

## Περιοδικό της Ελληνικής Κτηνιατρικής Εταιρείας

Τόμ. 75, Αρ. 4 (2024)



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doi: [10.12681/jhvms.36509](https://doi.org/10.12681/jhvms.36509)

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### Βιβλιογραφική αναφορά:

Çetinkaya, M., & Yesilovali, G. (2025). Proximal radius fracture with caudal subluxation of the ulna in a dog: Reverse lesion of Monteggia's. *Περιοδικό της Ελληνικής Κτηνιατρικής Εταιρείας*, 75(4), 8481–8486.  
<https://doi.org/10.12681/jhvms.36509>

## Proximal radius fracture with caudal subluxation of the ulna in a dog: A reverse lesion of Monteggia's

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**ABSTRACT:** This paper aims to describe a new type of proximal antebrachial fracture-dislocation lesion. A client-owned, 5-year-old male, intact, 28kg Golden retriever is the case of this paper. The fracture was repaired with a 4-holed standard 3.5 reconstruction plate and screws. However, this fixation caused an iatrogenic lengthening of the radius and secondary elbow incongruity and prevented the reduction of the ulna into its place. Therefore, a dynamic ulnar osteotomy and ulnar IM pinning were performed to release plate-caused tension on the elbow joint. After the splinted bandage removal the dog had weight-bearing lameness, but gradually improved over time. The owner reported that the dog had intermittent lameness for a few minutes right after waking up on some days. A slight soft tissue thickening and the periosteal reaction were determined on the 4th and 6th-week evaluations. The joint range of motion values (extension and flexion) was slightly lower than the healthy side. Monteggia fracture describes a specific lesion of the proximal antebrachium, no other specific fracture-sub/luxation lesion of the proximal antebrachium has been described in humans and animals. Therefore, the patient with a proximal radial fracture and ulnar luxation/subluxation can be considered a new type of proximal antebrachial lesion.

**Keywords:** Dog; elbow joint; proximal antebrachium; radius fracture; ulnar dislocation

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*Date of initial submission: 15-1-2024*  
*Date of acceptance: 15-6-2024*

## INTRODUCTION

Fractures of antebrachium are common for dogs, and the main cause of these fractures is vehicular trauma; however, Monteggia fractures are not common (Phillips, 1979; Girling, 2016; Fox, 2018). In 1814, Italian surgeon Giovanni Battista Monteggia first described a fracture of the proximal part of the ulna with concurrent luxation or subluxation of the radial head for humans, and this specific and rare lesion was named after him (Bado, 1967; Rehim et al., 2014). Later, this lesion was also classified into four different groups according to the direction of the dislocated radial head and angulation of the ulnar fracture (Bado, 1967). Type I Monteggia lesions are the most common type of these lesions in small animals. Many successful ways of treatment were described in textbooks and scientific reports for this specific fracture-dislocation (Schwarz and Schrader, 1984; Bush and Owen, 2009; Vallone and Schulz, 2011; Girling, 2016; Koch, 2017; Fox, 2018).

The case presented in this report is completely different from Monteggia's lesions. With a proximal radius fracture and caudally subluxated ulna, this report describes a different kind of specific proximal antebrachial lesion.

## CASE HISTORY

A 28kg, 5-year-old intact male, Golden retriever was brought to the Animal Hospital of Near East University Faculty of Veterinary Medicine for treatment immediately after being involved in a vehicular accident. Following routine clinical assessments for trauma patients, the dog only presented right forearm non-weight-bearing lameness. Radiographs revealed a proximal radius fracture and a concomitant caudal ulnar subluxation (Figure 1).

Before the surgical procedure, medetomidine (Domitor®, Finland, 25 mcg/kg IM) and butorphanol (Butomidor®, Austria, 0.1mg/kg SC) were administered for premedication, and propofol (PROpo-



**Figure 1.** Radiographic view of proximal radius fracture and caudal subluxation of ulnae.

fol-®Lipuro %1, Germany, 4 mg/kg IV) was used for induction. The dog was intubated, and anesthesia was maintained with 3% sevoflurane (Sevorane®, England) in oxygen. Cefazolin (Eqizolin®, Istanbul, 30 mg/kg IV) was used as a single shot before anesthetic induction. The surgical site was clipped and prepared for aseptic surgery.

