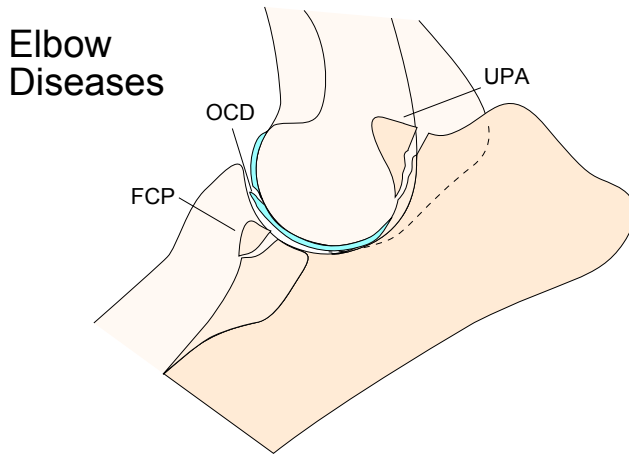


# Sliding Humeral Osteotomy for Treatment of Elbow Dysplasia in Dogs

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Arthritis of the elbow joint is the most common cause of fore-leg lameness in dogs. Most of the arthritic diseases of the elbow are considered forms of developmental elbow malformation (dysplasia).



## What is Elbow Dysplasia?

Elbow dysplasia refers to a group of congenital diseases of the elbows of dogs, which include:

- **Fragmented coronoid process (FCP)**
- **Medial compartment disease (MCD)**
- **Osteochondrosis dessicans (OCD)**
- **Ununited anconeal process (UAP)**
- **Incomplete ossification of the humeral condyle**

## Fragmented Coronoid Process

Fragmented coronoid process (FCP) is the most common form of elbow dysplasia in dogs. In this disease, a fragment of bone and cartilage of one of the bones of the elbow joint (ulna) is broken off. This fragment may be small or large and may stay in place or move about. More important, the rest of the joint may be normal or there may be additional cartilage damage, including OCD or severe full-thickness cartilage loss. Damage to the cartilage in dogs with elbow dysplasia is called medial compartment disease because it commonly results in severe erosion of the cartilage of the medial aspect of the joint.



*Arthroscopic view of a fragmented coronoid*

## Diagnosis of FCP and Medial Compartment disease (MCD)

Diagnosis of FCP and MCP can be challenging. The diagnosis is initially based on a careful orthopedic examination. Examination findings with elbow dysplasia will show varying degrees of joint thickening, pain on joint manipulation, and loss of range of motion.

X-rays (radiology) are of limited use in the diagnosis of FCP. The FCP fragment cannot be seen on x-rays and by the time there are significant changes on x-rays there may already be damage to the cartilage of the joint. In fact, recent studies have confirmed that there can be severe cartilage damage in a joint despite normal x-rays. We do not recommend waiting until there are x-ray changes to treat elbow diseases. The FCP fragment can be seen on a cat scan, but this procedure requires general anesthesia, does not provide an opportunity for treatment and does not show the condition of the cartilage in the joint.

We recommend arthroscopy for the diagnosis of FCP because it allows accurate diagnosis and treatment of FCP as well as assessment of the cartilage of the joint.

## Treatment of FCP

The basic principle of management of FCP is removal of the fragmented bone and cartilage. Arthroscopy is the fastest, most effective, and least invasive method for fragment removal. Arthroscopic treatment of FCP takes between 15 and 30 minutes per elbow and many dogs may be treated on an out patient basis.

## Prognosis with FCP

The prognosis following arthroscopic treatment of FCP varies tremendously based primarily on the condition of the cartilage in the joint. As stated above, in mild cases we find a small fragment, which is easily removed. In these cases, examination of the rest of the joint shows healthy white cartilage with little wear and tear. For these dogs the prognosis for return to normal activity is good. Most dogs return to normal activity over a few weeks to two months with little to no lameness. They may need infrequent anti-inflammatory medications or rest for short bouts of lameness, but at this time there is no evidence that more fragments will occur in the joint and the progression of osteoarthritis in these cases appears to be slow.

## FCP and Medial Compartment Disease

The prognosis for more severe cases of FCP is less certain. In these cases the fragment may be large and there may be significant cartilage damage to the point that, in the worst cases, all of the cartilage on the inner (medial) side of the joint may be worn away. This is termed Medial Compartment Disease and unfortunately can occur in dogs as young as 1 year of age. Dogs with Medial Compartment Disease will likely have some degree of lameness even after arthroscopic removal of the fragmented coronoid process. Arthroscopy may also include techniques called microfracture or abrasion arthroplasty which are intended to promote



*Arthroscopic view of worn cartilage in the elbow joint*

cartilage healing although significant cartilage healing with these techniques alone is unlikely. Dogs with medial compartment disease usually require more continuous medical treatment of osteoarthritis and owners should consider additional treatment options.

