Hemodynamic Alterations during weaning from mechanical ventialtion

Original Article

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ABSTRACT

Background: Cardiac dysfunction can prevent successful discontinuation of mechanical ventilation. An estimated 9% to 37% of all mechanically ventilated patients exhibit significant difficulty during the transition from positive pressure to spontaneous ventilation or weaning. This study aims to describe and compare hemodynamic parameters between baseline mechanical ventilation and pressure support mode weaning trial.

Methods: One hundred thirty – Two patients were involved in this study and received mechanical ventilation and divided into two groups according to the success of spontaneous breathing trial. Hemodynamics data was recorded by connection to the monitoring system, cental line was inserted and cardiac output was evaluated by transthoracic echo at the following time **points:** Baseline during the last 6 hours of mechanical ventilation before the weaning trial, Half an Hour, One Hour after the start of the weaning trial and End of the Trial 2-hour from weaning trial.

Results: In the fourth assessment after extubation, the group with successful spontaneous ventilation exhibited significantly better outcomes compared to the unsuccessful group.This highlights the importance of these hemodynamic parameters in predicting weaning success.

Conclusion: During the fourth assessment after extubation, there were significantly superior outcomes across multiple hemodynamic parameters. Specifically, marked improvements in heart rate, blood pressure (both systolic and diastolic), oxygen saturation, and cardiac index in Group 1 compared to Group 2. These findings suggested the important role of these hemodynamic parameters in delineating successful transitions from mechanical ventilation to spontaneous breathing.

Key Words: cardiac index,hemodynamics alterations, mechanical ventilation,,Spontaneous breathing trial, weaning.

Received: 01 December 2024, **Accepted:** 21 january 2025

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ISSN: 2812-5509, 2024

BACKGROUND:

Meningioma is the most frequent primary intracranial tumor type, accounting for a significant portion. Primary intracranial tumors account for a specific percentage, which ranges from 14.3% to 19% of all central nervous system (CNS) tumors, comprising approximately 34-36.4% of the total [1].

Meningiomas can be in various areas, such as the parasagittal region, the convexity of the brain, the tuberculum sellae, the sphenoidal wing, the olfactory groove, the falx, and other sites. Meningiomas with a sphenoidal wing origin account for 11.9% of all meningioma cases. As new diagnostic procedures such as Computed tomography (CT) Scan and Magnetic resonance Imaging (MRI) become more prevalent, technical issues now dominate, suggesting that it is more logical to classify these tumors into three separate groups: lateral sphenoid wing meningioma, middle third, and medial sphenoid wing meningioma (MSWMs) [2].

The MSWMs originate from this distinct boundary dividing the subfrontal area from the middle cranial fossa. The sphenoid wing extends laterally from the anterior

DOI: 10.21608/ARCMED.2025.340969.1064

clinoidal process, curving outward in a horizontal plane until it broadens and becomes obscured within the pterional region of the cranial vault [3].

The anterior clinoid process contains a complex anatomical structure, due to the presence of several vital neurovascular structures in the area; specifically, the third cranial nerve (oculomotor) courses along the superolateral margin, where the meningeal branches of the middle meningeal artery originate from the sharp boundary between the subfrontal region and the middle cranial fossa. MSWM is a non-threatening tumour that can grow quite large and encroach on the parasellar area, including its front-to-back and side-to-side expansions. As a result, the tumour may protrude laterally into the cavernous sinus (CS) or posteriorly into the petroclival region [4, 5]. The involvement of the central spinal cord is a key factor influencing the degree of surgical resection of medullary syringomyelia-related waste material. Resection of a meningioma which has invaded the CS can result in a high risk of complications and potentially death due to the interruption of blood supply to cranial nerves and damage to the internal carotid artery (ICA) [6, 7].

Subtotal resection (STR) and gross total resection (GTR) of MSWMs are types of surgical resection, and while studies have found little difference between these approaches, others have reported comparable recurrence rates after both STR and GTR, the application of stereotactic radiosurgery (Gamma knife) is also significant in managing MSWMs, as it has been shown to offer similar tumor control as microsurgery, but with a reduced risk of neurovascular damage [8].

