New Technologies in Radiation Oncology

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New Technologies in Radiation Oncology provides an excellent overview of recent technologic developments in the field of radiation oncology. This book is intended for physicians and medical physicists who are working in radiation oncology and those just entering the field. It encompasses a broad range of new technologies in radiation therapy—from image acquisition and processing to treatment planning to therapy—and helps the reader grasp the basic ideas of each new technology. If the reader wants more information than the book provides, each chapter includes a wealth of references for learning about a particular subject in detail.

The book begins with a preface by the editors that includes a brief history of recent technologic milestones, including linear accelerators, CT/MRI-based 3-dimensional (3D) planning, stereotactic radiotherapy, 3D conformal radiation therapy with multileaf collimators, intensity-modulated radiotherapy, proton or ion therapy, and image-guided radiotherapy. The many new technologies that have emerged since the 1960s clearly demonstrate the rapid changes that have occurred in the field of radiation oncology and highlight the important contribution of this book in helping busy practicing physicians and physicists to stay up to date on new technologies.

One of the editors provides a review chapter covering the framework for the major sections of the book: the basics of 3D imaging, 3D imaging for radiotherapy, 3D treatment planning for conformal radiotherapy, new treatment techniques, and verification and quality assurance. This informative overview connects the technologies covered in the 5 major sections of the book. The basic steps in radiation therapy—immobilization, imaging, tumor localization, treatment planning, patient positioning, and treatment—are briefly discussed. This is a must-read chapter for those just entering the field.

The section on the basics of 3D imaging includes chapters on image reconstruction, segmentation, visualization, registration, and fusion, as well as data formats, networking, archiving, and telemedicine. The image reconstruction chapter is brief and could be reasonable for the radiation oncology community. The other chapters provide excellent overviews of the tools of image processing and data communication. Illustrations of images are abundant, and the reader will find the concepts of many image-processing techniques, as well as data communication protocols, presented in a relatively straightforward manner.

The section on 3D imaging for radiation therapy provides an excellent introduction to the applications of multislice CT, 4-dimensional CT, MRI and MR spectroscopy, PET and PET/CT, and ultrasonography. These imaging modalities are all of great importance to radiation therapy. An in-depth description of multislice CT and an introduction to cone-beam CT are provided. The practice of using 4-dimensional CT to estimate tumor motion in the thorax, which has gained acceptance in many institutions, is covered in detail. Excellent discussions of tissue contrast with MRI and functional imaging of chemical composition with MR spectroscopy are also included. These chapters are written primarily from the perspective of radiation therapy, and they provide the reader with an understanding of how the images acquired from different imaging modalities are used in treatment planning. The organization and presentation of this section are excellent. As image-guided radiation therapy becomes more prevalent, the materials covered in this section will become more important to practicing physicians and physicists. The section would have benefited, however, from the inclusion of SPECT.

In the next main section of the book, 3D treatment planning for conformal radiation therapy—from image acquisition and processing to treatment planning to therapy—and helps the reader grasp the basic ideas of each new technology. If the reader wants more information than the book provides, each chapter includes a wealth of references for learning about a particular subject in detail.
A radiation oncologist is a specialist physician who uses ionizing radiation (such as megavoltage X-rays or radionuclides) in the treatment of cancer. Radiation oncology is one of the three primary specialties, the other two being surgical and medical oncology, involved in the treatment of cancer. Radiation can be given as a curative modality, either alone or in combination with surgery and/or chemotherapy. It may also be used palliatively, to relieve symptoms in patients with incurable cancers. About Radiation Oncology. Understand Your Care. Radiation therapy, sometimes called radiotherapy, is the use of various forms of radiation to safely and effectively treat cancer and other diseases. Doctors use radiation therapy to try to cure cancer, to control the growth of the cancer, or to relieve symptoms, such as pain. Radiation therapy works by damaging the DNA within cancer cells and destroying the ability of the cancer cells to reproduce. When these damaged cells die, the body naturally eliminates them. A radiation oncologist, a doctor who specializes in using radiation to treat cancer, leads this team. Types of Radiation Treatments. External Beam Radiation Therapy. Stereotactic Radiosurgery (SRS). Stereotactic Body Radiotherapy (SBRT). HDR Brachytherapy. 10 Department of Radiation Oncology, Memorial Sloan Kettering Cancer Center, New York, New York. 11 Department of Radiation Oncology, University of California - Los Angeles, Los Angeles, California. 12 Department of Radiology, University of Washington Medical School, Seattle, Washington. Expert clinicians and scientists discussed innovative technology in radiation oncology, in particular as to how these technologies are being developed and translated to clinical practice in the face of current and future challenges and opportunities. Technologies encompassed topics in functional imaging, treatment devices, nanotechnology, and information technology. The technical, quality, and safety performance of these technologies were also considered. A list of 18 new radiation oncology books you should read in 2020, such as Radiation Oncology and Clinical Radiation Oncology. Concise, templated chapters cover the basic biology of oncologic disease processes as well as updated treatment algorithms, the latest clinical guidelines, and state-of-the-art techniques and modalities.