Giant Pineal Meningiomas: Surgical Experiences With Two Cases

Dev Pineal Meningiomalar: Cerrahi Yaklaşımlar ve İki Olgu Sunumu

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ABSTRACT

Meningiomas rarely occur in the pineal region. Total removal should be performed because of their benign characteristics. Meningiomas can reach huge diameters in the pineal region. Classical pineal approaches may be insufficient during the total removal of giant or large pineal meningiomas.

In this report, we present two cases of giant pineal meningioma in which a combination of modified classical surgical approaches to the pineal region were used.

KEY WORDS: Meningiom, pineal region, surgery

ÖZ

Meningiomlar nadir olarak pineal bölgede bulunur. Benign karakterlerinden dolayı total olarak çıkarılmaları gerekir. Meningiomlar pineal bölgede dev boyutlara erişebilirler. Dev ya da büyük pineal meningiomların cerrahi olarak çıkartılmaları esnasında klasik yaklaşımlar yetersiz kalabilir.

Bu yazıda; pineal bölgenin klasik yaklaşımlarının kombinasyonu ve modifikasyonu ile opere edilen iki adet dev pineal meningioma olgusu sunuyoruz.

ANAHTAR SÖZCÜKLER: Cerrahi, meningioma, pineal bölge

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INTRODUCTION

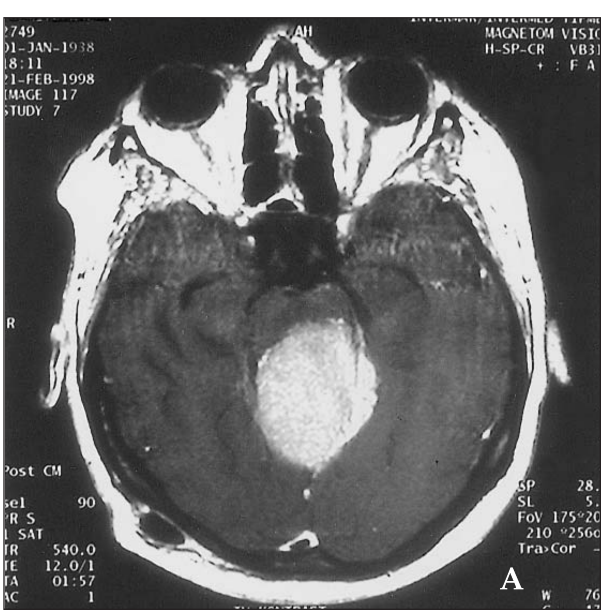
Pineal region tumors are very rare and represent only 1% of brain tumors. Meningiomas rarely occur in the pineal region. Pineal meningiomas are usually small or moderate in size and asymptomatic. However, giant or large meningiomas may also occur in this region. Small or moderate-sized pineal meningiomas can be removed by classical pineal approaches. More sophisticated surgical approaches might be needed for the removal of giant or large pineal meningiomas. In this report we present our surgical experience with two cases of giant pineal meningioma.

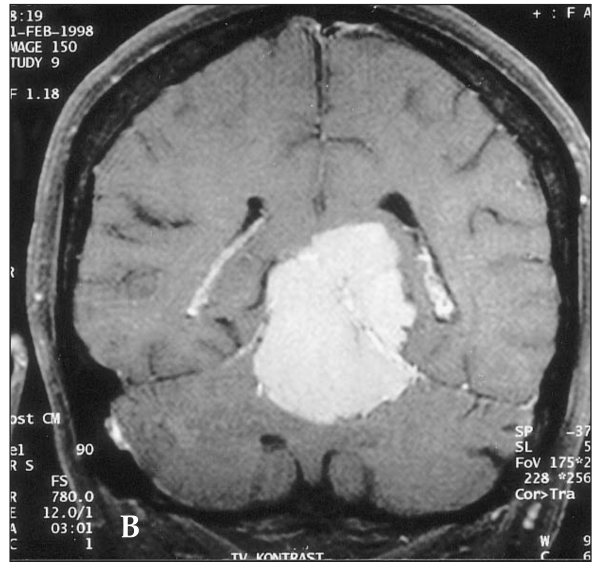
CASES

Case 1:

A 60-year old woman was admitted with a 2-year history of headaches, gait disturbance and one-month history of vomitting and dizziness. Neurological examination revealed bilateral papilledema, dysmetria and ataxia.

