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Case Report

Recurrence of Solitary Spinal Meningothelial Meningioma in a Dog

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Abstract: This report identifies clinical, Magnetic Resonance Imaging (MRI), surgical and histological findings of recurrent solitary spinal meningothelial meningioma in a dog. Five-year-old female Pomeranian dog with a history of severe cervicalgia was subjected. A solitary mass between C3-C4 vertebras were diagnosed by MRI, and surgery was carried out with successful results; however, clinical signs reappeared one year after surgery. Control MRI revealed the recurrence of the mass at the same location. Patient reoperated and it was histopathologically reconfirmed as meningothelial meningioma. In conclusion, reoperation of the recurrence of spinal meningioma can be suggested for the practitioners.

Keywords: *Dog, Meningioma, Recurrence, Spinal tumor*

Bir Köpekte Nüks Eden Soliter Spinal Meningothelial Meningioma

Öz: Bu rapor bir köpekte nüks eden soliter spinal meningothelial meningiomanın klinik, manyetik rezosans görüntüleme (MRG) ve histopatolojik sonuçlarını bildirmektedir. Şiddetli servikalji ile kliniğe getirilen 5 yaşlı dişi Pomerian ırkı köpekte, C3-C4 vertebraları arasında solid yapılı bir kitle MRG ile tespit edildi ve operatif mudahale ile başarılı sonuç alındı. Ancak 1 yıl sonra klinik bulguların tekrar ortaya çıkmasıyla birlikte çekilen kontrol MRG'sinde kitlenin nüks ettiği görüldü. Hasta tekrar operasyona alındı ve alınan kitlenin histopatolojik incelemesinde ilk sonuçla aynı olan meningothelial meningioma tanısı kondu. Sonuç olarak, nüks eden spinal meningioma hastalarına operasyon yapılması pretisyen hekimler için önerilir bulundu.

Anahtar sözcükler: *Köpek, Meningiom, Nüks, Spinal tümör*

Introduction

Spinal meningiomas can be classified as encapsulated like tumors according to their well-defined shape. They constitute between 55-65% of spinal tumors [1]. MRI is the method of choice in diagnosing of meningiomas because the scenery of the tumor is typical which has a well-defined shape and is located intradural-extramedullary or extradurally. They often have a broad-based attachment to the duramater [2,3]. Tumor appears as iso-intense or hypointense in T1W images and mildly hyperintense in T2W images. In addition to that, it has a homogeneous contrast enhancement [4]. However, histopathologic examination is required for definitive diagnosis.

Optimal treatment for spinal meningioma is surgery. Other treatment options for spinal meningioma are chemotherapy, radiotherapy or different combinations of them with surgery. The combined treatments of surgery and radiotherapy can significantly extend the life expectancy and decrease the rate of recurrence [5].

The aim of representing this report was to evaluate the clinical symptoms, advanced diagnostic work up, surgical management and histopathologic characteristics of cervical meningioma in a dog that faced a recurrence one year after surgery, and to determine the successful reoperation for the second time with satisfactory improvement.

Case History

Five-year-old Pomeranian dog was admitted to Ankara University Faculty of Veterinary Medicine Department

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of Surgery with a history of severe pain in cervical spine and she had a certain loss of appetite. An "informed consent form" involving the whole process was obtained in the presented case. In neurologic examination, the dog was mentally alert and had normal cranial and spinal reflexes. All limbs had intact deep pain perception. Serum biochemistry and cell blood count were checked and they were all in reference. Spinal radiographs were normal.

MRI was carried out with 3 Tesla (Siemens). Anesthesia was induced by butorphanol (0.1 mg/kg) and diazepam (0.5 mg/kg) and it was maintained by Total Intravenous Anesthesia (TIVA) consisted of propofol with a dosage of 0.3 mg/kg/min. Images acquired as sagittal, dorsal and transverse views in T1W, T2W and post contrast T1W (Gadolinium Dimeglumine was used at dose of 0.1 mmol/kg body weight (BW) intravenously). The lesion was observed as a focal mass. It looked hypointense in T1W and isointense to hyperintense in T2W images. Lesion was located at the right side adjacent to the dural margin. Post contrast T1W image revealed a broad-based attachment to the duramater located both extra and intradurally in C3-C4 region *(Fig. 1)*. The images mimicked nerve sheath tumor.

