

CT diagnosis of occipital condyle fracture in a dog presented for severe cervical hyperesthesia

Liesbet Ledeganck¹  | Kaatje Kromhout² | Koen Chiers³ | Elke Van der Vekens² | Luc Van Ham¹ | Sofie F.M. Bhatti¹ | Ine Cornelis¹

¹Small Animal Department, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

²Department of Veterinary Medical Imaging and Small Animal Orthopaedics, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

³Department of Pathology, Bacteriology and Poultry disease, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

Correspondence

Liesbet Ledeganck, Small Animal Department, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium.
Email: liesbet.ledeganck@ugent.be

Abstract

A 9-month-old male entire Doberman Pinscher presented with acute onset of severe cervical hyperesthesia after a fall. Neurological examination revealed a normal gait with low head carriage and severe cervical hyperesthesia. A CT scan of the cervical vertebral column revealed the presence of a comminuted fracture at the dorsomedial aspect of the right occipital condyle and sclerosis of the underlying bone. Medical management was initiated consisting of an external bandage, strict rest, and pain medication. Due to the lack of clinical improvement, the dog was euthanized 2 months after diagnosis. Histopathology of the lesion was compatible with a healing fracture.

KEYWORDS

craniocervical junction, neck pain, spinal trauma

1 | SIGNALMENT, HISTORY, AND CLINICAL EXAMINATION FINDINGS

A 32.5kg, 9-month-old male entire Doberman Pinscher was presented with a 1-week history of acute onset severe cervical hyperesthesia that started after a fall. At that time, the dog had been running on a frozen path and suddenly slipped, causing a hard fall with the ventral part of his head and neck on the path. The dog immediately screamed. He was unable to eat from a floor-based bowl and could barely move his head up and so the owner promptly sought veterinary attention. A treatment with carprofen (4mg/kg/24h/PO; Rimadyl, Zoetis, Belgium) was initiated for one week, but the intermittent screaming in pain remained, and the dog was referred two weeks later.

On admission, the dog was calm and intermittently screaming in pain, but further normally alert and responsive. General physical examination revealed no abnormalities. A low head carriage with intermittent screaming when the head was moved, together with severe hyperesthesia on palpation and manipulation of the neck was noticed on neurological examination. Further neurological examination was unremarkable. A complete blood count and serum biochemistry profile were within normal limits. Because of the suspicion of a traumatic

lesion, CT of the cervical vertebral column was performed under general anesthesia.

2 | IMAGING, DIAGNOSIS, AND OUTCOME

Computed tomography was performed of the complete cervical vertebral column using a 4-slice multidetector CT scanner (Lightspeed QX/I, General Electric Medical systems, USA). Scanning parameters were: 120 kV, 139 mAs, 0.6 mm contiguous transverse slices using soft tissue and bone algorithms. Imaging revealed multiple, variably-sized, non-displaced fragments within an associated irregular defect at the dorsomedial aspect of the right occipital condyle (Figure 1). The surrounding occipital condyle showed an ill-defined rim of sclerosis of the underlying subchondral bone. The vertebral canal or foramen magnum were not narrowed by the occipital condylar fracture fragments. No other abnormalities could be detected in the cervical vertebral column. At this time, both an osteochondrosis dissecans (OCD) lesion of the occipital condyle and a traumatic fracture were the main differential diagnosis. To rule out the presence of additional inflammatory disease, a cerebrospinal fluid collection at the level of the cerebellomedullary

Abbreviations: OCD, osteochondrosis dissecans; OCFs, occipital condyle fractures.

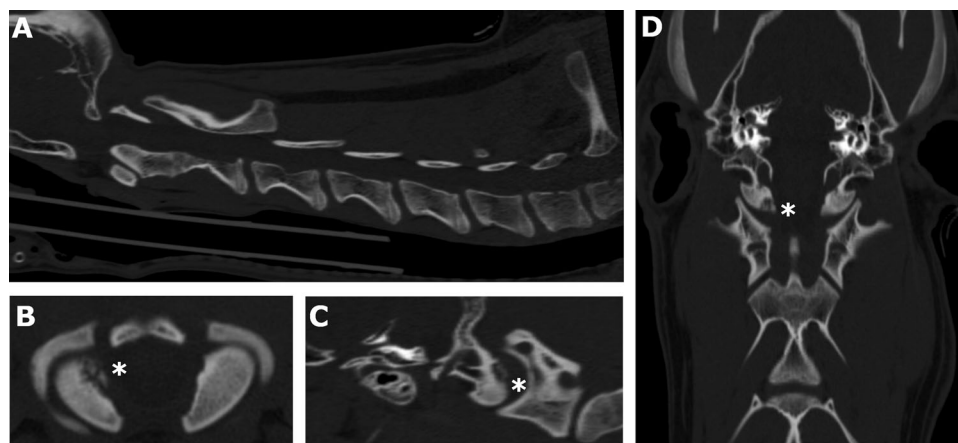


FIGURE 1 Median (A), right sagittal (C), and dorsal (D) multiplanar CT reconstructions and a transverse CT image at the level of the occipital condyles (B). Multiple fragments are visible within an associated irregularly-bordered defect at the dorsomedial aspect of the right occipital condyle (*). A sclerotic rim is surrounding the bone defect. Left is cranial in the sagittal and right in the transverse and dorsal images

cistern was performed, revealing a normal total nucleated cell count of 0 white blood cells/ μ L (reference 0–5 white blood cells/ μ L).

