Clinical Case Reports

ISSN: 2675-3626

Recurrence Of Pilocytic Astrocytoma Of The Sellar Region With Intraventricular Growth: Clinical Case And Improvement Of Objective Vision

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Introduction/Background: Pilocytic astrocytoma (PA) rarely originates in the sellar region. Tumor recurrence with intraventricular extension represents a complex neurosurgical scenario because of the proximity to the optic apparatus and the risk of persistent or progressive visual dysfunction.

Case presentation: An 11-year-old patient with a history of subtotal resection of a sellar pilocytic astrocytoma presented with tumor recurrence three years after the initial surgery, with intraventricular growth on magnetic resonance imaging (MRI). After the first procedure, the patient developed severe visual impairment and diabetes insipidus. Preoperative functional assessment included visual evoked potentials (VEP), which demonstrated delayed conduction along the visual pathways, suggesting compromised but potentially reversible pathway function. The patient underwent repeat surgical treatment via craniotomy with transcortical transventricular tumor resection, aiming at decompression of the visual pathways and maximal safe removal of the recurrent lesion. Postoperatively, gradual functional improvement was observed, including recovery of objective vision characterized by improved ability to perceive details and to discriminate the shape and movement of objects. However, limitations in recognition of fine details persisted, consistent with residual pathway injury.

Conclusions: In recurrent sellar pilocytic astrocytoma with intraventricular extension, surgical reintervention and decompression may lead to meaningful visual functional recovery even after prolonged deficits. VEP constitutes a valuable adjunct for documenting visual pathway dysfunction and may help estimate the potential for postoperative visual improvement.

Keywords: Pilocytic Astrocytoma; Sellar Region; Intraventricular Neoplasms; Vision Disorders; Visual Evoked Potentials.

INTRODUCTION

Tumors of the chiasmatic–sellar region (CSR) constitute a heterogeneous group of neoplasms, accounting for up to 10-15% of all intracranial tumors. Their anatomical proximity to the optic chiasm, hypothalamus, pituitary gland, cavernous sinus structures, and the third ventricle leads to the development of a complex neurological symptom constellation, in which visual and neuroendocrine disturbances play a dominant role [1]. The most common neoplasms in this region are pituitary adenomas and craniopharyngiomas, whereas glial tumors-particularly pilocytic astrocytomas (PA) - are encountered considerably less frequently [1].

Pilocytic astrocytoma (WHO Grade I) is a relatively benign glial tumor that predominantly occurs in childhood and adolescence. The classic locations of PA include the cerebellum and the visual pathways; in the latter case, the tumor is often associated with neurofibromatosis type I [1]. At the same time, solid forms of pilocytic astrocytoma primarily arising in the sellar or suprasellar region without a direct connection to the optic nerve are exceedingly rare and present significant diagnostic challenges, frequently mimicking more common tumors of this anatomical area. Moreover, such atypical localization predisposes to a complex growth pattern with a tendency to infiltrate adjacent functionally critical structures, including the walls of the third ventricle, which substantially limits the feasibility of radical surgical resection and increases the risk of tumor recurrence [2].

Surgical management of tumors of the chiasmatic–sellar region is aimed at histological verification, decompression of vital structures, and maximal feasible cytoreduction [2]. In cases of recurrence, especially following previous interventions complicated by neurological deficits, surgical strategy becomes considerably more complex due to altered anatomical relationships, scar formation, and an increased risk of complications [3].

