SYSTEMATIC REVIEWS

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Intracranial Tumor in an Infant: A Diagnostic and Therapeutic Challenge in Well-Child Care—A Case Report

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Abstract

Intracranial tumors in early childhood present a diagnostic challenge, particularly in infants, due to the nonspecific nature of symptoms and limited communication of complaints. This report describes the case of a 1 year and 9-month-old female infant with progressive neurological changes initially noticed by a caregiver, culminating in the diagnosis of a large intracranial mass with mass effect and hydrocephalus. The patient had adequate neuropsychomotor development and an unremarkable perinatal history. Signs such as head deviation, tremors, and abnormal head circumference growth led to imaging studies. After reviewing the imaging exam, the patient was promptly referred to a high-complexity service for follow-up with a specialized team. This case reinforces the importance of pediatric well-child visits (puericulture) as a fundamental tool for early recognition of neurological changes, highlighting the relevance of systematic evaluation of growth and development, as well as an integrated clinical approach for accurate diagnosis and appropriate treatment.

Keywords: infant; brain tumor; well-child care.

Resumo

Os tumores intracranianos na infância representam um desafio diagnóstico, especialmente em lactentes, devido à inespecificidade dos sintomas e à limitação na comunicação das queixas. A paciente, de 1 ano e 9 meses, apresentava desenvolvimento neuropsicomotor adequado e histórico perinatal sem intercorrências. Iniciou com sinais como lateralização da cabeça, tremores e aumento do perímetro cefálico, percebidos por uma

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cuidadora, que motivaram investigação por imagem. Após a análise do exame de imagem, foi diagnosticada uma massa intracraniana extensa, com efeito de massa e hidrocefalia. A paciente foi prontamente encaminhada para um serviço de alta complexidade para seguimento. O caso reforça a relevância da puericultura como ferramenta essencial para o reconhecimento precoce de alterações neurológicas, destacando a importância da avaliação sistemática do crescimento e desenvolvimento infantil, bem como da atuação clínica integrada para o diagnóstico e tratamento adequados.

Palavras-chave: lactente; tumor cerebral; puericultura.

Introduction

Well-child care is a fundamental component of primary health care, aimed at the continuous and comprehensive monitoring of children's growth and development. Through regular follow-up visits, healthcare professionals can not only assess neurodevelopmental milestones but also identify subtle clinical changes that may indicate serious conditions, including neurological disorders and neoplasms.[1] According to the Brazilian Ministry of Health, the frequency of well-child visits is determined according to the child's age, reflecting the changing health needs and risks throughout development. These visits are intended to monitor physical growth and neurodevelopment while providing caregivers with guidance on appropriate childcare practices and the early recognition of warning signs related to child health.[2] In this context, systematic surveillance enables the early detection of clinical findings that might otherwise go unnoticed outside the healthcare setting.

Central nervous system (CNS) tumors are the second most common malignancy in the pediatric population and are associated with substantial morbidity and mortality.[3] Clinical manifestations vary according to tumor location and the child's age but commonly include increased head circumference, persistent vomiting, irritability, impaired balance, develo-

pmental delay, and altered level of consciousness.[4] In infants, diagnosis is particularly challenging because symptom reporting is limited and clinical manifestations are often nonspecific or insidious.

The initial recognition of these signs frequently occurs in the home environment, where parents or caregivers first notice changes in the child's behavior or developmental progress.[5] However, the appropriate interpretation of these findings depends on careful clinical assessment by healthcare professionals, particularly during well-child visits, where subtle deviations from normal development can be recognized and investigated promptly.

Outcomes following the diagnosis of pediatric CNS tumors are heterogeneous and depend on factors such as histological subtype, tumor location, age at diagnosis, and access to specialized treatment. In high-income countries, advances in diagnostic and therapeutic approaches have resulted in survival rates exceeding 70% for certain tumor types, whereas outcomes remain substantially poorer in low- and middle-income countries, largely reflecting disparities in access to early diagnosis and appropriate treatment.[6–8] In addition to reduced survival, many patients experience long-term neurological and cognitive sequelae, underscoring the importance of early diagnosis and multidisciplinary management.

