About the issue of clinical and morphologic diagnosis of intracranial tumors

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Abstract

Background: According to the literature data, there has been a significant increase in central nervous system tumors recently. The problem of neuro-oncology is to define the biological “behavior” of tumors, which carries the key importance for the respective effective treatment and prognostication. By informative value, radiologic studies take one of the leading place in the latest diagnostic methods established in the practical medicine; in addition, its known that regardless of informative value of any study method, the ultimate verification of the process is done based on morphologic study results. Thus, the knowledge of morphologic equivalents of the radiologic study data is of utmost significance, both for implementation of targeted treatment strategy as well as for defining the possible risk of relapse. The aim of the study was to compare the clinical and postoperative morphological study results in presence of intracranial tumors.

Material Methods: The postoperative material sampled during the 5 consecutive years was studied – 219 cases overall. Complete clinical-laboratory studies were performed in given cases, including MRI with T1flair, T2tse, T2flair, DWI, dADC-DWI, T1-FFE regimens, in axial, sagittal and coronal sections, with contrast enhancement (Magnevist, average 15 ml.). In some cases per needed, MR angiography was performed (Ven-3D-PCA, 3DI-MC-HR). Postoperative material was fixed in neutral 10% formalin solution. Samples were paraffin-embedded. The sections with 5-6 µm thickness prepared by rotational microtome were stained by hematoxylin, eosin and picrofuxin (by Van Gieson). We were using the immunohistochemistry study method. Microscopic films were studied by light microscope “Balphan” (with halogen light) in different magnifications (200-400). The malignancy grade of tumors was defined by WHO classification 2007.

Results: Complete matching of the diagnoses was revealed in 131 cases (59.8%). In 26 cases of discrepant diagnosis, the clinical diagnosis indicated the histogenesis of intracranial tumor, which was not verified by morphology study. High indices of complete matching between clinical and postoperative morphology study data in intracranial tumors were observed for neurinoma (100.0%), pituitary adenoma (92.8%), meningioma (92.1%), and average indices of matching for glioblastoma (66.6%) and astrocytoma (62.5%) cases.

Keywords: Intracranial tumor, Morphology, Stereotactic biopsy, Meningioma, Neurinoma, Pituitary adenoma, Glioblastoma, Astrocytoma

Introduction

According to the literature data, a significant increase in central nervous system tumors has been observed worldwide recently. Respectively, there is no doubt that defining of biological “behavior” of tumors represents the key issue of neuro-oncology, as long as it carries decisive importance for the adequate effective treatment and prognostication 1,2,3,4.

By informative value, radiologic studies take one of the leading place in the latest diagnostic methods established in the practical medicine (ultrasound study, computerized tomography, magnetic resonance imaging); in addition, its known that regardless of informative value of any study method, the ultimate verification of the process is done based on morphologic study results. Thus, the knowledge of morphologic equivalents of the radiologic study data is of utmost significance, both for implementation of targeted treatment strategy as well as for defining the possible risk of relapse 7,6. Comparison of the radiologic study data with the morphologic analysis results of postoperative material revealed that modern non-invasive methods are not always able to give the precise definition to the nature of brain tumors 9. In some cases with typical radiological data characteristic for astrocytoma, the morphology study subsequently showed the presence of glioblastoma multiforme 9.

The modern approach implies the application of
stereotactic biopsy at the initial stage of assessment for patients with brain tumors, which can be followed by the dynamic follow-up – excision of the tumor, radio- or chemotherapy.

Rarely, the stereotactic biopsy data is interpreted as edema of the white matter of brain by radiologic study, which actually represents the zone of infiltration by tumor cells. Stereotactic biopsy is mini-invasive surgical method enabling the retrieval of pathologically altered tissue from brain for microscopic study, in order to define the precise histological diagnosis and treatment strategy. In addition, due to non-uniform structure of tumor tissue, the abovementioned method can sometimes be not completely reliable. The precise data is provided by detailed morphologic study of different sites from the tumor tissue.

Aim

The aim of the study was to compare the clinical and morphology study data of postoperative material in intracranial tumor cases.

