

Radius Curvus

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Radius Curvus is a condition which can happen if the growth plate of the bones, the epiphyseal cartilage, in young dogs somehow becomes injured or damaged. When this happens, these bones can no longer develop normally. In certain breeds the growth plate can also be affected by a congenital malposition and an inappropriate strain/exposure during early growth can result in deformity of the limb.

The bones grow most rapidly between the age of 4 to 7 months and during this time 90% of the final length of the limbs will be reached. By about the end of the 11th month the longitudinal growth of the bone will come to an end with the closure of the growth plates. Injury during this time can cause the growth plates of a young dog to close prematurely and will thus prevent the further longitudinal growth of the bone. This can cause a shortening of the affected bone and a deviation from the normal development of surrounding bone and cartilage. In single long bones (such as upper arm or thigh bones) a premature closure of one of the growth plates can partly be compensated by the second growth plate at the other end of the bone – in which case the effects will most often hardly be noticed.



However, quite the contrary happens in the case of the lower arm (antebrachium). The risk of growth disturbance in the radius and the ulna is great. These two parallel growing bones of the lower arm depend on a congruent growth. Otherwise it will soon result in an obvious axis deviation and displacement of the limb will become apparent to the owner. In addition, the epiphyseal cartilage at the distal end of the ulna has a cone-like form. In the case of external trauma, this will cause a contusion of the growth plate instead of a fracture as might occur in other bones. Immediately after the injury, radiographs of the growth plate will appear completely normal, but the ulna loses its growth potential and the consequences will not be noticed before it is too late, that is not before the bone is clearly deformed. A third negative factor is that the ulna has no way to compensate for the injury, as almost all longitudinal growth happens through the distal cone-shaped plate, contrary to all the other bones. The consequences are obvious: the ulna stops growing and remains shortened, while the radius will continue growing. This will lead to a curvature of the radius, the so-called *Radius Curvus*. Furthermore, this condition can create a subluxation of the joints in the elbow and pastern. From the outside an outward rotation and X-curvedness of the lower arm will be visible.

Although the disease usually can be diagnosed by clinical examination, radiographs are indicated in order to document the extent of the alteration. Every deformation of a limb during the growth period requires a differentiated clarification.

A limb deformity is usually treated by surgery, the object being to correct the deformity as soon as possible for the best result. The choice of operation method depends essentially on the dog's age, the extent of deformity and the epiphysis concerned. Because of the osteogenetic activity of the epiphysal cartilage, the corrective surgery will have to be carried out as soon as possible.

While the deformity in the mature dog is completed and a correction will be final, the growth potential in a young dog will continue after the surgery and can result in a new deformity.

An osteotomy (transection) of the ulna is especially indicated in the case of premature closure of the distal epiphysis. In young dogs a simple linear osteotomy is often not sufficient, it is better to remove a piece of bone, a cuneiform osteotomy, at the level of the prematurely closed epiphysis. Often with these patients, the deformity is not yet severe and the growth potential of the remaining epiphysal cartilages is still present. However, in older dogs with obvious axis deviation, a displacement osteotomy will be applied. For the reconstruction of the physiological axis, a bone wedge will be removed and the bone fixed in the correct position by means of plates.

In the case of greater growth potential and for complex bone deformities or irregularities, even more complicated surgery may be required. In these dogs the correct position will not be achieved until weeks after the transection of the bone. Usually a ring fixator will be applied to the leg. By means of wires fixed to the bones the transected bones will be connected with an outer frame around the leg, which consists of several rings and connecting rods. By extending the rings just a few millimeters each day, the desired correction of the deformity will slowly be obtained. The advantage of this slow correction is that over a period of weeks the ligaments, muscles and tendons will be able to adjust to the new bone alignments.



Ring fixator

Translated from German: ANo and KC

Comments by CCI

It is important to note that the corrective procedures in these and the main article on Radius Curvus are primarily intended for extreme cases, particularly in breeds which do not typically exhibit achondroplastic traits, but have an inherited recessive dwarfism which is a detrimental deformity or in the case of individuals which have suffered an injury during early development.

In Cardigans, some curvature of the radius (wrap) and displacement of the pastern (turnout) is a signature breed characteristic, but this should not be confused with a front which exhibits these traits to the extreme, is structurally unsound in any way and prone to lameness.

Some useful references:

Veterinary reference guide, Textbook of Small Animal Orthopedics

Chapter 41: Radial And Ulnar Osteotomy

http://cal.vet.upenn.edu/projects/saortho/chapter_41/41mast.htm

Treating Bone Deformities With Circular External Skeletal Fixation

A comprehensive article originally published in Vol 21, No 6, June 1999 issue of Small Animal/Exotics Compendium

<http://www.scribd.com/doc/23752606/Treating-Bone-Deformities-With-Circular-External-Skeletal-Fixation>