Medical Dosimetry, Vol. 26, No. 1, p. 1, 2001

0958-3947/01/$–see front matter

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PII: S0958-3947(01)00054-1

● *Editorial*

MIMiC-BASED IMRT- PART I

Intensity-modulated radiation therapy (IMRT) has presented itself as a new technologically advanced technique of performing precision radiotherapy. It introduces new concepts of inverse-planning and intensity variation across a treatment field. The inverse-planning system is different from the forward-planning system in the sense that the desired dose distribution is specified in the former system. Once the dose distribution is specified, the planning system seeks optimal beam settings subject to a quality criterion referred to as objective or cost function. Such a technique usually leads to a higher degree of target conformity compared to three-dimensional conformal radiation therapy (3DCRT), in particular, for concave targets. To achieve this outcome, the inverse planning algorithm invariably leads to the use of a nonuniform treatment field. This nonuniform field is generated using a computerized beam-intensity modulator such as the multileaf collimator.

Two beam delivery systems that use multileaf collimation are commercially available to perform IMRT. The first system is the multileaf intensity-modulating collimator (MIMiC) introduced by the NOMOS corporation. The MIMiC, attached to the treatment head of a linear accelerator, is a binary collimator consisting of 2 rows of 20 leaves. A controller whose instructions are derived from the CORVUS treatment planning system directs the modulation of the leaves. The second system uses the multileaf collimation that comes with the linear accelerator. Integration of the various components of the computed tomography (CT) scanner, treatment planning system, and the linear accelerator is critical for the success of IMRT.

IMRT is emerging and growing rapidly, in part due to the fact that they are available commercially. The attractive feature of IMRT is reduced dose to organ-at-risk; which consequently provides a means of escalating doses to the target. However, the clinical efficacy based on endpoints of tumor control, side effects, quality of life, and cost benefit ratios remain to be determined. Early clinical experience in the use of 3DCRT and IMRT in the treatment of prostate and head and neck cancers is encouraging. Therefore, IMRT presents itself as a very promising radiotherapy modality. Linear accelerator and treatment planning system manufacturers are investing significant effort in perfecting this technology and bringing them to widespread use. We, as users, must understand and familiarize ourselves with these new concepts, treatment planning algorithms, and beam delivery systems before clinical implementation. *Medical Dosimetry* is devoting 3 special issues on IMRT to assist medical physicists, dosimetrists, therapists, and radiation oncologists with this familiarization. Of primary concern with this new modality are the understanding of the principles of operation, the implementation of uncertainties associated with patient immobilization, uncontrolled patient and organ motion, and imaging inaccuracies. In addition to implementation, there are other issues, such as the length of treatment times, quality assurance, and economic considerations; manuscripts have been solicited from experts in the IMRT field to deal with these issues. As with any new technology, there are also original works being developed that will be incorporated into these special issues. The special issues are presented in sequence favoring MIMiC-based IMRT first, followed by MLC-based IMRT and, finally, clinical applications of IMRT.

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