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CASE REPORT Open Access

Role of imaging in falcotentorial meningiomas: a case report

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Abstract

Background Falcotentorial meningiomas are rare tumors that arise from the junction of the falx cerebri and the tentorium. Accurate preoperative imaging plays a crucial role in surgical planning and management. Magnetic resonance imaging (MRI) is the preferred imaging modality for meningiomas. In this report, we present a case of type 1 falcotentorial meningioma and discuss the role of preoperative imaging and management.

Case presentation A 62-year-old female patient presented with gradually progressive bilateral lower limb weakness. Contrast-enhanced MRI showed a circumscribed lobulated extraaxial lesion near the falcotentorial junction with an adjacent dural tail, consistent with a type 1 falcotentorial meningioma. Based on these radiological features, the patient was diagnosed with a type 1 falcotentorial meningioma. The patient was referred for neurosurgical evaluation for further management.

Conclusion Falcotentorial meningiomas are rare tumors that require careful preoperative imaging and surgical planning. Radiological reporting should include the relationship of the tumor to the vein of Galen to aid neurosurgical approach. Complete surgical resection is the preferred therapy, but subtotal resection can be considered in certain cases.

Keywords Falcotentorial meningioma, Vein of Galen, Preoperative imaging

Background

Falcotentorial meningiomas are rare extraxial intracranial tumors that arise from the junction of the falx cerebri and the tentorium. They account for only 0.5–3% of all intracranial meningiomas [1]. Accurate preoperative imaging plays a crucial role in surgical planning and management. Magnetic resonance imaging (MRI) is the preferred imaging modality for meningiomas due to its superior soft-tissue contrast resolution [2]. In addition to localization, imaging features such as the degree of tumor infiltration and the relationship to adjacent structures, such as the vein of Galen, aid in determining the potential for complete surgical resection [3]. In this report, we present a case of type 1 falcotentorial meningioma and discuss the role of preoperative imaging and management.

Case presentation

A 62-year-old female patient presented with gradually progressive bilateral lower limb weakness over a period of 6 months. Her medical history was unremarkable. Clinical examination revealed hypertonia and hyperreflexia in bilateral lower limbs with reduced power. There were no sensory abnormalities or bowel/bladder involvement. Magnetic Resonance Imaging (MRI) (3 T MR MAGNETOM Skyra System, Seimens Healthcare Ltd., Germany) was performed to investigate the patient's neurological symptoms. Contrast-enhanced MRI (CEMRI) showed a circumscribed lobulated extraaxial lesion near the falcotentorial junction with an adjacent dural tail. The lesion was located posteriorly in relation to the inferior free margin of the falx cerebri. The imaging features

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were consistent with a type 1 falcotentorial meningioma. On T1-weighted images (T1W), the lesion was iso- to hypointense in relation to the gray matter (Image A). On T2-weighted images (T2W) and fluid-attenuated inversion recovery (FLAIR) images, the lesion appeared hyperintense (Image B). Contrast-enhanced T1W images revealed intense heterogeneous enhancement (Image C and D). There was no evidence of blooming or diffusion restriction within the lesion. Bilateral internal cerebral veins and great cerebral vein were inferiorly displaced (red arrows in Image D). The patient was referred for neurosurgical evaluation for further management (Fig. 1).

Discussion: Falcotentorial meningiomas are rare intracranial tumors that arise from the arachnoid cap cells along the falcotentorial junction, which is the interface between the falx cerebri and the tentorium cerebelli. These tumors pose unique challenges due to their anatomical location and proximity to critical structures. Falcotentorial meningiomas account for a small percentage of all meningiomas, with a distinct predilection for the posterior cranial fossa. They typically present with a range of clinical symptoms, including headache, seizures, visual disturbances, and focal neurological deficits. Diagnostic imaging, particularly magnetic resonance imaging (MRI), plays a crucial role in characterizing the tumor's size, location, and relationship with adjacent structures. These tumors can be classified into three types based on their relationship with the vein of Galen [4]: type 1, located anterior to the vein of Galen; type 2, located posterior to the vein of Galen; and type 3, involving the vein of Galen itself [5].

