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Influence of collimator size on three-dimensional conformal radiotherapy of the cyberknife.

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PURPOSE: In stereotactic conformal radiotherapy of the CyberKnife, multiple narrow beams from a cylindrical collimator are delivered to a planning target volume (PTV) without an isocenter by inverse planning. The influence of collimator size on stereotactic conformal radiotherapy was examined.

MATERIALS AND METHODS: Five targets including two spherical targets (2.1 ml, 16.4 ml), an ellipsoidal target (2.9 ml), and two irregularly shaped targets (1.6 ml, 6.6 ml) were evaluated. Conformity and homogeneity of dose distribution, doses covering 95% volume of PTVs (D95), dose volume histograms (DVHs), and patterns of dose distribution were investigated in relation to collimator size for each target. We evaluated conformity and homogeneity using VD95/PTV (VD95 = volume covered by a D95 isodose surface) and Dmax/Dmin (Dmax, Dmin = maximum and minimum dose within the PTV, respectively), respectively.

RESULTS: Conformity and homogeneity were not significantly influenced by collimator size. By using a considerably smaller collimator compared with the minor axis of the target the central dose of the target fell by less than 10% and D95 often decreased slightly.

CONCLUSION: In stereotactic conformal radiotherapy of the CyberKnife, a smaller collimator tended to reduce the central dose and D95. These characteristics of the CyberKnife system should be considered.

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