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SURGICAL TREATMENT OF BRAIN TUMORS METASTASES

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The literature data on metastatic brain lesions are analyzed. The aim of the review is to attempt to determine the optimal tactics of surgical treatment of multiple brain metastases, since there is currently no standard approach to treatment for patients with multiple metastases.

Key words: brain metastases, neurosurgery, oncology, radiosurgery, radiation therapy

Currently, oncological diseases are one of the main causes of death among the working-age population, accounting for 13.8%. The number of patients with oncological diseases is growing, as is the number of patients with metastatic lesions of the central nervous system (CNS). The reasons for the increase in the number of patients with brain metastases are the overall increase in the number of patients with oncological diseases, the increase in the life expectancy of such patients, advances in cancer treatment, and improved quality of neuroimaging [1, 2]. The frequency of metastatic lesions of the central nervous system varies from 15 to 35%, and according to autopsy data, brain metastases are found in 60-70% of people who died from oncological diseases. Previously, it was believed that metastases account for about 20% of all CNS tumors, or 2 cases per 100,000 population per year. According to some authors, this figure is significantly underestimated, and the incidence of metastatic lesions is 20-40 per 100,000 population per year in Russia, which exceeds the incidence of primary tumors. According to the US, the incidence of primary CNS tumors is 8.2-12.5 cases per 100,000 population, and metastatic brain lesions are about 30 per 100,000 people per year [3, 4, 5, 6]. Brain metastases in the presence of malignant tumors in adults are much more common than in children. In patients under 35 years of age, the incidence of metastatic tumors is less than 1 per 100,000 people, and in patients aged 60-70 years, it exceeds 30 per 100,000 people per year. These data show [7, 8]. The most common tumors that metastasize to the brain are lung cancer (30-64%), breast tumors (15-25%), melanoma (5-20%), and kidney cancer (about 5%). Less common tumors that disseminate to the brain are gastrointestinal tract tumors, uterine tumors, and ovarian tumors. Tumors of the pelvic and abdominal localization often metastasize to the posterior cranial fossa. Patients with metastases in this localization have a less favorable prognosis. Metastatic brain damage in breast cancer usually occurs in the late stages of the

disease and is rarely the first symptom of the oncological process. According to autopsy data, intracranial metastases in patients with colorectal carcinoma occur in 3% of cases. The frequency of infratentorial localization of carcinoma metastases is 35-55%. This is several times higher than the incidence of cerebellar metastases in lung cancer (15%), renal adenocarcinoma (16-19%), breast cancer (10%) and melanoma (7%). Metastatic brain damage in kidney cancer is often asymptomatic, and according to autopsy data, it is detected in 10-20% of cases [9, 10, 11]. Most often (up to 80%), metastatic brain damage is detected after the detection of the primary lesion (metachronous diagnostics) or simultaneously with the detection of the primary tumor (synchronous diagnostics). In 15% of cases, metastatic brain damage is detected before the detection of the primary lesion, and in 5% of patients, brain metastases remain the only sign of the disease with an undetected primary lesion [12,13]. In most cases, brain metastases have a hematogenous nature of spread and are distributed proportionally to the volume of cerebral blood flow: cerebral hemispheres (80%), cerebellum (15%), brainstem (5%). Metastases are very rare in the basal ganglia, pineal gland and pituitary gland. Metastasis to the cortex or basal ganglia is typical for melanoma. A number of studies have noted a tendency for more frequent metastasis to the frontal and parietal lobes, compared to the occipital and temporal lobes. According to various authors, brain metastases are solitary (single) in 15-50% of cases, multiple - in 50-85% of patients [14, 15, 16]. According to various studies, the clinical picture in percentage terms varies insignificantly. In metastatic brain lesions, 60-75% of patients had some neurological symptoms. In most patients, the symptoms progressed gradually, and only 5-10% of patients had a stroke-like onset of neurological symptoms. This is due to hemorrhage into the tumor, embolism, or compression occlusion of blood vessels. The leading symptom is headache, which is most typical for multiple metastatic brain lesions and the presence of foci in the posterior cranial fossa. At the onset of the disease, 40-42% of patients already have mild neurological symptoms, which subsequently progress. Cerebellar disorders were noted in 66% of patients, and speech disorders in 19%. Episyndrome is relatively rarely (in 10% of cases) the first symptom of metastatic brain lesions. According to some authors, seizures develop in 30-35% of patients. Mental disorders and cognitive impairment occur in 75% of patients, especially in the presence of multiple metastases or increased intracranial pressure. [17, 18]. The reason for surgical removal of metastases in some clinics (in addition to the presence of focal neurological symptoms) is intracranial hypertension detected during examination of the fundus and dislocation syndrome. In the case of an asymptomatic course of the disease, difficulties arise in diagnosis and, consequently, treatment. Some authors believe that

