Surgical management of Type 1 Monteggia Fracture using Ulnar Plating along with circumferential sutures

Amal K.A.[1]*, V. Devi Prasad[1], P. Ravi Kumar[2], B. Kondeti[1]

[1]Department of Veterinary Surgery and Radiology. NTR College of Veterinary Science, Gannavaram. Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Garividi. [4]Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram, Sri Venkateswara Veterinary University, Tirupati, India
*Corresponding Author: amalanurag091194@gmail.com

Journal of Livestock Science (ISSN online 2277-6214) 17: 400-406
Received on 27/10/25; Accepted on 20/5/26; Published on 28/6/26
doi. 10.33259/JLivestSci.2026.400-406

Abstract

A six-year-old mongrel dog was presented to Department of Veterinary surgery and radiology, NTR College of Veterinary Science, Gannavaram with a history of non-weight bearing lameness of the left forelimb, following a fall from a height. On physical examination, swelling over the antebrachium, pain and crepitus on the proximal ulna and restricted range of motion of elbow joint were detected. Radiographic examination revealed fracture of the proximal fragment of ulna with concurrent cranial luxation of the radio-humeral joint. Open reduction and internal fixation were performed using a lateral 2.0-mm locking compression plate to repair the ulnar fracture and circumferential sutures passed through bone tunnels to treat the humeroulnar instability. The dog regained normal range of motion of elbow without any untoward exigencies.

Keywords: Dog; Monteggia Fracture; Ulnar Plating; Figure of eight sutures; Radio-humeral luxation.

Introduction

Monteggia fracture was first described in people by Giovanni Battista Monteggia in 1814 as a "fracture of the proximal third of the ulna and an anterior dislocation of theproximal epiphysis of the radius" (Monteggia and Milan, 1914). These injuries are most commonly associated with direct trauma to the antebrachium during weight bearing, such as road traffic accidents or other high-impact forces (Anatolitou et al., 2024). In dogs, automobile injuries are the most common cause for fractures (Phaneendra et al., 2016) especially (Monteggia fractures (MF), whereas in cats falling from heights is the most reported cause (Catalkaya et al., 2022). Monteggia fractures were categorized into four groups according to the direction of radial luxation and angulation of the ulnar fractureby Bado (1967). Type I fractures are the most common in all species (Anatolitou et al.,2024). The ulnar fracture can occur at various levels; however, fractures distal to the annular ligament are commonly associated with disruption of the annular and proximal interosseous ligaments, resulting in increased instability of the radioulnar joint (Richard and Vallefuoco, 2022). Open reduction followed by immobilization is considered the preferred surgical approach. This case report describes a Type I Monteggia fracture of the proximal one-third of the ulnar diaphysis with cranial dislocation of the radial head in a dog, and its successful surgical management.

Materials and Methods

A 6-year-old male spitz dog with a body weight of 9.6 kg was admitted to Department of Veterinary surgery and radiology, NTR College of Veterinary Science, Gannavaram for non-weight bearing lameness of the left forelimb for the previous three days (Fig 1). Lameness was continuous and static and suddenly appeared following a fall from a height. Intense swelling in the forearm, pain and crepitus in the proximal ulna, and restricted range of motion of the left elbow were detected during physical examination. General and neurological examinations revealed no other abnormalities. Radiographic examination revealed fracture of the proximal fragment of ulna with concurrent cranial luxation of the radial head (Fig 2). After clinical and radiological evaluation, case was diagnosed as closed type I Monteggia fracture and surgical treatmentthrough open reduction was planned. The animal was premedicated with atropine sulphate (0.044 mg/kg) SC; anaesthesia was induced with a combination of Midazolam (0.2 mg/kg) and Ketamine hydrochloride (5mg/kg) through intravenous injection and general anaesthesia was maintained using 1.5–2% isoflurane in oxygen via intubation.

