New Imaging Techniques Used to Help Patients Suffering from Epilepsy

Canadian Association for Neuroscience

New techniques in imaging of brain activity developed by Jean Gotman, from McGill University's Montreal Neurological Institute, and his colleagues lead to improved treatment of patients suffering from epilepsy. The combination of electroencephalogram (EEG) and functional magnetic resonance imaging (fMRI) leads to more precise localization of the areas generating epileptic seizures, giving neurosurgeons a better understanding of the optimal ways of intervention, if appropriate. These results were presented at the 2013 Canadian Neuroscience Meeting, the annual meeting of the Canadian Association for Neuroscience - Association Canadienne des Neurosciences (CAN-ACN).

Epilepsy is a brain disorder in which a person has repeated seizures. These seizures are episodes of abnormal brain activity, in which the brain sends out abnormal signals. Seizures can often be controlled using medication. In an estimated 40% of patients, however, drugs do not control seizures well, and for some of these people surgery to remove the abnormal brain cells that cause the seizures can be considered.

Before brain surgery can be performed, doctors and surgeons must determine if the point of origin of the seizures, which can be viewed as brain activity spikes, is discrete, and if it can be removed without damaging other important brain areas. Dr. Gotman and his colleagues developed a new imaging technique, combining EEG, which delivers excellent information on the timing of the spikes but is not always capable of precisely locating the source of the discharge, with fMRI, which allows to very precisely localize this activation in the brain.

EEG- fMRI, while technically challenging, since the strong magnetic field required for fMRI can interfere with the recording of the minute electrical currents emitted by brain cells, is useful for patients in whom precise localization of the focal point, or point of origin of seizures, was not well defined. It is also important for a better understanding of how epileptic discharges affect brain function.

Citation from Dr. Gotman: "Combing EEG and fMRi is a unique method to define non-invasively in the whole brain the regions involved in epileptic discharges. It is a complex tool but it is likely to play an increasing role among the methods currently used to localize the source of epileptic activity"

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