Stereotactic Body Radiation Therapy (SBRT) for Treatment of Lung Cancer

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Introduction

• What is SBRT?

- SBRT is a form of external beam radiation therapy that provides noninvasive cancer treatment (Wei et al., 2022).

• "SBRT delivers a hypofractionated dose to the target volume while sparing surrounding tissue" (Kessel et al., 2020, p. 2).

• SBRT is well known for achieving excellent local tumor control (Kennedy et al., 2019).

• Lung cancer information

• More than half of all cancer patients experience lung metastases (Kessel et al., 2020).

• SBRT may not be a favorable choice for all lung cancers. Tumors located within close proximity to important structures such as the main bronchus can lead to high-grade toxicity reactions (Lindberg et al., 2021).

• Why use SBRT for treatment of lung cancer?

• "In cases where surgery cannot be performed due to the irresectability of the tumor, insufficient medical patient conditions, or patient refusal, stereotactic body radiation therapy (SBRT) reveals a noninvasive alternative treatment" (Kessel et al., 2020, p. 2).

• With high rates of local tumor control and minimal toxicity, SBRT provides a promising cancer treatment option to lung cancer patients (Wei et al., 2022).

• SBRT has shorter treatment times and improved survival rates in lung cancer patients as opposed to conventionally fractionated radiation therapy (Kennedy et al., 2020).

VMAT VS. IMRT

- **Volumetric modulated arc therapy (VMAT)**

• Irradiates cancerous tumor from many incident angles, which may cause an increase in unnecessary dose to the lung outside of the treatment volume

• Treatment delivery times are 70% less than those of IMRT treatments.

• Weakened conformity in comparison to intensity modulated radiation therapy (IMRT) and increased dose delivery accuracy

• Intensity modulated radiation therapy (IMRT)

• IMRT treatments report higher doses to the spinal cord, skin, and esophagus than VMAT treatments.

• Flatter dose fall-off curve than that of VMAT treatment

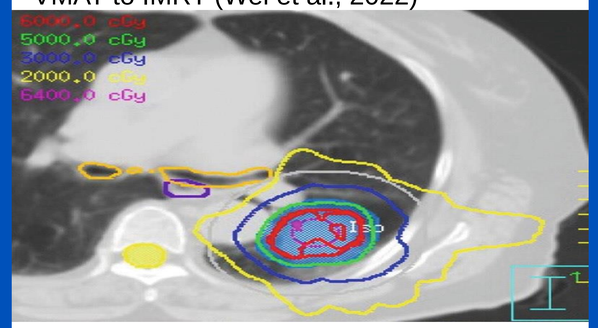
• Better homogeneity and increased pulmonary toxicity

• Similarities

• Doses to the ribs do not demonstrate mentionable difference between VMAT and IMRT treatment types.

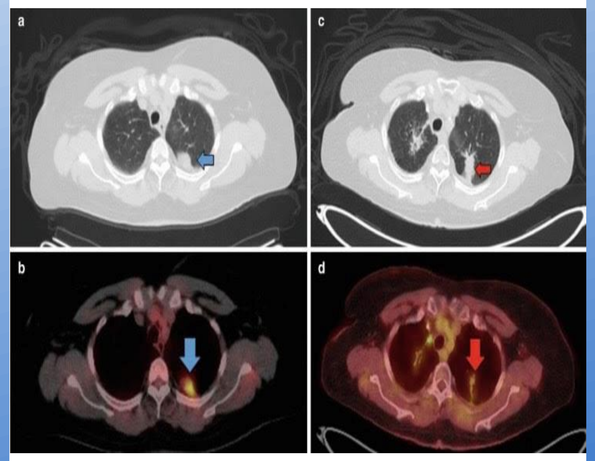
• Dose fall-off trends become very similar between both treatment types as the distance from the primary treatment volume (PTV) increases.

• No difference in PTV conformity from VMAT to IMRT (Wei et al., 2022)



The treatment area with isodose lines that are color-coordinated according to the dose of the area. (Trifletti, Chao, Sahgal, & Sheehan, 2019, p. 610)

SBRT of Lung Metastases



Pre and post SBRT cross sectional lung images for comparison. (Trifletti et al., 2019, p. 605)

- **Outcomes**

• Patients who did not receive chemotherapy but received higher dose SBRT lived longer.

• 69.9% of patients with lung metastases treated with SBRT passed away in the study conducted between 2004 and 2019.

• The overall survival rate was found to have a median of 27.6 months.

• Severe dyspnea was a common complaint of patients post-SBRT.

• Dyspnea was linked to chronic obstructive pulmonary disease (COPD) as all patients who reported it were also diagnosed with COPD prior to treatment.

• Toxicity

• Most documented toxicity is below stage 3.

• "Acute symptomatic pneumonitis grade 2 was observed in 9.7% (20/207), as grade 3 in 0.5% (1/207)" (p. 1).

• 6.2% of patients experienced late pneumonitis.

(Kessel et al., 2020)

Repeat SBRT Treatment

- **Background**

• 10-15% of early-stage non-small cell lung cancer cases treated with SBRT result in local recurrence.

• "Even in initially operable patients treated with upfront SBRT, only approximately 20% of patients with a local recurrence undergo salvage lung resection. Therefore, for the majority of patients, radiotherapy remains the only definitive salvage option in this setting" (p. 233).

• Study

• Median age of study participants is 75.

• Of the participants, 67% initially. received 54 Gy in 3 fractions and 33% initially received 50 Gy in 5 fractions.

• For salvage SBRT, 57% of participants received 50 Gy in 5 fractions and 43% received 54 Gy in 3 fractions.

• Toxicity of salvage SRT

• No toxicity above grade 3 was reported in this study and no toxicity of the esophagus or bronchial tree reported.

• Grade 2 radiation pneumonitis was reported by 2 participants.

• Four participants reported chest wall toxicity, two of these reports were rib fractures.

• Success of salvage SBRT

• In a group of 21 salvage SBRT patients, median survival rate was 39 months.

• Post-salvage estimated primary tumor control success rate was 80%.

• Post-salvage estimated regional node control was 89%.

• Post-salvage overall survival rate was 68%.

(Kennedy et al., 2020, p. 232)

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