when asymptomatic brain metastases are detected in patients with melanoma, treatment should be started with radiation therapy, and in kidney cancer, treatment is started only when neurological symptoms occur [19, 20]. Currently, the median life expectancy in patients with metastatic brain damage is largely determined by the treatment. Treatment of patients with brain metastases is an extremely pressing problem for oncology, radiology, chemotherapy and neurosurgery. The prognosis for the life of patients with multiple brain metastases is poor in most cases. This is due to both the patient's condition (severity of the general condition, prevalence of the process) and the lack of clear algorithms for treating patients in this category [21, 22,]. The goal of treatment is to prolong the life of patients and improve its quality. These indicators directly depend on the chosen treatment tactics, the use of monotherapy or a comprehensive approach, as well as on timely diagnostics. According to various studies, the life expectancy of patients is: with metastases without any therapy 1-1.5 months, with the appointment of corticosteroids increases to 2 months, with isolated use of radiation therapy - 3-6 months, in operated patients with subsequent radiation and chemotherapy, the life expectancy is 10-16 months. An important factor, in addition to increasing life expectancy, is the ability of patients to self-care. Thus, operated patients are capable of self-care for 9-9.5 months, while after isolated radiation therapy only about 2 months. It should also be taken into account that surgical treatment of metastatic brain tumors promotes regression of intracranial hypertension signs, which creates conditions for complex treatment. Radiation therapy in combination with radiosurgery or chemotherapy increases the period of absence of relapses, and total surgical removal of metastases with complex treatment increases the median life expectancy in patients of this group and extends the period during which patients are capable of self-care [23, 24, 25]. Removal of brain metastases is possible in approximately 25% of patients with metastatic lesions of the central nervous system. Indications for surgical removal of metastases are anatomical accessibility, high "mass effect" provided that the underlying disease is in remission, and the patient's general condition is compensated. The outcomes after surgical treatment of patients with brain metastases are as follows: improvement occurs in 83-93% of patients, 7-10% are discharged without significant dynamics, deterioration occurs in about 5% of patients, mortality is 2-3% [26, 27]. The importance of obtaining a histological diagnosis is still debated. Some researchers explain the need for surgical intervention by the fact that in 11% of cases with a confirmed systemic oncological process and a conclusion about metastatic damage to the brain according to neuroimaging methods, after surgical treatment, histological examination did not confirm metastatic damage (primary brain tumors or abscesses were detected) [28]. It

