In spite of extensive literature devoted to MLC dosimetry, there is little information available to assist physicians in confidently defining field edges using MLC. While specific concerns can be resolved using a treatment planning system, for simple cases not requiring complex dose calculations, fields using MLC must be defined during simulation. We designed a series of measurements to provide practical guidelines for clinical multi-leaf collimator (MLC) usage. Such guidelines are particularly useful when the leaves project a jagged edge. We have quantified the dosimetric properties of field edges defined by MLC leaves as a function of depth, beam energy, distance off-axis, and the angle between the direction of leaf travel and the prescribed field edge (PFE). Circular fields were used as PFEs with diameters of 5, 10 and 20 cm. Beams eye view dosimetric measurements were made using XV film to compare fields shaped with MLC to fields shaped with Cerrobend blocks. Comparisons were made based on the positions of the 50%, 90% and 20% isodose, relative to the PFE, as well as the penumbra width as determined by the 20% and 80% isodose. For the MLC, these quantities were tabulated as a function of the approach angle. Deviation between the 50% isodose line and the PFE was greater in places for the MLC but closer on average than for the lead block due to block fabrication error. We conclude that these results are useful for clinical MLC field definition.
This work was partially funded by NATO.