Rare form of temporary amnesia highlights role of CA1 neurons in accessing memories

October 11 2011, by Bob Yirka

(Medical Xpress) -- German researchers working out of the Institute of Neuroradiology, University Hospital Schleswig-Holstein, University of Kiel, have found through the study of a rare form of temporary amnesia, that impairment of the CA1 neuron clusters in the Hippocampus appears to cause a loss of so-called autobiographical memories. The team has published its results in this week's issue of the *Proceedings of the National Academy of Sciences.*

Autobiographical memories are those that are built up over a lifetime and serve to provide a means of self identification and are thought to be a part of self-awareness. The loss of such memories tends to leave people with a limited ability to understand who they are which quite obviously makes understanding the world around them very difficult.

To find out what causes loss of autobiographical memories, the research team looked at patients afflicted with “acute transient global amnesia” a rare but debilitating condition that results in almost a total loss of short term memory in conjunction with a variety of problems associated with long term memory. Such patients are also incapable of forming new memories. Because it is so rare and because it generally only lasts for two to eight hours it has been notoriously difficult to study and until now, the condition has been little understood.

Because the team was working out of a major hospital they were able to have patients with the condition undergo an MRI while still experiencing symptoms. In so doing, they found that of sixteen patients examined,

fourteen exhibited lesions in the CA1 cell clusters. One of the researchers, Gunther Deuschl, notes that this indicates that proper functioning of the CA1 cells appears to be a necessary component in memory activation and retention.

This association could mean big news for the millions of people who suffer from dementia, particularly those with Alzheimer's disease, as the Hippocampus in general and the CA1 cluster in particular, appears to be one of the first to be affected in such people. By narrowing down which parts of the brain are impacted when memory loss occurs and how, new drugs might be developed that can target specific brain cells, thus helping to ward off nerve degeneration while minimizing side effects.

More information: CA1 neurons in the human hippocampus are critical for autobiographical memory, mental time travel, and autonoetic consciousness, *PNAS*, Published online before print October 10, 2011, doi:10.1073/pnas.1110266108

Abstract
Autobiographical memories in our lives are critically dependent on temporal lobe structures. However, the contribution of CA1 neurons in the human hippocampus to the retrieval of episodic autobiographical memory remains elusive. In patients with a rare acute transient global amnesia, highly focal lesions confined to the CA1 field of the hippocampus can be detected on MRI. We studied the effect of these lesions on autobiographical memory using a detailed autobiographical interview including the remember/know procedure. In 14 of 16 patients, focal lesions in the CA1 sector of the hippocampal cornu ammonis were detected. Autobiographical memory was significantly affected over all time periods, including memory for remote periods. Impairment of episodic memory and autonoetic consciousness exhibited a strong temporal gradient extending 30 to 40 y into the past. These results highlight the distinct and critical role of human hippocampal CA1

neurons in autobiographical memory retrieval and for re-experiencing detailed episodic memories.

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