has been proven that the general condition, age of the patient, as well as the condition of the primary lesion are prognostically important factors in predicting the patient's life expectancy. One of the important factors is the assessment of the patient's condition according to the Karnofsky scale (KPS). With a low KPS score, the possibility of surgical treatment can be considered if, in the surgeon's opinion, it will lead to the resolution of focal symptoms. It is noted that more severe focal symptoms correspond to shorter life expectancy periods. The issues of the possibility of surgical treatment should be resolved taking into account the prospects for further treatment. If there is a possibility of continuing treatment of the oncological process in the postoperative period, then the operation is considered appropriate. In a certain percentage of cases, surgical treatment is not a way to prolong life, but is aimed at improving the quality of life. This situation is often associated with the prevalence of the oncological process, when the cause of the deterioration of the general condition is extracranial lesions. According to some researchers, the issue of possible surgical treatment can be considered with an expected life expectancy of over 3-4 months [29, 30]. The clearest indications for surgical treatment are in a group of patients with solitary metastases. For them, indications for surgery are based on the findings of randomized studies. In patients with multiple brain metastases or extracranial metastases, there is no standard treatment approach. This situation leads to significant differences in the frequency of surgical interventions in such patients [31, 32, 33]. Provision of medical care to patients with oncological diseases should begin with an assessment of the prevalence of the process. Patients with multiple extracranial lesions are not amenable to surgical treatment. For such patients, it is worth considering the possibility of radiotherapy as a palliative treatment method to improve the quality of life during this period. In the postoperative period, it is always necessary to decide on the possibility of radiotherapy to destroy micrometastases that cannot be detected using CT or MRI studies. Radiotherapy is the method of choice in the treatment of single or multiple brain metastases that, for one reason or another, are not amenable to surgical treatment. Whole brain radiotherapy (WBRT) has been used since the middle of the last century. Metastases of non-small cell lung cancer and breast cancer respond well to this therapy, since the primary tumors themselves are radiosensitive. In order to increase the effectiveness of the therapy, drugs are used that increase the sensitivity of tissues to radiation. In general, radiation therapy is effective in more than 70% of patients with metastatic brain damage and allows not only to increase their life expectancy, but also to improve its quality [34, 34, 35]. Chemotherapy is also one of the main methods of treatment. Sensitivity to chemotherapy is a key factor in choosing this method of

treatment. It is known that intracranial metastases have the same sensitivity to chemotherapy as the primary lesion. A greater effect is observed in patients who have not previously received this therapy (mainly patients with a newly diagnosed oncological process). With repeated courses of chemotherapy, the effectiveness of the latter decreases. It has also been established that the response to chemotherapy of brain metastases of the most chemosensitive tumors (small cell lung cancer, germ cell tumors, breast cancer) is on average comparable to that observed with radiation therapy. The stumbling block in the treatment of patients with metastatic brain lesions is the blood-brain and blood-tumor barriers, which are an obstacle to the penetration of drugs to micrometastases. Methods for their delivery to brain metastases are being developed: destruction of the blood-brain barrier with hyperosmolar mannitol, action on the blood-brain barrier using bradykinin agonists, local chemotherapy [36]. Stereotactic radiosurgery is increasingly used to treat patients with brain metastases. This procedure delivers a single high dose of radiation through a stereotactic device to targets with a maximum diameter of 3-3.5 cm. The risk of damage to the surrounding nervous tissue is significantly reduced. Unlike primary malignant brain tumors, brain metastases are physically and biologically ideal targets for stereotactic radiosurgery. Such tumors resistant to radiation therapy as melanoma, kidney and colon cancer respond to stereotactic radiosurgery almost as well as other, more sensitive tumors to conventional radiation therapy regimens [37, 38]. There is still no definitive opinion on surgical treatment of multiple brain metastases. In some studies, surgical treatment is suggested only in the case of a life-threatening condition, when histological verification is required, or when there are two foci that can be removed from a single approach. In most cases, treatment of patients with multiple metastases is limited to radiation therapy and corticosteroids. However, according to other authors, the need for more than one craniotomy should not be a fundamental factor [39, 40]. Often, the presence of multiple metastases to the brain is considered a casus inoperabiles. However, studies conducted in the United States have shown that patients after simultaneous removal of multiple metastases are not inferior in terms of life expectancy to the group of patients after surgical treatment in the presence of single metastases. This group included patients with 2-4 metastases to the brain, accessible for surgical removal, with a controlled primary lesion, and no signs of extracranial metastases. On average, the survival time of patients after removal of solitary metastases was 14 months, after one-stage resection of multiple (2 to 4) metastases - 14 months, after removal of one or more metastases and preservation of one or more foci - 6 months. Thus, one-stage removal of multiple metastases (24) in the absence of signs of relapse in the area of the primary focus, the presence of extracranial

