CONCURRENT CHEMORADIATION IN NSCLC: (1) INDICATIONS AND (2) PRACTICAL NUANCES

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(1) INDICATIONS OF CONCURRENT CHEMORADIATION IN NSCLC

Inoperable Stage III NSCLC

(RTOG 9410 Superiority of Concurrent CT-RT over Sequential)

(In Guidelines

NCCN 2026, ASTRO 2023, ASCO 2021)

noun
plural noun **nuances**
a very small difference in meaning, feeling, sound, etc.
अर्थ, मनोभाव, ध्वनि आदि में सूक्ष्म अंतर

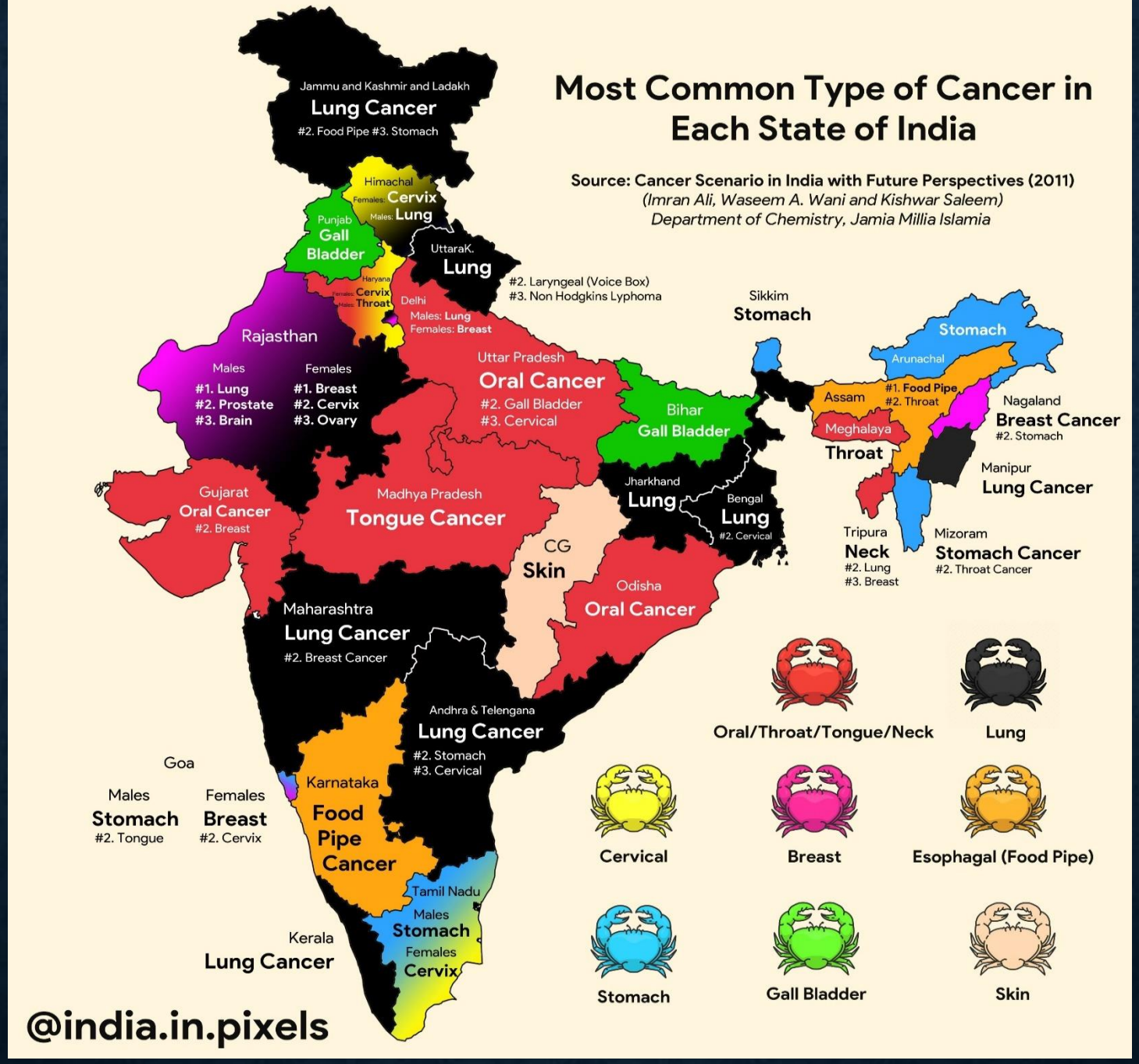
(2) NUANCES

nuance
'न्यूआन्स्

noun
plural noun: nuances
a very small difference in meaning, feeling, sound, etc.
अर्थ, मनोभाव, ध्वनि आदि में सूक्ष्म अंतर

- The small experience-based considerations that affect how you do something in real clinical practice

- Indications – who should get it
- Practical nuances – how to do it well in real life

