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Intramedullary spinal cord meningioma in a Boxer: a case report

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ABSTRACT: Meningiomas are the most common primary tumours of the canine central nervous system. The incidence of these tumours increases with age and they are more frequently encountered in dogs older than seven years. Meningiomas are solitary, well-defined neoplasias that more commonly grow via compression and less commonly by infiltrating the nervous tissue. Meningiomas exhibit 82% intracranial, 15% intraspinal and 3% retrobulbar location. Meningiomas of the spinal cord are mostly benign in character with intradural-extramedullary location in the cervical segments. The case reported here consisted of a 10-year old male Boxer presenting with a complaint of inability to use its left foreleg. In the neurological examination, upper motor neuron findings were recorded and direct radiography, myelography and magnetic resonance imaging (MRI) of the cervical region were performed. Interpretation of the transversal, coronal and sagittal cross-section magnetic resonance images taken of T1-weighted, T2-weighted and T1-weighted with contrast sequences, revealed a well-defined intramedullary mass at the level of the C5–C6 vertebra. Histopathological examination of the neoplastic mass revealed it to be a transitional (mixed) meningioma which had infiltrated into the spinal cord.

Keywords: meningioma; cervical region; spinal tumour; dog

Meningiomas are among the most common primary tumours of the central nervous system in dogs (Koestner et al. 1999; Summers et al. 1995; Bosschere et al. 2003). They are solitary, well-defined, thin-capsuled, reasonably hard, white-coloured neoplasia originating from the dura mater, pia mater and frequently the arachnoid villus cells of the meninges (Yeomans 2000). Subdurally, they grow slowly and lead to clinical symptoms caused by compression on the spine. Very rarely, they show metastasis and invasion of the nervous tissue. Different neurological findings occur depending on the location, compression upon nervous tissue, destruction, oedema and bleeding (Asano et al. 2005). Histologically, meningiomas are classified as meningothelial, fibroblastic, transitional, psammomatous, angioblastic, papillary, granular cell, myxoid and anaplastic meningiomas (Bosschere et al. 2003; Montoliu et al. 2006).

The objective of this report is to describe a case of meningioma located in a rare intramedullary position in the cervical region.

Case description

The case consisted of a 10-year old male Boxer presented to the Istanbul University, Veterinary Faculty, Surgery Clinics. The lameness had begun in the left foreleg a month previously and the dog had not been able to use its leg for the preceding week. In the clinical and neurological examination, paresis in the left foreleg, pain on neck flexion and

Table 1. Reflex examination findings

Reflex	Right	Left
Proprioception	+	–
Extensor carpi radialis	+2	+1
Triceps	+2	+1
Biceps	+2	+1
Forelimb flexor reflex	+	–
Patellar	+3	+3
Cranial tibial	+2	+3
Gastrocnemius	+2	+3
Hindlimb flexor reflex	+	+

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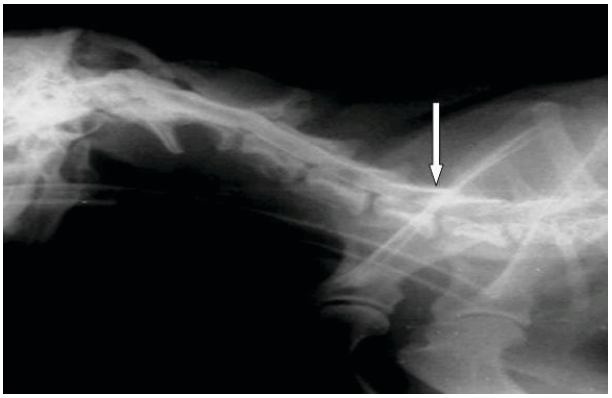

Figure 1. Subtotal blockage at the level of C6 in myelography

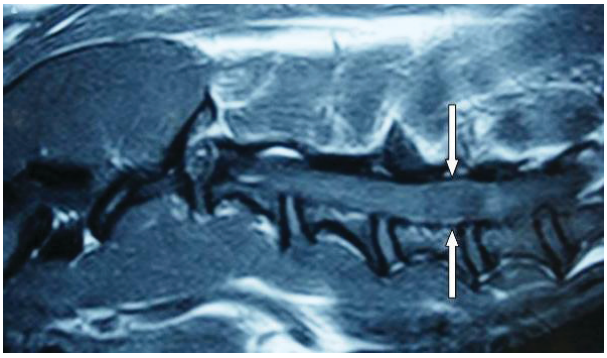

Figure 2. Mass lesion measuring 21× 12 mm with hypointense appearance in T1-weighted sequences

weakness in the left hindleg were identified. While right foreleg deep tendon reflexes were normal and left hindleg deep tendon reflexes showed an increase, there was a decrease in the left foreleg reflexes (Table 1).