metastases, does not differ from that in solitary metastases [41, 42]. It is necessary to revise the concept of providing medical care to patients with multiple metastases to the brain, to determine clear indications for surgical treatment in patients of this category. When determining the indications and contraindications for surgical treatment, it is important to understand one thing: "A doctor who decides to treat a patient with stage IV cancer assumes the responsibility for organizing this treatment in all areas until the clinical outcome is determined." In other words, if you do not create, even a virtual, center of interaction between oncologists, chemotherapists, radiation therapists, radiosurgeons, surgical oncologists, whose prerogative will be the implementation at the primary site (general surgeons, thoracic, urologists, gynecologists, etc.), all work on treating such patients becomes futile.

1. Ахмедов Ю. М., Курбанов Д. Д., Мавлянов Ф. Ш. Прогноз исхода врожденного гидронефроза у детей //Педиатрическая фармакология. – 2011. – Т. 8. – №. 1. – С. 108-111.
2. Ахмедов Ю. М. и др. Рентгенопланиметрические методы диагностики обструктивных уропатий у детей //Саратовский научно-медицинский журнал. – 2007. – Т. 3. – №. 2. – С. 66.
3. Кадыров Р. и др. Эндоскопические методы гемостаза при кровотечении из варикозно расширенных вен пищевода //Журнал проблемы биологии и медицины. – 2017. – №. 4 (97). – С. 44-47.
4. Ахмедов Ю., Кадыров Р. Сочетанный эндоскопический гемостаз при язвенных кровотечениях //Журнал вестник врача. – 2017. – Т. 1. – №. 1. – С. 11-14.
5. Стреляева А. В. и др. Лечение эхинококкоза печени взрослых больных, осложненного пециломикозом и ХОБЛ //Хирургическая практика. – 2014. – №. 1. – С. 37-42.
6. Шарков С. М., Ахмедов Ю. М. Сочетанное нарушение уродинамики верхних мочевыводящих путей у детей //Детская хирургия. – 1999. – №. 3. – С. 7-10.
7. Shakirov B. M. et al. Suicidal burns in Samarkand burn centers and their consequences //Annals of burns and fire disasters. – 2013. – Т. 26. – №. 4. – С. 217.
8. Shakirov B. M. et al. SUICIDAL BURNS IN SAMARKAND BURN CENTERS AND THEIR CONSEQUENCES.
9. Хайитов У., Ахмедов Ю., Бегнаева М. Клинико-рентгенологическая картина септической пневмонии у детей //Журнал гепато-гастроэнтерологических исследований. – 2021. – Т. 2. – №. 3.2. – С. 35-36.

10. Яцык П. К. и др. Функциональное состояние фагоцитарной активности нейтрофилов и характер бактериурии у детей с хроническим обструктивным пиелонефритом //Урол. и нефрол. – 1986. – Т. 5. – С. 24.

11. Стреляева, А. В., Сапожников, С. А., Чебышев, Н. В., Эгамбердыев, Б. Н., Садыков, Р. В., & Ахмедов, Ю. М. & Шамсиев, АМ (2014). *Лечение эхинококкоза легких, осложненного пециломикозом, у взрослых больных. Хирургическая практика,(1)*, *4350*.

12. Стреляева, А. В., Сагиева, А. Т., Абдиев, Ф. Т., Садыков, Р. В., Садыков, В. М., Габченко, А. К., ... & Закирова, Ф. И. (2012). Поражение сердца при эхинококкозе печени у взрослых больных. *Медицинская паразитология и паразитарные болезни*, (4), 40-42.

13. Ишкабулов, Д. У., Ахмедов, Ю. М., Ишкабулова, Г., & Эргашев, А. (2008). Хроническая почечная недостаточностью детей: современные методы оценки течения, лечения и прогноза хронических заболеваний почек в стадии почечной недостаточности. *Вестник врача*, *1*, 73-83.