Magnetic resonance imaging (MRI) demonstrated a tumor in the pineal region (5x4x4 cm), compressing the quadrigeminal plate, cerebellum, brain stem, corpus callosum and the third and lateral ventricles (Figure 1A, 1B, 1C). The lesion was isointense on T1-weighted images and enhanced uniformly after gadolinium injection. It was also adherent to the falx and tentorium cerebelli.





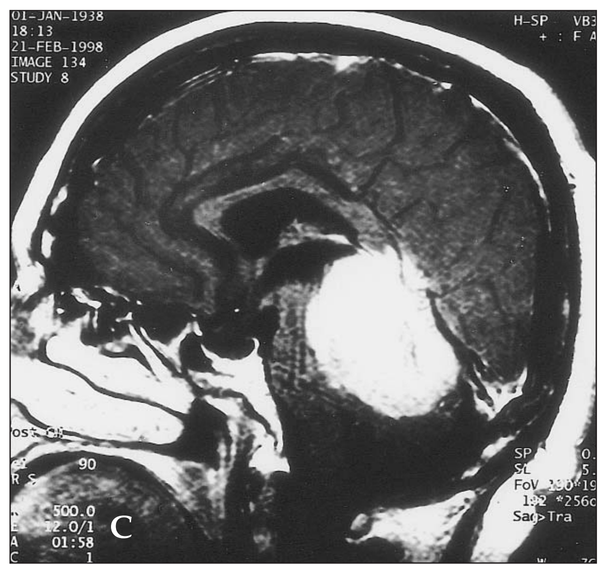


Figure 1A, 1B, 1C: Case 1: A huge solid mass, prominently enhanced, is seen in the pineal region on axial, coronal and sagittal planes in T1-weighted images with gadolinium.

In the first operation, the infratentorial part of the tumor was removed totally through an infratentorial supracerebellar approach. One week after the first operation, a right occipital transtentorial approach was performed in the sitting position and the supratentorial part of the tumor was removed. Histopathological diagnosis verified fibroblastic meningioma. The postoperative course was uneventful, and no neurological deficit was detected. No residual tumor was seen on postoperative MRI, four months after the operation (Figure 1D, 1E, 1F). The last follow-up of the patient (2 years after the operation) showed no neurological deficit.

