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Case report

VENTRAL SLOT SURGERY FOR MANAGEMENT OF GANGLIONEUROMA AND IVDD IN A CAT

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A Shorthair castrated 8-year-old tomcat was brought to a veterinary hospital for slowly progressive onset of tetraplegia developing within last 14 days. The clinical and blood examinations at admission showed no abnormalities, the neurological examination showed severe cervical pain and tetraplegia with lower motor neuron deficits on thoracic limbs and normal withdrawal with increased patellar reflexes on pelvic limbs. Deep pain perception was present on all four limbs. The neuroanatomic localisation was C6-T2 lesion. Magnetic resonance imaging of the cervical spine demonstrated severe spondylosis deformans, degeneration of multiple IVD, and ventral extradural right sided spinal cord compression at the level C7-T1. Mildly hyperintense on T2-weighted and STIR, mildly hypointense on T1-weighted pre-contrast, and homogeneously contrast-enhancing mass on T1-weighted post-contrast images was observed at this area.

This article describes an interesting case of a tumor in a cat localised in the cervicothoracic spinal segment extradurally compressing the spinal cord and causing severe neurological dysfunction. These clinical symptoms were successfully treated through a ventral slot surgery, the tumor was well circumscribed and comfortably removable through this approach. This rare tumor is considered benign and prognosis is favourable after surgical removal due to its non-invasive growth pattern. After surgery, the cat was observed continuously for a few months and the recovery was sufficient with no recurrence of neurological symptoms by now. This case is worth attention mainly because, despite the serious clinical presentation, it has a good long term prognosis and does not require a complex surgical approach.

Keywords: cervical discs, outcome, small animals, spinal surgery, tumor

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INTRODUCTION

Tumors of peripheral neurons can be classified into ganglioneuromas, ganglioneuroblastomas, and neuroblastomas. Ganglioneuroma is a rare benign neoplasm of the peripheral nervous system that is composed of mature ganglion cells and abundant axons accompanying a various number of Schwann cells. The origin of this tumor remains unclear, but it is suspected to be derived from neuroblasts. They most frequently develop around the adrenal glands, retroperitoneum, posterior mediastinum, or presacral space, but have been reported along the entire neuroaxis. In people, ganglioneuromas most commonly arise at the mediastinum, retroperitoneum and pelvis, where sympathetic ganglia are located. In domestic animals, ganglioneuroma is classified as a tumor of the peripheral nervous system and is composed of both neuronal and peripheral glial cells [1,2]. This tumor is rare but it has been reported in dogs, pigs, horses, cattle, and birds [3-13]. Common sites of origin include the intestine [5-8,12], skin [9], spinal cord [3], urinary bladder [14] and brachial plexus [11]. In cats, one case of intestinal ganglioneuroma [15] and a malignant cardiac ganglioneuroma with systemic metastasis [1] has been reported. Because ganglioneuromas are considered mostly benign, asymptomatic lesions are typically observed. Symptoms can develop from mass effect or secretion of vasoactive peptides, which can be similarly observed in patients with pheochromocytomas and paragangliomas. Resection is indicated with the development of neurological or endocrinological symptoms or evidence of growth on imaging [2,11].

The described case brings new information that can be used in clinical veterinary practice. Most causes of neurological dysfunctions in cats are associated with vascular disorders, intervertebral disc disease, and feline infectious diseases. Tumors are typical in the older population of cats, in our case the cat was not geriatric and we considered neoplasia at the bottom of our list of differential diagnoses. Differential diagnoses for this case were vascular, traumatic, degenerative, inflammatory and neoplastic diseases affecting the caudal cervical segments.

