

Posterior petrous bone meningioma case series

2013

A series of 48 consecutive patients operated on for posterior petrous meningiomas between 2002 and 2011 is reported. The main symptom on first admission was hypoacusis, impairment of the fifth cranial nerve and cerebellar ataxia. The tumour was found to be attached to the premeatal dura in 46%, the inframeatal dura in 29% and the postmeatal dura in 25% of cases. Tumour resection was categorized as grade I in 16 patients, grade II in 29 patients, grade III in 1 patient and grade IV in 2 patients, according to the Simpson classification system. The petrosal approach and retrosigmoid approach were suitable for posterior petrous meningiomas.

Postoperative facial nerve dysfunction appeared in 8 and further deteriorated in 2 patients. Hearing function deteriorated after surgery in 8 and improved in 2 cases. Perioperative death occurred in two patients. Tumour recurrence was observed in two patients, and both underwent a second operation and postoperative stereotactic radiotherapy. ¹⁾

2012

Peyre et al. from the Department of Neurosurgery, Hopital Beaujon, [Clichy](#), France, performed a retrospective chart review of 53 consecutive patients operated on for a posterior petrous bone meningioma in a tertiary referral center and a literature review. Tumors were classified in four groups according to the modified Desgeorges and Sterkers classification: posterior petrous (P; 17 tumors), meatus and internal auditory canal (M; 12 tumors), petrous apex without invasion of the internal auditory canal (A; 9 tumors), and cerebellopontine angle with invasion of the internal auditory canal (AMP; 15 tumors). The facial function was preserved in 100% of P and A tumors, 75% of group M tumors, and 53% of AMP tumors. Hearing preservation was attempted only in P, A, and M groups where rates of serviceable hearing preservation were 82%, 80%, and 66%, respectively. The cumulative rate of hearing preservation for AMP tumors was 45% in our literature review. The increased facial morbidity associated with AMP tumors compared with other groups was also confirmed by the review of the literature. In conclusion, this study shows that among posterior petrous bone meningiomas, tumors invading the internal auditory canal present with increased postoperative functional morbidity in spite of a tailored approach regarding dural insertion ²⁾.

2011

Data were examined from 57 patients who were treated for 59 tumors. The tumors were classified into 3 types according to the location of their primary dural attachment: Type A, located around the porus trigeminus (33 tumors); Type M, located at the level of the porus of the internal auditory canal (IAC) (12 tumors); and Type P, located laterally to the IAC (14 tumors). The median tumor diameter was 34 mm (range 20-67 mm).

The choice of the approach was based on tumor location, as the displacement of vascular structures and cranial nerves was primarily determined by the site of dural attachment on the posterior petrous bone. An anterior petrosectomy was performed in 82% of Type A meningiomas, and a retrosigmoid approach was used in 86% of Type P meningiomas. The spectrum of approaches was less uniform for Type M meningiomas. Overall, total resection was obtained in 39% of all cases, and in 18%, 50%, and 86% of Type A, Type M, and Type P tumors, respectively. The postoperative mortality rate was 8.8% (5 deaths among 57 patients), and all 5 patients who died during the early postoperative period had large Type A tumors. At last follow-up, the functional preservation of the facial nerve was excellent in 49 (94%) of the 52 surviving patients.

The authors believe that proper selection of the approach favorably impacts functional outcome in patients undergoing surgery for the treatment of skull base tumors. In the authors' case series of posterior petrous bone meningiomas, Type P and most Type M tumors were safely managed through a regular retrosigmoid approach, whereas Type A tumors were optimally treated via an epidural anterior petrosectomy ³⁾.

2009

A retrospective analysis of the clinical records of 42 patients was used to study the clinical significance of a classification system for posterior petrous meningiomas. According to clinical manifestations and radiological images, posterior petrous meningiomas were classified into three types: type I (cerebellar type; 12 patients), tumours involved and compressed the cerebellum; type II (cranial nerve type; 16 patients), tumours involved the cranial nerves; and type III (combined type; 14 patients), tumours involved more than one structure such as the cerebellum, cranial nerves and the brain stem. All patients underwent microneurosurgery and the total resection rate was 90%. It was more difficult totally to resect type II and III tumours than type I tumours and the post-operative functional outcomes were worse. Microneurosurgical techniques and skills are critical to increase the total resection rate of posterior petrous meningiomas in order to decrease the mortality and disability rates ⁴⁾.

