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Tetraplegia Due to Fracture of the Articular Facet of the Fourth Cervical Vertebra in A Llama (*Lama glama*)

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Abstract: An 8 year old intact male llama, used for exhibition in a zoo, was presented with 24 hours history of progressive weakness and recumbency. During neurological examination, the llama appeared to have tetraplegia due to a spinal cord lesion in the segment starting from the first to the fifth cervical vertebrae. Radiographic examination of the cervical spine revealed fracture of the articular facet of the fourth cervical vertebra. The fracture was likely occurred during the administration of an anthelmintic medication where the llama must have had struggled against restraint. The llama did not respond to treatment and was humanely euthanized. To the best of the author's knowledge, this is the first report of cervical vertebral fracture causing spinal cord damage and tetraplegia in South American camelids. Care should be taken during handling llamas and rough manipulation should be avoided.

Key words: Llama · Lama Glama · Tetraplegia · Fracture · Recumbency

INTRODUCTION

Similar to other ruminants, diseases of the nervous system in South American camelids are classified to congenital, infectious and non-infectious diseases. Congenital diseases include hydrocephalus, meningocele or myelomeningocele, spina bifida, hemivertebrae and agenesis of the spine and spinal cord. Infectious diseases include rabies, tetanus, borna, tick paralysis, toxoplasmosis, sarcocystosis and meningeal worm. Non-infectious diseases of the nervous system includes spinal cord neuronal degeneration, polioencephalomalacia, neoplasia and trauma [1].

MATERIALS AND METHODS

Case History: An 8 year old intact male llama (Lama glama) was presented with 24 hours history of progressive weakness and recumbency. The llama was bought 4 years before presentation and has been healthy with no major illness till presentation. The llama belonged to a zoo and was used for exhibition. The llama was kept in a small paddock with another pregnant female llama that gave birth 2 months before presentation. The paddock is 20 meter long by 10 meter wide with a chain link fence. The llama was dewormed regularly and fed oats, bran and sometimes alfalfa hay. Few days before presentation, the llama was handled and restrained to be given an anthelmintic drug; netobimin (albendazole).

Physical Examination: On presentation, the llama was recumbent, but bright alert and responsive. The llama was mildly dehydrated. Examination of the cranial nerves revealed no abnormal findings and the llama appeared to have normal mentation. Examination of the four limbs revealed normal reflexes and muscular tone. However, the llama was unable to bear weight on all four limbs. The llama had normal anal and tail tone. The llama was passing urine and feces. During to the neurological examination, it appeared that the llama has a spinal cord

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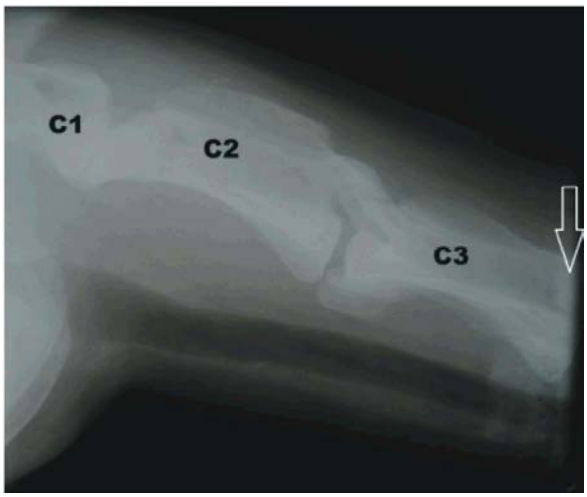

Fig. 1: Lateral radiograph of the first 3 cervical vertebrae in a llama affected by fracture of the articular facet of the fourth cervical vertebra. Note the radiopaque bone fragment on the caudal area of the spinal canal of C3 (arrow).

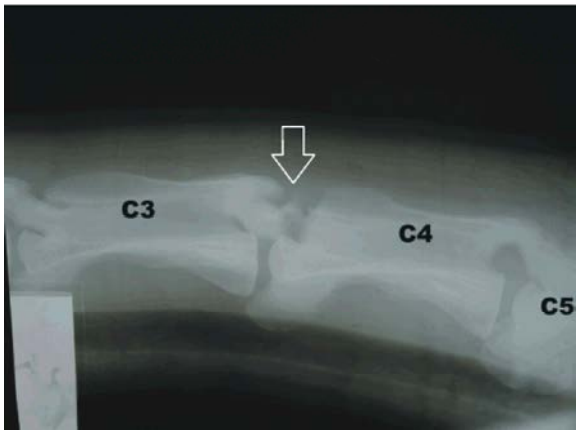

Fig. 2: Lateral radiograph of the neck, flexed position, in a llama affected by fracture of the articular facet of the fourth cervical vertebra. Note the large bone fragment and fracture of C4 (arrow).

lesion in the segment starting from the first to the fifth cervical vertebrae. When the llama was held up it had an abnormal head and neck position. Closer examination of the neck revealed painful swelling and edema. Crepitation sound was heard when the neck was manipulated.

