

Case Report

Clinical and radiographical findings of Monteggia fracture in a one-year-old-male mule

Samaneh Ghasemi^a, Ali Mirshahi^a, Omidreza Raei Abbasabadi^a, Negin Rahimdoust Mozhdehi^a, Alireza Safarzadeh^a

^a Department of Clinical Sciences, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran

Corresponding author: Dr. Samaneh Ghasemi

Postal address: Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran

University/organization email address: s.ghasemi@um.ac.ir

ORCID ID: 0000-0003-3551-6261

Keywords

Elbow joint, Equine, Luxation, Monteggia fracture, Young mule, Radius, Ulna

Abstract

The elbow joint is between the distal humerus and proximal radius and ulna. On uncommon occasions, the severe traumatic insult to elbow joint results in concomitant fracture luxation or subluxation of its structure. The Monteggia fracture is defined as dislocation of radial head combined with proximal ulnar fracture. This fracture is a rare injury, infrequently reported in the horse and not reported in mule. Concurrent fractures of the ulna and radius can be particularly challenging. Because of the extensive soft tissue and articular cartilage injuries, cases with Monteggia fracture have an unfavorable prognosis. However, some reports document successful surgical management of this condition. Even though the successful reports of repair of Monteggia fracture, these cases are as pasture-sound animals. This article reports a Monteggia fracture in a mule. Severe swelling, pain, crepitus and non-weight-bearing lameness were observed. Radiographic evaluation confirmed the Monteggia fracture. Little information

about Monteggia fracture exists in equine, and a better understanding of treatment of this injury is necessary.

Introduction

The humeroradial/elbow joint is between the distal humerus and proximal radius and ulna. The elbow joint is supported by collateral ligaments. Its joint capsule is attached to the margins of the articular surfaces of the humerus, radius, and ulna bones [1]. In equines, elbow lameness is commonly associated with direct trauma, falls or even collisions with objects or another animal. On uncommon condition, this traumatic event will be vigorous that lead to concomitant luxation of humeroradial joint and fracture of the proximal part of the ulna that is most known as a Monteggia fracture [1, 2, 3] that first described in 1814 by Giovanni Battista Monteggia [4]. Originally Monteggia is a rare condition in equines [5, 6, 7, 8] and not reported in mule. This case report describes clinical and radiographic findings of Monteggia fracture in a mule.

Case Presentation

History and clinical finding

A one-year-old 180 kg male mule was referred to the Veterinary Clinic of Ferdowsi University of Mashhad with a history of a sudden acute lameness of left forelimb.

The mule was trapped by a rope wrapped around a tree, suffering trauma while trying to escape. On clinical examination a non-weight bearing lameness with dropped elbow posture of the affected limb was observed. The elbow joint and antebrachium were severely swelled. With palpation of this region, sever pain, crepitation and bone displacement was elicited. Based on clinical findings, a fracture or dislocation was suspected.

Radiographic Findings and Interpretation

Mediolateral and craniocaudal radiographic views of the left elbow were obtained and complete anterior luxation of humero-radial joint with comminuted fracture of the proximal ulna were observed. These radiograph findings are consistent with a type I Monteggia fracture.

Treatment

Surgical correction is recommended and described but the owner declined the procedure.

Results and Discussion

The elbow joint is a hinge (ginglymus) joint. Articulation of the radial head with the semi-lunar notch of the ulna formed the humeral capitulum. When the elbow joint is extended, the anconeal process of the proximal part of the ulna rests into the olecranon fossa of the humerus. This provides an interlocking mechanism that stabilizes the elbow joint. The radius and ulna are closely associated with each other via four important interosseous ligaments including the cranial, caudal, medial and lateral collateral ligament. These ligaments have a broad-based attachment that diffuse the high tensile forces placed during flexion and extension of the elbow joint. Because of these anatomical characteristics, the injuries of the elbow joint are rare, and often involve external trauma or association with a catastrophic event [1].

