

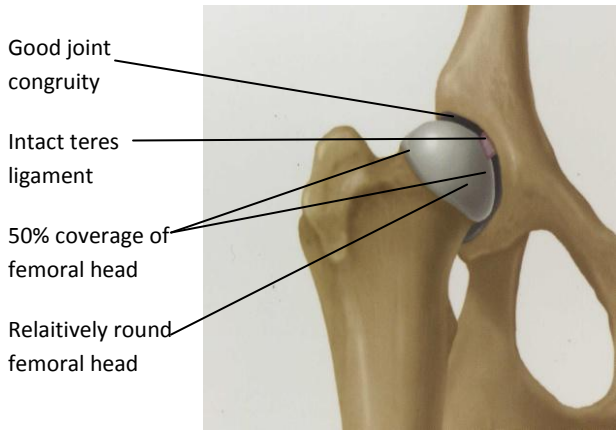
Rachel Watkins, Meadow Farm Hydrotherapy, North Common, Hepworth, Diss, IP22 2PR

Hip and elbow dysplasia are the two most common joint conditions seen in large breed growing dogs. The structure of the hip and elbow joint are quite different.

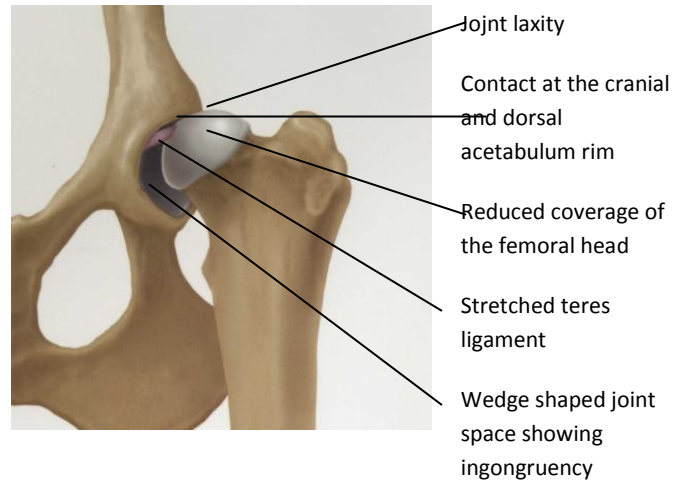
The hip joint is a ball and socket joint. The normal hip joint has a neat snug fit between the ball (femoral head) and socket (acetabulum) and is characterised by more than 50 % coverage of the femoral head by the acetabulum. There will be good joint congruity with the femoral head being relatively round and the acetabulum having a clear cup shape. The Teres ligament between the head of the femur and acetabulum fossa will be intact there should be no laxity. Normal articular cartilage is characterized by a smooth surface without any superficial damage. There is no thickening of the joint capsule.

There are varying ranges of hip dysplasia, from only very slight changes from normal to complete dislocation. Hip dysplasia is largely genetically mediated but is also influenced by environmental factors.

The Hip dysplastic joint is characterised by reduced coverage of the femoral head by the acetabulum. There will be a wedge shaped appearance to the joint space and there may be contact at the cranio dorsal acetabular rim. The Teres ligament is stretched and often swollen. In early or mild cases the femoral head may keep its round shape and the acetabulum may retain its distinct cup shape. In more severe cases the femoral head and neck and the acetabulum lose their normal shape and congruity. Osteophytes develop between the femoral head and greater trochanter and on all aspects of the femoral neck and acetabulum. The articulating surface of the femoral head can become devoid of all cartilage. The joint capsule becomes thicker in response to inflammation and to help stabilise the joint.