In our opinion, ganglioneuromas might not be as rare as literature sources indicate. The reason could be the fact that historically, there has been a greater focus on dogs in veterinary medicine likely due to their long-standing role as companions and working animals. However, the growing popularity of cats as pets led to an increase in research and articles related to cats in recent years. This probably might lead to an increase in the number of affected cats with this rare type of tumor. The second reason for the rare finding of feline ganglioneuroma in veterinary literature can be the fact that these cats are either not further diagnosed when showing serious symptoms, or these tumors are misdiagnosed as other types of tumors. The occurrence of ganglioneuroma in humans is linked to young age, and therefore it is necessary to think about some selected oncological diseases in cats of a lower age.

CASE PRESENTATION

An 8-year-old Shorthair castrated tomcat weighing 4.5 kg was presented to the clinic with slowly worsening signs of tetraplegia developing within the last 14 days. According to the owner, the cat is eating normally, urination and defecation are also normal. The cat is regularly vaccinated and dewormed, it is an indoor cat, owners did not notice any kind of traumatic event. The first clinical signs appeared 14 days before admission to our clinic as an unwillingness to jump onto furniture, then the cat started to be weaker, slower and finally completely paralysed the day before admission.

Clinical examination

The clinical examination at admission showed no abnormalities in the general health status. At admission, the cat was bright, alert and responsive with normothermia and normopnoea. The neurological examination showed tetraplegia with severe cervical pain. There were lower motor neuron deficits on thoracic limbs (no withdrawal reflex, weak muscle tone), and upper motor neuron lesion with normal withdrawal and increased patellar reflexes on pelvic limbs. The deep pain perception was present on all four limbs. The neuroanatomic localisation was C6-T2. The results of blood examinations (haematology, serum biochemistry) and urinalysis were all within normal limits, as well as the snap tests for feline infectious diseases, which were negative.

Informed consent has been obtained for client-owned animals included in this study.

No ethical approval was obtained because this study did not involve laboratory animals.

Diagnosis and Differential diagnosis

The diagnosis of tetraplegia and cervical pain was assigned to the C6-T2 myelopathy and further imaging diagnostics were performed. Differential diagnoses were vascular, traumatic, degenerative, inflammatory and neoplastic diseases affecting the caudal cervical segments.

Magnetic resonance imaging of the cervical spine demonstrated severe spondylosis deformans, degeneration of multiple IVD, and ventral extradural right sided spinal cord compression at the level of C7-T1. Mild hyperintense signal on T2-weighted and STIR, mild hypointense signal on T1-weighted pre-contrast, and homogeneously contrast-enhancing mass on T1 – weighted post-contrast images was observed at this area.

Treatment

Due to severe compression due to an IVDD, a standard ventral slot surgery was performed at C7-T1 level to remove the compressing material and to decompress the spinal cord. During surgery, a gelatinous mass with fat-like appearance was removed from the spinal canal together with the disc material.