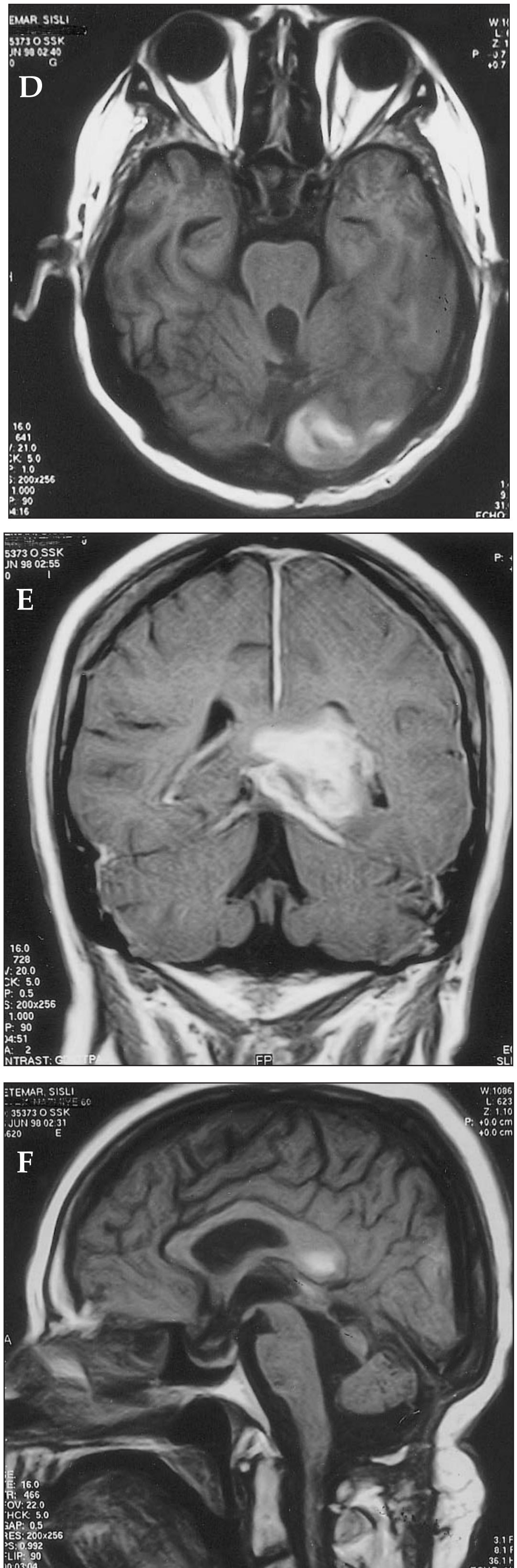


Figure 1D, 1E, 1F: Case 1: There are some postoperative hemorrhagic changes at the operation site on the axial , coronal and sagittal planes in T1-weighted images.

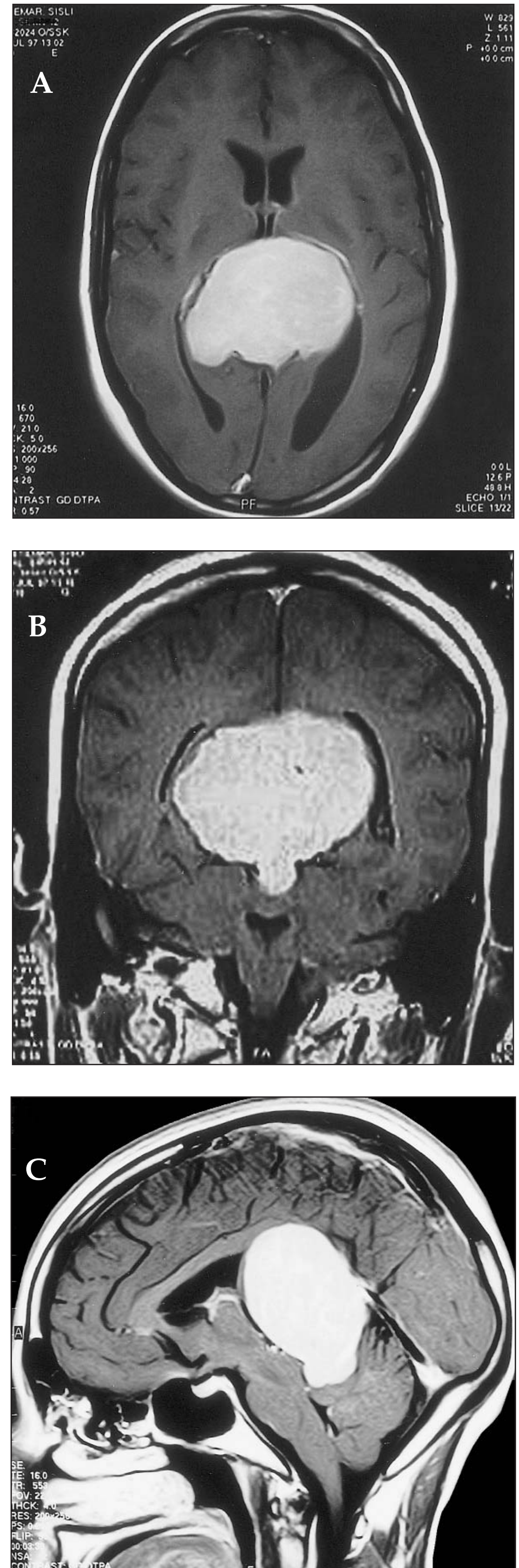


Figure 2A, 2B, 2C: Case 2: Post-gadolinium axial, coronal and sagittal plane T1-weighted images show prominent enhancement in the pineal region.