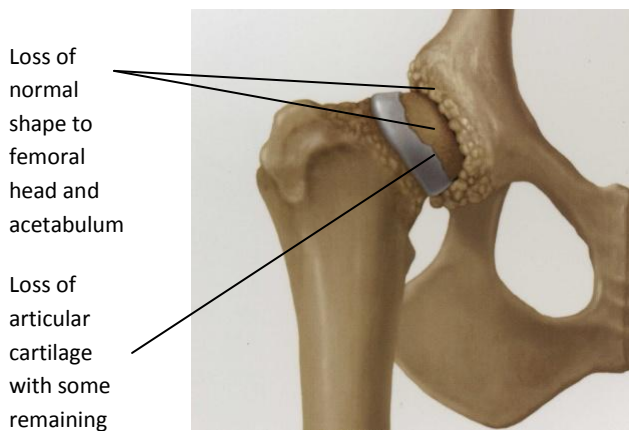


Normal Right hip joint



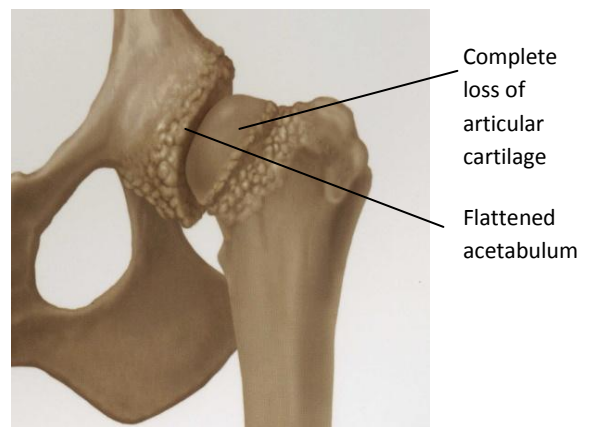
Joint laxity left hip

Osteophyte production



Moderate to severe right hip dysplasia
With secondary arthritic change

More severe degenerative changes



Severe left hip dysplasia showing end
stage arthritic change

The Elbow joint is a composite hinge joint, made up of 3 main bones. In the young growing dog the elbow joint is not fully formed. The bones are not one piece of bone, but several different pieces with cartilage in between. As the dog develops and the growth plates close the cartilage changes into bone and these smaller bones fuse together forming one entire bone. In the normal elbow joint the growth plates will close between 5 and 8 months of age (some breeds can be later). The anconeal process will normally unite between 16 and 20 weeks and the coronoid process at approximately 22 weeks of age completing ulna formation.



