Stereotactic Conformal Fixed Field Radiosurgery/therapy:
Verification of a Dose Calculation Algorithm

The stereotactic irradiation of irregularly shaped intracranial lesions may be performed with conformal fixed fields to provide a high dose volume that conforms to the lesion and spares healthy tissue. In this work a dose calculation algorithm for a commercial conformal stereotactic fixed field system is verified. The verification 1) involves comparing calculated isodose lines and absolute point doses with the ones measured using film, and 2) is done for a complete six field treatment involving slightly irregular field apertures as well as for a six individual fields with apertures of varying shape, size and irregularity. There is good agreement between most of the measured and calculated data, however, the algorithm overestimates the dose in the small protrusions possessed by some of the field aperture shapes (i.e., ~ 20% at the tip of a 5mm protrusion). The dose at a point within a protrusion is probably overestimated because the algorithm does not factor in the effect of the penumbra from adjacent edges of the protrusion. Also, for conformal fixed field systems involving poured blocks, the algorithm underestimates the low dose end of the penumbra by not accounting for the ~6% transmission of radiation through the Cerrobend. The transmission is misrepresented because the relative dose profiles used in the algorithm were measured for circular titanium alloy collimators that transmit relatively little radiation. Use of the conformal fixed beam system with the limitations in the dose calculation algorithm is discussed.