Submitted: 11 December 2025
Accepted: 01 January 2026
Published: 19 January 2026

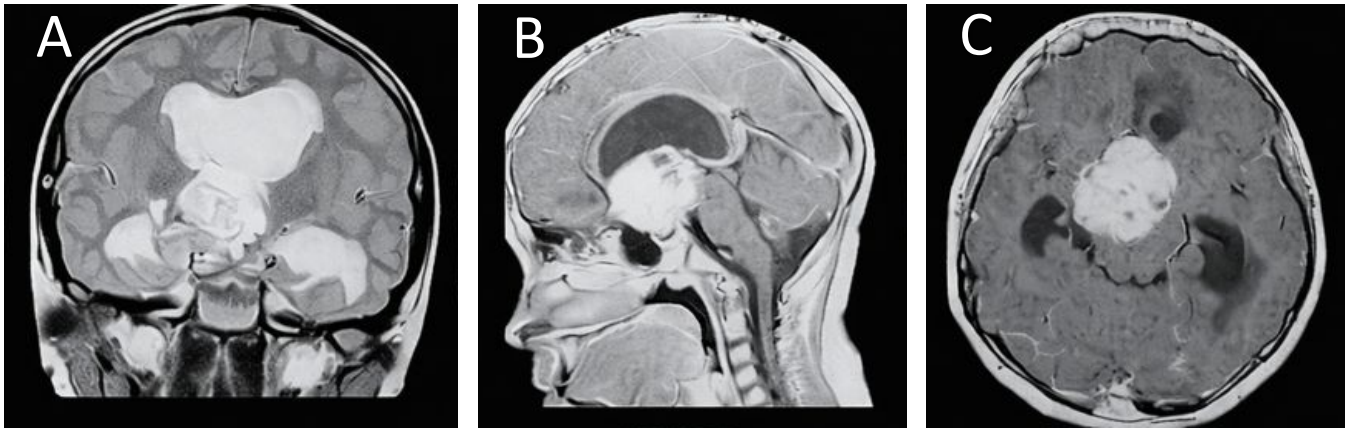

Figure 1: Preoperative contrast-enhanced MRI of the brain. Volumetric formation of the chiasmatic-sellar region with supra-, retro- and antiselular spread and a pronounced intraventricular component filling the third ventricle and causing occlusive hydrocephalus is visualised. Heterogeneous contrast enhancement is noted.A — frontal, B — sagittal, C — axial slices.

A key criterion for the effectiveness of repeat surgical intervention in such patients is the dynamics of visual function. Complete recovery of visual acuity after prolonged compression of the optic chiasm is rarely observed and remains largely unpredictable [3]. At the same time, a clinically meaningful outcome may consist of qualitative improvement in functional vision-namely, a transition from the perception of blurred, coarse contours to object vision and spatial orientation [4]. Such a “stepwise” functional recovery, which substantially enhances the patient’s quality of life, may be regarded as one of the most important outcomes of neurosurgical treatment in this region.

This type of outcome is closely associated with mechanisms of neuroplasticity and the potential reversibility of visual pathway injury following relief of compression. An objective method for preoperative assessment of the extent of damage and the prognosis for recovery is the evaluation of visual evoked potentials (VEPs) [4]. Changes in latency and amplitude of cortical responses on VEP studies reflect the degree of demyelination and the preservation of axonal conduction, providing unique in vivo information on the functional state of the visual analyzer that is not accessible through neuroimaging modalities [5].

This article presents a rare clinical case of recurrent pilocytic astrocytoma of the chiasmatic-sellar region with a massive intraventricular component in an 11-year-old patient. The case is notable for the combination of an atypical localization of a histologically benign tumor, a prolonged severe visual deficit following the initial intervention, and the use of a transcortical transventricular approach for repeat decompression. Particular emphasis is placed on the functional visual outcome, with a clinically significant improvement observed from the perception of coarse, blurred contours to detailed object vision [5].

CASE REPORT

Medical History and Previous Treatment. An 11-year-old boy was admitted to the neuro-oncology department with complaints of progressively worsening diffuse headache over a two-month period, episodes of nausea and vomiting, and absence of object vision. The medical history revealed that in 2018 the patient underwent bifrontal craniotomy with subtotal resection of a tumor of the chiasmatic–sellar region, histologically verified as pilocytic astrocytoma. The postoperative course was complicated by the development of persistent central diabetes insipidus and severe visual impairment. According to the parents, following the initial surgery the child lost object vision and was only able to distinguish coarse contours of large objects at a distance of up to 2–3 meters.

