ROLE OF RADIOTHERAPY IN EXTENSIVE STAGE SCLC (INCLUDING PCI)

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SCLC : INTRODUCTION

- Small cell lung cancer (SCLC) is a highly metastatic & recalcitrant
- 13-15% of lung cancers
- Neuroendocrine origin
- At presentation 60-70% have metastatic disease
- Strongest association with cigarette smoking
- Characterized by loss of tumor suppressor genes TP53 & RB1
- Very rapid tumor doubling time of 25-217 days

SCLC INVESTIGATIONS

Table 1. Diagnostic and staging work-up of SCLC

History and clinical examination
Medical history (including smoking history and comorbidities)
PS
Physical examination
Assessment of paraneoplastic syndromes (especially when initiating immunotherapy)
Laboratory analysis
CBC, liver enzymes, sodium, potassium, calcium, glucose, LDH and renal functions tests should be carried out
Imaging
CT of the thorax and abdomen should be carried out in all patients; an FDG—PET—CT is optional
In case of a suspicion of bone metastasis and no other metastasis, a bone scintigraphy should be carried out unless FDG—PET is available
Imaging of the brain (preferably MRI) is mandated in patients with stage I-III disease
MRI of the brain is recommended for patients with stage IV disease who are eligible for PCI but who choose not to undergo PCI
Tumour biopsy
A diagnosis of SCLC is preferably assessed based on histological examination of a biopsy
In case of planned surgery, invasive mediastinal staging is required
Functional assessment
Pulmonary function testing (FEV1, VC, DLCO) is required for patients with stage I-III SCLC who are candidates for surgery or RT
VO2 max assessment by cycle ergometry should be carried out if surgery is planned when pulmonary function tests are limited

STAGING:VALSG

Table 1: VALSG Staging System
LS-SCLC
Confined to a single radiation port
Confined to the ipsilateral mediastinum
Ipsilateral mediastinal or supraclavicular lymph nodes
ES-SCLC
Not confined to a single radiation port
Contralateral mediastinal or supraclavicular lymph nodes
Malignant pleural or pericardial effusion
Metastatic disease

Table 2: Modified VALSG Staging System
LS-SCLC
Confined to a single radiation port
Ipsilateral mediastinal or supraclavicular lymph nodes
Contralateral mediastinal or supraclavicular lymph nodes
Ipsilateral pleural effusions (benign or malignant)
ES-SCLC
Not confined to a single radiation port
Metastatic disease

Zelen M :Cancer Chemother Rep 1973:31-42

STAGING : AJCC 2018 (TNM)

- AJCC 8th Edition 2018 applies to staging SCLC as well

T Category	T Criteria
TX	Primary tumor cannot be assessed, or tumor proven by the presence of malignant cells in sputum or bronchial washings but not visualized by imaging or bronchoscopy
T0	No evidence of primary tumor
Tis	Carcinoma *in situ* Squamous cell carcinoma *in situ* (SCIS) Adenocarcinoma *in situ* (AIS): adenocarcinoma with pure lepidic pattern, ≤3 cm in greatest dimension
T1	Tumor ≤3 cm in greatest dimension, surrounded by lung or visceral pleura, without bronchoscopic evidence of invasion more proximal than the lobar bronchus (i.e., not in the main bronchus)
T1mi	Minimally invasive adenocarcinoma: adenocarcinoma (≤3 cm in greatest dimension) with a predominantly lepidic pattern and ≤5 mm invasion in greatest dimension
T1a	Tumor ≤1 cm in greatest dimension. A superficial, spreading tumor of any size whose invasive component is limited to the bronchial wall and may extend proximal to the main bronchus also is classified as T1a, but these tumors are uncommon.
T1b	Tumor >1 cm but ≤2 cm in greatest dimension
T1c	Tumor >2 cm but ≤3 cm in greatest dimension
T2	Tumor >3 cm but ≤5 cm or having any of the following features: • Involves the main bronchus regardless of distance to the carina, but without involvement of the carina • Invades visceral pleura (PL1 or PL2) • Associated with atelectasis or obstructive pneumonitis that extends to the hilar region, involving part or all of the lung T2 tumors with these features are classified as T2a if ≤4 cm or if the size cannot be determined and T2b if >4 cm but ≤5 cm.
T2a	Tumor >3 cm but ≤4 cm in greatest dimension
T2b	Tumor >4 cm but ≤5 cm in greatest dimension
T3	Tumor >5 cm but ≤7 cm in greatest dimension or directly invading any of the following: parietal pleura (PL3), chest wall (including superior sulcus tumors), phrenic nerve, parietal pericardium; or separate tumor nodule(s) in the same lobe as the primary
T4	Tumor >7 cm or tumor of any size invading one or more of the following: diaphragm, mediastinum, heart, great vessels, trachea, recurrent laryngeal nerve, esophagus, vertebral body, or carina; separate tumor nodule(s) in an ipsilateral lobe different from that of the primary

N Category	N Criteria
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in ipsilateral peribronchial and/or ipsilateral hilar lymph nodes and intrapulmonary nodes, including involvement by direct extension
N2	Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s)
N3	Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene, or supraclavicular lymph node(s)

Definition of Distant Metastasis (M)

M Category	M Criteria
M0	No distant metastasis
M1	Distant metastasis
M1a	Separate tumor nodule(s) in a contralateral lobe; tumor with pleural or pericardial nodules or malignant pleural or pericardial effusion. Most pleural (pericardial) effusions with lung cancer are a result of the tumor. In a few patients, however, multiple microscopic examinations of pleural (pericardial) fluid are negative for tumor, and the fluid is nonbloody and not an exudate. If these elements and clinical judgment dictate that the effusion is not related to the tumor, the effusion should be excluded as a staging descriptor.
M1b	Single extrathoracic metastasis in a single organ (including involvement of a single nonregional node)
M1c	Multiple extrathoracic metastases in a single organ or in multiple organs

AJCC PROGNOSTIC STAGE GROUPS

When T is…	And N is…	And M is…	Then the stage group is…
TX	N0	M0	Occult carcinoma
Tis	N0	M0	0
T1mi	N0	M0	IA1
T1a	N0	M0	IA1
T1a	N1	M0	IIB
T1a	N2	M0	IIIA
T1a	N3	M0	IIIB
T1b	N0	M0	IA2
T1b	N1	M0	IIB
T1b	N2	M0	IIIA
T1b	N3	M0	IIIB
T1c	N0	M0	IA3
T1c	N1	M0	IIB
T1c	N2	M0	IIIA
T1c	N3	M0	IIIB
T2a	N0	M0	IB
T2a	N1	M0	IIB
T2a	N2	M0	IIIA
T2a	N3	M0	IIIB
T2b	N0	M0	IIA
T2b	N1	M0	IIB
T2b	N2	M0	IIIA
T2b	N3	M0	IIIB
T3	N0	M0	IIB
T3	N1	M0	IIIA
T3	N2	M0	IIIB
T3	N3	M0	IIIC
T4	N0	M0	IIIA
T4	N1	M0	IIIA
T4	N2	M0	IIIB
T4	N3	M0	IIIC
Any T	Any N	M1a	IVA
Any T	Any N	M1b	IVA
Any T	Any N	M1c	IVB

ROLE OF RADIOTHERAPY
ES - SCLC

ES-SCLC: CHEMOTHERAPY

PRIMARY THERAPY FOR EXTENSIVE-STAGE SCLC:

Four cycles of therapy are recommended, but some patients may receive up to 6 cycles based on response and tolerability after 4 cycles.

