



NOTE

Wildlife Science

Conservative treatment of a synovial cyst in a golden eagle (*Aquila chrysaetos*) with triamcinolone acetonide

Matteo SERPIERI¹), Giuseppe BONAFFINI¹), Chiara OTTINO¹),
Giuseppe QUARANTA¹)*, Luca MANASSERO²), Mitzy MAUTHE VON DEGERFELD¹)

¹)Centro Animali Non Convenzionali, Department of Veterinary Sciences, University of Turin, Grugliasco, Italy

²)Department of Veterinary Sciences, University of Turin, Grugliasco, Italy

J Vet Med Sci

86(5): 592–595, 2024

doi: 10.1292/jvms.23-0474

Received: 21 November 2023

Accepted: 22 February 2024

Advanced Epub:

15 April 2024

ABSTRACT. In human and veterinary medicine, the treatment of synovial cysts involves medical or surgical approach. When medical treatment is chosen, triamcinolone acetonide is one of the most used drugs. In this case, intracystic triamcinolone was administered for the treatment of a non-infectious elbow synovial cyst in a subadult female Golden eagle (*Aquila chrysaetos*), unable to fly. The bird was brought to a wildlife rescue center after an aerial fight with a conspecific. After the treatment, no clinically detectable adverse effects were noted and there was no recurrence within two weeks. Given the improvement of the clinical conditions and the recovery of flight ability, the animal was released back into the wild 17 days after administration of the drug.

KEYWORDS: golden eagle, raptor, synovial cyst, triamcinolone

Trauma is among the most frequent causes of admission of birds of prey to wildlife rescue centers [11, 17] and the origin of trauma could be a fight between birds for territorial dominance. It is reported that the Golden eagle (*Aquila chrysaetos*), a sedentary and nesting raptor in Europe and Italy, is often involved in episodes of intraspecific aggression, resulting in severe or fatal injuries [8, 11, 18]. In many cases, the subjects involved are adults or subadults flying in an area already occupied by a pair of eagles, triggering the aggression, with episodes reported throughout the year and regularly between February and May [8].

Impact trauma, as occurs during aerial fights, can cause joint injuries resulting in increased synovial fluid and traumatic arthritis [3, 8, 16]. This can also lead to the formation of extra-articular synovial cysts or hernias of the synovial membrane, due to the leakage of fluid in the direction of least resistance [2]; these lesions are usually treated with corticosteroid injection or surgical resection in human medicine [1, 19]. In veterinary medicine, the intraarticular use of corticosteroids is described, particularly for horses, with extensive use of triamcinolone acetonide [4, 14]. This corticosteroid, when administered intraarticularly, presents some peculiarities: it exerts a marked glucocorticoid activity with reduced mineralocorticoid effects, has a long duration of action, reduced systemic absorption and few adverse effects [19].

This report presents a case of conservative treatment of an elbow synovial cyst in a golden eagle (*Aquila chrysaetos*) with the use of triamcinolone acetonide.

In April 2023, a subadult Golden eagle was found on the ground in a non-urban area in Cesana Torinese (TO, Italy) after an aerial fight with a conspecific subject; the animal was captured and brought to the Centro Animali Non Convenzionali (CANC), the wildlife rescue center of the Veterinary Teaching Hospital of the University of Turin. The eagle was placed in a cage in a dark and silent room and, to avoid sudden stress, physical examination was performed two hours later. The patient had slightly depressed mental status, weighed 5.2 kg, and was in good body condition. Cardiopulmonary auscultation and coelomic palpation were normal. Inspection of the oral cavity revealed the presence of a degloving injury of the skin on the right side of the gnatheca (Fig. 1). On the lateral aspect of the left elbow there was a cystic lesion, about 2 cm in diameter, with smooth surface (Fig. 2). At palpation, firm consistency and presence of thick liquid inside could be perceived. No overt asymmetry, decreased range of joint motion, fractures, or bone dislocations were noted.

