COMPARATIVE TREATMENT PLANNING USING CALCULATIONS OF SECONDARY CANCER INCIDENCE

Abstract

Purpose: Probabilities for mortality from secondary cancers have been calculated for a patient with Hodgkin's disease which has been planned with different radiation treatment modalities using photons and protons.

Materials and Methods: The ICRP calculation scheme has been used to calculate mortality from dose distributions. To this purpose target volumes as well as critical structures have been outlined in the CT set of a patient with Hodgkin's disease. Dose distributions have been calculated using conventional as well as intensity modulated treatment techniques using photon and proton radiation. From the mean doses of each organ the mortality has been derived.

Results:

(i) Intensity modulated treatment of Hodgkin's disease using 9 photon fields (15 MV) results in nearly the same mortality as treating with two opposed photon fields (6 MV).

(ii) Intensity modulated treatment using 9 proton fields (maximum energy 177.25 MeV) results in nearly the same mortality as treating with one proton field (160 MeV).

(iii) Irradiation with protons using the spot scanning technique decreases the avoidable mortality compared to photon treatment by a about a factor of two. This result is independent of the number of beams used.

Conclusions: By looking at the incidence of secondary cancer our work suggests that there are radiotherapy indications where intensity modulated treatments will give little or no improvement over conventional treatments. However proton treatment can result in a lower mortality than photon treatment.