CASE REPORT
Diagnosis and surgical management of a fractured atlas in a cat

Monty S Bali Dr Vet Med Diplomate ECVS (SA)
Fachtierarzt für Kleintiere,
Tierärztliche Klinik Stommeln,
Nettegade 122, 50259 Pulheim,
Germany

A 6-month-old male-castrated domestic shorthair cat was presented shortly after being bitten on the neck by a large breed dog. On presentation the cat was non-ambulatory tetraparetic with preserved deep pain perception. Plain radiographs of the neck did not show any abnormalities. Computed tomography was performed and showed a right-sided depressed fracture of the dorsal lamina of the atlas. A partial dorsal laminectomy was performed to alleviate the spinal cord compression. The cat made a full recovery within 12 weeks of surgery.

Date accepted: 25 November 2010 © 2010 ISFM and AAFP. Published by Elsevier Ltd. All rights reserved.
the resection of the dorsal lamina was started caudally with a Kerrison rongeur. After the decompression was completed, the surgical field was rinsed with lactated Ringer’s solution. The individual muscle bellies as well as the subcutaneous tissues were reapposed in a routine fashion, using polydioxanone absorbable suture material (4-0 USP Surgicryl Monofilament, SMI). The skin incision was closed with polyamide sutures (4-0 USP Trulon, Sutures India). A postoperative CT was conducted to confirm the decompression (Fig 2). During the entire anaesthesia, ventilation remained spontaneous and monitoring never suggested hypoventilation or respiratory compromise. During recovery the cat was monitored extensively, including regular SpO2 and NIBP measurements. Postoperatively the cat received buprenorphine (0.01 mg/kg IV q 8 h), potentiated amoxicillin (20 mg/kg IV q 12 h), meloxicam (0.01 mg/kg SC q 24 h, Metacam; Boehringer Ingelheim) and lactated Ringer’s solution (4 ml/kg/h IV). To prevent decubital ulcers the patient was turned over every 3–4 h. Physical therapy was initiated the day after surgery (passive movements and massage five times daily). At this point the cat was already showing the return of spontaneous micturition and slight voluntary motor function in all four limbs. It was returned to the owners 2 days later with instructions to administer meloxicam and potentiated amoxicillin (12.5 mg/kg q 24 h, Synulox; Pfizer) for another 5 days. At this point the cat had recovered enough to turn itself and demonstrated controlled micturition. The owners were instructed and advised to continue with the physical therapy (passive movements, massage and proprioceptive exercises five times daily). The cat showed a rapid improvement of neurological function, 2 weeks after the surgery, it was already able to walk, although still exhibiting a pronounced tetraparesis. At the final control 12 weeks after surgery, the cat was completely normal with no residual neurological deficits.

Vertebral fractures are common in cats. In a study of 100 consecutive feline trauma patients, spinal injuries occurred in 26% of all patients. Feline spinal injury most often results from motor vehicle trauma and high-rise syndrome, whereas bite wounds and gunshot wounds are uncommon causes. Most injuries occur at the thoracolumbar and lumbosacral junction, whereas the cervical vertebral column is only very rarely affected. In an effort to estimate the incidence of feline cervical vertebral fractures, the literature was reviewed by the author. Of a total of 515 cats with spinal injuries, only six had cervical vertebral fractures. The axis (C2) was affected in three animals and the fifth cervical vertebrae (C5) in another. Two more feline cervical fractures were not further localised. This stands in contrast to canine studies, which describe an involvement of the cervical vertebral column in 7–20% of cases. Possible explanations for this disparity between species could be differences in aetiology and body size. Anatomical differences might further contribute, but comparative experimental biomechanical studies are lacking.

It was not unexpected that the radiographs of the cervical vertebral column were inconspicuous. In a recent study, that evaluated radiographic sensitivity and negative predictive value for acute canine spinal trauma, radiography only had a moderate sensitivity for vertebral fractures (72%) and subluxations (77.5%). Low negative predictive values were found for the presence of vertebral canal narrowing (58%) and fracture fragments within the vertebral canal (51%). It was concluded that radiography cannot be used to reliably rule out acute vertebral lesions, and further imaging is indicated in patients with a high risk of such injuries.

Hypoventilation is a serious potential complication in any animal with a severe cervical spinal cord injury. Three main mechanisms have been proposed. The resulting cervical myelopathy may be extensive enough to interrupt conduction along all motor fibres of the spinal cord, resulting in near-paralysis of the respiratory muscles. Haemorrhage and oedema may secondarily affect the respiratory centres of the medulla and C1 spinal cord, leading in turn to a decreased respiratory drive. Lesions involving the C5 spinal cord segment

Fig 1. Preoperative transverse computed tomographic image of the atlas, depicting the impression fracture (white arrow).

Fig 2. Postoperative transverse computed tomographic image of the atlas, after the partial laminectomy (white arrow).
or the corresponding nerve roots, may result in dia-
phragmatic paralysis due to phrenic lower motor neu-
ron damage. In our case, ventilation remained
spontaneous during the entire anaesthesia and moni-
toring never suggested hypoventilation or respiratory
compromise. The location of the lesion was too far cra-
nially for a direct phrenic nerve injury to occur, but the
first two mechanisms might have resulted in hypoventi-
lation. Most probably the spinal cord injury was not
severe enough, otherwise hypoventilation might have
required mechanical ventilatory support.

References
1. Zulauf D, Kaser-Hotz B, Hässig M, Voss K, Montavon
PM. Radiographic examination and outcome in consecu-
tive feline trauma patients. Vet Comp Orthop Traumatol
2. Bali MS, Lang J, Jaggy A, Spreng D, Doerr MG, Forterre F.
Comparative study of vertebral fractures and luxations in
3. Besalti O, Ozak A, Tong S. Management of spinal trauma
4. Sommer K. Fractures, luxations and fracture/luxations
of the vertebral column in dogs and cats. Munich,
5. Carberry CA, Flanders AJ, Dietze AE, Gilmore DR,
Trotter EJ. Nonsurgical management of thoracic and
lumbar spinal fractures and fracture/luxations in the
dog and cat: a review of 17 cases. J Am Anim Hosp Assoc
6. Chai O, Johnston DE, Shamir MH. Bite wounds involv-
ing the spine: characteristics, therapy and outcome in
7. Feeley DA, Oliver JE. Blunt spinal trauma in the dog
and cat: insights into radiographic lesions. J Am Anim
8. Grasmueck S, Steffen F. Survival rates and outcomes in
cats with thoracic and lumbar spinal cord injuries due
9. McKee WM. Spinal trauma in dogs and cats: a review of
10. Richter K, Lorenzana R, Ettinger SJ. Traumatic displace-
ment of the dens in a cat: case report. J Am Anim Hosp
11. Selcer RR, Bubb WJ, Walker TL. Management of verteb-
ral column fractures in dogs and cats: 211 cases
and negative predictive value for acute canine spinal
animal spinal disorders: diagnosis and surgery. 2nd