The Monteggia fracture is classified into four types based on the direction of the radial head dislocation and the fracture pattern of the ulna. These types are type I, anterior radial head dislocation with unlar fracture. Type II, posterior or postero-lateral radial head dislocation with unlar fracture. Type III, lateral or antero-lateral radial head dislocation with unlar fracture. Type IV, anterior radial head dislocation with a fracture of both radius and ulna [4, 9].

The pathophysiology of Monteggia fracture in animals is not fully understood. The mechanism is believed to be a force or trauma applied to the caudal aspect of the antebrachium when the limb is fully extended during weightbearing [5]. Differential diagnoses for this condition include fracture of the humerus, radius and olecranon and brachial plexus paralysis that can be confirmed radiographically.

There are only a few case reports of surgical correction of Monteggia fractures in horses in the veterinary literature [5, 6, 7, 8]. Management of Monteggia fractures can be challenging in horses because it needs extensive excision and reduction of the radius is difficult. Complete reduction of radius requires traction supplemented by neuromuscular blockade and application of a mechanical distractor followed by the ulnar fracture stabilization with a caudally positioned dynamic compression plate (DCP) engagement of the radius with or without additional plate applied to the lateral or craniolateral aspect of the radius [3, 5, 6, 7, 10]. However, in addition to ulnar fracture repair, the determination of lateromedial stability of elbow joint and interdigitation of the three bones is necessary to provide sufficient stability. Although partial damage to the one collateral ligament may be amenable to repair, complete disruption of one ligament or disruption of both ligaments is difficult. In this condition, euthanasia is warranted [8].

To our knowledge, a total number of five horses with Monteggia fracture has been reported only once previously. Levine et al. described a successful surgical treatment of Monteggia fracture in a three-year-old Arabian horse with a dynamic compression plate. They reported that this filly was free of any apparent lameness [7]. In another report, Trostle et al. described a twenty-seven-month-old Rocky Mountain horse that was treated surgically by a DCP. In this case, wound dehiscence and swelling in surgical site, lameness and infection were reported ten days after surgery. This horse was sound several months after management of these complications. Although bony proliferation and dystrophic mineralization of the along the proximolateral aspect of the ulna and distolateral aspect of the humerus related to traumatized collateral ligament was observed radiographically [5]. Surgical treatment of a Monteggia fracture with a DCP plate in a four-month-old, Anglo-Arab filly was reported by Jalim et al. in this case mild degree of flexural deformity and advanced secondary degenerative joint disease occurred [6]. Janicek reported a fourteen-year-old Tennessee Walking gelding horse with

Monteggia fracture that finally was euthanized because of the poor prognosis related to maintaining elbow joint congruity and stabilization [8]. In another case with Monteggia fracture, the horse euthanized because of the concurrent fracture of radius with presence small size of the proximal radius fragment that makes this difficult for fixation [10]. Although in our patient different aspects of this condition, including its treatment options, outcomes, prognosis and animal welfare, were fully discussed with the owner, but the owner refused.

It confirms that one of the possible consequences of elbow injuries, especially after fractures and soft tissue injuries is osteoarthritis [2]. The evidence of this condition may be affected by the degree of articular disruption due to severity of initial trauma [1]. So, degenerative joint disease of elbow joint, is considered to have a guarded prognosis. These patients are as pasture-sound animals.

Recovery from anesthesia is another challenge so, it should be assisted for prevention of implants failure, humeroradial luxation or refracturing the ulna [8].

Infection of the surgical site is another complication of horses undergoing surgical repair of Monteggia fractures and prevention of this condition is necessary [5].

A well-recognized complication of olecranon fracture repair is acquired flexural deformity. Therefore, timely removal of the initial instigating factor including orthopedic implants and prevention of permanent joint capsule contracture is necessary [1].

