

Purpose:

Homogeneous irradiation of the scalp is challenging due to relatively complex and superficial treatment volume. Conventional treatment approach of combining matched electron and photon fields produces dose heterogeneity, especially at matched lines. Fixed gantry IMRT techniques have not been able to provide clinically acceptable plans but helical tomotherapy has been demonstrated to be an alternative option. We have implemented total scalp treatment with volumetric modulated arc therapy (VMAT) and compared the dosimetric characteristics to tomotherapy and conventional method.

Materials and Methods:

Two patients have been planned for total scalp irradiation using RapidArc VMAT, helical tomotherapy and conventional electron and photon field combination. The same anatomy and structure sets have been used for the planning purposes. After each operator achieved clinically acceptable results for the particular method, the dose distributions and dose volume histograms were compared.

Results:

VMAT and tomotherapy provide significantly more homogeneous dose distribution and target coverage. Maximum PTV dose with VMAT and tomotherapy were 20% and 30% less than the conventional method respectively. Although, the conventional method provided 2/3 less dose to brain at D50% and D75%, tomotherapy and VMAT gave lower dose to the brain in high-dose regions. Brainstem was best spared by conventional method with 1/4 of the maximum dose delivered with tomotherapy and VMAT. Tomotherapy provided more homogeneous dose distribution than VMAT but the brain and brainstem sparing were comparable.

Conclusions:

VMAT for total scalp irradiation is a clinically acceptable and comparable to tomotherapy. VMAT provides significantly more homogeneous distribution than conventional method. VMAT and Tomotherapy give lower dose to the brain in high-dose regions than conventional method. Moreover, VMAT and tomotherapy plans can be delivered more reproducibly and reliably than conventional treatments. Average beam on time for VMAT and tomotherapy were 2.5 mins and 7.7 mins respectively.

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