Dynamic Chiropractic

Chronic Back Pain May Shrink the Brain

SCIENTISTS LINK LONG-LASTING PAIN WITH REDUCED LEVELS OF GRAY MATTER

Editorial Staff

A recent study published in *The Journal of Neuroscience* has revealed that people who suffer from chronic back pain (CBP) for one year may experience a reduction in the brain's gray matter equivalent to the amount lost by the average person in 10 to 20 years of normal aging.[1] The study is believed to be the first of its kind to show brain morphometric abnormalities in chronic pain.

Also found in the spinal cord, "gray matter" refers to the darker-colored tissue of the brain, which is composed of the bodies of neurons. In the brain, the gray matter includes structures such as the cerebral cortex, the thalamus, the basal ganglia, and the outer layers of the cerebellum. Gray matter is considered by many to be the "thinking" center of the brain, and is responsible for functions such as memory and information processing.

In the study, investigators compared 26 CBP patients with 26 matched normal volunteers. The CBP patients experienced unrelenting pain for one year, "primarily localized to the lumbosacral region including buttocks and thighs, with or without pain radiating to the leg." Of those with CBP, 55 percent had musculoskeletal diagnoses, 20 percent had pure radiculopathy, and 26 percent had a combination of musculoskeletal and radiculopathic pain. CBP patients were divided into neuropathic and non-neuropathic subtypes, with neuropathic patients experiencing significant radiculopathy, with or without the presence of musculoskeletal pain.

The normal decrease in neocortical gray matter volume was found to be 2.8 cm^3 (0.5%) per year in both groups. After adjusting for age and gender factors, the investigators found that the resultant gray matter volume loss was 663 ± 27 cm^3 in the control subjects and 590 ± 28 cm^3 in the CBP patients, reflecting an 11 percent decrease in gray matter volume for those with CBP. CBP patients with sciatica had the largest decrease in gray matter. In addition, the more years someone had chronic back pain, the more loss of gray matter they suffered. Interestingly enough, the authors found that the "mean gray matter volume was not different between neuropathic (nuCBP) and non-neuropathic (non-nuCBP) subtypes."

From their findings, the authors arrived at several conclusions:

"The role of the brain in chronic pain conditions remains speculative. Our results imply that chronic back pain (CBP) is accompanied by brain atrophy and suggest that the pathophysiology of chronic pain includes thalamocortical processes.

"Our studies show that CBP (sustained for six months) is accompanied by abnormal brain chemistry, mainly a reduction in the N-acetyl-aspartate-creatine ratio in the prefrontal cortex, implying neuronal loss or dysfunction in this region and reduced cognitive abilities on a task that implies abnormal prefrontal processing.

"Our results demonstrate regionally specific reduced gray matter in patients with CBP. At the

whole-brain level, this reduction is related to pain duration, regionally depends on multiple pain related characteristics, and is more severe in the neuropathic sub-type.

"Given that normal whole-brain gray matter atrophy is 0.5% per year of aging and that atrophy caused by CBP is 5-11%, the magnitude of brain gray matter atrophy caused by CBP is equivalent to 10-20 years of aging. However, this analogy only holds for the overall magnitude, because the regional specificity of atrophy in CBP is distinct from that seen with aging."

While this is the first study to show brain morphometric abnormalities in chronic pain, it is not the only study of morphometry in pain conditions. Another study conducted in 2003 looked at migraine patients and found no significant differences.[2]

Perhaps even more interesting was the revelation that "only 18% of whole-brain matter variance could be explained by pain duration." The authors note that most of the whole-brain atrophy in CBP patients "cannot be accounted for by the measured pain characteristics." The authors suggest that this may imply "genetic and experiential predispositions contributing to the observed atrophy."

While this study opens the door for significant speculation, it tends to generate more questions than it answers. From a chiropractic standpoint, it is easy to see why chronic back pain can cause additional symptoms beyond those that would be considered mechanical in nature. These findings most certainly serve as a serious warning to patients with back pain to seek care as soon as possible in order to prevent the condition from becoming chronic.

While there will likely be a number of studies that follow up on these findings, chiropractic researchers should explore the possibility of communicating with these authors in an effort to better understand the details of their methodology and findings. This is an area of research in which chiropractic could test the impact of musculoskeletal pain, spinal joint function and the subluxation.

References

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