Case 2:

A 43 year old woman presented with a 6-month history of headaches and gait disturbance and two-month history of vomitting. Neurological examination revealed paralysis of upward gaze, bilateral papilledema and ataxia.

The MRI study demonstrated a tumor in the pineal region (6x6x6 cm), compressing the quadrigeminal plate, corpus callosum and the third and lateral ventricles (Figure 2A, 2B, 2C). Moderate obstructive hydrocephalus was present. The lesion was isointense on T1-weighted images and enhanced uniformly after gadolinium injection. MR angiography demonstrated that the internal cerebral veins were displaced significantly downward and that the great vein of Galen was not visualized.

A right occipital transtentorial approach was performed with the patient in the sitting position. It was not possible to continue the operation after taking a biopsy due to swelling of the right occipital lobe which herniated through the craniotomy. Duraplasty was performed and the wound was closed without inserting a bone flap. Left homonymous hemianopia was detected postoperatively. Control computerized tomography (CT) scans showed right occipital lobe infarction and tissue damage. One week after the first operation, a wide exposure was achieved following right occipital lobectomy in the prone position with a right occipital transtentorial approach and the right part of the tumor was removed (Figure 2D, 2E, 2F). The tumor was not adherent to the dura mater. Histopathological examination revealed a fibroblastic meningioma. The postoperative course was uneventful, and no additional neurological deficit was detected except left homonymous hemianopia. The patient was followed-up for 3 years. Minimal tumor growth was detected on the third year and the patient was referred to radiotherapy. In the last follow-up examination 6 years after the first operation, no additional neurological deficit was observed.

Figure 2D, 2E, 2F: Case 2: After the operation, post-gadolinium axial, coronal and sagittal plane T1-weighted images show residual mass in the pineal region and some postoperative changes in the surrounding parenchyma.

DISCUSSION

Meningiomas arising in the pineal region are very rare. Although many series do not contain any pineal meningiomas and comprise up to 6% of pineal tumors, most cases have been reported as a 'case report' while only one series with 10 patients has been reported by Konovalov in 1998 (1).

Pineal meningiomas may either arise from the falcotentorial junction or from the velum interpositum cerebri, the double layer of pia mater that forms the roof of the third ventricle. However, there is disagreement in the definition of pineal meningioma. Stein (2) suggested that only meningiomas of velum interpositium should be named pineal meningioma. On the other hand, according to Piatt and Campbell (3) and Obrador (4) falcotentorial junction meningioma should be included in this definition. Today many authors accept anterior inferior projecting falcotentorial junction meningiomas and meningiomas of velum interpositium as pineal meningiomas and use the terms pineal meningioma and pineal region meningioma as synonyms. Meningiomas arising from the velum interpositum are not adherent to the dura mater (3, 5-7). The blood supply of these tumors is based on two sources. Falcotentorial meningiomas receive their supply mainly from the artery of the tentorium, while velum interpositium meningiomas receive their supply mainly from branches of the posterior lateral choroidal arteries (7).

Patients with meningioma are usually older than those with other pineal region tumours; there is also a female predominance (1, 8). The clinical history is usually insidious and there is a long interval between the start of symptoms and the diagnosis (1). Hydrocephalus secondary to the compression of aqueductus sylvius and associated increased intracranial pressure occurs in 80 to 85% of cases and is the most common manifestation of these lesions (9). The clinical presentation is often with signs of increased intracranial pressure, ataxia, visual disturbances (10), hearing loss (11), hemifacial spasm or Parinaud's Syndrome (3, 6).

The differential diagnosis of a pineal region tumor can be a dilemma (12). Invasion of adjacent tissues and intracranial seeding, which can be detected on contrast-enhanced MRI, are characteristics of germ cell tumors (8). Tumors of the pineal gland itself are often calcified, a characteristic seen better on CT than on MRI (12). However pineal meningiomas are usually isointense on T1-weighted images. Postcontrast MRI images show homogenously enhanced lesions. The characteristic feature of dural attachment is best seen on the coronal view (8). Cerebral angiography plays an important role in the diagnosis and in delineating the blood supply, which is invaluable in surgical planning by identifying feeder vessels and adjacent venous drainage (1, 5, 13). Tumors originating from the velum interpositum and falcotentorial junction cause upward and downward displacement or occlusion of the internal cerebral veins and the great vein of Galen's, respectively (1, 14). Preoperative embolization can facilitate surgical removal by reducing tumor vascularity and decreasing blood loss during surgery in addition to softening the tumor, and reduces the chance of recurrence (15, 16).

