



ADVANCED RADIOTHERAPY TECHNIQUES

1. INTRODUCTION TO MODERN RADIOTHERAPY TECHNIQUES

Q. How do Modern Radiotherapy Techniques optimise cancer outcomes?

- **Reduce side effects** eg IMRT reduces dryness of mouth in head-neck cancer
- **Enable superior tumor control** eg IMRT & IGRT allow delivery of higher doses leading to superior disease control in prostate cancer
- **Provide disease control solutions in innovative treatment settings**, eg SBRT for hepatocellular carcinoma

IMRT

- **Highly conformal** dose distribution=treatment dose fits on the target & spares normal tissue as far as possible
- **Inverse Planning**= physician is able to specify desired dose-constraints to the target & normal tissues

VMAT /Rapid Arc

- VMAT =more sophisticated form of IMRT
- Comparatively much **faster** treatment delivery , within 2-2.5 minutes.
- Faster treatment minimises patient movement & maximises comfort.

IGRT

- Imaging done in the treatment room for more **accurate treatment delivery**.
- IGRT is mainly to ensure accurate patient positioning and overcoming problems due to organ motion.
- IGRT most commonly uses kv Xray imagers orthogonally mounted on the gantry of the linear accelerator for ensuring accuracy of treatment

Stereotactic radiotherapy

- Stereotaxy =**extremely accurate** localisation of a point in space
- Stereotactic radiotherapy =technique of **extremely focused** radiotherapy
- Small number of fractions (**1-5**), with large dose/fraction (>4Gy/#)



- **Higher biologically effective dose**
- The effect of stereotactic radiotherapy is akin to surgery.

Uses of Stereotactic Radiosurgery:

Most useful for treatment of a small target, adjacent to vital areas, to a dose much higher than the tolerance dose of nearby structures.

➤ **Benign tumours**

- Arterio-venous malformations
- Craniopharyngeoma
- Pituitary adenoma
- Acoustic neuroma

➤ **Brain metastases**

Stereotactic body radiotherapy (SBRT)

- SBRT is done for tumours of the **lung, liver, pancreas, prostate & spine**
- More feasible than surgery for patients with poorer performance status / less accessible lesions

2. VITAL BEAM

- At SGCCRI, Thakurpukur, we have been installing our state-of-the-art linear accelerator, the Varian Vital Beam, capable of IMRT, IGRT, SRS and SBRT.
- CSR from Coal India Limited

Components

- Photon beams-6MV & 15MV
- Unflattened photon beam-6X
- Electron beams-6 energies
- 120-leaf Millennium MLCs
- High Dose Rate mode



- Electron Portal Imaging Device
- On-Board Imager

Capabilities

- Conventional RT
- 3D conformal RT
- Electron Beam therapy
- IMRT
- Rapid Arc
- IGRT (2D-MV)
- IGRT (2D-KV, 3D)
- TBI
- TSET
- SRS/SRT (cranial)
- SBRT