Growth plates 2 ½ month old Rhodesian Ridgeback

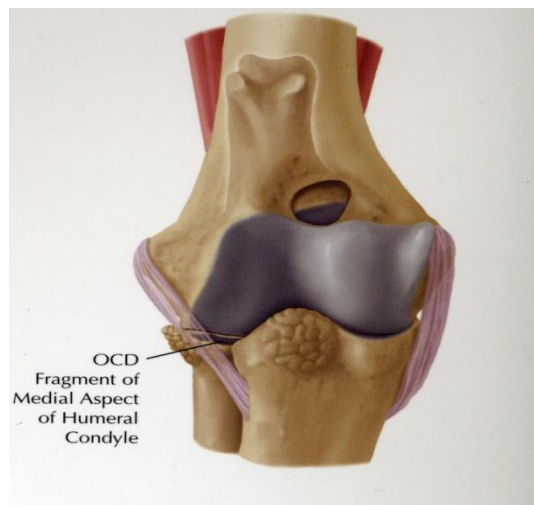


Normal Elbow Joint 1 year old Labrador

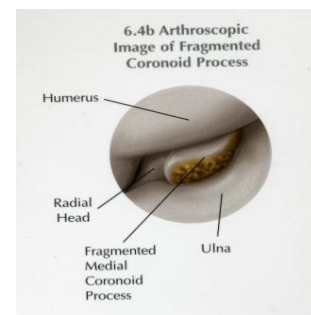
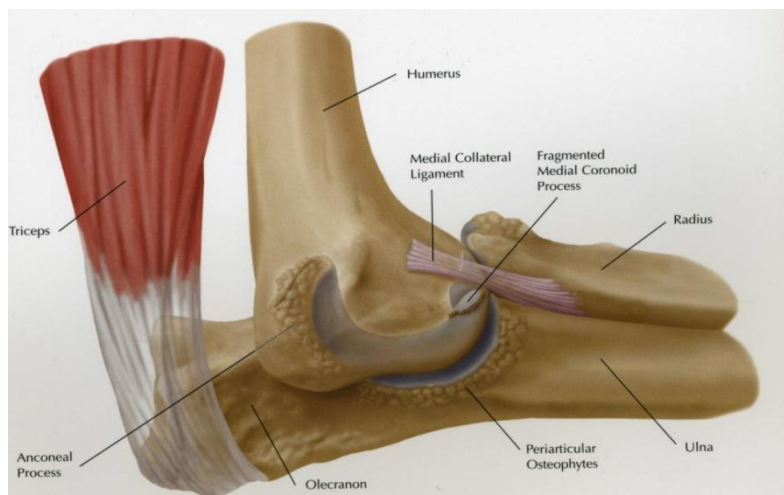
The bones that form the elbow joint are the humerus, radius and ulna. The radius and ulna bones act as one bone, they are held tightly together by several ligaments, they move together as one. The distal end of the humerus has two rounded edges, these are the lateral and medial condyles, there is a hole between them that extends completely through the bone. The upper end of the ulna has a hook that fits neatly into this hole, the anconeal process and a curved ridge called the trochlear notch that fits against and rotates between these condyles. At the base of this notch and on either side of it are the medial and lateral coronoid processes that the condyles of the humerus rest on. The upper end of the radius also lies between the coronoid processes of the ulna. In the normal elbow all of these surfaces that articulate against each other are covered with articular cartilage and

are perfectly smooth. Elbow dysplasia is the general term given to cover several conditions affecting medium to large breed dogs. Each condition affects the joint in a different way.

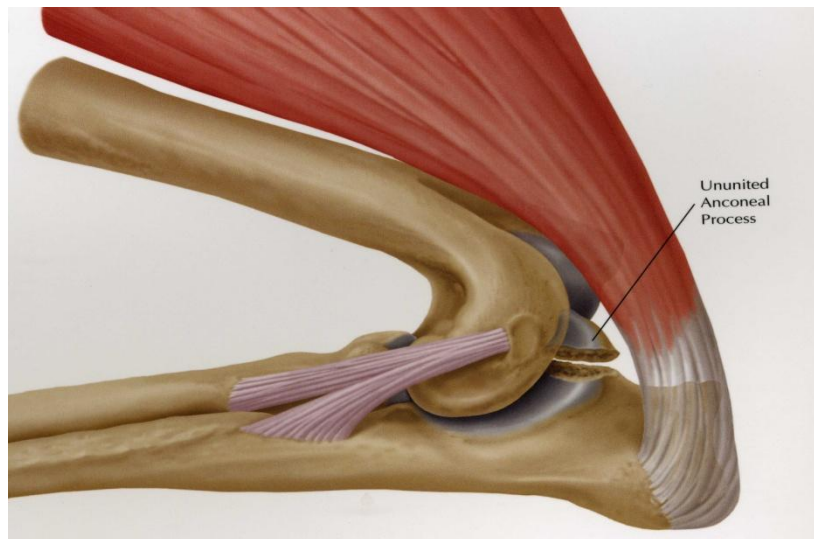
Osteochondrosis is where there is an abnormality of the cartilage and the bone underneath it. In **Osteochondritis dissecans**, a portion of cartilage loosens from the underlying bone and inflammation is present. The fragment may break loose and float free in the joint and form a joint mouse, or remain partially attached to the bone like a flap.