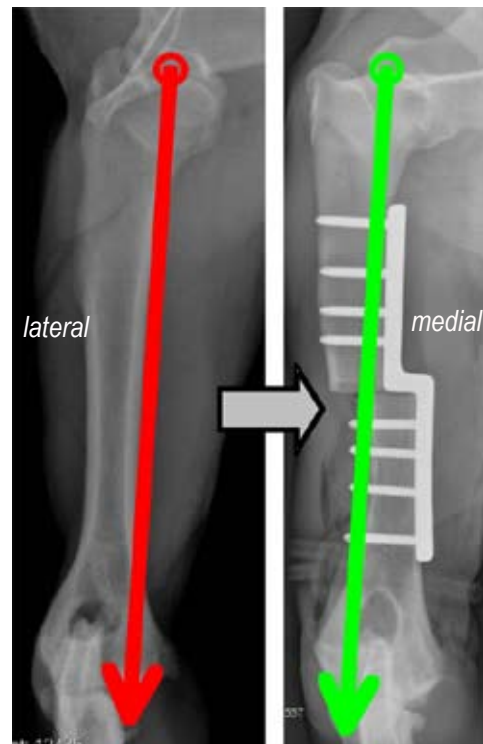
Advanced surgical treatments of Medial Compartment Disease include Sliding Humeral Osteotomy (SHO) and total elbow replacement.

Total elbow replacement may be indicated when the cartilage is severely damaged throughout the elbow joint. Numerous total elbow replacements have been designed over that last 15 years and to date none has been proven to be safe and effective enough for routine use.

## Sliding Humeral Osteotomy

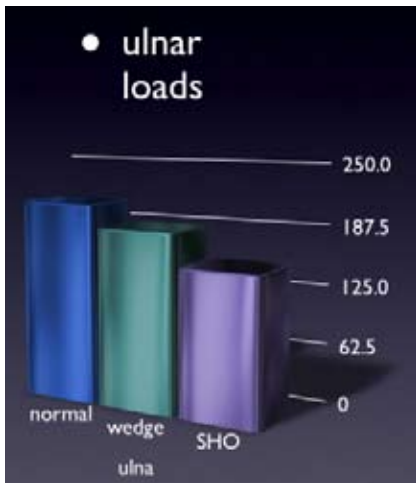
Sliding Humeral Osteotomy (SHO) was developed in the Orthopedic Research Laboratory of the University of California by Dr Schulz. This procedure is based on similar procedures that are performed on people for arthritis of the knee. The procedure realigns the limb to shift the forces off of the area of cartilage damage and back on to healthy cartilage. This relieves the pain of grinding of bone on bone and gives the damaged joint an opportunity to heal.

## How it works



*Shifting of load by the SHO procedure*

Medial Compartment Disease results in painful destruction of cartilage and eventual grinding of bone on bone. As the cartilage destruction progresses the joint collapses on the side of cartilage damage, further contributing to the cartilage damage and pain. In order to stop the progression of cartilage damage and decrease the pain, pressure on the damaged portion of the joint must be decreased. In the human knee this has been done for over 50 years by performing a wedge osteotomy on the tibia or humerus. We originally performed a similar wedge procedure in dogs and then developed the slide procedure. The sliding humeral osteotomy results in less joint pressure and is simpler to perform with fewer complications.



Graph showing reduction in joint loads following SHO

The sliding humeral osteotomy procedure is the result of over 10 years of laboratory research. These studies have demonstrated that the sliding humeral osteotomy significantly decreases joint pressure in the medial side of the elbow joint. Clinical studies have been performed to design a bone plate and screw system that results in superior osteotomy stability. And through use of the procedure in over 70 dogs the surgery has been refined to a rapid and accurate procedure.



Equipment and implants for the SHO procedure

**Multinational Patents Pending**

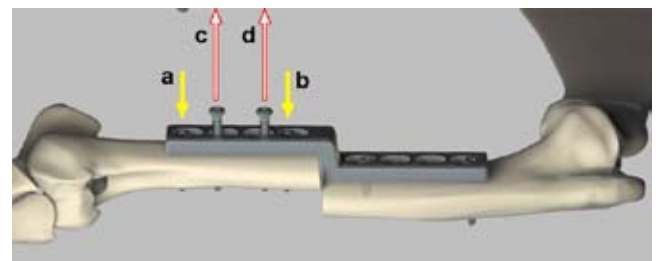
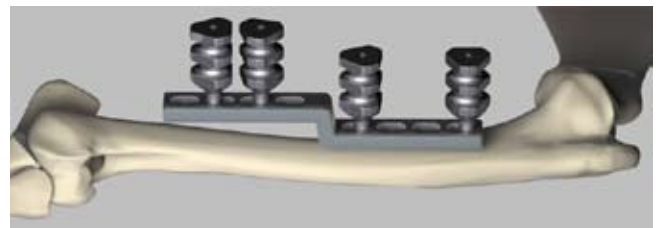
## Patient selection

