Petroclival meningioma

- Face the Pain: Radiobiological and Clinical Considerations of Re-radiosurgery to the Trigeminal Nerve Following Irradiation of an Abutting Petroclival Meningioma
- Efficacy and safety of stereotactic radiosurgery for petroclival meningiomas: A systematic review and Meta-Analysis
- Trigeminal neuralgia caused by compression of the trigeminal nerve between the vertebral artery and Meckel's cave meningioma extending to the posterior fossa successfully treated with the endoscopic-assisted anterior petrosal approach
- Diverse accessory techniques and working corridors to enhance the retrosigmoid approach: a versatile option for the treatment of meningiomas of the petroclival region
- Clinical features of intrasellar meningiomas treated with endoscopic endonasal surgery: a case series and comparison with other parasellar meningiomas and a literature review
- Clinical outcomes of the neuroendoscopic far lateral supracerebellar infratentorial approach for resection of deep brain lesions
- Giant Meningiomas Invading the Cavernous Sinus: The "Inevitable Ones"
- Abducens Nerve Duplication: Novel Intraoperative and Radiographic Observation of a Rare Anatomical Variant

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Petroclival meningiomas are lesions arising from the upper two thirds of the clivus with dural attachment centered on the petroclival junction. They are seated medial to the internal auditory meatus and posterior to the gasserian ganglion. This differentiates them from clivus meningiomas that arise close to the midline of the clivus [1) 2)].

Classification

They frequently invade the cavernous sinus and the Meckel’s cave area.

Sekhar et al. have developed a useful scheme that is based on the tumor's anatomical location along the clivus, mainly along the upper, middle, or lower clivus [3)].

Ichimura et al. classified this tumors into four subtypes according to the main attachment and trigeminal nerve deviation into, upper clivus (UC), cavernous sinus (CS), tentorium (TE), and petrous apex (PA).

The characteristic symptom was ataxia in the UC type (37.5%), abducens nerve palsy in the CS type (64.3%) and trigeminal neuropathy, mainly neuralgia in the PA type (80.0%) with a higher statistical difference from other subtypes.

This classification is useful to predict the relation between the tumour and the cranial nerves based on symptoms and images. The anterior transpetrosal approach could be used for all four subtypes and with an absolute indication in the UC and TE types showing middle fossa extension [4)].

see also Orbitosphenopetroclival meningioma

see also Sphenopetroclival meningioma.

Natural History

Although the natural history of these tumors involves a slow course, the incidence of cranial nerve deficits and the extent of tumor resection vary widely in the literature. Some reviews on this topic have been conducted, but data remain fragmentary and based on retrospective case series, which hinders attempts at meta-analysis [5].

Clinical Features

These disorders appear due to the cranial nerves and brainstem compression, as well as some vertebrobasilar circulation anomalies.

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They commonly present because of local mass effect. A symptom that proves challenging to definitively manage is trigeminal neuralgia (TN), which occurs in approximately 5% of PCM cases. To date, there is no consensus on whether microsurgical resection or stereotactic radiosurgery (SRS) leads to better outcomes in the treatment of TN secondary to PCM [6].

Hevia-Rodríguez P, Equiza J, Alonso-Lacabe M, de Goñi-García I, Sampron N. Posterior Circulation Ischemic Stroke Due to Bilateral Petroclival Meningiomas. Neurology. 2023 Aug 14:10.1212/WNL.0000000000207638. doi: 10.1212/WNL.0000000000207638. Epub ahead of print. PMID: 37580159.

Diagnosis

One of the most important and useful pieces of information in the preoperative evaluation of a large petroclival meningioma is the running course of the abducens nerve. The abducens nerve is small and has a long intracranial course, making it prone to compression by the tumor at various anatomical points. In relatively large tumors, it is difficult to confirm the entire course of the abducens nerve, even by heavy T2-thin slice imaging. Yang et al. report a case of successful preoperative estimation of

the course of the abducens nerve that aided in its complete preservation during the resection of a large petroclival tumor [7].

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a. of tentorium (AKA artery of Bernasconi and Cassinari): the blood supply of petroclival meningiomas

Treatment

see Petroclival meningioma treatment.

Outcome

The petroclival meningioma impairment scale (PCMIS) provides a specific tool for quantitative assessment of the patient's state [8]

The rarity of the tumor, different treatment philosophies, and variations in reporting complicate the outcome analysis. With this limitation in mind, Diluna et al. analyzed the literature on this disease and report the combined outcomes in a unified fashion in hopes that it will serve as a starting point for further prospective analysis. Data was extracted from all available reports on MEDLINE/PubMed published in English. All studies were retrospective and uncontrolled. The majority of studies represent the experience of a single surgeon at a single institution. Of the 19 studies with detailed demographic and outcome data, no data met criteria for meta-analysis. A total of 1000 patients were reported. The mean age of the patients was 50 years. The male to female ratio is 1:3. GTR (gross total resection) was reported in 49% of patients. Thirty-four percent of patients experienced some neurological deficit in the early postoperative period (<3 months). The most common morbidities reported were cranial nerve deficits (34.4% [range: 20 to 79%]) with facial nerve injury accounting for 19%, followed by motor deficits (14%), infection rates (1.6%), Cerebrospinal fluid fistulas (5%), hemorrhage (1.2%), and hydrocephalus (1%). Death within 1 year of surgery was reported for 1.4% of patients. Once considered untreatable, petroclival meningiomas can now be approached relatively safely. There, however, still remains an ~34% morbidity with the most common being cranial nerve. Despite this, >75% of patients return to independence at 1 year, many of which will resume employment. The nature of this study limits the conclusions that can be drawn; however, it provides some generalizations that may help guide patient questions regarding treatment outcomes [9].

They were originally considered largely unresectable. Until the 1970s, resection carried a 50% mortality rate, with very high rates of operative morbidity if attempted. However, in the past 40 years, advances in neuroimaging and approaches to the region were refined, and results from resection of petroclival meningiomas have become more acceptable. Today, the developments of a multitude of surgical approaches as well as innovations in neuroimaging and stereotactic radiotherapy have proved powerful options for multimodality management of these challenging tumors [10].

Outcomes can be improved, however by improving patients' psychosocial support; striving to decompress, preserve, and minimize dissection of ill-defined planes of cranial nerves; and using Simpson Grade 4 gamma knife approaches when radicality is precluded. Currently, the performance of transpetrosal surgery for petroclival meningiomas is a major undertaking that significantly affects a patient's health for several years; however, the combined transpetrosal surgical approach allowed a high degree of tumor control with relatively little neurological morbidity [11].

Petroclival meningiomas smaller than 2 cm carry a much smaller surgical risk than large tumours, and in unselected series the small tumours dilute information regarding the problematic larger tumours. Numbers for the rate of gross total resection and surgical morbidities given in the published unselected series differ widely: gross total resection between one-third and two-thirds, and surgical morbidity also between one-third and two-thirds [12)].

Al-Mefty et al., reported in 1988 thirteen patients harboring large petroclival meningiomas, there was no mortality, and total removal was achieved in all but two patients. Morbidity included cranial nerve deficit, pulmonary embolism, and hemiparesis [13)].

Case series

see Petroclival meningioma case series.

Case reports

Petroclival meningioma case reports.

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