

Optimization in brachytherapy for childrens' H/N rhabdomyosarcoma

CT was used in brachytherapy of H/N rhabdomyosarcoma in children to obtain proper optimization techniques. After surgical ablation of the tumor, a mould with catheters was placed in the defect. Brachytherapy was given with Ir-192 wire sources. Reconstruction of the implant and dose prescription were based on orthogonal radiographs. A CT-scan was performed but was initially not used for dosimetry. Since 1998, CT-assisted brachytherapy Treatment Planning software became available. Apart from CT-based reconstruction, optimisation for stepping source brachytherapy techniques is available. For several patients a replanning of the original treatment was performed. In the CT-slices target and critical structures were delineated. Dose prescription was now based on the delineated target volume. Apart from the reproduction with a stepping source of the originally given treatment (no optimization), 3 optimization techniques based on using a stepping source, were compared, i.e. geometrical volume optimization, geometrical distance optimization and optimization on dosepoints.

The results show that CT reconstruction offers a better basis for dose prescription than the conventional method based on orthogonal radiographs. Of the three optimisation techniques, dosepoint optimization scored best in terms of highest dose within the target and steepest dose gradient in the first tissue layer outside the target. An important advantage of our method is the production of dose-volume histograms, which are not solely based on the geometrical aspects of the implant, but which are truly based on a delineated target and critical structures.