MAIN ASPECTS OF RADIATION THERAPY IN THE TREATMENT OF BRAIN TUMORS IN CHILDREN

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Annotation: Central nervous system (CNS) tumors in children account for 2nd place By frequency V structure malignant neoplasms of childhood and 1st place among solid tumors. According to register data, they account for about 20% of all malignant neoplasms in childhood and are represented mainly by brain tumors (BMT). The frequency of CNS neoplasms in children aged 0 to 19 years is 3.5–4.0 per 100,000 children; approximately 1,000–1,200 new cases of BMT are registered annually in Uzbekistan.

Key words: brain tumors, children, radiation therapy.

95% of central nervous system (CNS) tumors in children are brain tumors . Treatment tactics are determined by their histological type. When possible, tumors are removed (surgical resection); an important treatment method in children over 3 years of age is radiation therapy; in young children, chemotherapy plays a major role in the treatment of CNS tumors, allowing for the postponement of radiation therapy or a reduction in its dose, and in some cases, eliminating it altogether. Central nervous system (CNS) tumors in children account for 2nd place By frequency V structure malignant neoplasms of childhood and 1st place among solid tumors. According to register data, they account for about 20% of all malignant neoplasms in childhood and are represented mainly by brain tumors (BMT). The frequency of CNS neoplasms in children aged 0 to 19 years is 3.5–4.0 per 100,000 children; approximately 1,000–1,200 new cases of BMT are registered annually in Uzbekistan [1, 2]. CNS tumors in children are a large heterogeneous group of neoplasms, the diversity of histological variants of which depends on the age of the patient. In children under 15 years of age, embryonic tumors and astrocytomas of varying degrees of differentiation predominate, while other variants are rare. In the adolescent group, a decrease in the frequency of embryonic tumors typical for children is noted, and an increase in the number of neoplasms that occur in adult patients. In 70% of cases in children, CNS tumors are represented by infratentorial localization, supratentorial tumors are detected in 30% of patients [2, 4]. Among malignant tumors of the CNS in children, medulloblastoma (MB) ranks first , followed by malignant gliomas (multiforme glioblastoma - GBM - and anaplastic astrocytoma - AA) and anaplastic ependymoma ; among low-grade tumors, pilocytic astrocytoma and craniopharyngioma predominate . In approximately 45% of patients with malignant brain tumors, metastasis to other parts of the central nervous system is detected during the primary

diagnosis; this is more common with MB [1, 3–5]. Magnetic resonance imaging is mandatory in the diagnosis of CNS tumors. tomography (MRI) and computed tomography (CT) with and without contrast enhancement (CE). Additional research methods (such as cytological examination of lumbar cerebrospinal fluid for the presence of tumor cells and MRI of the spinal cord with and without CE) are performed to assess the spread of the tumor process in patients with brain tumors with a possibility of metastasis. In the diagnosis of intracranial germinal cells tumors (GKO) it is important to determine tumor markers in the blood serum and lumbar cerebrospinal fluid - α - fetoprotein (AFP) and β - human chorionic gonadotropin (β - hCG). Increase AFP and hCG levels are diagnostic and do not require histological verification of the tumor. AFP and β - hCG levels are tested is used For diagnostics GKO , assessment of response to chemotherapy (CT) and radiation (RT) therapy , detection of relapse of the disease. However, an increase in the level of AFP and β - hCG Not Necessarily indicates on progression of the tumor process - their sharp rise can be observed during tumor lysis during chemotherapy (the half-life of AFP is 6 days, β - hCG – 16 h) [1, 3, 6, 7]. In rare cases, with embryonic tumors of the central nervous system, extraneural metastasis is observed, mainly in the bone marrow (about 5%) and bones (2%), which may be accompanied by a decrease in the level of hemoglobin, platelets and leukocytes in the general blood test. Diagnosis of extraneural metastases is carried out using bone marrow examination and technetium bone scan [6, 7]. The treatment tactics for central nervous system tumors are determined by the histological type of the tumor. An important principle of treating central nervous system tumors is a multidisciplinary approach involving neurosurgeons, radiation therapists, oncologists - chemotherapists , and morphologists .

Material and methods.

Active Neurologists, ophthalmologists, endocrinologists, as well as pediatricians, otolaryngologists and psychologists take part in the treatment of children with CNS tumors [5, 7, 8]. The first stage of treatment of CNS tumors is surgical resection of the tumor, the purpose of which is the maximum removal of the tumor, clarification of the histological variant and reduction of neurological symptoms. In the last 20 years, the majority of patients with CNS tumors have received surgical treatment. If it is not possible tumor removal, a tumor biopsy is performed and its histological variant is clarified. An exception are patients with diffuse brainstem tumors, for whom surgical intervention in any form is associated with serious consequences. A tumor biopsy in patients with a brainstem tumor is advisable in the case of an atypical radiological picture [5, 7, 8]. Today, radiation therapy (RT) is a very important method for treating CNS tumors. RT is a very important method for treating CNS tumors in children. Existing irradiation concepts make it possible to select the correct amount of RT individually for each child. The

standard for RT of brain tumors in children is 3D conformal Irradiation . New research has made a significant contribution to minimizing the consequences of RT. In the near future, the use of proton irradiation in pediatrics for CNS tumors is expected to increase, since the high conformality of this type of RT theoretically does not cause late consequences and does not increase the risk of secondary tumors. Craniospinal tomotherapy may be a good alternative to conventional irradiation techniques and is therefore an object of research [8–10].

