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LASER VAPORIZATION OF CEREBRAL GLIAL TUMORS

Introduction: The use of modern technologies in neurooncology for the treatment of glial brain tumors aims to ensure basic principles such as: high precision of handling surgical instruments, reduction of surgical trauma, protection and preservation of adjacent anatomical structures, surgical safety and prevention of postoperative neurological deficiency and its progression and as a result an improvement in the quality of life of patients with brain tumors.[1-4]

In 1969 S. Stellar performed the first operation of resection of the glial brain tumor with the use of high-energy radiation from the carbon dioxide laser, which confirmed the prospect of developing a new direction in the surgical treatment of brain tumors. During the removal of brain tumors with the laser, its thermal action on biological tissues is used, which ensures the effect of laser dissection, laser aspiration and laser coagulation.

Materials and methods: At the INN Neurosurgery Clinic, 29 surgical procedures for ablation of cerebral gliomas were performed with the application of laser technology. Results of histological examinations determined 9 gliomas with degree of malignancy I-II, 6 gliomas with degree of malignancy III (anaplastic gliomas) and 8 cases of gliomas with grade IV malignancy (glioblastomas). At the preoperative examination stage, all patients were investigated by computed tomography, cerebral magnetic resonance imaging, functional brain MRI. The complex evaluation of CT, MRI and fMRI results allows the diagnosis of the intracerebral tumor process with a high degree of certainty, to obtain accurate information about the location, size and particular qualities of tumor growth, as well as the involvement of adjacent brain structures, the degree of tumor vascularity, perifocal reactions, the presence of the cystic component, areas of necrotic change and foci of intratumoral hemorrhage. Based on the information gathered, surgical

tactics are planned: choosing the appropriate surgical approach for tumor localization, the optimal volume of surgery, rational intraoperative use of laser technologies, use of different ablation techniques or laser-microsurgical tumor destruction.

Results: The special features of operations to remove cerebral gliomas with the help of carbon dioxide laser radiation are as follows: first of all, laser technologies are used in the most critical stages of surgery, when there is a need to remove glial tumor fragments, located in important areas of the brain or median structures, ie in the involvement of critical areas of the brain. Second, during this important stage of the operation traction of the brain with surgical instruments for tumor ablation is avoided, because it is removed by the laser vaporization method, which allows to perform evaporation of gliomatous tissue by the layers, under continuous visual control, , within the planned volume. Third, during evaporation, unlike the use of traditional surgical methods, tumor ablation can be stopped at any stage without risk of developing heavy bleeding from tumor vessels, because during laser application hemostasis is provided continuously during vaporization.[5]

Considering the irreversible nature of the destructive changes caused by the influence of laser radiation, during the resection and vaporization of cerebral gliomas disappears the need for "total" visual ablation of tumor tissue, which can lead to progression of neurological deficit. At the same time, by using laser vaporization, we approached the original proposed goal of total surgical resection of tumors.

Conclusion: The modern arsenal of laser technologies used in neurosurgery, provides a new level of surgical treatment for cerebral gliomas. Laser microsurgical ablation of tumors is the progressive surgical method in neuro-oncology. The optimization of laser methods for the ablation of cerebral gliomas is based on the application of both existing laser means and new, highly efficient laser methods developed for irradiating tumor tissue. Need in the differentiated approach in the use of laser technologies is dictated by the different location, size, topographies of the tumor extension, the involvement in the tumor process of the functional and vital centers, the degree of malignancy and the degree of vascularization of cerebral

glioma. Laser technologies allow surgery to be performed in an adequate volume to ensure the quality of life of patients.

Laser radiation provides a "selective" destruction of tumor tissue while providing protection and morphological and functional preservation of adjacent brain structures. The results of the operated patients confirm the delayed effect of laser destruction of the tumor tissue, which was objectified in postoperative CT and MRI scans.

References:

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