

The need for, and implementation of, image guidance in radiation therapy

G.S. Ibbott

Department of Radiation Physics, UT MD Anderson Cancer Center, 1400 Pressler St., Unit 1420, Houston, TX 77030, USA; e-mail: gibbott@mdanderson.org

Abstract—The introduction of image guidance in radiation therapy has revolutionized the delivery of cancer treatment. Modern imaging systems can supplement and often replace the historical practice of relying on external landmarks and laser alignment systems. Rather than depending on markings on the patient's skin, image-guided radiation therapy (IGRT) using techniques such as computed tomography (CT), cone-beam CT, MV on-board imaging (OBI), and kV OBI allows the patient to be positioned based on the internal anatomy. These advances in technology have enabled more accurate delivery of radiation doses to anatomically complex tumor volumes, while simultaneously sparing surrounding healthy tissues. While these imaging modalities provide excellent bony anatomy image quality, magnetic resonance imaging (MRI) surpasses them in soft tissue image contrast for better visualization and tracking of soft tissue tumors with no additional radiation dose to the patient. However, the introduction of MRI into a radiotherapy facility carries with it a number of complications including the influence of the magnetic field on the dose deposition, as well as the affects it can have on dosimetry systems. The development and introduction of these new IGRT techniques will be reviewed and the benefits and disadvantages of each will be described.