ELECTRON BEAM TOTAL SKIN IRRADIATION

G. Marinello[1], F. Jaffre[1], K. Ślosarek[2], J.P. Bourgeois[1]

[1]Departement de Cancerologie, CHU Henri Mondor, 94010 Creteil, France
[2]Present adress: Centre of Oncology Maria Skłodowska-Curie, Gliwice, Poland

Total skin low energy electron irradiation (TSEI) remains one of the most effective modes of treatment for generalized superficial lesions. After a brief review of the irradiation beam requirements (treatment of the first few milimeters of skin, uniformity of dose distribution in spite of variations in the shape and size of patients) and the different irradiation methods, the autors present the technique used at Henri Mondor hospital and some other french centers. It consist of 3 vertical adjacent fields with patient lying alternatively in prone then supine position. An custome-made lucite scattering screen used together with incident electron beams of 7-9 MeV provides an homogenous dose distribution in patient's parts of large radius of curvature.

The dosimetric study performed essentially with TLD dosimeters and films has shown that the lucite screen was the best choice because its transparency makes easier patient positionning and it induces a very low X-ray contamination. It also shown that the screen has to be set close to the patient both to increase the skin dose and to keep an acceptable dose-rate at the patient's level.

Besides experiments performed with a semi-infinite flat phantom made of equivalent-tissue material and an Alderson Rando phantom simulating the human body, experiments were carried out with layered flat phantoms of small thicknesses and cylindrical phantoms (radii varying from 1 to 9 cm) simulating hand and lower limb cross sections. Results obtained at 4 MeV (mean energy at the patient's surface) have shown that the overdosage in anatomical structure of large radius of curvature but small thickness (palme of hands) is 200% of the prescribed dose for 1 cm thickness, 160% for 2 cm and becomes normal for thicknesses ≥3 cm. Large variations of dose have also been measured in cylindical phantoms simulating fingers, ankle or wrist. They depend on both the radius of the structure and the incidence angle of the beam at the skin surface. Some examples are presented.

Such results confirmed by in vivo measurements can explain the complications in anatomical regions of small radii of curvature and/or small thickness (erythematous skin, swelling of feet, ankles and hands) reported by different authors. It is the reason why shields for the hands or feet have to be provided well before the full course of therapy is completed, and thus irrespective of the irradiation technique used.

HOW EFFECTIVELY TO USE BIOPHYSICAL MODELS IN TREATMENT PLANNING?

P. Matula

Department of Radiation Therapy & Oncology University Hospital, Kosice, Slovak Republic

Introduction

The potential of biophysical models is rarely used in clinical practice. Calculations are time consuming, tedious which deter of clinicians to use them. There is a challenge to develop a suitable computer support system for flexible evaluation of radiobiological consequences of radiation therapy.

Materials & Methods

A computer program (RADBIO) based on the linear quadratic model (LQM) with an involvment of the „4Rs" of radiobiology (repopulation, repairing, reoxygenation and redistribution) has been developed. The biologically equivalent dose (BED), the predictive values of NTCP - F (BED, DVH) and tumour control probability (TCP) are calculated simultanously for all tissues of interest. A total biological effect is a result combined courses of external beam therapy and brachytherapy. The data base contains all current available radiobiologic data of tumours and normal tissues. Entries of individual patient data are simple and take