MEDICAL MANAGEMENT OF MULTIPLE TRAUMATIC VERTEBRAL SUBLUXATIONS AND FRACTURES IN A RABBIT (*ORYCTOLAGUS CUNICULUS*)

Aliya Wilson McCullough, MS, DVM, David Sanchez-Migallon Guzman, LV, MS, Dip. ECZM (Avian), Dip. ACZM, Dominique Keller, PhD, DVM, Michelle Ellison, VMD, Sophie Petersen, DVM, PhD, Dip. ACVIM (Neurology), and Kurt Sladky, MS, DVM, Dip. ACZM

Abstract

A 2-year-old castrated male Holland lop rabbit (*Oryctolagus cuniculus*) was presented for loss of hind limb motor function after leaping from the owner's arms. Results of a neurologic examination revealed appropriate mentation, normal thoracic limb posture and gait, paralysis in the right pelvic limb, and voluntary movement of the left pelvic limb. Superficial pain perception and withdrawal reflexes were present bilaterally in the hind limbs. Bilateral proprioception was evident in the forelimbs but absent in the hind limbs. Standard radiographs and a myelogram were performed, revealing subluxations at T5-T6, L1-L2, and L3-L4, a comminuted fracture of the T9 vertebral body, fractures of the right articular facets of L3-L4, and spinal cord swelling at T9. The clinical signs continued to decline, resulting in paraplegia with loss of deep pain perception in the left hind limb after the myelogram procedure. The owners of the rabbit were given a guarded-to-poor prognosis for the animal to regain mobility in the hind limbs. The rabbit was hospitalized and medical treatment including pain management, intravenous fluid therapy, nutritional support, and cage rest was initiated. After the initial decline of the clinical signs, the neurologic deficits stabilized during hospitalization. At the time of discharge, partial voluntary movement had been regained in the right hind limb, but there was no movement or pain perception in the left hind limb. This gradually resolved over 3 months of conservative therapy, at which point the rabbit had recovered the voluntary movement in both hind limbs and was able to ambulate by walking and hopping. This case report documents acute spinal cord trauma in a rabbit, as well as recovery of the neurologic deficits after prolonged medical management. Copyright 2012 Elsevier Inc. All rights reserved.

Key words: medical management; *Oryctolagus cuniculus*; rabbit; recovery; spinal cord trauma; vertebral fracture

A 2-year-old, 1.65-kg, castrated, male domestic rabbit (*Oryctolagus cuniculus*) was presented 30 minutes after jumping from the owner's arms approximately 3 feet from the ground. The owner reported that the rabbit landed awkwardly and within 20 minutes was nonambulatory in its hind limbs. A physical examination of the rabbit found the patient bright and responsive and in good body condition (5 out of 9). The rabbit's respiratory effort was increased but with normal respiratory sounds. Abdominal palpation was within normal limits. The rabbit's rear legs were nonambulatory and scoliosis was observed at the level of the caudal thoracic spine.

From the School of Veterinary Medicine, University of Wisconsin, Madison, WI USA.

[1]Current affiliation: Companion Exotic Animal Medicine and Surgery, Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California Davis, Davis, CA USA

[2]Current affiliation: Cascade Veterinary Referral Center, Tigard, OR USA

Address correspondence to: David Sanchez-Migallon Guzman, LV, MS, Dip. ECZM (Avian), Dip. ACZM, Department of Medicine, Epidemiology, School of Veterinary Medicine, University of California, Davis, One Shields Avenue, 2108 Tupper Hall, Davis, CA 95616. E-mail: guzman@ucdavis.edu.

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Results of a neurologic examination found normal mentation with a concurrent bright and alert attitude. Normal thoracic limb posture and gait, paralysis in the right pelvic limb, and voluntary movement of the left pelvic limb were observed. Palpation of hind limb and lumbar musculature was not performed to avoid causing further trauma. Cranial nerve function was normal. There was intact bilateral proprioception of the forelimbs; however, it was absent in the hind limbs. Patellar and withdraw reflexes were present in both rear legs. Superficial pain was present bilaterally in the hind limbs. The neuroanatomic localization of injury was between T3 and L3 and was suspected to be a traumatic vertebral fracture. Additional, but less likely, differential diagnoses included vertebral luxation, intervertebral disk protrusion, or pathologic vertebral fracture.

