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Stereotactic Body Radiotherapy in Primary and Metastatic Lung Tumors – 14-year experience of Tertiary Cancer Center of India

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Abstract
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Abstract

Objectives:

Primary early-stage medically inoperable lung tumors and lung metastases are frequently treated with Stereotactic Body Radiation Therapy (SBRT). In this retrospective study, we analyzed local control, survival outcomes, and toxicities of lung tumors both primary and metastases treated with SBRT at our tertiary cancer center.

Methods:

In this retrospective study, from January 2008 to Aug 2022, we treated 161 patients with either primary lung (PL) tumors (n=100) or lung metastases (LM) (n=61). From Jan 2012, all patients underwent four-dimensional CT scans to evaluate the tumor motion for Internal target volume generation. All patients were either treated with three-dimensional conformal radiotherapy (3D-CRT), Intensity Modulated RT (IMRT), or Volumetric Modulated Arc Therapy (VMAT). Post RT, patients were followed up every 3 months for 1st year and 6 months thereafter with contrast-enhanced CT Thorax. Any suspicious local recurrence was either proven with biopsy or confirmed radiologically on follow-up scans. Overall Survival (OS) and Progression Free Survival (PFS) were calculated from the date of diagnosis till the date of death or progression/death, respectively. Local control was calculated as the absence of any local failure/progression at the treated lung lesion. Survival analyses were performed with the Kaplan-Meier method and a p-value of < 0.05 were considered statistically significant.

Results:

A total of 169 lung lesions in 161 patients were treated with SBRT. One hundred patients had PL tumors and 61 had LM. The median age was 64, (range,23-88), and the majority were males (70%). The median tumor size of PL and LM was 3.3 cm (1.1-7.6 cm) and 2.3 cm (0.8-6.5 cm), respectively. For PL tumors, adenocarcinoma was seen in 58%, and in LM, the most common histology was adenocarcinoma from lung primary (50%). Of 161, 89 were peripheral in location, central - 36, and ultra-central-38. The median SBRT dose and dose per fraction for all patients was 60Gy (range, 18-60Gy) & 8Gy (4-20), Peripheral were 60Gy (48-60) & 12Gy (6-20), Central were 60Gy (48-60) & 7.5Gy (5-12), and ultra-central were 50Gy (36-60) & 6Gy (4-12). The median follow-up was 36 months (range, 2-160). The local control for PL at 3 years was 97.3% and for LM was 88.6%. Local failure was observed in 5 patients (3%). Regional relapse was observed in 17 (10.5%) (PL-11, LM-6) patients. Fifty-three patients (33%) (P=28, M=25) developed distant metastases. For PL, PFS at 2 and 4-year were 42% & 35%, OS were 60% & 36%, loco-regional failure FS were 70% & 52%, respectively and for LM, OS were 42% & 32%, PFS were 34% & 23%, respectively.
No grade ≥2 toxicities of cough and esophagitis were reported at 1 yr, however, radiation pneumonitis was seen in 5%. Seven patients (4.3%) died within 90 days of RT starting, all had pulmonary or cardiac co-morbidities (C-3, UC-3, P-1). There was a significant difference in OS of patients treated between 2008-2015 vs 2016 onwards, with a median OS of 17.3 vs 36.6, p=0.00, with a significant difference in delivered biologically effective dose (BED), (p=0.00).

Conclusion(s):

SBRT has shown comparable survival outcomes and minimal ⩾grade2 toxicities (5%) as per the reported literature. There exists a significant survival difference between the early and later SBRT-treated period possibly suggesting an appropriate patient selection and total delivered BED are the key factors for improved outcomes.