

Palmaro-medial luxation of the radial carpal bone in the dog: two case reports



Luxation of the radial carpal bone is an uncommon orthopaedic condition in dogs. Here we describe two cases of radial carpal bone luxation, one in a 7-year old, mixed breed, spayed bitch (case 1), the other in a 9-year-old, mixed breed, neutered male dog (case 2).

Both dogs were referred for severe front limb lameness. Physical examination showed a reduced range of motion of the radio-carpal joint and palmaro-medial swelling. Radiographs showed palmaro-medial luxation of the radial carpal bone. In case 1 computed tomography scans did not reveal any other lesions to the radial carpal bone or to the adjacent carpal bones.

In case 1 an open reduction of the radial carpal bone was performed, restoring the bone to its anatomic position; the joint capsule was sutured and the limb was immobilized with a splint for 2 weeks. In case 2 a closed reduction was obtained and a transarticular external fixator was applied for 3 weeks.

In both cases, at 8 weeks after surgery, the radial carpal bone was still in its anatomic place. The range of motion was partially reduced but no lameness was detected.

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INTRODUCTION

The main conditions involving the radial carpal bone are fractures and luxation. Although both are uncommon, fractures are more frequently observed and described, whereas only a few cases of luxation have so far been reported in the literature^{1,2,3,4,5,6}.

Luxation of the radial carpal bone occurs as a result of trauma and the condition does not appear to be associated with age-, gender- or breed-related predisposing factors.

According to published data, luxation of the radial

carpal bone is most frequently palmaro-medial, with a 90° rotation around the bone's dorso-palmar and medio-lateral axes^{2,3}. This type of lesion is usually associated with traumatic hyperextension and rotation of the antebrachio-carpal joint^{1,2,3} which causes partial or complete rupture of the ligaments of the radial carpal bone, involving, in particular, the short radial collateral ligament, the volar radiocarpal and ulno-carpal ligaments and the short intercarpal ligaments¹.

CASE REPORTS

CASE 1

Chicca, a 7-year old, mixed breed, spayed bitch, weighing 19 kg was brought for examination because of

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Figure 1 - Dorso-palmar (A) and medio-lateral (B) X-rays of the carpus of the right anterior limb of case 1. Medial (A) and caudal (B) luxation of the radial carpal bone (*) can be seen.

grade 4 lameness of the right front limb, which developed acutely following a run.

Clinical examination revealed palmaro-medial swelling of the radiocarpal joint and a reduced range of movement of the joint.

X-rays in standard mediolateral and dorso-palmar views of the carpus showed palmaro-medial luxation of the radial carpal bone (Fig. 1).

With the consent of the owner, three-dimensional computed tomography was performed to exclude the presence of other lesions, such as microfractures, not visible on the X-rays (Fig. 2).

Luxation of the radial carpal bone is an uncommon, trauma-related orthopaedic condition. No age-, gender-, or breed-related predisposing factors have been reported. The luxation is more frequently palmaro-medial.

The patient was then pre-medicated with medetomidine (Sedastart®, Esteve) (10 µg/kg) and methadone hydrochloride (Semfortan®, Dechra) (0.5 mg/kg), before general anaesthesia was induced with propofol (Proposure®, Merial) (1 mg/kg) and maintained with isoflurane gas. The diagnostic examination confirmed the palmaro-medial luxation of the radial carpal bone with consequent distal collapse of the radius and excluded the presence of other pathologies of this or adjacent carpal bones.