The beak wound was cleaned with 10% povidone-iodine solution (Betadine, Viatrix Italia S.r.l., Milan, Italy), 1:10 diluted with saline (Sodio Cloruro 0.9%, S.A.L.F. S.p.A., Cenate Sotto, Bergamo, Italy), scraping with a gauze until slight bleeding was obtained. The skin flap was placed on the degloved area, and few drops of cyanoacrylate (Loctite® Super Attack, Henkel Italia S.r.l., Milan, Italy) were placed on the edge of the wound to keep it in place. Then, the followings were administered: 60 mL Lactate Ringer's

*Correspondence to: Quaranta G: giuseppe.quaranta@unito.it, Centro Animali Non Convenzionali, Department of Veterinary Sciences, University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco, Italy

©2024 The Japanese Society of Veterinary Science



This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License. (CC-BY-NC-ND 4.0: <https://creativecommons.org/licenses/by-nc-nd/4.0/>)



Fig. 1. Degloving injury of the skin on the right side of the gnatcatcher.



Fig. 2. Lateral aspect of the left elbow. A cystic lesion, about 2 cm in diameter with smooth surface, can be noted.

solution (Ringer Lattato, S.A.L.F. S.p.A., Cenate Sotto, Bergamo, Italy) subcutaneously (SQ) into the interscapular region, and 0.5 mg/kg meloxicam (Meloxidyl® 5 mg/mL, Ceva Salute Animale S.p.A., Agrate Brianza, MI, Italy) intramuscularly (IM) into the pectoral muscles. Also, 0.2 mg/kg ivermectin (Ivomec 1%, Boehringer Ingelheim Italia, Milan, Italy) was administered SQ into the interscapular region, as part of an antiparasitic procedure routinely performed on wild animals upon admission to the CANC. The eagle was then moved into an aviary (2 × 2 m).

The day after, the animal failed to gain altitude when stimulated to fly in a dedicated flight tunnel. To detect any further abnormalities and to better investigate the elbow lesion, total body plain computed tomography (CT) scan was performed (16 slice CT Scanner, Somatom Emotion, Siemens Healthcare S.r.l., Milan, Italy). Chemical restraint was obtained by IM administration of 7.5 mg/kg ketamine (Lobotor® 100 mg/mL, Acme S.r.l., Corte Tegge-Cavriago, RE, Italy) and 0.15 mg/kg medetomidine (Dormisan® 1 mg/mL, ATI Azienda Terapeutica Veterinaria S.r.l., Milan, Italy). After 5 min, the eagle lost the righting reflex. It was positioned in sternal recumbency on the CT table, with 100% O₂ delivered through a face mask (Anesthetic face mask, S, Jørgen Kruuse A/S, Langeskov, Denmark), using a non-rebreathing respiratory system (Bain coaxial breathing system, Intersurgical, Wokingham, UK). Lactate Ringer's solution (60 mL, SQ) and meloxicam (0.5 mg/kg, IM) were administered.

Plain CT scan excluded the presence of any traumatic bone lesion, but revealed the presence of a periarticular soft tissue neoformation of about 2 cm in diameter next to the lateral humeral epicondyle of the left elbow. This lesion had homogeneous slightly hypodense tissue and resulted to be associated with osteophytosis at the level of the joint and sclerosis on the proximal ulnar epiphysis (Fig. 3). After the CT scan, coelomic endoscopy (Sopro Imaging, Sopro SA, La Ciotat, France) was performed to evaluate the air sacs, and no overt lesion was noted. The eagle was a subadult female, as immature ovaries were seen.

After the procedure, 0.75 mg/kg atipamezole (Sedastop® 5 mg/mL, Ecuphar Italia S.r.l., Milan, Italy) IM was administered. After 10 min, spontaneous movements of the head and limbs reappeared, and recovery (bird in bipedal station) was obtained in about an hour. The eagle was left in the flight tunnel with an available prey—a deceased eastern cottontail (*Sylvilagus floridanus*).

On the second day, the eagle was standing with normal posture, feeding on the prey, but still unable to climb on a wood log of about 100 cm, nor to fly.

Since the inability to fly was still present on the fifth day, and no further lesions were present, the eagle was captured and brought to the procedural room of the CANC. In sternal recumbency and manually restrained, surgical scrub with chlorhexidine (LH New Clorexidina 70, Lombarda H S.r.l., Abbiategrosso, Milan, Italy) was performed on the left elbow over the cyst, after having plucked some feathers.

