

The use of gravity-oriented shield in conformal and intensity-modulated radiation therapy. Chen-Shou Chui

Multileaf collimator (MLC) has been used widely for shaping field and for delivering intensity-modulated field. The use of MLC instead of a physical device is preferred as no re-entry into the room is necessary. Moreover, adjustment of field shapes or intensity distributions can be made easily without having to re-fabricate the physical device. However, one of the impediments of MLC is its finite leaf width, typically 1 cm at the isocenter. For certain disease sites, such leaf width may not provide adequate protection to the critical organs.

One possible solution to this problem is the use of gravity-oriented shield (GOSh) together with the MLC--the former provides smooth edge to cover critical organs while the latter defines the rest of the field and delivers intensity-modulated field. The gravity-oriented mechanism was designed in such a way that as the gantry rotates, both the position and the orientation of the shields are maintained to point to the protected organs.

A nasopharynx case with sinus involvement was chosen as an example. Eight 6-MV photon beams were used. The goal was to deliver uniform dose to the target, while keeping the doses to brainstem and the eyes below respective limits. Two intensity-modulated plans were studied: the first with MLC only, while the second also uses GOSh. For the target, plan-2 achieves better dose uniformity than plan-1. For critical organs, plan-2 provides much better protection than plan-1. The significant differences in critical organ protection can be seen both on DVHs and on isodose distributions.