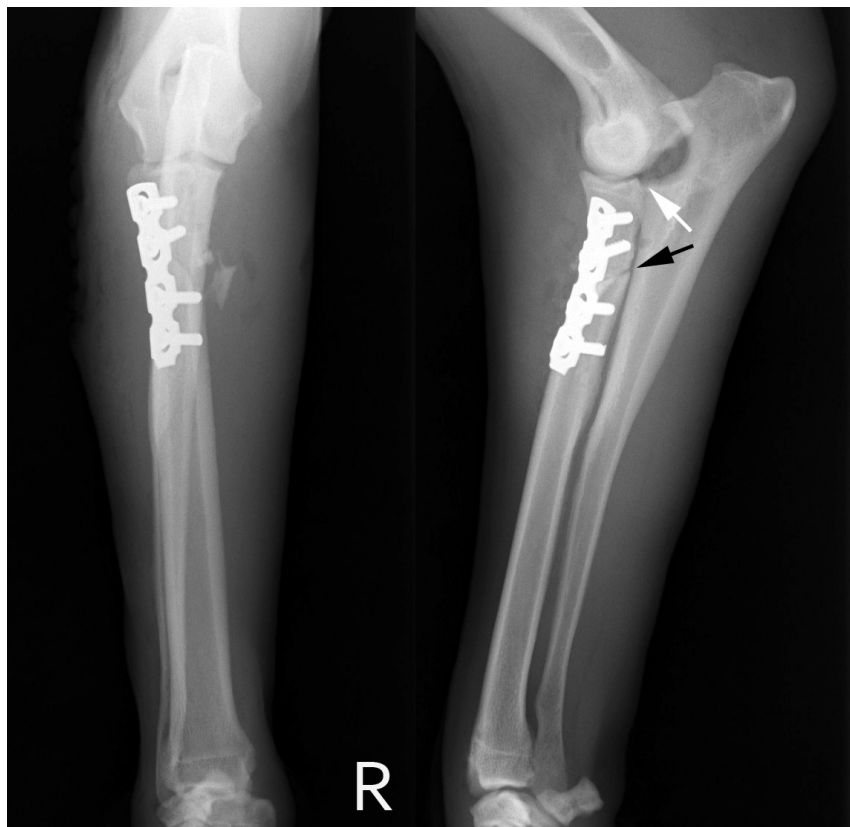
A cranial approach to the proximal radius was performed, and the radial fracture was repaired with a 4-holed 3.5 mm reconstruction plate and screws. Due to the difficulty in flexion of the joint after plating the radial fracture, the fracture and joint were evaluated by an intraoperative radiograph, and it revealed further dislocation of the ulna caudally because there was a gap between the radial fracture ends.

This iatrogenic gap created elbow incongruity, more tension on the ulna, and caused a further dislocation of it caudally, and prevented its reduction (Figure 2). Therefore, following a lateral approach, dynamic ulnar osteotomy and ulnar intramedullary pinning were performed to release plate-caused tension on the elbow joint. In this way, reduction of the ulnar dislocation was achieved. Since mobility was

observed in the fracture line during manipulations, the plate and screws were re-evaluated and the screw located third from the top was substituted with a larger 4.5mm screw.