Direct radiography, myelography and magnetic resonance imaging of the cervical region were performed. Myelography revealed a sub-total blockage in the level of C6 (Figure 1). In magnetic resonance images, a mass lesion at the level of the C5–C6 vertebral body with an intramedullary location within the spinal cord was observed. The mass measured approximately 21×12 mm at its widest point, with a hypointense appearance (Figure 2) in T1-weighted sequences and a medium heterogeneous, hyperintense appearance in the T2-weighted sequences. In the proximal cross-section of the mass, a syringohydromyelic dilatation appearance (Figure 3) in the lineal form continuing up to the level of the C2 body was seen. In the post-contrast investigation, a mass lesion showing contrast uptake in a heterogeneous form was identified (Figure 4). Euthanasia was performed due to the intramedullary location of the tumour. In the morphological investigation of the area, an opaque, excessive, friable, thickening approximately 1.5 cm in length and 0.5 cm in width, with a grey-white cross-section surface was noted within the spinal cord (Figures 5 and 6). Samples taken from the tumorous tissue were cut down to appropriate dimensions and fixed in 10% formal saline solution for two days. These samples were then subjected to routine tissue follow-up procedures and embedded in paraffin. The tissue blocks produced were sectioned at 4–5 µ thickness using a rotary microtome, stained with haematoxylin and eosin and examined under a light microscope. Microscopically, the neoplastic tissue was of solid structure, had no capsule and was formed of neoplastic cells, similar to meningothelial cells exhibiting a medium level of pleomorphism, and were spindle-shaped, with narrow cytoplasm and a clear nucleus, creating spiral focal points and with

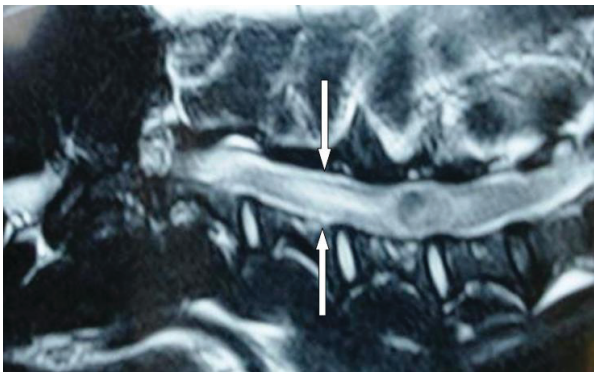

Figure 3. Appearance of syringohydromyelic dilatation in the lineal form, reaching the level of the C2 body in T2-weighted sequences

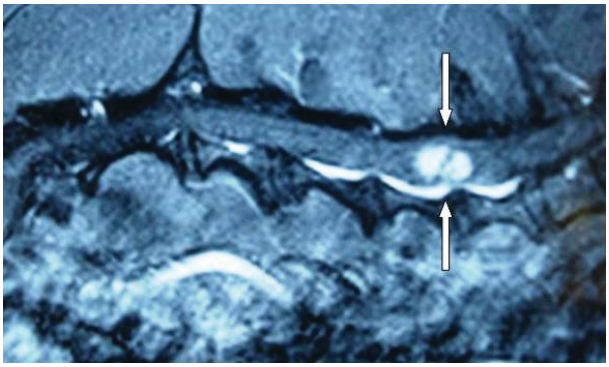

Figure 4. Mass lesion showing heterogeneous uptake in post-contrast examination

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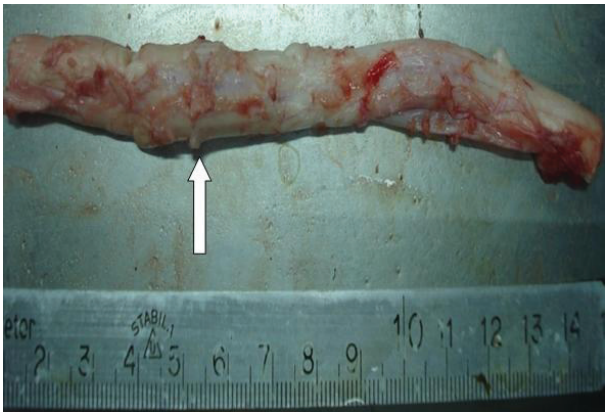