Recovery from general anesthesia was uneventful, and a cervical external bandage was placed using thick bandaging material to significantly reduce movement in the cranial cervical area. The first layer of cotton wool was spirally twisted around the neck from rostral to the ears until the mid-cervical area in 3–4 thick layers. The second layer consisted of adhesive, elastic material which was twisted likewise leaving approximately 2 cm cotton sticking out of the bandage. It was important to wrap the adhesive, elastic material around with a mild strength, but not by stretching it significantly to avoid constriction. Tightness was perfect if two fingers could be introduced nicely in the bandage at all sides. The dog was discharged with tramadol hydrochloride (4 mg/kg/8h PO for 1 week, followed by 2 mg/kg/8h/PO for 1 week; Tramadol, Eurogenerics, Belgium) and strict cage confinement. A follow-up consultation after 4 weeks revealed the dog being much brighter and more playful, however tapering of the tramadol therapy deemed impossible because of immediate recurrence of the pain episodes. Additionally, providing strict rest to a young large breed dog was a big challenge to the owner. An additional 4 weeks later, the dog presented for a second follow-up consultation, still revealing intermittent pain episodes despite pain medication and rest. Because of the lack of more complete clinical improvement, the dog was humanely euthanized and complete necropsy was performed.

On gross pathology, apart from a blue discoloration of the dorso-medial aspect of the right occipital condyle (Figure 2), no other gross pathological findings including indentation, discoloration, or compression were detected at the level of the brainstem, cerebellum, and spinal cord. Further histological examination with the hematoxylin and eosin stain (H&E stain) revealed the presence of a necrotic bone fragment, embedded in fibrovascular tissue with a presence of new bone formation at the level of the right occipital condyle. The absence of a cartilaginous flap containing clusters of proliferative chondrocytes made OCD less likely. Therefore, the histological pattern of the lesion in the presented case was compatible with a healing fracture of the right

occipital condyle. The histological examination of the spinal cord at the level of C1 showed no abnormalities.

3 | DISCUSSION

Published descriptions of occipital condyle fractures (OCFs) in dogs were not found, and only one published report described OCFs in a horse that experienced minor head trauma.¹ In human medicine, OCFs are generally considered rare with incidence rates varying widely between studies, ranging from 1–19% in trauma patients.^{2–4} Although rare, they may be life-threatening due to their relation to the foramen magnum and the risk of destabilization of the craniocervical junction.⁵ In 75% of the patients, the mechanism of injury was a high-energy trauma (such as a fall from more than 6 meters, bicyclist/pedestrian hit by car, or a person thrown from a car/motorcycle), and one third of these patients presented with concomitant cervical vertebral column fractures, indicating the high need for advanced imaging.⁵ Although cervical tenderness and pain were the most common presenting clinical symptoms, one third of human patients with OCFs presented with neurological deficits of the lower cranial nerves (cranial nerves IX, X, XI and especially XII).^{5–7} The dog in the presented study had a low-energy trauma (falling from a standing height or less)⁵ and presented only with cervical hyperesthesia with no further neurological abnormalities.

Diagnosis of OCFs has been proven difficult by means of plain radiography in human medicine,⁸ so CT examination is advised in patients presenting with blunt trauma to the head, particularly when an altered level of consciousness is present.⁹ Ideally, in cases of severe or high-energy trauma, full-body CT should be performed to rule out any further injuries, but due to the low-energy trauma, this proved not be necessary in this presented canine case. Based on the history, and clinical and laboratory findings, the differential diagnoses were spinal trauma, atlantoaxial subluxation, steroid responsive meningitis-arteritis, meningomyelitis, syringomyelia, intervertebral disc disease and spinal neoplasia. Based on the age, spinal neoplasia and