Transcutaneous puncture was performed using a 20G, 40 mm needle (BD Microlance, Becton Dickinson Italia, Milan, Italy), and 12 mL of dense fluid were collected. With the needle still inserted, the connected syringe was removed and another was connected, through which 2 mg/kg triamcinolone acetonide (Kenacort 40 mg/mL, Bristol Myers Squibb, Rome, Italy) was inoculated. The area was covered with gauzes, and a “figure-of-8” bandage was made on the wing, using cotton and self-adherent wrap (Vet-flex, Jørgen Kruuse A/S, Langeskov, Denmark), to create a slight compressive force on the elbow. The eagle was placed in the flight tunnel, with a prey at its disposal.

The aspirated fluid had rosy and turbid appearance. Microscopic evaluation revealed some erythrocytes with poor cellularity represented by monocytic cells, macrophages, and some synoviocytes in a rosy matrix, consistent with normal synovial fluid. A microbiological analysis was also performed on the fluid, with absence of bacterial growth.

On the seventh day, the figure-of-8 bandage was removed. The cystic lesion had not swollen since the aspiration of fluid, and the wing showed no decrease in the range of motion.

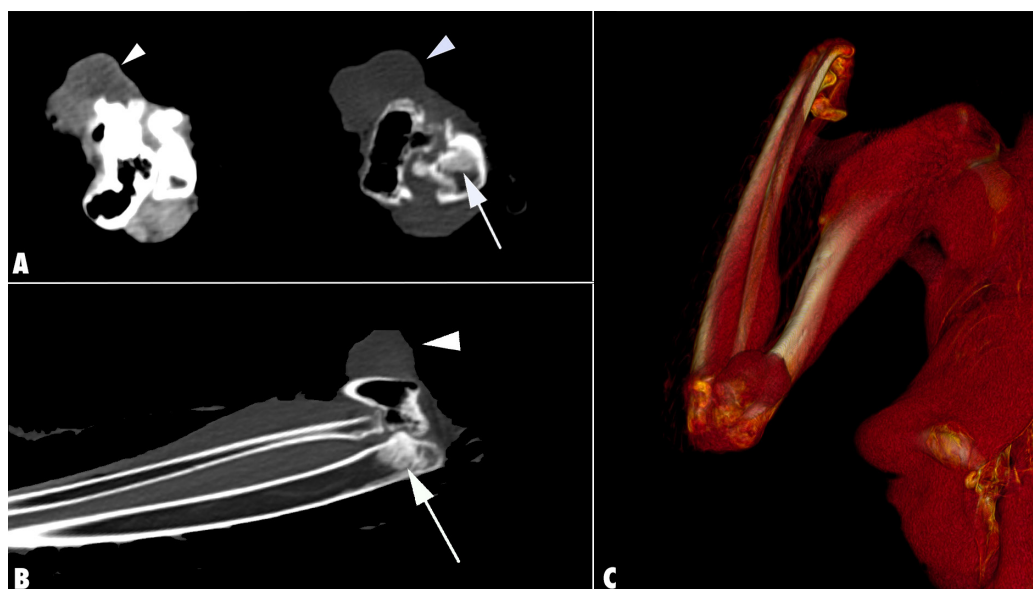


Fig. 3. CT images of the left elbow with the periarticular soft tissue neoformation. (A) Transverse scan with left to the right soft and bone windows. Arrowhead at the level of the neoformation, arrow indicates the sclerosis at the level of the proximal ulnar epiphysis. (B) Sagittal view of the elbow the neoformation (arrowhead) and ulnar sclerosis (arrow). (C) 3D Volumetric Rendering of the CT showing the soft tissue neoformation.

On the eighth day, the eagle managed to jump on the wood log in the flight tunnel, and on the tenth day it could fly for some meters when stimulated by a technician. The bird was then trained daily in the flight tunnel until the 21st day, showing improvement in flight, with no asymmetries.

On the 22nd day, the eagle was captured and briefly examined. No asymmetries or new lesions were noted, and 0.3 kg were gained since its arrival. Also, the skin flap on the right gnatoteca was healed.