14. Akhmedov I. Y. et al. IS THE MEGAURETER THE PROBLEM OF YESTERDAY, TODAY OR TOMORROW? //European journal of molecular medicine. – 2021. – Т. 1. – №. 1.

15. Мавлянов Ш. Х. и др. Наша тактика в лечении ущемленных паховых грыж у детей //Российский вестник детской хирургии, анестезиологии и реаниматологии. – 2020. – Т. 10. – №. S. – С. 99-99.

16. Стреляева, А. В., Гаспарян, Э. Р., Сагиева, А. Т., Курилов, Д. В., Щеглова, Т. А., Зуев, С. С., ... & Ахмедов, Ю. М. (2011). Гомеопатические препараты в лечении преэклампсии, осложненной пециломикозом. *Традиционная медицина*, (4 (27) 2011), 23-28.

17. Ибрагимов, Э. К., Ахмедов, И. Ю., Мирмадиев, М. Ш., & Ахмедов, Ю. М. (2022). хирургическАя коррекция кист холедохА в детском возрАсте. *FORCIPE*, *5*(S1), 83-83.

18. Ахмедов Ю. М. и др. Особенности патологического протеолиза в развитии ожоговой пневмонии у детей //IVсъезд комбустиологов России: сб. науч. трудов. М. – 2013. – С. 44-45.

19. Шарков, С. М., Яцык, С. П., Фомин, Д. К., & Ахмедов, Ю. М. (2012). Обструкция верхних мочевых путей у детей. Союз педиатров России, Научный центр здоровья детей. *Москва*.

20. Ишкабулов Д. И., Ахмедов Ю. М. Наследственные заболевания почек //Нефро-урология у детей. – 2008. – С. 205-207.

21. Akhmedov Y. M. et al. X-ray planimetric methods for the diagnosis of obstructive uropathy in children //Saratov Journal of Medical Scientific Research. – 2007.

22. Ахмедов Ю. М., Сабиров Б. У., Мамышева Н. О. Местная тканевая реакция со стороны организма-носителя в зависимости от наличия патогенной микрофлоры в эхинококковых кистах //IBN SINO-AVICENNA. – 2005. – №. 1-2. – С. 13.

23. Яцык П. К., Ахметов Ю. М. Микрофлора мочи у детей с хроническим обструктивным пиелонефритом Ю. м. Ахмедов, ЛК Катосова //депонированная рукопись. – 1991. – С. 24.

24. Ахтамов М. А., Рахимов А. У., Ахмедов Ю. М. Применение продигиозана при хроническом гематогенном остеомиелите у детей //Хирургия. – 1985. – №. 7. – С. 92.

25. Ахмедов И. Ю. и др. ХИРУРГИЧЕСКИЕ МЕТОДЫ ЛЕЧЕНИЯ МОЧЕКАМЕННОЙ БОЛЕЗНИ В ПЕДИАТРИЧЕСКОЙ ПРАКТИКЕ (ОБЗОР ЛИТЕРАТУРЫ) //ЖУРНАЛ РЕПРОДУКТИВНОГО ЗДОРОВЬЯ И УРО-НЕФРОЛОГИЧЕСКИХ ИССЛЕДОВАНИЙ. – 2022. – Т. 3. – №. 3.

26. Джуракулов Ж. Д., Ахмедов И. Ю., Мирмадиев М. Ш. ДИАГНОСТИКА И ЛЕЧЕНИЕ ДИАФРАГМАЛЬНЫХ ГРЫЖ В ДЕТСКОМ ВОЗРАСТЕ //FORCIPE. – 2022. – Т. 5. – №. S1. – С. 65.

27. А. М. Ишанкулов, С. А. Аллазов, Ю. М. Ахмедов, Ж. А. Дарханов, О. А. Ишанкулов Удачный случай свободной реплантации суицидально ампутированного полового члена // Вестник экстренной медицины. 2013. №1.

