GLIAL TUMORS OF THE BRAIN: GENERAL PRINCIPLES OF DIAGNOSIS AND TREATMENT (REVIEW)

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Abstract. Despite significant advances in oncology and neurosurgery, glial brain tumors continue to be an urgent problem of modern healthcare. The proportion of gliomas in the overall structure of glial neoplasms is 40-45%, they are predominantly detected at the age of 30-60 years, affecting the most able-bodied part of the population. Glial neoplasms, as a rule, develop from cells of an astrocytic or oligodendrocyte population and are characterized by rapid growth of the primary tumor node, invasiveness , a tendency to early metastasis, a high recurrence rate , and poor prognosis. The article presents a modern clinical classification of gliomas based on the principles of localization, histogenesis and activity of the tumor process. A characteristic feature of glial brain tumors is invasive growth with no macroscopically clear boundary between the tumor and normal brain tissue. This type of growth is typical for fast-growing high-grade gliomas (anaplastic astrocytomas, glioblastomas), it is characterized by an unfavorable prognosis. As with most malignant tumors, anaplastic types of gliomas are characterized by the intensive development of an abnormal vascular network, which accelerates the growth rate of the neoplasm, the rate of invasion and metastasis, and also increases the risk for patients due to the possibility of hemorrhage into the tumor. The nodular type of growth with a clearly defined border and slight infiltration is less common in conditionally benign gliomas, which have a more favorable treatment prognosis. The article provides a detailed review of the main surgical, radiological and chemotherapeutic directions in the treatment of gliomas. In the end, it is concluded that the described methods do not exhaust all proposals for increasing the effectiveness of the treatment of glial tumors and the development of new methods will bring neurooncologists closer to solving this urgent problem.

Key words: brain tumors; gliomas; neurooncology; neurosurgery; neuroimaging; neuronavigation.

Gliomas (neuroectodermal, neuroepithelial tumors) are primary tumors of the central nervous system, initially arising from glial cells that make up the brain parenchyma. Interest in the problem of glial brain tumors is currently due to two main factors: the steady increase in the proportion of patients with gliomas in the overall structure of oncological morbidity and the lack of breakthrough achievements in the results of treatment of patients with this pathology, despite the partial successes of fundamental and clinical oncology, the expansion of the arsenal of antitumor

chemotherapy and improving the technical equipment of diagnostic and neurosurgical departments [1, 2, 4-7].

Among all neoplasms of the central nervous system, gliomas occupy a leading place, accounting, according to various estimates, for 40-45% of all intracranial tumors [3, 8, 9-11]. About 70% of primary brain tumors are represented by various gliomas, of which more than half already have a high degree of malignancy at the time of diagnosis (high grade gliomas ; WHO grade III-IV degree according to the classification of the World Health Organization (WHO)) [29]. Conditionally benign gliomas (low grade gliomas; WHO grade I-II degrees according to the WHO classification) are observed relatively rarely: no more than 1500 patients are registered in the USA annually [12].

In general, the incidence of various types of gliomas in the world is 10–13 cases per 100,000 population [13, 14, 16-18]. At the same time, at least 10,000 newly diagnosed cases of primary neuroepithelial brain tumors are registered annually in the Russian Federation alone, and this figure has a steady upward trend [15]. The main reasons for this growth are conventionally divided into two groups: absolute and relative. Absolute factors include all factors that directly contribute to an increase in the number of cases of neoplasms, such as the rapid aging of the population of economically developed countries, the gradual accumulation of dangerous mutations in the human population that increase the potential risk of developing tumors, environmental degradation and high rates of urbanization, closely related changes lifestyle and diet of people. A relative circumstance is, paradoxically, the widespread introduction of medical examinations and the development of high-tech methods of medical care that contribute to more frequent and early detection of tumors.

The nodular type of growth with a more or less clearly defined border and slight infiltration is much less common, most often with conditionally benign gliomas (I-II degree according to the World Health Organization classification), which have a more favorable treatment prognosis.

