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**Functional Magnetic Resonance Techniques to Enhance Brain Tumor Diagnostics**

Modern imaging technologies provide doctors with ever more precise images of our inner body. However, traditional imaging is not always sufficient to make a secure and exact diagnosis. Particularly in the case of brain tumors, commonly used methods often fail. Thus, it is often hard to determine with certainty whether a change of signal in a magnetic resonance imaging scan is caused by an aggressive glioblastoma or by a metastasis of a possibly yet undetected primary tumor. Transformed cells of the lymphatic system occasionally also colonize the brain and are difficult to distinguish from other tumors. Conventional imaging is also insufficient when it comes to differentiating aggressive, higher grade gliomas from less malignant, lower grade ones.

Collaborating with colleagues of Heidelberg University Hospitals, radiologists of the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) have investigated whether new methods called functional magnetic resonance (MR) technologies facilitate a more precise diagnosis than commonly used imaging techniques. Functional MR methods visualize individual physiological functions or tissue parameters. In their recent study, the medical researchers compared MR spectroscopy, which visualizes the distribution of tumor-specific metabolic products, with various methods that visualize blood perfusion of the tissue.

Seventy-nine patients whose CT scan had caused doctors to suspect a brain tumor were included in the study. Tissue samples of all participants were taken from the suspicious areas and the results of functional MR techniques were aligned with the histological findings.

The study showed that perfusion measurements had a higher diagnostic performance in the diagnosis of brain tumors than detection of tumor-specific metabolic products. Thus, because of their higher tumor blood flow, glioblastomas can be distinguished with high certainty from lymphomas, which typically have a very low blood flow. A look at the tissue zone directly surrounding a tumor proved to be helpful to distinguish metastases of tumors in other organs from glioblastomas. Perfusion in the tissue surrounding secondary tumors is significantly lower than in the region around glioblastomas. Tissue perfusion measurements also turned out to be more helpful than conventional imaging for differentiating higher and lower grade gliomas.

“Such differentiation is crucial for determining the treatment strategy,” says **Dr. Marc-André Weber** of DKFZ’s **Radiology Division**. “Early classification of a brain lesion determines, for example, whether or not a patient may take specific drugs such as glucocorticoids before a tissue biopsy or whether additional radiotherapy or chemotherapy is recommended after surgery. Nevertheless, non-invasive MR examinations cannot replace tumor tissue examinations to secure the diagnostic findings.”

M. A. Weber, S. Zoubaa, M. Schlieter, E. Jüttler, H.B. Huttner, K. Geletneky, C. Ittrich, M. P. Lichy, A. Kroll, J. Debus, F. L. Giesel, M. Hartmann and M. Essig: Diagnostic performance of spectroscopic and perfusion MRI for distinction of brain tumors. Neurology, vol. 66, page 1899, 2006

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