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Diagnosis and Surgical Management of Foramen Magnum Meningioma

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Abstract Two cases of foramen magnum meningioma were successfully treated at early stage. The magnetic resonance imaging (MRI) played an important role for accurate diagnosis. The tumors were microsurgically removed and the patients returned to society in full capacity.

The foramen magnum meningioma is rare, and potentially curable. The recognition of this entity is important for neurologists, orthopedists and neurosurgeons in the differential diagnosis of the craniocervical problems.

Key words : Foramen magnum tumor, Meningioma, Magnetic resonance imaging

Introduction

Benign extramedullary tumors in the region of the foramen magnum have been of special interest to neurologists, neurosurgeons and orthopedists. These tumors are likely to be unrecognized until serious and often tragic neurological complications develope, because early complaints include such ubiquitous symptoms as neck pain or dysesthesia of the hand. Even at the stage when serious neurological deficits are present, the lesions are often misdiagnosed as another disease, especially multiple sclerosis and cervical spondylosis, and patients may undergo improper conservative or even surgical treatments[1/5/7/11]. The bizarre neurological signs and symptoms caused by these tumors are emphasized and several reports have mentioned the pitfalls in the clinical diagnoisis of foramen magnum tumors[3/4/7/11]. Incomplete myelographic studies with negative results have been often a source of misdiagnosis and CT scan has a limited value in the demonstration of lesions of craniocervical junction due to bony artifacts[8/9].

Recent advent of magnetic resonance imaging (MRI) technique has renewered our interest in the various pathological processes in the craniocervical junction because of its excellent diagnostic capabilities[6/12/13]. Improved outcomes of foramen magnum meningioma are expected with early and accurate diagnosis by MRI and subsequent microneurosurgical resection with the aid of new technology such as surgical laser[10].

In this paper, we present our recent experiences in the successful surgical management of 2 patients with foramen magnum meningioma. Problems associated with the diagnosis and management are discussed with review of the literatures.

Case Reports

CASE 1

A 52-year-old male noted cold sensation in his left arm 8 months prior to admission. The cold sensation of the left arm extended progressively over the left body during the next 6 months. He began to have severe occipital headache, neck stiffness, neck pain, weakness in the right arm and the bowel and bladder dysfunction for one month. Cervical myelography and CT scans showed abnormality in the craniocervical junction.

The examination on admission showed that the patient was alert and oriented. He complained of occipital pain. The gag reflex was absent. The tongue protrusion was deviated to the right. The right sternocleid-mastoid muscle showed weakness and atrophy. The motor weakness was 2/5 in the upper extremity and 3/5 in the lower extremity on the right side. The sensory examination showed hypalgesia and hypesthesia on the left side of the body except face. The positon and vibration sensation was intact. He showed Brown-Séquard syndrome.

CT scan showed a round enhanced mass lesion in the craniocervical junction. The vertebral angiograms demonstrated postero-lateral deviation of the bilateral vertebral arteries. MRI scan demonstrated a well demarcated mass lesion in the foramen magnum compressing the medulla and upper cervical spinal cord posteriorly and to the left side. This mass lesion had isointensity signal on the T1 weighted images and iso-to hypointensity signal on the T2 weighted images, which were consistent with the findings of a meningioma (Fig.1).

The patient was positioned on his left side and right suboccipital craniectomy and C1 laminectomy were performed. The tumor was located anterolaterally to the spinal cord and the medulla oblongata, displacing them to the left side and posteriorly. The lower margin of the tumor was at the level of the first cervical vertebra. The spinal accessory nerves overlying the tumor were stretched and flattened. The posterior roots of C1 was displaced inferiorly. The vertebral artery and posterior inferior cerebellar artery were compressed superio-posterioly. The tumor was totally removed with microsurgical technique using YAG laser. Pathological examination of the surgical sepcimen showed transitional type meningioma (Fig.2). The postoperative MRI showed complete removal of the tumor (Fig.3). Postoperative course was uneventful. He recovered completely with no neurological deficits at discharge. He returned to work as a paramedic in full capacity.

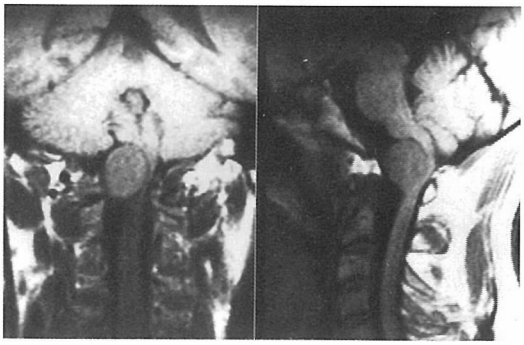

Fig. 1 Coronal (left) and sagittal (right) MRI (case 1). A well demarcated round mass in the foramen magnum compresses the medulla and the upper spinal cord.

