Foramen magnum meningioma case series

2021

20 patients diagnosed with FMMs who underwent surgical treatment from 1999 to 2019 at Santa Paula Hospital in Sao Paulo. This case series was compared with previously published ones to better understand this relatively rare disease.

Results: Twenty patients were included, with a mean follow-up of 110 months. Their mean age was 37.8 years old. The mean preoperative Karnofsky performance status scale (KPS) was 84%. We found a female (65%) and left hemisphere predominance (50%). Involvement of both hemispheres was found in 25% of patients. FMM locations were anterior, anterolateral, lateral and posterior, in 45%, 35%, 10%, and 10%, respectively. Simpson resection grades I, II, and III were achieved in 25%, 60%, and 15% of cases, respectively. Mean postoperative KPS was 79%. Three patients with anterior and bilateral located meningiomas had a worse postoperative KPS in comparison to the preoperative one.

Conclusion: Anterior and bilateral FMMs seem to be related to a worse prognosis. A gross total resection can reduce the recurrence rates. The KPS is worse in patients with recurrence [1)].

Ten patients operated between 2014 and 2019 were retrospectively analyzed in terms of age, gender, neurological examination, and postoperative status. The female-to-male (F/M) ratio of the patients was 6/4, and the age range was 19?70 years (mean = 59). All patients presented with occipitocervical pain and were operated using the midline lateral suboccipital approach.

Results: One of the operated patients died in the intensive care unit due to upper gastrointestinal tract bleeding. Additionally, one patient had paresis in the early postoperative period, which resolved in the third follow-up month.

Conclusion: Foramen magnum meningiomas are operated safely by microsurgical methods using the midline lateral suboccipital approach after suboccipital triangle and vertebral artery are exposed [2)].

2020

16 consecutive patients with antero-lateral FM meningiomas operated on by a single surgeon. FMs were classified as ovoid (n = 8) and nonovoid (n = 8) using radiographic evaluation. Results Sixteen patients were examined: seven males and nine females (mean age of 58.5, and range of 29 to 81 years). Gross total resection was achieved in 81% of patients, with tumor encased vertebral arteries in 44%. Patient characteristics were similar including age, sex, preoperative tumor volume, relationship of vertebral artery with tumor, preoperative Karnofsky performance score (KPS), symptom duration, and presence of lower cranial nerve symptoms. The ovoid FM group had lower volumetric extents of resection without statistical significance (93 ± 10 vs. 100 ± 0%, p = 0.069), more intraoperative blood loss (319 ± 75 vs. 219 ± 75 mL, p = 0.019), more complications per patient (1.9 ± 1.8 vs. 0.3 ± 0.4, p = 0.039), and poorer postoperative KPS (80 ± 21 vs. 96 ± 5, p = 0.007). Hypoglossal nerve palsy was more frequent in the ovoid FM group (38 vs. 13%). Conclusion This is the first study demonstrating that ovoid FMs may pose surgical challenges, poorer operative

outcomes, and lower rates of extent of resection. Preoperative radiological investigation including morphometric FM measurement to determine if FMs are ovoid or nonovoid can improve surgical planning and complication avoidance [3].

2019

28 patients with FMM. The Median follow-up was 5.9 years. Tumors were World Health Organization grade I (92.9%) or grade II (7.1%). The vertebral artery was completely encased (25%), partially encased (11%), or not encased (64%). The median size was 11.9 cm 3. EOR was a gross total (39%) and subtotal (61%). The observed recurrence rate was 4% (n = 1). There were 38 complications in 12 patients (43%), and 6 patients (21%) had complications requiring additional surgery. Complications included cerebrospinal fluid leak/hydrocephalus (n = 7, 25%), weakness (n = 4, 14%), numbness (n = 4, 14%), and cranial nerve deficits: IX, X (n = 4, 14%), XI (n = 2, 7%), XII (n = 5, 18%). Medical complications included pneumonia (n = 1, 4%) and meningitis (n = 1, 4%). Tumor volume greater than 14 cm 3 (odds ratio [OR] = 21.7, p = 0.0010), any vertebral artery encasement (OR 6.1, p = 0.0386), and subtotal resection (OR 6.4, p = 0.0398) were significantly associated with complications. Tumor volume greater than 14 cm 3 was also significantly associated with subtotal resection (OR 8.3, p = 0.0201). Conclusions Resection of FMM carries perioperative morbidity that increases with larger tumor size. Despite the morbidity, long-term recurrence-free survival is achievable with maximal safe resection and adjuvant radiation [4]

2015

During two years, Mostofi operated 5 patients.

All the patients had magnetic resonance imaging (MRI) with angio-MRI to study the relationship between tumour and vertebral artery (VA). In all the cases, operated in prone position.

In one case, considering the tumour localization (posterior and pure intradural) the tumour was removed via a midline suboccipital approach with craniotomy and C1-C2 laminectomy. In all other cases, meningiomas were posterolateral (classification of George) with extradural extension in one case. In all cases, VA was surrounded by tumor and opted for a modified postero-lateral approach with inverted L incision, craniotomy and C1-C2 laminectomy without resecting the occipital condyle. Epidural part of VA was identified and mobilized laterally. Once VA was identified he opened dura mater and began to remove the tumour [5].