Two main approaches to the pineal region (supracerebellar infratentorial and occipital transtentorial) are most widely used and appropriate for most pineal tumors. The supracerebellar approach was first used by Horsley and formally described by Krause in 1926 (17). This approach was modified and popularized by Stein in 1971 (2). The occipital transtentorial approach was first used by Horrax (18) and modified by Poppen (19) and Jamieson (20). However, the choice of surgical approaches for surgery in the pineal region are still controversial (21).

The infratentorial approach has several advantages and disadvantages. Orientation is easy and important veins can be seen well. The main disadvantage of this approach is the limited working space. Lesions above the deep venous system and posterior incisural space cannot be exposed. This approach is performed with the patient in the sitting position. The patient is therefore at risk of the well known complications of the sitting position (air embolism, etc.)

The major advantages of the occipital transtentorial approach is the greater exposure of the lesion and the better view of the quadrigeminal region. This approach can be extended to the ipsilateral posterior temporal gyrus although exposure of the contralateral half of the quadrigeminal region is difficult. Observation of the internal cerebral vein and basal vein of Rosenthal is also difficult. A small part of the splenium must be sacrificed to access the posterior third ventricle in this approach. The main disadvantage of this approach is the possibility of postoperative hemianopsia due to occipital lobe retraction.

The occipital transtentorial approach can be performed with the patient in the sitting or the prone position. Ausman (22) described a three-quarter prone position for the occipital transtentorial approach in 1982 to eliminate the risks of the sitting position. The other advantages of this position are no need for retraction of the occipital lobe due to gravity and the comfort of the surgeon . However, Konovalov (1) prefers the occipital transtentorial approach with the patient in the sitting or semi-sitting position because of poor visualization of the contralateral Rosenthal vein and lack of orientation associated with the three-quarter position. We also performed the occipital transtentorial approach with the patient in the sitting position.

Naffziger (23) described a combined occipital-suboccipital approach to the posterior fossa by ligating the transverse sinus and cutting the tentorium to obtain a wide exposure in 1928. Sekhar (24) and Ziyal et al (25) described transsinus transtentorial approaches to large pineal meningiomas in 1992. They resutured the transverse sinus to reestablish the blood circulation. This approach can however be used only in the non-dominant transverse sinus side in the presence of transverse sinus dominance. Kawashima (21) et al have recently described a new approach called the occipital bitranstentorial falcine approach, which is a modification of occipital transtentorial approach, as an anatomic study.

We used two different approaches in our cases. In the first case we performed two classical approaches in two stages. These combined approaches provided the advantages of the classic approaches while avoiding their disadvantages. We could therefore remove the large meningioma which could not be removed with a single classical approach. In the second case, we removed the tumor partially following right occipital lobectomy. We do not recommend occipital lobectomy for the removal of pineal region tumors. We performed lobectomy because of an infarct following the first operation. Although occipital lobectomy provided a wide space in which to work, we could not remove the tumor totally because of poor visualization of the contralateral side. The tumor was also one of the largest pineal region meningiomas that have ever been reported. We did not attempt to remove the other part of the tumor to spare the vision of the patient who had developed hemianopsia following the first operation. Partial removal controlled tumor growth for several years and tumor size was stable following the radiotherapy performed 3 years after the operation.

In conclusion, large pineal region lesions cannot be removed by using classical approaches to the pineal region. A combination or modification of these approaches might be helpful.

