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NEWS

RSNA Press Release

Study Finds Chronic Abnormal Brain Blood Flow in Gulf War Veterans

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At A Glance

- Veterans with Gulf War illness have abnormal brain blood flow 20 years after the war.
- MRI results showed that, in some cases, blood flow worsened over time.
- Symptoms of Gulf War illness include fatigue, neuropathic pain, memory loss and depression.
- One-quarter of Gulf War veterans are affected by Gulf War illness.

OAK BROOK, Ill. — Blood flow abnormalities found in the brains of veterans with Gulf War illness have persisted 20 years after the war, and in some cases have gotten worse, according to a new study published online in the journal *Radiology*.

"We confirmed that abnormal blood flow continued or worsened over the 11-year span since first being diagnosed, which indicates that the damage is ongoing and lasts long term," said principal investigator Robert W. Haley, M.D., chief of epidemiology in the Departments of Internal Medicine and Clinical Sciences at the University of Texas (UT) Southwestern Medical Center in Dallas. "We also identified a special MRI procedure that better diagnoses and distinguishes between the three main types of Gulf War illness."

Gulf War illness is a poorly understood chronic condition associated with exposure to neurotoxic chemicals and nerve gas. It affects an estimated 25 percent of the 700,000 military personnel deployed to the 1991 Persian Gulf War, according to the U.S. Department of Veterans Affairs' scientific advisory committee.

Robert W. Haley, M.D.

There are three main syndromes associated with Gulf War illness, producing a variety of symptoms, including fatigue, neuropathic pain, memory and concentration deficits, balance disturbances and depression.

The hippocampus is the part of the brain responsible for forming long-term memories and helping with spatial navigation. Many Gulf War illness neurological symptoms, such as memory loss, confusion, irritability and disorders in motion control suggest impairment of the hippocampus.

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In 1998, Dr. Haley's research team published a study using single photon emission computed tomography (SPECT) to assess hippocampal blood flow in veterans with Gulf War Syndrome. For the current study, the researchers used a novel technique called arterial spin labeled (ASL) MRI to assess hippocampal regional cerebral blood flow (rCBF) in 13 control participants and 35 patients with Gulf War syndromes 1 (impaired cognition), 2 (confusion-ataxia) and 3 (central neuropathic pain).

Each patient received intravenous infusions of saline in an initial session, and physostigmine in a second session 48 hours later. Physostigmine is a short-acting cholinesterase inhibitor, used to test the functional integrity of the cholinergic system, a neurotransmitter system involved in the regulation of memory and learning.

"ASL scanning after giving this medication is particularly well suited to diagnosing Gulf War illness, because it picks up brain abnormalities too subtle for regular MRI to detect," said co-author Richard W. Briggs, Ph.D., professor of radiology at UT Southwestern. "This allows us to make the diagnosis in a single two-hour session without the need for exposure to ionizing radiation."

The findings replicated the results of the initial SPECT study of largely the same group of veterans. The results showed that abnormal hippocampal blood flow persisted and may have progressed 11 years after initial testing and nearly 20 years after the Gulf War, suggesting chronic alteration of hippocampal blood flow.

Physostigmine significantly decreased rCBF in control participants and veterans with syndrome 1, but significantly increased rCBF in the right hippocampus of veterans with syndrome 2 in the original study. The abnormal increase in rCBF was now found to have progressed to the left hippocampus with syndrome 2 and to both hippocampi of the veterans with syndrome 3.

"Having an objective diagnostic test allows researchers to identify ill veterans for future clinical trials to test possible treatments," Dr. Haley said. "It is also critical for ongoing genomic studies to see why some people are affected by chemical exposures, and why others are not."

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"Hippocampal Dysfunction in Gulf War Veterans: Investigation with ASL Perfusion MR Imaging and Physostigmine Challenge." Collaborating with Drs. Haley and Briggs on this paper were Xiufeng Li, Ph.D., Jeffrey S. Spence, Ph.D., David M. Buhner, M.D., M.S., John Hart Jr., M.D., C. Munro Cullum, Ph.D., Melanie M. Biggs, Ph.D., Andrea L. Hester, Ph.D., Timothy N. Odegard, Ph.D., and Patrick S. Carmack, Ph.D. The study was funded by a federal research contract administered by the Department of Veterans Affairs Medical Center, Dallas, Texas, and grants from the U.S. Army Medical Research and Materiel Command and the National Institutes of Health.

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