

Intraventricular meningiomas and their troubling surgical approach: a case report

Abstract

Intraventricular meningiomas require a cautious surgical preoperative planning in an attempt to avoid unwanted postoperative neurological deficits. Despite that better surgical approaches exist, the posterior parietal transcortical approach to intraventricular trigonal lesions, with its unavoidable damage to the posterior parietal white matter pathways, is still popular in clinical practice, at times, like in the following case report, without any electrophysiological support.

Keywords: surgical approach, optic ataxia, hemianopsia, optic radiation

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Introduction

Intraventricular meningiomas are found infrequently in clinical practice^{1,2} and, although the development of neuro-imaging technology has enabled its non-invasive diagnosis, their delayed clinical expression, which is usually vague and at times intermittent, allows these lesions to reach a significant size by the time of their detection.³ Because the cerebral ventricles are surrounded by eloquent neural structures, the surgical approach taken for the resection of these lesions must be individualized, taking into account the lesion's location within the ventricular system, its size and blood supply, in an attempt to reduce to a minimum the occurrence of unwanted postoperative neurological deficits.⁴

Materials and methods

A careful literature search under the titles of "meningioma" and "Intraventricular tumors" was carried out and the reference lists of the publications thus gathered was reviewed in order to augment the data on the surgical aspects concerned with these lesions and their potential complications.

Case report

An elderly right handed male, with a personal and family history of migraine, reported that, for the previous few years, he had been experiencing recurrent episodes of flicker scotoma in his right homonymous visual fields. It was not triggered by any particular stimulus, it was colorless and showed no movement. It lasted a few minutes and cleared spontaneously, only to recur after variable periods of time. The flicker scotoma was not associated with any change in his mental status, headache, convulsions nor with any auditory components. Through these years the patient did not notice any visual field defect nor any deterioration in his visual acuity. Later on, when he developed some mood changes and gait imbalance, a neurological consultation was obtained and a magnetic resonance imaging was done, which revealed a right intraventricular meningioma (Figure 1).

He was transferred to a tertiary neurosurgical referral center where his neurological examination and visual field testing by confrontation revealed no abnormalities. Surgery was undertaken via a right posterior parietal transcortical approach with image guidance assistance. Under the operating microscope the tumor was visualized and a biopsy taken which revealed a meningioma grade 2. The mass was debulked by ultrasonic aspiration and it was completely resected.

Post-operatively the patient presented a left homonymous hemianopsia and optic Ataxia,¹ which caused him difficulty reaching and grasping of objects and playing his guitar and piano. Moreover he also experienced trouble in shifting gaze to the next text line while reading which caused difficulties in his work at the computer and Reading subtitles while watching a movie or television. His pre-existing gait imbalance also worsened somewhat. Four months after the surgery a magnetic resonance scan with contrast enhancement revealed a small left parietal cortical defect (Figure 2A) and the surgical track from the posterior parietal area into the right lateral ventricle (Figure 2B) but showed no evidence of residual or recurrent tumor.

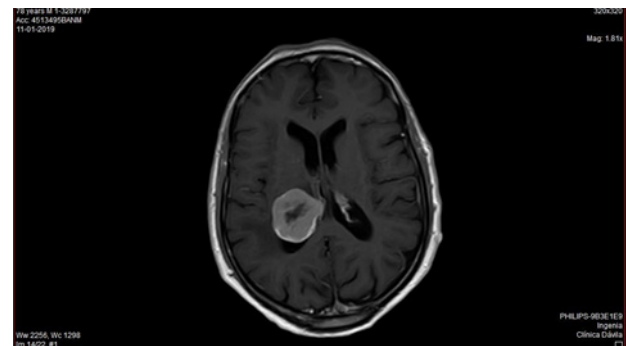


Figure 1 Contrasted MRI depicting a rightsided intraventricular meningioma

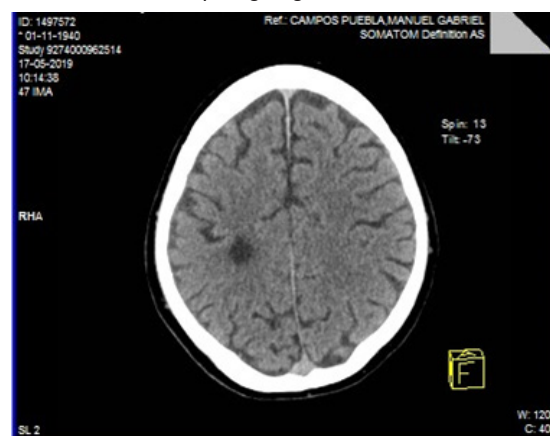


Figure 2A Contrasted MRI depicting the small postsurgical cortical defect.



