Posterior fossa meningioma

Epidemiology

Posterior cranial fossa meningiomas constitute ~10 % [1) 2)] of all the intracranial meningiomas. [3) 4) 5) 6) 7) 8)].

Thus posterior fossa meningiomas constitute only about 2% of intracranial tumors. Nevertheless, they deserve particular attention as they are adjacent to or involve very critical structures, and there are potentially serious consequences related to their surgical excision.

Classification

Posterior fossa meningioma classification.

Outcome

Petroclival and foramen magnum meningiomas are among the most difficult cranial base lesions to treat. Because of their slow growth, they often have caused considerable distortion of the brain stem at presentation, have involved CNs III-XII in various ways, and have encased the vertebrobasilar arteries in about 25% of patients. Before the modern era of cranial base surgery, the surgical treatment of these lesions was unsuccessful; indeed, the results were so poor that the tumors were considered inoperable.

Only one successful total removal was reported before 1970.

More recently, the advent of new cranial base approaches and specific microsurgical strategies has revolutionized the management of these lesions. A comparison of recently reported series indicates a progressive decline in mortality and an increase in the percentage of gross total resection [9) 10) 11) 12) 13) 14) 15) 16)].

Possible postoperative complications include intracranial hematoma, Cerebrospinal fluid fistula or infection, obtundation or hemiparesis due to brain stem dysfunction, and CN palsies. The most significant CN palsies are those involving CNs III, VII, IX and X. A good intensive care and neurosurgical ward, team work, and post-hospital rehabilitation (if necessary) will promote an optimal outcome for these patients.

Case series

This study is a retrospective analysis of a prospectively maintained IRB-approved database. Inclusion criteria were a diagnosis of WHO grade I PFM with subsequent treatment via single-session SRS and a minimum of 3 follow-up MRI studies available. Volumetric analysis was performed on the radiosurgical scan and each subsequently available follow-up scan by using slice-by-slice area calculations of the

meningioma and numerical integration with the trapezoid rule. RESULTS The final cohort consisted of 120 patients, 76.6% (92) of whom were female, with a median age of 61 years (12-88 years). Stereotactic radiosurgery was the primary treatment for 65% (78) of the patients, whereas 28.3% (34) had 1 resection before SRS treatment and 6.7% (8) had 2 or more resections before SRS. One patient had prior radiotherapy. Tumor characteristics included a median volume of 4.0 cm3 (0.4-40.9 cm3) at treatment with a median margin dose of 15 Gy (8-20 Gy). The median clinical and imaging follow-ups were 79.5 (15-224) and 72 (6-213) months, respectively. For patients treated with a margin dose ≥ 16 Gy, actuarial progression-free survival rates during the period 2-10 years post-SRS were 100%. In patients treated with a margin dose of 13-15 Gy, the actuarial progression-free survival rates at 2, 4, 6, 8, and 10 years were 97.5%, 97.5%, 93.4%, 93.4%, and 93.4%, respectively. Those who were treated with ≤ 12 Gy had actuarial progression-free survival rates of 95.8%, 82.9%, 73.2%, 56.9%, and 56.9% at 2, 4, 6, 8, and 10 years, respectively. The overall tumor control rate was 89.2% (107 patients). Post-SRS improvement in neurological symptoms occurred in 23.3% (28 patients), whereas symptoms were stable in 70.8% (85 patients) and worsened in 5.8% (7 patients). Volumetric analysis demonstrated that a change in tumor volume at 3 years after SRS reliably predicted a volumetric change and tumor control at 5 years ($R2 = 0.756$) with a $p < 0.001$ and at 10 years ($R2 = 0.421$) with a $p = 0.001$. The authors also noted that the 1- to 5-year tumor response is predictive of the 5- to 10-year tumor response ($R2 = 0.636$, $p < 0.001$). CONCLUSIONS Stereotactic radiosurgery, as an either upfront or adjuvant treatment, is a durable therapeutic option for WHO grade I PFMs, with high tumor control and a low incidence of post-SRS neurological deficits compared with those obtained using alternate treatment modalities. Lesion volumetric response at the short-term follow-up of 3 years is predictive of the long-term response at 5 and 10 years [17].

1)
Campbell E, Whitfield R D. Posterior fossa meningiomas. J Neurosurg. 1948;5(2):131–153.
2)
Castellano F, Ruggiero G. Meningiomas of the posterior fossa. Acta Radiol Suppl. 1953;104:1–177.
3)
Long DM: Surgical approaches to tumors of the skull base: An overview. In: Wilkins RH, Rengachary SS (eds) Neurosurgery Update I: Diagnosis, Operative Technique, and Neuro-oncology. McGraw-Hill, New York, 1990, pp 226-276
4)
Cherington M, Schneck SA: Clivus meningiomas. Neurology 16: 86-92, 1966
5)
Russell JR, Bucy PC: Meningiomas of the posterior fossa. Surg Gyneco[Obstet 96: 183-192, 1953
6)
Cushing HW, Eisenhardt L: Meningiomas. Their Classification, Regional Behaviour, Life History and Surgical End Results. Charles C. Thomas, Springfield, IL, 1938, pp 3-387
7)
Yasargil MG, Mortara RW, Curcic M: Meningiomas of the basal posterior cranial fossa. In: Krayenbuhl H (ed) Advances and Technical Standards in Neurosurgery, Volume 7. Springer-Verlag, Wien, 1980, pp 1-115
8)
Olivecrona H: The surgical treatment of intracranial tumors. In: Olivecrona H, Tonnis W (eds) Handbuch der Neurochirurgie. Springer-Verlag, Berlin, 1967, pp 1-301
9)
Briccolo AR Turazzi S, Talacchi A, Cristofori L: Microsurgical removal of petroclival meningiomas: A report of 33 patients. Neurosurgery 31: 813-828, 1992
10)
Sekhar LN, Swamy NKS, Jaiswal U, Rubinstein E, Hirsch Jr. WE, Wright DC: Surgical excision of meningiomas involving the clivus: Preoperative and intraoperative features as predictors of postoperative functional deterioration. J Neurosurg 81: 860-868, 1994
11)

Al-Mefty O, Fox JL, Smith RR: Petrosal approach for petroclival meningiomas. Neurosurgery 22: 510-517,1988
12)

Sekhar LN, Jannetta PJ, Burkhart L, Janosky J: Meningiomas involving the clivus: A six-year experience with 41 patients. Neurosurgery 27: 764-781, 1990
13)

Mayberg MR, Symon L: Meningiomas of the clivus and apical petrous bone. Report of 35 cases. J Neurosurg 65: 160- 167, 1986
14)

Samii M, Ammirati M, Mahran A, Bini W, Sepehrnia A: Surgery of petroclival meningiomas: Report of 24 cases. Neurosurgery 24: 12-17, 1989
15)

Nishimura S, Hakuba A, Jang B, Inoue Y: Clivus and apicopetroclivus meningiomas: Report of 24 cases. Neurol Med Chir 29:1004 101i, 1989
16)

Spetzler RE Daspit CR Pappas CTE: The combined supraand infratentorial approach for lesions of the petrous and clival regions: Experience with 46 cases. J Neurosurg 76: 588-599, 1992
17)

Patibandla MR, Lee CC, Tata A, Addagada GC, Sheehan JP. Stereotactic radiosurgery for WHO grade I posterior fossa meningiomas: long-term outcomes with volumetric evaluation. J Neurosurg. 2018 Jan 5:1-11. doi: 10.3171/2017.6.JNS17993. [Epub ahead of print] PubMed PMID: 29303453.