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New imaging technique captures brain activity in patients with chronic low back pain

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Research from Brigham and Women's Hospital (BWH) uses a new imaging technique, arterial spin labeling, to show the areas of the brain that are activated when patients with low back pain have a worsening of their usual, chronic pain. This research is published in the August issue of the journal *Anesthesiology*.

"This study is a first step towards providing tools to objectively describe someone's chronic pain which is a subjective experience. We've found that when a patient has worsening of their usual pain, there are changes in the activity of the brain," said Ajay Wasan, MD, MSc, lead author of the paper and a researcher in the Pain Management Center at BWH. "These changes occur in the network of areas in the brain that process pain and mood."

Researchers compared 16 patients with chronic low back pain (CLBP) to 16 healthy subjects. Participants underwent three imaging sessions. The first was for a characterization and training session. During the second session, researchers used clinical maneuvers, such as pelvic tilting or straight leg raising , to temporarily exacerbate back pain. In the third session, heat was applied to the skin at an intensity that matched the pain levels during the second session. Patients rated their pain levels before and after the sessions and after each stimulation during the sessions.

During the last two sessions, researchers used the arterial spin labeling

technique, which allows them to quantify the blood flow to specific regions of the brain over time. The amount of blood flow is indicative of neuron activity in that region of the brain. They found that there was increased activity in the brain of CLBP patients only when they experienced a worsening of their chronic pain and not during the heat pain session or in the healthy participants. Researchers also note that some of the areas of the brain that were activated when participants experienced a worsening of chronic pain have been shown to be associated with other types of pain found in other studies. However, researchers also observed activation of some areas, including the superior parietal lobule, which have been less frequently associated with pain in previous research.

"While this study begins to uncover some of the basic physiology of the brain as it processes pain, more studies are needed to help us understand how the brain function may change over the course of treatment of pain and to examine the brain mechanisms by which pain improves," Wasan said. "We are getting closer to describing, on an objective level, how the body and brain are reacting when a patient reports having more pain. We are hopeful that this could lead to an understanding of an individual patient's neurocircuitry and that knowledge could lead to therapies that would be tailored to the individual."

Provided by Brigham and Women's Hospital

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