Clinical Presentation at the Time of Current Admission. On admission, the patient’s condition was assessed as moderately severe. The neurological examination was dominated by signs of increased intracranial pressure, including diffuse headache with morning predominance and episodes of nausea and vomiting. Focal neurological deficits were primarily represented by marked visual disturbances. Ophthalmological Examination: The patient was cooperative and was able to correctly localize the direction of a light source. Visual function was limited to the perception of large moving objects by their general contours; discrimination of details, recognition of faces, and reading were not possible. Persistent manifestations of diabetes insipidus were noted and were adequately controlled with regular desmopressin therapy (polyuria up to 5–6 L/day, polydipsia).

Neuroimaging and Functional Diagnostic Methods 1. Magnetic Resonance Imaging (MRI) of the Brain with Intravenous Contrast Enhancement. MRI revealed a space-occupying lesion of the chiasmatic–sellar region with supra-, retro-, and ante-sellar extension. The main tumor component was located within the cavity of the third

DOI: 10.46900/apn.v8i1.348

ventricle, causing its marked dilatation and resulting in obstructive triventricular hydrocephalus. The lesion

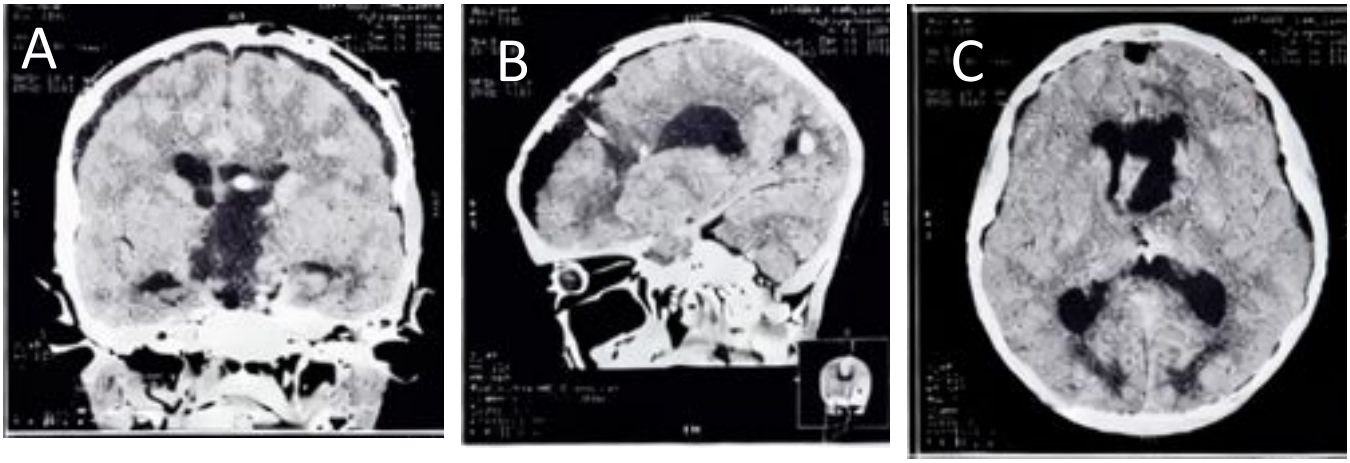

Figure 2: Postoperative MSCT of the brain (1st day). A — frontal, B —sagittal, C — axial sections. Condition after left-sided frontoparietal craniotomy and transventricular tumour removal: resection cavity in the projection of the third ventricle, reduction in the size of the ventricular system; bone flap fixed.

measured 4.2 × 4.1 × 4.1 cm. The tumor demonstrated heterogeneous contrast enhancement with minimal perifocal edema (Fig. 1).

