AbstractID: 9592 Title: The Advantage of Noncoplanar versus Coplanar IMRT for Pediatric Posterior Fossa Tumors

Pediatric tumors of the posterior fossa (PF) are adjacent to several critical structures. Because high radiation doses are required to treat these tumors, structures such as the cochleas and temporal lobes may receive a dose that produces significant morbidities including hearing loss and neurocognitive decline. In conformal radiation therapy (CRT) for PF tumors, noncoplanar beams provide superior dose distributions relative to coplanar ones. A previous study in head and neck tumors suggested that the advantage of noncoplanar beams in IMRT is site- and geometry-specific (1). Therefore, we hypothesized that noncoplanar IMRT is better than coplanar IMRT in PF tumors. To test this, IMRT plans using noncoplanar and coplanar beams were generated for several patients with PF tumors and compared to each other as well as conventional CRT plans. Two different optimization algorithms and multi-leaf collimators with two different leaf sizes (4 and 10 mm) were used for planning. In general, noncoplanar IMRT plans are better than coplanar IMRT plans. However, noncoplanar CRT plans compete with the IMRT plans when considering all factors including tumor coverage and avoidance of critical structures. The choice of beam orientation appears critical in noncoplanar treatment planning. Smaller leaf size also improves dose reductions to smaller critical structures. While the different algorithms produce similar results for limiting dose to critical structures, they differed significantly in tumor coverage. The reasons for this remain unclear and will be further explored.

(1) Pugachev et. al., Role of Beam Orientation Optimization in Intensity Modulated Radiation Therapy, IJROBP 50:551-560, 2001.