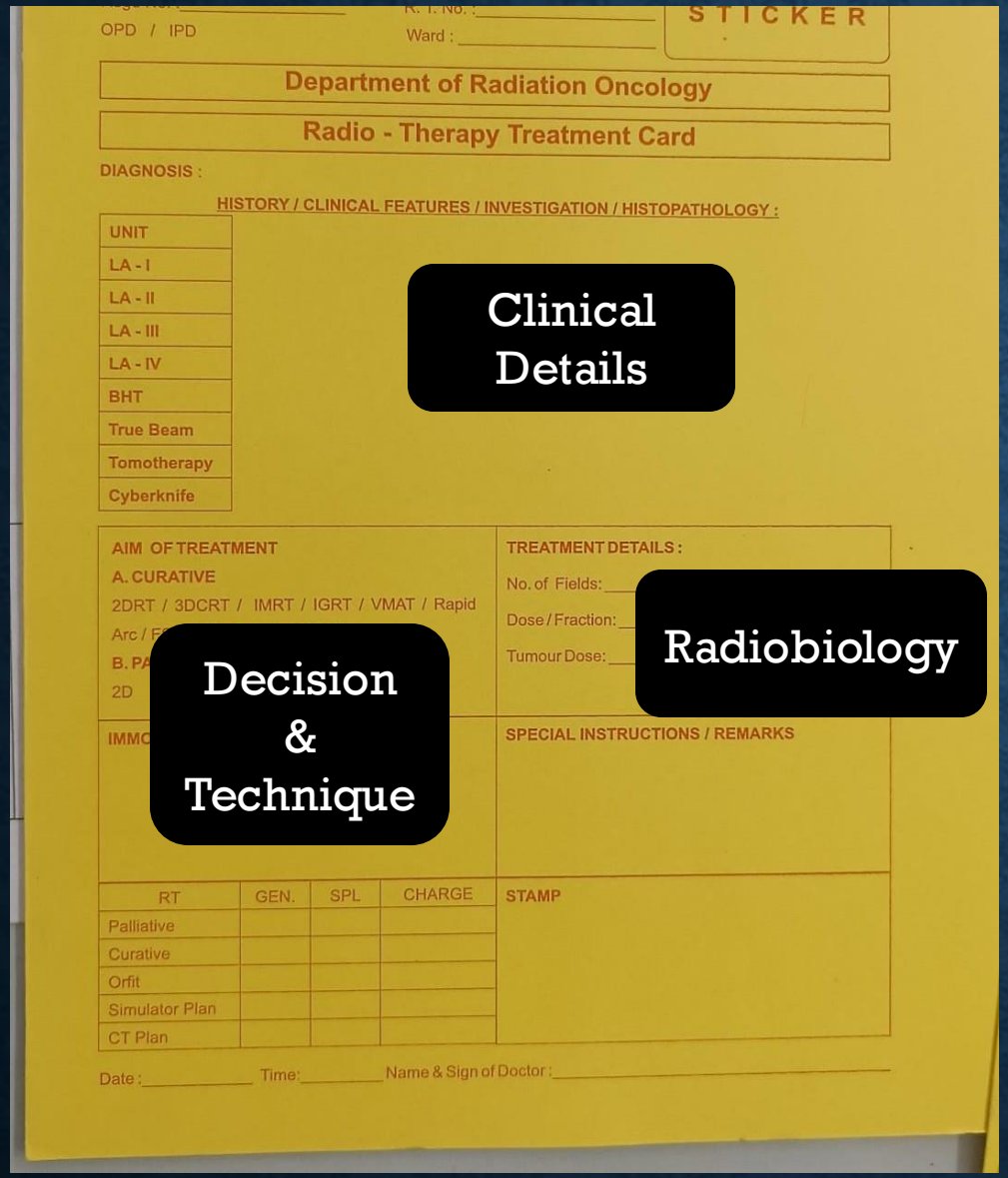

Most Common Type of Cancer in Each State of India
Source: Cancer Scenario in India with Future Perspectives (2011)
(Imran Ali, Waseem A. Wani and Kishwar Saleem)
Department of Chemistry, Jamia Millia Islamia
Jammu and Kashmir and Ladakh
Lung Cancer
#2. Food Pipe #3. Stomach
Himachal
Females: Cervix
Males: Lung
Punjab
Gall Bladder
UttaraK.
Lung
#2. Laryngeal (Voice Box)
#3. Non Hodgkins Lyphoma
Haryana
Females: Cervix
Males: Throat
Delhi
Males: Lung
Females: Breast
Rajasthan
Males
#1. Lung
#2. Prostate
#3. Brain
Females
#1. Breast
#2. Cervix
#3. Ovary
Uttar Pradesh
Oral Cancer
#2. Gall Bladder
#3. Cervical
Sikkim
Stomach
Bihar
Gall Bladder
Stomach
Arunachal
Assam
#1. Food Pipe
#2. Throat
Meghalaya
Throat
Nagaland
Breast Cancer
#2. Stomach
Manipur
Lung Cancer
Gujarat
Oral Cancer
#2. Breast
Madhya Pradesh
Tongue Cancer
Jharkhand
Lung
Bengal
Lung
#2. Cervical
CG
Skin
Odisha
Oral Cancer
Tripura
Neck
#2. Lung
#3. Breast
Mizoram
Stomach Cancer
#2. Throat Cancer
Maharashtra
Lung Cancer
#2. Breast Cancer
Andhra & Telengana
Lung Cancer
#2. Stomach
#3. Cervical
Goa
Males
Stomach
#2. Tongue
Females
Breast
#2. Cervix
Karnataka
Food Pipe Cancer
Tamil Nadu
Males
Stomach
Females
Cervix
Kerala
Lung Cancer
Oral/Throat/Tongue/Neck
Lung
Cervical
Breast
Esophagal (Food Pipe)
Stomach
Gall Bladder
Skin
@india.in.pixels

Inoperable Stage III NSCLC

- Guidelines ≠
- Indian Scenario
- Our own Practice

Nuiance 1: NSCLC is an aggressive tumor of a vital organ that is poorly functioning at baseline in majority of patients.