2. Visual Evoked Potentials (VEPs). VEPs were recorded using a standard pattern-reversal checkerboard stimulation protocol. A pronounced, symmetrical prolongation of the P100 latency to 155–160 ms was observed in both eyes (age-adjusted normal value ≤115 ms). Response amplitude was reduced by approximately 40–50% but remained clearly recordable. These findings were consistent with severe demyelinating involvement of the visual pathways with partial preservation of axonal conduction.

SURGICAL INTERVENTION

Indications and Objectives of Surgery. The decision to perform repeat surgical intervention was made due to progression of obstructive hydrocephalus and worsening focal neurological symptoms, with a threat of further loss of residual visual function. The dominant intraventricular tumor component causing cerebrospinal fluid (CSF) flow obstruction at the level of the third ventricle determined both the urgency and the surgical strategy. The objectives of the intervention were: (1) elimination of obstructive hydrocephalus through resection of the intraventricular portion of the tumor and restoration of CSF pathways; (2) decompression of the optic chiasm and visual pathways; and (3) maximally safe resection of the tumor mass.

Choice of Surgical Approach. MRI demonstrated that the main tumor volume was located suprasellarly with marked extension into the cavity of the third ventricle. Given the predominantly midline mass effect, a left-sided transcortical transventricular approach through the anterior horn of the left lateral ventricle was selected to achieve the surgical goals. This approach provided a direct and minimally traumatic trajectory to the tumor within the third ventricle, allowed for ventriculocisternostomy under direct visualization if required, and minimized traction on the basal brain structures and the optic chiasm.

Surgical Technique. Under general endotracheal anesthesia, a left-sided frontoparietal craniotomy was performed. Following opening of the dura mater, a corticotomy was made in the region of the middle frontal gyrus. Using neuronavigation guidance, catheterization of the anterior horn of the left lateral ventricle and ventriculostomy were carried out. Intraoperative Findings and Resection Stages. Upon entry into the cavity of the third ventricle, a tumor completely filling its lumen was visualized. The tumor tissue was grayish-pink, moderately vascularized, soft-elastic in consistency, with a well-defined capsule that was densely adherent to the floor of the third ventricle and the vessels of the choroid plexus, without evidence of extensive infiltration of the ventricular walls.

Using microsurgical techniques and an ultrasonic aspirator, intracapsular tumor removal was performed, allowing visualization and preservation of the thalamus, internal cerebral veins, and the foramina of Monro. In areas of dense adhesion to hypothalamic structures, resection was deliberately limited, and subtotal removal was achieved with preservation of a thin residual tumor layer. The primary objectives-decompression of the cerebrospinal fluid pathways and visual structures-were successfully accomplished.

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Histopathological examination confirmed the diagnosis of pilocytic astrocytoma, demonstrating a typical biphasic pattern with compact bundles of spindle-shaped cells and Rosenthal fibers, as well as loose microcystic areas. Tumor cells showed strong diffuse expression of glial fibrillary acidic protein (GFAP). The Ki-67 proliferative index was <2%, consistent with a benign biological behavior. Postoperative Course and Outcome Assessment. The early postoperative period was uneventful. Follow-up multislice computed tomography (MSCT) of the brain on postoperative day one confirmed adequate decompression of the ventricular system (Fig. 2).

The key outcome was a positive dynamic change in visual function. On postoperative days 2–3, the patient reported improved discrimination of object shape and boundaries, as well as direction of movement. Brief visual fixation and attempts to track large objects were observed. Thus, a transition from perception of only blurred contours to initial object vision was documented, despite persistently low visual acuity. Diabetes insipidus persisted and continued to require replacement therapy.

The patient was discharged on postoperative day 12 in satisfactory condition, with recommendations for dynamic follow-up by a neurosurgeon and an endocrinologist, as well as consultation with a pediatric oncologist.

DISCUSSION

The presented clinical case of recurrent pilocytic astrocytoma (PA) of the chiasmatic-sellar region with intraventricular growth highlights several key challenges and decision-making principles in pediatric neuro-oncology.

