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Case Report

Pilocytic Astrocytoma of the Left Cerebellar Hemisphere with Obstructive Hydrocephalus in A Pediatric Patient: A Case Report

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ABSTRACT

Pilocytic astrocytoma is a World Health Organization (WHO) Grade I glioma commonly affecting children and adolescents, with the cerebellum being the most frequent site of involvement. These tumors often present with features of raised intracranial pressure due to obstruction of cerebrospinal-fluid pathways. We report a case of a 14-year-old female who presented with headache, recurrent vomiting, giddiness, and sudden episodes of fall. Neuroimaging revealed a solid cystic lesion in the left cerebellar hemisphere causing compression of the fourth ventricle and obstructive hydrocephalus. The patient underwent left suboccipital craniectomy with tumor decompression, and histopathological examination confirmed pilocytic astrocytoma. Postoperative recovery was favorable, with complete resolution of presenting symptoms. This case highlights the importance of early diagnosis, timely surgical intervention, and the critical role of clinical pharmacists in optimizing drug therapy, monitoring adverse effects, and improving patient outcomes in pediatric neuro-oncology cases.

Keywords: Cerebellar tumor, Pediatric brain tumor, Pharmacy practice, Pilocytic astrocytoma.

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INTRODUCTION

Pilocytic astrocytoma is a slow-growing, benign brain tumor classified as World Health Organization (WHO) Grade I (Louis *et al.*, 2021), predominantly seen in the pediatric population. It commonly arises in the cerebellum and may cause symptoms related to increased intracranial pressure due to mass effect or hydrocephalus. Although considered histologically benign, its location in the posterior fossa can lead to significant morbidity if diagnosis or treatment is delayed. Reporting such cases is important to enhance clinical understanding, highlight therapeutic challenges, and emphasize the role of pharmacists in multidisciplinary care (Burger, 2007; Cherlow *et al.*, 2019; Johnson *et al.*, 2014; Ostrom *et al.*, 2020; Pollack, 2013).

CASE DESCRIPTION

A 14-year-old female patient was admitted to a tertiary care hospital on March 26 2025 with complaints of sudden onset of fall episodes, persistent headache, reeling sensation, and repeated episodes of vomiting. The symptoms were acute in onset and progressively worsened over a short duration, prompting hospital evaluation. There was no history of seizures, fever, trauma, or visual disturbances prior to admission. The patient had no known comorbid conditions and no significant past medical or medication history. There were no identifiable risk factors, and family history was noncontributory. On admission, the patient was conscious but drowsy. Her vital signs revealed a blood pressure of 90/60 mM of mercury and a pulse rate of 84 beats per minute. Neurological examination suggested raised intracranial pressure, although no focal motor or sensory deficits were observed at the time of initial assessment.

Baseline laboratory investigations, including liver function tests, renal function tests, and serological parameters, were within normal limits. Complete blood count revealed leucocytosis with a total white blood cell count of 16,030 cells/mm^3 and neutrophil predominance (83%), suggesting a stress or inflammatory response. These findings warranted further neurological evaluation through imaging studies. Contrast-enhanced magnetic resonance imaging of the brain performed on March 25 2025, revealed a large, peripherally enhancing solid cystic lesion measuring approximately 6.2 × 5.6 × 4.2 cm in the left cerebellar hemisphere. The lesion was associated with significant mass effect, compression of the brainstem, and obstruction of the fourth ventricle, resulting in dilatation of the lateral and third ventricles consistent with obstructive hydrocephalus.

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Based on the radiological findings and clinical presentation, the patient was planned for surgical intervention. On March 28 2025, she underwent a left retromastoid suboccipital craniectomy with tumor decompression under general anesthesia. Postoperative computed tomography of the brain demonstrated expected postoperative changes with an external drainage tube *in situ*. However, a residual hypodense lesion measuring approximately 6.5 × 5.3 × 4.5 cm was noted, and the possibility of residual tumor could not be ruled out.

Histopathological examination of the excised tumor tissue revealed features of a glial neoplasm exhibiting a biphasic pattern. The tumor consisted of compact areas with elongated pilocytic cells and loose microcystic areas composed of protoplasmic astrocytes. Rosenthal fibers and eosinophilic granular bodies were identified, with no evidence of increased mitotic activity. These findings were consistent with pilocytic astrocytoma (WHO Grade I). Immunohistochemical analysis further supported the diagnosis, with tumor cells expressing glial fibrillary acidic protein, Olig2, and p16, retained alpha-thalassemia/mental retardation syndrome X-linked expression, and negative immunoreactivity for isocitrate dehydrogenase 1 (R132H). Despite initial surgical management, the patient continued to exhibit features of raised intracranial pressure, including visual disturbances and papilloedema. A follow-up Magnetic Resonance Imaging (MRI) brain performed on April 22 2025 confirmed the presence of a large residual lesion measuring approximately 67 × 59 mm with heterogeneous enhancement and central necrosis. Magnetic resonance spectroscopy demonstrated elevated choline levels with a high choline-to-creatinine ratio and a prominent lipid-lactate peak, indicating persistent tumor activity.