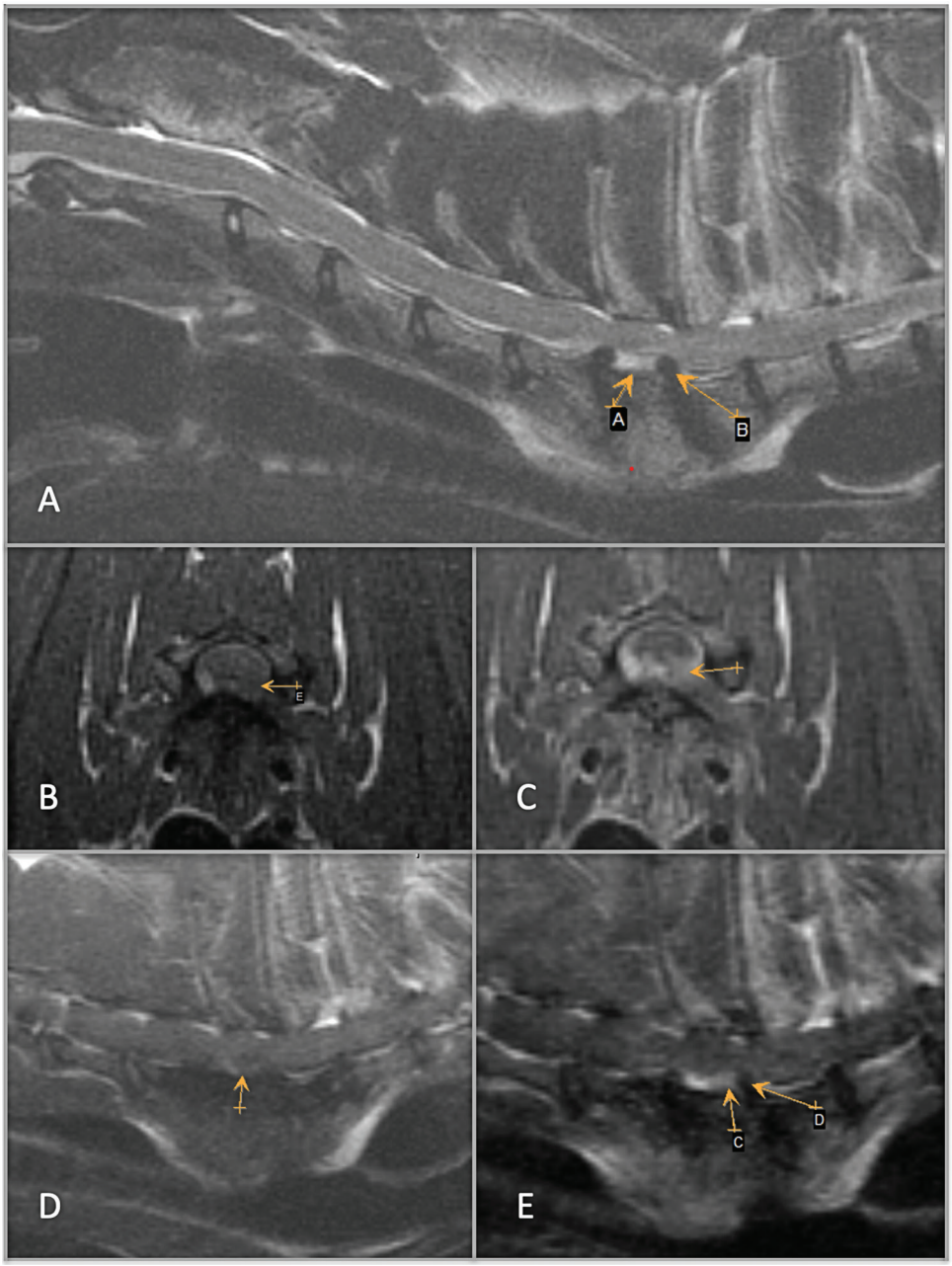

Figure 1. MRI findings (3.0 mm, 1.5 Tesla Siemens) of ganglioneuroma at C7-T1 level in a 8-year-old Shorthair castrated tomcat with progressive tetraplegia.
T2-weighted sagittal **(A)** - (arrows- A- mass, B- herniated disk material), transverse pre- **(B)** and post-contrast **(C)**, T1-weighted sagittal pre- **(D)** and post-contrast **(E)** images at C7-T1 demonstrate a smoothly emarginated, homogenously contrast-enhancing mass displacing the spinal cord dorsally and to the right side.
Arrows in images B, C, D – mass, E – c- mass, D- herniated disk material.

Postoperative care consisted of nonsteroidal anti-inflammatory drugs, antibiotics and cage rest. The neurological status showed improvement after surgery, by 14 days the cat was non-ambulatory tetraparetic, it could stand alone and walk with support with improvement of muscle tone and reflexes on thoracic limbs. One month after surgery the neurological status improved, the cat was only slightly ataxic at repeated neurological examination and there are no signs of recurrence of neurological deficits 6 months after surgery.

RESULTS

Histological findings

The results of histological examination of the removed mass described separately located cells of various sizes; mostly polygonal in shape, with small eccentric rounded nuclei, in which one large nucleolus is determined. The cell cytoplasm was abundant, lightly eosinophilic and heterogeneous. These cells were located among the fields of spindle-shaped glial cells that formed the stromal component determined the diagnosis of ganglioneuroma, which is a benign tumor that develops from the nerve fibres of peripheral and central nervous system.