The dog was prepared for aseptic surgery and animal was positioned inright lateral recumbency with the affected limb uppermost. A caudolateral skin incision was made at the left proximal ulna and elbow joint, (Fig 3) from the lateral humeral epicondyle, extending along the joint and centered between the ulna and radius to the midpoint of these bones. Then, the subcutaneous fat and fascia were dissected and muscles were exposed.The dislocated radial head was exposed by careful dissection between the common digital extensor and the lateral digital extensor muscles.The elevation of the anconeus muscle exposed the dislocated articular processes (Fig 4). A circumferential suture in "figure of 8 pattern" was placed to augment the damaged ligaments, by drilling two holes with 1 mm drill bit from lateral to medial surfaces (1) humeral transcondylar: at the origin of the lateral collateral ligaments immediately craniodistal to the lateral epicondyle and directed towards a point immediately craniodistal to the medial epicondyle; and (2) transradial: at the insertion of the lateral collateral ligaments on the radial head. This tunnel was aimed approximately 15° cranial to avoid inadvertent drilling into the medial coronoid process. A straight suture material Polyamide no.2 was passed through the tunnel in figure of 8 pattern through transcondylar (distal humerus) and trans-radial (proximal radial) and this strand was tensioned by hand and tied laterally (Fig 5 and 6). The dislocated radio-humeral joint was repositioned manually and ulnar fracture was anatomically reduced and stabilized in compression using a lateral four -hole, 2.0-mm reconstruction plate (Fig 7). The deep antebrachial fascia was closed using simple continuous suture using 1-0 polyglactin 910 and the skin was closed routinely.

Following this maneuver, normal elbow reduction was apparent and a full range of motion had been re-established.Postoperative radiographs documented good reduction and bone tunnel location (Fig 8 and 9). The owners were advised to maintain the dog in strict cage confinement. The joint was fixed in its physiological angle by reinforced Robert jones bandage and medicated with Inj.Taxim @ 25 mg per kg body weight for 7 days, Inj. Meloxicam @ 0.2 mg per kg body weight for 3 days Tab. Clindamycin @10 mg per kg body weight given orally.Daily antiseptic dressing of wound was done upto suture removal. Skin sutures were removed 10 days after surgery.

Postoperatively, the animal made an uneventful recovery without any post-operative complications The animal began bearing the limb on the ground on the third postoperative day, although complete weight bearing not restored (Fig 10). Eight weeks after surgery, the radiographs showed satisfactory healing of the radius and ulna and an osseous proliferation between the radius and ulna without complete radioulnar synostosis. The owners reported that there were no signs of pain and the dog walked with slight lameness. The joint mobilization was pain free and the range-of-motion in flexion and extension was near normal.

Fig.1. Non weight bearing lameness of the left fore limb

Fig.2. Skiagram showing the Dislocation of radio-humeral joint and fracture of proximal ulna