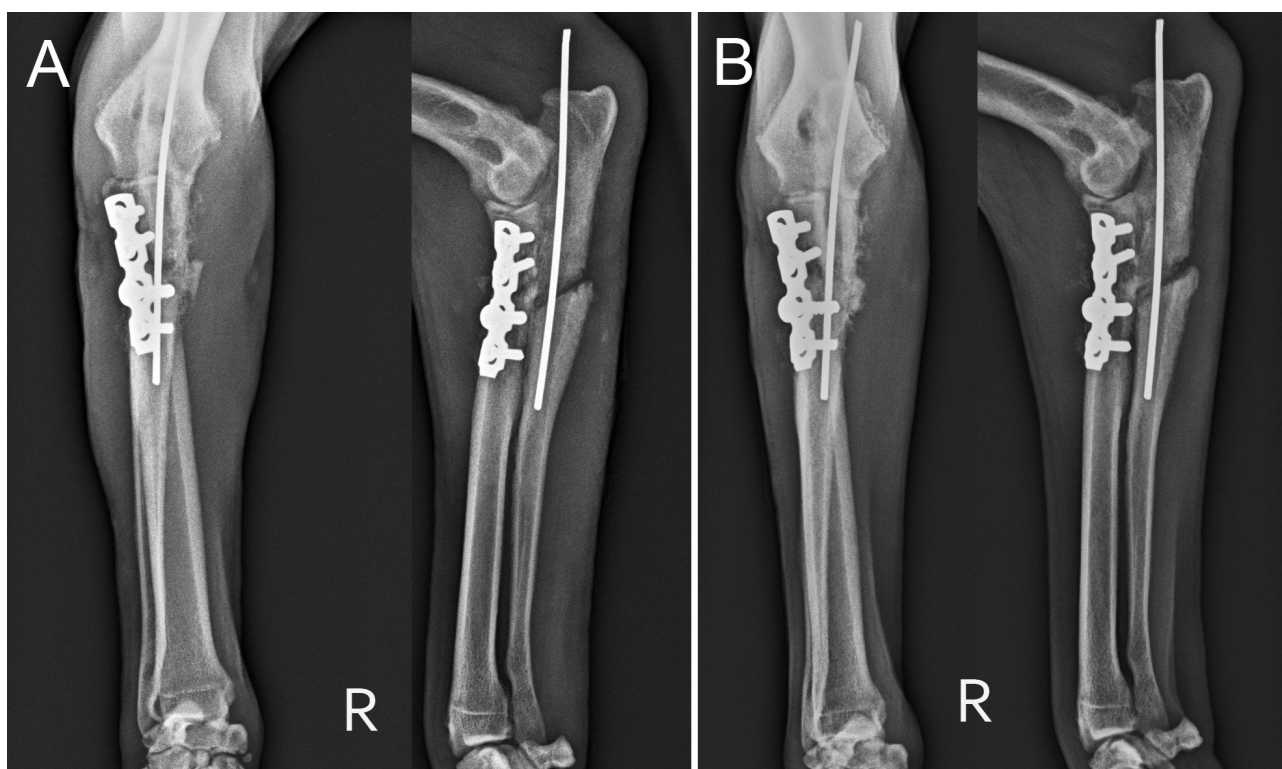
During the surgery, the annular ligament was also examined through palpation and observation. Stretching and partial tearing were identified and partially torn annular ligament was stitched with an "X" pattern.

The dog was hospitalized for two weeks. A splinted bandage was applied to support the fracture and joint for ten days. The surgical wound healed without any complications. Following the removal of the splinted bandage, the dog had weight-bearing lameness and pain on palpation. After that, the dog was allowed to have short leash walks and was confined to a small place/room for six weeks. The dog gradually began using the limb better and better in the following days. On the 14th day, there was mild pain noticed while examining the joint range of motion. During the fourth-week evaluations, the dog did not exhibit any signs of lameness or pain. However, joint range of motion values for extension and flexion were slightly



**Figure 2.** Intraoperative radiographic view following plate fixation revealed further dislocation of the ulnae; the gap between fracture ends (black arrow) caused iatrogenic elongation of the radius and more tension on the joint and elbow incongruity (white arrow).





**Figure 3.** A. Fourth-week radiographic views; a slight periosteal reaction on the humeral condyles and fracture site, excluding the joint. B. Sixth-week radiographic views; the periosteal reaction is more evident.

lower than the healthy side. Furthermore, upon palpation, the examination revealed a slight thickening of the soft tissues surrounding the area.

