
RSNA Press Release

Chronic Back Pain Linked to Changes in the Brain

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CHICAGO — A German research team using a specialized imaging technique revealed that individuals suffering from chronic low back pain also had microstructural changes in their brains. The findings were presented today at the annual meeting of the Radiological Society of North America (RSNA).

The researchers, led by Jürgen Lutz, M.D., a radiology resident at University Hospital, Ludwig-Maximilians University in Munich, Germany, used a technique called diffusion tensor imaging (DTI) to track the movement of water molecules in the brain's gray and white matter.

"A major problem for patients with chronic pain is making their condition believable to doctors, relatives and insurance carriers. DTI could play an important role in this regard," Dr. Lutz said. "With these objective and reproducible correlates in brain imaging, chronic pain may no longer be a subjective experience. For pain diagnosis and treatment, the consequences could be enormous."

Individual water molecules are constantly in motion, colliding with each other and other nearby molecules, causing them to spread out, or diffuse. DTI allows scientists to analyze water diffusion in the tissues of the brain that indicate changes in brain cell organization.

"In normal white matter, water diffuses in one main direction," Dr. Lutz explained. "But when fiber pathways are developing during childhood or are extensively used, their microstructural organization becomes more organized and complex with measurable changes in diffusion."

Dr. Lutz and colleagues studied 20 patients experiencing chronic back pain with no precisely identifiable cause and 20 age- and gender-matched healthy control patients. DTI was performed to measure the diffusion in several areas of each patient's brain.

At A Glance

- Using diffusion tensor imaging, researchers have found a connection between chronic back pain and changes in brain microstructure.
- Patients with chronic back pain exhibited increased direction of water diffusion in three pain and emotion processing regions of the brain.
- These findings may explain chronic back pain's extreme resistance to treatment and may redirect therapeutic attention away from the spine and to the brain.

Compared to the healthy volunteers, the patients with chronic low back pain had a significantly more directed diffusion in the three pain-processing regions of the brain, including the cingulate gyrus, postcentral gyrus and superior frontal gyrus.

"Our results reveal that in chronic pain sufferers, the organization of cerebral microstructure is much more complex and active in the areas of the brain involved in pain processing, emotion and the stress response," said co-author Gustav Schelling, M.D., Ph.D. from the Department of Anaesthesiology at Munich University.

The researchers said the findings may help explain the extreme resistance to treatment for chronic low back pain and provide much-needed evidence for individual sufferers. However, it is unclear which occurs first, the chronic back pain or the microstructural changes in the brain.

"It's difficult to know whether these are pre-existing changes in the brain that predispose an individual to developing chronic pain, whether ongoing pain creates the hyperactivity that actually changes the brain organization, or if it is some mixture of both," Dr. Schelling said.

"DTI may help explain what's happening for some of these patients, and direct therapeutic attention from the spine to the brain," he added.

Co-authors are Maximilian F. Reiser, M.D., Olaf Dietrich, Ph.D., Lorenz Jaeger, M.D. and Robert Stahl, M.D.

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RSNA is an association of more than 40,000 radiologists, radiation oncologists, medical physicists and related scientists committed to promoting excellence in radiology through education and by fostering research, with the ultimate goal of improving patient care. The Society is based in Oak Brook, Ill.

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