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## Elbow dysplasia and related conditions

The elbow is quite 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.

There are number of conditions that we see that affect the elbow and lameness as a result of elbow pain is the single most common cause of forelimb problems in dogs. Many of these conditions have some genetic component and they have been grouped together within the umbrella title of elbow dysplasia but it important to remember that the genes responsible for the different causes of elbow dysplasia are separate, some individual dogs may have more than one form of elbow dysplasia present at the same time.

### **Dogs with Elbow Dysplasia should not be used to breed from.**

There are certain sites in the elbow joint that preferentially become damaged:

- The medial coronoid is the most common site to see disease. This is an area of bone on the inside of the ulna where it articulates with the end of the humerus and radius. The specific cause for medial coronoid disease is unknown.
- The medial humeral condyle is another site for injury. It is a site for Osteochondrosis Dissecans (OCD) which is a disease of the articular cartilage that occurs as the dog is growing. A flap of cartilage becomes loose on the end of the humerus within the joint. It is not uncommon to see medial coronoid disease and OCD at the same time and in these cases the prognosis is worse than for cases that have either condition in isolation.
- The anconeus is another part of the ulna and forms the back of the elbow joint. When the joint is extended it locks in place into a notch in the end of the humerus. The anconeus forms as a separate piece of bone in some dogs and usually fuses to the ulna at about 5 months of age, if the anconeus does not fuse to the ulna it will become loose and cause pain.
- The development of Osteo Arthritis will occur with any of these conditions and in many dogs it is not until extensive OA has occurred that the lameness develops. The treatment of this OA can be difficult and is a life long condition that must be managed as such.

### **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.

Radiographs are taken of both elbows, because the elbow is so complex we usually arrange for 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. However it is important to remember that no one diagnostic tool will give all the information required and so each part of the process should be seen as a part of a complete process to make a diagnosis, determine the extent of the problem and plan for managing the problem.

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 X ray or 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.

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 incisures 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.

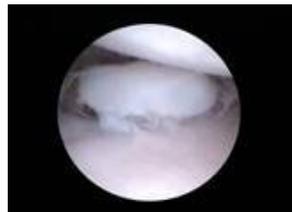
- **For very early medial coronoid disease** where the CT scan just shows some loss of normal bone structure but no clear fissuring and the lameness is a persistent feature then arthroscopy to examine the cartilage is important, in some cases we can relieve some of the medial compartment pressure and 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.

- **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 ostectomy 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 STMC may be performed arthroscopically. However this may result in losing significant portions of the medial coronoid which could have significant long term effects therefore in young dogs we may also discuss the benefits of Canine Unicompartmental Elbow resurfacing (CUE) or Sliding Humeral Osteotomy (SHO), see later for more details.

- **In chronic cases (often older dogs)** where the disease is no longer just associated with the fragmentation but has progressed into a medial compartment collapse and significant OsteoArthritis then we can consider a combined treatment of STMC, release of the biceps muscle to try and relieve the medial stress and also injections of drugs into the elbow to make it more comfortable. This is really only a palliative treatment however and there will be an advancement of the problem with time. In older dogs that are otherwise well Canine Unicompartmental Elbow Resurfacing is a good option albeit invasive to improve function medium and long term.



Arthroscopic pictures of the medial coronoid showing just coronoid disease with no fragments a coronoid fragment with little cartilage injury and a coronoid fragment with extensive cartilage disease

## **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.

### **Dynamic Ulna Osteotomy**

- This is a surgery which involves cutting the ulna and allowing it to find its more nature position. It is performed in dogs where there is a distinct mismatch between the length of the ulna and the radius.
- In dogs less than 7 months of age and in some dogs up to 10 months this can be done distally and have sufficient effect that it achieves the desired outcome, this has the benefit of being relatively easier and causes less discomfort than the alternative to cut the ulna proximally
- The proximal ulna osteotomy cannot be performed safely in dogs over 14 months because it risks not healing and creating a significant deformity it does however provide a more reliable outcome than the distal cut in dogs between 8 and 14 months of age.
- In both these surgeries there is some discomfort associated with the bone cut until it has healed and in the proximal cut this discomfort is more than the distal cut
- We only perform this surgery if there is a clear humeroulna subluxation seen on CT or arthroscopy

### **Sliding Humeral Osteotomy**

- This is a surgery designed to relieve load from the medial aspect of a badly diseased joint to the healthy lateral aspect
- It is a major invasive surgery and holds some distinct risks including humeral fracture and so it is rare that we embark upon this surgery however in some cases it is the most appropriate option available, another similar surgery designed to have the same effect is the Proximal Abducting Ulna Osteotomy which we do not offer.

### **Total Elbow Replacement**

- Total elbow replacement is an option in dogs with end stage total elbow arthritis but it is exceptionally invasive and holds a high complication rate (25%). In the very rare occasion that we feel it may provide a benefit we would refer you to Willows Vet Referral Centre in Solihull where they have more experience in this procedure.

### **Canine Unicompartmental Elbow resurfacing**

This is a procedure designed to relieve the pain associated medial coronoid fragmentation where there is extensive loss of cartilage. 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 surgery involves replacing the weight bearing surfaces only of the medial (inside) aspect of the elbow where the cartilage has worn out and provides the major benefit of arresting the further destruction, it is however a significantly invasive surgery and so is not appropriate for all dogs. 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.



Images of the implants in position in an elbow model and the post operative X ray, images courtesy of Arthrex



### **Osteochondrosis Dissecans (OCD)**

- In these cases arthroscopic removal of the loose flap of cartilage is usually all that is needed however in many cases there may also be coronoid fragmentation as well present and this means that the end result is effectively medial compartment syndrome
- If there is extensive medial coronoid disease and OCD present we will discuss whether consideration should be given the Canine Unicompartamental 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 Synecart.

### **Ununited Anconeal Process**

- This is a rare condition and in most chronic cases the process of bone must be removed as it is not possible to achieve fusion however in some cases it may be possible to reattach the anconeus
- The anconeal process is reattached with a screw via an open approach
- In all cases of reattachment a dynamic ulna osteotomy is also performed to relieve tension on the repair

**In all cases the long term treatment of osteo arthritis is essential.** The use of anti-inflammatory pain killers will alleviate the symptoms of chronic pain and sometimes this can be used in conjunction with other forms of chronic pain relief such as acupuncture. The use of nutraceuticals such as chondroitin and glucosamine is advised.

Joint Disease Management