In preoperative period, cefazolin (Equizolin 500 mg/2 mL) was used at dose of 20 mg/kg intravenously for prophylaxy. Butorphenol (0.1 mg/kg) was applied subcutaneously in order to apply preemptive analgesia. Intravenously diazepam (0.5 mg/kg) was used (Diazem 10 mg/2 mL) for premedication. Propofol, with a dosage of 3 mg/kg, was used to make induction of anesthesia and the dog intubated orolaryngeally. The anesthesia was maintained by isoflurane. Constant Rate Infusion (CRI) of ketamine at a dosage of 0.3 mg/kg/h with the speed rate of 5 mL/kg/h was applied for perioperative analgesia.

The dog was positioned in sternal recumbency with the head gently flexed in a neutral position, and operation table was slightly tilted to the left side. Midline incision was made over the C2-C5 spinous processes. Paraspinal muscles were separated by subperiosteal dissection. Hemilaminectomy was performed at C3-C4 intervertebral foramen by surgical burr and hemilaminectomy defect was extended both cranially and caudally based on the size of the mass. A pale yellowish tumor along the nerve roots and invading intradurally was revealed by durotomy. The mass including root was removed by microdissection and aspiration under the operation microscope blood vessels of the meninges were obscured by electrocoagulation. Durotomy defect was not sutured. Fat graft, which was harvested subcutaneously, was placed in hemilaminectomy defect.

In the post-operative period gabapentin (Neruda 250 mg/5 mL suspension) with a dose of 10 mg/kg was administered in every 12 h PO for two weeks after the surgery. Prednisolone at a dose of 0.5 mg/kg, PO, BID for two weeks and amoxicillin and clavulonic acid was used (Augmentin 625 mg) at dosage of 25 mg/kg PO, BID for one week after the surgery. Ten days after operation patient was clinically normal and was followed by telephone communications in certain periods.

The retrieved mass was examined histopathologically *(Fig. 2)*. Uniform meningothelial cells with large, round/oval, normochromatic basophilic nuclei were seen. In some regions, fibrous bundles were identified, as well. These cells tend to come together as lines or small clusters in which the cytoplasmic borders could not be distinguished. Microcalsification was observed in some areas. In addition to that, psammoma bodies were observed. Furthermore, there exists an ascending rate of mitotic activity of the cells without necrosis. The results were at the same line with meningothelial meningioma which was classified as grade 1 tumor of meningioma.

Twelve months after surgery, the similar clinical signs reappeared. In addition to cervicalgia, incoordination and ataxia was observed in the gait analysis. MRI was taken for the second time with the same anesthesia protocol, accordingly *(Fig. 3)*. The tumor became larger than the

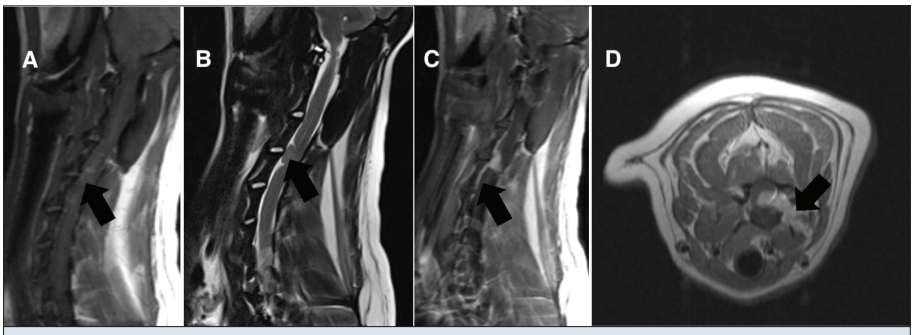

Fig 1. T1W, T2W and post contrast T1W sagittal and transversal images of the patient. **A:** The T1W sagittal image indicates the hypointense lesion at C3-C4 *(black arrow)*, **B:** T2 W sagittal image shows the iso-to-hyperintense lesion *(black arrow)*, **C-D:** shows sagittal and transversal postcontrast T1W images, respectively. The dural tail sign can be seen (black arrow) in the sagittal image

