Radiation Dose and Cancer Risk After Bone Marrow Transplant

High-dose radiation, younger age increase risk of developing subsequent cancer, new study finds

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A new study draws a striking link between the intensity of radiation that patients receive before a bone marrow transplant and their risk of developing a new cancer.

Patients who undergo high-dose, total-body irradiation, or TBI, are at highest risk — nearly eight times greater than the general population, researchers found. Patients who receive the increasingly common low-dose TBI have a significantly lower cancer risk — but that risk is still twice as high as that of the general population.

The results stress the importance of lifelong monitoring for all transplant patients, said Scott Baker, MD, the study’s lead author and director of the Fred Hutch Survivorship Program.

“The biggest takeaway is that people need to be aware of this risk,” Baker said. “For those patients who received high-dose radiation, they need to be especially vigilant about following all the standard cancer prevention and screening recommendations. And younger patients, especially women, should talk to their doctor about starting screening for some cancers, such as breast, at an earlier age than recommended for the general population.”

Bone marrow transplants are lifesaving treatments for patients with blood cancers and other diseases. During these procedures, patients first undergo chemotherapy and/or radiation to destroy their diseased bone marrow. A donor’s healthy, blood-forming stem cells are then given directly into the patient’s bloodstream.

The retrospective study looked at data from nearly 5,000 patients who underwent a bone marrow transplant between 1969 and 2014. It was the first study to look at outcomes in the era of so-called “mini-transplants.” Pioneered at Fred Hutch, these treatments use low-dose radiation and chemotherapy to suppress the immune system rather than destroy it.

The investigators were pleased to find that these low-dose regimens lowered the risk of subsequent cancer in transplant patients, Baker said. But he cautioned that one size doesn’t fit all when it comes to these preparative, or conditioning, regimens. Despite the associated risks, high-dose TBI may still be the most effective treatment for certain patients.
The researchers identified breast, oral cavity and skin cancers as the most common subsequent malignancies. In addition to high-dose TBI, age is another significant risk factor in developing a new cancer. Patients who were younger than 20 at the time of transplant were more than twice as likely to develop cancer than those who were older than 50 at transplant, the researchers found.

Baker hopes that the study helps drive research into less-toxic treatments for patients who need a blood stem cell transplant or other forms of stem cell transplantation.

“The ultimate goal for us in the transplant world is to find effective, non-radiation-based conditioning regimens, especially for children,” he said.

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