The primary objective of this study was to evaluate and contrast the various treatment methods employed for managing MSWMs, as well as to examine the effects of these methods on postoperative clinical results in patients with MSWMs.

PATIENTS AND METHODS:

This prospective study was conducted on 33 patients, comprising both sexes, with meningiomas of varying sizes, all of which were confined to the medial sphenoid wing, across different age groups. This research was conducted between June 2022 and October 2023, following ethical clearance from the Ethical Committee. Written consent, informed and in writing, was obtained from the patients.

Exclusion criteria were recurrent cases or cases had previously undergone stereotactic radiosurgery for their tumor, those of Glasgow Coma Scale less than or equal to eight, patients who do not complete their follow up data, patients with multiple meningioma and patients with neurofibromatosis type two.

All patients were subjected to complete history taking, clinical, neurological and ophthalmological examination, laboratory investigations [complete blood picture, bleeding and clotting times, fasting and two hours post prandial blood glucose, prothrombin time and concentration, liver and kidney function tests and endocrinological tests], and radiological investigations [MRI, CT scans, electrocardiogram (ECG), X-ray chest and abdominal sonography].

All patients diagnosed as MSWMs are divided into three groups according to the line of treatment either surgery alone, stereotactic radiosurgery alone or combined surgery and stereotactic radiosurgery: Group (1): tumor is on medial sphenoid wing but there no invasion of CS nor encroching carotid artery and not small (more than 3cm in maximum dimensions) was treated with surgery alone. Group (2): tumor is involved in CS (intracavernous) or encroching carotid artery and small (less than 3cm in maximum dimensions) was treated with stereotactic radiosurgery alone. Group (3): tumor is on medial sphenoid wing, invades CS or more than 3cm in size was treated with combined surgery and stereotactic radiosurgery for the residual.

Preoperatively,antibiotics(third generation cephalosporins) were administered to all cases in this study, starting at the time of anesthesia induction (2 gm), and continuing for at least a week following surgery (1 gm every 12 hours). Steroids (16 mg as a loading dose, then 8 mg every 6 hours after that) were started for 48 hours at least before surgery, continued during surgery, and gradually tapered in 2 days following the surgery. Antiepleptic (phenytoin) were given also to all cases in loading (15 mg/kg) and maintenance doses.

Surgical procedure:

The patients were lying on their backs during their general anesthesia. A lumbar drainage procedure has not been undertaken. The head was positioned at a 15-degree angle above the heart and secured in a three-point fixation head holder to facilitate venous drainage. The eyes were covered. Rotating the head thirty degrees to the side opposite the tumor allowed the sphenoid ridge to be oriented vertically. In cases where large tumors obscured and distorted normal brain landmarks, a vertically oriented sphenoid ridge played a crucial role in helping surgeons maintain spatial orientation during the initial tumor removal surgery. To reduce brain retraction during the surgery, the head was angled so that the mento-nasal line became horizontal, and the vertex pointed downwards. A curved skin incision began 1cm in front of the tragus, extended upwards along the temporal crest to the superior temporal line, and then turned forward, ending at the midline behind the hairline. To protect the frontal branch of the facial nerve, a subfascial dissection was performed. The pericranium was cut near the midline at the supraorbital ridge, curving backwards 5cm to intersect the superior temporal line, after which all the layers of the fascia were incised downwards towards the zygomatic arch. The fascia is separated from the temporalis muscle and from the zygomatic arch and then reflected outwards and to the side. The supraorbital nerve should be preserved when elevating the pericranium at the location of the supraorbital ridge. The temporalis muscle is cut along its length on the fascia and carefully separated from the bone, preserving a part of the muscle attached to the temporal line to facilitate later reconstruction. The muscle is reflected anteriorly and inferiorly.