Preferred Regimens

- **Carboplatin AUC 5 day 1 and etoposide 100 mg/m² days 1, 2, 3 and atezolizumab 1,200 mg day 1 every 21 days x 4 cycles followed by maintenance atezolizumab 1,200 mg day 1, every 21 days (category 1 for all)[b,5]**
- **Carboplatin AUC 5 day 1 and etoposide 100 mg/m² days 1, 2, 3 and atezolizumab 1,200 mg day 1 every 21 days x 4 cycles followed by maintenance atezolizumab 1,680 mg day 1, every 28 days[b]**
- **Carboplatin AUC 5–6 day 1 and etoposide 80–100 mg/m² days 1, 2, 3 and durvalumab 1,500 mg day 1 every 21 days x 4 cycles followed by maintenance durvalumab 1,500 mg day 1 every 28 days (category 1 for all)[b,6]**
- **Cisplatin 75–80 mg/m² day 1 and etoposide 80–100 mg/m² days 1, 2, 3 and durvalumab 1,500 mg day 1 every 21 days x 4 cycles followed by maintenance durvalumab 1,500 mg day 1 every 28 days (category 1 for all)[b,6]**

Other Recommended Regimens

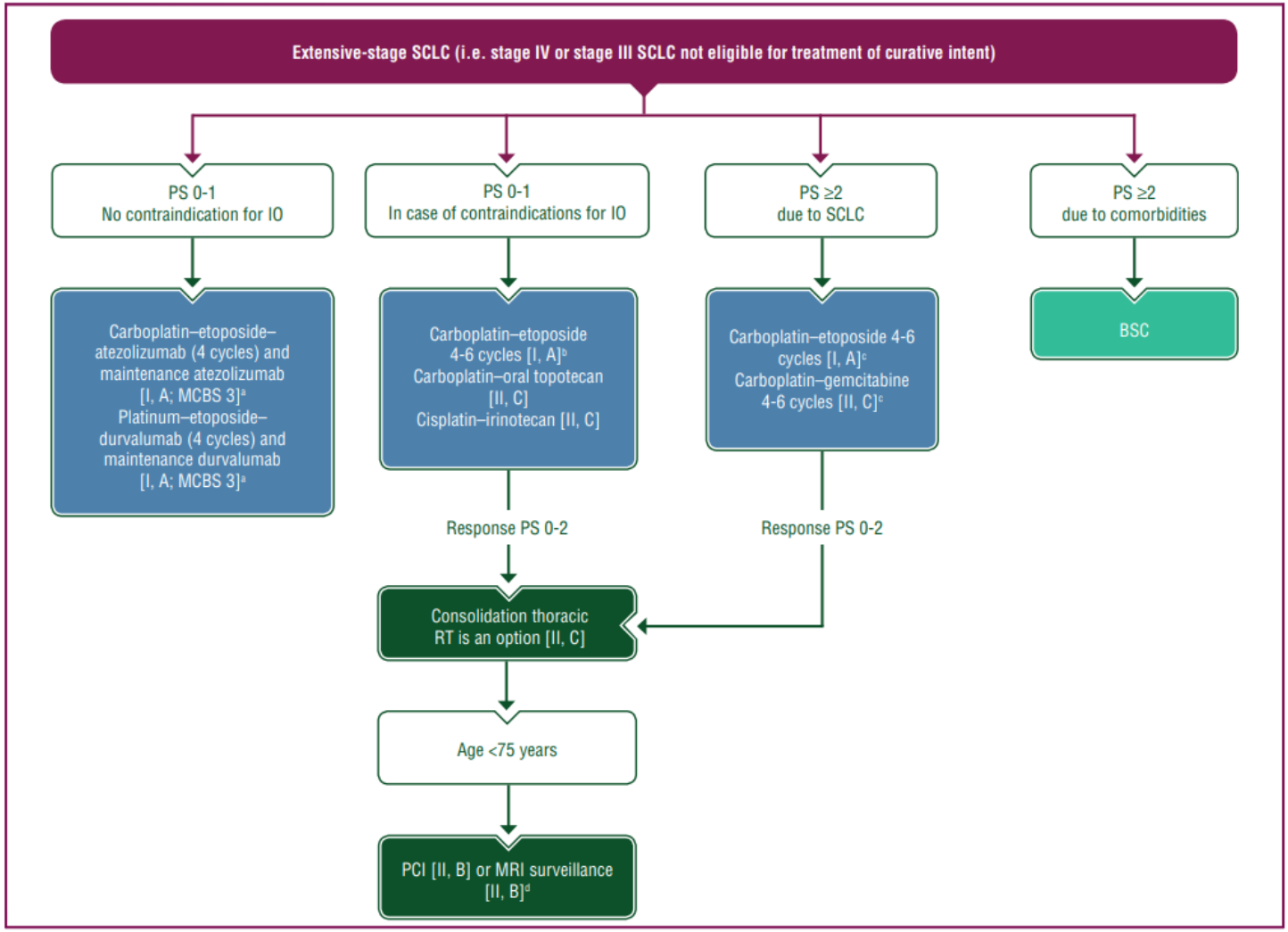
- **Carboplatin AUC 5–6 day 1 and etoposide 100 mg/m² days 1, 2, 3[7]**
- **Cisplatin 75 mg/m² day 1 and etoposide 100 mg/m² days 1, 2, 3[8]**
- **Cisplatin 80 mg/m² day 1 and etoposide 80 mg/m² days 1, 2, 3[9]**
- **Cisplatin 25 mg/m² days 1, 2, 3 and etoposide 100 mg/m² days 1, 2, 3[10]**

Useful In Certain Circumstances

- **Carboplatin AUC 5 day 1 and irinotecan 50 mg/m² days 1, 8, 15[11]**
- **Cisplatin 60 mg/m² day 1 and irinotecan 60 mg/m² days 1, 8, 15[12]**
- **Cisplatin 30 mg/m² days 1, 8 and irinotecan 65 mg/m² days 1, 8[13]**