2008

A retrospective study of 27 patients (23 females) operated on for meningioma of the posterior petrous bone between 1994 and 2004. These were compared with 424 patients with vestibular schwannoma VS operated on between October 1994 and January 2001. All patients had a full audiovestibular workup before and after surgery.

Tumours were classified according to the Desgeorges classification for meningiomas and Koss for the VS.

For smaller tumours, facial function is better for the VS, whereas other cranial nerves are more frequently affected in the meningiomas. For larger tumours, facial function results are better for meningiomas, but other cranial nerve complications are more frequent, with a 33.3% cranial nerve V complication rate and a mortality rate of 6.6%.

Meningiomas of the posterior temporal bone may present clinically and radiologically like a VS, especially for intracanalicular tumour and stage IV tumours. For smaller meningiomas, hearing

preservation is similar to VS and could be proposed even for stage III meningiomas. On the other hand, trigeminal nerve, facial nerve, and other cranial nerve complications are more common after excision of stage I and II meningiomas ⁵⁾.

2007

Of 139 patients with posterior fossa meningioma, 81 occurred on the posterior petrous face of the temporal bone and were the object of this study.

Thirty-one patients were approached by the enlarged [translabyrinthine approach](#). The enlarged translabyrinthine approach with transapical extension Type II was performed in 29 patients. The combined retrosigmoid-retrolabyrinthine approach was chosen in 8 cases. The modified transcochlear approach Type A with permanent posterior transposition of the facial nerve (FN) was performed in 6 patients. Two patients underwent a retrolabyrinthine subtemporal transapical approach. One patient underwent a transpetrous middle cranial fossa approach. Four patients with intracranial meningiomas were operated on through the enlarged middle cranial fossa approach.

Total removal of the tumor (Simpson Grades I and II) was achieved in most patients (92.5%). The FN was anatomically preserved in 79 of the 81 (97.5%) patients. Five patients had less than 1 year follow-up, and 2 patients were lost to follow-up and were excluded in evaluation of the final FN outcome. At 1-year follow-up, 46 patients (63%) had Grade I to II, 19 (26%) had Grade III, 4 (5.4%) had Grade IV, 1 (1.3%) had Grade V, and 3 (4.1%) had Grade VI. Hearing-preserving surgery was attempted in 15 patients (18.5%) with preoperative serviceable hearing. Of these 15 patients, 11 had their hearing preserved at the same preoperative level, and 4 experienced postoperative deafness. Postoperatively, a new deficit of 1 or more of the lower cranial nerves was recorded in 3 patients. One patient experienced subcutaneous cerebrospinal fluid collection that required surgical management.

Total tumor removal (Simpson Grades I-II) remains our treatment of choice and takes priority over hearing preservation. Subtotal resection is indicated for older and debilitated patients with giant lesions to relieve the tumor compression on the cerebellum and brainstem. Subtotal removal is also preferred in the face of the absence of a plane of cleavage between the tumor and the brainstem, in the presence of encasement of vital neurovascular structures, in elderly patients with tumors adherent to preoperatively normal facial or lower cranial nerves ⁶⁾.

Devèze et al. carried out a retrospective case-series study in a multidisciplinary tertiary care center on all patients who underwent meningiomas removal from January 1989 to September 2005. Surgical approaches were transpetrosal: widened retrolabyrinthine, translabyrinthine, transotic and transcochlear, occasionally combined with a subtemporal transtentorial approach. Epidemiology, symptoms, preoperative evaluation, surgery, postoperative complications and facial and auditory results were analyzed using standardized grading systems. The Desgeorges and Sterkers classification was used to assess tumor size and location.

Forty women and three men underwent surgery (mean age: 56.7). Medium-sized tumors stages 2 and 3 (84%) and AM and P localization (34% and 20.4%) predominated. In 65% of cases, the tumor extended beyond the CPA. Main presenting symptoms were balance disorders (72%) and sensorineural hearing loss (53.5%). Mortality was nil. A preoperative facial nerve paresis was present in 14% of patients. Tumor removal was complete in 79.1% of cases. At 1-year post-op, 73% of patients had a normal or subnormal facial function and 55% had serviceable hearing. A Cerebrospinal

fluid fistula occurred in 6.9%.