28. Хаджибаев АМ А. Ю. М., Карабаев Х. К. др. Выбор лечебно-диагностической тактики при закрытой сочетанной абдоминальной травме //В сб.«Современная военно-полевая хирургия повреждений». Санкт-Петербург. – 2011. – С. 175.

29. Б. М. Шакиров, Ю. М. Ахмедов, К. Р. Тагаев, Х. К. Карабаев, Э. А. Хакимов Раннее хирургическое лечение глубоких ожогов тыльной поверхности стопы // Вестник экстренной медицины. 2011. №2.

30. Яцык П. К. и др. Функциональное состояние фагоцитарной активности нейтрофилов и характер бактериурии у детей с хроническим обструктивным пиелонефритом //Урол. и нефрол. – 1986. – Т. 5. – С. 24.

31. Ишкабулов Д. У. и др. Хроническая почечная недостаточностью детей: современные методы оценки течения, лечения и прогноза хронических заболеваний почек в стадии почечной недостаточности //Вестник врача. – 2008. – Т. 1. – С. 73-83.

32. Ахмедов Ю. М. и др. Особенности патологического протеолиза в развитии ожоговой пневмонии у детей //IVсъезд комбустиологов России: сб. науч. трудов. М. – 2013. – С. 44-45.

33. Атакулов, Б. М., Габченко, А. К., Садыков, В. М., Абдухалик-Заде, Г. А., & Ахмедов, Ю. М. (2006). Морфолого-экспериментальные исследования пневмонии у детей пециломикозной этиологии. *Проблемы хирургии, фармакологии, фармации и паразитологии*, 13-14.

34. Ахмедов Ю. М., Садыков В. М. Хирургическое лечение осложненного эхинококкоза //Проблемы биологии и медицины. – 2005. – №. 1. – С. 12-15.

35. Ахмедов Ю. М., Ахмеджанов И. А., Мавлянов Ф. Ш. Результаты лечения врожденного гидронефроза у детей //Современные технологии в оценке отдаленных результатов лечения урологической патологии у детей: Тезисы докладов науч.-практ. конф. детских урологов. М. – 2001. – Т. 68.

36. Мамадалиев А.М., Мамадалиева С.А. Значение фронто-темпорально-орбито-зигоматикального доступа для удаления менингиомы кавернозного синуса и крыла основной кости// Матер. Всеросс. НПК «Поленовские чтения». СПб. 2005. с.283-284.

37. Мамадалиев А.М. К гистологическим особенностям опухолей головного мозга//Матер. Всеросс. НПК «Поленовские чтения». СПб. 2010. с.266

38. Norkulov N.U., Mamadaliev A.M., Shodiev A.Sh. The importance of neurological symptoms of mild traumatic brain injury for clinical and forensic assessment of patients. *Vrach-aspirant*. 2012;4.2 (53):245-249. (In Russ.).

39. Норкулов Н.У., Мамадалиев А.М., Шодиев А.Ш. Значение неврологической симптоматики легкой черепно-мозговой травмы для клинической и судебно-медицинской оценки состояния больных. Врач-аспирант. 2012;4.2 (53):245-249.

40. Ravshanov Davron Mavlonovich Some Features of the Clinical Course of Parasagittal Meningiomas of the Brain, *Asian Journal of Case Reports in Medicine and Health*, Page 19-23

41. Abdukholikovich A. M., Mamatkulovich M. A., Abdurakhmonovna M. S. The study of the improved complex neurosurgical treatment in patients with posttraumatic chronic subdural hematomas and hygromas //European science review. – 2016. – №. 1-2. – С. 28-32.

42. Abdukholikovich A. M., Mamatkulovich M. A., Abdurakhmonovna M. S. The study of the results of endolumbal insufflation of ozone and pyracetam in the treatment of posttraumatic epilepsy //European science review. – 2015. – №. 11-12. – С. 29-32