Figure 2B Contrasted MRI in sagittal view showing the surgical track into the lateral ventricle.

An EEG revealed a right parietal delta focus without epileptiform activity. Nevertheless and because the clinically suggestive epileptic nature of the flicker scotoma, which did not seem to be directly related to the rightsided tumour, treatment with Pregabalin 100 mg/day was initiated and shortly thereafter the flicker scotoma ceased and did not recur. Through a three year follow-up period, the gait imbalance gradually improved to his preoperative level, the difficulty in reaching and grasping objects and his difficulty playing guitar and piano also gradually improved, but the left homonymous hemianopia and the reading difficulties remained unchanged.

Discussion

The initial challenge posed by intraventricular meningiomas was their timely diagnoses, a difficulty that has been significantly subserved with the advent of imaging technologies. A second challenge remained and consisted in the selection of the optimal surgical technique that would allow for the safe and complete resection of these lesions, a pursuit that benefited with the development of microneurosurgery. A third, and still ongoing quest, is the one posed by the selection of the optimal surgical approach that could provide for the shortest avenue to the lesion and enable its complete resection.^{2,5} The current surgical planning is usually based on the location of specific cortical sulci to determine the point of entry, with no consideration been paid to the underlying white matter pathways.

Despite that functional MRI, and whole-brain diffusion tensor imaging have improved this preoperative planning,⁶ most of the current publications on that topic focus on the identification and anatomical location of the optic radiation in its relation to the ventricular system, but ignore⁷⁻¹⁰ other important white matter pathways that should also be considered in such a plan. For instance, identifying the white matter ventral and dorsal visual streams emanating from the striate cortex^{11,12} deserve being included in such a preoperative planning since their disruption could cause significant neurological deficits.¹³

At the present time, the posterior parietal transcortical approach to the lateral ventricular atrium is still a popular one in neurosurgical practice, and, although the cortical damage it causes may be restricted, a significant disruption of the subcortical white matter pathway network is unavoidable. Moreover, this approach also places visual function itself in double jeopardy: a.-By disrupting the white matter dorsal visual stream, that connects the striate cortex to the posterior parietal lobe, this approach can cause Optic Ataxia,¹³ a disfunction at a more integrative sensorymotor level that results in difficulty completing reaching and grasping tasks guided by peripheral vision, as well as other related disabilities¹⁴ in the absence of a primary motor

or sensory deficit. b.- By damaging fibers of the optic radiation, either at the surgical point of entry into the atrium^{8,9} or by trans-ependymal optic radiation trauma caused during tumor removal¹⁵ it could result in an homonymous visual field defect. Because of these significant postoperative problems, a different surgical approach have been suggested in an attempt to improve the surgical results.^{16,17}

With this objective in mind, the use of preoperative non-invasive functional neuroimaging and electrophysiological monitoring have also been incorporated to the preoperative planning. Nevertheless for most of these techniques, the identification of white matter eloquent pathways remains problematic. As a consequence, the use of intraoperative real-time direct electrical cortical and subcortical stimulation has been recommended¹⁸⁻²⁰ as a method that could allow for a safer tumor resection. The case reported herein exemplify the current situation where even at a neurosurgical tertiary referral center this quest remains unsolved.

Conclusion

The transcortical approach to the lateral ventricle through the posterior parietal cortex, should be avoided and replaced by the interhemispheric transcallosal approach in order to minimize potential operative neurological injury. In those cases where the transcortical parietal approach must be used, it should be carried out with the support of the adjuncts herein outlined, ideally by intraoperative electrical cortical and subcortical mapping.

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Conflicts of interest

The author declares that there is no conflicts of interest.

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