Unsynchronized growth of the radius and ulna due to premature closure of the growth plates is the greatest cause of deformity observed in the forelimbs of dogs (1-4). The reason for this premature closure is usually Salter-Harris fractures (1-7), along with genetic factors, nutritional imbalances, radiation and intramedullary pin applications involving the growth plates (1,3,4).

In most cases, premature closure of the growth plates in the radius results in the shortening of the bone. Since the whole growth plate is affected, premature closure of either the distal or the proximal growth plate of the radius is symmetrical (3,4,7). This is why rather than angular deformity, a step is formed in the radio-ulnar joint on the elbow plane due to the shortening of the radius (1-5,7).

The first symptom of closure is a slowly progressing lameness and pain observed in the elbow joint region. Surgical intervention is inevitable in order to minimize the alterations formed or that may form in the joint (1,2,4,7-9). Radius ostectomy is recommended (3-7) for immature dogs diagnosed in the early period; however, in cases where incongruency and degeneration develop in the joint, following radius ostectomy, plates or external fixators are used for fixation (3,6,8,10). It is reported (2,4,7-12) that the Ilizarov apparatus is the most convenient fixator for distraction. For cases in which radial shortening is minimal and the animal is nearly mature, removing a short section (ostectomy) of the ulna to restore the congruency of the elbow joint may be the treatment of choice, but this will cause the leg to shorten (13).
Stretching of the bone length is performed according to the distraction osteogenesis principle. Distraction osteogenesis involves new bone formation due to step-by-step controlled distancing of bone fragments when the fragments are stabilised in a central region. Circular external fixators have been reported to be the most appropriate method for this procedure (3,11-17).

Description of the Case

Our case was a 9-month-old male German shepherd. The reason for the disease could not be determined because the dog had been obtained from an unknown source 1 month prior to admission to our clinic. In the clinical examination, it was revealed that the patient was lame in the left leg, touching the ground with the tip of the toes, and pain was present in the elbow joint. Degenerative arthritis of the elbow joint, formation of a step in the radio-ulnar joint (1.2 cm), premature closure of the distal growth plate of the radius and subluxation together with a slight degree of carpal valgus in the radio-carpal joint were observed radiologically. In the radiological measurement of the antebrachium bones it was seen that the length of the radius was 15.4 cm, which was 3 cm shorter than the healthy leg (Figure 1).

Closure had not yet occurred in the distal growth plate of the radius in the healthy leg (Figure 2). The length of the ulna was 0.7 cm shorter than that in the normal leg.

Surgical Intervention

After routine preparation of the patient, an incision was made cranio-laterally to approach the mid diaphysis of the radius. Corticotomy was performed on the radius by entering between the extensor carpi radialis muscle and the extensor digitorum communis muscle. After the incision was closed, two Kirschner wires 1.6 mm in diameter were placed in the proximal fragment. The wires were placed parallel to the joint surface of the head of the radius with one of the wires coursing from the cranio-lateral to the caudo-medial direction and the other from the cranio-medial to the caudo-lateral direction. The wires were fixed to a ring and stretched. The Ilizarov apparatus was constructed by the same procedure on the distal fragment (Figure 3).

Starting on post-operative day 4, distraction was achieved by raising the upper ring 0.5 mm proximally.
each morning and evening (at intervals of 12 hours) for 16 days (Figure 4).

At the end of this procedure it was observed that the elbow joint returned to normal with regression of degenerative changes and the incongruity in the joint had disappeared to a great extent 41 days after surgery (Figure 5).

A partial contracture was observed in the flexor tendons due to late adaptation of the soft tissues to the distraction procedure. The Ilizarov apparatus was removed 6 weeks later. There were few or no clinical and radiological problems three months after the removal of the fixator (Figure 6).

Results and Discussion

Premature closure of the antebrachial growth plates is frequently seen due to exogenous and endogenous factors resulting in the deformation of the related joint and bones (1-5,7,16,17).

Although a detailed history was not obtained in this case, our opinion is that the premature closure was due to trauma.

In early-diagnosed cases, where development is not yet complete and anatomical changes have not yet started, treatment involves ostectomy of either the radius or the ulna (1-5,7,10,13). However, in cases where degenerative disorders have already formed in the joints and the anatomical structure is impaired, external fixators are the ideal method of treatment (2-4,7,9). Based on this, we treated the dog using an Ilizarov external fixator after corticomy of the radius. Although there was a step of 1.2 cm in the proximal radio-ulnar joint, it was only possible to bring the joint close to normal after a distraction of 1.6 cm. We think that this difference of 0.4 cm resulted from a downward movement of the distal fragment during distraction. We agree with Latte (6) that this complication can be eliminated by performing distraction on the ulna by making a flag.

We think that the reason for the ulna of the injured leg being 0.7 cm shorter than that of the other, normal leg (Figures 1 and 2) is due to all the weight on the antebrachium during ground contact being carried by the ulna, and that the growth plate may have closed prematurely due to this excessive load.

Clinical and radiological follow-up at 3 months (Figure 6) showed that lameness and degenerative arthritis in the elbow regressed to a great extent, to the satisfaction of the owner.
Treatment by the Use of an Ilizarov External Fixator of Incongruity in the Elbow Joint
Due to Premature Closure of the Distal Radial Growth Plate in a German Shepherd

References

