

## ASTROCYTOMA OF THE BRAIN AND OPHTHALMOLOGICAL SIGNS

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### ABSTRACT

**Background:** The central nervous system neoplasms frequency is 1 per 1700 children aged from 0 up to 15 years old. The problem of the early diagnostics has not been solved yet. The recognition of the pathology, especially in childhood and adolescence is considerably difficult and affects the patient's life prediction and quality.

**Objective:** To reveal the value of ophthalmological signs in the diagnosis of astrocytoma of the brain.

**Methods:** The young man with the only complaint of the binocular horizontal diplopia during the last year. One month prior to the visit, the patient lost his consciousness. Standard ophthalmic examination, optical coherence tomography (Cirrus HD-OCT), computer perimetry (Humphrey), MRI of the head on (Siemens symphony) with contrast were carried out.

**Results:** Visual acuities were 20/20 for both eyes, an outward motions limitation of both eyes, the presence of paracentral and peripheral scotomas in computer perimetry, the reduction of the visual evoked potentials, pallor of the optic disk, thinning of the nerve fiber layer and ganglion cell on OCT. MRI with contrast revealed the existence of large tumor with a with clear, hilly contours compressing the brain stem. After confirming the presence of a large tumor size, signs of development of occlusal internal and external hydrocephalus, compression of brain stem with the development of life-threatening condition, the patient was referred for neurosurgical consultation. According to the urgent indications the surgical resection of the intracerebral tumor was performed. Biopsy result: pilocytic astrocytoma of the fourth ventricle region.

**Conclusion:** Thus, in the absence of specific cerebral and focal neurological symptoms, the appearance of oculomotor disorders, defects in field of vision and fundus changes can be decisive factors in establishing an accurate diagnosis and timely referral of the patient to a neurosurgeon.

**Keywords:** Binocular diplopia, OCT, pilocytic astrocytoma, brain tumor, visual disturbances

## Introduction

The central nervous system neoplasms frequency is 1 per 1700 children aged from 0 up to 15 years old.<sup>1</sup> There are 48, 7 % of the astrocytic neoplasms of all primary brain tumor in the bodies aged 15-19 years as per Central Brain Tumor Registry of the United States (CBTRUS) statistic data.<sup>2</sup> Astrocytomas are generated from neuroglia cells that have the ability to divide throughout a life, which justifies the habitude of the brain tumors formed from them to spread out again. Pilocytic astrocytoma is a benign central nervous system tumor (the World Health Organization grade I) and reaches 27, 9% of all neuroepithelial tumors in the persons aged 15-19 years.<sup>2</sup> This astrocyte type accumulates in the midline structures of the cerebrum along the craniospinal axis and usually looks like a well-circumscribed nodule.

General cerebral symptoms are characterized by severe headache, vomiting and convulsive seizures. Focal symptoms depend on the tumor site and size. Visual disorders are manifested as a visual functions decrease and oculomotor disorders. However if there are no cerebral and focal symptoms, the neoplasm is difficult to identify and the tumor can not be timely located. The problem of the early diagnostics has not been solved yet. The recognition of the

pathology, especially in childhood and adolescence is considerably difficult and affects the patient's life prediction and quality.

## Methods

The standard ophthalmological examination was carried out during the first patient's visit. Electrophysiological researches were carried out to examine a functional condition of the retina and of the optic nerve. In addition, computer perimetry (Humphrey) was performed under the visual field testing program within 120 points from the fixation center. The optic disk and peripapillary layer of the retina nerve fibers (RNFL) were measured by using OCT (CIRRUS HD-OCT ("Carl Zeiss Meditec Inc.)) by the protocol Optic Disc Cube 200x200 and RNFL Thickness Analysis program accordingly, the ganglion cells were scanned by the protocol Ganglion Cell Analysis: Macular Cube 512x128. The patient was directed to MRI scanning revealing the contrast at the axial, sagittal and frontal views (SIEMENS SYMPHONY 1,5 Tesla).

This study followed the tenets of the Declaration of Helsinki and all privacy requirements were met.

## Results

A 17-years-old young man first visited the S.N. FEDOROV NMRC "MNTK "EYE MICROSURGERY". The patient complained of the constant horizontal diplopia when looking with both eyes into the distance during the last year. He didn't make a complaint about other symptoms (loss of vision, headaches, nausea, vomiting, an obsessive compulsive disorder).

Anamnesis: born premature from the first pregnancy at 36 weeks (the mother had an abruption of the placenta). The patient grew up and developed properly. Chronic diseases and injuries are denied by him. The allergic anamnesis is not compromised. Heredity is not burdened. One month prior to the visit, the patient lost his consciousness, after that episode he was consulted by a therapist of the local polyclinic. There was no somatic pathology detected.