Clinical and radiographical assessments were performed on the day of bandage removal, the 14th day, 4th and 6th weeks. After the sixth-week evaluations, the patient's owner moved to another city. Since the patient's owner moved to another city after the sixth-week evaluations, subsequent follow-ups were conducted over the phone. Radiographs revealed a slight periosteal reaction on the humeral condyles and fracture site, excluding the joint. However, this was considered insignificant (Figure 3-A). In the sixth week evaluations, the results were similar to the previous one, but there was a more noticeable presence of periosteal reaction on the radiographs (Figure 3-B). Additionally, the owner complained that the dog had weight-bearing intermittent lameness after waking on two different days, which improved later in the day.

Telephone follow-ups with the patient's owner over six months confirmed that the dog experienced weight-bearing intermittent lameness after waking up on some days and resolved in 15 minutes without requiring any specific treatment. Regular check-ups and

additional supplements were recommended for the joint to prevent possible long-term effects of arthritis.

## DISCUSSION

Monteggia lesions describe radial head dislocation and proximal ulnar fracture. In human and veterinary medicine, these are specific and rare lesions of the proximal antebrachium (Bado, 1967; Rehim et al., 2014; Ramponi, 2022). Many techniques were described to repair this specific fracture-luxation combination and presented for surgeons' preferences (Girling, 2016; Fox, 2018; Calderazzi et al., 2018; Xiao et al., 2021). However, a reverse case of this specific lesion has not been previously represented. This case report described the opposite situation of the Monteggia lesion.

Although Monteggia lesions were then classified into four different types according to the direction of dislocated radial head and angulation of the ulnar fracture, all describe radial head dislocation and proximal ulnar fracture (Bado, 1967). But in this case, a proximal radial head fracture and caudal ulnar dislocation, a reverse lesion of Monteggia's, was shown. Since this new proximal antebrachial lesion is the op-

posite of Monteggia's, it should not simply be trivialized as a normal proximal radius fracture and ulnar dislocation.

In Monteggia lesions, the annular ligament is torn, and following the reduction of the radial head it needs to be repaired, transfixation to the ulna with a pin or screw, substitution of the annular ligament, and closed reduction (Phillips, 1979; Schwarz and Schrader, 1984; Bush and Owen, 2009; Vallone and Schulz, 2011; Girling, 2016; Koch, 2017; Fox, 2018). During surgical assessments of the dog, the annular ligament was only partially torn. As a result, there was no need to resort to transfixation or substitution techniques for its repair. Therefore a simple "X" suture was applied to support the ligament. Additionally, because the annular ligament was nearly intact, cranial displacement of the proximal radial fragment was considered to have forced the proximal ulna backward.

Apart from developmental cases, elbow incongruity can sometimes be encountered because of radius-ulna synostosis, a complication of antebrachial fracture healing in young growing dogs. Furthermore, proximal radial fractures may also disrupt elbow congruity. Therefore, following the treatment of proximal antebrachial fractures, the elbow joint should be examined for possible complications. The insufficient fixation of the radial fracture of the dog caused elbow incongruity determined intraoperatively, and resolved with dynamic ulnar osteotomy and intramedullary pinning of the ulnae.

Falling onto an outstretched hand (FOOSH), and "pulled elbow syndrome" are defined as mechanisms for Monteggia Lesion's occurrence. Monteggia lesions occur mostly in children (especially at ages 4-10 years) (Bado, 1967; Ramponi, 2022). However, Monteggia Lesion was also reported in adults in both humans (Ring et al., 1998; Calderazzi et al., 2018; Xiao et al., 2021) and veterinary medicine (Schwarz and Schrader, 1984; Vallone and Schulz, 2011; Schreiber et al., 2022). It is difficult to determine which forces act on the fracture during a traffic accident for this type of fracture to occur; however, a sufficient force directed on the proximal antebrachium will simply cause fracture and dislocation. A displaced fracture on the proximal radius will disrupt ventral joint support and cause more pressure to the caudal direction of the ulnar notch, and subsequent subluxation of the ulna.

Monteggia lesion refers to certain injuries in the upper antebrachium. No other types of fracture and dislocation injuries have been identified in humans and animals about this localization. As a result, a patient who has a proximal radial fracture and ulnar dislocation/subluxation can be classified as having a different type of injury in the proximal antebrachial region.

#### CONFLICT OF INTEREST

The authors declare no conflicts of interest.

The client was informed and signed the Informed Consent Form.

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