Sphenopetroclival meningioma

- Comprehensive analysis of the distribution of dural artery-derived tumor-feeding arteries in intracranial meningiomas
- Giant Meningiomas Invading the Cavernous Sinus: The "Inevitable Ones"
- Factors Influencing Long-Term Outcomes of Single-Session Gamma Knife Radiosurgery in Large-Volume Meningiomas >10 cc
- Combined Transpetrosal Approach: 2-Dimensional Operative Video
- Impact of the Extent of Microsurgical Resection in Sphenopetro-clival Meningiomas Trough a Multistaged Approach: A Volumetric Analysis
- The Minimally Invasive Posterolateral Transcavernous-Transtentorial Approach. Technical Nuances, Proof of Feasibility, and Surgical Outcomes Throughout a Case Series of Sphenopetroclival Meningiomas
- Evaluation of classification of petroclival meningiomas and proposed selection of microsurgical approach: a single center experience of 179 cases
- Total Petrosectomy for the Total Resection of Sphenopetroclival Meningioma: 2-Dimensional Operative Video

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Petroclival meningiomas extending into the parasellar region.

Sphenopetroclival meningiomas are often considered complex and challenging to treat because of their location.

Clinical features

These tumors can compress or invade surrounding structures, leading to various neurological symptoms, such as headaches, hearing loss, facial numbness, balance issues, and other deficits. The specific symptoms and impact on an individual's health can vary depending on the tumor's size and location.

Diagnosis

Typically involves neuroimaging, such as MRI or CT scans, to visualize and determine the location and extent of the tumor.

Treatment

Treatment options for sphenopetroclival meningiomas may include:

Observation: For small, asymptomatic tumors, doctors may choose to monitor them with regular imaging to assess their growth and the development of symptoms.

Surgery: Surgical resection is often the primary treatment, but it can be complex due to the tumor's location and the proximity of critical structures. Surgeons aim to remove as much of the tumor as possible while preserving neurological function.

Radiation Therapy: If complete surgical removal is not possible, radiation therapy may be used to target any remaining tumor cells. This approach is also used for tumors that recur after surgery.

Other Treatments: In some cases, other therapies or approaches, such as stereotactic radiosurgery or embolization, may be considered based on the tumor's specific characteristics and the patient's overall health.

The management of sphenopetroclival meningiomas typically involves a multidisciplinary team of healthcare professionals, including neurosurgeons, radiation oncologists, and neurologists, to develop an individualized treatment plan that aims to balance tumor control and preserving neurological function. The prognosis and long-term outcomes can vary depending on several factors, including the tumor's size, location, and the success of treatment. It's essential for individuals diagnosed with sphenopetroclival meningiomas to consult with medical experts to discuss the best treatment options for their specific case.

Surgery

see Kawase approach.

Case series

Fourteen patients harboring SPC meningiomas were surgically treated through a Minimally Invasive Posterolateral Transcavernous-Transtentorial Approach (MIPLATTA). MIPLATTA includes a mini-pterional craniotomy, anterior extradural clinoidectomy, peeling of the temporal fossa, decompression of cranial nerves (CNs) in the cavernous sinus, and sectioning of the tentorium to reach the upper part of the posterior fossa.

Gross total resection was achieved in 11 of 14 patients (78%), whereas near total resection was accomplished in the other 3 patients (22%), each of whom underwent a further complementary retrosigmoid approach for gross total resection. There were no deaths, and 13 of 14 patients were independent at 6 months follow-up (modified Rankin Scale score ≤2). One patient had pontine infarction after the procedure and experienced moderate disability at follow-up (modified Rankin Scale score 3). All patients had some degree of CN impairment. Of 38 cranial neuropathies, 15 (39%) improved, 20 (53%) remained stable, and 3 (8%) worsened postoperatively. Four new CN deficits were observed postoperatively in 3 patients (fourth CN, 2 patients; third CN, 1; fifth CN, 1).

MIPLATTA is a useful and safe treatment alternative that allows resection of large SPC tumors with dominant invasion of cavernous sinus and middle fossa, preserves hearing and facial motor function, and provides good chances of recovery of visual and oculomotor deficits [1)].

In summary, the study suggests that MIPLATTA is a useful and safe approach for treating large SPC

meningiomas, with promising outcomes in terms of tumor resection, cranial nerve preservation, and patient independence. However, the study's small sample size, short-term follow-up, and potential selection bias should be considered when interpreting the results. Larger studies with longer-term follow-up and comparative analyses may provide more comprehensive insights into the effectiveness of MIPLATTA and its role in the management of SPC meningiomas.

