Case Report

Falcotentorial meningiomas: Optimal surgical planning and intraoperative challenges – case report


Abstract

Meningiomas arising from the falcotentorial junction are rare, and selecting the optimal surgical approach is essential. We report a 41-year-old man presented with progressive left paresis in the lower limbs. A magnetic resonance image showed a solid mass inside the third ventricle in contact with the falcotentorial dural junction. The tumor was removed by the transtentorial/transfalcine occipital approach, performed with the patient in the three-quarter prone position. The tumor was devascularized from the tentorium, then debulked and finally dissected. The affected falx and tentorium were resected, but all of the patent dural venous sinuses were preserved. The tumor was a subtotal resect. Choosing the surgical approach is essential for the safe and effective removal of an falcotentorial meningioma and preoperative imaging analysis should identify the tumor’s anatomical relations and guide toward the least disruptive route that preserves the neurovascular structures. This article aims to report a successfully treated a falcotentorial meningioma.
**Introduction**

Among pineal region tumors, meningiomas are a rare entity, corresponding to 2-8% of pineal tumors and 1% of all intracranial meningiomas.\(^1\,^3\) Guttmann described the first pineal meningioma in 1930.\(^4\) These tumors originate from the posterior portion of the velum interpositum or fal cotentorial union.\(^3\)

Falcotentorial meningiomas (FTM), as with other pineal region tumors, are prevalent more in females.\(^3\) These tumors can present a different relationship with vital neuroanatomical structures; therefore, it is essential to decide the ideal surgical approach. It is often difficult to discriminate between FTM and velum interpositum meningiomas, even after significant advances in neuroimaging.\(^3\) However, arterial irrigation is the main difference between these two groups of tumors. The tentorial branches of the meningohypophyseal trunk usually supply FTMs, while branches of the posterior choroidal arteries irrigate velum interpositum meningiomas.\(^3\,^5\) The surgical treatment of these tumors is not well established in literature since there are two main controversial issues. Firstly, concerning validating criteria for selecting the optimal surgical approach, and secondly, whether the main infiltrated venous structures can be sacrificed to obtain a radical resection of the tumor or whether they should be preserved.\(^6\)

We report an FTM case approached by occipito-trans tentorial access and subtotal tumor resection presenting a satisfactory clinical outcome.

**Case Report**

A 41-year-old man, with no significant medical history, was admitted with progressive paresis in the left lower limb, which started one year earlier and deterioriated in the final 3 months and no other neurological alterations were found. A computed tomography (CT) scan revealed a solid mass in the pineal region, causing hydrocephalus. A ventricle-peritoneal shunt was performed as a primary hydrocephalus treatment. Posteriorly, brain magnetic resonance imaging (MRI) showed a solid mass inside the third ventricle in contact with the falcotentorial dural junction, 42 x 43 x 38 mm in diameter, hypointense in T1 and slight hyperintense in T2 sequences, with diffusion restriction and enhancement post gadolinium (Figure 1). It was minimally lateralized to the right side, with inferior displacement of the deep venous complex of Galen.

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The patient underwent a transtentorial/transfalcine occipital surgical approach in a three-quarter prone position. The patient’s head was slightly elevated to 15 degrees in relation to the floor and turned 60 degrees toward the floor (Figure 2). The tumor was larger on the right side, and that side was chosen for a surgical approach. Firstly, the tumor was de-vascularized from the tentorium, then debulked and finally dissected. The affected falx and tentorium were resected, but all the patent dural venous sinuses were preserved. The tumor underwent a subtotal resection (Figure 3).

**Figura 2.** Transtentorial/transfalcine occipital surgical approach in three/quarter prone position and the patient head fixed in Mayfield.