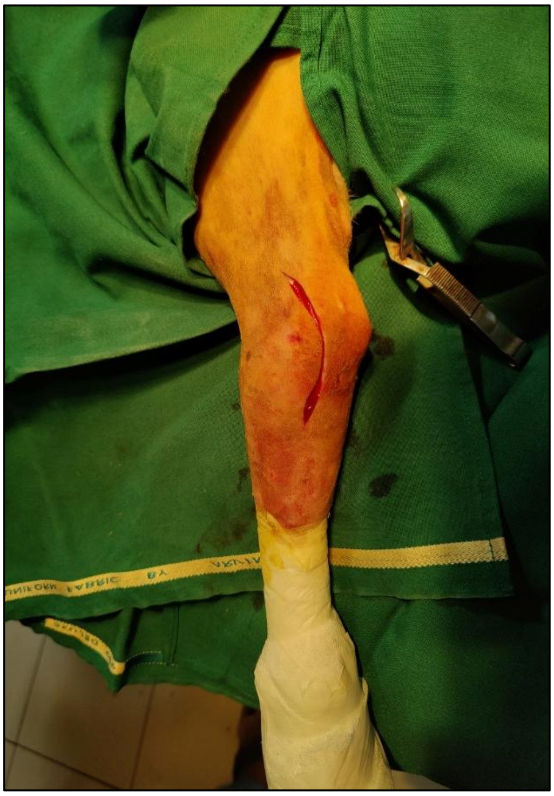

Fig.3. Lateral approach to the Radius and Ulna

Fig.4. Dislocated articular surfaces

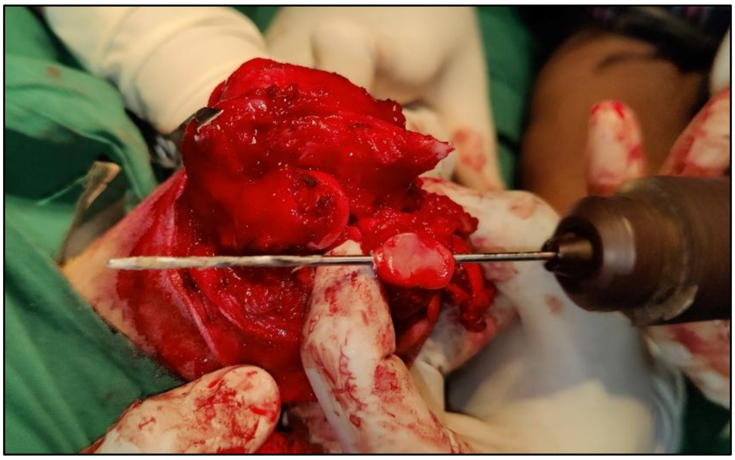

Fig.5 Bicortical medio-lateral drilling of radius for placing the suture material.

Fig.6. The Figure of eight suture in place with Polyamide No.2

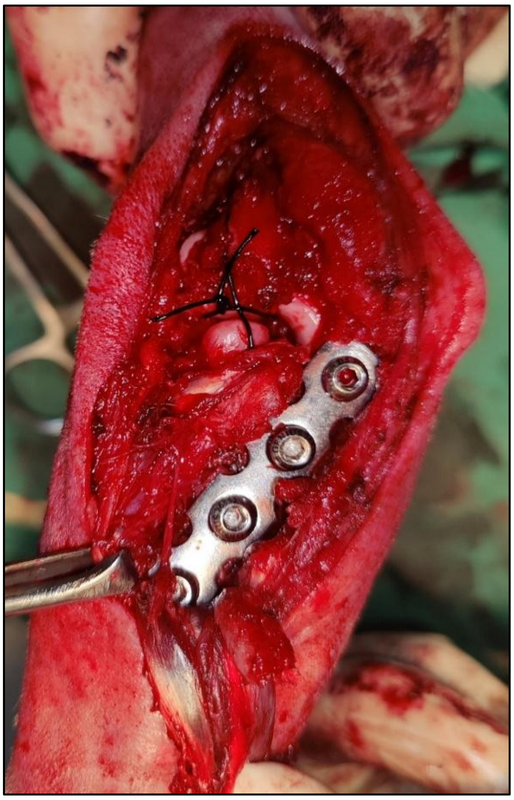

Fig.7. Intraoperative photograph showing the repair of Monteggia fracture

Fig.8. Skiagram showng the repair of ulnar fracture (Lateral view)

Fig.9. Skiagram showng the repair of ulnar fracture (AP view)

Fig.10. Note partial weight bearing on the affected forelimb on the third postoperative day

Results and Discussion

The eponym Monteggia fracture originally referred to a proximal ulnar fracture accompanied by anterior radial head luxation (Monteggia and Milan, 1914). Subsequently, Monteggia fractures were subclassified by Badobased primarily on the direction of radial head luxation. They involve cranial luxation of the radial head with cranio-proximal angulation of the ulnar fracture. Type II fractures involve caudal luxation of the radial head and caudal angulation of the ulnar fracture. In type III fractures, the radial head is luxated laterally and the ulna fracture is angled caudally. Type IV involves radial and ulnar fractures with concurrent radial head luxation. Although ulnar fractures may develop at different levels, they are most commonly observed distal to the annular ligament, frequently resulting in disruption of the annular and interosseous ligaments (Richard and Vallefuoco, 2022). According to Bado's classification, this case could be described as a type I fracture because the radial head was luxated cranially.

