Editorial
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New horizons in radiotherapy computer treatment planning

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During last decade, the Monte Carlo calculation techniques using PC computers of the third generation (32 bit) are developed to fit numerous practical tasks, from modelling of physiological processes in humans, nuclear medicine, radiation protection dosimetry to radiodiagnostics, radiation therapy and radiobiology. When radiation therapy is concerned, Monte Carlo simulations (codes) are the most actual engines for dose calculation in 3D treatment planning for routine clinical practice (1). Presently, the Monte Carlo calculation techniques are used for preparation of beam data library in a few treatment planning systems-TPS i.e. Helax (MDS Nordion, Canada), CadPlan Plus - Helios (Varian, USA); Focus (CMS, USA)*, etc., and would be fully incorporated, as the base calculation algorithm of the future treatment planning systems, specially those devoted to the IMRT, SRS, proton and heavy ion beam therapy.

What makes the Monte Carlo calculation technique for radiotherapy planning systems superior to other calculation methods?

The most of all, Monte Carlo technique enables simulation of particles transport in a complex shape medium composed of different materials (inhomogeneities), and gives real and accurate 3D dose distribution (1,2). For the practical purposes (calculation time efficiency), the two-step approach is a common technique for simulating accelerator treatment head and performing dose calculations in patients. The first step deals with complex accelerator head geometry, creating detailed phase space information matrix (consists of information on energy, charge, impact points and direction) for particles incident on the patient surface that is practically unmeasurable for a clinical beam. The second step consists of application of phase space matrix for the dose calculation in the patient which geometry is built from CT data (1,2).

The article entitled "Comparision of measured and Monte Carlo calculated electron beam central axis depth doses in water" by D. Lalic, R. Ilic and S. Stankovic (3) represents an efficient attempt in solving complex problem of the medical accelerator (CLINAC 2100C, Varian, USA) head geometry, acquiring the phase space information matrix that allows calculation of various energy electron beams central axes depth doses in water. The comparision of calculated and measured depth doses pointed out the aplicability and quality of used Monte Carlo software package FOTELP that was developed to simulate the transport of photons, electrons and positrons for numerical radiation research experiments and dosimetry for radiation therapy (4). It seems that this work represents only the first step from modelling to real 3D treatment planning for electron beams based on the FOTELP Monte Carlo software package. However, final data precision has to be improved to meet the recommended dosimetry requirements (2 % deviation from measured data for commercial TPS).

Wish them all the best.

* The electron therapy planning module - in development.

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