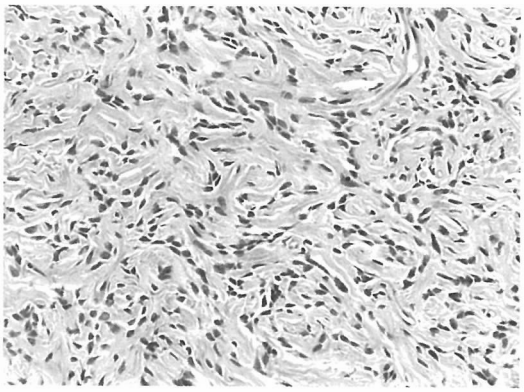

Fig. 2 Photomicrograph of the surgical specimen (case 1). The tumor cells show mixture of whorls and streaming pattern. (transitonal type meningioma). Hematoxylin and eosin, X 200.

CASE 2

The patient was a 68 year old right handed woman with a history of left posterior occipital headaches for one year. The headaches were intermittent, of a sharp character and radiated to the right occipital area and were increased in severity at night. The headaches were precipitated by positional changes or exertion without nausea or vomiting. She denied any associated weakness, paraethesias, visual disturbances, dysphasia, gait disturbances or aura. The patient had also had episodes of labile hypertension with difficulty in medical management for one month.

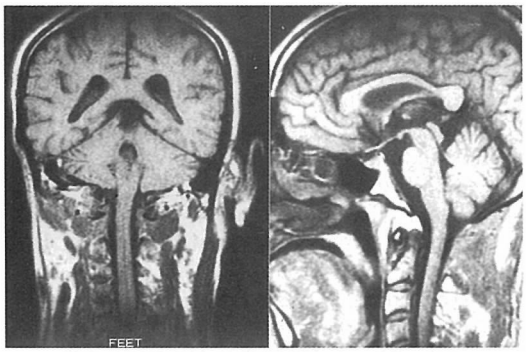

Fig. 3 Postoperative MRI (case 1). The tumor is completely removed.

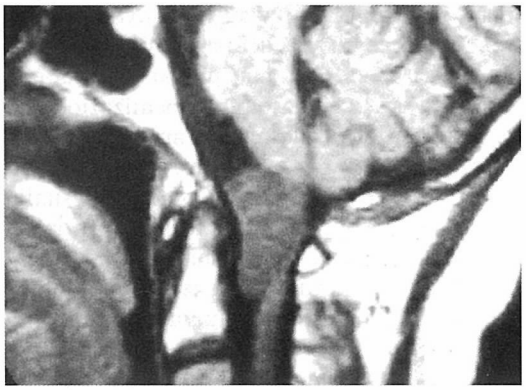

Fig. 4 Sagittal MRI (case 2). A mass in the foramen magnum compresses the medulla and the upper spinal cord.

The past history and family history were non contributory. Neurological examination showed an alert and well oriented lady. Cranial nerves 2 through 12 were intact with the exception of the anisocoria due to glaucoma. Motor and sensory examinations were normal. Deep tendon reflexes were 2+ in all extremities with the exception of 1+ bilaterally at ankles. Plantar response was flexor. The rest of the neurological examination were within normal limits. Because of the persistent headache with above mentioned characteristics, MRI was obtained, which demonstrated a foramen magnum tumor (Fig.4).

The patient was placed in the lateral semiprone position on her right side. A left suboccipital craniectomy and C1 laminectomy were performed. The tumor was located anterior to the lower medulla, more on the left side. The medulla was gently retracted and the tumor was debulked by vaporization with CO_2 laser. The tumor was then carefully dissected out from the medulla and upper spinal cord and totally removed. Pathological diagnosis of the surgical specimen was meningioma. Her postoperative course was uneventful and she returned home with full capacity as a house wife.

Discussion

Foramen magnum meningioma is defined as the meningioma attached to dural edge of the foramen or the inferior groove of the clivus. This is a rare tumor, comprising only 2-3% of the intracranial meningioma[3,7,11]. Since the most of meningiomas are histologically benign, they are potentially curable by surgical removal. Unfortunately, however, the unusual and bizzare symptomatology of the foramen magnum meningiomas had often lead to misdiagnosis and inappropriate treatment[1,4,5,7,11].

