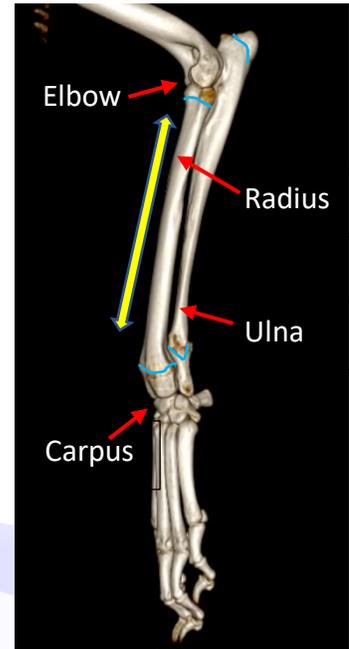


Angular Limb Deformity of the Forelimb

Anatomy

In dogs, the growth plates are responsible for longitudinal bone growth, which takes place primarily during the fourth to eighth months after birth. Growth plates (blue lines) are near the ends of bone I (see right) By one year of age, most growth plates have disappeared and growth, for the most part ceases.



Cause of angular limb deformity of the forelimb

The growth plates are the softest parts of the bone, therefore it is prone to injury. If an injury to the growth plate has occurred during the period of rapid growth, the bone may not grow to a normal length or it may become twisted. The forelimb has two bones between the carpus (wrist) and the elbow joint: the radius and ulna bones. The growth plate of ulna bone located near the carpus is particularly susceptible to becoming injured, as it is shaped like a cone (arrow, photo right). This V-shaped (conical) growth plate of the ulna bone is responsible for about 90% of the bone's longitudinal growth. Therefore, following damage to this growth plate, the ulna does not grow to normal length, yet the radius continues to grow (yellow arrow). The result is a "bow-string" effect in which the radius becomes bowed. This causes the limb to become twisted and bowed near the carpus. In addition, the elbow joint may become pulled out of alignment due to a shortened ulna bone.

Signs and diagnosis

Angular limb deformities may affect both large and small breed dogs and signs are typically seen when the dog is less than one year of age. Lameness and twisting of the limb are the cardinal signs of an angular limb deformity. In some dogs, the elbow joint may be pulled out of alignment, thus causing swelling and pain in this joint. Bowing of the limb to the side may cause pain in the carpus joint due to excessive stresses put on the ligaments (medial collateral ligaments).

The diagnosis of an angular limb deformity is based on physical examination findings and x-rays of the affected forelimb. The surgeon likely will complete a CT scan of the affected and normal limbs, with your pet under sedation, in order to develop a precise surgical plan to correct the deformities. The surgeon may also submit the CT scan to a lab to make a 3D model and surgical guide to aid in the correction of the deformity. The images right show a twisted limb (left) and a straight limb (right).



The day of surgery

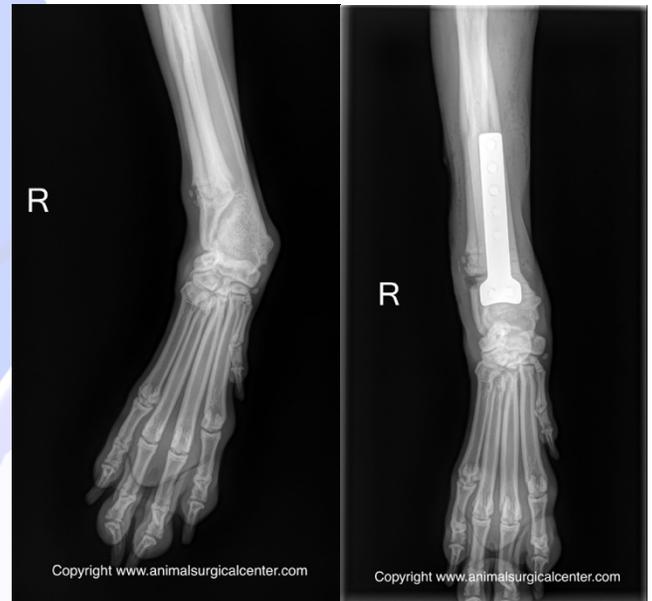
Our anesthesia and surgical team will prescribe a pain management program, both during and after surgery that will keep your companion comfortable. This may include a combination of general anesthesia, injectable analgesics, infiltration of a long-lasting local anesthetic (Nocita), oral analgesics and anti-inflammatory medication.

Surgery

If the patient is still growing and the angular limb deformity is mild, a simple surgery involving removal of a part of the ulna bone will allow the limb to straighten (or at least not worsen) within a few months. Should the procedure not be done at this time, inevitable marked twisting of the limb will result.

If the patient is eight months of age or older, or if the deformity is severe, the limb must be surgically straightened. Timing of the surgical straightening procedure of the limb is important and will be decided upon by your pet's surgeon.

During corrective surgery, the ulna and radius bones are cut near the carpus, where the bones are twisted. Usually a wedge of bone is removed from the radius bone. The limb is then realigned to correct the deformity. The bones are held in place by means of a bone plate and screws or an external skeletal fixator.



At ASCM, the preferred method to secure the bones in place is with a bone plate and screws, as there is less postop care needed by the pet owner (see pre and post images to right). In most cases, the metal plate and screws are left in place, unless there is some indication to remove them once healing has taken place.

A second method of bone fixation is with an external skeletal fixator. This involves placement of pins through the skin and bone and these are fastened to external bars with a series of clamps. After full healing takes place, the apparatus is removed.

If the elbow joint has been pulled out of alignment by the shortened ulna, cutting the ulna bone will allow the elbow to come back into position.

Home care

After surgery, you can continue to give your pet a prescribed pain reliever to minimize discomfort. If a plate and screws have been used to secure the bones in place, a splint or cast may be used for period of time, pending the surgeon's discretion. It's also extremely important to limit your dog's activity and exercise level during the post-operative period. Detailed instructions will be given to you after the surgery. The surgeon will monitor the healing process with a series of follow-up exams, depending on which method has been used to secure the bones in place. At eight weeks after the surgery, x-rays will be made to evaluate the healing of the bone.

Results

Surgically correcting an angular limb deformity has the advantage of relieving carpus and elbow pain, and reducing arthritis from developing within the joints over time. The pet owner must understand that angular limb deformities are commonly complex, in three planes and may involve multiple levels of the bone. Therefore, following surgery, the deformity will be greatly improved upon, but may not be perfectly normal.

Uncommon complications following surgery include infection, nonhealing of the cut bones, breakage of the implants (metal plate, screws or pins), bone cancer (from leaving implants in place), cold sensitivity and fracture of the bone. In general, about 90 to 95% of the patients that have surgery will heal uneventfully.

Assessment and recommendations

Patient name: _____

Date: _____

Treatment

- Surgery is recommended
- Surgery is not recommended

The following has been prescribed

- No medications or special diet are necessary at this time
- Pain controlling medication: _____
- Nonsteroidal anti-inflammatory medication: _____
- Other: _____

Exercise

- Confine your pet to a crate and carry him/her outdoors for bowel movements and urination
- Confine your pet to the house other than very short leash walks necessary for bowel movements and urination

Preparation for surgery

- Start fasting your companion at midnight, before the surgery; water should not be withheld
- Pepcid AC 10 mg tablets: give _____ tablet(s) with water (if needed use a syringe) at 6 AM on the day of surgery