proximal ulna osteotomy

- Late stage 3. There is considerable remodelling of the anconeus and it cannot be reattached. The dog is less than 10 months old. Removal of the anconeus via a caudolateral arthrotomy and proximal ulna osteotomy to try and improve mechanics and so slow OA. The prognosis for normal function is guarded as the extent of OA present will limit outcome.
- End stage 4. The anconeus cannot be replaced and OA is very advanced and or the dog is older than 12 months. Removal of the anconeus on its own or removal of the anconeus and Canine Unicompartmental Elbow Resurfacing in order to relieve advanced medial compartment syndrome should be considered.

### **Humeral Intracondylar Fissures (HIF) or Incomplete Ossification of the Humeral Condyle**

This is a complex condition with which we are only just starting to truly appreciate. There is an additional information sheet for this

- Frequently seen in Spaniels and CT is the Gold Standard to diagnose and manage the condition
- Identification is important in order to relieve the pain caused by the crack but also to limit the risk of the elbow sustaining a significant fracture.
- Typically we will then use the CT scan to have patient specific guides made in order to place a very large (5mm) screw across the humeral condyle