Over a period of 4 years, patients with SPCMs were treated using a middle fossa approach versus posterior fossa approach, or a two-stage surgery combining both approaches, based on the tumor location in relation to the petrous ridge and tumor volume. Retrospectively, all cases were analyzed with regard to tumor volume, extent of resection (EOR), functional outcome, and complications. Twenty-seven patients with SPCMs met the inclusion criteria, and the mean follow-up was 24.8 months. Eleven patients underwent a two-stage surgery, while 16 patients had their sphenopetroclival meningioma resected via a single craniotomy. Mean EOR was 87.6% and gross total resection was achieved in 48% of patients. Patients with greater EOR had better functional outcomes ($r = 0.81$, $p < 0.01$). Greater EOR was not accompanied by a significant increase in surgical complications. There was a trend toward lower postoperative volumes and better EOR with our two-stage approach (2.2 vs. 3.2 cm 3 , $p = 0.09$; and 94.1 vs. 91.2%, $p = 0.49$, respectively), without an increase in the rate of complications (18.7 vs. 18.2%, $p = 0.5$). Staging of the surgical resection of larger tumors may lead to greater EOR, and this strategy should be considered for larger tumors [2)]

In summary, while the study provides valuable insights into the surgical management of SPCMs, it has limitations such as a small sample size, a retrospective design, and a relatively short follow-up period. The findings should be interpreted with caution, and further research with larger sample sizes, longer follow-up, and possibly a prospective design is needed to draw more definitive conclusions about the optimal surgical approaches for SPCMs.

Case reports

Sphenopetroclival meningioma is a most formidable meningioma. Many patients have few preoperative deficits and surgery has the potential of severe neurological complications. Surgical treatment is challenging due to brainstem compression, the involvement of multiple cranial nerves and cerebral vessels. Wide tumor exposure, multiple dissection axis, and short distance are paramount factors in the quest of achieving total removal of Simpson grade I, including the involved dura and bone. The posterior petrosal, transtentorial presigmoid approach offers a wide and shallow operative field.1-7 When the patient has hearing loss, extending the resection of the temporal bone provides unmatchable exposure facilitating safer and more complete tumor removal. This article demonstrates the removal of a sphenopetroclival meningioma through total petrosectomy with closing of the external auditory canal and preservation of the facial nerve in the Fallopian canal. A total resection of the tumor was achieved with long-term preservation of cranial nerve function. The surgical steps of total petrosectomy are shown, including the skin flap, combined middle and posterior fossa craniotomy, skeletonization of the sigmoid transverse sinus, radical mastoidectomy, dissection of the Fallopian canal, and drilling of the labyrinth, cochlea, and petrous apex for superb exposure.8 We demonstrate the intra-arachnoidal microsurgical dissection utilized for the radical resection of petroclival meningioma. This surgery performed in 1995 is a testament to the time-tested technique [3)].

A report presents a new surgical method and the results in 10 patients with petroclival meningiomas extending into the parasellar region (sphenopetroclival meningiomas). Minimal but effective extradural resection of the anterior petrous bone via a middle fossa craniotomy offered a direct view of the clival area with preservation of the temporal bridging veins and cochlear organs. The dural incision was extended anteriorly to Meckel's cave, and in cases with invasion of the cavernous sinus, Parkinson's triangle was enlarged by mobilization of the trigeminal nerve. This approach offered an excellent view from the mid-clivus to the cavernous sinus. Extra-as well as intradural tumor masses and dural attachments could be cleared under direct view of the pontine surface. The risk of injury to the lower cranial nerve and of retraction damage to the temporal lobe and brain stem were kept minimal by this approach. Total tumor resection was achieved in 7 patients, with no resultant mortality. Eight patients had a satisfactory postsurgical course, extraocular paresis being their main complaint. The extent of tumor resection depended on the degree of tumor adhesion to the carotid artery, and operative morbidity on the degree of tumor invasion of the brain stem. Of the 3 patients in whom subtotal tumor removal was achieved, only one experienced regrowth of the tumor and underwent a second operation during the follow-up period (6 months-6 years) [4].

1)
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2)
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4)
Kawase T, Shiobara R, Toya S. Anterior transpetrosal-transtentorial approach for sphenopetroclival meningiomas: surgical method and results in 10 patients. Neurosurgery. 1991 Jun;28(6):869-75; discussion 875-6. PubMed PMID: 2067611.