



Advancements in Radiation Therapy Revolutionizing Cancer Treatment

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Abstract

Keywords: External Beam Radiation therapy; Brachytherapy; Intensity-Modulated Radiation therapy (IMRT); Stereotactic Radiosurgery (SRS); Proton therapy; Image-Guided Radiation therapy (IGRT); Adaptive Radiation therapy (ART)

Introduction

Radiation therapy, a cornerstone in cancer treatment, utilizes ionizing radiation to target and destroy cancer cells. Its efficacy in reducing tumor burden and improving survival rates has been established across various malignancies [1]. However, advancements in radiation therapy techniques and technologies continuously refine its precision and effectiveness, offering new avenues for enhancing patient outcomes. Radiation therapy, also known as radiotherapy, is a cornerstone in the treatment of cancer [2]. It involves the controlled use of high-energy radiation to target and destroy cancer cells while minimizing damage to surrounding healthy tissue. Radiation therapy can be delivered externally, using machines that aim beams of radiation at the tumor from outside the body, or internally, through the placement of radioactive sources directly within or near the tumor site [3]. Over the decades, radiation therapy has evolved significantly, with advancements in technology, treatment planning, and delivery techniques, allowing for more precise and effective tumor targeting. It plays a crucial role in both curative and palliative settings, offering the potential to shrink tumors, alleviate symptoms, and improve quality of life for cancer patients [4]. As a key component of multidisciplinary cancer care, radiation therapy is integrated into treatment plans alongside surgery, chemotherapy, and other modalities, contributing to comprehensive and personalized approaches to cancer management.

Methodology

The methodology section outlines the diverse approaches and modalities employed in radiation therapy. It encompasses traditional techniques such as external beam radiation therapy (EBRT) and brachytherapy, as well as cutting-edge methods like intensity-modulated radiation therapy (IMRT), stereotactic radiosurgery (SRS), and proton therapy [5,6]. Additionally, it discusses the role of imaging modalities, treatment planning systems, and quality assurance protocols in ensuring accurate delivery of radiation doses while minimizing damage to surrounding healthy tissues.

Results and Discussion

The results and discussion section evaluates the clinical outcomes and technical advancements achieved through radiation therapy [7].

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