Media Report

Bern, 25 February 2016 / mk

Inselspital: Images from the depths of the brain

The Neuroradiology Department of Bern University Hospital has managed to make the pathological electrical activity within the brain visible by means of an innovative procedure. This is improving the diagnostics of epilepsy patients.

For over 20 years, doctors have been dreaming of depicting the brain's electrical activity in an MRI scan. Researchers from Bern University Hospital have now succeeded in making this dream a reality by means of a unique method. The electrical fields are measured indirectly through their effect on magnetic fields,rather than directly. But although a healthy brain's electrical fields are too weak to produce a measurable disruption of the magnetic field, neuroradiologists can now measure this where the fields are more pronounced in the short term. In patients with epilepsy.

Imaging helps to localise epilepsy and shows healing

The research team of physicist Dr Claus Kiefer and doctors Eugenio Abela, Kaspar Schindler and Roland Wiest from the Support Center for Advanced Neuroimaging (SCAN) at the Department of Diagnostic and Interventional Neuroradiology and the Department of Neurology at Bern University Hospital used the new method in a pilot study with eight epilepsy patients. In doing so, it was found that the newly developed MR sequence makes magnetic field disturbances visible, even in deep regions of the brain. The surface EEG, which is otherwise used, has never achieved this. As a result, it is possible to localise the origin of the epileptic seizures with even more precision, which benefits those patients who exhibit no structural abnormalities in the "normal" MRI.

In addition, researchers demonstrated that epilepsy patients, who are seizure-free after an operation, no longer show such magnetic field disturbances – that their brain works "disruption-free" like that of a healthy person. On the other hand, patients who continued to have seizures still demonstrated the typical pathological signals. These astounding new insights into the function of our brain were published on 29th January in the renowned American journal, *Radiology.*

Patented methods only in Bern

The revolutionary imaging method is patented by the University of Bern and is only currently offered at Bern University Hospital. The advantage: If epilepsy patients, whose medication is not helping, need an MRI examination, just eight additional minutes in the MRI can better localise the region of origin of the exaggerated electrical brain activity. This is also the case if patients are not currently having a seizure, as the method is so sensitive that it even records weak epileptic activity that exists between the actual seizures.

The newly developed MR sequence is now expected to be validated internationally in further clinical studies.

Link to study: http://www.ncbi.nlm.nih.gov/pubmed/26824710

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Captions:

The new method can do what the surface EEG cannot: show electrical activities in the brain. (Photo: Susi Bürki)

Example of an epilepsy patient before and after the successful operation:
The colour distribution on the left shows the electrical discharge on the surface of the brain: Blue is the negative pole with the epileptic activity;
A. The electrical fields within the brain are visible with the enhanced MRI,
B. Calculation of the probable region of origin of the epilepsy from the surface EEG and after insertion of the depth electrodes (marked in green),
C. After the operation, the seizure-free patient no longer exhibits any electrical activity.
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Further information for media professionals:

About the new imaging:
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About the use in epilepsy patients:
Prof Dr Kaspar Schindler, Chief Physician, Department of Neurology, Bern University Hospital, +41 31 632 30 54 (available on 25th February, 10:00 - 12:00).