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Neurofeedback Improves 'Chemo Brain' in Cancer Patients

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November 17, 2011 (Cleveland, Ohio) — Neurofeedback, also known as EEG biofeedback or neurotherapy, has the potential to reduce or even reverse the cognitive impairment associated with chemotherapy, according to the results of a pilot study.

Patients using neurofeedback showed significant improvement, over the course of 3 testing phases, in cognitive function, quality of life, perceived impairment, use of sleep medications, and depression. Improvements were generally maintained during follow-up testing.

"This study is interesting because we are not just teaching compensatory skills but actually correcting cognitive problems that have developed," said lead author Jean Alvarez, EdD, cofounder of the Lake Erie Brain Performance Institute, Cleveland, Ohio. "Well, we hope that's true."

Dr. Alvarez presented the study results here at the 8th International Conference of the Society for Integrative Oncology.

Chemo Brain Is Real

Before 2000, it was thought that chemotherapy agents could not cross the blood–brain barrier and could not be responsible for the cognitive problems that cancer patients were reporting to their oncologists, Dr. Alvarez noted. However, research in the past decade has found that these problems are real — that they are a postcancer phenomenon but not necessarily a postchemotherapy phenomenon. In fact, the latest study on chemo brain, [reported this week](#) by *Medscape Medical News*, used magnetic resonance imaging to show that the cognitive defects are real, and are seen after cancer and even more so after chemotherapy.

The International Cognition and Cancer Task Force, which was formed to advance the understanding of the impact of cancer and cancer-related treatment on cognitive and behavioral functioning in adults with noncentral nervous system cancers, is looking at the different factors that play a role in cognitive dysfunction. These factors include the cancer itself, the body's inflammatory response, chemotherapy, and the role of genetic vulnerability, explained Dr. Alvarez.

So-called chemo brain often manifests as foggy thoughts, cognitive changes and dysfunction, and memory challenges that occur during and after treatment. A number of patients also report problems with sleep impairment, fatigue, and anxiety and/or depression. "These are included in some but not all of the studies of this condition, but we have included measures of all of those in our study," said Dr. Alvarez.

"Nobody is formally calling this chemo brain; it is a much more complex issue than that," she added.

"When assessing patients who complain of these problems, the most obvious thing to do is to send them for neuropsychological evaluation, but the literature on this is confusing," she explained. "There can be difficulties in interpreting this type of evaluation unless the patient had the foresight to get a neuropsychological evaluation prior to getting cancer for comparison purposes."

Cognitive dysfunction can be assessed using patient self-reports, but this method is completely subjective, she said. It can also be assessed with "neuroimaging, usually with [functional magnetic resonance imaging]; but again, without a precancer baseline image," it is hard to establish.

Improvements Across Measures

This study looked at 23 female breast cancer survivors, 6 months to 5 years after chemotherapy, who self-reported distressing cognitive symptoms. They participated in two 33-minute neurofeedback training sessions each week for 10 weeks. The neurofeedback was delivered with NeuroOptimal professional equipment (Zengar Institute), which provides concurrent EEG activity in 16 standard time–frequency envelopes.

Four self-reported outcome measures (the Functional Assessment of Cancer Therapy Cognitive Scale [FACT-Cog]; the Functional Assessment of Chronic Illness Therapy, fatigue subscale; the Pittsburgh Sleep Quality Index; and the Brief Symptom Inventory 18) were used to assess cognitive impairment, fatigue, sleep disturbances, and psychologic distress.

The women were tested 3 times at regular intervals during a 10-week period before beginning neurofeedback, and 3 more times during course of the neurofeedback regimen. The final test was conducted 4 weeks after the sessions ended.

"Neurofeedback has been around for more than 50 years, but in my opinion, its only been in the past 10 to 15 years that small computers have become powerful enough and mathematical analysis has become sophisticated enough to give this the potential as an intervention," she said.

Dr. Alvarez noted that for right now, there is no way of doing a blinded study with this intervention, because it is not possible to do sham feedback.

In this group, 21 of the 23 participants improved; on most measures, the improvement was significant ($P < .001$). Improvement was seen in all 4 cognitive measures (included in FACT-Cog), and was particularly strong for fatigue and the psychologic symptoms of somatization and depression. At follow-up testing, slight and nonsignificant improvements and declines were seen on some measures.

"Our conclusion is that there is certainly potential here for a way to restore cognitive function," Dr. Alvarez reported.

Susan Bauer-Wu, PhD, RN, associate professor of nursing at Emory University in Atlanta, Georgia, agrees that neurofeedback has potential. "The results are exciting," she told *Medscape Medical News*. "This is an interesting form of biofeedback, and has a lot of promise for these patients."

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