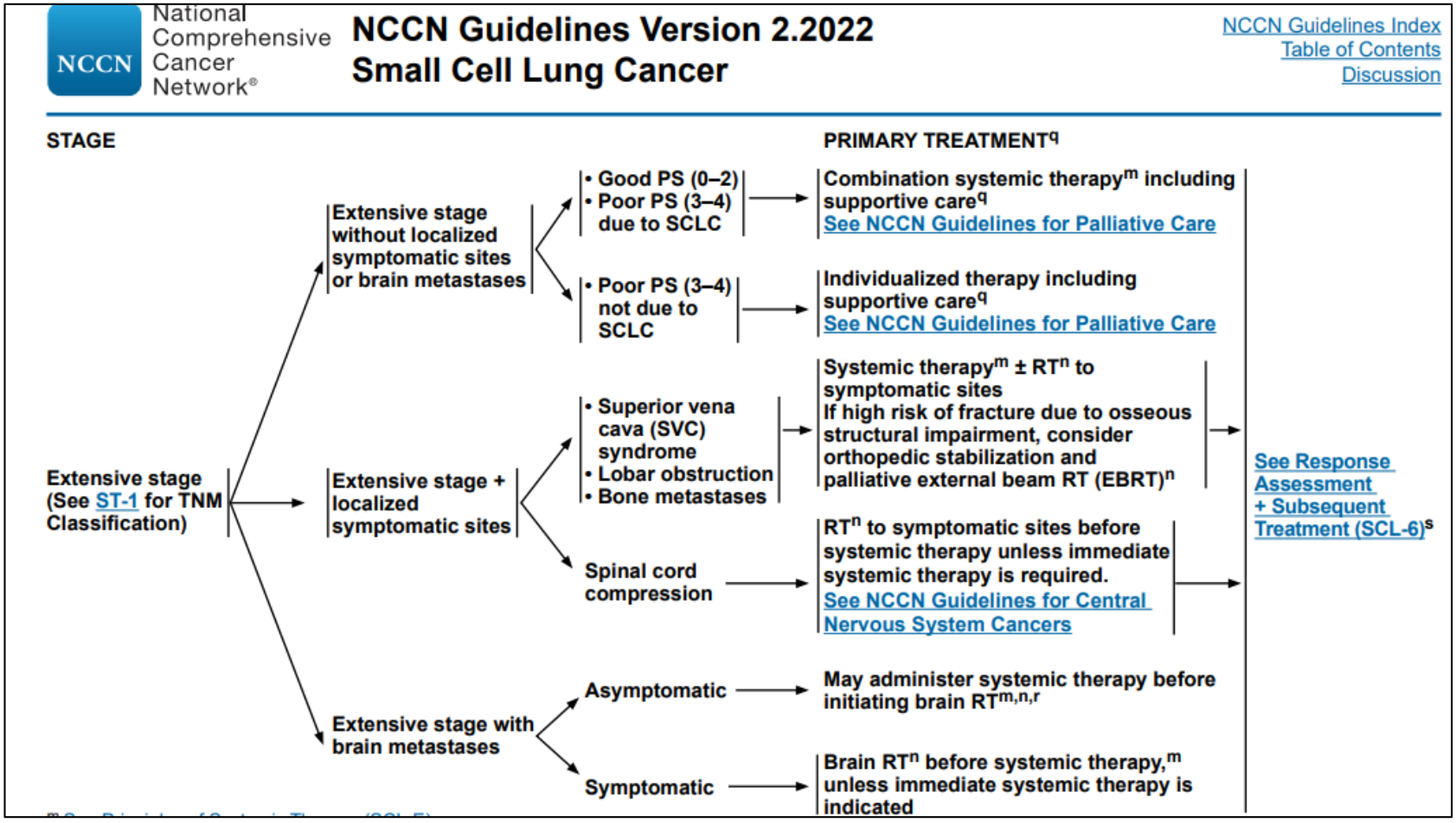
Subsequent Systemic Therapy (SCL-E 2 of 5
Response Assessment (SCL-E 3 of 5
References (SCL-E 4 of 5