Even though the successful reports of repair of Monteggia fracture in horse, the prognosis of this condition for athletic performance remains guarded. The extensive destruction of soft tissue, articular cartilage and joint capsule, types of bone fracture, osteoarthritis and limb deformity often preclude a successful outcome and surgical management preserve the horse for pasture or breeding soundness [5, 6].

References

1. Hu AJ, Scheuch B, Cannon J. Repair of a Complete Luxation of The Humero-radial Joint in a Foal with Securos Suture. *Equine Veterinary Education*. 2007;19(8): 424-8.
2. Baccarin RAY. Accessing the Equine Elbow Joint: New Insights on an Old Approach. *veterinary record*. 2016; 179:170-2.
3. Wright IM. Fracture of the Ulna. In: Wright I, editor. *Fractures in the Horse*. 1e. John Wiley & Sons Ltd: 2022. p. 561,580.
4. Delpont M, Louahem D, Cottalorda J. Monteggia injuries. *Orthopaedics and Traumatology: Surgery and Research*. 2018; 104.
5. Trostle SS, Peavey CL, King DS, Hartmann FA. Treatment of Methicillin-resistant *Staphylococcus epidermidis* Infection Following Repair of an Ulnar Fracture and Humero-radial Joint Luxation in a Horse. *Journal of American Veterinary Medical Association*. 2001; 218(4):554-9.
6. Jalim SL, McKinnon AO, Russell TM. Repair of a Type IV Monteggia Fracture in a foal: Case Report. *Australian Veterinary Journal*. 2009;87(11):463-6.
7. Levine SB, Meagher DM. Repair of an Ulnar Fracture with Radial Luxation in a Horse. *Veterinary Surgery*. 1980;9(2):58-60.
8. Janicek JC. What Is Your Diagnosis? *Journal of American Veterinary Medical Association*. 2005;227(11):1743-4.
9. ElKhouly A, Fairhurst J, Aarvold A. The Monteggia Fracture: Literature Review and Report of a New Variant. *Journal of Orthopedic Case Reports*. 2018;8(4).
10. Nixon AJ. Equine fracture repair. In: Nixon AJ, editor. *Equine Fracture Repair*. 1e. John Wiley & Sons: 2019; p. 555.