Frontotemporal free bone flap was performed using three burr holes: Immediately above the frontozygomatic suture, beneath the most anterior extension of the superior temporal line, is the first burr hole, also known as the "keyhole." On the frontal bone, 4 cm from the keyhole and near the superior orbital rim, is where the second burr hole is located. One centimeter below the petrol, on the squamous temporal bone, behind the saphenofemoral suture, is where the third burr hole is made. The keyhole is connected to the third foramen with a high-speed drill or Kerrison punch followed by a wide perforation of the lateral sphenoid bone after the craniotomy is performed, a wide perforation of the sphenoid crest is performed with wax-up bone control, the medial extension of the puncture was the orbital meningeal artery which is a landmark for the superior orbital fissure and this artery is a major source of meninges. meningiomas of the sphenoid arm. The anterior clinoid is routinely removed at this stage of surgery because aggressive bone removal facilitates extradural devascularization of the tumor and may improve gross tumor removal, especially if the clinoid is infiltrated by tumor. The optic canal and orbital bone were not systematically removed at this stage of the operation. The dural fold at the level of the meningioorbital artery is then incised to allow detachment of the temporal lobe dura mater from its attachment to the frontal dura mater through the sphenoid bone. into the anterior clinoid process. This brings the anterior clinoid process to a more superficial point. This procedure of exposing the anterior clinoid process itself leads to significant devascularization of the tumor, which receives its blood supply from the anterior dural branches of the middle meningeal artery and from the meningioorbital artery. The exposure of the clinoid ICA and the subsequent exposure of the arterial branches of the Sylvian fissure provided the two normal ends of the vascular tree, which could then be dissected proximally and distally while respecting the tumor. The dura mater is opened in a C-shape at the base, reflected and attached to the temporal muscle, and the operating microscope is introduced into the field. The arachnoid of the Sylvian fissure is dissected to drain the cerebrospinal fluid (CSF) from the Sylvian cistern, which is opened widely, exposing the lateral extension of the tumor in the Sylvian fissure and operates through the Transylvanian approach. The anterior temporal transit veins, covering the lateral aspect of the tumor, were coagulated and divided. Frontal and temporal lobe retractors were placed more to protect cortical surfaces than to actively retract the lobes, which generally do not require retraction after proper patient positioning and cerebrospinal fluid release.

Single-layer cotton pads were placed under the retractors to avoid adhesion and damage to the cortical surface during long operations, reduction was performed with CUSA or microscissors and bipolar cauterization. Dissection of the tumor from the branches of the middle cerebral artery (MCA) is performed and followed along the MCA to the carotid bifurcation, if the tumor involves blood vessels, a small, coagulated portion of the tumor may be left in the vessel. in the framework of in the process of removing the anterior clinoids, the optic canal is decompressed by removing the optic support and the optic roof. The dural layer over the optic canal is opened along the optic nerve. This provides access to the tumor extending into the optic canal (more common in type III tumors). The tumor is followed along its extension into the orbit. Extra care is taken when dissecting the optic nerve to preserve the very small blood vessels that supply the optic canal from the superior branches of the pituitary gland. It is also important to note that the direct arterial supply of the ophthalmic artery near its origin can sometimes be inadvertently damaged. This is best avoided by performing a careful dissection with magnification and having an anatomical knowledge of these vessels. In tumors extending into the suprasellar and subchiasmatic regions, it is important to dissect the dural ring around the ICA to widen the space between the ICA and the ACI. optic nerve to access tumor segments located in the subchiasmatic and possibly retrochiasmatic regions. The objective of the surgery should be to treat the remaining tumor with a Gamma Knife according to the extent of the tumor. Good judgment is exercised in determining the extent of tumor resection to avoid injury to adherent vessels and to avoid additional morbidity. When the appropriate degree of resection is achieved, the reconstruction of the base of the skull is done carefully. Dural defects are reconstructed with the pericranium. The closure is strengthened with duration. Repositioning of the bone flap. The temporalis muscle is sutured to its trunk and the temporalis fascia is realigned. At the end, the skin is closed with drainage.