In this context, this report aims to highlight the importance of well-child care and an integrated clinical approach through the presentation of a case of an intracranial tumor in an infant, emphasizing the diagnostic and therapeutic challenges involved. By describing this case, we seek to underscore the value of early recognition of clinically significant findings and to promote discussion regarding the multidisciplinary approach to the diagnosis and management of pediatric intracranial tumors.

Methods

This descriptive, qualitative case report was based on a retrospective review of clinical, laboratory, and imaging data from a female infant who was initially evaluated at an urgent care facility and subsequently admitted to a referral hospital.

Data were obtained from medical records and family reports, with emphasis on the perinatal history, neurodevelopment, presenting signs and symptoms, physical examination findings, diagnostic test results, clinical management, and disease course. This report was prepared in accordance with the CARE (Case Report) Guidelines to ensure the quality and transparency of the information presented.

The review of the data and preparation of the manuscript were authorized by the Research Ethics Committee of the hospital where the patient was admitted and by her legal guardians.

Case Presentation

B.N.B., a 21-month-old girl, presented with progressive neurological symptoms that ultimately led to the identification of a large intracranial mass. She was an only child, born by cesarean delivery at 41 weeks of gestation following an uncomplicated pregnancy, and her immunizations were up to date. Her neurodevelopment had been appropriate for age, with no previous relevant clinical events. There was no history of vomiting, fever, or other complaints, no family history of tumors or other diseases, and no reported exposure to teratogenic agents.

The patient's teacher initially noticed balance disturbances. Two days later, her mother reported episodes of tremor, unusual somnolence,

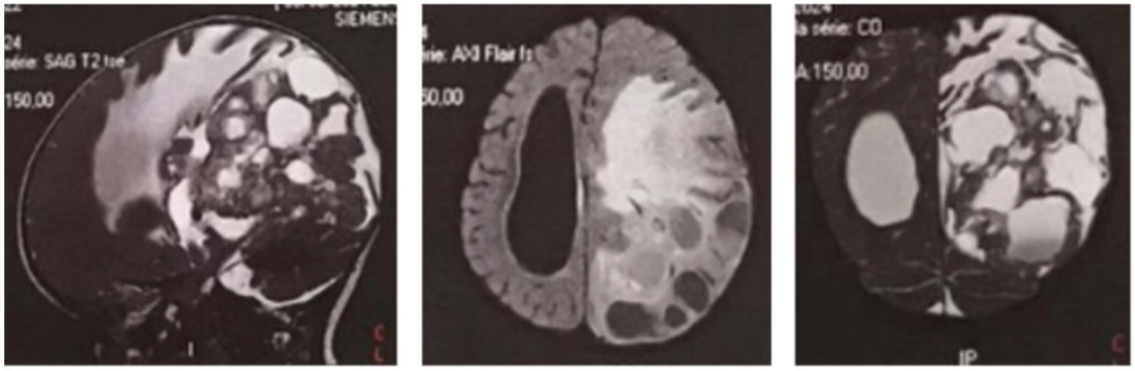
and persistent leftward head deviation, prompting evaluation at an urgent care unit. She was subsequently referred for hospital admission.

Physical examination revealed a widely open anterior fontanelle and leftward head rotation. Head circumference measurements recorded in the child health booklet were 47 cm at 18 months and 52 cm at 22 months of age. Transfontanelle cranial ultrasonography showed marked dilation of the right lateral ventricle and a solid hyperechoic lesion with irregular margins and fluid-containing components in the left cerebral hemisphere, associated with mass effect and mild rightward midline shift.

Contrast-enhanced magnetic resonance imaging revealed an expansive intra-axial mass involving the left parietal and occipital lobes, as well as the thalamic region and basal ganglia. Marked vasogenic edema, extrinsic compression of the third ventricle, and rightward displacement of the brainstem were observed. The lesion contained cystic areas and imaging features suggestive of previous hemorrhage. Severe supratentorial hydrocephalus was also identified, with no abnormalities in the right cerebral hemisphere (Figure 1).

Following these findings, the patient was transferred to a tertiary referral hospital for specialized evaluation and management. She subsequently underwent two tumor resection procedures because of recurrence, as well as cranioplasty, and remained under specialized follow-up.