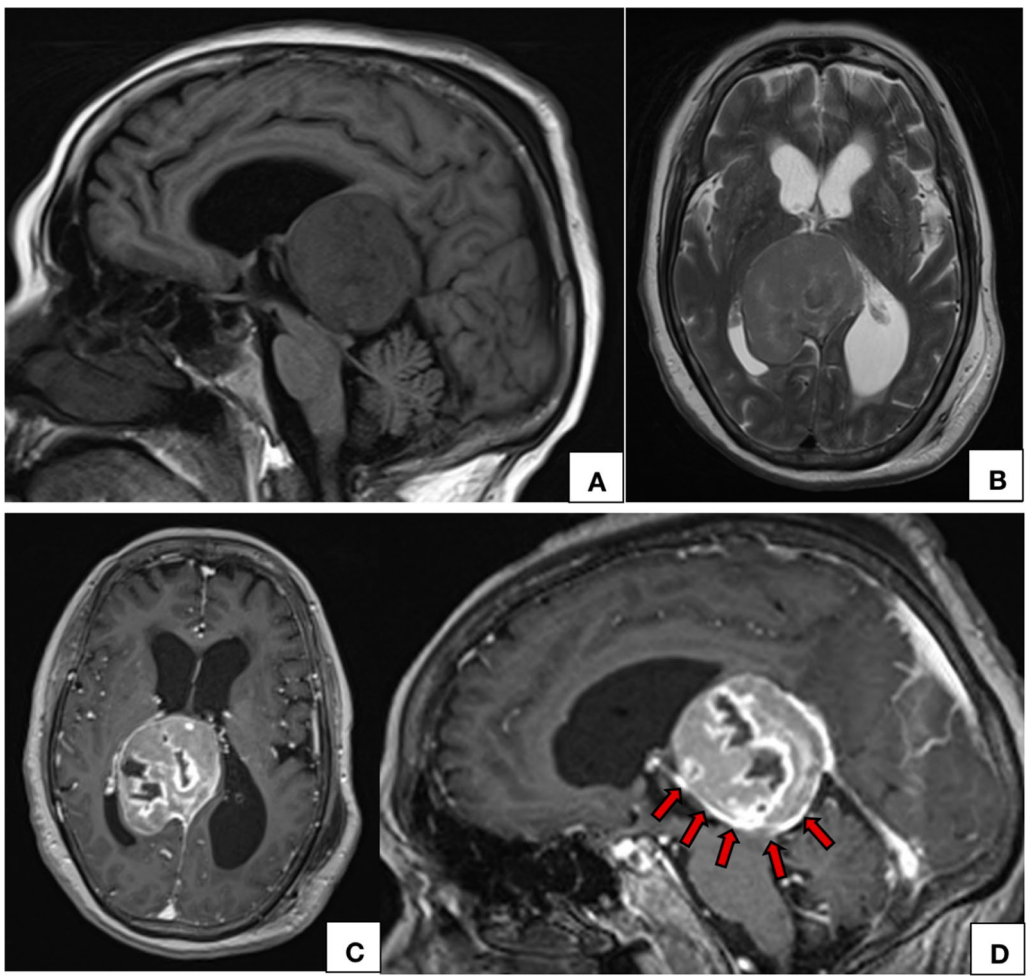

Fig. 1 Sagittal T1W (**A**), axial T2W (**B**), and axial (**C**) and sagittal (**D**) T1W post-contrast images show a circumscribed lobulated extraaxial lesion in relation to the inferior free margin of the falx cerebri posteriorly appearing iso- to hypointense on T1W (**A**), hyperintense on T2W (**B**) showing intense enhancement (**C**, **D**) with non-enhancing areas within and an adjacent dural tail. The vein of Galen is displaced inferiorly (red arrows in **D**) by the lesion

Type 1 falcotentorial meningiomas, as in the presented case, are located anterior to the vein of Galen and are the most common type, accounting for approximately 75% of cases [6]. The blood supply for these tumors is usually derived from the meningohypophyseal branch of the internal carotid artery. These tumors can displace the vein of Galen inferiorly, which can aid in their radiological diagnosis [7].

