

A New Method of Dosimetrically Setting Multileaf Collimators for Shaping a Radiation Field

A new method is developed for dosimetrically setting Multileaf Collimators (MLC) to shape a radiation field. The method eliminates the MLC scalloping effects and could be used for any conventional three-dimensional treatment planning system freeing the vendor and the user from developing a detailed dose calculation model for a specific MLC system. For the current method, the maximum isodose line (MIL) covering the entire planning target volume (PTV) was first determined from a physician prescribed smooth cerrobend block contour in the beam's eye view (BEV). An iterative optimization method is developed to position the MLC leaves to best match the MLC field with the MIL contour at the same isodose level. Comparison was carried out between the current dosimetric leaf-setting method and conventional leaf-setting methods using geometric criteria. Phantom measurements were performed to validate the results of the comparison. Significant differences up to 0.5 cm in MLC leaf positions and isodose coverage were found between the current method and the conventional methods. Therefore, we have demonstrated that it is important to set the MLC leaves dosimetrically rather than geometrically to achieve optimum dose conformation for a treatment field. This becomes essential in using the MLC-shaped fields for conformal radiotherapy where dose conformity plays an important role in improving the therapeutic index.