Given that it was impossible to perform a closed re-

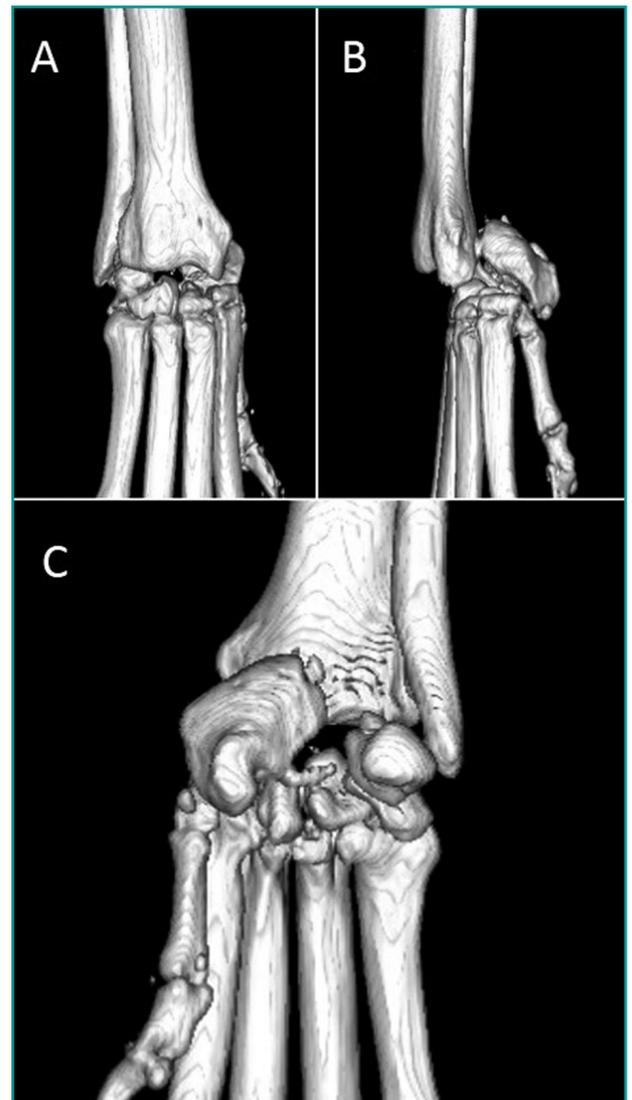


Figure 2 - Computed tomography images with 3D reconstruction of the right anterior carpus of case 1 in dorsal (A), lateral (B) and palmar (C) views.

duction, it was decided to reposition the radial carpal bone during open surgery.

The bitch was, therefore, given an antibiotic (Cefazolin[®], Teva) (22 mg/kg) prior to the operation and, with the patient in dorsal decubitus, a surgical access was made to the dorsum of the carpus.

The maximum possible distraction of the radiocarpal joint was achieved with the help of a Gelpi retractor and, exercising caudo-cranial pressure, the radial bone was easily repositioned. The short radial collateral ligament and the joint capsule were reconstructed with simple, interrupted stitches with 2-0 monofilament, absorbable suture (Serasinth[®], Serag Wiessner).

Post-operative radiographic and computed tomographic studies confirmed the correct reduction of the radial bone (Fig. 3). Considering that the stability of the carpus obtained during surgery was satisfacto-



Figure 3 - Post-operative radiographic and tomographic images of the carpus of the right anterior limb of case 1 (*).

ry, a palmar splint was applied with bandaging, with a maximum extension of 195° and maximum flexion of 30°, for 2 weeks. The dog was prescribed carprofen (Dolagis®, Ati) (4 mg/kg) and cephalexin (Cefaseptin®, Vetoquinol) (22 mg/kg) for 7 days.

At the clinical follow up after 4 weeks a grade 2 lameness was still present and joint excursion was reduced, particularly for flexion which was limited to 25°, while the X-ray control showed that the radial carpal bone was in its correct anatomic position. The management consisted of continued restriction of physical activity, for another 3 weeks, and passive flexion-extension exercises of the antebrachio-carpal joint performed by the owner. At the clinical follow up 2 months after surgery the lameness had resolved and the range of motion of the joint had improved, with a maximum extension of 195° and a maximum flexion of 22°.

CASE 2

Billy, a mixed breed, 9-year old castrated male dog, weighing 10 kg, was brought for assessment because

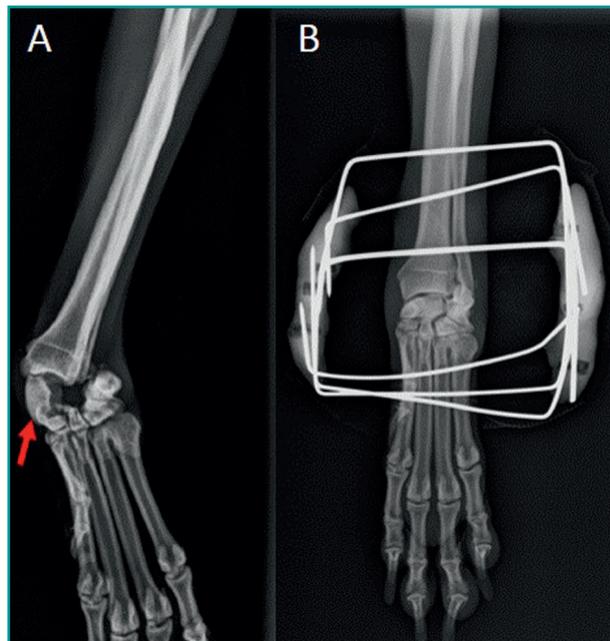


Figure 4 - Dorso-palmar view of the carpus of the left anterior limb of case 2. The arrow points to the radial bone of the carpus which has dislocated in a palmaro-medial direction (A). Dorso-palmar view of the fixator with bilateral trans-articular monoplanar resin (B).

of grade 4 lameness of the left front limb which had started following a fall.

