早期アルツハイマーにおいて脳結合の破壊が画像検査により示される（Abstract NRS399）

早期アルツハイマー病患者の脳白質の結合が変化していることが拡散テンソル画像により示される

Diffusion tensor imaging shows changes in white matter connection in brains of patients with early Alzheimer's disease

MRI検査において現れる脳結合の変化はアルツハイマー病の画像バイオマーカーとなり得る、とのスタディ結果が2014年Radiological Society of North America年次集会で発表された。研究者らは、Alzheimer's Disease Neuroimaging Initiative（ADNI）2に登録された患者102人の結果を解析した。患者は、白質路周囲の水の動きやすさを計測することにより白質統合性を評価するMRI検査である拡散テンソル画像（DTI）を施行された。研究者らは、構造的なコネクトームの変化と脳内βアミロイドプラーク量を計測する技術であるflorbetapir陽電子放射断層撮影（PET）画像の結果とを関連付けた。Florbetapir取り込み上昇はβアミロイド量が多いことと一致した。この結果は、florbetapir取り込みと調査された脳の5つの領域それぞれにおける構造上のコネクトームの強さの低下との強力な関連を示した。これらの結果に基づくと、DTIは早期アルツハイマー病における脳傷害の評価や新たな治療法の効果の観察に役立つ可能性がある。

Full Text

Changes in brain connections visible on MRI could represent an imaging biomarker of Alzheimer's disease, according to a new study presented at the 2104 annual meeting of the Radiological Society of North America (RSNA).

Alzheimer's disease is the most common form of dementia. Preventive treatments may be most effective before Alzheimer's disease is diagnosed, such as when a person is suffering from mild cognitive impairment (MCI). Previous efforts at early detection have focused on beta amyloid, a protein found in abnormally high amounts in the brains of people with Alzheimer's disease.

For the new study, researchers looked at the brain's structural connectome, a map of white matter tracts that carry signals between different areas of the brain.

"The structural connectome provides us with a way to characterize and measure these connections and how they change through disease or age," said study co-author Jeffrey W. Prescott, M.D., Ph.D., radiology resident at Duke University Medical Center in Durham, N.C.

Dr. Prescott and colleagues analyzed results from 102 patients enrolled in a national study called the Alzheimer's Disease Neuroimaging Initiative (ADNI) 2. The patients had undergone diffusion tensor imaging (DTI), an MRI method that assesses the integrity of white matter tracts in the brain by measuring how easy it is for water to move along them.

"It is known that water prefers moving along the defined physical connections between regions in the brain, which makes DTI a great tool for evaluating the structural connectome," Dr. Prescott said.

The researchers correlated changes in the structural connectome with results from florbetapir positron emission tomography (PET) imaging, a technique that measures the amount of beta amyloid plaque in the brain. Increased florbetapir uptake corresponds with greater amounts of the protein.

The results showed a strong association between florbetapir uptake and decreases in strength of the structural connectome in each of the five areas of the brain studied.

"This study ties together two of the major changes in the Alzheimer's brain—structural tissue changes and pathological amyloid plaque deposition—and suggests a promising role for DTI as a possible diagnostic adjunct," Dr. Prescott said.

Based on these findings, DTI may offer a role in assessing brain damage in early Alzheimer's disease and monitoring the effect of new therapies.

"Traditionally, Alzheimer's disease is believed to exert its effects on thinking via damage to the brain's gray matter, where most of the nerve cells are concentrated," said Jeffrey R. Petrella, M.D., professor of radiology at Duke and senior author on the study. "This study suggests that amyloid deposition in the gray matter affects the associated white matter connections, which are essential for conducting messages across the billions of nerve cells in the brain, allowing for all aspects of mental function."

"We suspect that as amyloid plaque load in the gray matter increases, the brain's white matter starts to break down or malfunction and lose its ability to move water and neurochemicals efficiently," added Dr. Prescott.

The researchers plan to continue studying this cohort of patients over time to gain a better understanding of how the disease evolves in individual patients. They also intend to incorporate functional imaging into their research to learn about how the relationship between function and structure is affected with increasing amyloid burden.

Other co-authors on the study are P. Murali Doraiswamy, M.D., and Kingshuk R. Choudhury, Ph.D.

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