Due to persistent obstructive hydrocephalus, the patient was readmitted and underwent right parietal Medium-Pressure Ventriculoperitoneal shunt placement on April 30 2025. Subsequent imaging on May 01 2025 continued to show a heterodense lesion in the left cerebellar hemisphere exerting mass effect on the fourth ventricle. The patient also underwent left occipital craniectomy with external drainage tube placement as part of ongoing management.

Postoperatively, the patient received comprehensive pharmacological management, including antiepileptics, antiemetics, antiedema agents, antibiotics, antacids, analgesics, neuroprotective drugs, and multivitamin supplementation. Clinical pharmacists played an essential role in optimizing drug therapy, monitoring for adverse drug reactions, ensuring appropriate dosing, and providing medication counseling to the patient and caregivers. Given the presence of residual disease, the patient was planned for adjuvant radiotherapy. She received external beam radiotherapy from June 04 2025 to July 15 2025, with a total planned dose of 54 Gy delivered in 30 fractions. Concurrent pharmacotherapy included antiepileptics, antiemetics, gastric protection, multivitamins, topical antibiotics, and temozolomide administered as part of the chemoradiation protocol.

At the time of discharge, the patient was clinically stable with resolution of headache, vomiting, and gait disturbances. She was conscious, orientated, and neurologically improved. Discharge medications were provided along with detailed counseling regarding medication adherence, recognition of adverse effects, and the importance of regular follow-up and neuroimaging.

DISCUSSION

Pilocytic astrocytoma is a WHO Grade I glioma that most commonly affects children and adolescents, with a predilection for the cerebellum. Although classified as a benign and slow-growing tumor, its clinical behavior can vary significantly depending on its location. Tumors arising in the posterior fossa often pose serious challenges due to the limited anatomical space and proximity to critical neural structures. In the present case, the lesion was located in the left cerebellar hemisphere and resulted in compression of the fourth ventricle, leading to obstructive hydrocephalus and symptoms of raised intracranial pressure (van den Bent *et al*., 2011). The patient's clinical presentation was characteristic of posterior fossa involvement. Symptoms such as persistent headache, recurrent vomiting, reeling sensation, and sudden episodes of fall are commonly associated with cerebellar dysfunction and increased intracranial pressure. The presence of drowsiness at the time of admission further suggested raised intracranial pressure and indicated the need for urgent neurological evaluation. While pilocytic astrocytomas often present with slowly progressive symptoms, this case demonstrated an acute and rapidly worsening clinical course, emphasizing that even low-grade tumors can present aggressively when vital cerebrospinal-fluid pathways are obstructed (Jellinger, 2012).

Neuroimaging played a central role in establishing the diagnosis and guiding management. Contrast-enhanced MRI revealed a large solid cystic lesion with peripheral enhancement and significant mass effect on the brainstem and ventricular system. These radiological features are typical of pilocytic astrocytoma and help differentiate it from other posterior fossa tumors. Serial imaging using computed tomography and MRI further highlighted the evolving nature of the disease, demonstrating residual tumor burden and persistent hydrocephalus despite initial surgical intervention. Such findings reinforced the need for a staged and individualized treatment approach (Cohen *et al*., 2011).

Histopathological evaluation confirmed the diagnosis through classical features such as a biphasic architecture, presence of Rosenthal fibers, and eosinophilic granular bodies, with no evidence of increased mitotic activity. Immunohistochemical findings, including positivity for glial fibrillary acidic protein and Olig2, retained alpha-thalassemia/mental retardation syndrome X-linked expression, and absence of isocitrate

dehydrogenase 1 mutation, supported the diagnosis of a WHO Grade I pilocytic astrocytoma. Accurate histopathological and molecular characterization was essential in excluding high-grade gliomas and in planning further therapy. Surgical resection remains the primary treatment modality for symptomatic pilocytic astrocytoma. In this case, the patient initially underwent left retromastoid suboccipital craniectomy with tumor decompression. However, complete excision could not be achieved due to the tumor's size and close proximity to critical neurovascular structures. Postoperative imaging confirmed residual disease, highlighting a common limitation encountered in posterior fossa tumors, where radical resection may not always be feasible without risking neurological damage (Duffner, Cohen, Myers, and Heise, 1986).