At ophthalmological examination, the patient's visual acuities were 20/20 in both eyes. A visual field: peripheral borders of the both eyes are normal. Intraocular pressure is OU 16 mm. An outward motions limitation of the both eyes has been revealed. Biomicroscopy: the anterior segments of both eyes were unremarkable. He had no pupillary abnormalities. Fundus examination: OU pallor of the optic disk in the temporal side, the borders are clear. Arteries are narrowed; veins are extended and convoluted. Visual evoked potentials of both eyes: optic nerve electrolability is 30 Hz. Computer perimetry detected absolute and relative scotomas of both eyes in the paracentral area and mainly throughout the periphery of the lower quadrants. As per the OCT average thickness of the nerve fibers layer is OD=70 μm, OS=72 μm. In the upper segment there are the results of OD = 73 μm, OS = 68 μm; in the lower segment - OD = 100 μm, OS = 116 μm; in the temporal segment - OD = 48 μm, OS = 47 μm; in the nasal segment - OD = 59 μm, OS = 59 μm. The total minimum thickness of the ganglion cells layer is OD = 63 μm, OS = 60 μm. Thinning of the neuroepithelium is parahoveal (Figure 1).

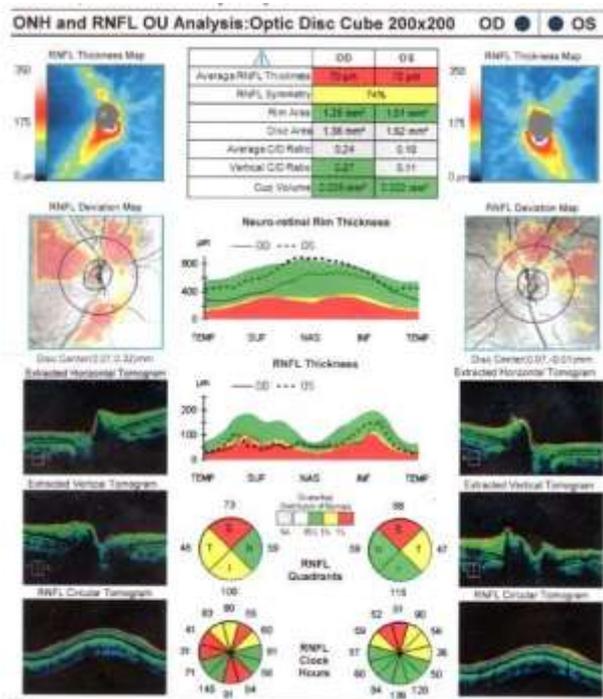


Figure 1. Both eyes OCT

Optic disk pallor of the both eyes, thinning of the nerve fibers layer and thinning the layer of ganglion cells as per OCT, paracentral and peripheral scotomas at the lower quadrants, liability decrease were revealed under the examination. Clinical diagnosis: OU optic atrophy. Medium degree myopia.

MRI with contrast: in the projection of the fourth ventricle there is an inhomogeneously hyperintensive at T2 and FLAIR, moderately hypointensive at T1 with central moderately hyperintensive areas at T1, there is big neoplasm of 4.4 × 2.3 × 3.0 sm with clear, hilly contours and apparent "mass effect" that compresses a brain stem. The size of the fourth ventricle is up to 3.6 sm, that is deformed clearly, a neoplasm closes the outlet. After contrast administration along T1 in the lower pole of the neoplasm, an intensive center of "accumulation" and tuberos contours of 0.9x0.8x0.6 sm are detected, central areas are intensely hyperintensive. The lateral ventricles of the brain are asymmetric and a little enlarged. Basal cisterns are expanded and deformed. Subarachnoid cavity and sulci are unevenly widened (Figure 2).



Figure 2. Brain MRI

Magnetic resonance imaging revealed the existence of large tumor, factors of the internal occlusal and external hydrocephalus development, compression of the brain stem. The patient was urgently sent to consultation of neurosurgeon because of life-threatening condition. At the neurosurgical hospital because of urgent indications, an incomplete surgical resection of the intracerebral tumor was performed by using ultrasound visualization. Histopathologic examination was performed, and the diagnosis of pilocytic astrocytoma of the cerebrum was made according to the WHO criteria. The patient was reported in stable condition.

Following neurosurgery the patient's visual functions are as follows: visual acuities are 20\20 for both eyes, intraocular pressure is OU 15 mm. Extraocular movements are normal. The anterior segments of both eyes are unremarkable. Fundus

examination: OU - pallor of the optic disk in the temporal side, the borders are clear. The patient detects diplopia abatement. On computer perimetry the number of absolute and relative scotomas along the periphery in the lower quadrants has been decreased. Visual evoked of both eyes: electrical lability is 30 Hz.

Due to the incomplete surgical resection of the brain tumor, the patient has been recommended to pass a control MRI of the brain with contrast in 6 months, and to be observed dynamically by a neurosurgeon and an ophthalmologist.