Postoperatively, patients were kept under close observation in the intensive care unit (ICU) of neurosurgery department for at least 24 hours. An hourly checkup was made for the blood pressure, pulse rate, temperature, respiratory rate, fluid intake, urinary output, conscious level, papillary reaction and motor power. Serum electrolytes, hematocrit and blood gases were immediately postoperatively for most cases. Antibiotics continued for at least one week after surgery. Steroids were gradually withdrawn within 2 days. CT scans within 48 hours after the operation to detect any residual tumor or late hematoma.

Follow-up: all patients' early postoperative data was

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assessed, and after that, they were monitored as outpatients. A late evaluation was conducted to look for any recurrence of the removed tumor, both radiologically (using MRI) and clinically (assessing any improvement or deterioration in the symptomatology). Three months later, all patients were called for their initial follow-up, and six months later, they received clinical exams and contrast-enhanced MRI.

The outcome was using two lines of Snellen acuity to measure changes in VA: improvement or worsening; transitioning from light inspection to hand motion or transitioning from hand motion to figures-countering.

Statistical analysis

Statistical analysis was conducted utilizing the SPSS v26 software package (developed by IBM Inc., based in Chicago, Illinois, USA). Quantitative variables were presented as the mean and standard deviation, with comparisons made between three groups via the ANOVA test (F-statistic) and subsequent post hoc analysis using the Tukey test. The qualitative variables were displayed in terms of frequency and percentage and were then analyzed through the use of a Chi-square test. A two-tailed p-value less than 0.05 was considered statistically significant.

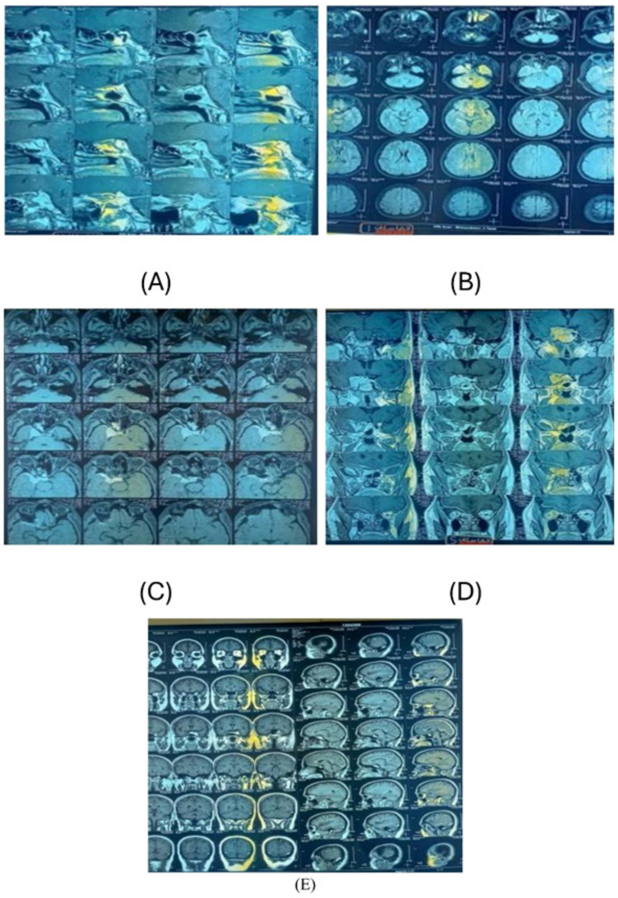
RESULTS:

Demographic characteristics, preoperative clinical presentation, blurring of vision, affected visual field, optic atrophy and site were insignificantly different between both groups. Papilledema was significantly higher in group 1 compared to group 2 ($P<0.05$). There was a significant difference between three studied groups regarding histopathology ($P<0.05$). Table 1

