

Case of the Week

STEREOTACTIC BODY RADIATION THERAPY (SBRT) FOR LUNG CANCER – A CLINICAL CASE SCENARIO

Stereotactic Radiation Therapy is a highly specialized technique of External Beam Radiation Therapy where in a very high dose of Radiation is delivered to a target / tumor from various directions in a stereotactic manner with a very high level of accuracy and precision usually with help of some form of Image Guidance in a very limited number of sittings. It delivers a highly focused radiation treatment that gives an intense dose of radiation concentrated on a tumor, while limiting the dose to the surrounding normal organs. When such a treatment is planned for a target in the Central Nervous System (CNS) it is called Stereotactic Radio Surgery (SRS). This is indicated for various benign & malignant tumours as well as for some functional conditions / irregularities of the brain. On the other hand when such a treatment is planned for a tumour situated extra cranially it is called as Stereotactic Body Radiation Therapy (SBRT) also known as Stereotactic Ablative Radiotherapy (SABRA). Conventional Radiotherapy treatment is delivered over a period of 6-7 weeks on an average, treatment being delivered 5 days a week (Monday – Friday). Whereas SBRT treatment is delivered in 1-5 Fractions / sittings.

A 52-year-old male with a good general condition, initially presented in August 2018 as Metastatic Carcinoma of Right Lung. Biopsy from the lung mass was called as Non-Small Cell Lung Cancer – favouring Squamous Cell histology. He was treated with Chemotherapy with Carboplatin + Paclitaxel till November 2019. Subsequently he developed Brain Metastases (n=2) which were treated with SRS.

He was then started on Immunotherapy with Pembrolizumab which he is continuing till date. A PET-CT scan done in an interim period showed a Complete Metabolic Response. But a subsequent PET-CT scan done in June 2020 revealed an FDG avid spiculated soft tissue mass lesion in upper lobe of right lung - 2.3x1.6x2.4 cm lesion (SUVmax-22.86) abutting the upper lobe bronchus with no evidence of any metabolically active disease anywhere else. So it was labelled as a Locally Progressive disease. In view of that he was planned for SBRT to the Right lung lesion.

Procedure & Planning: Thoracic region was immobilized with help of Vacuum Bag (Vaclok) with patient in supine position. Radiation planning 4-dimensional - CT (4-DCT) scan was done with non-ionic contrast. CT & PET scan image fusion, Localization & Target Volume delineation were done in Treatment Planning Work Station (Eclipse). Internal Target Volume (ITV) & all Organs at Risk were delineated as per Standard Guidelines on 4D CT scans. The ITV approach is one of the main respiratory motion – management strategies under free breathing. The Planning Target Volume (PTV) was generated from ITV with 5 mm margin & edited accordingly. Daily patient positioning was accomplished with Cone Beam CT (CBCT) scan. The treatment was delivered with Coplanar Volumetric Arc Technique (VMAT). Treatment was delivered in Linear Accelerator with Photons. Treatment was done on alternate days. **The total dose delivered was 60 Gray / in 5 Fractions (@ 12 Gy / Fraction).**

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Figure-1: CT scan & PET scan Fusion for Target Volume delineation

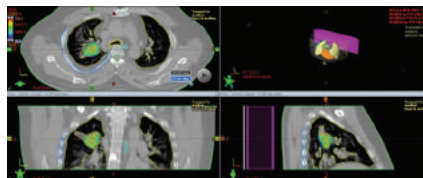


Figure 2: SBRT Planning

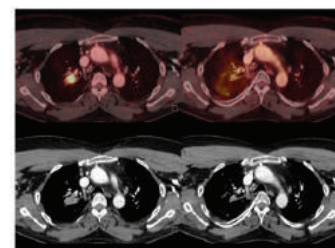


Figure 3: PET –CT scan at 6 months post SBRT: Images on Right – Pre –SBRT & Images on Left – Post-SBRT

PET-CT scan done 6 months post completion of SBRT treatment revealed a complete metabolic response to the treatment site.

Conclusion: SBRT delivers a very high Biologically Effective dose to a target with minimal toxicity achieving excellent clinical response. It has become a treatment of choice

for many people with limited volume tumours for whom surgery may not be an optimal treatment. Worldwide there is an ever increasing clinical experience of treating tumours throughout the body, that include head and neck, thorax, abdomen (liver, pancreas, adrenal), prostate, pelvis and bone lesions.

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