MRI技術によりADHDにおいて脳内鉄が少ないことが示された（Abstract: SSK01-02）

磁場相関と呼ばれるMRI技術がADHDの診断改善および最良の治療を導くのに役立つ可能性がある

MRI technique called magnetic field correlation may help improve ADHD diagnosis and guide optimal treatment

磁気共鳴画像（MRI）により注意欠陥多動性障害（ADHD）患者の脳内鉄レベルを非侵襲的に測定できるとのスタディ結果が2013年Radiological Society of North America年次集会で発表された。過去のスタディにおいて、精神刺激薬はドーパミンレベルを上昇させドーパミンレベル低下が疑われる小児に役立つことが示された。脳内鉄はドーパミン合成に必要であるため、筆者らはMRIによる鉄レベル評価によりドーパミンを非侵襲的で間接的に測定できると確信した。彼らはADHDの小児と成人22人および健康なコントロールの小児と青少年27人の脳内鉄を磁場相関（MFC）と呼ばれるMRI技術を用いて測定した。薬物療法を一度も受けたことのない12人のADHD患者は精神刺激薬による治療を受けた10人のADHD患者や標準的に成育したコントロール27人よりもMFCが有意に低かった。一方、緩和速度または血清測定を用いた場合には群間で有意差は認められなかった。薬物療法未施行群における脳内鉄レベル低値は、精神刺激薬により正常化するようであった。MFC画像の非侵襲的脳内鉄レベル検出能力は、ADHDの診断改善および最良の治療を導くのに役立つ可能性があると研究者らは述べている。

Full Text

Magnetic resonance imaging (MRI) provides a noninvasive way to measure iron levels in the brains of people with attention deficit hyperactivity disorder (ADHD), according to a study presented at the 2013 annual meeting of the Radiological Society of North America (RSNA). Researchers said the method could help physicians and parents make better-informed decisions about medication.

ADHD is a common disorder in children and adolescents that can continue into adulthood. The American Psychiatric Association reports that ADHD affects 3 to 7 percent of school-age children.

Psychostimulant medications such as Ritalin are among the drugs commonly used to reduce ADHD symptoms. Psychostimulants affect levels of dopamine, a neurotransmitter in the brain associated with addiction.

"Studies show that psychostimulant drugs increase dopamine levels and help the kids that we suspect have lower dopamine levels," said Vitria Adisetiyo, Ph.D., postdoctoral research fellow at the Medical University of South Carolina in Charleston, S.C. "As brain iron is required for dopamine synthesis, assessment of iron levels with MRI may provide a noninvasive, indirect measure of dopamine."

Dr. Adisetiyo and colleagues explored this possibility by measuring brain iron in 22 children and adolescents with ADHD and 27 healthy control children and adolescents using an MRI technique called magnetic field correlation (MFC) imaging. The technique is relatively new, having been introduced in 2006 by study co-authors and faculty members Joseph A. Helpern, Ph.D., and Jens H. Jensen, Ph.D.

"MRI relaxation rates are the more conventional way to measure brain iron, but they are not very specific," Dr. Adisetiyo said. "We added MFC because it offers more refined specificity."

The results showed that the 12 ADHD patients who had never been on medication had significantly lower MFC than the 10 ADHD patients who had been on psychostimulant medication or the 27 typically developing children and adolescents in the control group. In contrast, no significant group differences were detected using relaxation rates or serum measures. The lower brain iron levels in the non-medicated group appeared to normalize with psychostimulant medication.

MFC imaging's ability to noninvasively detect the low iron levels may help improve ADHD diagnosis and guide optimal treatment. Noninvasive methods are particularly important in a pediatric population, Dr. Adisetiyo noted.

"This method enables us to exploit inherent biomarkers in the body and indirectly measure dopamine levels without needing any contrast agent," she said.

If the results can be replicated in larger studies, then MFC might have a future role in determining which patients would benefit from psychostimulants—an important consideration because the drugs can become addictive in some patients and lead to abuse of other psychostimulant drugs like cocaine.

"It would be beneficial, when the psychiatrist is less confident of a diagnosis, if you could put a patient in a scanner for 15 minutes and confirm that brain iron is low," she said. "And we could possibly identify kids with normal iron levels who could potentially become addicts."

Along with replicating the results in a larger population of patients, the researchers hope to expand their studies to look at the relationship between cocaine addiction and brain iron.

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