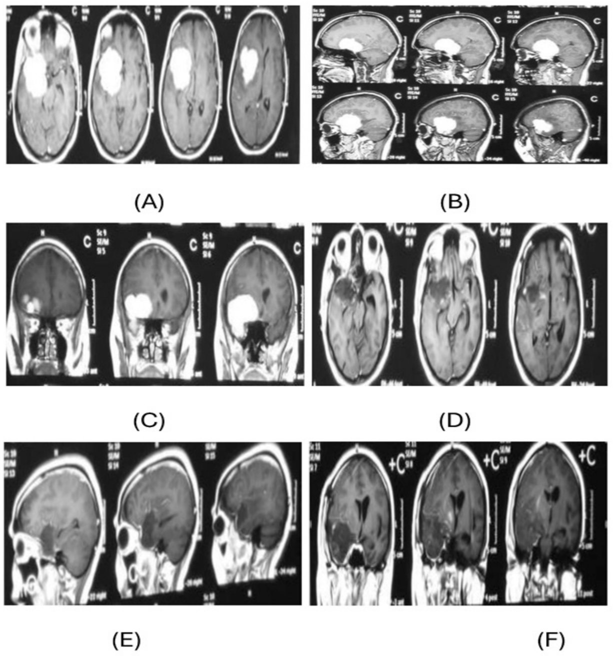
No significant differences were observed among the three groups studied in terms of the 3rd, 4th, and 6th cranial nerves, as well as homogenous, heterogeneous, calcification, and demo graphic characteristics. Hyperostosis levels were significantly higher in group 3 than in group 2 (P<0.05). Vascular intrusion was significantly more prevalent in groups 2 and 3 compared to group 1 (P<0.05). The surgical method and vascular removal revealed a considerable disparity among the three investigated groups (P<0.05). Table 2

Postoperative complications, recurrence, headache and fits were insignificantly different between both groups. None of cases in the three groups regarding mortality. Postoperative vision was significantly improved in group 1 and 3 compared to group 2 ($P<0.05$). Table 3

Case 1: A female -58Y with Rt MSWM complained of rt eye proptosis, decreased vision bilaterally more on the rt eye and severe headache, had history of menstrual al irregularity, no hx of DM no HTN surgically excised subtotally with residual due to CS involvement via extended pterional approach, histopathology was transitional meningioma GI, treated with Gamma Knife Surgery (GKS) for the residual post operative parasellar, CS and intra orbital meningioma encasing rt optic nerve, the lesion received 12 gray to 45 isodose curve and tumor control (even regression detected) in follow up for more than 1 years. Figure 1 Q2



Case 2: A female -39Y with Rt MSWM complained of fits and severe headache surgically excised totally via extended pterional approach, histopathology was meningiothelial meningioma GI. Figure 2



DISCUSSION

The most typical site of skull base meningiomas is the sphenoid wing. Most sphenoid wing meningiomas are histopathologically benign [1].

This investigation performed is an important modality for investigating these tumors giving a clear three plane picture of the tumor location, dural enhancement, intra-parenchymal invasion, vascular encasement, state of the surrounding vasculature,intratumoral changes, approximate degree of vascularity, and other soft tissue details important for planning the surgical management of these patients. In our study we found, MRI was superior in evaluating the tumor's relationship to the nearby vascular structures. The signal void produced by flowing blood produced a high contrast to the adjacent soft tissue intensity of the tumor. Ojemann [9] found that the tumor's soft tissue plaque is visible on an MRI, but the degree of the hyperostosis must be determined using a CT scan with bone windows.

In agreement with our results about MRI, Nakano et al.[10] reported a considerable association between the tumor's size and perifocal edema incidence, with less incidence of edema in smaller tumors. Russell SM, Benjamin V[11] reported that all their individuals with meningiomas of the medial sphenoid wings had vascular encasement. Nakamura et al. [12] found arterial encasement in 91% of all cases.

In our study we have 33 patients of medial sphenoid meningiomas. Russell SM and Benjamin V. [11] because individuals with meningiomas of the medial sphenoid wing frequently do not complain and present until the tumors have grown to a size of more than 3 cm and have begun to surround or dispense with the optic nerves, surgical resection is still the accepted standard of care for these patients

Postoperative Hemorrhage was reported in a case in group, (1), CSF leakage was reported in a case in group, (1) and in one case in group, (3) and dural repair required only in 1 patient and the remaining resolved with repeated dressing while infection was reported in one case in group (3). In a series by Ojemann [9] including 7 cases of outer and middle sphenoidal meningiomas in 1992 All seven patients had complete removal of the tumor, there were no complications, there has been no recurrence. Brotchi and Bonnal, [13] reported similar results with nine patients.