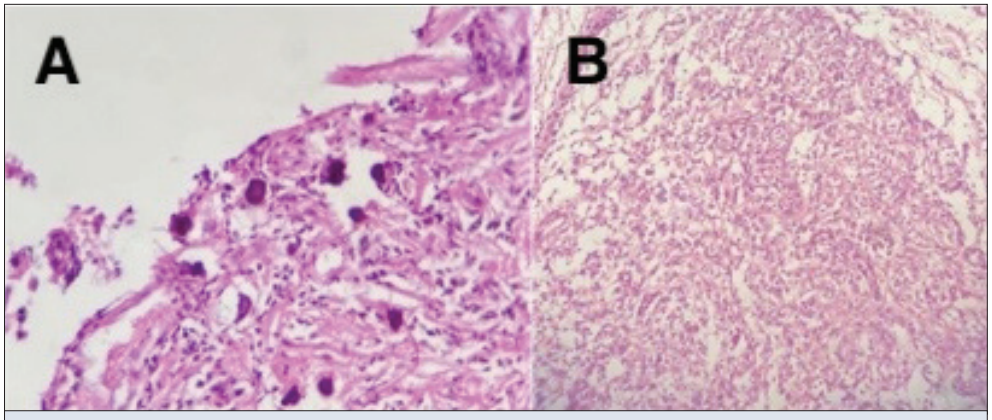

Fig 2. The histopathologic examination of the mass that was retrieved at C3-C4. **A:** Psammoma bodies and fibrous bundles were observed, **B:** Increased mitotic activity of the cells is shown and there does not exist any necrotic area

beginning which was filling nearly about 2/3 diameter of spinal canal. The lesion was hypointense in both T1W and T2W images; however, in T2W image the circumference of the lesion was hyperintense, and well contrast enhanced in postcontrast T1W images.

Surgical intervention was carried out with the same protocol. The difference from the first surgical findings was swelling and a purplish color change in the duramater. Based on the differences, hemilaminectomy defect was enlarged, the mass was revealed in greyish color, well demarcated and it pushed the spinal cord to left side. The mass was removed by microdissection and aspiration. The dural attachment was extensively coagulated. The dural defect was not repaired for the possibility of tumor recurrence. Operation wound was closed with the same procedure as the first operation. In the post-operative period, the same pharmacy was used in order to make pain management and prophylaxis for infection. The patient's neurological status was indistinguishable from before the operation at the 2nd day; however, it was deteriorated from second month to the fourth by the time. The owner declined further diagnostic workup and preffered euthanasia, accordingly.

Discussion

Surgery is the optimal treatment option for solid spinal meningiomas, although there is limited data for reoperation of meningioma after recurrence[6,7]. In human studies, the residual volume of meningioma after the operation considered as an important cause of recurrence. Thus, gross total resection is the primary goal of surgeons, however retrieving tumor is carry a high risk of neural damage. In the presented case, the authors did not have information about the residual volume because of absence postoperative control MRI, but it was estimated that there was no residual tumor in both interventions.

MRI provides evaluation of the tumors with their characteristic features to reach presumptive diagnosis. The reported case introduces a meningioma which mimics nerve root tumor. The shape and location of the mass led us to consider nerve sheath tumor rather than meningioma in MRI. In generally, meningiomas do not spread through the intervertebral foramen and they are located as intradural-extramedulary as a solid mass and causing root compression in some cases [6]. However, in this case report meningioma protrudes through intervertebral foramen which is an important finding and

