

The Art and Science of Radiation Oncology

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Ever since the discovery of X-rays by Rontgen in 1895 and radioactivity by Curie in 1896, curiosity to apply this new science in medicine grappled many. Only one year later, X-ray was used therapeutically by Grubbe to treat breast cancer.

These electromagnetic waves being invisible and causes lethal genetic damage is the science and its use for killing cancer cells is the art. Because this art was not known initially, the inventor herself died of the toxicities, thereby highlighting importance of protection and safety aspect.

The science has moved from the era of Radium to Cobalt-60 to Linear Accelerator. Modern day radiation therapy banks upon a balanced use of external beam radiation therapy (EBRT) and brachytherapy. Even complex EBRT plans are executed with the help of conformal techniques such as Intensity Modulation Radiation Therapy [IMRT], Volume Modulated Arc Therapy [VMAT], Stereotactic Radio-Surgery [SRS], Stereotactic Body Radiotherapy [SBRT] taking help of Image Guidance and equipment like Gamma Knife, Cyber Knife (Robotic radiotherapy), Tomotherapy etc. to further improve accuracy.

Radiation treatment with proton beam and particle beam therapy has opened up a new dimension challenging medical physics and radio-biology with a promise to improve outcome in specific scenario. In spite of these developments, re-irradiation still remains a problem across globe.

Brachytherapy has been evolved through Low Dose Rate (LDR) to Moderate Dose Rate (MDR) to after-loading High Dose Rate [HDR] sources with various types of applicators and image guided three-dimensional treatment planning.

As we move from conventional to conformal delivery of radiation to the tumor, the art of radiation planning, beam shaping and isolating critical structures from radiation field has become very pertinent. It can be aptly said that "A well planned conventional planning is always better than a badly conceived conformal one". Mostly radiation accompaniments are irreversible in nature, thereby quality assurance (QA) of the machine and optimization of conformal has to be performed on regular basis. In the interest of patient safety, the concept of radiation audit is gradually creeping into the subject. Spectrum of application of radiation not only involves almost all sites and types of malignancies, it also has a pronounced role in definitive, adjuvant as well as palliative settings. Many be-

nign clinical conditions demand service of radiation while a stroll in to past reminds of experimentation of radiation in conditions such as Tuberculosis, Psoriasis etc.

In India, patient to radiation machine ratio being abysmally disproportionate, situation is gradually improving. Radiation facilities are concentrated in and around big cities, which need further penetration in addition to production of qualified manpower in tandem with changing technology.

Since then the curriculum has been developing from radiotherapy to clinical oncology to radiation oncology in various parts of the world. In India nearly two-thirds of all cancer patients with need radiation therapy either alone or in combination with other modalities during the course of their management justifying recent change of the nomenclature from Radiotherapy to Radiation Oncology.

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