**Functional brain MRI in patients complaining of electrohypersensitivity after long term exposure to electromagnetic fields.**

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Abstract

INTRODUCTION:

Ten adult patients with electromagnetic hypersensitivity underwent functional magnetic resonance imaging (fMRI) brain scans. All scans were abnormal with abnormalities which were consistent and similar. It is proposed that fMRI brain scans be used as a diagnostic aid for determining whether or not a patient has electromagnetic hypersensitivity. Over the years we have seen an increasing number of patients who had developed multi system complaints after long term repeated exposure to electromagnetic fields (EMFs). These complaints included headaches, intermittent cognitive and memory problems, intermittent disorientation, and also sensitivity to EMF exposure. Regular laboratory tests were within normal limits in these patients. The patients refused to be exposed to radioactivity. This of course ruled out positron emission tomography (PET) and single-photon emission computed tomography (SPECT) brain scanning. This is why we ordered fMRI brain scans on these patients. We hoped that we could document objective abnormalities in these patients who had often been labeled as psychiatric cases.

MATERIALS AND METHODS:

Ten patients first underwent a regular magnetic resonance imaging (MRI) brain scan, using a 3 Tesla Siemens Verio MRI open system. A functional MRI study was then performed in the resting state using the following sequences: A three-dimensional, T1-weighted, gradient-echo (MPRAGE) Resting state network. The echo-planar imaging (EPI) sequences for this resting state blood oxygenation level dependent (BOLD) scan were then post processed on a 3D workstation and the independent component analysis was performed separating out the various networks. Arterial spin labeling. Tractography and fractional anisotropy.

RESULTS:

All ten patients had abnormal functional MRI brain scans. The abnormality was often described as hyper connectivity of the anterior component of the default mode in the medial orbitofrontal area. Other abnormalities were usually found. Regular MRI studies of the brain were mostly unremarkable in these patients.

CONCLUSION:

We propose that functional MRI studies should become a diagnostic aid when evaluating a patient who claims electrohypersensitivity (EHS) and has otherwise normal studies. Interestingly, the differential diagnosis for the abnormalities seen on the fMRI includes head injury. It turns out that many of our patients indeed had a history of head injury which was then followed sometime later by the development of EHS. Many of our patients also had a history of exposure to potentially neurotoxic chemicals, especially mold. Head injury and neurotoxic chemical exposure may make a patient more vulnerable to develop EHS.

About Gunnar Heuser M.D. Ph.D.

Dr. Heuser is a practicing physician of international reputation. He has coauthored several books and written numerous scientific papers and abstracts. He has been an invited speaker all over the United States as well as Europe, South America and Australia.

Doctor Heuser has designed an objective, standardized testing protocol to document EMF related injuries.

After completion of his medical degree in Germany he immigrated to Canada and graduated with a Ph.D. degree studying with the famous stress expert, Hans Selye. He also was an intern and then resident at the Royal Victoria Hospital in Montreal. He finally became a Diplomat in Internal Medicine (McGill University).

While he had an offer to join research teams at the National Institute of Health (NIH) and also at the Massachusetts Institute of Technology (MIT) in Boston, he chose to work at UCLA. He eventually joined a research team at the UCLA Brain Research Institute (BRI) of which he became a member. However, after several years of pure research, he missed working with "human" patients and then chose to enter private practice as a clinician.

Somewhere between seeing patients, doing research, publishing, speaking, and testifying in court as an expert witness he found the time to:

· Participate in Calif. State Senator Mark’s subcommittee on MCS and the Disabilities Act Compliance.

· Testify before the Calif. State Senate on behalf of MCS patients needing safe public places.

· Serve on an advisory committee to U.S. congressman Bernard Sanders, investigating carpet toxicity.

· Testify to U.S. Congressmen regarding carpet toxicity and the Gulf War Syndrome.

· Present the health effects of toxic chemicals to the Washington State Labor and Industry Board.

· Appear before the EPA with comments regarding chemical effects on human health.

· Attend by invitation the World Forum in 1996 and participate in the Environmental Health Committee discussions.

· Go into the field and evaluate victims of toxic spills in the United States, Europe and Australia

· Become a consultant to the ROA Department of California, Persian Gulf War Illness, Diagnosis and Treatment Committee.

· Become a consultant to the Olympic Co-ordination Authority (Sidney, Australia), 1999-2000.

· Function as a Medical Advisor for the International Hyperbaric Association

This is in essence an "in the trenches" doctor who has used his experience as much as possible to inform the public and his colleagues of the potentially devastating effects of environmental and electromagnetic exposure.

Dr. Heuser reads and speaks fluent German and some French.

[CLICK HERE to see Dr. Gunnar Heuser's CV](http://emfdoc.com/pp/cv.html)

     Sylvia A. Heuser, B.A. M.A.
Director of EMRIC (Environmental Medical Research and Information Center). EMRIC is the entity supporting Dr. Heuser's research projects and provides information, prepares computer aided presentations and in general, has assisted in related medical and office activities for twenty plus years.