Figure 5. Thickening in the tumorous region in the spinal cord

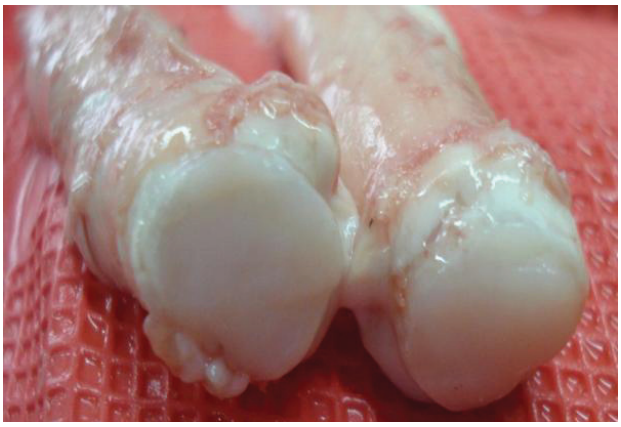

Figure 6. Cross-section surface of the tumorous region

capillary vessel structure in the centre of some cells. These neoplastic cells were seen to develop from the fibrous connective tissue strands between them. In different areas, occasional mitosis and intermittent hyperchromatic cells were observed (Figure 7). In conclusion, it was determined that the tumorous lesion had invaded the parenchyma of the spinal cord by originating from the meninges and that it was a transitional (mixed cell) meningioma occasionally forming islets within the parenchyma, some of which were wide while most were solid focal points (Figure 8).

DISCUSSION AND CONCLUSIONS

Spinal meningiomas are usually seen in dogs older than seven years of age (Bosschere et al. 2003; Petersen et al. 2008) and mostly in Boxers (Petersen et al. 2008). The fact that the dog in this case was a 10-year old Boxer is consistent with the age and breed predisposition reported in the literature.

It has been reported that with advanced imaging techniques such as magnetic resonance imaging (MRI), definitive diagnosis of tumours can be achieved and exact location of the tumour can be

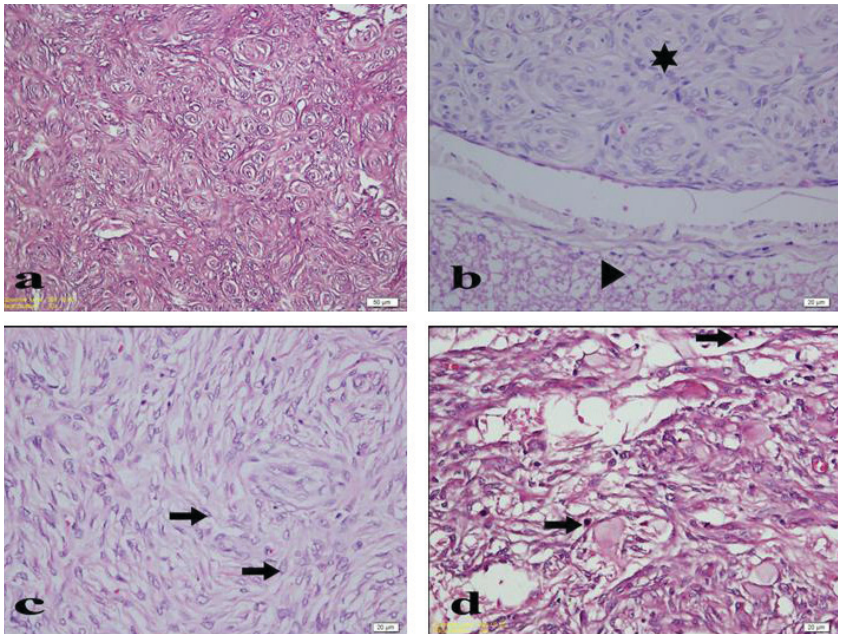

Figure 7. **a**. Solid tumour focal point with spiral appearance in which capillary vessel structure was present in the centre of some cells. **b**. Solid tumour focal point (star) within the spinal cord parenchyma (arrow head). **c**. Neoplastic tissue made of meningothelial cells (arrow) and fibrous connective tissue and fibres. **d**. Mitotic figures in the neoplastic tissue invading spinal cord parenchyma (arrow)