In the series of Morokkoff et al. [14] including 163 cases, all patients passed without mortality and with (1.7%) development of new neurological deficit and total complication rate (9.4%). In the early days of microsurgery, the rate of surgical death could reach 43%; however, mortality rate ranging from 0% to 15% has been reported in most recent studies, including this series.

No mortality occurred in our series also in Abdel-Aziz et al. [15].

A rate of surgical mortality of 1.9% was reported by Bassiouni et al. [16] based on 2 surgical deaths. Acute subdural hematoma located contralaterally to the site of surgery occurred in one patient during the tumor excision procedure. Following the removal of a large meningioma measuring 7.5 cm, the other patient experienced an MCA infarction. On the eighth day after surgery, the patient passed away from global brain edema.

surgical outcomes for the ocular motor nerve function and postoperative visual acuity (VA) following removal of meningiomas with ACP. Early after surgery, VA increased in 37% of patients in the Bassiouni et al. [16] series, Stayed the same in 51%, and declined in 12% of patients. VA improved in 61.1% of our series, stayed unchanged at 38.9%, and no patients declined soon after surgery. Additionally, Patients who had visual loss prior to surgery did not experience any improvement, which is in line with other reports.

Limitations of this study included that sample size was relatively small.

CONCLUSIONS:

MSWM lesions are more common in females and peak in incidence between the ages of 40 and 60. The surgical management of sphenoid wing meningiomas remains a difficult task for neurosurgeons. Sphenoid wing meningioma surgery presents a range of difficulties due to the intricate anatomy of the sphenoid area. The primary factors that should guide the choice to operate on these tumors are patient's clinical status and tumor's radiological findings. The degree of tumor resectability is significantly influenced by the meningioma's location. Limiting factors for radical removal include the encasement of MCA and their branches, as well as their extension into the superior orbital fissure and the CS. Recurrence is caused by the presence of hyperostosis, incomplete tumor removal, and atypical histopathological variant. Meningiomas originating from the medial sphenoid wing can lead to compression and encasement of the carotid artery, its branches, the pituitary stalk, and the optic apparatus. Cerebral angiography and MRI are valuable tools in surgical planning, providing insight into the mass's attachment, relationship with vessels, and impact on nerves. The Extended pterional approach with early extradural tumor devascularization including extradural unroofing of the optic canal, extradural clinoidectomy, with early optic nerve decompression and use of surgical microscope are associated with decreased morbidity and mortality and better functional and visual outcome. During surgery, close links were found between postoperative complications and the presence of tumors in critical neurovascular structures that had become encased or were adhering to them. Our suggestion is to retain an intra-carriage segment, if it exists, as experience has shown it can improve the patient's quality of life following surgery. The use of radiosurgery is becoming more prevalent in managing residual or primary lesions. Nonetheless, surgery is still required for almost all patients with MSWM. For a better functional outcome, a conservative surgical approach for clinoidal and sphenocavernous meningiomas should be considered.

List of abbreviations:

CNS: Central nervous system

CS: Cavernous sinus

CSF: Cerebrospinal fluid

CT: Computed tomography

ECG: Electrocardiogram

GSK: Gamma knife surgery

GTR: Gross total resection

ICA: Internal carotid artery

ICU: Intensive care unit

MCA: Middle cerebral artery

MRI: Magnetic resonance imaging

MRI: Magnetic resonance imaging

MSWMs: Medial Sphenoid Wing Meningiomas

STR: Subtotal resection

VA: Visual acuity

DECLARATIONS:

ETHICS APPROVAL AND CONSENT TO PARTICIPATE:

The study was done from June 2022 and October 2023 after approval from the Ethical Committee Military Medical Academy, Cairo, Egypt. An informed written consent was obtained from the patients.

