
Preface

Our goal with radiation therapy (RT) is to improve the therapeutic ratio, which means to kill cancer cells without increasing normal cell-kill adjacent to the cancer cells. A significant advance in RT to improve the therapeutic ratio has been partly achieved by application of intensity-modulated radiation therapy (IMRT). IMRT has shown improvement of conformality to give a higher dose to the target volume and a lower dose to the surrounding normal tissue, especially in organs at high risk for toxicity. IMRT has provided us the opportunity to give a simultaneous boost to intensify the dose to the gross tumor volume (GTV) and a decreased dose to the clinical target volume (CTV).

Since the start of IMRT in the mid-1990s, much clinical evidence of the advantage of IMRT has been collected. Now, IMRT is a standard RT technique and is widely used for many tumor sites. The number of patients treated by IMRT is increasing in Japan, although the clinical application is limited compared with that in the United States. One reason for this limitation may be related to the difficulty of treatment planning and quality assurance (QA) for IMRT. It is not easy to carry out appropriate treatment planning with high-quality control of IMRT in daily practice. One of the reasons that IMRT has not been used more often in Japan is that there is a lack of medical physicists and dosimetrists in Japan, unlike the United States.

This book is an attempt to provide collected clinical evidence of IMRT with the appropriate advanced techniques of IMRT for clinicians and physicists. Several books on IMRT were published in the early 2000s. However, clinical evidence was scant at that time. In addition to the now-accumulated evidence for IMRT, the techniques for IMRT also have progressed. As an example, tumors and normal tissues move with time, and this movement may be clinically significant from second to second, day to day, week to week, or longer. It has been demonstrated that image-guided RT (IGRT) and/or adaptive RT (ART) are clinically advantageous for IMRT of these moving targets. Combined with a molecular imaging technique using PET/CT, IMRT based on molecular imaging will be soon available. This book covers these recent advances in IMRT.

In Part I, on foundations and techniques, the history, principles, quality assurance, treatment planning, radiobiology, IGRT, ART, and related topics of IMRT are presented. In Part II, on clinical application, several case studies including

contouring and dose distribution with clinical results are described, following the description of indications and a review of clinical evidence for each tumor site.

While we were making plans to publish this book in 2013, our close friend Dr. K. Kian Ang, Professor of Radiation Oncology, Gilbert H. Fletcher Memorial Distinguished Chair, Department of Radiation Oncology, The University of Texas, MD Anderson Cancer Center, suddenly passed away. Dr. Ang was a great radiation oncologist, and produced significant achievements on RT for head and neck cancer, which included IMRT. The authors of this book are well recognized for their expertise in their respective fields both in Japan and the United States. In addition, all authors respected Dr. Ang very much and were greatly saddened by his sudden death. Thus, we decided this book should be dedicated to the memory of Dr. K. Kian Ang.

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