Anterolateral Foramen Magnum Meningioma: Case Report and Literature Review

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ABSTRACT

Meningiomas are benign tumors dependent on arachnoid cells. Localization to the foramen magnum is rare and represents a surgical challenge. Surgical planning is crucial to choose an optimal approach and to avoid morbidity. We report a case of anterolateral meningioma of the craniovertebral junction in a 49-year-old female patient with complaints of progressive weakness of the right arm for the past 6 months. Magnetic resonance imaging showed an extramedullary intradural tumor with dural insertion regarding the body of C1 vertebrae. The patient underwent surgery via suboccipital approach with a C1 laminectomy and a Simpson grade 2 resection was performed. The patient improved postoperatively and returned to her daily activities. We perform a literature review to discuss the considerations for the optimal surgical strategy for the approach of foramen magnum meningiomas.

Keywords: craniovertebral junction, meningioma of the foramen magnum.

I. INTRODUCTION

Meningiomas are slow-growing benign tumors derived from arachnoid cells and the foramen magnum is a rare location, accounts for approximately more than 3% of all meningiomas [1]. Meningiomas are the most common benign tumor of the foramen magnum [2], [3]. The surgical approach of foramen magnum meningiomas (FMM) presents a surgical challenge. Surgery is the treatment of choice and has the aim of maximum resection with the preservation of the neurological function [4]. The posterior and postero-laterally lesions were operated by the midline posterior approach [5].

Postero-lateral suboccipital approach or far lateral approach was a common approach to anterior or lateral meningioma [6]. Total surgical excision helps reduce recurrence rates. Several factors influence the outcome of surgery, including the area of tumor insertion and its relation to near structures such as the vertebral artery (VA) [7]. Surgical planning is crucial to choose the appropriate surgical approach and to avoid morbidity. We report a case of an anterolateral meningioma that was surgically managed. Then, we discuss, through the literature, the optimal surgical strategy of foramen magnum meningioma.
II. CLINICAL CASE

A 49-year-old woman with no particular history had presented neck and occipital pain for 2 years. The pain was exacerbated during the night and resistant to analgesics. The progressive worsening of a weakness in the right arm over the past 6 months motivated the patient to consult. The neurological examination noted a muscle strength of 3/5 in the right arm. The patellar tendon reflexes are sharp on the right. The signs of Hoffman and Babinski were present on the right. There were no proprioception disturbances. Cervical magnetic resonance imaging (MRI) showed a rounded mass at the base of dural insertion facing C1 and extending to the foramen magnum (Fig. 1). This mass appears isodense in T1 weighted images with an enhancement after injection of gadolinium. The tumor produced a mass effect on the medulla oblongata with hypointense from the spinal cord. There is no associated syrinx in the spinal cord.

Surgical resection was suggested to the patient who gave her informed consent. Under general anesthesia, the patient was placed in a prone position with the head slightly flexed. After an occipital to cervical midline incision, a disinsertion of the occipital muscles was carried out limiting itself to the upper part of the spinous process of C2. A left suboccipital craniectomy is performed associated with a C1 laminectomy. The dura is opened in Y and a peripheral dural suspension is made to highlight the spinal cord, the lower posterior part, then the upper pole of the tumor. The V3 segment of the left vertebral artery has been protected. The tumor capsule was first coagulated and then opened. An intratumoral recess and resection of the right lateral part of the tumor were performed. Resection was then completed at the tumor implantation area and by careful dissection of the midline contiguous to the spinal cord. Tumor resection was complete with coagulation of the insertion area (Simpson grade 2). Hemostasis is satisfactory in the tumor insertion bed. After irrigation of the surgical bed, the dura was closed. The closure continued plan by plan.

Postoperatively, the patient was extubated without incident and the neurological examination was stationary. Neurological rehabilitation was performed with complete motor recovery after 2 months. A cervical CT scan was performed immediately postoperatively and showed gross total resection without bleeding in the surgical bed (Fig. 2). An MRI at 2 months showed a macroscopic total resection of the tumor.