A palmaro-medial swelling of the left carpus was noted, together with valgism of the paw and reduced range of motion of the joint.

X-rays performed in the standard medio-lateral and dorso-palmar views showed palmaro-medial luxation of the left radial carpal bone, without collapse of the radius on the second row of carpal bones (Fig. 4-A). Computed tomography was not performed because of the owner's lack of consent.

The patient was pre-medicated with medetomidine (Sedastart®, Esteve) (10 µg/kg) and methadone hydrochloride (Semfortan®, Dechra) (0.5 mg/kg); general anaesthesia was induced with propofol (Proposure®, Merial) (1 mg/kg).

Through digital pressure exerted on the radial carpal bone, together with a combination of hyperextension and supination movements, closed reduction of the luxation was achieved. An external fixator with bilateral monoplanar transarticular resin was then applied (Figure 4-B).

Antibiotic therapy was started pre-operatively (Cefazolina®, Teva) (22 mg/kg) and the patient was placed on the operating table in dorsal decubitus with the left front limb suspended. The trans-articular external fixator, formed of six 1.2 mm Kirschner wires, was applied without open surgery and kept in place for 3 weeks.

The animal was prescribed carprofen (Dolagis[®], Ati) (4 mg/kg) and cephalexin (Cefaseptin[®], Vetoquinol) (22 mg/kg) for 7 days.

Three weeks after the operation, following a radiographic control that showed that the radial carpal bone was in the correct position and that there was no bone lysis around the nails, the external fixator was removed. Grade 2 lameness of the left anterior limb remained, together with a reduced range of motion of the carpal joint with the maximum extension being 185° and the maximum flexion 27°. The owner was asked to carry out passive flexion-extension exercises of the animal's radio-carpal joint each day. Two months after the intervention the patient was no longer limping and joint excursion was slightly improved with an extension of 190° and flexion of 24°.

DISCUSSION

Luxation of the radial carpal bone is an uncommon condition for which there is no known gender-, age- or breed-related predisposition. In recent years, 12 cases have been documented in dogs^{1,2,4,5,6} and one in a cat³.

The aetiopathogenesis of luxation of the radial carpal bone is usually trauma, secondary to hyperextension and pronation movements of the carpus¹.

Luxation of the radial carpal bone is usually palmaro-medial, with a 90° rotation around the dorso-palmar and medio-lateral axes which gives the proximal joint surface of the radial carpal bone a palmaro-medial orientation^{1,2} (Fig. 5). The single clinical case in which the luxation was dorso-medial is the exception¹.

Both cases reported here showed the typical signs of this orthopaedic condition, namely palmaro-medial luxation of the radial carpal bone following trauma. In case 1, however, the radius collapsed on the second row of carpal bones, whereas this did not occur in case 2 in which there was valgism of the anterior paw.

Since computed tomography could not be performed in case 2, it was not possible to investigate the relationships between the luxated radial

carpal bone and the radius, but it was reasonable to consider that the radial bone had not completed its palmar luxation and had remained partially wedged under the distal epiphysis of the radius.

As demonstrated by a cadaveric study carried out by Palierne in 2007, the main ligament preventing dislocation of the radial carpal bone is the short radial collateral ligament, which is formed of two parts: oblique and linear. Rupture of a single part causes cranial luxation, whereas rupture of both components of the

Rupture of one or both components of the short radial collateral ligament causes, respectively, dorsal or palmar luxation of the radial carpal bone.

ligament leads to palmar luxation of the radial carpal bone. Thus, the cases described here were affected by rupture of both parts of the short radial collateral ligament, as well as the palmar ulno-carpal and radio-carpal ligaments and the dorsal and volar short metatarsal ligaments. Through computed tomographic 3D reconstruction in case 1 it was seen that the distal and caudo-medial borders of the radial bone remained attached to the second row of carpal bones. It was thus confirmed that there was rotation around the distal and caudo-medial fulcrum of the radial carpal bone (Fig. 5). Since in case 2 there was no distal col-

