Virtual brain could aid surgical planning

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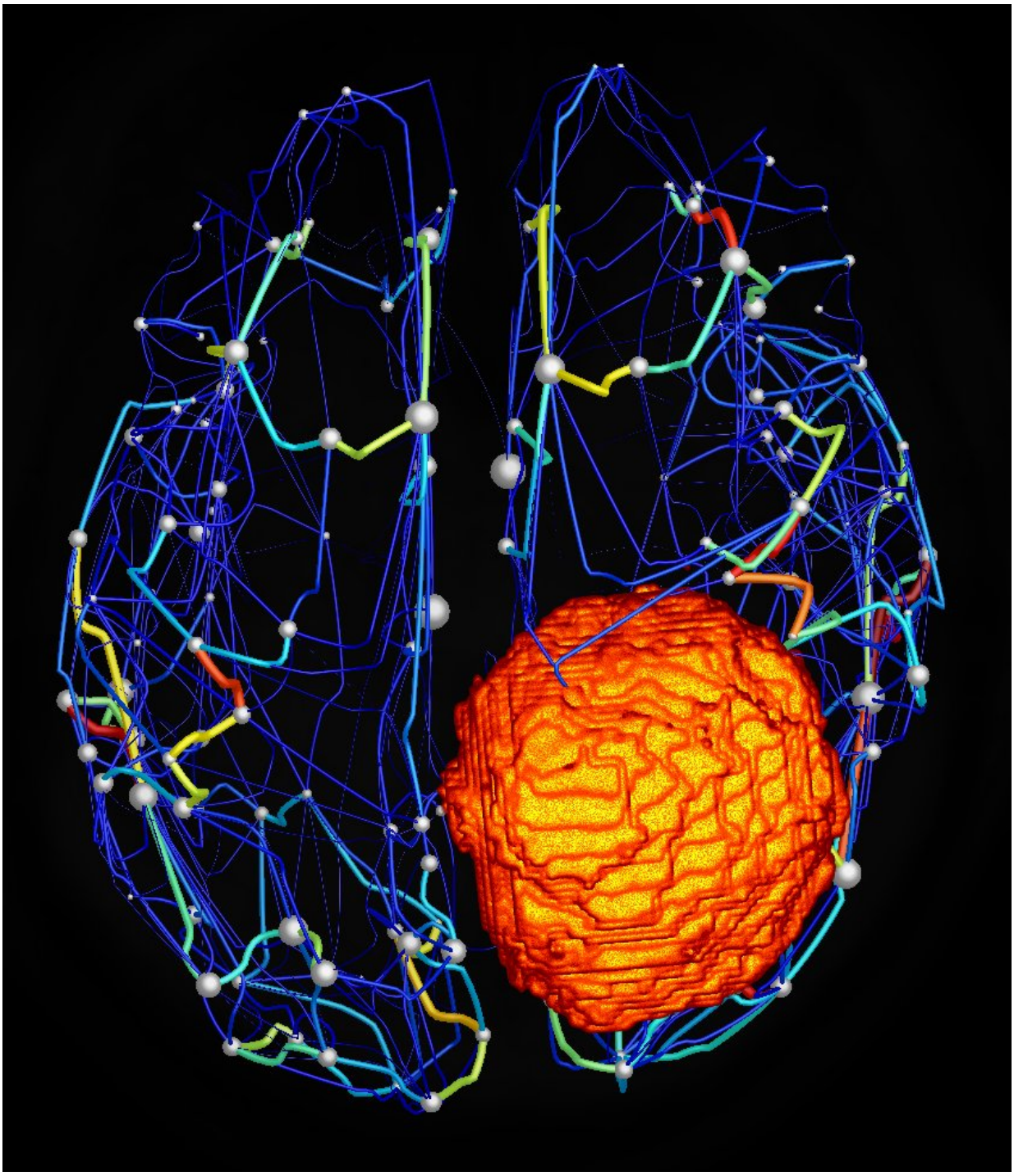

Structural brain network in a brain tumor patient from the study. Different brain regions are depicted as spheres, whose size indicates the relative importance within the network. The strength and direction of the structural links between them is represented by different colors and width. The brain tumor, a large meningioma, is the orange mass. Credit: Hannelore Aerts

Researchers have simulated neural activity based on the unique structural architecture of individual brain tumor patients using a platform called The Virtual Brain. The findings, reported in *eNeuro*, are a first step toward creating personalized brain models that could be used to predict the effects of tumors and consequent surgery on brain function.

Brain surgery is delicate work that requires careful planning to maximally remove a tumor while leaving the surrounding tissue intact. Common techniques such as functional magnetic resonance imaging (fMRI) are used to map out a surgical strategy by identifying important functional areas close to the tumor. These approaches are limited, however, in their ability to predict post-surgical outcome because of the complex dynamics of the brain and the widespread modifications of brain activity.

Using the open-source software The Virtual Brain, Hannelore Aerts and a team led by Daniele Marinazzo modeled 25 individual brain networks of brain tumor patients and 11 of their partners as a control group. The researchers demonstrated that these individualized models can accurately predict the effects of the tumors on brain connectivity. This result opens the possibility of integrating neuroimaging data with virtual brain modeling to improve surgical planning and outcomes.

More information: Hannelore Aerts et al, Modeling Brain Dynamics in Brain Tumor Patients Using the Virtual Brain, *eneuro* (2018). DOI: 10.1523/ENEURO.0083-18.2018

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