DISCUSSION

Ganglioneuromas are rare, benign tumors resulting from the sympathetic nervous tissue. Because of their slow type of growth, they can be managed with surgical intervention and surgery is the only treatment in all cases around the world. There are two types of surgical interventions. Gross-total resection remains the choice where the whole mass is removed, and subtotal resection is performed when important neurovascular structures must be preserved. In this paper, we present one case that was managed with ventral slot surgery and the whole mass was removed with a good outcome after surgery.

In conclusion, although ganglioneuromas and other neuroblastic tumors have been reported in various organs of dogs and cats, to our knowledge, the present case is a rare report of a ganglioneuroma found accidentally when suspecting an IVDD in a tetraplegic cat with cervical pain. We believe that the findings of the present case may aid in the diagnosis of similar cases of neurological dysfunction in cats in the future.

At the time of publishing this paper, the cat is almost 6 months after surgery with no neurological dysfunction reported till yet. It is to be mentioned, that thorough diagnostic approach including sophisticated imaging is essential to prevent hasty conclusions in severely affected neurological cases.

Authors' contributions

BB, NK, and SP did the diagnostics and therapeutic procedures. OM, OCh, and BB did the postoperative management. MK, TL, OM, and BB prepared the manuscript. All co-authors made the critical revisions of all versions of the manuscript and the final approval.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Statement of Informed Consent

The owner understood procedure and agrees that results related to investigation or treatment of their companion animals, could be published in Scientific Journal Acta Veterinaria-Beograd.

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OPERACIJA PREKO VENTRALNOG PROREZA U CILJU HIRURŠKOG TRETMANA GANGLIONEUROMA I IVDD KOD MAČKE

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Kratkodlaki kastrirani osmogodišnji mačor doveden je u veterinarsku stanicu zbog sporog progresivnog početka tetraplegije koja se razvijala u poslednjih 14 dana. Klinički i hematološki pregledi pri prijemu nisu pokazali abnormalnosti, neurološki pregled je pokazao jak bol u cervikalnom delu kičme i tetraplegiju sa deficitom donjih motornih neurona na torakalnim udovima i normalnim refleksom povlačenja sa pojačanim patelarnim refleksima na karličnim udovima. Duboka percepcija bola bila je prisutna na sva četiri ekstremiteta. Neuroanatomska lokalizacija bila je lezija na nivou C6-T2. Magnetna rezonanca vratne kičme je pokazala tešku deformaciju usked spondiloze, degeneraciju više IVD i ventralnu ekstraduralnu desnu kompresiju kičmene moždine na nivou C7-T1. Blago hiperintenzivna slika na T2 i STIR snimcima, kao i blago hipointenzivna na T1 pre-kontrasta i homogena masa koja pojačava kontrast na T1 post-kontrastnim slikama uočene su u ovoj oblasti.

Ovaj članak opisuje zanimljiv slučaj tumora kod mačke lokalizovanog u cervikotorakalnom segmentu kičmenog stuba koji ekstraduralno komprimira kičmenu moždinu i izaziva tešku neurološki disfunkciju. Ovi klinički simptomi su uspešno lečeni putem operacije preko ventralnog proreza, tumor je bio dobro ograničen i jednostavno uklonjen ovim pristupom. Ovaj retki tumor se smatra benignim i prognoza je povoljna nakon hirurškog uklanjanja zbog njegovog neinvazivnog obrasca rasta. Nakon operacije, mačka je kontinuirano posmatrana nekoliko meseci i oporavak je bio zadovoljavajući i bez ponovnog pojavljivanja neuroloških simptoma. Ovaj slučaj je vredan pažnje pre svega zbog toga što, uprkos ozbiljnoj kliničkoj slici, ima dobru dugoročnu prognozu i ne zahteva složen hirurški pristup.