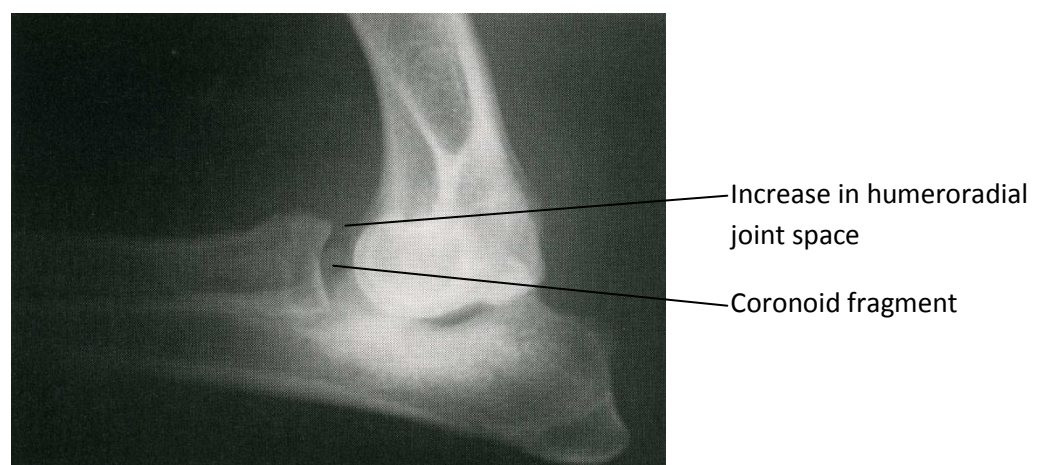
Fragmented medial coronoid process (FCP) is where the medial coronoid process of the ulna is either malformed or has separated from the ulna and is floating free in the elbow joint.



Ununited anconeal process (UAP) is where the anconeal process, fails to fuse correctly to the rest of the ulna, instead it floats loose. This leads to joint instability, preventing the humerus and ulna from interacting correctly. An ununited anconeal process is often found by itself although in larger breeds it is often seen with fragmentation of the medial coronoid process.



Ununited medial humeral epicondyle (UME) is where the medial epicondyle fails to unite with the humerus, this is not commonly seen.



The elbow dysplastic joint is characterised by joint incongruity, thickening and erosion of articular cartilage, osteophyte formation on various aspects of the joint, depending on the condition present, leading to further and often severe osteoarthritic changes. There is usually thickening of the joint capsule in an attempt to stabilise the joint and in response to inflammation.

There are many treatment options for animals with dysplastic joints, both conservative and surgical. Surgical options are often chosen for the more severe cases or those that are more symptomatic than x-ray would indicate.

Surgical options for hip dysplasia include;

1. Salvage Surgery;
 - a) Femoral Head and Neck Excision Arthroplasty
 - b) Total Hip replacement
2. Triple Pelvic Osteotomy
3. Pectineal Myotomy (now not often performed)

Surgical options for Elbow Dysplasia include

1. Ulna Osteotomy (to improve the incongruity of the joint)
2. Lag screw fixation of the anconeal process
3. Arthroscopic fragment removal
4. Salvage surgery;
 - a) sliding humeral osteotomy (SHO),
 - b) total elbow replacement (TER)
 - c) elbow joint arthrodesis (fusion)

Surgical techniques for hip dysplasia bring generally good results, femoral head and neck excision and total hip replacement are the procedures most likely undertaken today by orthopaedic surgeons.

Femoral head and neck excision

Femoral head and neck excision (FHNE) is the removal of the femoral head and neck to create a pseudoarthrosis (false joint). This procedure is best used in smaller dogs (under 25kg) however good results are also seen in larger breeds. FHNE can be carried out bilaterally and simultaneously if required. There are disadvantages to this procedure;

1. FHNE effectively reduces the length of the operated limb so the femoral shaft lies dorsally to the normal position
2. Reduces the range of hip movement
3. Damage to the sciatic nerve is rare but can occur if undertaken without due care
4. Large dogs often don't return to full athletic function.

