**Title:** Hippocampal sparing whole brain radiotherapy with volumetric modulated arc therapy

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**Introduction:** Hippocampal Avoidance whole brain radiotherapy (HA-WBRT) is a strategy that aims to mitigate the neuro-cognitive side effects of whole brain radiotherapy treatment. The purpose of this study was to investigate the feasibility and efficiency of using volumetric modulated arc therapy (VMAT) to spare the hippocampi while delivering the prescribed dose to the rest of the brain.

**Methods:** A total of four patients were replanned for hippocampal sparing for a prescription dose of 30 Gy in 10 fractions. A cranial mask system with a 25° angle, inclined board was utilized for patient positioning. The hippocampi were contoured and hippocampal avoidance regions were created using a 5 mm volumetric expansion around the hippocampi. The whole brain planning target volume was defined as the whole brain tissue minus hippocampal avoidance region. The VMAT plans were generated in Eclipse treatment planning system version 11 for a Varian True Beam STx linear accelerator equipped with a high definition multileaf collimator. Different beam arrangements were studied.The treatment plans were evaluated on target coverage, homogeneity of the PTV, and minimum, maximum, mean dose, D40% to the hippocampi and maximum and mean dose to the lens. The goal was to generate treatment plans that met the RTOG 0933 [1] criteria for HAWBRT treatment.

**Results:** The choice of beam arrangements consisted in six arcs with two non-coplanar arcs and different collimator rotation. All the VMAT plans achieved target coverage of the brain while maintaining hippocampal doses conform to the RTOG 0933 protocol. Concerning the PTV, the mean D98%, D95% and D2% were 27.3 ± 0.3 Gy, 29.0 ± 0.1 Gy and 30.8 ± 0.1 Gy, respectively. The mean values of homogeneity index and conformity index were 0.11 ± 0.01 and 0.94 ± 0.01, respectively. The D100%, mean and maximum doses to hippocampi were 7.9 ± 0.4 Gy, 10.1 ± 0.8 Gy and 14.6 ± 1.0 Gy, on average, respectively. On average, the mean and maximum doses to lenses were 4.5 ± 0.4 Gy and 5.2 ± 0.2 Gy respectively.

**Conclusion:** An inclined head board at 25° combined to six VMAT arcs with two non-coplanar arcs provided highly conformal plans that spared hippocampi and met the RTOG 0933 criteria. In the future, we plan to evaluate dose escalation on multiple brain metastases and assess the minimum distance from the metastases to the hippocampi to satisfy hippocampal avoidance.

**References:**

[1] *Radiation Therapy Oncology Group RTOG 0933 A Phase II Trial of hippocampal avoidance during whole brain radiotherapy for brain metastases*. 2012.