REFERENCES

1. Konovalov AN, Spallone A, Pitzkhelauri DI: Meningioma of the pineal region: a surgical series of 10 cases. J Neurosurg 85; 586-590, 1996
2. Stein BM: Surgical treatment of pineal tumors. Clin Neurosurg 26; 490-510, 1979
3. Piatt JH, Campbell GA: Pineal region meningioma: report of two cases and a literature review. Neurosurgery 12; 369-376, 1983
4. Obrador S, Soto M, Gutierrez-Diaz JA: Surgical management of tumors of the pineal region. Acta Neurochir 34; 159-171, 1976
5. Madawi AA, Crockard HA, Stevens JM: Pineal region meningioma without dural attachment. British J Neurosurgery 10 (3); 305-307, 1996
6. Rosario R, Adelman L, Prager RJ, Stein BM: Meningiomas of the pineal region and third ventricle. Neurosurgery 5; 489-495, 1979
7. Tung H, Appuzzo MLJ: Meningiomas of the third ventricle and pineal region, in: Al-Mefty O, ed, Meningiomas. New york: Raven Press Ltd, 1991: 583-591
8. İplikçioglu AC, Bayar MA, Kokes F, Camurdanoglu M, Buharali Z: Pineal meningioma: MRI. Neuroradiology 35; 539-540, 1993
9. Jooma R, Kendall BE: Diagnosis and management of pineal tumors. J Neurosurg 58; 654-665, 1983
10. Miyazawa T, Fukui S, Otani N, Tsuzuki N, Katoh H, Ishihara S, Nawashiro H, Wada K, Shima K: Peduncular hallucinosis due to a pineal meningioma; case report. J Neurosurg 95; 500-502, 2001
11. De Monte F, Zelby AS, Al-Mefty O: Hearing impairment resulting from a pineal region meningioma. Neurosurgery 32; 665-668, 1993
12. Zee CS, Segall H, Apuzzo M, Destian S, Colletti P, Ahmadi J, Clark C: MR imaging of pineal region neoplasms. J Comput Assist Tomogr 15; 56-63, 1991
13. Mallucci CL, Obukhov S: Successful removal of large pineal region meningiomas: Two case reports. Surg Neurol 44; 562-566, 1995
14. Matsuda Y, Inagawa T: Surgical removal of pineal region meningioma: Three case reports. Neurol Med Chir (Tokyo) 35: 594-597, 1995
15. Grand C, Bank WO, Baleriaux D, Matos C, Dewitte O, Brotchi J, Delcour C: Godolinium-enhanced MR in the evaluation of

preoperative meningioma embolization. AJNR 14; 563-569, 1993

16. Sagoh M, Onozuka S, Murakami H, Hırose Y: Succesful removal of meningioma of the pineal region after embolization; case report. Neurol Med Chir (Tokyo) 37: 852-855, 1997
17. Krause F: Operative freilegung der vierhugel nebst beobachtungen über hinbrisk und dekompression. Zentralb Chr 53; 2812-2819, 1926
18. Horrax G: Extirpation of a huge pinealoma from a patient with a pubertous praecox: new operative approach. Arch Neurol Psychiatr 37; 385-397, 1937
19. Poppen JL: The right occipital approach to a pinealoma. J Neurosurg 25; 706-710, 1966
20. Jamieson KG: Excision of pineal tumors. J Neurosurg 35; 550-553, 1971
21. Kawashima M, Rhoton AL Jr, Matsushima T: Comparison of posterior approaches to the posterior incisural space: microsurgical anatomy and proposal of a new method, the occipital bi-transtentorial/falcine approach. Neurosurgery 51 (5); 1208-1220, 2002
22. Ausman JI, Malik GM, Dujovny M, Mann R: Pineal region: rare location of a cavernous haemangioma. Neurol Res 16 (2); 133-136, 1994
23. Naffziger HC: Brain surgery: with special reference to exposure of the brain stem and posterior fossa; the principle of intracranial decompression, and relief of impactions in the posterior fossa. Surg Gynecol Obstet 46; 241-248, 1928
24. Sekhar LN, Goel A: Combined supratentorial and infratentorial approach to large pineal meningioma. Surg Neurol 37 (3); 197-201, 1992
25. Ziyal IM, Sekhar LN, Salas E, Olan WJ: Combined supra/infratentorial-transsinus approach to large pineal region tumors. J Neurosurg 88; 1050-1057, 1998