Type 2 falcotentorial meningiomas are located posterior to the vein of Galen and account for approximately 20% of cases. These tumors can invade the tentorium and cause obstructive hydrocephalus by compressing the aqueduct of Sylvius [5].

Type 3 falcotentorial meningiomas are the least common type, accounting for approximately 5% of cases. These tumors involve the vein of Galen and can cause venous congestion, leading to symptoms, such as headache, nausea, and vomiting. Treatment for these tumors requires careful consideration, as the surgical resection can lead to significant morbidity [5].

Preoperative imaging plays a crucial role in the localization and management of falcotentorial meningiomas. Radiological reporting should include the relationship of the tumor to the vein of Galen to aid neurosurgical approach. Contrast-enhanced magnetic resonance imaging (CEMRI) is the imaging modality of choice for these tumors, as it can accurately delineate the tumor extent and its relationship to adjacent structures. The imaging can also provide valuable information on the tumor vascularity and blood supply, which can aid in surgical planning [8]. Diagnostic magnetic resonance angiography (MRA) and magnetic resonance venography (MRV) are essential in the preoperative evaluation of falcotentorial meningiomas. MRA provides valuable information about the arterial supply to the tumor, including the origins and course of feeding vessels. This knowledge guides surgical planning by identifying the blood supply that needs preservation or control during resection. MRV evaluates venous drainage patterns, visualizing major venous structures like the superior sagittal sinus and deep cerebral veins. Understanding the venous drainage minimizes the risk of venous infarction or hemorrhage during surgery. Additionally, MRA and MRV aid in selecting the optimal surgical approach based on the involvement of critical venous structures or major arteries, maximizing safe tumor resection. These imaging techniques also help identify associated vascular abnormalities such as arteriovenous malformations or aneurysms. By detecting these lesions, MRA ensures their appropriate management during surgery. The detailed vascular information obtained from MRA and MRV contributes to the overall risk assessment of falcotentorial meningiomas. Surgeons can evaluate potential complications associated with vascular involvement and plan intraoperative strategies accordingly. Integrating MRA and MRV into the preoperative evaluation enhances surgical planning, improves patient outcomes, and minimizes the risk of intraoperative vascular complications.

Complete surgical resection is the preferred therapy for falcotentorial meningiomas, as it offers the best chance of long-term tumor control. However, in cases where the tumor is adherent to or infiltrating the adjacent structures, subtotal resection may be considered. Patients who undergo subtotal resection require close imaging follow-up and revision surgery in case of recurrence [9].

Conclusion

In conclusion, falcotentorial meningiomas are rare tumors that require careful preoperative imaging and surgical planning. Radiological reporting should include the relationship of the tumor to the vein of Galen to aid neurosurgical approach. Complete surgical resection is the preferred therapy, but subtotal resection can be considered in certain cases. Close imaging follow-up is required for patients who undergo subtotal resection.

Abbreviations

MRI	Magnetic resonance imaging
CEMRI	Contrast-enhanced MRI
T1W- T1	Weighted images
T2W	T2-weighted images
FLAIR	Fluid-attenuated inversion recovery

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Not applicable.

Author contributions

EA: guarantor of integrity of the entire study, study of concept and design, literature research, manuscript preparation, and manuscript editing. SA: study concepts and design, literature research, manuscript preparation, and manuscript editing. SS: study concept and design, and manuscript editing. RS: study concept and design, and manuscript editing.

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Availability of data and materials

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Declarations

Ethics approval and consent to participate

All procedures performed in this study involving a human participant were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The case was a part of an undergoing research and a part of blanket institutional ethical committee approval was obtained (dated 29/08/2022 with ref. no. 92/04/2022/174).

Consent for publication

Informed consent was obtained from the patient to publish the case and use her radiological images involved in the preparation of this manuscript.

Competing interests
The author(s) declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

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