≠ The treatment principles presented should be viewed as guidelines and not as a cookbook for the management of this disease"



OPD / IPD

R. T. No. :

Ward :

STICKER

Department of Radiation Oncology

Radio - Therapy Treatment Card

DIAGNOSIS :

HISTORY / CLINICAL FEATURES / INVESTIGATION / HISTOPATHOLOGY :

UNIT
LA - I
LA - II
LA - III
LA - IV
BHT
True Beam
Tomotherapy
Cyberknife

Clinical Details

AIM OF TREATMENT

A. CURATIVE

2DRT / 3DCRT / IMRT / IGRT / VMAT / Rapid

Arc / F

B. PA

2D

TREATMENT DETAILS :

No. of Fields:

Dose / Fraction:

Tumour Dose:

Radiobiology

Decision & Technique

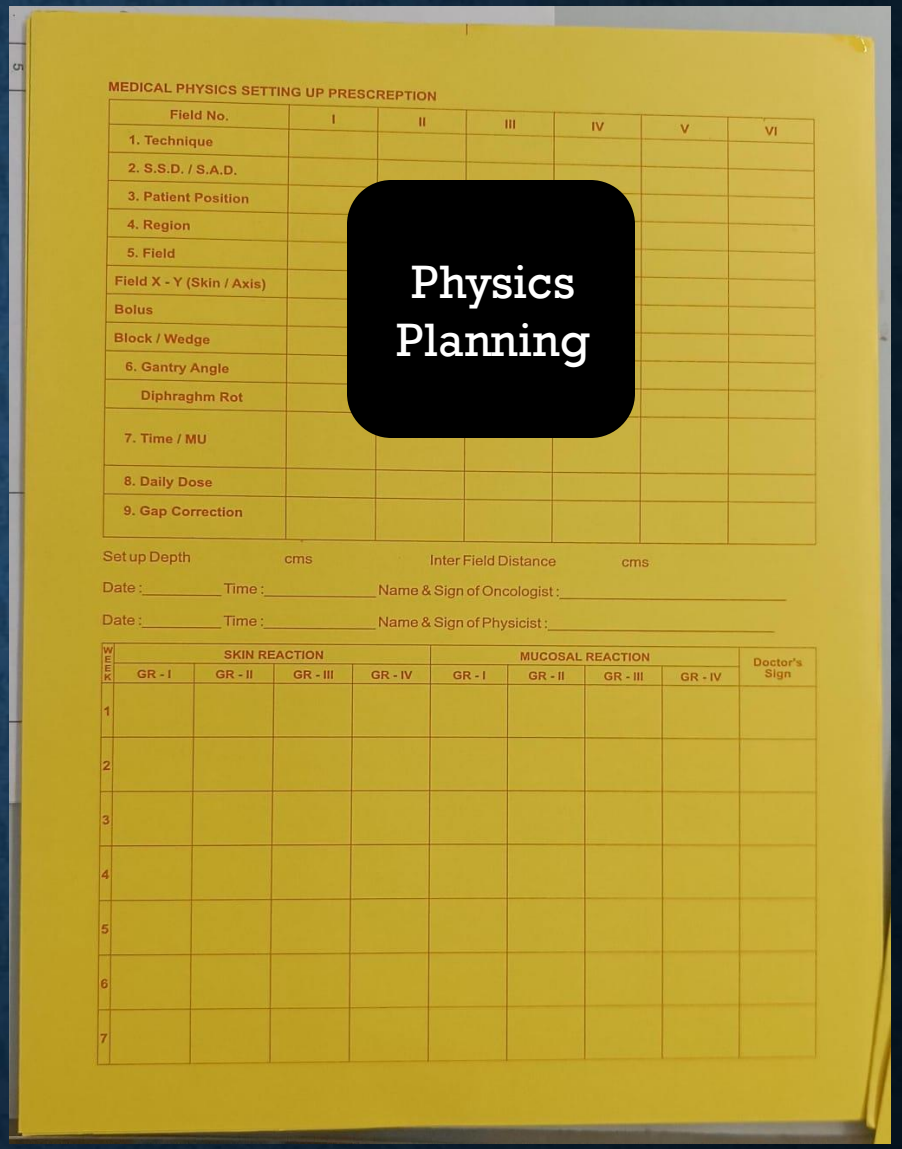
IMMO

SPECIAL INSTRUCTIONS / REMARKS

RT	GEN.	SPL	CHARGE
Palliative			
Curative			
Orfit			
Simulator Plan			
CT Plan			

STAMP

Date : Time: Name & Sign of Doctor :



MEDICAL PHYSICS SETTING UP PRESCREPTION

Field No.	I	II	III	IV	V	VI
1. Technique						
2. S.S.D. / S.A.D.						
3. Patient Position						
4. Region						
5. Field						
Field X - Y (Skin / Axis)						
Bolus						
Block / Wedge						
6. Gantry Angle						
Diphraghm Rot						
7. Time / MU						
8. Daily Dose						
9. Gap Correction						

Physics Planning

Set up Depth cms Inter Field Distance cms

Date : Time : Name & Sign of Oncologist :

Date : Time : Name & Sign of Physicist :

WEEK	SKIN REACTION				MUCOSAL REACTION				Doctor's Sign
	GR - I	GR - II	GR - III	GR - IV	GR - I	GR - II	GR - III	GR - IV	
1									
2									
3									
4									
5									
6									
7									

Pearls, Natural History, Biology

Lung cancer grow with constant doubling time

Adenoca – slowest,
Small cell - fastest

LN Metastasis –
37% Lobectomy
94% Necropsy series

Spread –
Intrathoracic, Regional, Distant
No particular order

Garland and colleagues – by the time a tumor of the lung first detected on chest radiograph – it has already completed 75% of its natural history.

Histologic confirmation of Neoplasm in Mediastinal nodes recommended

Pearls, Natural History, Biology

SEER – 15% localized to primary site at initial Dx, 22% regional nodes, 56% distant mets

❖In one study involving pathologic staging up to 44% of nodes with metastatic deposits were <1 cm in diameter and 18% of patients with pathologically involved mediastinal nodes did not have any nodes >1cm.