ES-SCLC: ROLE OF RADIOTHERAPY



Ann Oncol 2021

ES-SCLC: ROLE OF RADIOTHERAPY



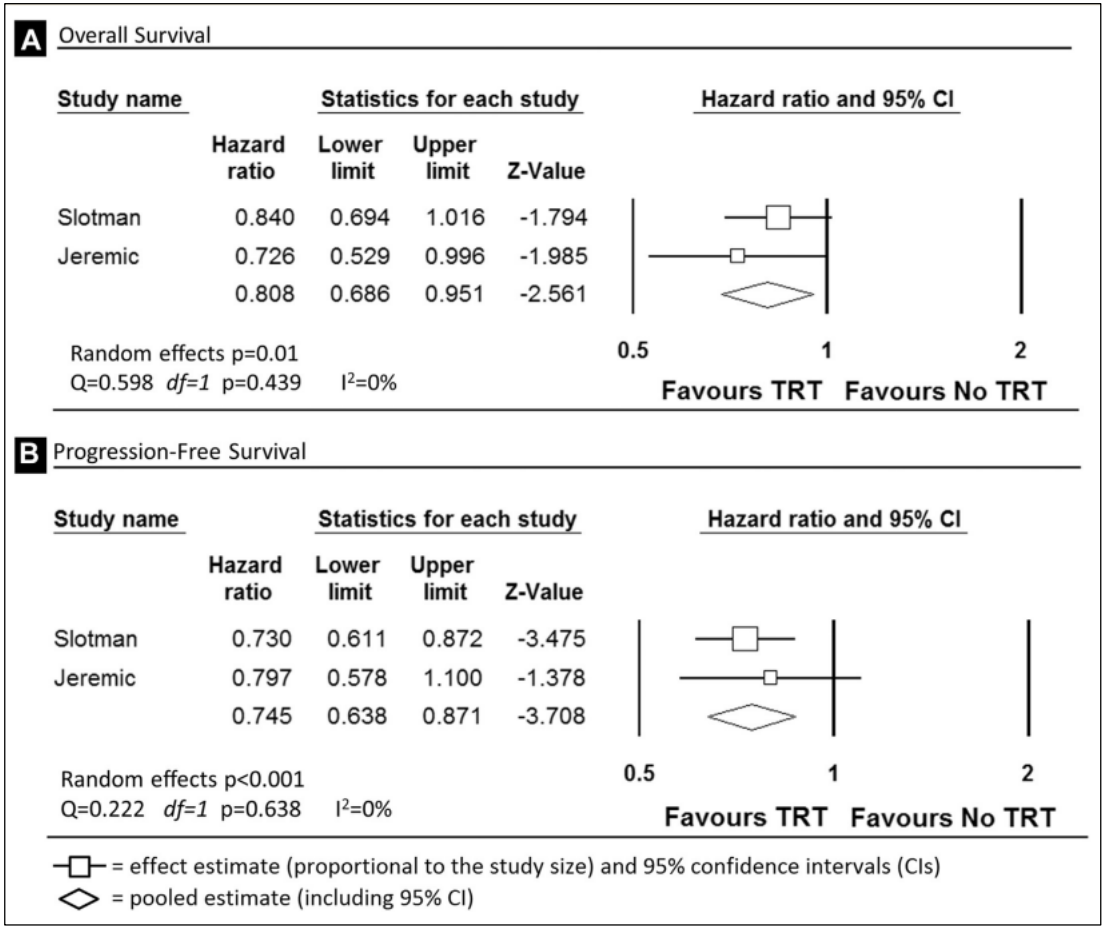
ES SCLC : ROLE OF RADIOTHERAPY

Trial	Years enrolled	Number of patients	Patient selection	Thoracic RT dose scheme	Local control (thorax RT *vs.* no thorax RT)	Progression-free survival (thorax RT *vs.* no thorax RT)	Overall survival (thorax RT *vs.* no thorax RT)
Jeremic *et al.*, 1999	1988 to 1993	109	All patients with ES-SCLC with complete response at metastatic sites and at least partial response in thorax to chemotherapy	54 Gy in 36 BID fractions	5-year LC: 20% *vs.* 8.1% (P=0.06)	1-year PFS: 56% *vs.* 41% (P=0.045)	Median OS (primary outcome): 17 months *vs.* 11 months (P=0.041)
CREST, 2015	2009 to 2012	495	All patients with ES-SCLC with any response to chemotherapy	30 Gy in 10 daily fractions	Crude LC: 56.3% *vs.* 20.2% (P<0.0001)	6-month PFS: 42% *vs.* 7% (P=0.001)	1-year OS (primary outcome): 33% *vs.* 28% (P=0.066); 2-year OS: 13% *vs.* 3% (P=0.004)
RTOG 0937, 2017	2010 to 2016	97	Patients with ES-SCLC with 1–4 extracranial metastases, with any response to chemotherapy	45 Gy in 15 fractions	Not reported	Median PFS: 4.9 months *vs.* 2.9 months (P=0.01)	1-year OS (primary outcome): 50.8% *vs.* 60.1% (P=0.21)

RT, thoracic radiotherapy; ES-SCLC, extensive-stage small cell lung cancer; BID, twice daily; LC, local control; PFS, progression-free survival; OS, overall survival.

Table :Randomized trials of Radiotherapy in Extensive Stage SCLC

ROLE OF RADIOTHERAPY IN ES-SCLC METANALYSIS



Palma DA et al.Clinical Lung Cancer, Vol. 17, No. 4, 239-44

ES-SCLC: PATIENT SELECTION FOR TRT

Recommendations for TRT in fit patients with limited extrathoracic tumour burden, based on overall response to chemotherapy and initial bulky thoracic disease. IASLC – medical oncologists, ESTRO – radiation oncologists.

Thoracic response	Extrathoracic response	Initial bulky disease	IASLC	ESTRO	*p*-value
CR	CR	Yes	62% (8/13)	46% (6/13)	0.69
CR	CR	No	46% (6/13)	38% (5/13)	1
CR	PR	Yes	54% (7/13)	46% (6/13)	1
CR	PR	No	38% (5/13)	38% (5/13)	1
PR	CR	Yes	92% (12/13)	92% (12/13)	1
PR	CR	No	77% (10/13)	92% (12/13)	0.59
PR	PR	Yes	62% (8/13)	92% (12/13)	0.16
PR	PR	No	46% (6/13)	92% (12/13)	**0.013**

bold *p*-value was statistically significant.

- Limited extra thoracic tumor burden
  Maximum 3 hepatic metastasis
  No hepatic metastasis
  Few small metastasis without a numerical cut off

- TRT likely to be recommended

1. Fit patients with good response to chemotherapy
2. Limited extrathoracic tumor burden

- Age not considered a criteria

Putora PM Radiotherapy and Oncology 135 (2019) 74–77

ES-SCLC: PATIENT SELECTION FOR TRT

- Patients with ES-SCLC with a response to chemotherapy alone but residual disease in thorax

- Patients with ES-SCLC with a response to chemotherapy & immunotherapy and residual disease in the thorax

Practical Radiation Oncology (2020) 10, 158-173

ES-SCLC : THORACIC RADIOTHERPY DOSE

- 30 Gy /10#/2weeks

  ES-SCLC with a response to chemotherapy alone & residual disease in thorax is conditionally recommended. (CREST 2015)

- 45 Gy/ 15# daily (RTOG 0937) or

  30-40Gy/10#

- 30 Gy/10#/2 weeks

  ES-SCLC with response to *chemotherapy + immunotherapy* and residual disease in the thorax ,within 6-8 weeks is conditionally recommended

- 54Gy /36# BID (Jeremic et al)

ES-SCLC :DOSE ESCALATION

Lung Cancer 124 (2018) 283–290

Contents lists available at ScienceDirect

Lung Cancer

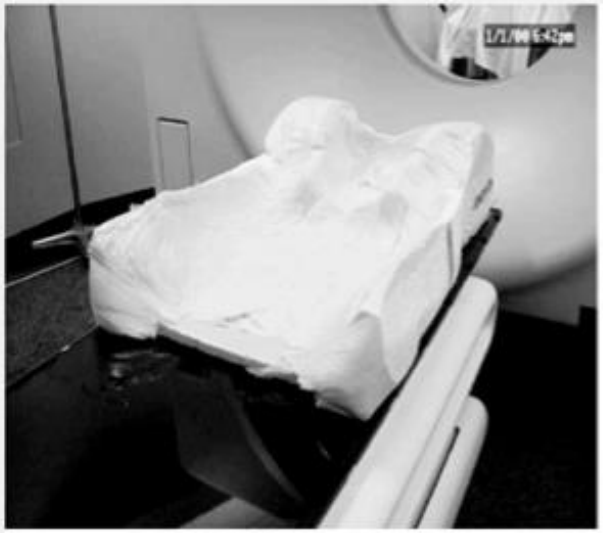
journal homepage: www.elsevier.com/locate/lungcan

Dose escalation and associated predictors of survival with consolidative thoracic radiotherapy in extensive stage small cell lung cancer (SCLC): A National Cancer Database (NCDB) propensity-matched analysis

