Clival Meningioma

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 clival meningiomas that arise close to the midline of the clivus [1) 2)].

Clivus meningioma is either petroclival meningioma or foramen magnum meningioma.

Removal of clivus meningiomas is extremely difficult, because of their abundant vascularity and tight adhesion to many cranial nerves which are usually found running over the tumor.

The basilar artery is displaced posteriorly or entangled by the tumor, and at times one or both vertebral arteries may be involved.

Usually the midbrain,pons and medulla are indented by the tumor, so that separation of the tumor capsule from these structures is most hazardous, if possible at all.

Videos

Essayed W, Aboud E, Adada B, Al-Mefty O. Clival Meningioma: Remove the Bone to Pursue of Ventral Exposure: 2-Dimensional Operative Video. Oper Neurosurg (Hagerstown). 2022 Jan 14. doi: 10.1227/ONS.0000000000000108. Epub ahead of print. PMID: 35030142 [3)].

---

https://youtu.be/d3u5Qrc-zIM

Clival Meningioma Removal through a Suboccipital Retrosigmoid Approach: Operative Video and Technical Nuances
https://www.thieme-connect.com/products/ejournals/pdf/10.1055/s-0040-1705163.pdf

Case series

2017

Between 1984 and 2015, 22 patients diagnosed with an intracranial chordoma were treated at the Karolinska University Hospital, Stockholm, Sweden. Sixteen of 22 were treated with Gamma Knife radiosurgery (GKRS) for tumour residual or progression during the disease course. Seven of 22 received adjuvant fractionated radiotherapy and 5 of these also received proton beam radiotherapy. RESULTS: Fifteen of 22 (68%) patients were alive at follow-up after a median of 80 months (range 22-370 months) from the time of diagnosis. Six were considered disease free after >10-year follow-up. The median tumour volume at the time of GKRS was 4.7 cm3, range 0.8-24.3 cm3. Median prescription dose was 16 Gy, range 12-20 Gy to the 40-50% isodose curve. Five patients received a

second treatment with GKRS while one received three treatments. After GKRS patients were followed with serial imaging for a median of 34 months (range 6-180 months). Four of 16 patients treated with GKRS were in need of a salvage microsurgical procedure compared to 5/7 treated with conventional or proton therapy. CONCLUSION: After surgery, 7/22 patients received conventional and/or photon therapy, while 15/22 were treated with GKRS for tumour residual or followed with serial imaging with GKRS as needed upon tumour progression. With this multidisciplinary management, 5- and 10-year survivals of 82% and 50% were achieved, respectively [4].

1994

In 75 patients with clival meningiomas operated on over a 7-year period, the following data were studied; preoperative variables such as presenting Karnofsky scale score, age, sex, and prior operations or radiation therapy. Radiological findings on magnetic resonance imaging or arteriography, such as the development of the arachnoidal cleavage plane between tumor and the brain stem, brainstem edema, tumor size, extent of compression on the brain stem, vascular encasement, and blood supply from the basilar artery were among other data studied. In addition, intraoperative findings such as development of the arachnoid plane, vascular encasement, and the difficulty of dissection were noted. Finally, each patient's neurological and functional statuses were recorded at 1 week postoperatively and at follow-up examinations. Early postoperative functional deterioration occurred in 45 patients (60%) and ranged from mild (30 patients) to severe (three patients). Significant improvement had occurred by the time of follow-up examination in all but four patients; however, permanent postoperative dysfunction was present in 12 patients. Statistical analysis revealed significant correlations between early functional deterioration and preoperative Karnofsky scale scores, male gender, radiological findings of the absence of an arachnoid plane, edema of the brain stem, and arteriographic supply from the basilar artery. Operative features included difficulty with dissection, an absent arachnoidal cleavage plane, and incomplete tumor resection. Permanent functional deterioration was statistically associated with the following: blood supply from the basilar artery, difficulty of dissection, incomplete tumor resection, and early postoperative dysfunction. Logistical regression analysis revealed that the most important risk factor for early postoperative deterioration was tumor size. Patients with large or giant tumors had a 6.7 to 13 times greater risk of functional deterioration, respectively, than patients with small- or medium-sized tumors. Excluding tumor size, the most important factor for permanent deterioration was blood supply from the basilar artery. Patients in this category had a 4.4 times greater risk of permanent functional deterioration. Three stages of tumor relationship to the brainstem arachnoid and pial membranes are proposed. Based on the results of this clinical study of clival meningiomas, suggestions are made for changes in the management strategy of these difficult lesions [5].