INT. J. RADIAT. BIOL 2000, VOL. 76, NO. 4, 453–462

2000

Quantitative clinical radiobiology of early and late lung reactions†

S. M. BENTZEN*, J. Z. SKOCZYLAS‡§ and J. BERNIER¶

(Received 26 July 1999; accepted 16 November 1999)

Abstract.

Purpose: To quantify the response of human lung to a course of fractionated radiotherapy based on a literature review of

strongly on the lung volume affected. It therefore seems likely that for small volumes irradiated to high doses, the dose-limiting complications may not be due to restriction of lung function,

The human lung is relatively sensitive to ionizing radiation especially when the whole lung volume is irradiated. Data in the literature suggest that 50% of the irradiated individuals will develop radiation pneu monitis after a single dose of 9.3Gy to the whole lung volume (Van Dyk et al. 1981).

This dose is considerably increased if a relatively small fraction of the total lung volume is irradiated or if the radiation is given in multiple fractions with a dose per fraction around 2Gy. On the other hand, some chemotherapeutic agents may considerably reduce lung tolerance to radiotherapy.

(V20 <35 Gy of Total Lung Volume. V5 <65% of the lung volume to minimize low dose bath effects across the lungs. MLD < 20 Gy)

a) Clinical Parameters

≠

Nuiance 2:

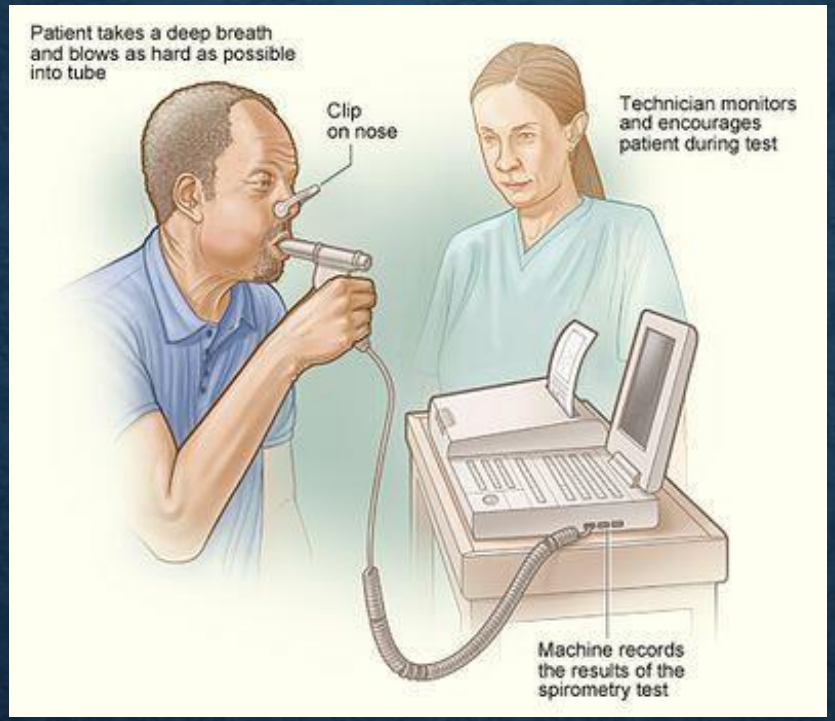
Limitations for Frail Patients

Performance Status: Patients with a poor performance status (e.g., ECOG ≥ 2) typically cannot tolerate the aggressive combined dosing.

Comorbidities: Pre-existing conditions (like severe cardiopulmonary disease) and significant baseline weight loss often necessitate selecting safer, less aggressive treatment strategies.

Advanced Age: While age alone is not an absolute barrier, elderly patients (> 75 years) are at a higher risk of severe side effects and frequently require treatment adjustments or fall into non-eligible categories.

a) Clinical Parameters



≠

Nuiance 3: Pre-existing interstitial lung disease may increase the risk of pulmonary toxicity from RT 5-fold to 10-fold.

a) Clinical Parameters

≠

Nuiance 4: Weight loss >5% from baseline has direct prognostic implications for survival in lung cancer. Ideally, if you are taking patient for concurrent chemoradiation there should be no or minimal weight loss.

c) Indicated Specific Investigations for Concurrent Chemoradiation

- All routine Ix + Biomarker testing including EGFR + PD-L1
- PFT
- FDG-PET/CT Scan
- Brain MRT with and without contrast
- Pathologic confirmation of Nodal disease by:

Mediastinoscopy, Supraclavicular lymph node biopsy

Thoracoscopy, Needle biopsy

Mediastinotomy, EUS biopsy, EBUS Biopsy

GOLD STANDARD : CT Scan Thorax + Upper Abdomen with Contrast

Nuiance 5: Appprox. 850 functional PET-CT scanners in India. Majority in Metropolitan cities. 2750 in 2019 in USA. 2100 Europe

Nuiance 6: Even in RCC, this procedures not done routinely

Nuiance 7: India has 31 CT Scanners per million people

❖**PFT** – Predictors to undergo surgical resection or withstand radiation

❖**Mediastinoscopy** – sensitivity of 85-100%, specificity of 100%, accuracy of 95%

❖**CT SCAN FOR RT PLANNING**: (with respect to Conventional RT Planning)

tumor extent 75%,

Change in assessment of size of lesion 43%,

Change in disease stage 40%,

Demonstration of inadequacy of conventional treatment plan 28%,

Change in volume of normal tissue irradiated 40%

CT- direct extension of primary into mediastinum or chest wall , detection of enlarged mediastinal lymph nodes. Can not differentiate inflammatory disease from neoplasia. Also fails to detect microscopic metastatic disease in normal sized lymph nodes.

