

Total body irradiation (TBI) is a conditioning regimen performed in conjunction with chemotherapy in patients undergoing bone marrow transplantation. TBI is mainly for tumor cell eradication, immunosuppression, as well as salvage therapy to sanctuary sites where chemo drugs are difficult to reach.

Conventional TBI techniques adopt large treatment fields with lung blocks to irradiate the patient's entire body at an extended source-to-skin distance, e.g. 5 meters, which requires costly, large-sized linear accelerator (LINAC) vaults. Conventional TBI often requires standing or lying-on-the-side position, which is exhausting for immunocompromised patients undergoing chemotherapy. The overall treatment time is often extended because of compliance issues. Moreover, further dose escalation in conventional TBI to improve potential advantage for survival was negated by possibly increased treatment-related morbidity and mortality.

Significant technological advances have been introduced in the radiation therapy recently. By delivering radiation using multiple segmented or modulated beamlets, intensity-modulated radiation therapy (IMRT) allows for greater sculpting of radiation doses to fit treatment targeted regions while spare adjacent critical organs. In this symposium, we will start with the review of conventional TBI techniques and the recent development of dedicated TBI irradiators. Then, we will describe new TBI techniques using IMRT techniques, including floor-based inverse-planned modulated-arc TBI (MATABI), volumetric arc therapy-based TBI (VMAT-TBI), and total bone marrow irradiation (TMI) with helical tomotherapy. Clinical experience with new dedicated irradiator and advanced modulation radiotherapy will be shared. Future technical and clinical development of TBI/TMI will be discussed.

Learning objectives:

1. Understand the principles and applications of TBI/TMI for bone marrow transplantation.
2. Learn about recent technological advances of TBI/TMI using modulated radiotherapy.
3. Learn clinical experience of new TBI/TMI treatment techniques and discuss future technique development and clinical implementation.