

UCLA Imaging Study Shows Changes in Brain Function Even 10 Years After Cancer Patients Undergo Chemotherapy

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Cancer survivors, take note. The mental fog and forgetfulness of "chemo brain" are no figment of your imagination.

A new UCLA study shows that chemotherapy causes changes to the brain's metabolism and blood flow that can linger at least 10 years after treatment. Reported Oct. 5 in the online edition of the journal *Breast Cancer Research and Treatment*, the findings may help to explain the disrupted thought processes and confusion that plague many chemotherapy patients.

"People with 'chemo brain' often can't focus, remember things or multitask the way they did before chemotherapy," explained Dr. Daniel Silverman, head of neuronuclear imaging and associate professor of molecular and medical pharmacology at the David Geffen School of Medicine at UCLA. "Our study demonstrates for the first time that patients suffering from these cognitive symptoms have specific alterations in brain metabolism."

Silverman and his colleagues used positron emission tomography (PET) to scan the brains of 21 women who had undergone surgery to remove breast tumors five to 10 years earlier. Sixteen of them had been treated with chemotherapy regimens near the time of their surgeries to reduce the risk of cancer recurrence.

The team compared PET images evaluating the chemotherapy patients' brain function to PET scans from five breast-cancer patients who underwent surgery only, and 13 control subjects who did not have breast cancer or chemotherapy.

As the women performed a series of short-term memory exercises, the UCLA team measured blood flow to their brains. The researchers also ran a scan of the patients' resting brain metabolism after the women finished the exercises.

"The PET scans show a link between chemo-brain symptoms and lower metabolism in a key region of the frontal cortex," explained Silverman. "We found that the lower the patient's resting brain metabolism rate was, the more difficulty she had performing the memory test."

The scans revealed that blood flow to the frontal cortex and cerebellum spiked as the chemotherapy patients performed the memory tests, indicating a rapid jump in these brain regions' activity level.

"The same area of the frontal lobe that showed lower resting metabolism displayed a substantial leap in activity when the patients were performing the memory exercise," said Silverman. "In effect, these women's brains were working harder than the control subjects' to recall the same information."

Finally, the researchers discovered that women who underwent hormonal therapy in addition to chemotherapy displayed changes to their basal ganglia, a part of the brain that works to bridge thought and action. On average, these women showed an 8 percent drop in resting metabolism in this brain region.

"Chemotherapy used to be prescribed primarily to treat metastatic disease," observed Silverman. "Now it's common for doctors to

administer chemotherapy to patients near the time of surgery to prevent metastasis. As many of these patients become long-term survivors, doctors are recognizing lasting side-effects of chemotherapy, and, in particular, the kind of chemo-brain symptoms we are studying."

"Our findings suggest that PET scans could be used to monitor the effects of chemotherapy on brain metabolism," he added. "The approach could be easily added to current whole-body PET or PET/CT scans already being used to monitor patients for tumor response to therapy."

Although chemo brain is an acknowledged phenomenon, doctors don't know what mechanisms cause it. More studies are needed to uncover how the damage occurs and whether modification of chemotherapy drugs could prevent it.

The National Cancer Institute recently awarded a five-year grant to oncologist Dr. Patricia Ganz, who is organizing a long-term study on chemo brain of a larger group of breast-cancer survivors with Silverman and their colleagues at UCLA.

More than 211,000 new cases of breast cancer are diagnosed a year, making it the most common cancer in women. Experts estimate that at least 25 percent of chemotherapy patients are affected by chemo brain, and a recent study by the University of Minnesota reported an 82 percent rate.

Source: UCLA

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