## Discussion

According to some retrospective reviews, the most cases of the brain tumors occur to the neurologists and oncologists that comes to the classical clinical symptoms of the pathological process.<sup>3</sup> As a rule, the patients with neoplasms in the area of the fourth ventricle have an occurred syndrome of Bruns because of outflow blockage of the cerebrospinal fluid from the ventricles of the brain. This syndrome is accompanied by the intense headaches when the position of the head changes, vertigo, vomiting and tonic convulsions. The tumor in the clinical case deformed the fourth ventricle, disrupted a cerebrospinal fluid outflow and expanded the ventricles of the brain, initiated an internal occlusal and external hydrocephalus. According to literary sources, the children compensatory capabilities of the craniocerebral system are much greater than adults' ones.<sup>4</sup> We assumed that the patient had no typical cerebral symptoms due to tumor slow growing and specific features of the patient's organism at the age. Indeed the brainstem structures compression, particularly the medulla oblongata, can lead to instant death due to a respiratory and a cardiac standstill.

When the patient visited an ophthalmologist with visual acuities 20/20, the movement of both eyes was restricted, there were scotomas at computer perimetry, a decrease of electrical lability, optic disk pallor, thinning of the nerve fibers layer and ganglion cells at OCT. These results confirm the duration of the pathological process and the diagnosis atrophy of the optic nerve.

Detailed anamnesis and a thorough examination by a neuro-ophthalmologist, computer perimetry and OCT detected a neoplasm of the brain. The episode of consciousness loss was associated with the compression of the brain stem by a large tumor. An outward motions limitation of the both eyes is explained by the bilateral affection of the VI pair of the cranial nerves innervating an external rectus muscle of the eyeball, but it is difficult to specify an exact affected area of the nerve. A possible cause could be the tension of the abduction nerve.

## Conclusion

The results of the surgery with gliomas and a prognosis for life depend upon early detection of the brain tumor. Neoplasms are not easy to identify in many cases particularly for young people despite the advanced methods of neuroimaging. The clinical picture of the brain tumors is diverse, children's one is less discernible than adults. Slow growth of the tumor, absence of the typical neurological

symptoms and complaints of the patient suggest the late detection reasons of tumors. We describe this clinical case because a large neoplasm of the brain in the area of the fourth ventricle was suspected only after the ophthalmological examination. A binocular diplopia, a single loss of consciousness of the patient and the results of examination by an ophthalmologist became the reasons to suspect the brain tumor. The patient was urgent neurosurgical treated because of the progressive life-threatening condition.

Therefore, when typical cerebral and focal neurological symptoms are absent, oculomotor disorders, of the visual field and fundus changes can be critical factors to diagnosis accurately and to send the patient to a neurosurgeon timely.

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## References

1. Kaatsch P, Kaletsch U, Spix , Michaelis J. German Childhood Cancer registry. Annual report. Lindner, Mainz; 2016.
2. Ostrom Q.T., Gittleman H., De Blank P.M., Finlay J.L., Gurney J.G., McKean-Cowdin R., Stearns D.S. et al. American Brain Tumor Association Adolescent and Young Adult Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012. *Neuro Oncology*; 2016.18:1-50. DOI: 10.1093/neuonc/nov297
3. Alswaina N, Elkhamary S, Shammari M, Khan A. Ophthalmic features of outpatient children diagnosed with intracranial space-occupying lesions by ophthalmologists. *Middle East African Council of Ophthalmology*; 2015. 22(3):327-330. DOI: 10.4103/0974-9233.159739
4. Larkin V, Larkin I. About brain tumors cell enlargement. *Children Neurosurgery and Neurology*; 2011.3:63-71.
5. Di Rocco F et al. Endoscopic biopsy interpretation difficulties in a congenital diffuse intracranial teratoma. *Child's nerv syst*; 2006.22:84-89. DOI: 10.1007/s00381-004-1088-y
6. Kleihues P, Cavenee WK. Pathology and genetics tumours the nervous system. Lyon; 2000.9-71. DOI: [https://doi.org/10.1002/1096-9896\(200102\)193:2<276::AID-PATH765>3.0.CO;2-Q](https://doi.org/10.1002/1096-9896(200102)193:2<276::AID-PATH765>3.0.CO;2-Q)
7. Raisa N, Marhaendraputro EA. The side effects of chemotherapy in glioma. *MNJ*; 2019.5(2):92-97. DOI: <http://dx.doi.org/10.21776/ub.mnj.2019.005.02.9>
8. Rahmawati D, Marhaendraputro EA., Kurniawan SN, Wirathmawati A. Extracranial metastasis of glioblastoma: A rare case. *MNJ*; 2019.5(1):51-54. DOI: <http://dx.doi.org/10.21776/ub.mnj.2019.005.01.10>