Posteriorly attached meningiomas are less symptomatic and of better prognosis than medially inserted ones. Transpetrosal approaches are reliable for the removal for all types and sizes of such tumors, and can be easily combined in the same procedure with a subtemporal transtentorial approach to remove extensions to the clivus and tentorium. They offer low morbidity and a high proportion of facial nerve and hearing preservation ⁷⁾.

2005

Data in a series of 51 patients with meningiomas of the posterior petrous bone who had undergone microsurgical treatment at the authors' institution between 1989 and 2002 were retrospectively reviewed. The patient population consisted of 46 women and five men with a mean age of 53 years (range 22-70 years). The main symptom on first admission was impaired hearing in 41%, dizziness in 20%, and tinnitus in 18% of the patients. Results of physical examination and audiological testing revealed hypacusis in 65% of patients, cerebellar ataxia in 31%, and impairment of the fifth cranial nerve in 26%. All patients underwent surgical treatment via a lateral suboccipital approach. Intraoperatively, the tumor was found to be attached to the postmeatal dura in 37%, the premeatal dura in 27.5%, the suprameatal dura in 19.6%, the inframeatal dura in 7.8%, and centered on the porus acusticus in 5.9% of cases. Tumor extension into the internal acoustic meatus was present in seven patients. Tumor resection was categorized as Grade I in 14 patients, Grade II in 29, Grade III in six, and Grade IV in two patients, according to the Simpson classification system. The site of displacement of the cranial nerves was predictable in up to 84% of patients, depending on the dural origin of the tumor as depicted on preoperative magnetic resonance (MR) imaging studies. Postoperatively, a new and permanent facial paresis was observed in five patients (9.8%). In 38 patients in whom both pre- and postoperative audiological data were available, hearing function deteriorated after surgery in 18.4% and improved in 7.9%. Clinical and MR imaging postsurgical data from a mean period of 5.8 years (range 13 months-13 years) were available in all patients. Forty-four patients (86%) resumed normal daily activity. Tumor recurrence was observed in two patients (3.9%), and both underwent a second surgery.

Preoperative detailed analysis of MR imaging data gives the surgeon a clue about the dislocation of critical neurovascular structures, particularly the cranial nerves. Nonetheless, the exact relationship of the cranial nerves to the tumor (dislocation, adherence, infiltration, and splaying of nerves) can only be fully appreciated during surgery ⁸⁾.

A retrospective analysis was performed in 82 patients with posterior petrous meningiomas for microsurgery. According to the anatomical relationship with the posterior surface of the petrous bone and with special reference to the internal auditory canal (IAC), posterior petrous meningiomas were classified into three types: Type I, located laterally to the IAC (28 cases); Type II, located medially to the IAC, which might extend to the cavernous sinus and clivus (32 cases); and Type III, extensively attached to the posterior surface of the petrous bone, which might envelop the seventh and eighth cranial nerves (22 cases). Sixty-eight (83%) of 82 cases involved total resection. The rate of anatomical preservation of facial nerve was 97.5%, whereas the functional preservation rate was 81%. The rate of hearing preservation was 67%. All Type I tumors were completely resected, and the rate of anatomical preservation of facial nerve was 100% and functional preservation was 93%.

Regarding Type II lesions, 75% of 32 cases involved total resection; the rate of anatomical preservation of facial nerve was 97% and functional preservation was 75%. For Type III lesions, 73% of 22 cases were totally resected. The rate of anatomical preservation of facial nerve in patients with this tumor type was 95%, whereas functional preservation was 73%.

Clinical manifestations and surgical prognoses are different among the various types of posterior petrous meningiomas. It is more difficult for Types II and III tumors to be resected radically than Type I lesions, and postoperative functional outcomes are significantly worse accordingly. The primary principles in dealing with this disease entity include preservation of vital vascular and central nervous system structures and total resection of the tumor as much as possible ⁹⁾.

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