

Radiotherapy Guideline for Small Cell Lung Cancer

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RT indication

1. General
 - RT is indicated across all stages of SCLC, for either definitive or palliative purposes.
2. Early-stage (I–IIA, T1–2N0M0)
 - Postoperative RT (PORT): Recommended for pN2, may be considered for pN1.
 - Non-surgical candidates: SABR to the primary tumor, followed by systemic therapy.
3. Limited-stage disease
 - Thoracic RT: Standard combined with chemotherapy.
 - Prophylactic Cranial Irradiation (PCI): Recommended for patients with complete or good response to initial therapy.
4. Extensive-stage disease
 - Consolidative thoracic RT: For selected responders to systemic therapy with residual thoracic disease.
 - PCI: May be considered in responders to systemic therapy.
5. Brain metastases
 - Typically WBRT; SRT/SRS for selected patients with limited lesions.
6. Palliative RT:
 - For symptom relief or prevention (e.g., pain, bleeding, obstruction).

Simulation and immobilization

- Simulation should be performed using CT scans obtained in the radiotherapy (RT) treatment position with appropriate immobilization devices. Intravenous (IV) contrast, with or without oral contrast, is recommended whenever possible for patients with central tumors or nodal disease to improve target and organ delineation.
- CT-based treatment planning should employ multiple conformal fields. Advanced techniques such as IMRT (intensity-modulated radiotherapy), VMAT (volumetric-modulated arc therapy), TomoTherapy, or Radixact may be utilized to optimize normal tissue sparing, with appropriate quality assurance (QA) measures and attention to tissue interfraction mobility.

- PET/CT improves target definition accuracy, particularly in cases with significant atelectasis or when IV contrast is contraindicated.
- Tumor and organ motion, especially due to respiration, should be evaluated at simulation. Strategies include fluoroscopy, inhale/exhale or slow-scan CT, or ideally, 4D-CT to better characterize motion.

Field design and treatment volume

- Target volumes should be defined for 3D-CRT (three-dimensional conformal radiotherapy), IMRT (intensity-modulated radiotherapy), VMAT (volumetric-modulated arc therapy), TomoTherapy, and Radixact according to standard oncologic and imaging principles.
- GTV (gross tumor volume): the visible or demonstrable extent of disease (primary and nodal) based on imaging and pathology.
- iGTV (internal gross tumor volume): generated from 4D-CT or motion-inclusive imaging by encompassing the GTV across all respiratory phases, thereby accounting for tumor motion.
- CTV (clinical target volume): includes the iGTV plus regions at risk of microscopic spread.
- PTV (planning target volume): adds a setup margin to the CTV to account for daily positioning error and mechanical variability.

Dose prescriptions

1. Limited-stage thoracic RT
 - Once-daily (QD): 60–70 Gy in conventional fractions (1.8–2.2 Gy per fraction).
 - Twice-daily (BID): 45 Gy in 30 fractions (1.5 Gy BID over 3 weeks, with ≥ 6 hours interfraction interval).
 - Both schedules are acceptable; regimen selection depends on institutional practice and patient condition.
2. Consolidative thoracic RT (extensive-stage responders)
 - Individualized dosing within 30 Gy in 10 fractions to 60 Gy in 30 fractions (1.8–2.2 Gy per fraction).
3. Prophylactic Cranial Irradiation (PCI)

- 25 Gy in 10 fractions (2.5 Gy per fraction).
 - 20 Gy in 5 fractions may be considered in extensive-stage patients or those with limited prognosis.
4. Whole-brain Radiotherapy (WBRT)
- Standard regimens: 30 Gy in 10 fractions; 20 Gy in 5 fractions.
 - Other accepted regimens: 37.5 Gy in 15 fractions; 40 Gy in 20 fractions; 25 Gy in 10 fractions; 8 Gy in 1 fraction (pure palliation).
 - For patients with better prognosis (≥ 4 months), hippocampal-sparing WBRT using IMRT, VMAT, TomoTherapy, or Radixact may be considered.
5. Palliative RT (non-cranial metastases)
- Common regimens: 30 Gy in 10 fractions, 20 Gy in 5 fractions, 8 Gy in 1 fraction.

Constraints for organ at risk

- Normal organ dose responses from the QUANTEC project.

Reference

- NCCN Practice Guidelines in Oncology, 2024
- Perez and Brady's : Principles and Practice of Radiation Oncology, 7th ed, 2018
- Eric K. Hansen, Handbook of Evidence-Based Radiation Oncology