Clinical manifestations of glial tumors of the brain are represented by a variety of cerebral and focal organic symptoms of varying severity in accordance with the location and volume of the neoplasm, syndromes of intracranial hypertension, hydrocephalus (with occlusion of the CSF pathways) and, in advanced cases, dislocation syndrome. Pathogenic symptoms are usually absent. In the early stages of development, a tumor can manifest with single signs (dizziness, epileptic seizures, impaired sensitivity, etc.), which often does not allow establishing either a topical diagnosis or determining the hyperplastic nature of the pathological process. In some cases, the diagnosis of a brain tumor is an accidental finding on computed tomography or magnetic resonance imaging during examination of a patient by a neurologist in connection with certain complaints.

Currently, magnetic resonance imaging of the brain is the "gold standard" for the diagnosis of brain tumors. In some cases, magnetic resonance angiography, magnetic resonance spectroscopy [19], functional magnetic resonance imaging, single photon emission computed tomography, multislice computed tomography, multislice computed tomography angiography, positron emission computed tomography [20, 21] can provide the necessary additional information.

The complexity of the treatment of malignant gliomas requires an integrated approach and the participation of a number of specialists. The first in this row is a neurosurgeon. The main tasks that are solved during the surgical intervention are the maximum reduction in the volume of the neoplasm and obtaining material for histological examination. At the same time, one of the conditions for surgical intervention is the preservation of functionally active areas of the brain to prevent a clinically significant neurological deficit and to preserve the patient's quality of life to the maximum extent possible.

The infiltrative nature of tumor growth, the absence of distinct boundaries of the tumor node, and the proximity of functionally important brain structures severely limit (practically exclude) the possibility of radical surgical removal of gliomas. Nevertheless, it is necessary to strive for this: the volume of tumor resection positively correlates with life expectancy, with the time of onset of continued neoplasm growth, and the need for repeated intervention [22, 23].

The high invasive activity and metastatic potential of gliomas have been most clearly demonstrated in a number of clinical studies [24, 25, 27], which have revealed an unusual increase in the incidence of distant neoplasm growth foci with improved treatment outcomes in the area of the primary tumor node (the most complete cytoreduction, aggressive radiation and chemotherapy). In our opinion, this assumption does not seem to be entirely correct, since it draws a direct causal relationship between these two events. Probably, in those cases when, after some period of time after the operation, the growth of the tumor node occurred at a distance from the intervention zone, there was a multifocal glioma with a distant focus (metastasis) that was not detected before the operation. Adequate treatment slowed down the rate of continued growth in the original area, and the growth of tumor metastasis in a remote area of the brain came to the fore.

A significant reduction in the volume of malignant glioma makes it possible in some cases to prevent the development of the syndrome of intracranial hypertension and occlusion of the CSF pathways, to reduce the severity of neurological symptoms by eliminating direct compression of nearby brain structures by the tumor node and gradually reducing perifocal edema, which ultimately improves the quality of life of the patient. It should be noted that the correlation between the volume of tumor resection and life

expectancy may not be so pronounced in the case of a glioma response to subsequent radiation and chemotherapy [26-31].

As part of the development of radiation therapy, studies on the use of proton therapy and boron neutron capture therapy in the treatment of glial tumors seem promising, but these methods of treatment are still at the stage of development and clinical research.

The possibilities of antitumor chemotherapy at the present stage are limited and consist in increasing the duration of the relapse-free period, prolonging the life of patients and improving its quality. The drugs are used in accordance with approved treatment standards, depending on the histological structure of the tumor, both in monotherapy and in a certain combination.

In conclusion, it should be noted that the above methods do not exhaust all proposals for increasing the effectiveness of the treatment of glial tumors and, perhaps, in the future, the development of new methods will finally bring neurooncologists closer to solving this urgent problem.

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