The FHNE is carried out under anaesthesia and epidural, a curved incision is made from proximal to the greater trochanter for approximately 1/3 rd of the length of the femur. After dissection of the biceps femoris, tensor fascia and deep gluteal muscle the cranial joint capsule is incised and the vastus lateralis is separated from the neck of the femur. The femoral head is then luxated from the acetabulum and the femur rotated to expose the cranio-lateral aspect of the femoral neck. Full removal of the femoral head and neck is performed using an oscillating saw, the femoral neck is rasped if necessary and pre closure x-rays can be taken to ensure accurate removal of the femoral neck has occurred to minimise the formation of bone spurs. Closure involves partial tenotomy (division) of the deep gluteal muscle and suturing of the vastus lateralis to the deep and middle gluteal muscles.



Femoral heads removed from a 6 month old GSD bitch. Note the articular cartilage damage to both heads.



Pre FHNE x-ray 9 month old Labrador



Post FHNE x-ray same 9 month old Labrador

Aftercare involves pain relief, opiates immediately post surgery (torbugesic) and NSAIDS (Carprofen/Meloxicam/firocoxib) 2- 4 weeks post surgery. Early use of the limb is essential to avoid joint stiffness and scar tissue build up. Physiotherapy/hydrotherapy and lead walking are recommended.

Total hip replacement

Total hip replacement (THR) surgery is the replacement of a dysplastic joint using both plastic and metal prosthesis in order to provide a pain free fully functioning joint for an active lifestyle. THR is carried out unilaterally (one sided) where bilateral replacement is required it is usual to separate the procedures by 12 weeks. There are two types of THR; cemented (using cement to fix the prosthesis in place) and cementless where the prosthesis have a porous coating into which the bone can grow, these are sometimes screwed in place.

There are disadvantages to this procedure;

1. Luxation of the new joint
2. Fracture of the bone
3. Loosening of the implants
4. Infection

If post surgical complications do occur additional surgery will be required.

Total hip replacement is carried out under general anaesthesia and epidural. There are a range of sizes of prosthesis available and the animal will be measured pre surgery, the prosthesis consists of the metal femoral stem and femoral head and the plastic and metal acetabular cup. It is common practice to wait until the animal has reached skeletal maturity before performing THR surgery.



Hip prosthesis in 4 different sizes

THR is a technically demanding procedure and is only carried out by specialist orthopaedic surgeons.

Strict asepsis is required during surgery to avoid post surgical infection.

Conventional cemented total hip replacement

A craniolateral or dorsal approach can be used to expose the femoral head and neck, dissection of the muscles around the hip exposes the femoral head and allows it to be outwardly rotated, the joint capsule is incised and the teres ligament is cut to allow luxation of the femoral head, all soft tissue attachments to the femoral neck are removed. An oscillating saw is used to create an osteotomy of the femoral neck using a template. The acetabulum is reamed (filed) through to the

medial cortex, holes are then drilled in the bone cranially into the Ilium and caudally into the ischium and around the periphery of the acetabulum under the dorsal rim of bone. The holes are then linked together this is essential to key in the bone cement. The femoral cavity is reamed until the chosen prosthesis is accommodated with ease. Bone cement is pushed into the acetabulum and the prosthetic cup positioned. Bone cement is then packed into the femoral cavity and the prosthetic stem positioned. The femoral head providing the best femoral neck length is chosen and tapped into position on the femoral neck. When the cement has set the prosthetic head is then reduced into the prosthetic cup. Closure involves suturing of the joint capsule.



Cementless hip replacement



Cemented hip replacement

After care involves pain relief, opiates immediately post surgery (torbugesic) and NSAIDS (Carprofen/Meloxicam/firocoxib) for 6-8 weeks, strict rest for 6- 8 weeks with just short lead walks to urinate and defecate, followed by a further 6-8 weeks of gradually increasing lead walks/ physiotherapy land based exercises and Aquatic treadmill exercise, where appropriate. Post operative x-rays are taken 8 weeks post surgery to ensure all is well before increasing exercise.