Materials and Method

The postoperative material sampled during 5 consecutive years (2010-2014) was studied – overall 219 cases. All patients had undergone surgery – excision of intracranial tumors with different locations. Complete clinical-laboratory studies were performed in given cases, including MRI with T1flair, T2se, T2flair, DWI, dADC-DWI, T1, FFE regimens, in axial, sagittal and coronal sections, with contrast enhancement (Magnevist, average 15 ml.). In some cases per needed, MR angiography of intra- and extracranial vessels was performed (Ven-3D-PCA, 3D-ICHR). Postoperative material was fixed in neutral 10% formalin solution. Samples were paraffin-embedded. The sections with 5-6 μm thickness prepared by rotational microscope were stained by hematoxylin, eosin and picrofuxin (by Van Gieson).

In some cases per needed, we were using the immunohistochemistry study method. Microscopic films were studied by light microscope “Balphan” (with halogen light) in different magnifications (200-400). The malignancy grade of tumors was defined by WHO classification 2007.

Results and Discussion

As our studies showed, the complete matching of clinical and morphologic diagnoses was observed in 131 cases out of 219, which accounts for 59.8% of total. In 62 cases from the remaining 88, the clinical diagnosis indicated the presence of intracranial tumor in general, while in 43 cases the postoperative morphology study data revealed the presence of neuroepithelial tumors (astrocytoma (8), oligodendroglioma (3), oligoastrocytoma (4), ependimoma (2), subependimoma (2), ganglioglioma (2), glioblastoma (16), medulloblastoma (2), primitive neuroectodermal tumor (2), chorioid carcinoma (2), and 15 cases with meningeal tumors (meningioma (6), angiosarcoma (1), hemangioblastoma (3), melanoma (1), germinoma (1), mature teratoma (2), cholesteatoma (1). 4 cases were found to have metastasized carcinoma.

In 26 cases of discrepant diagnosis, the clinical diagnosis indicated the histogenesis of intracranial tumor, which was not verified by morphology study. Specifically, in 2 cases out of 16 clinically diagnosed astrocytoma, the morphology study showed oligoastroctoma, 1 case showed ependimoma and 3 cases appeared to be glioblastoma – overall 6 cases of inconsistent diagnosis.

In single cases of clinically verified oligodendroglioma and anaplastic oligodendroglioma, the morphology study showed anaplastic oligoastroctoma and primitive neuroectodermal tumor, respectively. One of 2 clinical cases of ependimoma showed the presence of neurinoma later on. Only 18 cases of 27 clinically verified glioblastoma met the diagnosis by morphology study, the remaining 9 cases included astrocytoma (3), oligoastrocytoma (4) and carcinoma metastasis (2), 76 cases of clinically verified meningioma appeared to include the single cases of oligoastrocytoma, glioblastoma, neurinoma, eosinophilic granuloma and 2 cases carcinoma metastasis by further morphology study. One case out of 2 clinically verified hemangioblastoma showed the presence of hemangiendothelioma morphologically, and 1 of 14 cases of pituitary adenoma showed cholesteatoma later on.

Thus, the discrepancy between clinical and morphologic diagnoses was seen in 88 cases out of 219 with intracranial tumors studied by us (40.1%). High indices of complete matching between both data were observed for neurinoma (100.0%), pituitary adenoma (92.8%), meningioma (92.1%), and average indices of matching for glioblastoma (66.6%) and astrocytoma (62.5%) cases.

Based upon the above, we consider that inclusion of stereotactic biopsy in the complex of preoperative evaluation studies is strongly recommended as it results account for verification of the process in most cases, which in further steps serves for the development of optimal treatment strategy.

Conclusion

High indices of complete matching between clinical and postoperative morphology study data in intracranial tumors were observed for neurinoma (100.0%), pituitary adenoma (92.8%), meningioma (92.1%), and average indices of matching for glioblastoma (66.6%) and astrocytoma (62.5%) cases.
Application of stereotactic biopsy is strongly recommended in order to define the histogenesis, the maturity grade and treatment strategy for intracranial tumors, respectively.

References

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