AbstractID: 9406 Title: Initial dosimetric validation of an atlas-based method for automatic intracranial segmentation

**Purpose:**
We have developed a novel method for automatic segmentation of critical structures in the brain. The purpose of this study is to test the feasibility of this method as an alternative to manually-derived physician contours. We test feasibility by evaluating the dosimetric consequences of auto-segmentation versus physician-drawn contours.

**Methods and Materials:**
Brainstem, eyes, optic nerves and chiasm were segmented through non-rigid registration of CT and MR-based atlases to two patients. Patient A presents a challenging case in which a base of skull chondrosarcoma distorts normal brainstem anatomy. Patient B suffers from parotid disease and presents normal critical structure anatomy. Intensity-modulated radiosurgery treatment plans were derived from physician contours and applied to the automatic contours.

**Results:**
For patient B (tumor far from critical structures) calculated doses for manual and automatic contours were within 2% of tumor dose for a given volume. Dose to the eyes, optic nerves, and chiasm of patient A were similar in agreement to those of patient B. The maximum dose to the brainstem of patient A, however, was 13% higher for the automatic contour. These dose differences were clinically negligible for all structures except the brainstem of patient A, in which case the difference was significant but acceptable.

**Conclusion:**
Clinical incorporation of our automated method is shown to be feasible dosimetrically. For the tumor lying far from the critical structures, the dose differences between automatically and manually-derived contours were insignificant. The differences increased for the case in which a critical structure lay directly adjacent to a large tumor. These cases illustrate the system is accurate for critical structures far from the lesion but sensitive to local disturbance and inherently steeper dose gradients when the critical structures lie near the lesion.