Triple pelvic osteotomy

This is another procedure carried out to treat hip dysplasia in young dogs. The procedure must be carried out before degenerative changes develop in the joint this means the procedure is generally carried out in skeletally immature dogs between 5 and 12 months of age.

Triple pelvic osteotomy (TPO) is used to reconstruct the abnormal hip joint to make it more stable. This involves cutting the pelvis in three places and rotating the acetabulum over the femoral head. The rotated section is secured in the new position with a specially designed plate. This procedure has the advantage of maintaining the dog's own joint tissues and hopefully reducing the development of osteoarthritis. Unfortunately many young dogs with hip dysplasia are not good candidates for reconstructive surgery due to the presence of osteoarthritis.

Complications can arise and include

1. Implant (plate) failure
2. Sciatic nerve damage

TPO is carried out under general anaesthesia and epidural. A ventral approach is used and an incision is made over the pectineus muscle. The pectineus muscle is severed close to its origin and the abductor muscle (gracilis) and deep femoral vein are retracted away from the pubis. An oscillating saw is used to create an osteotomy of the pubis, ischium and Ilium to free a segment of the pelvis incorporating the acetabulum. This segment is rotated outwards to create more coverage of the femoral head. This rotation is maintained by the use of a plate attached to the Ilium. The ischial osteotomy can be fixed with a wire loop or left free.



Right sided TPO



plates used to fix TPO osteotomy



location of pelvic osteotomy

Aftercare involves pain relief opiates immediately post surgery (torbugesic) and NSAIDS (Carprofen/Meloxicam/firocoxib) for 4 weeks post surgery if required. Strict exercise restriction with towel support to prevent ilial fixation collapse for 4 weeks until post op x-rays indicate evidence of bone healing. Physiotherapy and hydrotherapy where indicated.

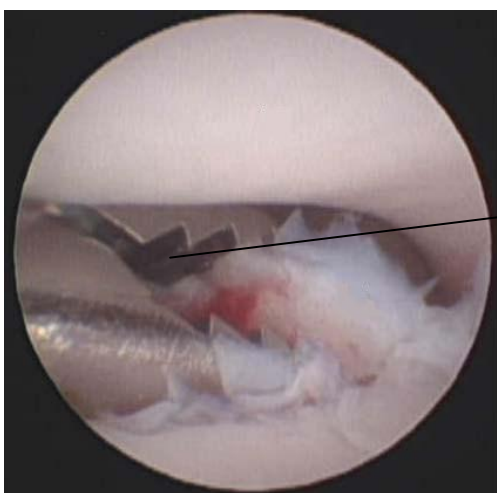
Surgical techniques for elbow dysplasia can bring a guarded prognosis and where possible a conservative non surgical approach is often used.

Arthroscopic fragment removal

The most common type of surgery for elbow dysplasia involves removing any loose fragments of cartilage and bone from the inside of the elbow joint. The elbow joint is a tight joint and there is little space for loose fragments, their presence may cause lameness and the development of secondary arthritis, removal of the fragments may reduce lameness and the rate of development of degenerative changes. Fragment removal can be done in conjunction with abrasion chondroplasty of the damaged cartilage. This can be done under guidance from a camera through keyhole surgery or via a direct surgical approach.

Recovery, especially from arthroscopic surgery, tends to be reasonably rapid. Occasionally lameness fails to improve. This may be due to the underlying joint incongruity or degenerative changes. This procedure is most often used to treat a fragmented medial coronoid process.

Arthroscopy is a surgical procedure where small endoscopes are passed into the joint allowing the joint surfaces to be visualised on a monitor. Arthroscopic images are magnified and fluid is used to flush away blood, the detail seen is much greater than could be seen with the naked eye via a traditional open surgery. A medial approach provides the best view of the most commonly affected areas. Incisions are made on the medial aspect of the elbow to allow placement of the endoscopes, a camera is attached to the eyepiece of the scope and images are transmitted to a screen. Fluid is continuously flushed through the joint to remove blood and debris and maintain a clear view of the joint. Forceps and/or an endoscopic motor drive are used to remove bone fragments and debris, diseased parts of the coronoid process and anconeal process (if very small) and the removal of Osteochondritis Dissecans cartilage flaps from the joint. If full thickness damage to the articular cartilage surrounding the fragment has occurred, the cartilage can be shaved down to bleeding subchondral bone (abrasion chondroplasty). Bleeding from the subchondral bone forms a clot that becomes fibrous tissue and, over time, modulates into fibrocartilage.