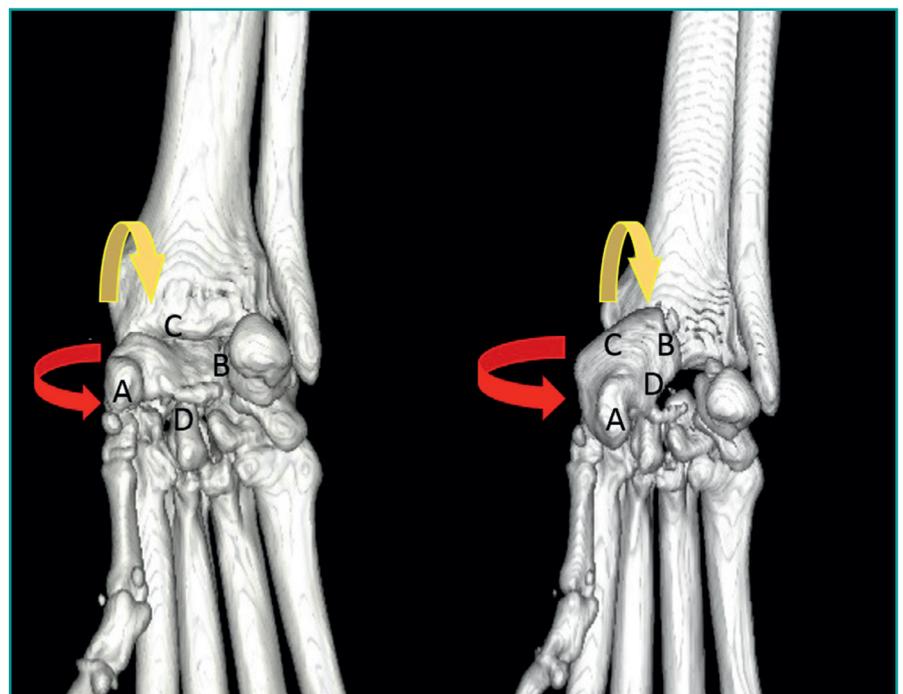


Figure 5 - Caudal view of the carpus in case 1 with 3D reconstruction. Comparison of the two images shows the rotation of the radial carpal bone around the dorso-palmar axis (yellow arrow) and the medio-lateral axis (red arrow). Anticlockwise rotation around its distal and caudo-medial fulcrum was observed (A).

lapse of the radius it was hypothesised that there had been an incomplete rupture of the volar radio-carpal ligaments which had limited the palmar luxation, with part of the radial carpal bone wedged between the distal epiphysis of the radius and the second row of the carpal bones. In case 2, ulnar deviation of the paw at the time of the trauma, rather than hyperextension, had probably played an important role, with greater involvement of the short radial collateral ligament and only partial involvement of the palmar ligaments.

As far as concerns treatment, both open and closed reduction of the radial carpal bone can be performed¹. The descriptions in the literature predominantly concern open surgery with stabilisation of the radial carpal bone by insertion of a transarticular pin or by reconstruction of the radial collateral ligament with a mattress suture or by figure of 8 cerclage anchored on screws or pins^{2,3}.

In the first case, given that non-invasive reduction was impossible, open surgical reduction was chosen. This enabled precise repositioning and, above all, reconstruction of the short radial collateral ligament and the joint capsule. In contrast, in the second case, closed reduction of the radial carpal bone was possible, probably because the radius had not collapsed on the second row of the carpal bones. In this case a transarticular external fixator was preferred because, given that the joint capsule was not sutured, it was necessary to ensure good containment of the carpus and distribute the load between the fixator and the joint.

In both cases some reduction in joint flexion was still present at the last clinical follow-up, presumably attributable to the prolonged immobilisation of the joint and establishment of chronic inflammation.

CONCLUSIONS

Luxation of the radial carpal bone is a trauma-related orthopaedic condition that occurs rarely in dogs and cats. The radial carpal bone most frequently luxates in a palmaro-medial direction. It is trauma with hyperextension and pronation of the carpus that causes the luxation, because of rupture of the oblique and linear components of the short radial collateral ligament.

Open or closed reduction of the radial carpal bone were observed to be equally effective. A system of immobilising the carpus enables the formation of the fibrous connective tissue necessary to contain the radial bone.

In our experience, both open and closed reduction of the radial carpal bone were equally effective.

In case 2 closed reduction was probably facilitated by the only partial rupture of the palmar components of the ligament, which limited the dorso-palmar rotation of the radial carpal bone. To our knowledge, this is the first clinical report of non-invasive reduction of a palmaro-medial luxation of the radial carpal bone in a dog. In both clinical cases the antebrachio-carpal joint was stabilised, by rigid bandaging for 2 weeks in case 1 and by an external fixator for 3 weeks in case 2. More prolonged immobilisation of the carpus was not necessary because good stability had already been obtained from repositioning the radial carpal bone.

In both cases there was a reduction in range of motion of the affected joint, not associated with lameness. This could be explained by the development of chronic inflammation and then the osteoarthritis typical of joint disorders.

KEY POINTS

- Orthopaedic condition of traumatic aetiology.
- No gender-, breed- or age-related predisposition.
- More frequently palmaro-medial luxation.
- Open or closed reduction, followed by immobilisation of the carpus with bandaging or external fixation were equally effective.

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