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Somatic and psychiatric symptoms of brain tumors - a review of the literature

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ABSTRACT

Introduction and Purpose

Brain tumors cause a variety of somatic and psychiatric symptoms, which vary depending on the age of the patient and the location and type of tumor. Symptomatology includes both physical symptoms, such as headache, nausea, seizures and weakness, and psychiatric symptoms, including mood, personality and cognitive dysfunction. In children, the clinical picture is more complex and includes specific developmental difficulties. The purpose of this paper is to analyze the various symptoms accompanying brain tumors in order to detect them early and enable faster diagnosis.

Material and Methods

A comprehensive literature review was conducted using the PubMed database, focusing on articles published until the end of 2023.The search included the keywords: "brain tumors" "symptoms" "headache" and "psychiatric" in various combinations. Relevant studies were selected based on criteria such as somatic and psychiatric symptoms and early diagnosis of brain tumors.

Results

Accumulating data show the diversity of symptoms associated with brain tumors. Somatic symptoms such as headache, optic disc swelling, nausea, and seizures depend on intracranial

pressure and tumor location. Psychiatric symptoms, including personality changes, mood disorders, and cognitive impairment, pose a significant diagnostic challenge in adult patients. In children, brain tumors can cause developmental delay and atypical neurological symptoms.

Conclusions

The symptoms of brain tumors are highly variable and difficult to diagnose, which significantly delays proper diagnosis of the disease. Its early detection is crucial as it improves the prognosis of patients, significantly improves their quality of life, and allows for the introduction of effective therapeutic interventions.

Keywords: brain tumor, psychiatric symptoms, somatic symptoms, symptoms in children

Introduction

Brain tumors are characterized by irregular and diverse symptoms that affect patients' prognosis, quality of life and assessment of response to treatment.[1] They are among the most aggressive cancers, and survivors of brain tumors diagnosed in childhood often experience long-term cognitive deficits. The mechanisms of these disorders, related to the tumor itself and its treatment, are still poorly understood.[2] The symptoms of tumors depend mainly on the location and rate of growth, as well as additional factors such as tumor size, swelling, hemorrhages or cerebrospinal fluid flow disorders. Symptoms that occur can be divided into those arising directly from the tumor and so-called peri-tumor factors. Among the latter are regional hypoxia and ionic changes that affect neuronal activity, and excess glutamate in the extracellular space can cause hyperactivity and seizures. Generalized symptoms, resulting from an increase in intracranial pressure, and local symptoms, related to the involvement of specific brain structures, further complicate diagnosis.[3] Although brain

tumors account for only 1.6% of all cancers and have a mortality rate of 2.5%, their timely diagnosis is crucial to patient survival. Even benign tumors can cause serious symptoms or be life-threatening due to pressure on critical brain structures. The most common initial symptoms, such as headache, nausea or psychiatric changes, are nonspecific and resemble other, less serious conditions, making it significantly more difficult to diagnose the disease at an early stage.[4]

Somatic symptoms

Brain tumors can present with a variety of somatic symptoms, often as a result of increased intracranial pressure. The most common symptoms include nausea, vomiting, headache, optic disc swelling, and seizures [5]. Headache can be a symptom of many serious conditions, including primary brain tumors or metastatic lesions. Headache is a fairly common symptom, occurring in 48-71% of patients with brain tumors in studies of adult patients with various types of tumors. Notably, patients over the age of 75 are less likely to report headaches.
There are "red flags" that suggest the possibility of serious or life-threatening causes of headache, such as brain tumors. Alarming signs include acute, new, severe headache that is different from previous episodes; headache that is worse with exertion or occurs at night or early in the morning; and headache that is progressive. In patients diagnosed with a malignant neoplasm, a new headache may indicate the presence of intracranial metastases, as occurs in 32% to 54% of such patients. Craniotomies can also cause headache after surgery, and colloid cysts often manifest as generalized headache [6] Brain tumors can lead to irritation of brain tissue, resulting in abnormal electrical discharges that can cause seizures. Among the seizures observed in patients with brain tumors, simple focal seizures, complex partial seizures, and generalized tonic-clonic seizures are the most common.[7] A number of other factors also influence the mechanism of epileptic seizures, including tumor type, tumor location and peri-tumor, and genetic alterations. Prophylactic use of antiepileptic drugs is not recommended in most cases, and their potential interactions with anticancer drugs may be detrimental, limiting the effectiveness of therapy. [8] In addition, studies have shown that patients with brain tumors may have non-epileptic seizure disorders (NEAD). These may be accompanied by emotional disturbances such as anxiety and depressed mood.[9] Symptoms related to tumor location vary. For tumors located in the right hemisphere, patients often experience somatic anxiety, and specific symptoms may include dizziness and palpitations.[10] Fatigue is another common symptom reported by patients with brain tumors and is a key factor in reducing their

