

Hippocampal Dysfunction in Gulf War Veterans: Investigation with ASL Perfusion MR Imaging and Physostigmine Challenge

1. [Xiufeng Li](#), PhD,
2. [Jeffrey S. Spence](#), PhD,
3. [David M. Buhner](#), MD, MS,
4. [John Hart, Jr](#), MD,
5. [C. Munro Cullum](#), PhD,
6. [Melanie M. Biggs](#), PhD,
7. [Andrea L. Hester](#), PhD,
8. [Timothy N. Odegard](#), PhD,
9. [Patrick S. Carmack](#), PhD,
10. [Richard W. Briggs](#), PhD and
11. [Robert W. Haley](#), MD

± Author Affiliations

From the Departments of Radiology, Division of Neuroradiology (X.L., R.W.B.), Internal Medicine (J.S.S., D.M.B., R.W.B., R.W.H.), Clinical Sciences (J.S.S., P.S.C.), Psychiatry (C.M.C., M.M.B., A.L.H.), and Neurology (J.H., C.M.C.), University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8874; School of Behavioral and Brain Sciences and Center for Brain Health, University of Texas at Dallas, Dallas, Tex (J.H.); Department of Psychology, University of Texas at Arlington, Arlington, Tex (T.N.O.); and Department of Mathematics, University of Central Arkansas, Conway, Ark (P.S.C.).

Address correspondence to R.W.B. (e-mail: Richard.Briggs@UTSouthwestern.edu).

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Abstract

Purpose: To determine, with arterial spin labeling (ASL) perfusion magnetic resonance (MR) imaging and physostigmine challenge, if abnormal hippocampal blood flow in ill Gulf War veterans persists 11 years after initial testing with single photon emission computed tomography and nearly 20 years after the 1991 Gulf War.

Materials and Methods: The local institutional review board approved this HIPAA-compliant study. Veterans were screened for contraindications and gave written informed consent before the study. In a semiblinded retrospective protocol, veterans in three Gulf War illness groups—syndrome 1 (impaired cognition), syndrome 2 (confusion-ataxia), and syndrome 3 (central neuropathic pain)—and a control group received intravenous infusions of saline in an initial session and physostigmine in a second session, 48 hours later. Each infusion was followed by measurement of hippocampal regional cerebral blood flow (rCBF) with pulsed ASL. A mixed-

effects linear model adjusted for age was used to test for differences in rCBF after the cholinergic challenge across the four groups.

Results: Physostigmine significantly decreased hippocampal rCBF in control subjects ($P < .0005$) and veterans with syndrome 1 ($P < .05$) but significantly increased hippocampal rCBF in veterans with syndrome 2 ($P < .005$) and veterans with syndrome 3 ($P < .002$). The abnormal increase in rCBF was found to have progressed to the left hippocampus of the veterans with syndrome 2 and to both hippocampi of the veterans with syndrome 3.

Conclusion: Chronic hippocampal perfusion dysfunction persists or worsens in veterans with certain Gulf War syndromes. ASL MR imaging examination of hippocampal rCBF in a cholinergic challenge experiment may be useful as a diagnostic test for this condition.

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Abbreviations:

ASL = arterial spin labeling

MP-RAGE = magnetization-prepared rapid acquisition gradient echo

PTSD = posttraumatic stress disorder

rCBF = regional cerebral blood flow

ROI = region of interest

<http://radiology.rsna.org/content/early/2011/08/17/radiol.11101715.abstract>