Hematology Analysis: Significant findings on complete blood count (CBC) included neutrophilia (segmented neutrophils:18.0x 103/µL, reference range:4.7-14.8 x 103/µL), slight monocytosis (monocytes:1050/µL, reference range: 0-1009/µL), hemoconcentration

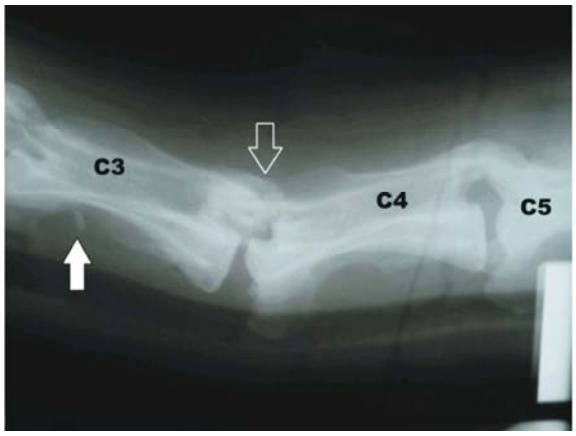

Fig. 3: Lateral radiograph of the neck, extended position, in a llama affected by fracture of the articular facet of the fourth cervical vertebra. Note the fracture of C4 (empty arrow) and the small bone chip underneath C3 (solid arrow).

(packed cell volume (PCV): 49%, reference range: 27-45%). These changes were attributed to dehydration and the inflammatory process in the neck area surrounding the fracture.

Radiographic Examination: Radiographic examination of the cervical spine was done in a flexed and extended neck position. Fracture of the articular facet of the fourth cervical vertebra was seen both positions (Figure 1-3). In addition there was a bone fragment below the third cervical vertebrae (Figure 3).

Case Management: A 14-gauge intravenous catheter was placed in the left jugular vein. The llama received 4 L of normal saline intravenously, 10 ml of procaine benzylpenicillin (300,000 IU) intramuscular and 10 mg dexamethasone sodium phosphate intravenously, 16.5 mg flunixin meglumine intravenously, daily for 3 days. The llama was put on a sling twice daily for three days. The owner was informed about the poor prognosis of the condition. The llama did not improve over the hospitalization days and was humanely euthanized. The owner declined the request of doing post mortem examination.

DISCUSSIOIN

To the best of the author's knowledge, this is the first report of cervical vertebral fracture causing spinal cord damage and tetraplegia in South American camelids. Trauma of the spinal cord following cervical vertebral

fracture in llama is not documented in the veterinary literature. Knowledge about the clinical signs, diagnosis and treatment has been extrapolated from other animal species.

Llamas have highly mobile neck that is covered by a skin that is up to 1cm thick [2]. The vertebral column of the neck consists of 7 elongated cervical vertebrae. In the ventral aspect of the neck, there are ventral projections of the cranial segments of the transvers process in the caudal 5 vertebrae (C3 to C7). This projection forms a U-shaped bony channel that protects vital structures of the neck. The first 6 vertebrae are easily identified using radiography [2]. However, the seventh cervical vertebra is situated deep in the neck and difficult to be visualized radiographically. The length of the cervical vertebrae varies and approximately they have the following measurements: C1, 5.5cm; C2,11cm; C3, 10cm; C4, 9cm; C5, 9cm; C6, 8cm; C7,5 cm. 2 Radiographic examination of the neck in adult llamas can be done by taking lateral and dorso-ventral views. The suggested MAS and KVP that should be used for the lateral view are 200 and 80, respectively, while for the dorso-ventral view, 100, 66, respectively [2].

Cervical vertebral fracture in this case was likely caused during the administration of the anthelmintic. The llama must have had struggled against the restraint and this is not unusual in that particular setting. However, the clinical signs did not appear until few days after that incident. Perhaps the condition was not clinically noticeable at the beginning because the edema and inflammatory process was not enough to lead to spinal cord compression. In addition, the fractured peace of bone was not close to the spinal cord and could have migrated close to it just before the start of the clinical signs. Another possibility is that the llama was showing clinical signs just after the incident and those signs were overlooked by the workers.

Cervical vertebral fractures occurs in other domestic species such as horses and cattle with variable treatment options and outcome[3,4]. In general it is hard condition to treat and manage in large animals. The treatment that was considered in this case was conservative in nature and included analgesic, anti-inflammatory, antibiotics medications and fluid therapy. In addition, slinging was done although llamas do not tolerate slinging well [2]. The cervical vertebrae of llamas and South American camelids in general, lack a flat surface where plates can be place during surgical intervention [2]. In case that the affected llama is still ambulating, its movement should be restricted [2].

Cervical vertebral fractures are detrimental to llamas and treatment is usually not difficult even if attempted. Handling llamas should be carefully done and rough manipulation should be avoided.

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