**Figura 3.** A. Opening of the interhemispheric fissure through the right transtentorial/transfalcine occipital approach; B. Interhemispheric retraction reveals the tumor in a posterior incisural space; C-D. Tumor devascularization from the tentorium and resection; and E. Operative cavity. (Continued on next page)
The patient presented superior temporal homonymous quadrananopia in the immediate postoperative period and after permanently. The post-surgery CT revealed hypointense imaging in occipital-parietal artery supply region, suggesting ischemia and a small pneumocephalus (Figure 4). The patient is under ambulatory follow-up in the last three months, without other neurological symptoms. After, an anatomopathologic study demonstrated a WHO grade I meningothelial meningioma.

**Discussion**

FTMs occurs mostly in patients between 42-56 years old as well as the posterior fossa meningiomas.\(^7\) Previously studies revealed headaches as the most common symptom in pineal region meningiomas (60 to 100% of the cases), followed by ataxia (43 to 62%), personality changes and bradypsychia (37 to 46%) with homonymous hemianopia (20 to 46%).\(^4\)

Ataxia is the most frequent late symptom in type I and II tumors. Personality changes and bradypsychia were mostly associated on obstructive hydrocephalus cases.\(^4\) Nevertheless, bilateral visual acuity deterioration due to progressive papilledema and the following atrophy of the optic nerve is extremely rare.\(^8\)

In 2008, Bassiouni et al. classified FMTs tumors according to tumor base location and included four types.\(^6\) In our case, the FTM originated from the posterior cerebral falx and displaced the venous system inferiorly, type I by the Boussioni classification.

Regarding surgical treatment, comprehending the relationship between meningiomas of the pineal region and the deep venous system is decisive for better results. Invasive tumor degree or the permeability of the vein of Galen and the straight sinus and the displacement of these vessels are relevant points in view of the tumor’s mass effect.\(^7,9\)

The vein of Galen and straight sinus occlusion and invasion were described in preoperative angiographic studies; consequently, the development of a secondary collateral venous drainage is frequently found.\(^7,9\) It can be explained because the posterior half of the vein of Galen and the anterior half of the straight sinus is mostly the first vessels affected by meningiomas and are not related to the tumor’s growth direction.

Identifying vessel occlusion and the secondary collateral venous drainage is essential to evaluate the optimal FMTs surgical planning.\(^7,9\) Many authors have proposed that the displacement of the deep venous system due to tumor growth direction is the most important characteristic when deciding the surgical approach.\(^1,2,4,6\) Therefore, Type I of FMTs displace the venous complex inferiorly, type II superiorly, type III medially (supero-/inferomedial), and type IV to the contralateral side of the meningioma.\(^9\)

FTMs surgical objective is to achieve a macroscopically complete resection of the lesion, to relieve or solve the neu
rologic/clinical symptoms, and to acquire a tissue sample for a definitive diagnosis. Therefore, the recommendation to perform an intraoperative biopsy is established, paving the way to obtaining a differential diagnosis from other pineal tumors (e.g., germinoma) for which the management may be different toward a partial resection after adjuvant therapy.¹⁰

Classically, for preoperative artery embolization is an important adjuvant treatment for meningioma. However, most FTM{s} present short artery caliber, which can difficult preoperative artery embolization.⁷

The anatomical relation between the tumor and the deep venous complex of Galen is the most important factor when choosing the surgical approach. Some surgical approaches are described for these tumors: transtentorial/transfalcine occipital approach, supracerebellar infratentorial approach, occipital bitranstentorial/falcine approach and anterior interhemispheric transsplenial approach.

**Conclusion**

The selection of an optimal surgical approach is essential for the safe and effective removal of an FTM. Preoperative imaging analysis should identify the tumor’s anatomical relations and guide the least disruptive route that preserves the neurovascular structures. This article aims to report a successfully treated FTM at our service and to serve as a literary review. Subtotal resections appear to reduce severe neurological deficit rates, thus, being beneficial in most cases such as ours.

**Referências**

7. Quiñones-Hinojosa A, Chang EF, Chaitchana KL and McDermott MW. *Surgical considerations in the management of...*