2014

Thirteen patients (11 Feminine / 2 Masculine with FM meningiomas operated on through lateral suboccipital approach were studied. Clinical outcome were analyzed using survival (SC) and recurrence-free survival curves (RFSC).

All tumors were World Health Organization grade I. Total, subtotal and partial resections were acchieved in 69.2%, 23.1% and 7.7%, respectively, and SC was better for males and RFSC for females. Tumor location, extent of resection and involvement of vertebral artery/lower cranial nerves

did not influence SC and RFSC. Recurrence rate was 7.7%. Operative mortality was 0. Main complications were transient (38.5%) and permanent (7.7%) lower cranial nerve deficits, cerebrospinal fluid fistula (30.8%), and transient and permanent respiratory difficulties in 7.7% each.

FM meningiomas can be adequately treated in public hospitals in developing countries if a multidisciplinary team is available for managing postoperative lower cranial nerve deficits [6].

2009

16 patients with foramen magnum meningiomas were operated in all cases by a posterior suboccipital approach with lateral extension of the bone opening according to the position of the tumour. In 14 patients, intraoperative monitoring of the lower cranial nerves was performed. Localisation of the tumours was ventral (3), ventrolateral (10), dorsal (1) and dorsolateral (2). Mean age of the patients was 61 years (ranging from 40 to 85 years). Preoperative and postoperative function was classified according to the McCormick scale.

Eight patients experience a postoperative upgrading of at least one grade, in five patients an unchanged status and a deterioration in only two patients. Complete removal of the tumour was possible in 14 cases (Simpson 1-2). The follow-up period varied from 24 to 119 months (mean 43.5 months), during this time there were no recurrences. In there experience, the posterior suboccipital approach is suitable for the majority of these tumours [7].

2006

Clinical data in a consecutive series of 25 patients experiencing a meningioma attached to dura of the anterior or anterolateral FM rim were retrospectively reviewed.

The most common symptoms of the 19 women and six men (mean age, 59.2 yr) was cervico-occipital pain (72%) and gait disturbance (32%). Clinical examination revealed gait ataxia in 48% of the patients. As depicted from preoperative magnetic resonance imaging (MRI), dural attachment of the meningioma at the FM rim was anterior in 36% and anterolateral in 64% of cases. Tumor removal was accomplished via a posterolateral suboccipital retrocondylar approach in all patients. A Simpson Grade 2 resection was achieved in 96% of the patients. Permanent surgical morbidity and mortality rates were 8 and 4%, respectively. No tumor recurrence was observed after a mean follow-up period of 6.1 years (range, 1-14 yr) with clinical and MRI examination, and 80% of the patients have regained full daily activity.

Anterior and anterolateral FM meningiomas that displace the medulla/spinal cord can be safely and completely resected via a posterolateral suboccipital retrocondylar approach. A tumor remnant should be left on critical neurovascular structures in cases with poor arachnoid dissection planes [8].

2004

Eleven cases with the foramen magnum meningioma were operated by using posterior approach with lateral extension.

Complete removal of the tumor was performed in 7 patients (7/11, 64%), subtotal resection in 2 cases (2/11, 18%) and partial resection in 2 cases (2/11, 18%). There were no operative death and

significant complication.

The posterior approach with lateral enlargement is sufficient to expose and remove foramen magnum tumors without expensive bone resection [9].

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22 patients underwent 23 surgical procedures with a diagnosis of foramen magnum meningioma at Marmara University, Department of Neurosurgery. The suboccipital approach was used for 2 posteriorly located tumors with radiological total removal. The paramedian suboccipital approach was replaced by the far-lateral modification in the treatment of ventral meningiomas. 1 of the 20 ventral tumors was operated twice. The classical suboccipital approach was followed by the far-lateral modification. A gross-total removal was achieved in 21 patients. The overall morbidity was 32%. No specific and clinically significant complications attributable to the far-lateral modification were observed. The far-lateral approach has improved the success of surgery in ventrally located lesions. The posterior suboccipital approach is still indicated in the removal of lesions placed posterior to the dentate ligament [10].

2002

Seven cases of foramen magnum meningioma (1.4%). All patients showed various neurological symptoms corresponding with foramen magnum syndrome. The tumor locations were anterior in five cases and posterior in two. Surgical removal was performed through a transoral approach in one patient, the suboccipital approach in three, and the transcondylar approach in two. Total removal was achieved in all patients, except for one who refused any surgical treatment. The major complications were tetraparesis and lower cranial nerve paresis for tumors in anterior locations, and minor complications for posterior locations. One patient died of atelectasis and pneumonia after a long hospitalization. The transcondylar approach is recommended for anterior locations, and the standard suboccipital approach for posterior locations [11].

2001

17 patients with foramen magnum meningiomas arising from the anterior or anterolateral rim of the foramen magnum underwent operations in the Department of Neurosurgery at King Edward Memorial Hospital and Seth G.S. Medical College. All patients were operated on in a semi-sitting position by use of a conventional suboccipital approach with a midline incision and extension of the craniectomy laterally toward the side of the tumor up to the occipital condyle.