PET OR PET-CT

- Standard of care
- PET can help distinguish atelectasis from tumor in certain cases.
- Largest benefit – lymph node metastasis in lymph nodes of normal size or distant metastasis not seen on CT scan
- PET-CT scan – anatomy and metabolically active . Detect malignancy in tumors as small as 0.5 cm.

- Positive PET should not be considered a proof of lymph node metastasis, especially if such a conclusion would otherwise exclude surgery.

- Target volumes solely based on FDG-PET positivity have limitations. With most notable being a false-negative rate of approximately 25% in mediastinal lymph nodes <1cm.

- When benchmarked against the true pathologic volume, the CT-derived contour appears to be more accurate than that derived from FDG-PET regardless of the algorithm employed.

Literature reports on impact of FDG-PET on Radiotherapy planning In NSCLC

Author	Study	PET/CT image fusion	Method of GTV contouring	Increase Of GTV/PTV	Decrease of GTV/PTV
Kiffer et al.[57]	Retrospective	Graphical coregistration of coronal PET with AP simulator image	Visual evaluation of FDG-PET	27%	73%
Nestle et al.[58]	Retrospective	PET-portal compared to CT-portal	Visual evaluation of FDG-PET	75%	25%
MacManus et al.[59]	Prospective	PET results used for treatment planning, no image fusion	Visual evaluation of FDG-PET	21%	79%
Mah et al.[60]	Prospective	Image coregistration CT-PET using external fiducial markers	50% intensity level of max. FDG uptake	30–76% of cases (varied between the 3 physicians)	24–70% of cases (varied between the 3 physicians)
Bradley et al.[61]	Prospective	PET/CT fusion	40% intensity level of max. FDG uptake	46%	54%
Erdi et al. [62]	Prospective	PET/CT fusion	40% intensity level of max. FDG uptake	64%	36%
Deniaud-Alexandre et [63]	Retrospective	Image fusion using fiducial markers	50% intensity level of max FDG uptake integrated PET/CT	55%	45%
Our study	Prospective	RTP scan and Diagnostic PET fusion	40% intensity level of max. FDG uptake	0	100%

In our study, we performed PET-CT scan fusion with planning CT Scan and used automated contouring at 40% intensity of the maximum FDG uptake. We only delineated the GTVp, not the GTVn. We observed a decrease in volume across all cases. Most of our patients were elderly with advanced diseases and significant atelectasis, which may explain why our results differ from those of previous studies.

c) Indications of Concurrent chemoradiation (Stagewise)

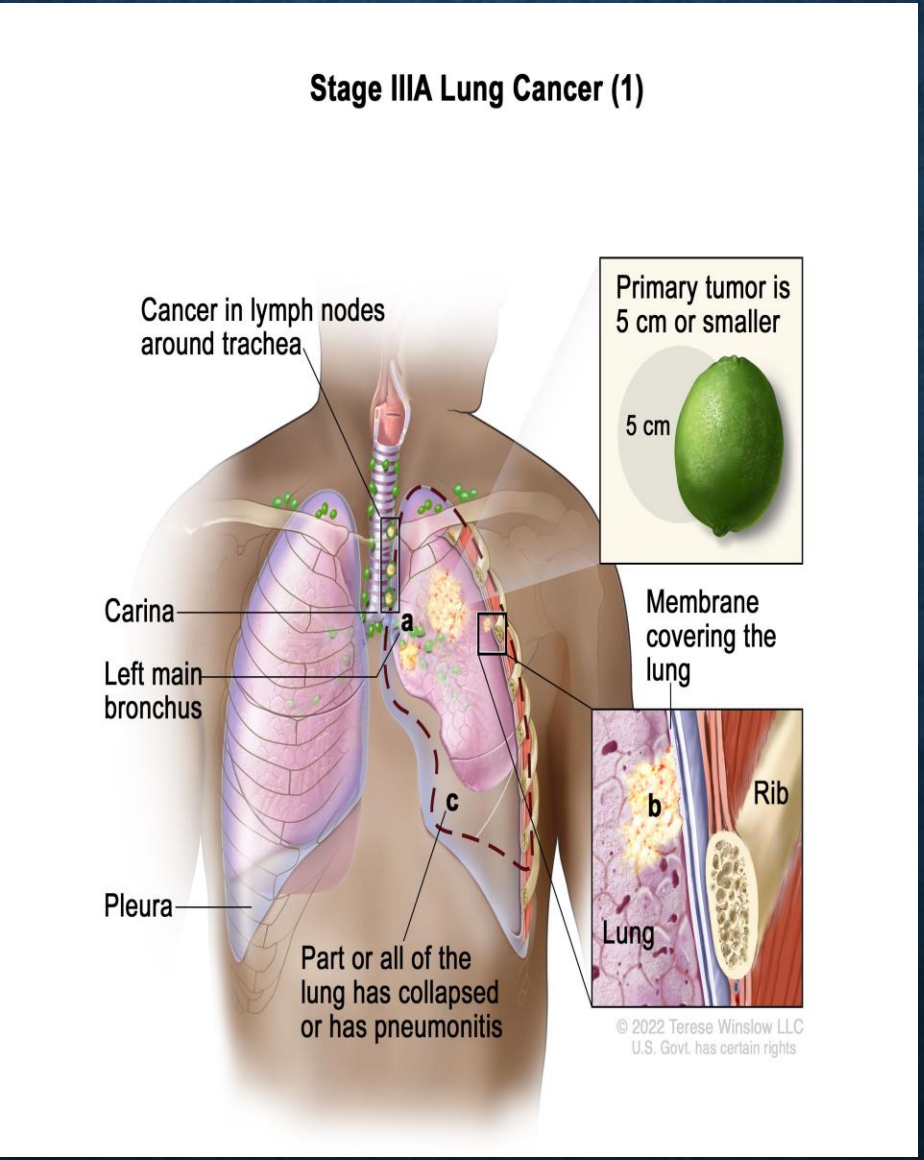
T1a-c, T2a-b
N2
(Mediastinal/Subcarinal)

