

ELECTRON BEAM TOTAL SKIN IRRADIATION

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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 millimeters of skin, uniformity of dose distribution in spite of variations in the shape and size of patients) and the different irradiation methods, the authors 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 cylindrical 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?

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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 involvement 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 simultaneously 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

1-2 minutes of clinicians time. The output obtains a complex radiobiologic report and a graphical picture with a „Therapeutic Ratio” for a relevant protocol.

Results

Comparison of rivals protocols for Ca of Uterine Cervix IIB, III (2 LDR insertions/20 Gy + EBRT 40,8 Gy versus 4 HDR insertions + EBRT 40.8 Gy) follows to an isoeffective HDR dose/fr = 6.65 Gy. Critical % doses (related to NTCP rectum, bladder -5%) are 65% and 80% respectively.

It correlates with a maximum „Benefit function” defined as BF-TCP (1-NTCP).

Conclusion

The contribution shows a simple and potentially useful approach for computing more realistic isoeffect relations for tumour, early and late responding tissues when comparing different radiotherapeutic protocols. It offers a real chance to optimize a „Therapeutic gain” as a final goal of radiation therapy.

ADJUVANT TREATMENT OF PATIENTS WITH RECTAL CANCER

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Adjuvant postoperative radiotherapy combined with chemotherapy is considered a standard management of rectal cancer patients with increased risk of local recurrence. In this study we evaluated the results of adjuvant chemo- and radiotherapy after radical surgery in 64 patients with rectal carcinoma with special reference to tolerance of treatment. All patients underwent radical surgery: anterior abdominal resection in 26, abdominoperineal resection in 19 and Hartman resection in one. Thirty three patients were postoperatively staged as Dukes B2 and 31 patients - as Dukes C. All patients received postoperative chemo-radiotherapy. Treatment included megavoltage irradiation with two parallel opposed fields to small pelvis at a dose of 45 Gy in 23-25 fractions and concomitant chemotherapy with 5-Fluorouracil during first three and last three days of irradiation.

Main early complications from chemoradiation included diarrhea (58%), nausea and vomiting (15%), dysuria (6%), leukopenia (31%) and anaemia (4%). In total, acute side effects occurred in 42 patients (66%) and in 16 of them (25%) were of grade 3 or 4. Three patients did

not complete the treatment due to exacerbation of side effects and/or serious deterioration of performance status. Late complications, mainly from bowels and urinary bladder, occurred in 19 patients (30%) and six of them (9%) were severe.

Nineteen of the 64 evaluated patients have deceased ill now. Median survival was 29 months (4 to 50 months). Local recurrence was seen in 14 patients (22%) and distant metastases - in 18 (28%).

Results of our study show that postoperative radiochemotherapy in rectal cancer patients is accompanied by a large number of acute and late complications. Literature data demonstrate that better tolerance of treatment may be achieved with the use of special surgical techniques preventing the replacement of small intestines to the pelvis after rectal amputation. Further improvement may be achieved with the use of multiple radiation fields, computerized treatment planning and customized blocking. Another option is an application of preoperative radiotherapy - the approach becoming recently more commonly used.