Purpose: To describe a TBI technique designed within the limits of a small-room geometry and its clinical implementation.

Methods: Following construction of the universal treatment devices, including the double-wedge, beam spoiler table, and patient support table, commissioning consists of measurements to determine the output, tissue-phantom ratio, effective source distance, and off-axis factor. Dose is calculated by applying these factors per patient-specific measurements to arbitrary point in the patient. Typically, ten calculation points are located at mid-separation along the mid-sagittal plane from the head to the ankles. When areas of unacceptably high dose are calculated, custom compensators are constructed from 5-mm sheets of PMMA and placed over the patient on top of the beam spoiler table. The typical dose homogeneity of the planning calculations is within 2% of the prescribed dose.

Results: To verify the accuracy of the technique, an anthropomorphic phantom was simulated and treated. In total, 128 thermoluminescent dosimeters (TLDs) were irradiated within the phantom. Concentrations of TLDs were located in the planes of selected calculation points, i.e. the head, neck, sternum, lung, umbilicus, and pelvis. Results showed the average dose to these locations differed from the intended dose by -3.5%, 3.4%, 2.6%, 9.5%, 2.8%, and 0.5%, respectively. Due to its heterogeneous material, a higher discrepancy in the lung dose was anticipated.

To demonstrate the dosimetric size of the radiation field, ionization chamber measurements were taken on one lateral side of the treatment area at a constant depth of 5 cm. A few measurements on the contralateral side were within 1%, verifying the field's lateral symmetry. The approximate treatment area for the current technique is approximately 180x50 cm.

Conclusions: We have demonstrated a small-room technique capable of meeting the dosimetric goal of TBI. To improve the dosimetric characteristics, new universal treatment devices are currently being designed and constructed.