Persistent obstructive hydrocephalus emerged as a major complication during the postoperative period. Despite tumor decompression, the patient continued to exhibit signs of raised intracranial pressure, including visual disturbances and papilloedema. This necessitated a second-stage intervention in the form of right parietal medium-pressure ventriculoperitoneal shunt placement. The requirement for cerebrospinal-fluid diversion underscores the importance of close postoperative monitoring and timely intervention to prevent long-term neurological sequelae. The multistage surgical strategy adopted in this case reflects real-world management of complex pediatric neuro-oncology cases. Subsequent procedures, including left occipital craniectomy with external drainage, further highlight the need for flexibility in treatment planning based on disease progression and patient response. Serial imaging remained crucial in evaluating treatment efficacy and guiding further clinical decisions.

Adjuvant radiotherapy was initiated due to the presence of residual tumor tissue. Although pilocytic astrocytoma is primarily managed surgically, radiotherapy is indicated in cases of incomplete resection, recurrence, or progressive disease. In the present case, external beam radiotherapy was delivered at a total dose of 54 Gy in 30 fractions with the aim of achieving tumor control while minimizing toxicity. The addition of temozolomide during radiotherapy reflects a tailored approach to managing residual disease and preventing further progression (Lassman and deAngelis, 2003).

Pharmacological management formed a cornerstone of care throughout the treatment course. Antiepileptic therapy with levetiracetam was used prophylactically to reduce the risk of seizures associated with intracranial tumors and neurosurgical procedures. Levetiracetam was preferred due to its favorable safety profile and minimal drug–drug interactions, making it suitable for long-term use in pediatric patients. Corticosteroids and osmotic agents such as glycerol were administered to control cerebral edema and reduce intracranial pressure, thereby stabilizing neurological status during critical periods.

Supportive drug therapy was carefully optimized to manage symptoms and treatment-related adverse effects. Antiemetics such as ondansetron and metoclopramide were used to control nausea and vomiting, improving patient comfort and ensuring adherence to oral medications. Gastric protection with pantoprazole was provided to prevent stress-related mucosal injury, particularly during corticosteroid therapy. Analgesics, including non-steroidal anti-inflammatory drugs and combination agents, were selected to achieve adequate pain control while minimizing opioid exposure. Antibiotics were administered prophylactically to reduce postoperative infection risk, with careful attention to duration and dosing. During radiotherapy, additional supportive medications were used to address fatigue, appetite loss, and anxiety. Multivitamin supplementation and appetite stimulants helped maintain nutritional status, while hydroxyzine was prescribed for anxiety and sleep disturbances. Pharmacotherapy was continuously reviewed and adjusted based on the patient's clinical condition and treatment phase.

The role of the clinical pharmacist was integral throughout the patient's care. Pharmacists actively participated in medication review, dose optimization, monitoring for adverse drug reactions, and prevention of drug–drug interactions, particularly during periods of polypharmacy. Patient and caregiver counseling provided by pharmacists improved medication adherence, enhanced understanding of therapy, and facilitated early recognition of potential complications. This pharmacist-led involvement contributed significantly to treatment safety and overall clinical outcomes. This case demonstrates that pilocytic astrocytoma, despite being a low-grade tumor, can exhibit clinically aggressive behavior due to its anatomical location and associated complications. The need for repeated surgical interventions, cerebrospinal-fluid diversion, adjuvant radiotherapy, and extensive pharmacological support highlights the importance of a multidisciplinary approach. Early diagnosis, structured follow-up, and integrated pharmaceutical care were key factors in achieving a favorable outcome in this pediatric patient (Lassman and deAngelis, 2003).

CONCLUSION

This case highlights the clinical complexity of pilocytic astrocytoma in a pediatric patient when located in the posterior fossa, where even a WHO Grade I tumor can lead to significant morbidity due to obstructive hydrocephalus. Early recognition of symptoms, prompt neuroimaging, and a staged multidisciplinary management approach involving surgical decompression, cerebrospinal-fluid diversion, adjuvant radiotherapy, and optimized pharmacotherapy were crucial in achieving a favorable outcome. The case underscores the importance of vigilant follow-up and the integral role of clinical pharmacists in optimizing drug therapy, monitoring adverse effects, and supporting treatment adherence, thereby reinforcing the value

of integrated pharmaceutical care in pediatric neuro-oncology practice.

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None.

ABBREVIATIONS

WHO: World Health Organization; **MRI:** Magnetic Resonance Imaging; **Gy:** Gray; **mmHg:** Millimeters of Mercury; **mm:** Millimeter.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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