quality of life. The medical literature indicates that fatigue is one of the symptoms that patients experience from the time of diagnosis until the end of treatment.[7] In studies using functional magnetic resonance imaging (fMRI) in patients with various types of tumors, brain activity in the central executive network (CEN) and default mode network (DMN), which are responsible for phasic alertness, was found to correlate with patient- reported fatigue scores. Fatigue was assessed using the Multidimensional Fatigue Inventory (MFI-20) [11]. Focal neurologic deficits in patients with brain tumors follow damage to brain

tissue from the tumor or treatment. These symptoms may include cognitive impairment, especially memory and learning, motor impairment, sensory impairment, and visuospatial orientation impairment [7]. It should be noted that many symptoms are not specific to a particular type of tumor, but rather to the location of the tumor in the nervous system. Direct tumor invasion usually occurs in gliomas and lymphomas, whereas meningiomas and metastases compress brain tissue and cause focal symptoms. Disruption of the blood-brain barrier leads to vasogenic edema, which creates a mass effect and increases pressure on the surrounding brain. The location of the tumor is critical to the nature of the symptoms, and certain types of tumors are more typical of certain areas of the brain, which may indicate the likelihood of their occurrence, e.g., glial-neuronal tumors and astrocytomas are often located in the temporal lobes, while oligodendrogliomas are more typical of the frontal lobes.[3] Symptoms of brain tumors, such as nausea, vomiting, seizures, and personality changes, can speed diagnosis, especially for high-grade tumors. The study found that the shortest interval from symptom onset to diagnosis was for nausea and vomiting (11 days) and the longest for visual disturbances (132 days). Low-grade tumors took longer to diagnose than high-grade tumors (138 days vs. 26 days). Convulsions and personality changes were more common in high-grade tumors, while sensory disturbances and ataxia were more characteristic of low-grade tumors.[4] Ultimately, early recognition and understanding of somatic symptoms can significantly affect the prognosis of patients with brain tumors and their subsequent treatment.

Psychiatric symptoms

Brain tumors often develop without obvious classic neurological symptoms, but instead present with psychiatric symptoms that mimic psychiatric disorders. These non-specific symptoms may include mood changes, behavioral changes or thinking problems, and often

lead to delays in diagnosis. Psychiatric symptoms should prompt a neuroradiological investigation, especially if there is a sudden onset of symptoms, a lack of response to standard psychiatric treatment, and no family or patient history of psychiatric disorders. Brain tumors can cause 'cancer pseudo-depression', where somatic symptoms such as fatigue, loss of appetite, slowness of movement, insomnia or problems with concentration and memory predominate. What is usually missing, however, is the negative content characteristic of depression, such as feelings of sadness, guilt, pessimism or suicidal thoughts. Such symptoms

are often sudden in onset and resistant to standard psychiatric treatment, which may indicate an organic cause, such as a brain tumor. The incidence of these symptoms varies according to the type and dynamics of the tumor. For example, high-grade gliomas and metastases that grow rapidly are more likely to cause depressive symptoms of recent onset, typically lasting 0 to 3 months. Studies also suggest that somatic symptoms outweigh cognitive-affective symptoms in patients with brain tumors, distinguishing 'cancer pseudodepression' from classic depressive disorders. Patients may also perceive their emotional symptoms as secondary to physical complaints, such as lack of energy or reduced activity, leading them to feel negative emotions as a result of reduced daily activities and social interactions.[12] Another symptom is cognitive and psychotic changes, which may include irritability, aggression and delusions, as in the case of a meningioma patient with a history of psychiatric disorders, encephalopathy and delusional delirium.[13] Tumors in the frontal lobe often affect cognitive and emotional functions, leading to symptoms such as confusion, impaired attention, memory and judgement, apathy, persistence and emotional detachment. Studies have shown that frontal lobe meningiomas can cause psychiatric symptoms long before neurological symptoms appear. Warning signs for the doctor include new, unexplained neurological symptoms (e.g. anosmia), the first psychiatric symptoms after the age of 40, e.g. psychosis, personality change with regression, apathy, impulsivity, and lack of response to psychiatric treatment or an atypical course of the disease.[5] Some brain tumors cause atypical psychiatric symptoms such as hallucinations or sleep disturbances. Hallucinations have been described, for example, in patients with midbrain tumors, where their occurrence disappeared after tumor removal [14]. Another study described the case of a patient with dementia caused by a brain tumor. He had symptoms that were different from classic dementia. He had word-finding difficulties and paraphasis, disorientation in familiar surroundings, and difficulty performing routine, complex tasks. Unlike typical neurodegenerative dementias, he did not develop significant memory problems. His symptoms progressed rapidly, and were accompanied by headaches,

incontinence, and gait and co-ordination abnormalities, which led doctors to suspect the presence of a tumor.[15] Sleep disorders are more common in patients with supratentorial tumors and are associated with other psychiatric or neurological symptoms such as fatigue and depression. Tumors that affect structures that regulate sleep and wakefulness, such as the hypothalamus, can lead to sleep problems, which in turn can contribute to the development of psychiatric disorders.