The eagle was placed in a darkened cage and transferred to the planned release area (Santa Elisabetta-Colleretto Castelnuovo, TO, Italy). There, the cage was opened on a large plateau, and the bird quickly flew away.

In veterinary medicine, articular synovial cysts have been occasionally described in dogs, cats, and horses [6, 10, 12]. The cause of synovial cyst formation is unclear. According to Baker, one of the first descriptors of this lesions, the formation of a synovial cyst could be related to the presence of joint inflammation, leading to the leakage of synovial fluid in the direction of least resistance, or forming a hernia of the synovial membrane [2]. Yet, not all cysts are related to the presence of joint diseases, and particularly in children it is assumed that most cysts are due to minor trauma [13]. In the described case, the etiology of the synovial cyst is unknown. The finding of osteophytosis on tomographic examination does not rule out the hypothesis of concomitant presence of a previous articular pathology, possibly exacerbated by the trauma. However, since the presence of joint damage can greatly affect the flight capabilities of a bird, it was decided to institute medical treatment with intracystic triamcinolone, thus avoiding a more invasive surgical approach in the first instance.

The choice in using intracystic triamcinolone for the treatment of synovial cysts is due to some peculiarities of this drug. Triamcinolone derives from hydrocortisone, with some changes in the chemical structure that increase the effects on glucocorticoid receptors and their anti-inflammatory activity, decreasing the effects on mineralocorticoid receptors, responsible for water and electrolyte balance. Furthermore, the chemical structure of triamcinolone slows down the metabolism of the drug, compared to hydrocortisone [19]. Few adverse effects due to intraarticular administration of this steroid have been reported, with post injection facial flushing for 2–3 days as the most common in human medicine, subcutaneous swelling reported in horses, and mild transient suppression of endogenous cortisol production was noted for up to 3 days in dogs [5, 7, 19].

In our case, a single intracystic injection of triamcinolone into a synovial cyst of a Golden Eagle produced improvement without clinically detectable adverse effects after 17 days. Furthermore, the application of a slightly compressive bandage concurred in avoiding recurrence, probably by preventing the fluid from flowing into an area of low resistance. Certainly, the short hospitalization and the absence of a follow-up did not allow to rule out any long-term recurrences, but prolonged permanence would not have been compatible with the welfare of a wild animal, free of further diseases and able of flying again [9]. It is also possible that the aspiration of the fluid and the application of the bandage could have been adequate as treatment, avoiding the use of the steroid: however, it was assumed that the local anti-inflammatory action of the drug could reduce the formation of fluid and relieve pain. Moreover, in a canine model of osteoarthritis, the use of triamcinolone reduced osteophyte formation compared to a control group [15]. Despite the clinical efficacy of the treatment, it is important to highlight that the administration of triamcinolone before excluding the bacterial etiology of the lesion is not to be considered a common practice. Typically, completion of the examinations should precede drug administration. In this case, the choice was made to avoid puncturing multiple times (for fluid collection and for treatment injection)

and in different points the skin which overlaid the cystic lesion, to prevent easier external contamination, and based on the presumed traumatic etiology of the lesion.

In the following six months, no other Golden eagle casualty was found or reported in the area covered by the activity of the CANC, in the Metropolitan City of Turin, Italy. It is therefore assumed that the animal was able to fly and survive, although it cannot be ruled out that the bird, in a possible condition of danger, was not found by anyone in the area. Despite the limitations in the follow-up of a wild bird, during the eagle's hospitalization it was possible to notice a clear improvement in its clinical conditions, and the animal was released back into the wild quickly and with no complications.

Based on a thorough literature search, this is the first report of the use of triamcinolone for the treatment of an elbow synovial cyst in an avian patient.

CONFLICT OF INTEREST. The authors declare no conflicts of interest with respect to the publication of this manuscript.