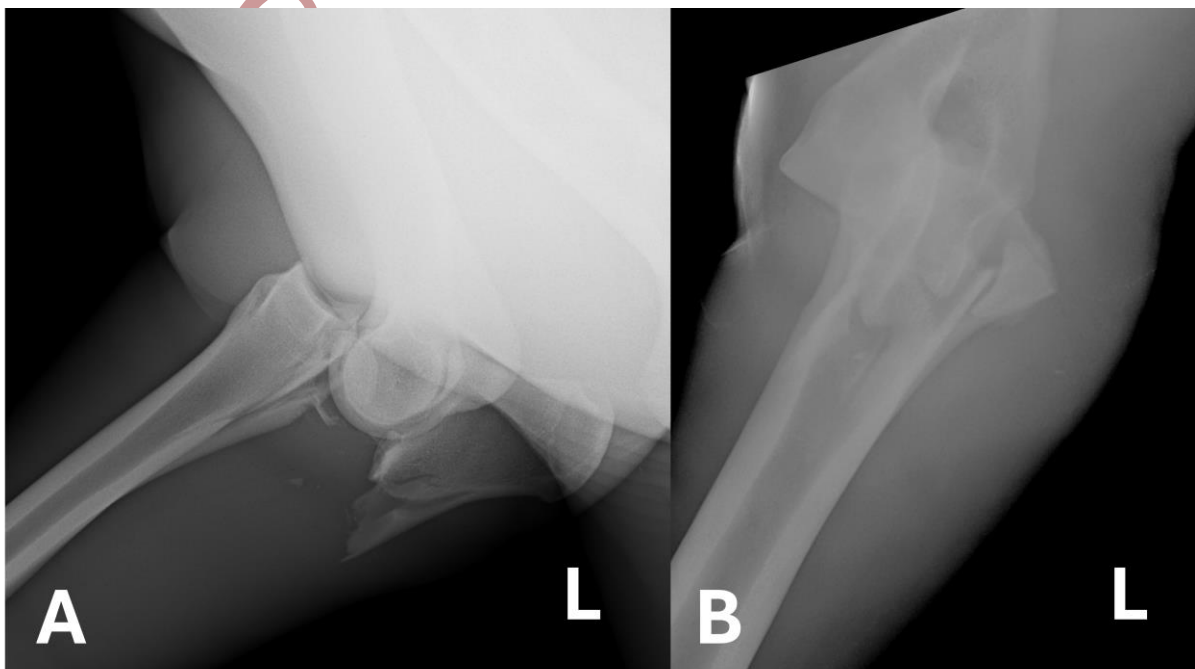
152 **Figures**

153 **Figure 1.** Left forelimb non-weight bearing lameness with severe swelling of elbow region.



154

Figure 2. Radiographic images obtained in mediolateral (A) and craniocaudal (B) projections of the left forelimb. The images demonstrate a Type I Monteggia fracture, characterized by a spiral and comminuted fractures of the proximal ulna associated with proximal and cranial luxation of the radial head, along with caudal displacement of the proximal ulnar fragment. Luxation of the humeroradial joint is evident, with the humeral condyle positioned caudal to the proximal radial metaphysis.



عنوان مقاله: یافته‌های بالینی و رادیوگرافی شکستگی مونتجیا در یک راس قاطر نر یک‌ساله

نویسندگان:

سمانه قاسمی¹، علی میرشاهی¹، امیدرضا راعی عباس آبادی¹، نگین رحیم‌دوست مزدهی¹، علیرضا صفرزاده¹

¹ گروه علوم درمانگاهی، دانشکده دامپزشکی دانشگاه فردوسی مشهد، مشهد، ایران

نویسنده مسئول: دکتر سمانه قاسمی

آدرس پستی: خراسان رضوی، مشهد، دانشکده دامپزشکی دانشگاه فردوسی مشهد

ایمیل سازمانی: s.ghasemi@um.ac.ir

خلاصه فارسی: مفصل آرنج بین بخش پایینی استخوان بازو و بخش بالایی درشتنی و نازک‌نی است. در موارد غیر معمول، آسیب شدید وارد شده به مفصل آرنج منجر به رخداد هم‌زمان شکستگی، دررفتگی کامل یا ناکامل می‌شود. شکستگی مونتجیا به عنوان جابه‌جایی سر درشتنی همراه با شکستگی بالای نازک‌نی تعریف می‌شود. این شکستگی آسیب نادری است، به ندرت در اسب رخ می‌دهد و در قاطر گزارش نشده است. شکستگی هم‌زمان درشتنی و نازک‌نی به‌ویژه چالش‌برانگیز است. به دلیل جراحات وسیع بافت نرم و غضروف مفصلی، موارد درگیر با شکستگی مونتجیا پیش‌آگهی نامطلوبی دارند. به هر حال، بعضی گزارش‌ها مدیریت موفقیت‌آمیز این شرایط را ثبت کرده‌اند. علی‌رغم گزارش‌های موفق ترمیم شکستگی مونتجیا، این حیوانات برای گشت آزاد مناسب هستند. این مقاله شکستگی مونتجیا را در یک راس قاطر گزارش می‌کند. تورم شدید، درد، کریپتان و لنگش مرتبط با عدم وزن‌گیری مشاهده شد. ارزیابی رادیوگرافی، شکستگی مونتجیا را تایید کرد. اطلاعات اندکی در مورد شکستگی مونتجیا در اسب‌سانان وجود دارد و درک بهتر درمان این جراحات ضروری است.

واژگان کلیدی: مفصل آرنج، اسب، دررفتگی، شکستگی مونتجیا، قاطر جوان، درشتنی، نازک‌نی