The results of a complete blood count revealed a normal white blood cell count with mildly decreased segmented leukocytes (1430 cells/μL, reference range: 1750-6600 cells/μL).[1] The results of a serum biochemical profile included a mildly elevated alkaline phosphatase (39 U/L, reference range: 4-16 U/L) and a mildly elevated total protein (7.7 g/dL, reference range: 5.4-7.5 g/dL), but no other significant abnormalities were noted.[1]

Standard radiographs and a myelogram were performed with the rabbit under general anesthesia to evaluate the cause of spinal ataxia and extent of possible trauma to the patient. The rabbit was premedicated with midazolam (0.5 mg/kg, intramuscularly, Versed; Roche Laboratories, Nutley, NJ USA) and butorphanol (0.4 mg/kg, intramuscularly, Torbugesic; Fort Dodge Animal Health, New York, NY USA). The rabbit was induced and maintained by mask on isoflurane gas anesthesia (2%-3%) and oxygen (1.5 L/min) throughout the procedure. The myelogram was performed by administering iohexol (300 mg iodine/mL; 1.0 mL, via an L5-L6 lumbar puncture with a 22-gauge spinal needle). No abnormalities in the hind limb or epaxial musculature were noted. Subluxations were identified at the T5-T6 and L3-L4 intervertebral disk (IVD) spaces (Figs 1 and 2). Small mineral opacities, most likely fracture fragments from the L3-L4 right articular facets, were observed adjacent to the IVD space. L1-L2 IVD protrusion was suspected because of narrowing of the right lateral portion of the disk space and mild dorsal deviation of the ventral contrast column (Fig 2). A comminuted fracture of the body of T9 and resulting cranial displacement of the left 9th rib were identified (Fig 1). These fractures and luxations resulted in malalignment of the thoracolumbar spine. Cranial to T9 the ventral contrast column was the widest and caudal to T9 the dorsal contrast column was the widest (Figs 1 and 2). The ventral contrast column caudal to T9 was thin to absent (Fig 1). The clinical significance of the asymmetry of contrast medium distribution was unknown. Additional manipulation, such as rolling of the patient in an effort to evenly distribute the contrast medium within the subarachnoid space, was not attempted because of lack of spinal column stability. The rabbit recovered uneventfully from anesthesia.

The rabbit was diagnosed with spinal cord injury due to traumatic vertebral fracture and subluxation. Prognosis in this case of severe trauma of the spinal cord was guarded to poor. Based on the neurologic and radiographic findings, there was concern that the rabbit might not regain mobility and euthanasia was discussed with the owners because of the likelihood of secondary complications. The rabbit was admitted to the hospital for 4 days of medical treatment. The rabbit was cage rested in an approximately 30 $\times$ 61 cm hospital cage (Fig 3). Normal saline solution fluid therapy (90 mL/kg/24 h intravenous), meloxicam (0.5 mg/kg subcutaneous, every 24 hours, Metacam; Boehringer Ingelheim, St. Joseph, MO USA), and 1 injection of oxymorphone (0.1 mg/kg intramuscular, Opana; Endo Pharmaceuticals, Inc., Newark, NJ USA) were administered to the patient during hospitalization. A urinary catheter was placed to prevent urine retention. Although manual expression of the urinary bladder in a male rabbit was an option, it was not performed in an effort to minimize patient manipulation. An Elizabethan collar was not applied in order to avoid additional anxiety for the patient, and the animal remained calm while hospitalized. Urinary and fecal production was monitored daily.

Throughout the hospital stay the rabbit voluntarily ate small amounts of timothy hay and timothy-based rabbit pellets, and produced urine normally. During this period the rabbit was also syringe-fed a critical care diet (15-25 mL by mouth every 8 hours, Critical Care for Herbivores; Oxbow Animal Health, Murdock, NE USA). The rabbit's vital signs were within normal limits and the treatment plan remained the same throughout its hospitalization.[2] No fecal pellets were observed on the first day of hospitalization, and the patient began to exhibit bruxism during the second day of hospitalization. The rabbit chewed out the urinary