Shaakir Hasan[a,*], Paul Renz[a], Andrew Turrisi[b], Athanasios Colonias[a], Gene Finley[c], Rodney E. Wegner[a]

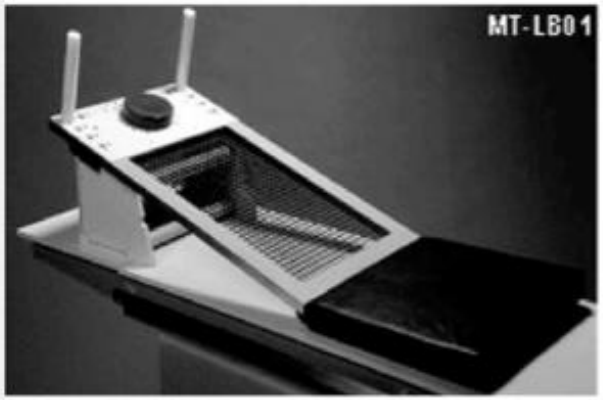
- Survival at 1 and 2 years for the 45 Gy or higher arm was 58.1% & 25.2% compared to 43.8% and 15.1% for the < 45 Gy arm (P < 0.001)
- Female gender, age < 65, lower comorbidity score, starting TRT 12 weeks after chemotherapy, and the absence of brain/liver/bone metastases (P < 0.01).

ES-SCLC: TREATMENT PLANNING TRT IMMOBILIZATION



Styrofoam cradle

Redifoam cradle



Lung board

Wing board

RADIOTHERAPY TECHNIQUES : CONVENTIONAL

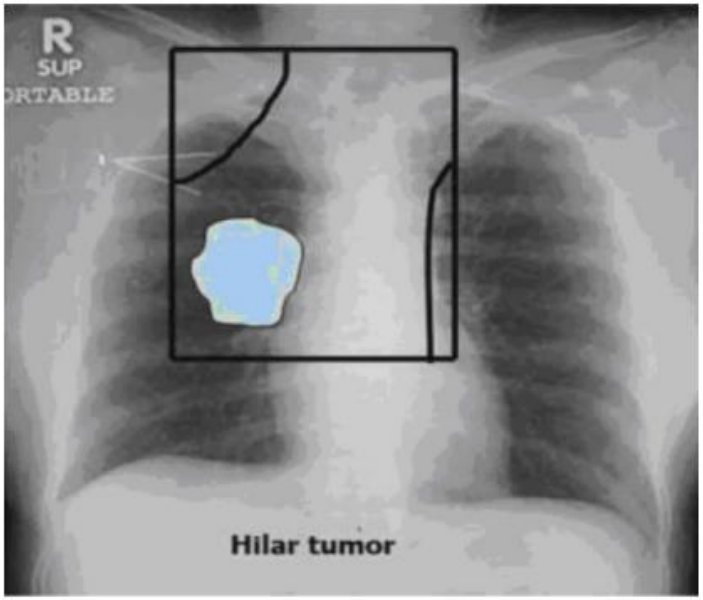


Figure 2 Field borders for hilar tumors.

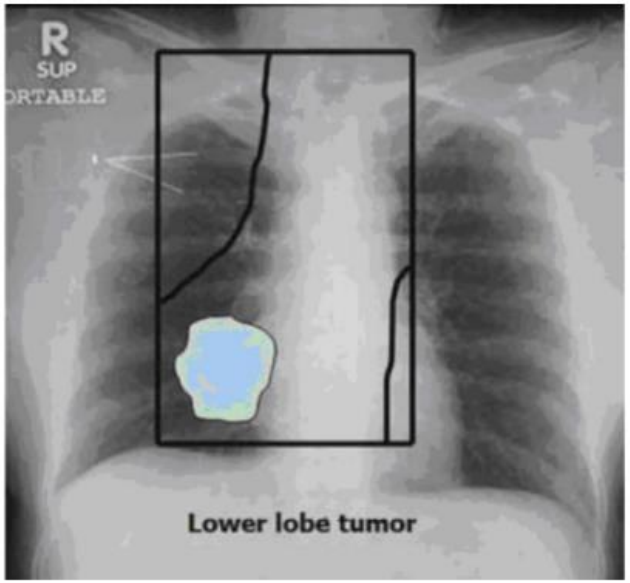


Figure 3 Field borders for lower lobe tumors.

RADIOTHERAPY TECHNIQUES : CONVENTIONAL

- The objective is to treat

1. All gross disease
2. Electively treat the ipsilateral hilum,
3. The mediastinal nodes bilaterally,
4. Ipsilateral supraclavicular area (±)

- First Phase : AP/PA portals 40 Gy/20#/ 4weeks

  Second Phase (off cord boost) : Anterior + Post obliques

ES-SCLC: TREATMENT PLANNING TRT

IMAGING	• Patient will be positioned in an immobilization device in the treatment position on a flat table. • Scans are obtained from the level of the cricoid cartilage and inferiorly through the entire liver for treatment of the primary disease and regional lymphatics. • If infra-diaphragmatic disease is to be treated, the scan will extend through the entire pelvis. • One scan will be used for all treatment planning for proper calculation of cumulative doses to GTV, PTV, and normal tissues.
GTV	• Will include disease as determined by physical examination and post-chemotherapy imaging studies. • Regional thoracic lymph nodes > 1 cm short axis diameter on diagnostic or planning CT or positive on PET will be included in the thoracic GTV and labeled GTVn. If multiple nodes are contoured, they will be distinguished numerically (GTVn1, GTVn2, etc.) • Separate GTVs will be defined for each extra-cranial treatment site. Each GTV should be uniquely identified either by number or treatment site and designated as GTVm

ES-SCLC: TREATMENT PLANNING TRT

CTV	• (CTV) is GTV + 0.5 cm to account for microscopic extension of tumor. CTV=GTV plus 0-1.0 cm is allowed. • It is acceptable to have CTV=GTV to protect critical structures. Alternatively for tumors with indistinct margins, CTV=GTV+1.0 cm may be preferred. • For patients that have had a complete response to chemotherapy at the primary site and regional lymphatics, the CTV will be defined as the region of origin of clinically evident disease at diagnosis. • This is not the same as pretreatment volume. For example, if the patient had a 10 cm mediastinal mass that involved the paratracheal and subcarinal lymph nodes and had a complete response to chemotherapy, the CTV would not necessarily be a 10 cm volume but rather a carefully defined volume including the subcarinal and paratracheal tissues
PTV	• (PTV) is the CTV plus a margin to account for treatment set-up uncertainty and motion. In most cases CTV + 1.5 cm=PTV. • For all treatment sites, a 0.5 cm margin should be added to the CTV for set-up uncertainty. A 1 cm margin should be added to the CTV for internal motion if free breathing CTs are used for planning. This may be reduced to 0.5 cm for breath hold or gating techniques or if ITV approach is used to define the GTV through the use of 4DCT.