Results.

At the beginning of the last century, total CNS irradiation was the fundamental standard of treatment for all CNS tumors, regardless of histological type. Currently, there are three different types of CNS irradiation: 1) craniospinal irradiation (CSI); 2) cranial irradiation; 3) local irradiation (tumor bed irradiation). Today, CSI is used only for certain types of CNS tumors associated with a significant risk of leptomeningeal dissemination, as well as in the detection of tumor metastasis to the CNS [10–12]. Local irradiation is most often used in the treatment of CNS tumors in children. In principle , this type of RT includes irradiation of the tumor (or postoperative bed) and an additional safe area that insures against potential tumor spread. The irradiation boundaries depend on the histological structure of the tumor and the extent of surgical treatment. This concept is typical for tumors with a low risk of leptomeningeal spread or situations where systemic chemotherapy is likely to successfully prevent tumor metastasis to the central nervous system [11–13]. In recent decades, the percentage of children cured of CNS tumors has increased significantly, with a 5 - year survival rate of 60–70%. Therefore, the main interest today is the quality of life after treatment. Unfortunately, any child with a CNS tumor is at risk of developing side effects, which depend on the dose and volume of RT, as well as the patient's age at the time of treatment. Possible side effects of RT include developmental disabilities, neurological disorders, hearing impairment, growth retardation, pituitary and thyroid dysfunction, psychosocial problems, and an increasing incidence of secondary tumors [10–12]. In this regard, it is obvious that the treatment strategy should be chosen in such a way as to delay or reduce the radiation dose, as well as limit the volume of RT, especially when it comes to small patients [12].

Conclusions.

Meningoblastoma is the most common tumor in childhood. In some countries, MB is better known as subtentorial primitive neuroectodermal tumor (PNET). MB often spreads through the cerebrospinal fluid spaces, and up to 45% of patients have stage M + at initial diagnosis [2, 19]. For many years, MB was treated only with CSO [12]. In the last decade, it has been found that chemotherapy and local irradiation are sufficient treatment for children under 3 years of age with the classic version of MB and stage M0 . patients In children under 3 years of age with the desmoplastic variant

of myeloma, the use of only polychemotherapy without radiation allows for relapse-free survival in 95% of cases [22]. Long-term relapse-free survival in patients with myeloma younger than 3 years with metastases is possible only in 30–40% of cases [14, 16, 23, 24]. In children older than 3 years, standard treatment still includes XSO at a dose of 24–36 Gy with additional booster irradiation of the tumor bed (up to 54–55 Gy) and polychemotherapy [10, 11, 15, 20, 21, 24, 27]. In patients older than 3 years, medium-dose polychemotherapy after tumor resection and XSO with parallel chemotherapy allows for long-term survival – overall (OS) and progression-free survival (PFS) – to be achieved in 70% of patients with myeloma (Figs. 2–4). Unfavorable prognostic factors are: stages M2 and M3, anaplastic/large cell variant of MB, presence of MYCC gene amplification [10, 11, 15, 18, 21, 28, 29]. Malignant gliomas – MG (AA and multiforme Glioblastoma (GBM) are characterized by an extremely unfavorable prognosis [2, 30, 31]. Despite progress in the treatment of neuro-oncological diseases, the median survival of patients with GBM, according to various authors, does not exceed 10-14 months , while in patients with AA, life expectancy reaches 2-3 years [32]. These tumors are associated with a high rate of relapse after initial treatment and are one of the main causes of death in patients with malignant neoplasms. The reason for the unfavorable prognosis in MH is, first of all, the diffuse invasion of tumor cells into the surrounding brain tissue, which limits the effectiveness of surgical removal of the neoplasm [33]. In addition, AA and GBM are characterized by significantly greater radio- and chemoresistance in comparison with other CNS tumors [33]. The modern therapeutic strategy for AA and GBM is based on surgical removal of the tumor to the maximum extent, followed by local RT and the use of chemotherapy (MacDonald T. isoavt ., 2005; StuppR ., HegiM ., 2007; 26

Literature

1. Del Verme J., Conti C., Guida F., Use of gelatin hemostatic matrices in patients with intraparenchymal hemorrhage and drug-induced coagulopathy. J Neurosurg Sci. 2019; 63: 737-742 https://doi.org/10.23736/S0390-5616.16.03362-2
2. Garza, N.; Toussi , A.; Wilson, M.; Shahlaie , K.; Martin, R. The Increasing Age of TBI Patients at a Single Level 1 Trauma Center and the Discordance Between GCS and CT Rotterdam Scores in the Elderly. *Front. Neurol.* 2020, *11*, 112.
3. Isakov, B. M., Mamadaliev, A. B., Khakimov, M. N., & Isakov, K. B. (2022). On the issue of surgical methods for the treatment of dislocation syndrome in supratentorial brain tumors. International journal of social science & interdisciplinary research ISSN: 2277-3630 Impact factor: 7.429, 11 (04), 14-16.
4. Nicoletti GF, Umana GE, Graziano F., Florio A., Scalia G. Repair of a spinal pseudomeningocele in a delayed postsurgical cerebrospinal fluid leak using titanium U-clips: technical note. Interdiscip Neurosurg Adv Tech Case Manag . 2020; 21: 100742 https://doi.org/10.1016/j.inat.2020.100742