Forceps being used during an arthroscopy to remove a FCP lesion

Immediate aftercare is minimal but includes the use of NSAIDS where required and exercise restriction.

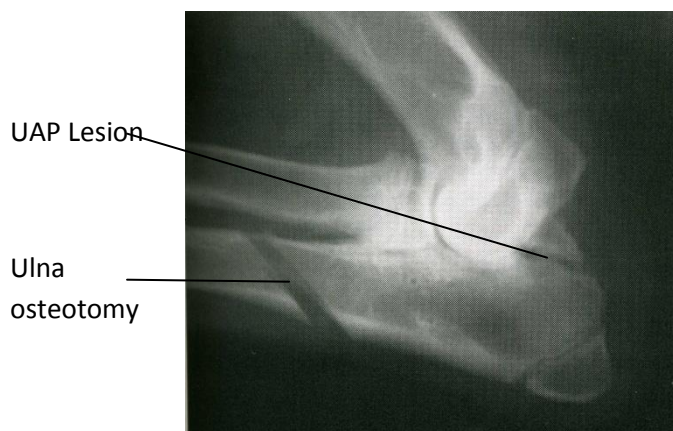
Ulna Osteotomy

Incongruity of the elbow joint can be improved by Ulna Osteotomy. This procedure is most often used to treat an ununited anconeal process and is best done between 5 and 6 months of age. The osteotomy relieves pressure on the anconeal process and encourages fusion.

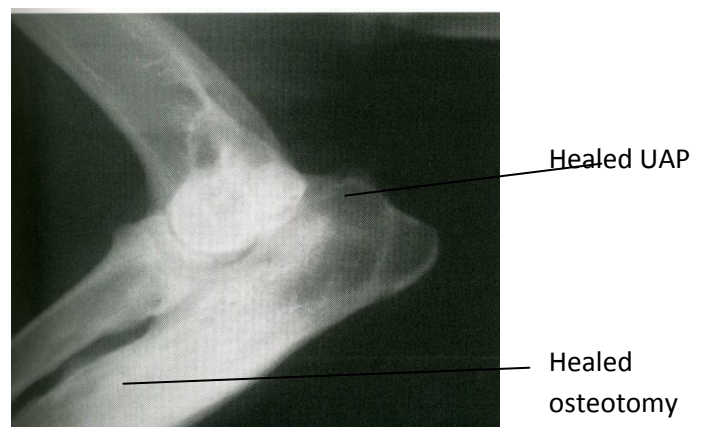
Complications post surgery includes;

1. Infection
2. Failure of the anconeal process to unite and continued lameness

Ulna Osteotomy is performed under general anaesthesia. An incision is made over the proximal section of the ulna, dissection of the flexor and extensor muscles on each side of the ulna is performed, an osteotomy is made distal to the annular ligament, no bone section is removed and the osteotomy is left unstable. The muscle bellies and fascia are joined using absorbable stitches and the wound closed. The space created by the osteotomy allows the proximal section of the ulna to move back and encourages fusion of the anconeal process. The osteotomy then heals.



Post op x-ray showing ulna osteotomy



8wk post op x-ray showing fused anconeal process and healed osteotomy

Aftercare includes a support bandage for five days pain relief opiates immediately post surgery (torbugesic) and NSAIDS (Carprofen/Meloxicam/firocoxib) as required. Lead exercise only for 2-4 months whilst the osteotomy heals. Physiotherapy and hydrotherapy as indicated.