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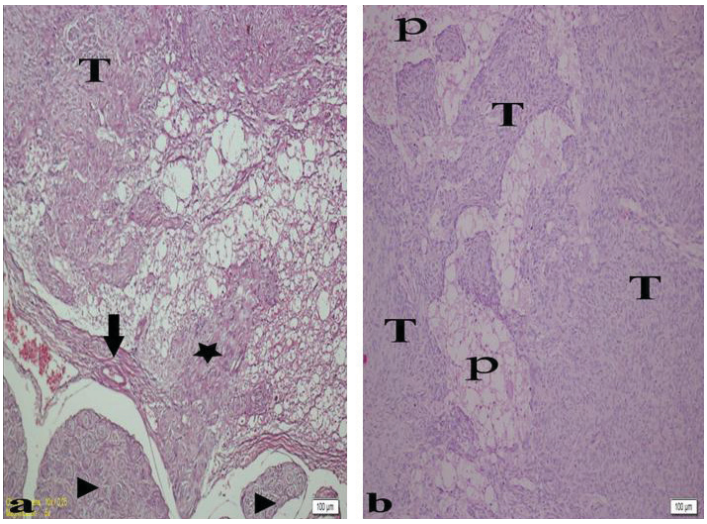

Figure 8. **a**. Invasion into parenchymal tissue of tumour (star) originating from meninges (arrow) and solid tumour focal points and nerve focal points outside the spinal cord (arrow head); **b**. Tumorous focal points (T) of different widths within the spinal cord parenchyma (p)

identified (Bagley et al. 2000). Meningiomas appear as well-defined masses that are iso-hypointense in T1-weighted cross-sections and hyperintense in T2-weighted cross-sections. Intradural, extramedullary location is identified by the widening of the subarachnoid distance due to the influence of the mass (McDonnell et al. 2005). In the patient in this study, the mass lesion identified at the level of the 5th to 6th cervical vertebra in MRI findings was consistent with meningioma, due to its hypointense appearance in T1-weighted sequences and medium heterogeneous and hyperintense appearance in T2-weighted sequences. In post-contrast examination, meningiomas show a dense and homogenous contrast uptake. The dural thickening, also called dural tail, observed in the vicinity of the tumour is seen in most meningiomas (Verdelhan et al. 2005). In the post-contrast T1-weighted images in this case, dense but heterogeneous contrast uptake was observed in the mass. In the images, neither widening of the subarachnoid distance nor dural tail appearance was encountered in contrast examinations. Spinal meningiomas generally exhibit cervical uptake and cause neurological symptoms due to the pressure created by subdural growth (Bosschere et al. 2003). The meningioma found in this case caused neurological symptoms due to its intramedullary formation and invasion of the spinal cord. Most meningiomas in dogs belong to the transitional (mixed) meningioma group. In this type, the microscopic features of both meningothelial and fibrous meningioma are seen. The typical finding in this type of meningioma is a spiral array appearance mostly located around capillary vessels (Koestner et al. 1999). In the case reported here, the diagnosed meningioma was of the transitional type and was consistent with previously published cases (Koestner et al. 1999; Montoliu et al. 2006) in its general microscopic findings. However, we did not observe the previously described psammoma bodies in the centre of the spirals. Meningiomas generally show intradural-extramedullary localisation (Kippenes et al. 1999). It has been reported that, in dogs, a large percentage of meningiomas develop intracranially (Summers et al. 1995) and less frequently in the spinal cord (Montoliu et al. 2006). Spinal meningiomas are mostly benign in nature with intradural-extramedullary location in the cervical segments (Bosschere et al. 2003; Asano et al. 2005). In this case, in contrast to earlier reports in the literature, the meningioma was diagnosed as an intramedullary spinal meningioma invading the spinal cord parenchyma and originating from the meninges. Despite intramedullary spinal meningioma cases being reported in humans, no intramedullary spinal meningioma case has yet to be reported in dogs. Thus, to the best of the authors' knowledge, this is the first case of intramedullary spinal meningioma reported in dogs.

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