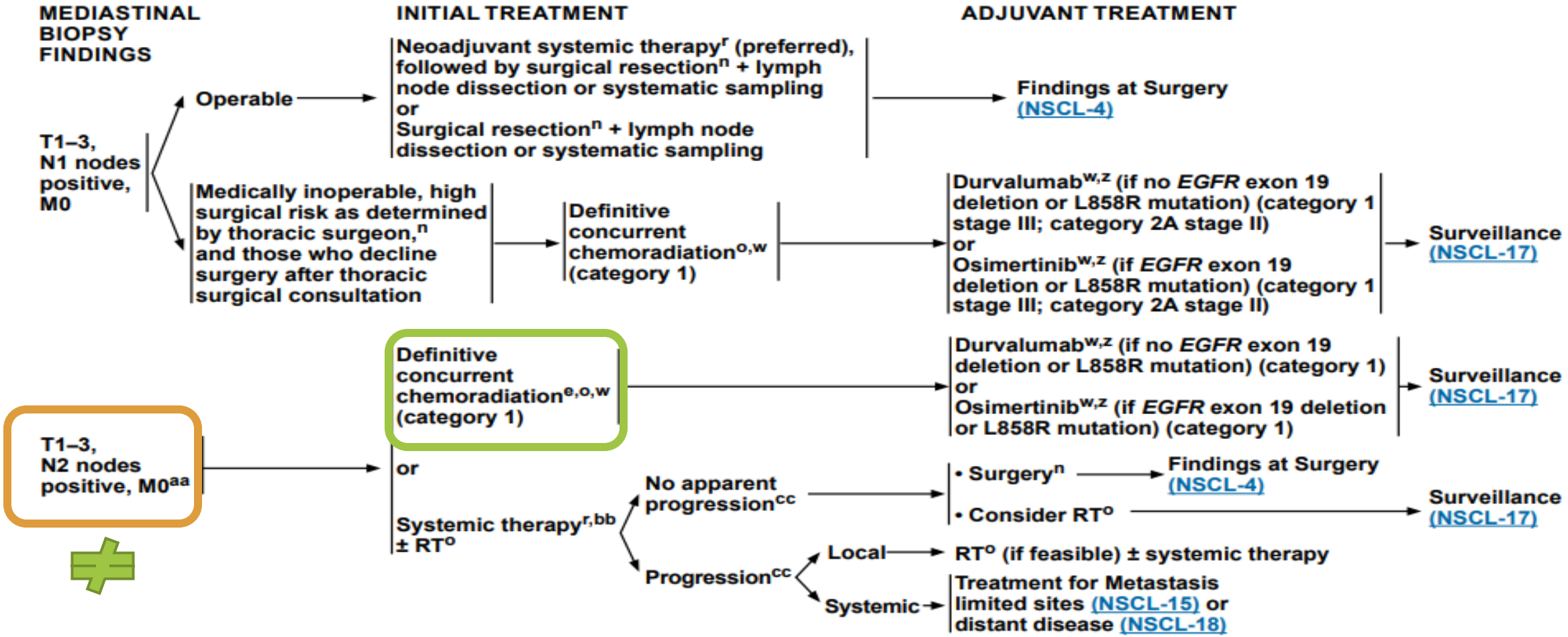
T1
</= 3 cm

T2
T2a >3 </=4
Or Invasion of main bronchus without carina or invasion in to visceral pleura, transgression fissure invading adjacent lobe

Atelectasis or obstructive pneumonitis extending to hilum

T2b <4 >/=5 cm





[e] For patients where more than one treatment modality (surgery, RT, or systemic therapy) is usually considered, a multidisciplinary evaluation should be performed.
[n] Principles of Surgical Therapy (NSCL-B).
[o] Principles of Radiation Therapy (NSCL-C).
[r] Principles of Perioperative Systemic Therapy (NSCL-E).
[w] Concurrent Chemoradiation Regimens (NSCL-F).

[z] For patients who have received sequential chemoradiation, durvalumab can be considered as consolidation immunotherapy or, if *EGFR* exon 19 deletion or L858R mutation, osimertinib is recommended.
[aa] Resectability should be determined by thoracic surgery evaluation prior to initiation of any therapy.
[bb] Selected patients with N2 disease (fit, single-station, non-bulky N2, requiring only lobectomy) may be considered for systemic therapy followed by surgery.
[cc] Chest CT with contrast and/or FDG-PET/CT to evaluate progression.