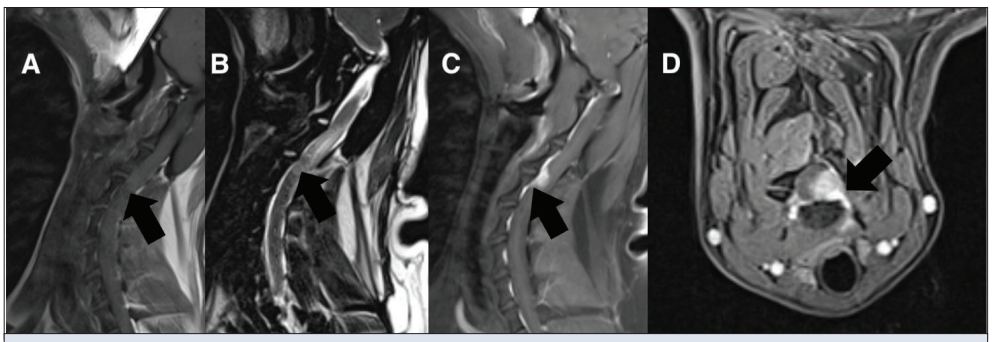

Fig 3. Sagittal T1 and T2 W images as well as sagittal and transversal postcontrast T1W images of the same patient one year after surgery with the recurrence signs. **A:** T1W sagittal image indicates the iso - hypointense lesion, **B:** Indicates the iso-hyperintense lesion in the T2W sagittal image, **C-D:** Well contrast enhanced mass in both sagittal and transversal images, **D:** It relocated intradural- extramedullary in transversal image

it highlights the uniqueness of the study. In accordance with these findings, histopathologic examination should be taken into account so as to come up with the definitive diagnosis. These unusual data should be considered by the practitioners.

Reoperation for spinal disorders carry heavy risk of surgical morbidity. As for the presented case, fibrous tissue was filled and adherent to the free fat graft. It was gently removed. The tumor was appeared as darker color and almost totally located intradurally. It was retrieved under the surgical microscope. In this case, after the second surgical intervention, recovery of the neurologic status of the patient was fast enough like the first surgery. However, the reason of faster deterioration of the neurological status of the case after second surgery compared with the first, could not be clarified because of not having further diagnostic work-up.

In general, histologically benign tumors prove to be non-recurring and non-metastasizing lesions; furthermore, histologically malignant tumors usually behave aggressively. In human grade I meningioma, surgery is the method of choice for the treatment and results are satisfactory and postoperative recurrence is low which is found approximately 3-20% [7]. Thus, for veterinary medicine, it is known that the observation rate of recurrence in grade 2 and grade 3 subtypes are higher than grade 1 subtype as human being. However, the natural history of recurrences of benign meningiomas in veterinary medicine have been described that there exists no specific rate of recurrence for grade 1 meningiomas [2,7-10]. In the presented case with grade 1 meningioma (WHO classification), recurrence was seen one year later, and required a reoperation. This illustrates that tumor regrowth is possible after gross total resection and careful follow-up is important for the recurrence.

Several important histologic variants of meningioma, and even a histopathologically typical meningioma can have unusual radiological features so less frequent and uncharacteristic imaging features should be known so as to suggest the correct pre-operative diagnosis in clinical cases. [11,12]. In this case, tumor has characteristic image which mimicked the nerve sheat tumor. After hemilaminectomy, the mass was seen alongside the nerve roots and adherent to the duramater. The appearance and location of the tumor was at the same line with MRI findings and consistent with nerve sheath tumor. In addition, after durotomy the part of intradural mass was also mixed with rootlets. In contrast, histological examination revealed type 1 meningothelial meningioma rather than nerve sheath tumor. This illustrates the uncharacteristic MRI images for the solitary meningothelial meningioma, and this should be taken into account in the pre-operative period [11].

In conclusion, further studies are needed for determining the rate of recurrence according to the tumor subtypes of meningiomas and for outcome of reoperation. The control MRI and detailed histological evaluation of the tumor are essential for the follow up of the cases. With respect to the experience that was gained from the presented case, reoperation of meningioma can be considered for the practitioners, should it be possible for them to evaluate and follow-up the case more in detail.

Availability of Data and Materials

The data, that support the findings of this study, are available from the corresponding author (O. Besalti) upon reasonable request.

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Competing Interests

The authors declared there is no conflict of interest

Author Contributions

Case examination, evaluation of clinical findings and interpretation of MRI images were done by authors and the article was written, accordingly. Authors submitted the article together.

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