Figure 1. (A) Sagittal T2-weighted magnetic resonance imaging (MRI) of the brain showing a heterogeneous intraparenchymal expansile lesion composed of multiple rounded and multiloculated T2-hyperintense areas, predominantly involving the supratentorial cerebral hemisphere, with a cystic appearance. (B) Axial diffusion-weighted imaging (DWI) showing asymmetry between the cerebral hemispheres and multiple internal areas with fluid-like signal intensity, which may correspond to foci of necrosis or cystic components. Marked mass effect is present, with compression of the ipsilateral ventricle, midline shift, and enlargement of the contralateral ventricle, suggesting obstructive supratentorial hydrocephalus. (C) Axial T2-weighted MRI showing a large heterogeneous multiloculated lesion with marked compression of the adjacent brain parenchyma and narrowing of the ipsilateral ventricular system.



Discussion

This case highlights the role of well-child care in the systematic assessment of childhood growth and development, enabling the early identification of clinically relevant abnormalities and timely imaging investigation in the presence of progressive neurological symptoms. The extensive intracranial mass, associated with marked mass effect and hydrocephalus, required a multidisciplinary approach and referral to specialized care. In this context, early recognition and appropriate management are essential to improve prognosis and quality of life.

Central nervous system (CNS) tumors are the second most common childhood malignancy, after leukemia, accounting for approximately 20% to 25% of all pediatric cancers and being associated with substantial morbidity

and mortality.[9,10] Their incidence is approximately 5 cases per 100,000 children per year, with the highest rates occurring between birth and 4 years of age, consistent with the age of the patient described in this report.

In infants, the early diagnosis of brain tumors is particularly challenging because the initial clinical manifestations are often nonspecific, including irritability, somnolence, feeding refusal, and developmental delay, in addition to subtle neurological symptoms such as those observed in this case.[11] Progressive increases in head circumference, as identified in this patient, represent an important warning sign and should be carefully assessed during well-child visits, particularly when no evident external cause is present.

According to Tully and Dobyns,[12] progressive macrocephaly in children may be one of the earliest manifestations of an intracranial space-occupying lesion, especially when accompanied by neurological signs such as balance disturbances, persistent head deviation, excessive somnolence, and seizures. These findings are consistent with the present case, in which the teacher first noticed impaired balance and the mother subsequently observed tremors and unusual somnolence. This sequence underscores the importance of actively considering reports from family members and observations made in the school setting.

Imaging remains essential in the diagnostic evaluation of suspected intracranial tumors. In the present case, transfontanelle ultrasonography was useful as an initial imaging modality, whereas contrast-enhanced magnetic resonance imaging was critical for lesion characterization. MRI revealed a heterogeneous expansile mass in the left cerebral hemisphere, associated with vasogenic edema, substantial mass effect, and hydrocephalus. These radiological findings may be observed in high-grade glial neoplasms, although such tumors are uncommon in early childhood.[7]

The literature indicates that delayed diagnosis of pediatric brain tumors may be associated with poorer neurological outcomes and increased mortality.[13] In a multicenter study by Kieran et al.,[14] the mean interval between symptom onset and definitive diagnosis exceeded 2 months in young children, reinforcing the need for continuing education of primary care professionals regarding neurological warning signs in childhood.

Multidisciplinary care is also crucial in the management of these patients and may involve pediatric neurology, neurosurgery, pediatric oncology, radiology, and palliative care teams when indicated. Early identification combined with prompt therapeutic decision-making may have a substantial effect on prognosis and quality of life.[15]

Conclusion

The diagnosis of central nervous system tumors in children can be challenging because the initial signs and symptoms are often subtle and nonspecific. In this context, an abnormal increase in head circumference is an important clinical finding that should be systematically assessed during well-child visits and may serve as a warning sign for both caregivers and healthcare professionals.

This case reinforces the importance of monitoring childhood growth and development, conducting appropriate clinical investigations, and providing caregivers with adequate guidance during well-child visits. Early recognition of these abnormalities supports timely therapeutic decision-making and may positively affect prognosis and quality of life.

The absence of a definitive histopathological diagnosis is a limitation of this report, as it restricts the precision of the etiological and radiological discussion.

Author contributions

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Data availability

The authors declare that the data supporting the results of this study are available in the article. Derived data supporting the conclusions of this study are available from the corresponding author upon request.

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