ES-SCLC: TREATMENT VOLUME

Radiotherapy and Oncology 152 (2020) 89–95

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Original Article

ESTRO ACROP guidelines for target volume definition in the thoracic radiation treatment of small cell lung cancer

Cecile Le Pechoux [a,*], Corinne Faivre-Finn [b], Sara Ramella [c], Fiona McDonald [d], Farkhad Manapov [e], Paul Martin Putora [f,g], Ben Slotman [h], Dirk De Ruysscher [i], Umberto Ricardi [j], Xavier Geets [k], José Belderbos [l], Christoph Pöttgen [m], Rafal Dziadiuszko [n], Stephanie Peeters [i], Yolande Lievens [o], Coen Hurkmans [p], Paul Van Houtte [q], Ursula Nestle [r,s]

- GTVp should include the post-chemotherapy volume .
- CTVn :Hilar & mediastinal nodes rather than lymph node stations that were considered initially involved should also be included in the target volume and delineated as CTVn.
- The volume reduction of lymph nodes should be taken into consideration but the cranio-caudal extent should be defined based on pre-chemotherapy imaging . OR
- Inclusion of whole anatomical nodal stations, but this approach will lead to large treatment volumes, with the risk of significant toxicity.

RADIOTHERAPY SEQUENCING

- Thoracic RT in ES-SCLC should be planned should be given after completion of chemotherapy.

TREATMENT RELATED TOXICITY

	Thoracic radiotherapy group (n=247)	Control group (n=248)
Cough (grade 3)	0 (0·0%)	1 (0·4%)
Dysphagia (grade 3)	1 (0·4%)	0 (0·0%)
Dyspnoea (grade 3)	3 (1·2%)	4 (1·6%)
Oesophagitis (grade 3)	4 (1·6%)	0 (0·0%)
Fatigue (grade 3)	11 (4·5%)	8 (3·2%)
Fatigue (grade 4)	0 (0·0%)	1 (0·4%)
Insomnia (grade 3)	3 (1·2%)	2 (0·8%)
Nausea or vomiting (grade 3)	1 (0·4%)	0 (0·0%)
Headache (grade 3)	3 (1·2%)	2 (0·8%)

Table 2: **Grade 3 and higher toxic effects**

Slotman et al Lancet 2015; 385: 36–42

CHALLENGES TO PRACTICE OF RADIOTHERAPY IN ES-SCLC

- Impact of advent of immunotherapy (IMpower133)

- IMpower 133

  Consolidative TRT not allowed

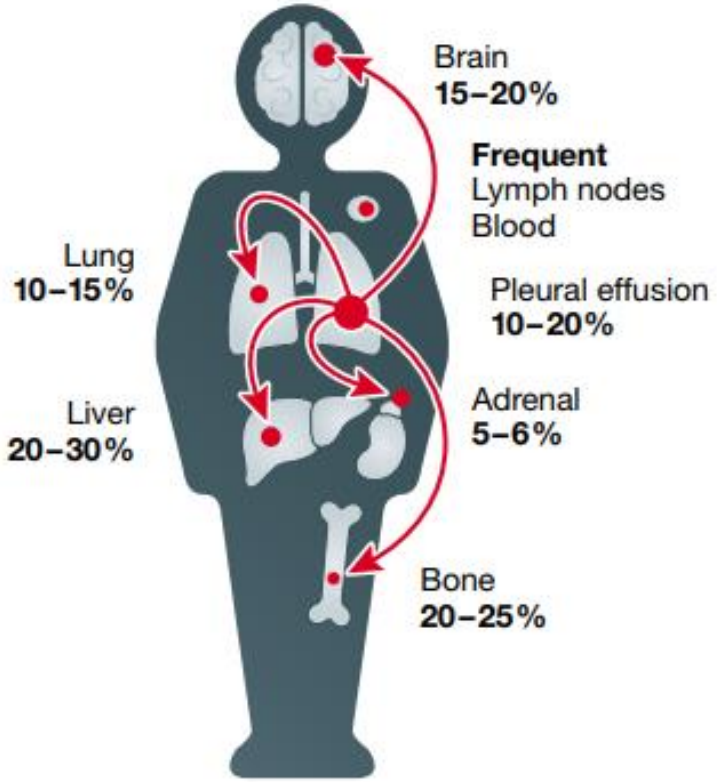
  PCI received in few patients

  In patients who did receive PCI CNS related events more in atezolizumab arm

- Integrating TRT with immunotherapy in ES-SCLC ?

PROPHYLACTIC CRANIAL RADIATION

RATIONALE OF PCI IN ES-SCLC



PCI has been carried out since the 1970s to prevent brain and central nervous system metastases which are less likely to be cured by systemic chemotherapy alone because of the presence of the blood–brain barrier

RATIONALE OF PCI IN ES-SCLC

The New England Journal of Medicine

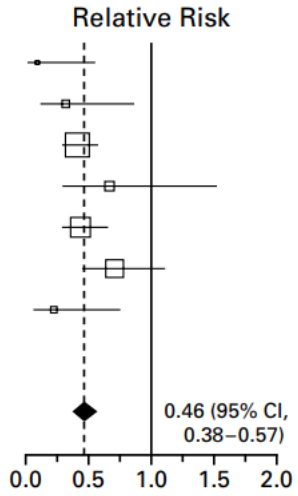
PROPHYLACTIC CRANIAL IRRADIATION FOR PATIENTS WITH SMALL-CELL LUNG CANCER IN COMPLETE REMISSION

ANNE AUPÉRIN, M.D., RODRIGO ARRIAGADA, M.D., JEAN-PIERRE PIGNON, M.D., PH.D., CÉCILE LE PÉCHOUX, M.D., ANNA GREGOR, M.D., RICHARD J. STEPHENS, PAUL E.G. KRISTJANSEN, M.D., PH.D., BRUCE E. JOHNSON, M.D., HIROSHI UEOKA, M.D., HENRY WAGNER, M.D., AND JOSEPH AISNER, M.D., FOR THE PROPHYLACTIC CRANIAL IRRADIATION OVERVIEW COLLABORATIVE GROUP*

B

Brain Metastasis

STUDY	NO. OF EVENTS/NO. ENROLLED		O−E	VARIANCE
	PCI	NO PCI		
UMCC	0/14	5/12	−2.9	1.2
Okayama	5/23	11/23	−4.4	3.8
PCI-85	46/149	87/151	−28.7	32.5
Danish–NCI	10/27	13/25	−2.3	5.7
UKCCCR–EORTC	46/194	54/120	−18.7	22.8
PCI-88	32/100	44/111	−6.4	18.9
ECOG–RTOG	4/17	8/15	−3.9	2.6
Total	143/524	222/457	−67.2	87.6



Test for heterogeneity: $\chi^2_6=9.71$, P=0.14

N Engl J Med 1999;341:476-84.