The patients ranged in age from 17 to 72 years, and the tumors ranged in size from 2.1 to 3.8 cm. The intradural vertebral artery was at least partially encased on one side in eight patients and on both sides in two patients. The brainstem was displaced predominantly posteriorly in each patient. A partial condylar resection was performed in two cases to enhance the exposure. Total tumor resection was achieved in 14 patients, and a subtotal resection of the tumor was performed in the other 3 patients. In one patient, a small part of the tumor was missed inadvertently, and in the other two patients, part of the tumor in relation to the vertebral artery and posterior inferior cerebellar artery was deliberately left behind. After surgery, one patient developed exaggerated lower cranial nerve weakness. There was no significant postoperative complication in the remainder of the patients, and their conditions

improved after surgery. The average length of follow-up is 43 months, and there has been no recurrence of the tumor or growth of the residual tumor.

From there experience, they conclude that a large majority of anterior foramen magnum meningiomas can be excised with a lateral suboccipital approach and meticulous microsurgical techniques [12].

1996

38 patients who were operated on for 40 meningiomas of the craniocervical junction between September 1977 and August 1995

Radiological examinations, clinical data, and operation notes were evaluated, and additional follow-up information was obtained from outpatient examinations, telephone calls, and questionnaires.

Four groups could be distinguished according to dural attachment as follows: 1) 15 spinocranial meningiomas originated from the spinal canal and extended intracranially; 25 craniocervical meningiomas of intracranial origin were divided into 2) meningiomas of the lower clivus (10 patients with 11 tumors), 3) lateral meningiomas (11 patients with 12 tumors), and 4) posterior meningiomas (2 patients). Standard midline or lateral suboccipital approaches with opening of the foramen magnum and laminectomy of the involved cervical segments were sufficient for the great majority of tumors. In seven instances only, drilling the posterior third of an occipital condyle was needed. Twelve of 15 spinocranial meningiomas and 13 of 25 craniocervical meningiomas could be removed totally. One patient underwent ventriculoperitoneal shunting only. With a rate of 63% of totally removed and 30% of subtotally removed meningiomas in this region, we observed clinical recurrences for two patients only. Complications were encountered in 30% of patients, predominantly with recurrent and/or infiltrative or en plaque meningiomas. Whereas motor weakness and gait ataxia tended to improve postoperatively, cranial nerve deficits usually remained unaltered.

The relationship of the tumor to neighboring structures, i.e., the vertebral artery in particular, determines its resectability [13].

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19 patients with ventral or ventrolateral foramen magnum meningiomas operated on via the dorsolateral, suboccipital transcondylar access route. It is emphasized that the microsurgical management of these lesions includes two important aspects which increase the safety of the procedure: a meticulous preoperative planning based on the microanatomical details of each patient, as well as an individualized tailoring of the surgical approach. There were no deaths, and, in the past 5 years, no neurological complications in this series. Gross total removal of the tumour was achieved in each case. It is concluded that microsurgical removal of ventral or ventrolateral foramen magnum meningiomas with this technique constitutes a safe and recommendable procedure [14].

1990

Three cases of foramen magnum meningioma. The first involved a ventral type tumor extending to the second cervical body. Following bilateral mandibulotomy, surgery was performed via the anterior transoral approach and the tumor was totally removed. Nine days postoperatively, she developed meningitis, which was successfully treated with antibiotics. The second patient's tumor was dorsal

type and was deeply embedded in the lateral part of the vermis. The tumor was totally removed via the midline suboccipital approach and she recovered uneventfully, with only slight upper-extremity paresthesia. In the third case, the tumor was ventral type and situated mainly in the clivus. Craniotomy was performed by the bilateral suboccipital approach and extended nearly to the jugular tubercle. The tumor, which severely displaced the lower cranial and upper cervical nerves, was totally removed. The postoperative course was lengthy and complicated. Artificial ventilation was required for 2 months, and difficulty in swallowing persisted during long-term follow-up. As illustrated by the second case, dorsal and lateral type foramen magnum meningiomas can usually be removed via the lateral suboccipital approach. In the case of ventral type tumors, the anterior transoral approach entails the risk of infection, as occurred in the first case. The authors conclude that the lateral suboccipital approach is preferable; craniotomy extending to the jugular tubercle lowers the risk of brainstem damage [15].

1986

Seven cases of the foramen magnum tumors were presented with the clinical manifestations and surgical consideration. Early clinical symptoms of the cases with extramedullary lesions were suboccipital neck pain followed by dysesthesia, clumsiness of hand and weakness. On the other hand, early symptoms of the cases with intramedullary lesions were dysesthesia, often followed by swallowing difficulty or hoarsness, which may have some difference from the clinical course of the extramedullary tumor cases. CT scan was remarkably useful in the diagnosis of the foramen magnum tumor. Surgical treatment was done to 6 cases: Five of these cases were operated by suboccipital craniectomy, and one case with an anteriorly located meningioma in the foramen magnum region was operated by transoral approach. Total removal could be performed in the case without damage to the medulla or spinal cord [16].

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