III. DISCUSSION

The clinical presentation of FMM is variable and depends on the size of the tumor and the relation to nearby structures. The lesion can produce a mass effect on the medulla oblongata and the spinal cord. The most common presenting symptoms of the patient with FMM are cervicoc-occipital pain and gait disturbance [6]. Other common symptoms include weakness, quadriaparesis, quadriplegia, nuchal rigidity, and diminished sensations [5], [8]. Less common symptoms include sphincter disturbances, hearing loss, and respiratory disturbances [8].

The foramen magnum extends anteriorly from the lower third of the clivus to the upper border of the C2 body and laterally from the jugular tubercle to the upper surface of the C2 lamina. Posteriorly, the FM extends from the anterior edge of the occipital bone to the spinous process C2 [8].

Fig. 1. The preoperative aspect of the foramen magnum tumor.

Fig. 2. The postoperative aspect of the foramen magnum tumor.
The anatomical structures in this area were the vertebral artery, medulla oblongata, lower cranial nerves, and upper cervical nerves. Meningioma can be classified according to its area of implantation as either an anterior, lateral, or posterior variety. The approaches are variables depending on the dural insertion. Bruneau et al. classified the foramen magnum meningioma with three criteria based on the tumor development compartment, dural insertion, and its relationship to the vertebral artery [9]. The vast majority of FMM are intradural extramedullary in location [9]. This classification based on the tumor development compartment improves the discussion to choose the optimal approach.

Anterior or lateral meningiomas are a technically complex subgroup. Posterolateral suboccipital approach or far lateral approach was a common approach of these subgroups [6]. Drilling of the occipital condyle can be done to have a better field of action. The approach to these lesions involves the problem of the potential instability of the craniocervical junction when the approach is too lateral, as well as the need for fixation. Preserving the occipital condyle helps maintain the stability of the craniocervical junction. A retro-condylar approach can be performed to avoid the drilling of the condyle. The imperative of this surgery is to be able to avoid manipulation of the medulla oblongata and the cervical cord and to preserve the nerves and the vertebral artery. Angio CT or Angio RM is often used preoperatively to identify the vertebral artery and its relationship with the tumor. The relationship of the meningioma to the VA determines its resectability [7]. Anatomical variations of the VA V3 segment are crucial to know and identify preoperatively, remembering them participate in lowering surgical morbidity [9].

The posterior approach has the advantage of being familiar to surgeons, but the risk of morbidity must be carefully considered. This approach is better for posterior tumors. However, several cases of anterolateral tumors can be approached posteriorly. In our case, it is an anterolateral meningioma with insertion in the body of C1 which led to the discussion of the posterior approach or a posterolateral approach. The tumor was not inserted on the clivus and did not encompass the inferior cranial nerves or the vertebral artery. The choice of the posterolateral approach in our case was justified after the analysis of the area of insertion of the tumor. The lateral mass of C1 and the occipital condyle were left intact. The need for fusion of the craniocervical junction was avoided.

Gross total resection was performed in our case with coagulation of the insertion (Simpson 2). Gross total resection was obtained in 45%-96% of cases [6], [9]-[11]. Common postoperative complications were cranial nerve deficits. The mortality rate was 2%-4.5% [6], [9], [10]. Recurrence rate was 2.5%-7.7% [4], [12]. Radiosurgery could be performed at diagnosis of recurrence, or in cases of subtotal resection or for small symptomatic FMM.

The neurosurgical planning of FMM considered the types of tumor such as on origin the clivospinal and spinocervical types, as well as anterior and anterolateral types [12]. The vertebral encasement is a major factor to be carefully analyzed.

IV. CONCLUSION

Meningiomas of the foramen magnum are associated with potential morbidity. The surgical approach must take into account the tumor insertion. The approach to anterolateral meningiomas should take into account the insertion compartment and the insertion area. A careful preoperative study is essential to appreciate the intimate relationship of the tumor with the vertebral artery and its extension from the cranial or cervical level.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES