Astrocytoma

Astrocytoma is the most common glioma of the brain, it can also be located in the spinal cord. It has a number of histological forms with varying degrees of malignancy. They occur mainly **supratentorial** (adults), **infratentorial localization** predominates in children (astrocytomas represent about a third of infratentorial tumors in children). Astrocyte malignancies do not commonly metastasize, although this may occur .

Spinal astrocytomas represent the most common intramedullary tumor in children, in adult patients they represent the second position in incidence (right after ependymomas). Furthermore, spinal astrocytomas are given a detailed description in an article dealing with spinal tumors.

Diagnosis

The degree of malignancy can be determined from **CT** and **MRI** , the use of contrast is important. It is often appropriate to use functional MRI, DTI - these imaging methods are essential primarily in cases where the tumor occurs in close proximity to eloquent areas.

Angiography is also used to image the vessels supplying the tumor. In both low-grade and high-grade astrocytomas, a pattern consistent with avascular mass, which tends to displace surrounding blood vessels, is typically seen. Strong vascularization can be observed angiographically, especially in glioblastomas .

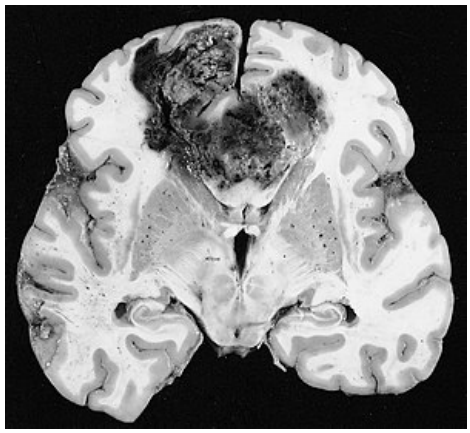
In addition to the above, it can be used for more detailed diagnosis of PET , EEG or cerebrospinal fluid examinations to rule out other diagnoses (eg metastases , lymphomas , medulloblastomas, etc.). [1][2]

Classification

WHO grade I

This group of astrocytic gliomas represents relatively non-aggressive and benign tumors. The collective name is the so-called pilocytic astrocytoma - it is a benign , slow-growing tumor. It is most often diagnosed in children and adolescents, it typically grows infratentorially (predominates in the cerebellum and brainstem), but it can also occur in the lobar area. As the only astrocytoma, it does not behave expansively, it grows limited.

Pilocytic astrocytoma can quite often occur around the optic nerve - in the case of surgical resection, vision is not preserved postoperatively on the given side.



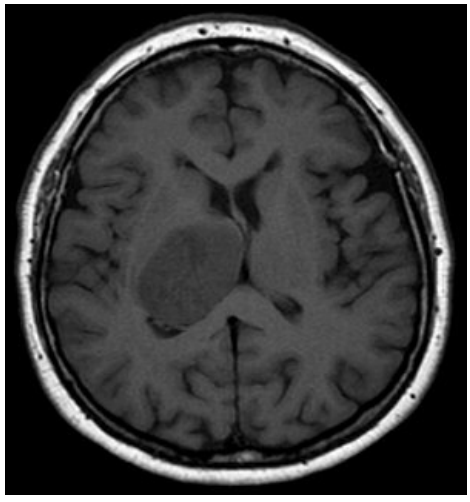
Glioblastoma with expansion outside the corpus callosum

WHO grade II

Diffuse astrocytoma represents approximately 10-15% of all astrocytomas, is not aggressive, but may gradually develop into a more malignant form, and is therefore included in the WHO grade II group. It is typical for its infiltrative growth in the white matter, it occurs mainly in younger patients. The average time to onset of progression to higher degrees of astrocytomas is about 4-5 years (possible delay of proliferation can be achieved especially in younger patients by radical surgical resection).

WHO grade III

Anaplastic astrocytoma stands between diffuse astrocytoma and glioblastoma with regard to the prognosis of individual patients . It is a malignant tumor, compared to diffuse astrocytoma, anaplastic astrocytoma is more common (about 25% of all astrocytomas). It most often occurs in people between 40 and 50 years of age. Unlike glioblastomas, this tumor does not demonstrate signs of necrosis or vascular proliferation.



MRI- glioblastoma multiforme

WHO grade IV

Glioblastoma is a WHO grade IV malignant tumor, most often diagnosed in adult patients, it represents approximately 50–60% of all astrocytomas (a total of 15% of primary brain neoplasms). Glioblastoma has a highly aggressive behavior, the prognosis is very unfavorable, it is still very resistant to treatment, it most often grows around the corticospinal tract , the expansion into the corpus callosum (so-called *butterfly* glioblastoma) is typical. Possible surgical resection is always followed by oncological treatment.

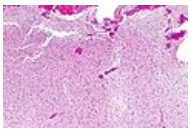
See the Glioblastoma multiforme page for more information .

Other classification

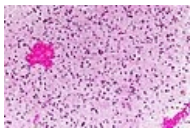
In addition to the WHO classification, astrocytomas can be divided into two groups: **low-grade** and **high-grade** .

1. The **low-grade** pilocytic and diffuse astrocytoma, which is characterized by their non-aggressive biological nature, relatively good prognosis in the case of immediate treatment. They typically grow among preserved brain cells, are low in cell, with no mitoses.
2. Anaplastic astrocytoma and glioblastoma are classified as **high-grade** astrocytomas - they are malignant , invasive, with cellular atypia and numerous mitoses, strongly vascularized, often contain cysts (necrosis is typical especially for glioblastomas.
3.

Low-grade astrocytomas prevalence in younger patients with increasing age are more common high-grade astrocytomas. This fact therefore supports the theory that the more low-grade (malignant) **degenerate** and pass into other forms, up to the secondary glioblastoma (only the pilocytic **astrocytoma** is a purely benign tumor).

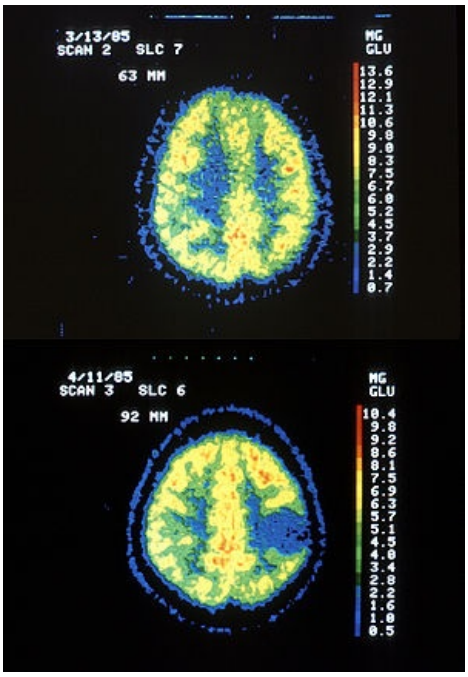


Anaplastic astrocytoma- low magnification



Anaplastic astrocytoma- high magnification

Symptomatology



Astrocytoma PET scan

Individual symptomatology is directly dependent on the **location of** the tumor, its size, behavior and biological nature.

Intracranial astrocytomas

Supratentorially, astrocytomas are manifested by epileptic seizures ; if they occur in the eloquent area, patients may experience speech disorders, focal neurological deficits, and symptoms of intracranial hypertension (primarily vomiting, nausea , headache).

Spinal astrocytomas

The most typical symptoms of spinal astrocytomas include motor ataxia , motor and sensory deficits, dysesthesia and associated sphincter disorders .

Although astrocytomas usually occur solitarily, they may be accompanied by other spinal tumors, and in some patients type 2 neurofibromatosis (NH-2) .

Therapy

In the **benign** form, radical **resections** are performed only in favorably stored ones (in *non-eloquent* areas - unnecessary for life). Sometimes **radical graphic resection** occurs . This is a resection where the tumor no longer appears on the MRI, but the tumor cells remain there (the entire lesion has not been removed). If resection is not possible, radiotherapy (RT) is possible.

In the **malignant** form, these tumors are usually indicated for surgery due to their large extent causing intracranial hypertension . We will remove as much of the tumor as possible, thus doing so-called **internal decompression** and supporting other modalities of oncological treatment (RT , CHT). Concomitant radiochemotherapy is often used.

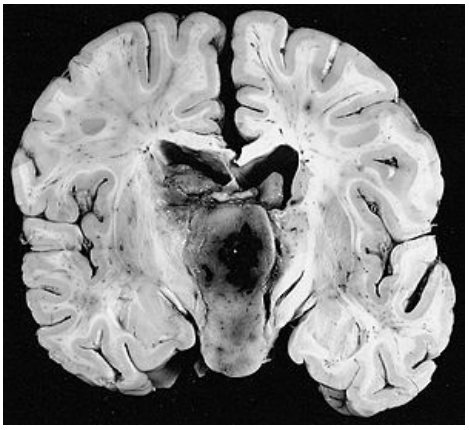
In the case of tumor localization in the eloquent cerebral area, it may be indicated for awake surgery for perioperative mapping of individual brain functions.

Prognosis

The prognosis is quite unfavorable. Survival factors in low-grade cerebral astrocytoma:

- age over 40,
- the presence of neurological extinctions,
- bearing size over 6 cm,
- penetration into the contralateral hemisphere,
- diffusion form.

The risk of progression to **glioblastoma** is high in the presence of three or more of these factors.



Pilocytic astrocytoma in the hypothalamus

The probability of recurrence in spinal astrocytomas is approximately 42–48% after 10 years, depending on the biological nature of the tumor, complete / partial resection . The risk of recurrence in completely resected spinal astrocytomas is around 6.3%, while in the case of partial resections, this value is about 42.5% within 10 years after surgery .

In adult patients, the prognosis is better compared to children.

Links

related articles

- Brain gliomas
- Spinal tumors
- CNS tumors
- Oligodendroglioma
- Ependymoma

External links

- Article on astrocytomas (https://radiopaedia.org/articles/astrocytic-tumours?lang=us)
- Lecture on astrocytomas and their imaging (https://www.youtube.com/watch?v=FCp37So20pI)
- Astrocytoma insula (https://www.researchgate.net/figure/Pilocytic-astrocytoma-of-the-right-posterior-insula-The-tumor-was-removed-via-a_fig2_221919312)

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CNS tumors			
Brain tumors	primary	glial	astrocytoma • ependymoma • oligodendroglioma • anaplastic ganglioglioma
		neuronal	gangliocytoma • neuroblastoma • central neurocytoma • medulloepithelioma
		meningeal tumors	meningioma
		embryonic	medulloblastoma • atypical teratoid rhabdoid tumor • neuroblastoma
		mixed	pituitary adenoma • craniopharyngeal
		peripheral nerve tumors	vestibular schwannoma
		lymphatic tissue tumors	primary CNS lymphoma
	secondary	metastases	
Spinal cord tumors	primary	extradural	benign: osteoid osteoma • osteoblastoma • hemangioma • enchondrum
			malignant: osteosarcoma • chondrosarcoma • Ewing's sarcoma • multiple myeloma • lymphoma • chordoma • fibrosarcoma
		intradural	extramedullary: meningioma • schwannoma • neurofibroma
			intramedullary: ependymoma • astrocytoma • teratoma • oligodendroglioma • lipoma • ganglioglioma • epidermoid tumor • dermoid tumor • hemangioblastoma
	secondary	metastases	
Portal: Neurosurgery			

1.
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