In Monteggia fractures, humeroradial instability implies insufficiency of the joint capsule, medial and lateral collateral ligaments, and the annular ligament of the radius (Anatolitou et al., 2024). The lateral and medial collateral ligaments are attached proximally to the lateral and medial humeral epicondyles respectively, and both collateral ligaments divide distally into two crura, one radial and the other ulnar. The annular ligament of the radius forms a fibro-osseous ring around the radial head and inserts on the margins of the radial notch of the ulna, thereby maintaining stability of the proximal radioulnar articulation (Piermattei et al., 2016). If the ulnar fracture is proximal as in this case, the annular and interosseous ligaments may be preserved, and a normal radioulnar articulation is maintained.Although the gross anatomy of the elbow joint is similar in dogs and cats, the feline interosseous ligament between the radius and ulna is comparatively less developed (Piermattei et al., 2016). The degree of interosseous ligament trauma depends in part on the level of the ulnar fracture and the affected species. In this case, the finding of an intact radioulnar articulation was important because significant controversy exists regarding the optimal method for reconstruction or replacement of damaged annular ligaments.Direct repair of the annular ligament is seldom performed in veterinary orthopedic practice because restoration of ulnar alignment typically re-establishes radial head stability (Anatolitou et al., 2024).Radioulnar stabilisation is more commonly performed via proximal transfixation of the radius and ulna with screws, pins or toggle sutures (Leclerc et al.,2014).

Reduction and internal fixation of the fracture is achieved by using plates and screws, pins or Kirschner wires and figure-of-eight tension bands. As the caudal aspect of the ulna serves as the primary tension surface, fracture stabilization is commonly performed using either caudal or lateral plate fixation and screw fixation (Piermattei et al., 2016). Indeed, screw fixation of the radio-ulnar joint prevents pronation and supination movements, which are important in cats, and may lead to further lameness (Irubetagoyena et al., 2011). Other reported complications of this technique include radioulnar synostosis, implant failure or screw breakage, restricted elbow motion, and the possible requirement for implant removal during postoperative management (Anatolitou et al., 2024).

The 2.0 mm reconstruction plate was fixed on the lateral surface in the present study, as suggested by (Fernandez-Sanchez et al., 2019) which allowed placement of two bicortical screws in the proximal fragment. It may be advantageous to place the plate on the lateral surface of the ulna, especially if the articular surface is not well reconstructed. The plate must be bent perfectly to avoid mal-articulation between the anconeal process and the humerus. Bone plates are ideal for accomplishing goal of early return of full function of injured limb, which is considered convenient method in the adults. Collateral ligament reconstruction techniques are relatively straightforward and provide effective joint stabilization, allowing early postoperative limb use without the need for prolonged external coaptation, while avoiding complications associated with external immobilization (Gadallah et al., 2023).

The procedure of circumferential figure of 8 sutures using non absorbable suture materials is subjectively simple and quick and givesbetter results in proximal ulnar fractures when combined with a plate on the ulna (Vallone and Schulz, 2011). As monofilament polyamide size 2 is thicker than standard veterinary sutures, strict aseptic technique is essential to prevent infection. A caudolateral approach was selected to ensure correct implant placement on the proximal radius and distal humerus to enable the proper drilling of holes and suture material to be correctly placed directly through both bones. In addition, the caudolateral approach may be necessary to effectively reduce the luxated radial head (Piermattei and Johnson, 2014). Reduction of the luxation first subsequently aided in reduction of the fracture. (Vallone and Schulz, 2011).

The most common complication after Monteggia fracture repair is long-term reduction in the range of elbow motion (Bado, 1967). This complication can be minimized by adhering to the principle of early and controlled remobilization. Other complications of Monteggia fracture repair include osteoarthritic changes, implant-related complications, reduced range of motion, and recurrent radial head luxation (Anatolitou et.al., 2024).

