

What Is an Angular Limb Deformity and How Can an Orthosis Help?

While an angular limb deformity can occur in either a forelimb or hind limb, this information will focus on thoracic (forelimb) angular limb deformities. An abnormal curvature of the radius or ulna is a complex biomechanical abnormality. The thoracic limb and carpus are composed of 2 antebrachial bones (radius and ulna), 7 carpal bones, and 4 or 5 metacarpal bones. Deformity to the thoracic limb due to the abnormal curvature of the antebrachium can cause carpal instability and digital pathology.

Clinical signs of carpal abnormalities include lameness, swelling and abnormal curvature of the antebrachium. The abnormal curvature of the antebrachium can lead to increased angulation of the carpus away from the midline (varus), toward the midline (valgus) or hyperextension. Common surgical approaches include wedge osteotomy, and/or pan carpal arthrodesis. Orthosis options include carpal orthosis with a paw segment Articulation at the carpus joint or paw joint is possible and is determined based on the unique biomechanical challenges presented. The design of the device depends on the type and severity of the deformity. An orthosis is considered an excellent option when surgery is not appropriate, not necessary, or not possible.



What will your vet be looking for?

Your veterinarian will complete a full evaluation on your pet and will likely take radiographs (x-rays) of the thoracic limb. Your veterinarian will utilize radiographs and complete a full assessment of your pet to determine whether a corrective surgical intervention is appropriate or if an orthosis can provide a functional solution in lieu of surgery.

Special considerations for when my veterinarian make the impression.

Non-surgical cases require an accommodative joint alignment due to the angular limb deformity. While creating the fiberglass impression, please reduce any joint instabilities that are not directly involved with the deformity itself.

For surgical procedures that involve wedge osteotomies and/or arthrodesis, we recommend the fiberglass impression be taken 10-14 days post-operatively to allow some skin healing as well as to allow the swelling to decrease. We recommend post-op radiographs be included with the case when it is sent in.

Because an orthosis is not the correct therapy for all patients, before choosing an orthosis the following points are important to keep in mind:



1. **Device design is paramount to success.** Careful consideration is taken in prescribing a device and its specific components. Important clinical variables surround use of a paw segment and whether articulation by way of hinges is possible.
 - a. The paw segment is required for angular limb deformity cases. Without a paw segment, the device is unable to reduce forces acting on the carpus and proximal limb segments due to abnormal paw contact to the ground. These patients commonly require a custom paw shell and wedge design to restore normal forces acting on the thoracic limb.
 - i. Without the custom paw shell and wedge design, these patients are at risk for poor control of their pathology and most importantly, serious skin trauma/wounds due to uncontrolled force, pressure and friction. Without the paw segment, suspension will be difficult since the patient will want to flex out of the orthosis.
 - b. Articulation (hinging) can be considered for patients who present with minimal angular limb deformities and minimal joint instability. Articulation cannot be provided under the following circumstances: severe carpal mal-alignment, bone tumors near the carpus, metacarpal fractures and non-reducible carpal bone luxation. When articulation is not possible, patients will not have a normal gait in the device; however, an orthosis can provide significant improvement as a part of an overall treatment plan (see #5 and #6 below). The recommended device design will be discussed with the veterinarian once the Case Manager has received the impression, paperwork and all of the media
2. **Adjustments are expected and are a normal part of the custom orthosis process.** The device is custom-made for your dog. Every effort is made to accurately fit the device. If adjustments are required, it will be necessary to ship the device to OrthoPets with a turnaround time of 1-3 business days excluding shipping time. Even so, your dog is much more active at home than here at the clinic. Think of the last time you bought a new pair of hiking or ski boots; they needed some break in time, right? Increased activity and activity intensity can expose fit issues requiring adjustment.
3. **Follow-up is critical to success.** An orthosis is considered a “durable medical device.” This means that proper use is necessary to meet therapeutic goals and to ensure its safe application over the lifetime of your dog or the duration of injury healing. Please discuss a follow up plan with your veterinarian.
4. **Rehabilitation, the first key for success.** Most dogs adapt quickly to wearing an orthosis. Behavioral techniques can facilitate this. Also, your dog will need to learn basic skills while wearing the device. These include: transitions (sitting, lying down, and getting up), stairs, getting into vehicles safely, managing on different types of surfaces (ground, carpet, hardwood floor, etc.). Finally, orthopedic injury leads to compensatory abnormal movement and associated muscle strain and weakness. The best way to ensure the highest level of success with an orthosis is to follow a rehabilitation schedule.
5. **A proactive approach to arthritis management is the second key to long-term success.** If the joint itself is injured rather than a ligament alone, osteoarthritis may develop. Just as rehabilitation is important, arthritis management is key as well. Steps taken early and continued throughout your dog’s lifetime will make a difference in terms of regaining and maintaining comfort and an active life-style well into the senior years. Consult with your veterinarian for a comprehensive pain management plan.