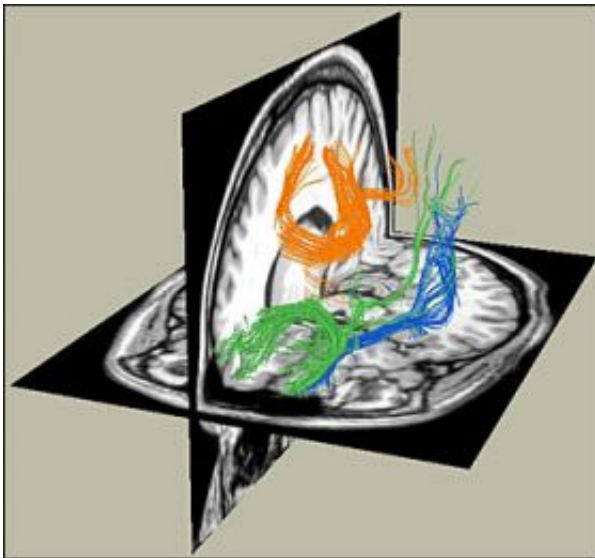


Baffling Chronic Pain Linked to Rewiring of Brain

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This 3-dimensional graphic shows the abnormal rewiring of the brain's right hemisphere in patients with complex region pain syndrome. The orange path shows the location of gray matter atrophy and damaged wiring in the anterior cingulate; blue shows damage in the insula; green in the medial prefrontal cortex.

(PhysOrg.com) -- Scientists peered at the brains of people with a baffling chronic pain condition and discovered something surprising. Their brains looked like an inept cable guy had changed the hookups, rewiring the areas related to emotion, pain perception and the temperature of their skin.

The new finding by scientists at Northwestern University's Feinberg School of Medicine, begins to explain a mysterious condition that the medical community had doubted was real.

The people whose brains were examined have a chronic pain condition called complex region pain syndrome (CRPS.) It's a pernicious and nasty condition that usually begins with an injury causing significant damage to the hand or the foot. For the majority of people, the pain from the injury disappears once the limb is healed. But for 5 percent of the patients, the pain rages on long past the healing, sometimes for the rest of people's lives. About 200,000 people in the U.S. have this condition.

In a hand injury, for example, the pain may radiate from the initial injury site and spread to the whole arm or even the entire body. People also experience changes in skin color to blue or red as well as skin temperature (hotter at first, then becoming colder as the condition turns chronic.) Their immune system also shifts into overdrive, indicated by a hike in blood immune markers.

The changes in the brain take place in the network of tiny, white "cables" that dispatch messages between the neurons. This is called the brain's white matter. Several years ago, Northwestern researchers discovered chronic pain caused the regions in the brain that contain the neurons -- called gray matter because of it looks gray -- to atrophy.

This is the first study to link pain with changes in the brain's white matter. It will be published November 26 in the journal *Neuron*.

"This is the first evidence of brain abnormality in these patients," said A. Vania Apkarian, professor of physiology at the Feinberg School and principal investigator of the study. "People didn't believe these patients. This is the first proof that there is a biological underpinning for the condition. Scientists have been trying to understand this baffling

condition for a long time."

Apkarian said people with CRPS suffer intensely and have a high rate of suicide. "Physicians don't know what to do," he said. "We don't have the tools to take care of them."

The new findings provide anatomical targets for scientists, who can now look for potential pharmaceutical treatments to help these patients, Apkarian said. He doesn't know yet if chronic pain causes these changes in the brain or if CRPS patients' brains have pre-existing abnormalities that predispose them to this condition.

In the new study, the brains of 22 subjects with CRPS and 22 normal subjects were examined with an anatomical MRI and a diffusion tensor MRI, which enabled scientists to view the white matter. In addition to changes in white matter, the CRPS patients' brains showed an atrophy of neurons or gray matter similar to what has been previously shown in other types of chronic pain patients.

Apkarian said the white matter changes in patients' brains is related to the duration and intensity of their pain and their anxiety. It is likely that white matter reorganizes in other chronic pain conditions as well, but that has not yet been studied, he noted.

Source: Northwestern University

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