

Contralateral Interhemispheric Occipital Approach for Deep Medial Precuneus Lesion in a Drug-Resistant Epilepsy Patient: A Case Report

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Abstract

Lesions located in the deep medial surface of the parieto-occipital region, particularly the precuneus, present significant surgical challenges due to their proximity to eloquent cortical and subcortical structures. Conventional transcortical approaches require cortical incision and retraction, increasing the risk of postoperative visual, cognitive, and language deficits. This describes the microsurgical technique of a contralateral interhemispheric occipital transtentorial approach for the safe resection of a deep medial precuneus lesion.

Introduction

Drug-resistant epilepsy is defined as the failure of two appropriately chosen and tolerated antiseizure medications to achieve sustained seizure freedom. In patients with MRI-visible focal lesions and concordant video-EEG monitoring, surgical resection is often the most effective treatment. The precuneus is a functionally complex region involved in visuospatial processing, memory integration, and higher-order associative networks. Lesions in its deep medial surface are difficult to access surgically due to the risk of injury to long association fibers of the visual system, including the inferior longitudinal fasciculus and inferior fronto-occipital fasciculus, particularly when operating on the dominant hemisphere. Transcortical approaches to this region require cortical incision and retraction, increasing the likelihood of postoperative neurological deficits. In contrast, interhemispheric approaches exploit natural anatomical corridors and reduce cortical manipulation. The contralateral interhemispheric occipital transtentorial route allows gravity-assisted separation of the occipital lobe from the falx cerebri, facilitating safe access to medial parieto-occipital lesions. This describes the surgical anatomy, positioning, and microsurgical steps of this approach, illustrated through its application in a pediatric patient with a rare epileptogenic tumor.

Case Report

A 14-year-old right-handed female presented with focal epilepsy beginning at 6 years of age, characterized by impaired awareness, behavioral arrest, automatisms, and occasional secondary generalization. Despite treatment with multiple antiseizure medications, seizures remained poorly controlled and were associated with developmental delay. At the time of evaluation, the patient was receiving carbamazepine (2 g/day), phenobarbital (400 mg/day), risperidone (2 mg/day), and diazepam (30 mg/day). Magnetic resonance imaging demonstrated a cortico-subcortical intra-axial lesion located in the inferomedial portion of the left precuneus. The lesion was isointense on T1-weighted images and hyperintense on T2-weighted and FLAIR sequences, without diffusion restriction, and contained small cystic components. The radiological features, together with concordant electroclinical findings, supported the epileptogenic nature of the lesion, leading to the indication for surgical treatment. Surgery was performed under general anesthesia with standard systemic monitoring, and a lumbar cerebrospinal fluid drain was placed to facilitate brain relaxation and minimize the need for occipital lobe retraction. The patient was positioned in a three-quarter prone (park-bench) position, lying obliquely on the side of the surgical approach, with the head slightly flexed and rotated approximately 30 degrees contralaterally. This configuration allowed gravity-assisted separation of the medial surface of the occipital lobe from the falx cerebri. A U-shaped parieto-occipital skin incision was performed with an inferiorly oriented base, followed by a parieto-occipital craniotomy exposing the occipital lobe, superior sagittal sinus, transverse sinus, and torcular Herophili. The dura mater was opened along the superior sagittal and transverse sinuses and reflected laterally. Microsurgical dissection proceeded through the interhemispheric fissure between the medial surface of the occipital lobe and the falx cerebri, a region typically devoid of significant bridging veins, allowing safe access with minimal venous risk. The falx cerebri was incised with its base directed toward the straight sinus, providing contralateral exposure of the medial surface of the opposite occipital lobe. After falcine incision, the lesion was visualized posterior to the splenium of the corpus callosum. The tumor was identified adjacent to the calcarine branch of the posterior cerebral artery, which was carefully preserved. Gross total resection was achieved, avoiding transcortical incision and excessive brain retraction. Histopathological examination confirmed the diagnosis of angiocentric glioma. The postoperative course was uneventful, with no new neurological deficits, including visual field disturbances or cognitive impairment. At follow-up, the patient remained seizure-free and no radiological or clinical recurrence was observed.

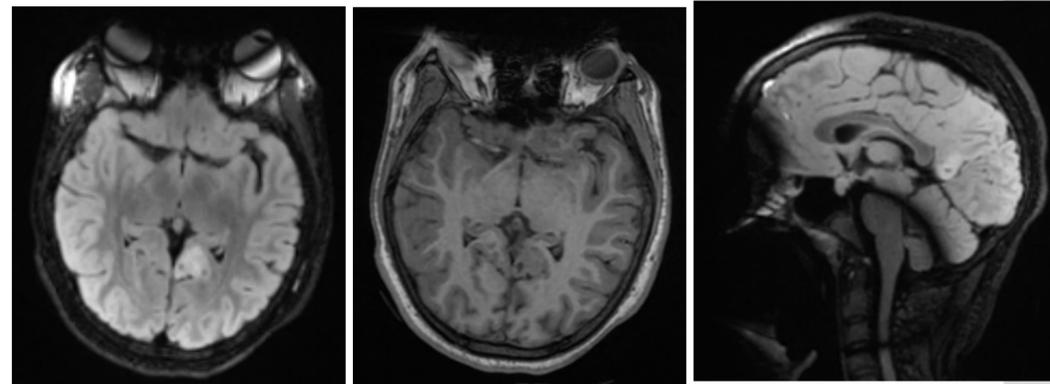


Figure 1. Preoperative magnetic resonance imaging demonstrates a cortico-subcortical intra-axial lesion located in the inferomedial portion of the left precuneus. The lesion is isointense on T1-weighted images and hyperintense on T2-weighted and FLAIR sequences, without diffusion restriction, and contains small cystic components.