Conclusion

This case report demonstrates the successful management of a type I Monteggia fracture in a dog was achieved through precise anatomical reduction of the ulnar fracture using a lateral 2.0 mm reconstruction plate combined with circumferential figure-of-eight ligamentous sutures. This technique provided optimal joint stability, facilitated early functional recovery, and prevented postoperative complications. The outcome emphasizes that meticulous surgical planning, rigid internal fixation, and appropriate restoration of ligamentous integrity are critical for achieving satisfactory elbow joint function in canine Monteggia fractures.

Declaration of Competing Interest

All authors declare that they have no competing interests, financial or personal, that could have influenced the work reported in this manuscript.

References

1) Anatolitou, A., Krystalli, A.A., Sideri, K.I., Markou, M., Kazakos, G., & Prassinos, N.N. (2024). A retrospective study of Monteggia fractures in 8 dogs and 1 cat. Topics in Companion Animal Medicine, 61, 100889. https://doi.org/ 10.1016/j.tcam.2024.100889.
2) Bado, J.L., 1967. The Monteggia lesion. Clinical Orthopaedics and Related Research 50: 71-86.
3) Catalkaya, E., Altan, S., Kanay, B.E., Yayla, S., & Saylak, N. (2022). Clinical and etiologically evaluation of cats with high-rise syndrome: assessment of 72 cases (A retrospective study). Veterinary Journal of Mehmet Akif Ersoy University, 7(1), 20-25. https://doi.org/10.24880/maeuvfd.957535

4) Fernandez-Sanchez, A., Calvo, I. and Farrell, M., 2019. Articular type II Monteggia fracture with concurrent humeroulnar luxation in a Bengal cat. Veterinary Record Case Reports 7(1). https://doi.org/10.1136/vetreccr-2018-000697.
5) Gadallah, S., El-Sunsafty, M., Sharshar, A., Misk, T., & Kramer, M. (2023). Management of elbow luxation in dogs and cats: an overview. Journal of Current Veterinary Research, 5(2), 233-244.https://doi.org/ 10.21608/jcvr.2023.320451.
6) Irubetagoyena, I., Lopez, T. and Autefage, A., 2011. Type IV Monteggia fracture in a cat. Veterinary and Comparative Orthopaedics and Traumatology 24(6): 483–486.https://doi.org/10.3415/VCOT-11-01-0005.
7) Leclerc, A., Greunz, E.M. and Daude-Lagrave, A., 2014. Surgical treatment of a type III Monteggia fracture in a ring-tailed lemur (*Lemur catta*). Revue de Médecine Vétérinaire 165(11-12): 313–317.
8) Monteggia, G.B. and Milan, G.M., 1914. Instituzioni Chirurgiche (3rd edn), Pirotta, Milan, pp 1813–1815.
9) Phaneendra, M.S.S.V., Dhana Lakshmi, N., Devi Prasad, V., Raju, N.K.B. 2016. Evaluation of biochemical parameters for assessment of fracture healing in dogs. Journal of Livestock Science 7: 111-113
10) Piermattei, D.L. and Johnson, K.A., 2014. An Atlas of Surgical Approaches to the Bones and Joints of the Dog and Cat (5th edn), W.B. Saunders, Philadelphia, i: 236–237, ii: 250–253, iii: 240–242.
11) Piermattei, D.L., Flo, G.L. and DeCamp, C.E., 2016. Brinker, Piermattei and Flo's Handbook of Small Animal Orthopedics and Fracture Repair (5th edn). Elsevier, St. Louis.
12) Richard, M., & Vallefuoco, R. (2022). Repair of an isolated traumatic cranial luxation of the radial head using a Tight Rope system in a cat. VCOT Open, 5(02), e131-e135. https://doi.org/ 10.1055/s-0042-1758677.
13) Vallone, L. and Schulz, K., 2011. Repair of Monteggia fractures using an Arthrex Tightrope system and ulnar plating. Veterinary Surgery 40(6): 734–737. https://doi.org/10.1111/j.1532-950X.2011.00848.