Use of a non-coplanar half-beam block on the lower spinal field to decrease the maximum bowel and cumulative dose in craniospinal irradiation.

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Purpose

To develop a non-coplanar half beam block technique for craniospinal irradiation (CSI) and compare it with conventional beam matching and IMRT in order to decrease the maximum dose and dose to the bowel, while maintaining the therapeutic dose to the spinal axis.

Materials and Methods

Three different geometric treatment techniques were designed and compared on six patients who underwent CSI. Organs of interest were contoured for each patient on their simulation CT scan. The first technique consists of the conventional method for CSI utilizing two coplanar beams to cover the entire spinal axis. Our technique uses a non-coplanar half beam block on the lower spinal beam to exactly match the upper spinal beam's divergence. Four “featherings” between the two spinal beams for each technique were still necessary to minimize under and overdosing which occur at field junctions. IMRT plans using 4 or 5 fields with 15MV energy were also generated for each patient. Mean or maximum doses for the plan and multiple organs were recorded between the three techniques on the same patient. Percent differences between doses from the conventional and IMRT plans and our technique were determined.

Discussion

Use of a non-coplanar half beam block to match the lower to upper spinal field in craniospinal irradiation, when compared to conventional or IMRT plans, significantly reduces the maximum dose of the entire plan, and especially to the bowel, possibly resulting in reduced gastrointestinal toxicity while maintaining therapeutic dose to the spinal axis.