A long, often remitting, clinical course is commonly observed in patients with this lesion. The most frequent inintial symptoms are pain in the suboccipital region or neck and dysesthesias of the upper extremities, followed by clumsiness, stereoanesthesia of the hands, and gait disturbance. Neurological findings may be absent early in the course, but severe deficits occur later[7,11]. A progression of motor weakness, initially involves one upper limb, followed by the ipsilateral lower limb, and eventually the contralateral lower and upper limbs are seen in about half of the cases. Sensory disturbances tends to involve the upper more than the lower extremities and had rather typical features, that is, cold dysesthesia followed by burning dysesthesia which typically preceded the onset of hypesthesia. Hypesthesia in the 2nd cervical dermatome has a high diagnostic reliance, seen in about one-third of the cases. Other frequent but not constant signs are : horizontal nystagmus, palsy of the last cranial nerves, mostly of the XIth[1,3,11]. In our case 1, the patient presented with cold sensation of the left arm initially, and developed the Brown-Séquard syndrome on the side of the tumor. In case 2, the patients had only occipital headache.

MRI has become a procedure of choice in the diagnosis of lesions of craniocervical

junction. Unlike CT scan and myelography, the effectiveness of MRI is not diminished by bony artifacts. The multiplanar images can delineate precise anatomical localization and extension of the tumor. It can also demonstrate adjacent vascular structures, especially the vertebral artery, which is usually encompassed by the tumor. These information are essential in planning the surgical treatment of the tumor. In case 1, the tumor was initially diagnosed by myelogram and CT, but MRI added important information, especially its relation to the medulla and upper spinal cord. In case 2, the patient had no neurological deficits and the initial CT scan did not show the tumor. This patient might have been misdiagnosed as other disease, if we had not obtained MRI which revealed the tumor at the foramen magnum. The early, accurate diagnosis with MRI and refined microsurgical technique with new tools such as surgical lasers have improved surgical outcome of the patients with foramen magnum tumors[2,3,7,10]. The postoperative neurological recovery was remarkable in our case 1, and no neuological deficits developed in case 2. Both of our patients returned to their previous social status in full capacity.

In conclusion, foramen magnum meningioma, a rare disease, is able to be diagnosed by the MRI imaging, leading to cure the patients. The recognition of this entity is important for neurologists, orthopedists and neurosurgeons in the differential diagnosis of the craniocervical problems.

References

1) Cohen, L. : Tumors in the region of the foramen magnum, In Vinken, P. J. and Bruyn, G. W.(eds) : *Handbook of Clinical Neurology*. Amserdam-Oxford, North-Holland Publ.Co., Vol. 18, pp.719-729,1975

2) Dodge, H. W. Jr., Love, J. G. and Gottlieb, C. M. : Benign tumors at the foramen magnum. Surgical considerations. *J. Neurosurg.*, **13** : 603-617, 1956

3) Guidetti, B. and Spallone, A. : Benign extramedullary tumors of the foramen magnum. In Symon,L.(ed.) : *Adv. Tech. Stand. Neurosurg.*, Springer-Verlag, vol. 16, pp.83-120, 1988

4) Howe, J. R. and Taren, J. A. : Foramen magnum tumors. Pitfalls in diagnosis. *J.A.M.A.*, **225** : 1061-1066, 1973

5) Krayenbühl, H. : Special clinical features of tumors of the foramen magnum. *Schweiz. Arch. Neurol. Neurochir. Psychiatr.*, **112** : 205-218, 1973

6) Lee, B. C., Deck, M. D., Kneeland, J. B. and Cahill, P. T. : MR imaging of the craniocervical junction. *A.J.N.R.*, **6** : 209-213, 1985

7) Mayer, F. B., Ebersold, M. J. and Reese, D. F. : Benign tumors of the foramen magnum. *J. Neurosurg.*, **61** : 136-142, 1984

8) Nishioka, I., Koyama, T., Tanaka, K. and All, H. : Neuroradiological evaluation of benign extramedullary tumors in the high cervical region and at the foramen magnum. (in Japanese) *No Shinkei Geka*, **14** : 837-845, 1986

9) Stein, B. M., et al. : Meningiomas of the formen magnum. *J. Neurosurg.*, **20** : 740-751, 1963

10) Tew, J. M. and Tobler, W. D. : The laser : History, Biophysics, and Neurosurgical Applications. *Clin. Neurosurg.*, **31** : 506-549, 1983

11) Yasuoka, S., Okazaki, H., H., Daube, J. R. and MacCarty, C. S. : Foramen magnum tumors. Analysis of 57 cases of benign extramedullary tumors. *J. Neurosurg.*, **49** : 828-838, 1978

12) Wagle, V. G., Villemure, J. G., Melanson, D., Ethier, R., Bertrand, G. and Feindel, W. : Diagnostic potentioal of magnetic resonance in cases of foramen magnum meningiomas. *Neurosurgery*, **21** : 622-626, 1987

13) Zimmerman, R. D., Fleming, C. A., Saint-Louis, L. A., Lee, B. C. P., Manning, J. J. and Deck, M. D. F. : Magnetic resonance imaging of meningiomas. *A.J.N.R.*, **6** : 149-157, 1985