# AbstractID: 12877 Title: Sparing of Neural Stem Cells during Whole-Brain Radiation Treatments

**Purpose:** Sparing of neural stem cells during whole-brain radiation treatments could help retain cognitive function. However, these cells are extremely radiosensitive, with impairment of neurogenesis being observed even at 2 Gy. This study investigates the fundamental physics issues associated with sparing the neural stem cells.

**Method and Materials:** Three factors are particularly important in determining the stem cell dose: intracranial scattering, collimator leaf leakage, and jaw positioning. A simple planning system was developed to study the relative contributions of these factors. This planning system includes a basic representation of scatter and average collimator leakage. In addition to these theoretical investigations, an IMRT plan was delivered in conjunction with blocks to further test collimator leakage. The effect of the blocks on the delivered fluence patterns was measured with a 2-D diode array.

**Results:** Plans covered 50% of the PTV at 30 Gy. With fixed collimator jaws and average leaf leakages of 0, 0.37, 0.5, 0.9, 1, 1.5, and 2%, half of the stem cells were kept below the doses of 2.27, 3.61, 4.00, 5.01, 5.24, 6.25, and 7.09 Gy, respectively. Moving collimator jaws to the edge of the field reduced these doses to 2.27, 2.62, 2.74, 3.05, 3.12, 3.44, and 3.73 Gy, respectively. These results are in qualitative agreement with an extrapolation of the experimental data, which indicates that collimator transmission from a machine with 0.9% leaf leakage contributes a dose of 2.4 Gy to the stem cells.

**Conclusion:** Intracranial scattering creates a substantial dose to the stem cells; thus, it is important to minimize the other contributing factors, in particular collimator leakage. Utilization of moving jaws and state-of-the-art collimators can minimize this leakage. In addition, treatment with these collimators could be combined simultaneously with blocks to further decrease this dose.

**Conflict of Interest:** Research sponsored by Siemens corporation.