1993

Seven cases of clivus meningioma were operated on. The tumors sized from 5 to 8 cm in diameter. They were classified into 3 types: petroclival (5 cases), clival (1), sphenopetroclival (1). Common symptoms were cranial nerve deficits of fifth, sixth, seventh, eighth and cerebral disturbance of gait. CT was accurate in determining tumor location and size. Vascular displacement and tumor stain were seen of vertebral angiogram. Blood supply to the tumor was derived primarily from branches of the internal, external carotid arteries and vertebral arteries. Temporo-transtentorial approach, combined temporo-transtentorialsuboccipita approach were used to remove the tumor. Total, Subtotal, and large partial resection of tumors was done in three, two and two cases respectively. Intraoperative technical difficulties were discussed. The mortality of the operation was 14.2% [6].

1991

A report of Javed and Sekhar concentrates on the experience with clival meningiomas, which are the most common intradural clival tumours. Between July 1983 and July 1990, 52 patients with petroclival meningiomas underwent surgical excision of their tumours. A variety of skull base approaches were utilized to obtain wide tumour exposure with minimal brain retraction. Large or giant tumours required multiple approaches and staged removal of tumour. Tumour resection was evaluated by a standard protocol of postoperative MR or CT scans. Total tumour resection was achieved in 38 cases (73%), subtotal resection in 11 (21%) and partial resection in 3 (6%). Follow-up has ranged from 4 to 83 months. Two patients had recurrence of tumour requiring re-operation with one receiving additional external beam radiation. Two postoperative deaths occurred, one from pneumonia and another from infectious complications. The most common postoperative morbidity were lower cranial nerve palsy, aspiration peumonia and temporary hemiparesis [7)].

1966

https://n.neurology.org/content/16/1/86

Case reports

https://www.neurosign.com/clival-meningioma/

A 70-year-old female who presented with a four-year history of progressive headaches in the occipital area. MRI revealed a right inferior clival meningioma. Treatment was delayed for over a year due to multiple referrals resulting in the development of new symptoms including decreased balance, generalized weakness, and difficulty swallowing [8)].

1)
Couldwell W T, Fukushima T, Giannotta S L, Weiss M H. Petroclival meningiomas: surgical experience in 109 cases. J Neurosurg. 1996;84(1):20–28.
2)
Al-Mefty O. Philadelphia, PA: Lippincott-Raven; 1998. Operative Atlas of Meningiomas.
3)
Essayed W, Aboud E, Adada B, Al-Mefty O. Clival Meningioma: Remove the Bone to Pursue of Ventral Exposure: 2-Dimensional Operative Video. Oper Neurosurg (Hagerstown). 2022 Jan 14. doi: 10.1227/ONS.0000000000000108. Epub ahead of print. PMID: 35030142.
4)
Förander P, Bartek J Jr, Fagerlund M, Benmaklouf H, Dodoo E, Shamikh A, Stjärne P, Mathiesen T. Multidisciplinary management of clival chordomas; long-term clinical outcome in a single-institution consecutive series. Acta Neurochir (Wien). 2017 Jul 22. doi: 10.1007/s00701-017-3266-1. [Epub ahead of print] PubMed PMID: 28735379.
5)
Sekhar LN, Swamy NK, Jaiswal V, Rubinstein E, Hirsch WE Jr, Wright DC. Surgical excision of meningiomas involving the clivus: preoperative and intraoperative features as predictors of postoperative functional deterioration. J Neurosurg. 1994 Dec;81(6):860-8. doi: 10.3171/jns.1994.81.6.0860. PMID: 7965116.

6)
Fang SM. [Diagnosis and surgical treatment of clivus meningioma]. Zhonghua Wai Ke Za Zhi. 1993 Aug;31(8):492-4. Chinese. PubMed PMID: 8112178.
7)
Javed T, Sekhar LN. Surgical management of clival meningiomas. Acta Neurochir Suppl (Wien). 1991;53:171-82. doi: 10.1007/978-3-7091-9183-5_28. PMID: 1803876.
8)
Tan VS, Best L. Delayed Treatment of Retroclival Meningioma in a 70-year-old Female. Cureus. 2020 Jan 6;12(1):e6579. doi: 10.7759/cureus.6579. PMID: 32047715; PMCID: PMC6999723.