CONSENT FOR PUBLICATION:

Not applicable

AVAILABILITY OF DATA AND MATERIAL:

Data is available on reasonable requests from corresponding author.

COMPETING INTERESTS:

Not applicable.

FUNDING:

No funding was received for conducting this study.

AUTHORS' CONTRIBUTIONS:

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Mohamed Abdelmonem Mohamed], [Hussein Atef Elbakeiey] and [Osama Mohamed Fahmy]. The first draft of the manuscript was written by [Magdy Elsayed Hassan Rashed] and all authors commented on previous versions of the manuscript. All authors read and approved of the final manuscript.

ACKNOWLEDGEMENTS:

Not applicable.

REFERENCES:

1. Güdük M, Özduman K, Pamir MN.(2019) Sphenoid wing meningiomas: surgical outcomes in a series of 141 cases and proposal of a scoring system predicting extent of resection. World Neurosurg.125:48-59.
2. da Silva CE, Zanatta C, Thibes AC, Vidaletti T.(2022) Sphenoid wing meningiomas with secondary cavernous sinus invasion: surgical results and algorithm for treatment at a single brazilian center. World Neurosurg.163:635-46.
3. Sankhla S.(2016) Medial sphenoid wing meningioma. Neurol India.64:476-7.
4. Kumar VR, Madhugiri VS, Karthikayan A, Ratha V, Bapu S.(2022) Simplifying the surgical strategy for excising medial sphenoid wing meningiomas: a stepwise approach. Neurol India.70:928-33.
5. Saeed P, van Furth WR, Tanck M, Freling N, van der Sprenkel JWB, Stalpers LJ, et al.(2011) Surgical treatment of sphenoorbital meningiomas. Br J Ophthalmol.95:996-1000.
6. Güdük M, Özduman K, Pamir MN.(2019) Sphenoid wing meningiomas: surgical outcomes in a series of 141 cases and proposal of a scoring system predicting extent of resection. World Neurosurg.125:e48-e59.
7. Mariniello G, de Divitiis O, Corvino S, Strianese D, Iuliano A, Bonavolontà G, et al.(2022) Recurrences of spheno-orbital meningiomas: risk factors and management. World Neurosurg.161:514-22.
8. Lee KS, Zhang JJ, Kirollos R, Santarius T, Nga VDW, Yeo TT.(2022) A systematic review and meta-analysis of the association between cyproterone acetate and intracranial meningiomas. Sci Rep.12:19-42.
9. Ojemann R.(2000) Sphenoidal wing meningiomas. Oper Neurosurg.50:605-10.
10. Nakano T, Asano K, Miura H, Itoh S, Suzuki S.(2002) Meningiomas with brain edema: radiological

characteristics on MRI and review of the literature. Clin Imaging.26:243-9.

11. Russell SM, Benjamin V.(2008) Medial sphenoid ridge meningiomas: classification, microsurgical anatomy, operative nuances, and long-term surgical outcome in 35 consecutive patients. J Neurosurg.62:38-50.

12. Roser F, Nakamura M, Jacobs C, Vorkapic P, Samii M.(2005) Sphenoid wing meningiomas with osseous involvement. Surg Neurol.64:37-43.

13. Pirotte BJ, Brotchi J. Lateral and Middle Sphenoid Wing Meningiomas. Meningiomas. 2nd ed: Springer; 2006. p. 371-8.

14. Morokoff AP, Zauberman J, Black PM.(2008) Surgery for convexity meningiomas. J Neurosurg.63:427-4.

15. Abdel-Aziz KM, Froelich SC, Dagnew E, Jean W, Breneman JC, Zuccarello M, et al.(2004) Large sphenoid wing meningiomas involving the cavernous sinus: conservative surgical strategies for better functional outcomes. J Neurosurg.54:1375-4.

16. Bassiouni H, Asgari S, Sandalcioglu IE, Seifert V, Stolke D, Marquardt G.(2009) Anterior clinoidal meningiomas: functional outcome after microsurgical resection in a consecutive series of 106 patients. Clinical article. J Neurosurg.111:1078-90.

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