

Carbon ion radiotherapy (CIRT): A highly interdisciplinary approach can overcome the hurdles in cancer treatment

Cancer is one of the leading death-causing diseases worldwide. Despite advancements in surgery, chemotherapy, radiotherapy, radiochemotherapy, and immunotherapy, Carbon Ion Radiotherapy (CIRT) is becoming very promising for the treatment of cancers, especially certain unresectable, chemoresistant, and radioresistant hypoxic tumors. Being the particle nature the CIRT has several inherent advantages over photon therapy like excellent dose localization due to characteristic Bragg's peak, lesser lateral scattering, higher relative biological effectiveness (RBE) value, more effective in killing gamma/chemo resistant tumor, effective against hypoxic tumor etc. About 70% of cancer patients are treated with radiotherapy. Both photons and particles are used in radiotherapy. The quality and quantity of cellular damage by the particle are different from that of photon due to the difference in physical nature and the detailed mechanism of cellular signaling/response after exposure to the ion beam is largely unknown. To understand the cellular response and improve the CIRT a highly interdisciplinary approach is required. Precise detection of tumors is associated with the success of treatment in radiotherapy. Computed tomography (CT), magnetic resonance imaging (MRI), single-photon emission computed tomography (SPECT), positron emission tomography (PET) etc are used for 3-D location of the deep-seated tumor. Furthermore, tremendous advancements have been done to treat movable targets like tumors in lungs using the respiratory-gated carbon-ion scanning radiotherapy. So, expertise in Imaging Techniques, Medical Physics, and Nuclear Physics is extremely important for a successful CIRT. Lastly, understanding the biology of cancer is of utmost importance. The cancer cells are highly heterogeneous and the genetic setup varies from patient to

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