REFERENCES

1. Babaei-Ghazani A, Eftekharsadat B. 2016. Ultrasound guided injection of resistant extra-articular shoulder and elbow cysts in rheumatoid arthritis: A case report. *J Back Musculoskeletal Rehabil* **29**: 381–385. [[Medline](#)] [[CrossRef](#)]
2. Baker WM. 1877. On the formation of the synovial cysts in the leg in connection with disease of the knee joint. *St Barth Hosp Rep* **13**: 245–261.
3. Campbell TW. 1993. Cytodiagnosis in raptor medicine. pp. 11–13. In: Raptor Biomedicine (Redig PT, Cooper JE, Remple JD, Hunter DB eds.), University of Minnesota Press, Minneapolis.
4. Caron JP. 2005. Intra-articular injections for joint disease in horses. *Vet Clin North Am Equine Pract* **21**: 559–573, v. [[Medline](#)] [[CrossRef](#)]
5. de Grauw JC, Visser-Meijer MC, Lashley F, Meeus P, van Weeren PR. 2016. Intra-articular treatment with triamcinolone compared with triamcinolone with hyaluronate: A randomised open-label multicentre clinical trial in 80 lame horses. *Equine Vet J* **48**: 152–158. [[Medline](#)] [[CrossRef](#)]
6. Franklin AD, Havlicek M, Krockenberger MB. 2011. Stifle synovial cyst in a Labrador Retriever with concurrent cranial cruciate ligament deficiency. *Vet Comp Orthop Traumatol* **24**: 157–160. [[Medline](#)] [[CrossRef](#)]
7. Gamble LJ, Boesch JM, Wakshlag JJ, Frye CW. 2020. Assessing the systemic effects of two different doses of intra-articular triamcinolone acetonide in healthy dogs. *VCOT Open* **3**: e96–e102. [[CrossRef](#)]
8. Glawischnig W, Netzer M, Schöpf K. 2011. Case report: two golden eagles (*Aquila chrysaetos chrysaetos*) crashed into the roof of a house in Austria. *Vet Med Austria* **98**: 133–135.
9. Grogan A, Kelly A. 2016. Rehabilitation and release. pp. 81–92. In: BSAVA Manual of Wildlife Casualties, 2nd ed. (Mullineax E, Keeble E eds.), BSAVA, Gloucester.
10. Hittmair KM, Maedl I, Reifinger M, Mayrhofer E. 2010. Synovial cyst of the fifth digit in a cat. *J Feline Med Surg* **12**: 175–178. [[Medline](#)] [[CrossRef](#)]
11. Hunt WG, Dunlop N, Lockhart JM. 2021. A revealing case of territorial fighting by golden eagles. *J Raptor Res* **55**: 112–114. [[CrossRef](#)]
12. Lacourt M, MacDonald M, Rossier Y, Laverty S. 2013. Equine articular synovial cysts: 16 cases. *Vet Surg* **42**: 99–106. [[Medline](#)] [[CrossRef](#)]
13. Liebling MR. 1999. Editorial response: Why a duck?—Or for that matter, why a cyst? *Clin Infect Dis* **29**: 279–280. [[Medline](#)] [[CrossRef](#)]
14. McIlwraith CW. 2010. The use of intra-articular corticosteroids in the horse: what is known on a scientific basis? *Equine Vet J* **42**: 563–571. [[Medline](#)] [[CrossRef](#)]
15. Pelletier JP, Martel-Pelletier J. 1989. Protective effects of corticosteroids on cartilage lesions and osteophyte formation in the Pond-Nuki dog model of osteoarthritis. *Arthritis Rheum* **32**: 181–193. [[Medline](#)] [[CrossRef](#)]
16. Punch PIP. 2001. A retrospective study of the success of medical and surgical treatment of wild Australian raptors. *Aust Vet J* **79**: 747–752. [[Medline](#)] [[CrossRef](#)]
17. Rodríguez B, Rodríguez A, Siverio F, Siverio M. 2010. Causes of raptor admissions to a wildlife rehabilitation center in Tenerife (Canary Islands). *J Raptor Res* **44**: 30–39. [[CrossRef](#)]
18. Sartirana F, Valfiorito R. 2018. Nesting of Golden Eagle (*Aquila chrysaetos*) at an exceptional altitude for the Italian Alp. *Riv Ital Ornitol* **88**: 43 (in Italian). [[CrossRef](#)]
19. Scherer J, Rainsford KD, Kean CA, Kean WF. 2014. Pharmacology of intra-articular triamcinolone. *Inflammopharmacology* **22**: 201–217. [[Medline](#)] [[CrossRef](#)]