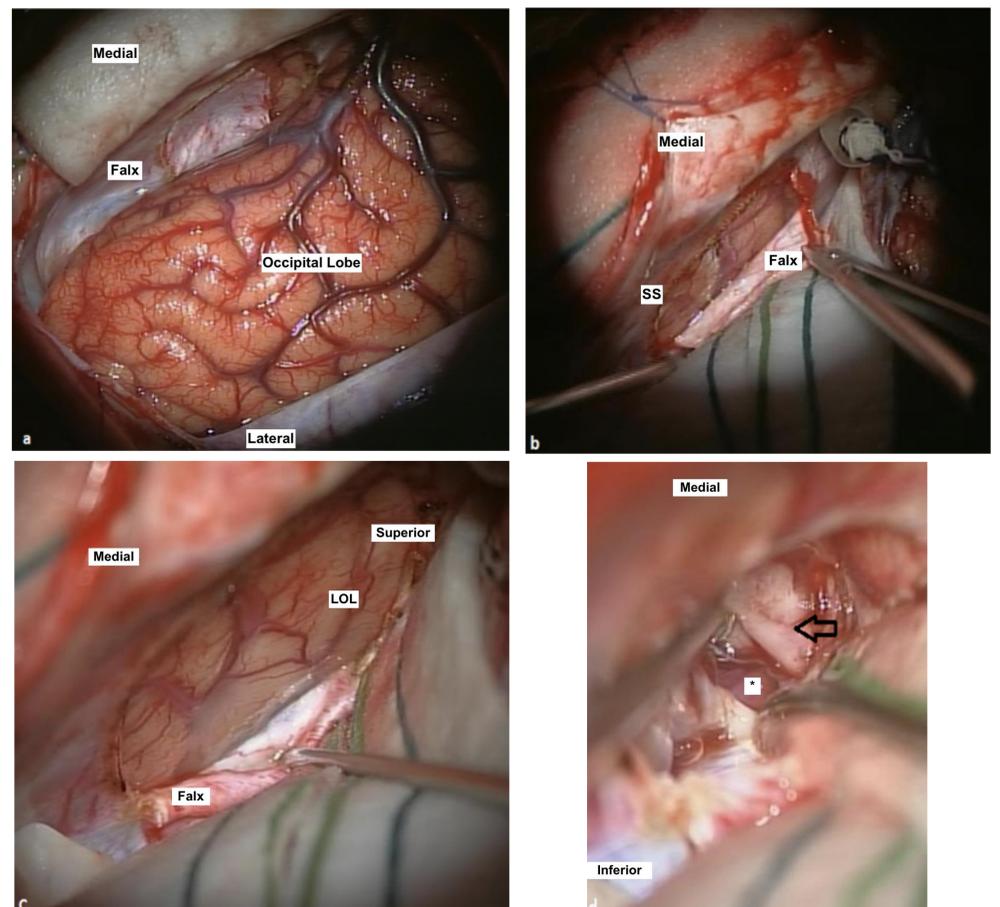


Figure 2. (a) Intraoperative view of the cerebral falx during occipital lobe retraction. (b) Technique of falx cerebri sectioning in an anterosuperomedial direction, based on the straight sinus. (c) After the incision, the falx is reflected, allowing contralateral visualization of the left occipital lobe (LOL). (d) Intraoperative view of the lesion located posterior to the splenium of the corpus callosum after falx incision (arrow). The calcarine branch of the posterior cerebral artery adjacent to the lesion is identified (*). **Abbreviations:** LOL = left occipital lobe; SS = straight sinus.

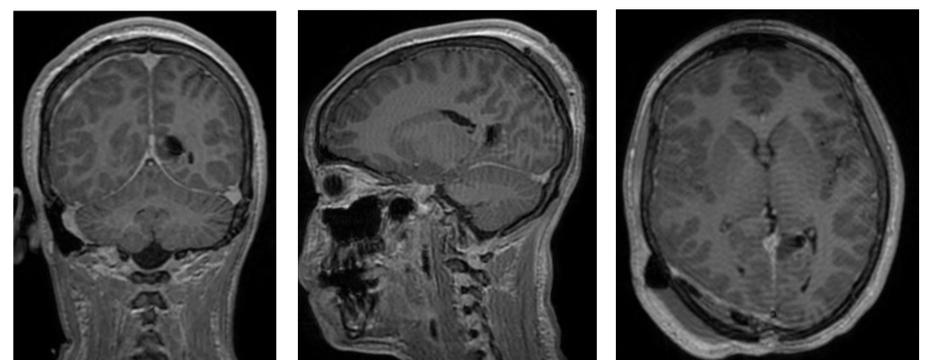


Figure 3. Postoperative magnetic resonance imaging demonstrating gross total resection.

Conclusions

Surgical treatment of lesions in the deep medial surface of the brain is challenging. Transcortical approaches carry risks due to the need for cortical resection or retraction, increasing the chance of postoperative deficits. The contralateral interhemispheric occipital route leverages gravity to naturally separate the occipital lobe from the falx, minimizing retraction. In this case, the dissection followed natural anatomical corridors—between the medial occipital surface and the falx. This approach allowed safe and effective resection of the lesion with minimal brain manipulation, supporting its utility in carefully selected cases.

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