RATIONALE OF PCI IN ES-SCLC

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Prophylactic Cranial Irradiation in Extensive Small-Cell Lung Cancer

Ben Slotman, M.D., Ph.D., Corinne Faivre-Finn, M.D., Ph.D., Gijs Kramer, M.D.,*
Elaine Rankin, M.D., Michael Snee, D.M., Matthew Hatton, F.R.C.R.,
Pieter Postmus, M.D., Ph.D., Laurence Collette, Ph.D., Elena Musat, M.D.,
and Suresh Senan, Ph.D., F.R.C.R., for the EORTC Radiation Oncology Group
and Lung Cancer Group†

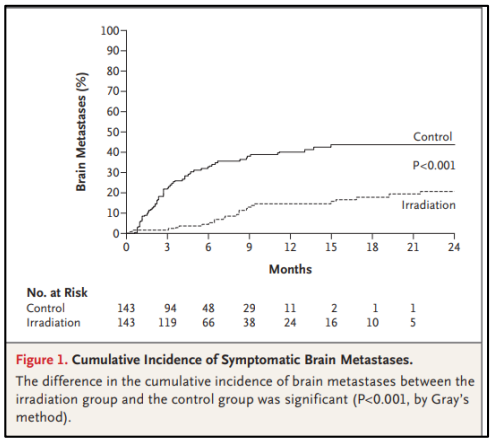


Figure 1. Cumulative Incidence of Symptomatic Brain Metastases.
The difference in the cumulative incidence of brain metastases between the irradiation group and the control group was significant (P<0.001, by Gray's method).

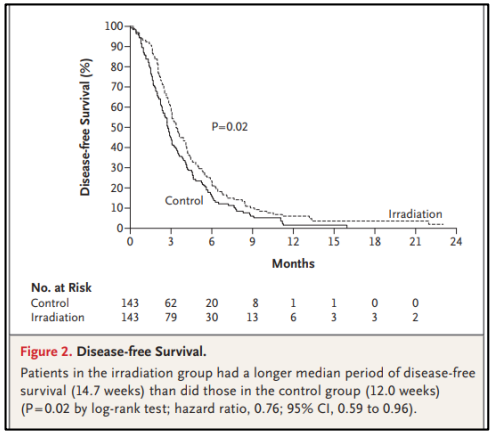


Figure 2. Disease-free Survival.
Patients in the irradiation group had a longer median period of disease-free survival (14.7 weeks) than did those in the control group (12.0 weeks) (P=0.02 by log-rank test; hazard ratio, 0.76; 95% CI, 0.59 to 0.96).

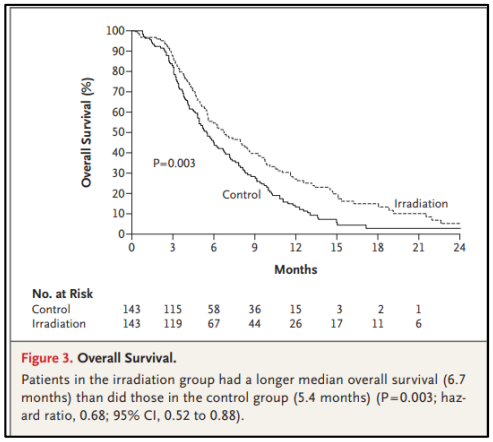


Figure 3. Overall Survival.
Patients in the irradiation group had a longer median overall survival (6.7 months) than did those in the control group (5.4 months) (P=0.003; hazard ratio, 0.68; 95% CI, 0.52 to 0.88).

The cumulative risk of brain metastases within 1 year was 14.6% in the irradiation group (95% CI, 8.3 to 20.9) and 40.4% in the control group (95% CI, 32.1 to 48.6)

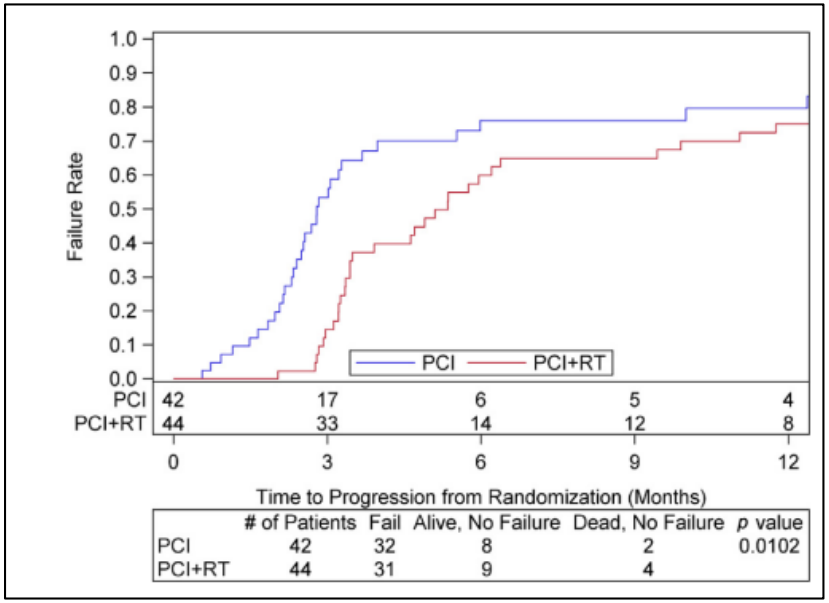
N Engl J Med 2007;357:664-72

RATIONALE OF PCI IN ES-SCLC

ORIGINAL ARTICLE

Randomized Phase II Study Comparing Prophylactic Cranial Irradiation Alone to Prophylactic Cranial Irradiation and Consolidative Extracranial Irradiation for Extensive-Disease Small Cell Lung Cancer (ED SCLC): NRG Oncology RTOG 0937

Elizabeth M. Gore, MD,[a,*] Chen Hu, PhD,[b,c] Alexander Y. Sun, MD,[d]



