Healthy carriers of the Alzheimer's gene

Method makes it possible to identify people at lowest risk for developing the disease

Montreal, January 10, 2018 — Does “ApoE4” ring any bells? It’s the code name of the so-called Alzheimer’s gene. Until recently, being a carrier of this gene meant that there was a very strong chance that you would develop the disease one day. However, not all carriers of this gene will develop Alzheimer’s. According to a new Canadian study published in the Journal of Alzheimer’s Disease, it is now possible to identify carriers of this gene who are at lower risk for developing the disease.

In this study, researcher Véronique Bohbot (Douglas Mental Health University Institute, CIUSSS de l’Ouest-de-l’Île-de-Montréal) has shown for the first time that we can distinguish, among healthy carriers of the ApoE4 gene, those who have a normal brain from those whose hippocampus and other related regions, such as the entorhinal cortex, have already atrophied, a sign of a future diagnosis of the disease.

“In the past, people committed suicide upon learning that they had the ApoE4 gene out of fear of developing Alzheimer’s disease. According to our results, being a carrier of the ApoE4 gene does not imply having the brain atrophy associated with Alzheimer’s disease,” explains Bohbot, an associate professor at McGill University.

In the laboratory, she and her team used virtual navigation and brain imaging to carry out this study among healthy, elderly carriers of the ApoE4 gene. They found that people with a completely normal brain (that is, with no hippocampal and entorhinal volume loss) use a spatial memory strategy to navigate in space. In this case, they develop mental maps using visual landmarks and cues. This strategy relies directly on and uses the hippocampus and promotes an increase in its grey matter volume.

In contrast, people with a hippocampal and entorhinal cortex volume loss use a stimulus-response strategy to move about. This navigation strategy does not use the hippocampus at all, but rather the caudate nuclei, an area of the brain that acts like an automatic pilot (for example, the usual route for going to work).

In a previous study, Bohbot had shown that Alzheimer’s patients had larger caudate nuclei than undiagnosed patients. This new study shows that people in excellent health who use their caudate nuclei already have atrophy of the hippocampus and entorhinal cortex, a sign of a future diagnosis of Alzheimer’s.

Towards earlier detection

Selected from among 515 volunteers, the elderly subjects who participated in the study were in excellent health, were carriers of the ApoE4 gene and did not have any memory problems. They obtained excellent scores on all the standard tests used in neuropsychology.

“Using brain imaging, we were able to identify the healthy carriers of the ApoE4 gene who had hippocampal and entorhinal cortex atrophy, with no brain activity in this region, signs of a high risk of Alzheimer’s disease. Therefore, this detection can possibly be done 10 years before the onset of the disease,” explains Bohbot.
This method could help identify people at risk for Alzheimer’s disease and intervene preventively while they are still in excellent health. According to the Alzheimer Society of Canada, 564,000 Canadians currently have Alzheimer disease or another form of dementia. The figure will be 937,000 within 15 years.

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The article entitled “Healthy versus Entorhinal Cortical Atrophy Identification and Asymptomatic APOE4 Carriers at Risk for Alzheimer’s Disease” was published in the Journal of Alzheimer’s Disease on December 20, 2017. DOI: 10.3233/JAD-170540

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