Psychiatric symptoms can also take the form of eating disorders. In some cases, loss of weight and appetite associated with brain tumors has been misdiagnosed as anorexia,

particularly in young women. Differences between the symptoms of tumor-associated anorexia and typical psychiatric anorexia include the absence of body image disturbances and behaviors associated with attempts to control weight. Hypothalamic tumors are most commonly associated with anorexia-like symptoms, highlighting the role of a thorough physical examination and neuroimaging in ruling out brain tumors as a cause of eating disorders.[16] One study describes a case report of an 86-year-old woman whose only symptom was anomic aphasia. The patient had difficulty naming familiar objects and people for a month, but was otherwise neurologically normal. CT and MRI scans revealed a large tumor in the left temporal lobe, compressing the left lateral ventricle and causing midline shift.[17] Psychiatric symptoms may mask the presence of a brain tumor, emphasising the need for diagnostic caution in cases of sudden or unusual psychiatric disorders.

Symptoms in children

Brain tumors in children have specific symptoms and clinical features that are different from those of adult tumors, both because of the different types of tumors and the developmental dynamics of childhood. Symptoms of brain tumors in children depend primarily on the type of tumor, its location and the age of the patient.[18] Patients who have had a brain tumor in childhood often have cognitive deficits as a result of the disease and treatment. [Children with new-onset headaches and systemic symptoms of cancer have an increased risk of developing brain tumors - the likelihood of being diagnosed with a metastatic brain tumor in such cases is about 12%, compared with 1% for a primary brain tumor.[6] Early diagnosis and assessment of vision is particularly important because brain tumors in children can cause permanent

visual impairment, which is not always reversible. Ophthalmic examination allows early detection of visual deficits and appropriate therapeutic response, although awareness of the need for this examination in children with brain tumors is still insufficient. The results of a prospective study conducted in the Netherlands between 2019 and 2021 showed that up to 78.8% of children with newly diagnosed brain tumors had visible visual abnormalities on eye examination. The most common changes included optic disc swelling, visual field loss, strabismus, nystagmus and reduced visual acuity. Importantly, visual abnormalities were diagnosed in 65.2% of children who had not previously reported visual symptoms, highlighting the importance of introducing routine ophthalmological examinations in the diagnosis of children with brain tumors [19]. In some children, the development of a brain

tumor may be due to genetic susceptibility, requiring additional testing for cancer predisposition syndromes. In these cases, tumors often occur as part of more complex syndromes, such as neurofibromatosis type 1 (NF1) or tuberous sclerosis (TSC), which increase the risk of developing CNS tumors. NF1, which manifests as café-au-lait macules and axillary freckles, often leads to the development of cancers, including optic nerve astrocytomas. Other neoplasms with a characteristic course in children are the gliomas seen in NF2, which are particularly common in adolescence. In contrast, von Hippel-Lindau syndrome (VHL) is characterised by embryonal haemangiomas of the brain and retina and other neoplastic lesions of internal organs. Less common are cases in which brain tumors are one of the first symptoms of syndromes such as Li-Fraumeni syndrome (LFS) or tuberous sclerosis (TSC), suggesting the need for interdisciplinary collaboration between specialists in the diagnosis of children with brain tumors.[20]

Summary

Despite modern imaging techniques, the diagnosis of brain tumors is often delayed from the onset of symptoms due to their diversity and non-specificity,[4] and many people face long-term effects such as neurological deficits after treatment. To address these challenges, new targeted therapies and advanced diagnostic techniques are emerging. Current techniques under investigation include focused ultrasound to ablate the tumor and disrupt the blood-brain barrier, intraoperative fluorescence, and laser ablation of the tumor.[21] The most common symptoms in patients diagnosed in the emergency department are focal symptoms, mental status changes, seizures, and headaches. Some patients are diagnosed incidentally during imaging for head injury.[22] The results indicate that diagnosis of brain tumors in the

emergency department is uncommon, so expanding knowledge of brain tumor symptoms may contribute to faster diagnosis and improved prognosis for patients.

Table 1. Symptoms of brain tumors

Category	Symptoms
Neurological	Seizures, anosmia (loss of smell), visual disturbances (double vision, blurred vision), motor weakness
Behavior and emotions	Indifference, loss of interest, impulsivity, aggression,
Psychiatric	Personality changes, confusion, euphoria, depression, emotional lability, disinhibition, delusions, hallucinations
Cognitive	Memory problems, difficulty concentrating, attention deficits, problems with judgment and criticism, loss of abstract thinking
Somatic	Headache, nausea, vomiting, fatigue, loss of appetite, urinary and fecal incontinence

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