Journal of Thoracic Oncology 2017; 12:10: 1561-1570

RADIOTHERAPY DOSE IN PCI

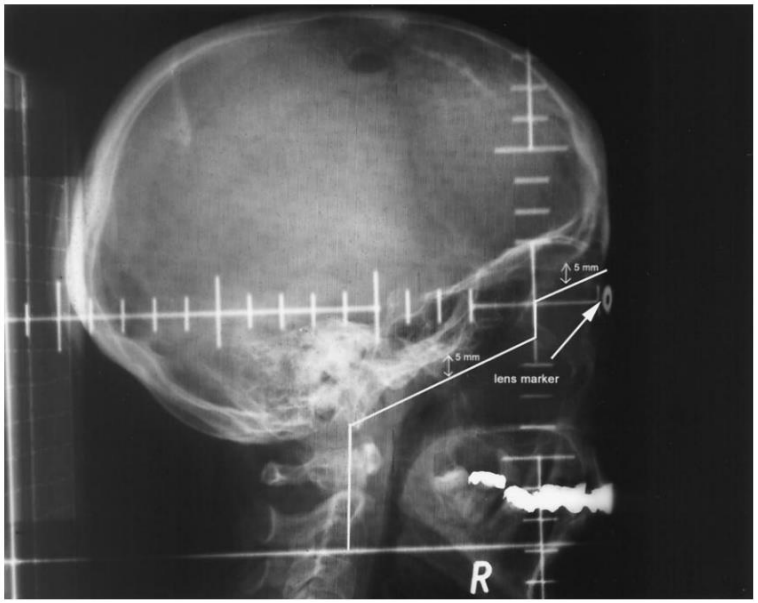
Recommendations

Selected patients with locally advanced metastatic SCLC who respond to primary chemotherapy should be offered PCI. Acceptable schedules are:

20 Gy in 5 fractions over 1 week (Grade A)
30 Gy in 10 fractions over 2 weeks (Grade A)
25 Gy in 10 fractions over 2 weeks (Grade A)
30 Gy in 12 fractions over 2.5 weeks (Grade A)

The types of evidence and the grading of recommendations used within this review are based on those proposed by the Oxford Centre for Evidence-based Medicine.[5]

RADIOTHERAPY TECHNIQUES IN PCI
GERMAN HELMET



- Lateral opposed, isocentric fields in supine patient position.
- The head was immobilized by an individual thermoplastic face mask.
- Osseous reference points were identified on these films and used for designing individual shieldings with 5-mm distance to the Frontobasis and the middle cranial fossa.
- The isocenter was placed 2-cm posterior to the lens markers positioned on the upper eye lids

RADIOTHERAPY TECHNIQUES IN PCI

ELSEVIER

Int. J. Radiation Oncology Biol. Phys., Vol. 49, No. 5, pp. 1475–1480, 2001

0360-3016/01/$–see front matter

PII S0360-3016(00)01548-0

PHYSICS CONTRIBUTION

DOES THE STANDARDIZED HELMET TECHNIQUE LEAD TO ADEQUATE COVERAGE OF THE CRIBRIFORM PLATE? AN ANALYSIS OF CURRENT PRACTICE WITH RESPECT TO THE ICRU 50 REPORT

ELISABETH WEISS, M.D., MICHAEL KREBECK, PH.D., BRUNHILD KÖHLER, M.SC., OLIVIER PRADIER, M.D., AND CLEMENS F. HESS, PH.D. M.D.

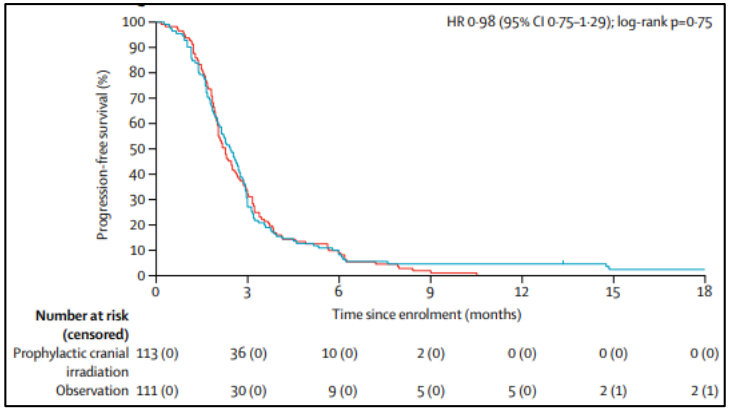
Department of Radiotherapy, University of Goettingen, Goettingen, Germany

The average dose received by 95% of the cribriform plate with the standardized helmet technique was 85% of the prescribed dose.

PCI VERSUS NO PCI

Prophylactic cranial irradiation versus observation in patients with extensive-disease small-cell lung cancer: a multicentre, randomised, open-label, phase 3 trial

Toshiaki Takahashi, Takeharu Yamanaka, Takashi Seto, Hideyuki Harada, Hiroshi Nokihara, Hideo Saka, Makoto Nishio, Hiroyasu Kaneda, Koichi Takayama, Osamu Ishimoto, Koji Takeda, Hiroshige Yoshioka, Motoko Tachihara, Hiroshi Sakai, Koichi Goto, Nobuyuki Yamamoto



Median overall survival was 11·6 months (95% CI 9·5–13·3) in the prophylactic cranial irradiation group and 13·7 months (10·2–16·4) in the observation group p=0·094).

Lancet Oncol 2017

PCI VERSUS NO PCI

Summary of ASTRO and ESMO clinical practice guidelines on the use of PCI in ES SCLC (stage IV or stage III disease not eligible for treatment with curative intent).(1,2).

	ASTRO Clinical Practice Guideline	**ESMO Clinical Practice Guidelines**
Response to induction treatment	For patients with ES SCLC who respond to chemotherapy, a consultation with a radiation oncologist to enhance decision-making on PCI versus MRI surveillance (considering patient- and disease-specific characteristics) is recommended.	PCI is recommended in patients with ES SCLC with no PD following first line chemotherapy. There is a paucity of data on the integration of PCI and immunotherapy. Additional research is therefore required regarding both the safety and efficacy of this approach.
Cranial imaging	N/a	Staging or follow-up brain MRIs are not required prior to PCI
Age and performance status	N/a	PCI is recommended in patients $\leq$ 75 years old and ECOG PS 0–2
Dose/ fractionation	25 Gy/10 fractions or 20 Gy/ 5 fractions	25 Gy/10 fractions or 20 Gy/5 fractions

TIMING OF PCI

- A significant trend favouring early PCI delivery (within four to six weeks) after induction therapy has previously been reported.

- Earlier delivery was associated with a reduction in the incidence of BM ($p = 0.01$) but did not significantly affect OS ($p = 0.39$).

CHALLENGES TO PRACTICE OF PCI

- PCI versus MRI survelliance ?

ES SCLC: OUTCOMES

- ES-SCLS is aggressive disease
- Despite treatment 5 year survival rates (SEER) 1-2% & 2 year survival rate 10%
- Median Survival time 8-10 months

CONCLUSION

- Radiotherapy is a integral part of treatment in ES-SCLC
- Integration of RT with immunotherapy needs evaluation
- PCI needs further evaluation against MRI surveillance

THANK YOU