First noninvasive technique to accurately predict mutations in human brain tumors

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Donald O'Rourke, MD, Associate Professor of Neurosurgery at the University of Pennsylvania School of Medicine and colleagues, were able to accurately predict the specific genetic mutation that caused brain cancer in a group of patients studied using magnetic resonance imaging (MRI). The researchers presented their findings this week at the American Association for Cancer Research 100th Annual Meeting 2009.

"The field of cancer research has evolved to the point where the identification of the mutations that cause tumors has changed how we treat patients in a number of cancers," says O'Rourke. "Potentially, we believe we have a method that uses MRI to identify a tumor mutation. Historically tumor mutations have been identified in only one way: take the tissue out and examine it using one of two laboratory tests to see if the mutation is present. In this study we've done this identification noninvasively. To my knowledge this is the first demonstration that an MRI, or any imaging technique, can accurately predict the type of mutation of a human tumor."

A particular MRI technique, called relative cerebral blood volume that measures blood flow to the tumor, very highly correlates with the presence of an important mutation in glioblastoma, a type of brain cancer. The mutation occurs in the epidermal growth factor receptor, EGFR, a well known cancer-related protein that helps tumors form their necessary blood vessels. EGFRvIII, the specific mutation the Penn group studied, is the hallmark of a more aggressive form of glioblastoma.

The research team compared MRI readings to tumor tissue samples from 97 glioblastoma patients. They found that patients with higher relative cerebral blood volume as measured by MRI correlates with the EGFRvIII mutation compared to those who did not have the mutation.

Glioblastoma is a variable disease, and clinicians need help to distinguish one form from another. "All of cancer research is evolving to a point where mutations can facilitate care, so a more accurate diagnosis and treatment course can be better planned by identifying the mutational status of the tumor," says O'Rourke.

EGFRvIII is an area of intense interest in the field of cancer, being associated with more aggressive cancers. Having a noninvasive way to identity patients with the EGFRvIII mutation could allow physicians to enroll these patients into trials using drugs that specifically target this mutation. Penn is part of a multicenter trial that is doing just that.

Another implication of having a noninvasive method to track a specific patient group is for following treatment response. "Currently we identify a tumor mutation by removing a tumor, and then we select a particular treatment and evaluate the response with an MRI to see if the tumor is stable or smaller," explains O'Rourke. "With this new method we'll be able to show whether a surrogate of the mutation is changing. EGFRvIII correlates with the elevated blood flow to the tumor and if we put a patient on an effective anti-tumor strategy, that blood flow should reduce. We'd be getting a more biological readout to therapy."

Ongoing work focuses on using advanced MRI to characterize additional mutations in glioblastoma tumors.

Source: University of Pennsylvania School of Medicine (news : web)