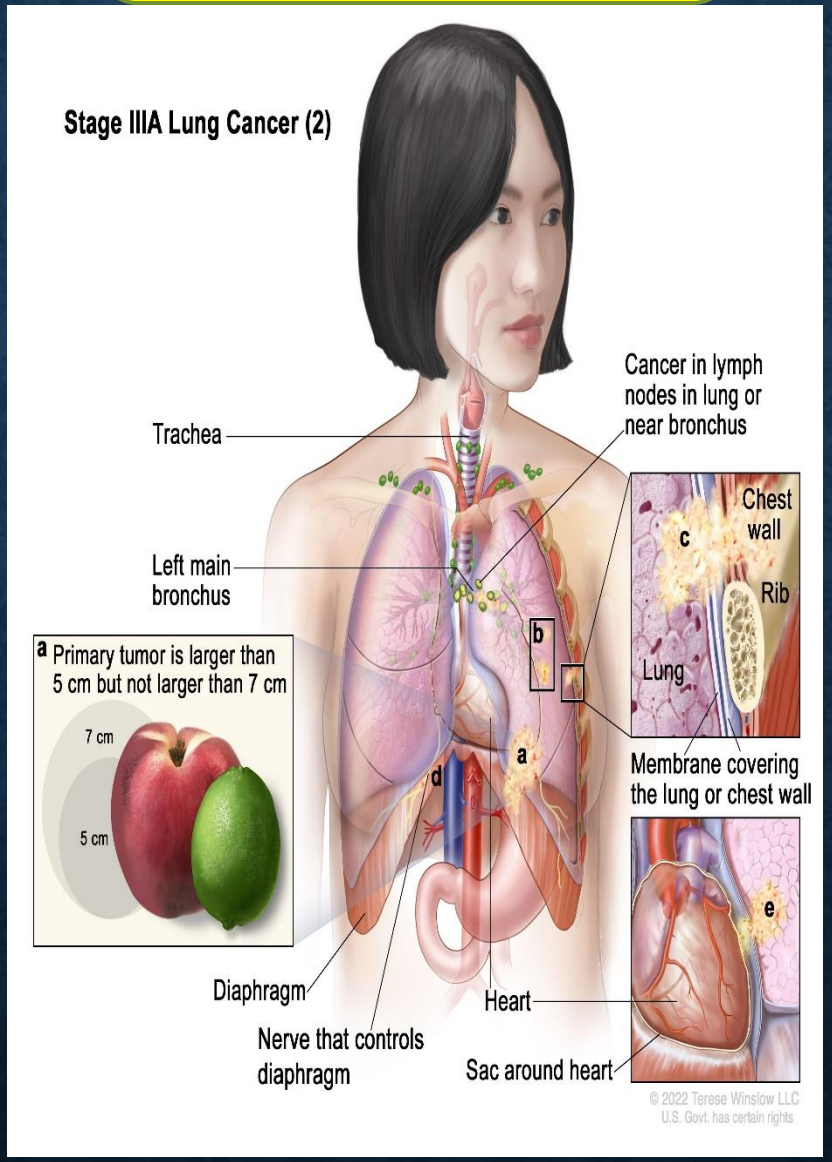
Nuiance 8: In this Stage, as per Guidelines if Performance status is good, no weight loss, baseline pulmonary function is good, Patietns are considered for concurrent chemoradiation in clinical practice.

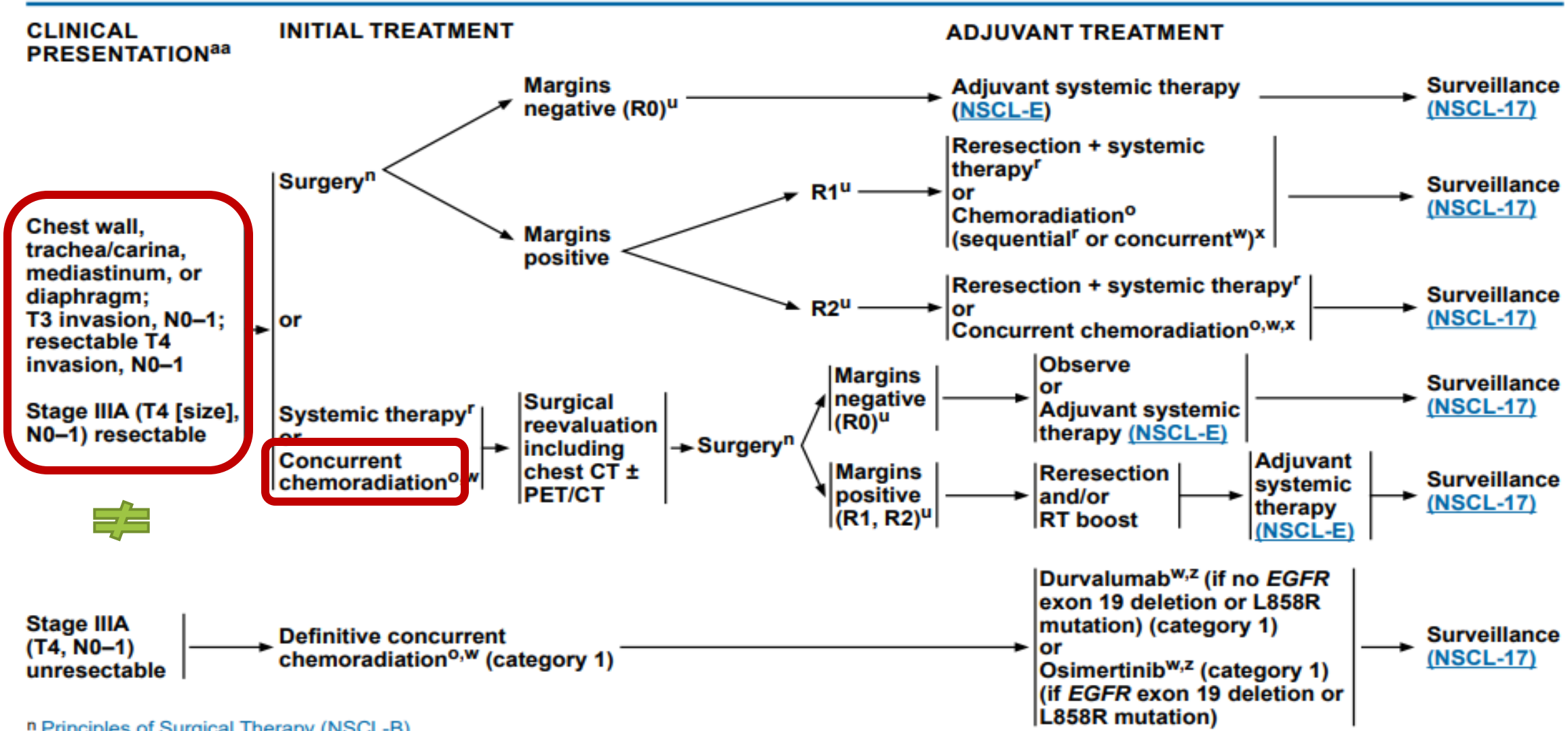
T3
N1 (Intrapulmonary/ Peribronchial/Hilar)