Almost any dog with medial compartment disease is a candidate for the SHO procedure. The diagnosis of medial compartment disease requires arthroscopic or surgical evaluation and the SHO procedure may be performed at the same time. Dogs with loss of cartilage throughout the elbow joint are not candidates for SHO; however, this scenario is uncommon regardless of radiographic findings. Any dog with forelimb lameness of uncertain cause warrants evaluation by a surgeon and possible arthroscopy of the elbow joint.

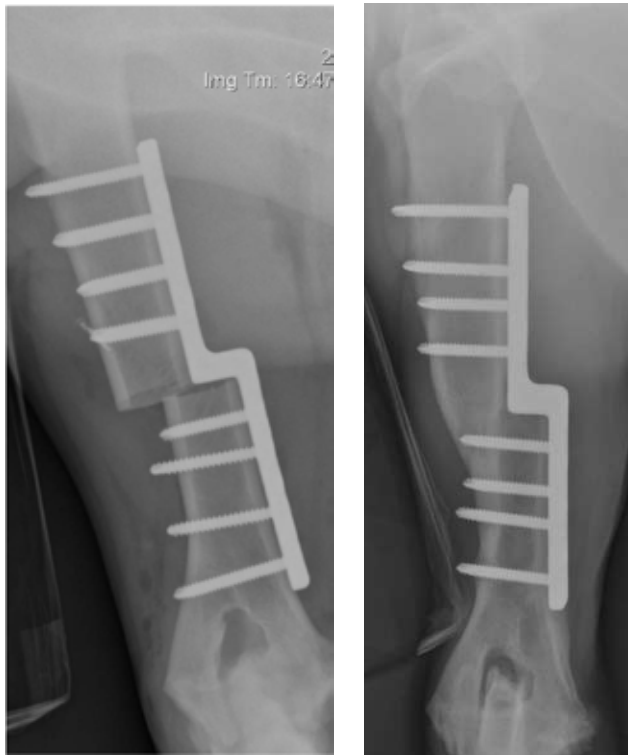
An SHO may be performed regardless of patient age. Although most dogs with elbow dysplasia are affected bilaterally, the SHO procedure should only be performed on one limb at a time.

## SHO surgery

The SHO procedure is performed from a medial approach to the humerus. Once the medial aspect of the humerus has been exposed, the SHO bone plate is attached to the bone to serve as a cutting jig. Once the bone has been cut, the bone screws automatically move the bone into the proper position. Custom designed locking bone screws are then placed to secure the bone and plate. The entire SHO procedure can be routinely performed in 30 to 60 minutes.



Surgical steps of the SHO procedure



*Postoperative SHO*

*Healed SHO*

### Postoperative care and rehabilitation

Postoperative care for dogs undergoing an SHO are similar to that for dogs following a fracture repair or TPLO. The patient should rest quietly for the initial two weeks followed by leash walking for the next 6 to 10 weeks. Complete healing of the SHO usually requires 8 to 12 weeks after which time the dog may be gradually returned to normal activity.

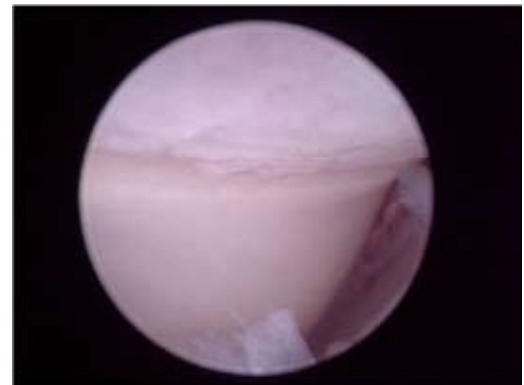
### Clinical results

Over the last 5 years the SHO procedure has been performed in over 200 dogs. Careful clinical studies have been performed to evaluate the efficacy of this procedure. The majority of dogs undergoing SHO have decreased lameness by 12 weeks postoperatively with many dogs having no visible lameness at a 26 week evaluation. The owner satisfaction rate following SHO has been nearly unanimous.

Arthroscopic examination of elbow joints several months after SHO procedures have been performed has revealed healing of the diseased joint surface with fibrocartilage, demonstrating that the SHO procedure effectively unloads the medial compartment of the elbow joint.



*Medial elbow joint before SHO*



*Medial elbow joint 6 months after SHO*

### SHO surgeons

Surgeons performing the SHO procedure are all highly experienced orthopedic veterinary surgeons. They have completed a course covering the theory, indications, and application of the SHO technique.

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