

Total Body Irradiation

Total body irradiation (TBI) is a treatment often used in preparation for stem cell and bone marrow transplantation. TBI is used both for malignant conditions, such as leukemia, and benign conditions, such as aplastic anemia. TBI is planned in conjunction with chemotherapy prior to transplant. It is given either as a single treatment or in multiple sessions (up to eight treatments, twice a day) depending on the patient's diagnosis and transplant treatment plan.

Risk of Total Body Irradiation

TBI has several purposes in the transplant setting, based upon the knowledge that the white blood cells giving rise to leukemia or benign disorders are very sensitive to radiation. First, TBI helps eradicate malignant tumor cells, should any be present. This is particularly important in areas of the body that chemotherapy has a more difficult time penetrating, such as the central nervous system. Second, TBI helps kill remaining bone marrow cells so that new, healthy transplanted cells can be engrafted into healthy bone marrow without rejection. Because bone marrow and tumor cells can be found all throughout the body, the target of radiation is the entire body.

What to Expect

Treatments for TBI can be delivered in a standing position, lying on a stretcher, or lying in a mold conforming to the patient's body. Selection of a technique by the physician is based upon individual patient needs and the length of treatment. Radiation therapists, who work with the radiation oncologist, will guide the patient during positioning and throughout the treatment. Remote cameras and audio are always on so patients can communicate to staff. Patients are asked to hold still and should not feel anything during the treatment, though fatigue and the effects of concurrent chemotherapy during this phase of the transplant may become prominent in longer treatments.

For those treated in the standing position, supports are built into a specialized stand to aid the patient. For those who will be treated lying down, we may use a stretcher or a mold to position the patient. In the latter approach, we use a novel technique called volumetric modulated arc therapy (VMAT) TBI that was developed here at our center. This technique allows us to more precisely treat the whole body while reducing the dose to the lungs and other organs sensitive to radiation, providing more convenient and potentially safer treatment. TBI treatments may last up to 1 hour or more, depending on the setup and the patient's need for breaks. This is due to the changes in positioning and a need to keep the delivery of radiation slow in order to minimize side effects long-term.

What to Expect

Side effects of radiation can be acute or late. The most common acute side effects of TBI include:

- Nausea and/or vomiting
- Diarrhea/loose stools
- Fatigue
- Difficulty swallowing/eating due to irritation of the mucosa
- Swelling of the salivary glands, which may be tender or painful, but usually resolves after treatment
- Rarely, patients may develop flu-like symptoms including cough and shortness of breath caused by “pneumonitis” (inflammation of the lungs), which can occur up to months after radiation and may require steroids for treatment

Medication can be prescribed to manage these adverse effects as needed.

Late or long-term side effects of radiation include:

- Early cataract formation
- Loss of thyroid function, which may require supplementation with daily pill
- Sterility
- Small risk of secondary cancer formation, particularly in children

Routine follow-up and physical exams with an oncologist or primary care provider are encouraged to monitor late side effects of TBI.

Coordination of Care

Scheduling for TBI treatment is coordinated between the Radiation Oncology Clinic and the Bone Marrow Transplant Clinic at the Simmons Cancer Center (for adult patients) or Children's Medical Center (for pediatric patients). Ambulance transportation will be arranged for patients admitted to the hospital during the entire transplant process.

Contact Us

For further questions regarding TBI treatments and the transplant process, please contact your oncologist or radiation oncologist.