
IMRT 2006: Technology, Research & Cancer Treatment

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Although intensity modulated radiation therapy or IMRT was clinically introduced only about a decade ago, it has had a profound influence on the field of radiation oncology. IMRT allows radiation dose distributions almost unimaginable previously and the technology behind IMRT has advanced at a remarkable rate since its inception. Clinical research and applications are currently in what appears to be an exponentially increasing growth phase.

This issue of *Technology in Cancer Research and Treatment* certainly lives up to its name with a collection of outstanding articles dealing with aspects of IMRT technology, basic research, and clinical treatment. Drs. Sanghani and Mignano of the Tufts-New England Medical Center lead off the series with a general overview of IMRT that introduces the various types of IMRT that currently exist. Following this introduction, Dr. Cedric Yu and colleagues describe some of the current limitations of IMRT. They discuss their specific research efforts to address these, specifically describing means of improving IMRT efficiency with direct aperture optimization, broadening the scope of optimization, and new planning methods for intensity modulated arc therapy. Next in the queue is a contribution from the team at the University of Wisconsin which focuses on their particular solution to the inherent challenges of IMRT. Helical tomotherapy was developed by the researchers at the University of Wisconsin and this paper outlines their current and proposed future research efforts that will ascertain the ultimate potential of their unique approach. Following this, Dr. Ibbott and colleagues discuss the fact that IMRT quality is not uniform from one institution to the next. In an effort to address this, the Radiological Physics Center has conducted a credentialing program through the use of anthropomorphic phantoms for the purpose of evaluating the planning and delivery of IMRT. This paper describes their results and emphasizes the importance of quality assurance in the use of IMRT in the clinic. In a nice translation from basic research to applications, Court *et al.* first detail the numerous challenges posed by tumors in the paranasal sinuses. The payoff can be substantial, however, as wide-field irradiation has potentially dire consequences including blindness. The researchers describe their commissioning and experimental validation of a Monte Carlo code for calculating dynamic IMRT treatments, along with their results of dose distributions using this compared to a commercially available treatment planning system and ion chamber measurements for radiotherapy of the paranasal sinuses.

Following these technical and research articles are a series of papers focusing on specific clinical applications. Dr. Malik and colleagues from the All-India Institute of Medical Sciences begin with the fascinating case of a child with retinoblastoma with intracranial extension and positive cerebrospinal fluid cytology. Treatment

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included an IMRT technique that encompassed the involved orbit and entire craniospinal axis while minimizing excessive dose to normal tissue. In another clinical application, Reddy *et al.* describe their approach to prostate and seminal vesicle irradiation at the New York Hospital Queens. Their IMRT solution is estimated by the linear quadratic formulation to provide radiobiological equivalence to the older two-step method of first irradiating the prostate and seminal vesicles to 45 Gy and then boosting the prostate to higher dose. In addition to improving seminal vesicle dose homogeneity, their technique significantly reduced time required for IMRT quality assurance and planning. Finally, Drs. Aydogan, Mundt

and Roeske describe their efforts with IMRT approaches to total body irradiation, specifically detailing their feasibility study on conventional linac-based total marrow irradiation.

In the past decade we have seen IMRT rapidly evolve from an interesting concept with potential into a clinical reality with numerous novel and important applications. The ever-increasing pace of development continues to accelerate in 2006 as clearly evidenced by this wide-ranging compilation of contributions in this particular issue of *Technology in Cancer Research and Treatment*.