Surgical complexity of recurrent CSR tumors and choice of approach

One of the main challenges in the management of recurrent tumors of the chiasmatic–sellar region is the selection of a surgical approach that provides effective decompression while minimizing the risk of complications. In the present case, the dominant intraventricular component and associated obstructive hydrocephalus rendered standard transcranial and transsphenoidal approaches suboptimal: the former would have required significant frontal lobe retraction in the setting of postoperatively altered anatomy, while the latter would not have allowed adequate control of the supra- and retrosellar compartments or the third ventricle.

A left-sided transcortical transventricular approach was therefore chosen as the most direct and controllable route to the tumor obstructing the third ventricle. This approach enabled restoration of cerebrospinal fluid dynamics and decompression of the visual pathways without additional trauma to basal brain structures. The effectiveness of this strategy for intraventricular CSR tumors in patients with hydrocephalus has been supported in the literature [6]. A critical intraoperative decision was to limit the extent of resection in areas of dense adhesion between the tumor and the floor of the third ventricle. Given the benign biological behavior of pilocytic astrocytoma, the patient's young age, and the high risk of hypothalamic injury, subtotal resection with prioritization of functional outcome appears both clinically and ethically justified [6].

Functional visual outcome as a treatment priority

The most important outcome of this case was the qualitative improvement in visual function following surgical decompression, despite a long-standing severe visual deficit. This effect may be explained by neuroplasticity and restoration of conduction along partially preserved optic pathway fibers after relief of chronic compression, resulting in improved signal transmission through anatomically intact but functionally compromised tracts. This aspect is often underestimated in the literature, where emphasis is frequently placed on the radicality of resection rather than on functional outcomes [7].

Prognostic role of visual evoked potentials

Preoperative VEP assessment played a significant prognostic role. Marked prolongation of P100 latency with preserved amplitude indicated predominantly demyelinating damage to the visual pathways with partial preservation of axonal conduction—a pattern associated with potential functional recovery after decompression [7,8]. VEP findings thus provided an objective basis for a cautiously optimistic prognosis.

The issue of adjuvant therapy

This case raises the question of postoperative management following subtotal resection of PA in critical locations. On the one hand, PA is a WHO Grade I tumor, and the role of radiotherapy in pediatric patients is limited. On the other hand, tumor recurrence poses a risk of further progression. In such situations, a strategy of active surveillance with serial MRI monitoring appears to be an attractive and reasonable option [8].

The main limitation of this report is its nature as a single clinical case. Assessment of visual function was predominantly subjective; however, this does not diminish the clinical relevance of the observed outcome for the patient.

DOI: 10.46900/apn.v8i1.348

CONCLUSION

Surgical planning for recurrent chiasmatic–sellar tumors should be guided by a detailed assessment of the lesion's relationship to the ventricular system and surrounding hypothalamic structures. In this region, preserving neurological and endocrine function must take precedence over radical resection. Meaningful qualitative visual recovery—such as improved detail perception and contrast sensitivity—supports the contribution of neuroplasticity and justifies an active surgical approach even in patients with long-standing severe deficits. Visual evoked potentials provide valuable prognostic information: preserved cortical responses with prolonged latency suggest potentially reversible pathway dysfunction and a greater likelihood of postoperative improvement. Long-term care should rely on active surveillance within a multidisciplinary framework, with quality of life as the primary outcome priority.

ACKNOWLEDGMENTS

The authors would like to thank all the staff of the operating theater and neurointensive care unit of the Republican Specialized Scientific and Practical Medical Center for Neurosurgery for their assistance in performing operations and providing postoperative care for patients.

DISCLOSURES

Ethical approval

This work is a retrospective analysis of a single clinical case and was conducted in accordance with the principles of the Declaration of Helsinki.

Consent to participate

The patients gave consent to use their information and images for research purposes. *Consent for publication*

The patient gave consent to use his information and images for publication.

Conflict of interest

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Artificial intelligence

Authors used Deepseek for editing and translating paper

CONTRIBUTIONS

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