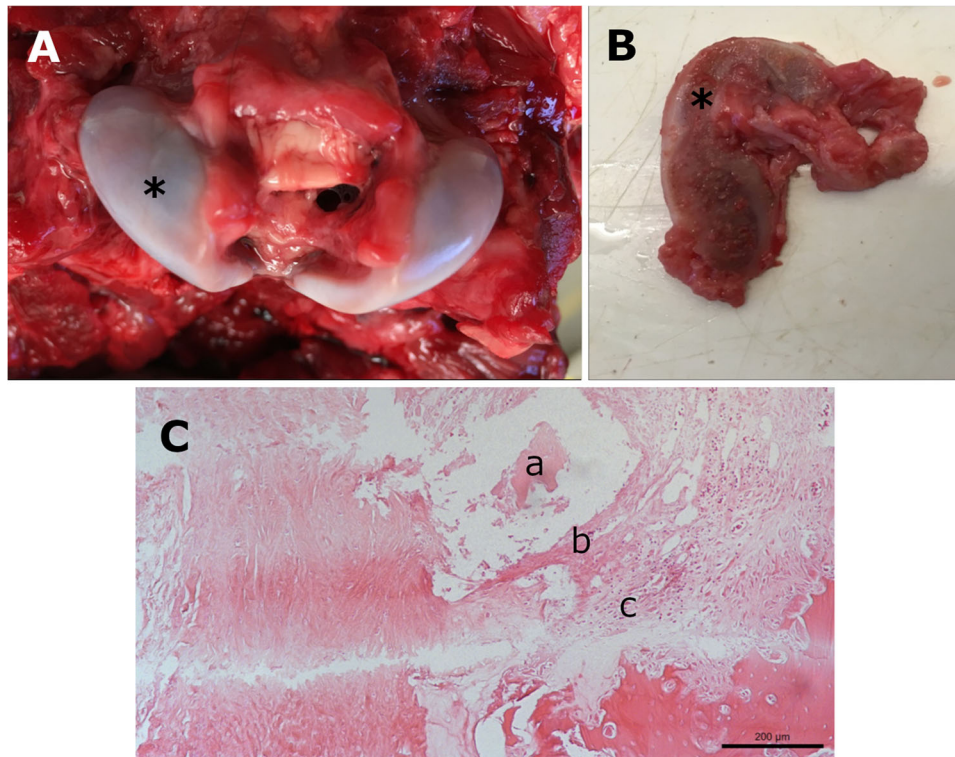


FIGURE 2 Gross pathology (A, B) and histology slide (C) of the comminuted fracture at the dorsomedial aspect of the right occipital condyle. On gross pathology, there is blue discoloration of the subchondral bone at the level of the right occipital condyle (A*) that has a slightly pale appearance after section (B*). With the H&E stain, there is presence of a necrotic bone fragment (a) embedded in fibrovascular tissue (b), with presence of new bone formation (c), all compatible with a traumatic fracture and signs of healing of the right occipital condyle (C) [Color figure can be viewed at wileyonlinelibrary.com]

intervertebral disc disease were deemed less likely. Based on CT images and the presence of sclerosis of the subchondral bone, the main differential diagnosis was an OCF or the presence of OCD at the level of the occipital condyle as previously described in the horse. However, this last lesion was excluded based on the histopathology findings. Based on the cerebrospinal fluid examination, additional inflammatory diseases such as steroid responsive meningitis-arthritis and meningomyelitis were much less likely.

The CT-findings assisted case management decisions by supporting the use of strict activity restriction and application of a supportive neck bandage for immobilization of a non-displaced OCF, as reported in humans.⁵ Unilateral OCFs that were not dislocated, could be treated with a stiff neck collar for 6 weeks in people, resulting in 71% of patients being pain free. At 12 weeks, 91% of patients were pain free and completely neurologically intact, indicating the good prognosis for this condition in human patients. In the presented case, a neck collar and strict cage confinement were advised for 8 weeks, but the dog was a young and very active large breed dog, so the strict rest might have been inadequate. As the fragment was not displaced and no further cervical lesions were present (both on advanced imaging and histologically), prognosis may have been good if strict immobilization for 6 weeks could have been provided. However, the owner was unable to keep the dog sufficiently calm for successful immobilization of the cranial cervical vertebral column with the external bandage.

LIST OF AUTHOR CONTRIBUTIONS

Category 1

- (a) Conception and Design: Ledeganck, Cornelis
- (b) Acquisition of Data: Ledeganck, Cornelis, Chiers
- (c) Analysis and Interpretation of Data: Ledeganck, Cornelis, Kromhout, Bhatti, Van Ham, Van der Vekens, Chiers

Category 2

- (a) Drafting the Article: Ledeganck, Cornelis
- (b) Revising Article for Intellectual Content: Bhatti, Kromhout, Van Ham, Chiers, Van der Vekens

Category 3

- (a) Final Approval of the Completed Article: Ledeganck, Kromhout, Cornelis, Chiers, Van der Vekens, Bhatti, Van Ham

Category 4

- (a) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: Ledeganck, Kromhout, Cornelis, Chiers, Van der Vekens, Bhatti, Van Ham

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

PREVIOUS PRESENTATION

This article was previously presented as a poster presentation at the annual ESVN-ECVN Conference in 2019, Wrocław, Poland.

DATA ACCESSIBILITY STATEMENT

The data that support the findings of this case report are available from the corresponding author upon reasonable request.

ORCID

Liesbet Ledeganck  <https://orcid.org/0000-0002-5236-2295>

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