T3
>5 cm </= 7 cm

Or Invasion
Parietal Pleura,
Chest wall
Pericardium
Phrenic nerve
Azygous vein
Thoracic nerve roots (T1, T2)
Satellite ganglion

Or
Separate nodules in same lobe





[n] Principles of Surgical Therapy (NSCL-B).
[o] Principles of Radiation Therapy (NSCL-C).
[r] Principles of Perioperative Systemic Therapy (NSCL-E).
[u] R0 = complete resection with negative margins, R1 = microscopic positive margins, R2 = gross unresected tumor remaining.
[w] Concurrent Chemoradiation Regimens (NSCL-F).
[x] After completion of chemoradiation for residual disease, consider systemic therapies that would be appropriate (NSCL-E 5 of 6).
[z] For patients who have received sequential chemoradiation, durvalumab can be considered as consolidation immunotherapy or, if *EGFR* exon 19 deletion or L858R mutation, osimertinib is recommended.
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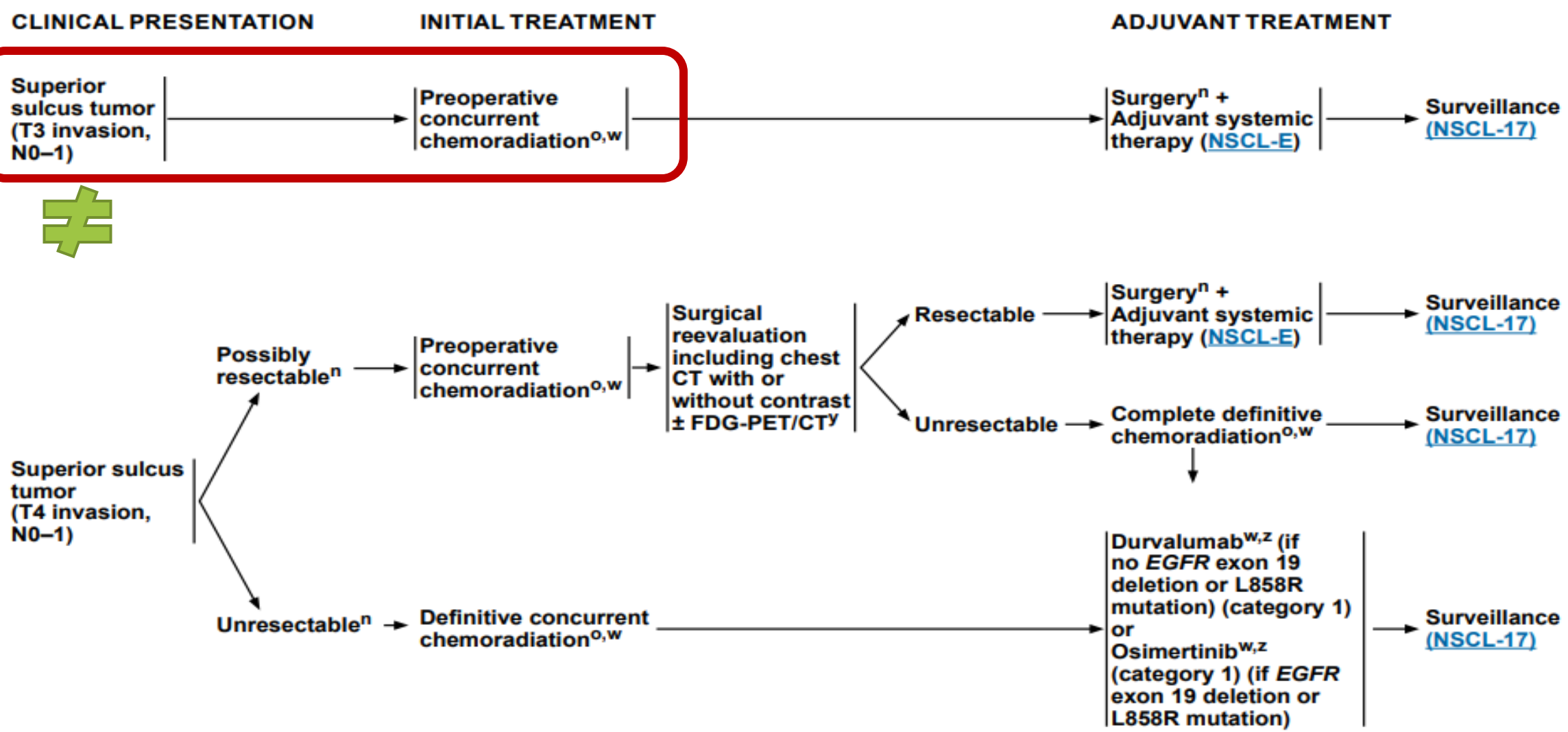
Note: All recommendations are category 2A unless otherwise indicated.



[n] Principles of Surgical Therapy (NSCL-B).
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[y] MRI with contrast of spine + thoracic inlet for superior sulcus lesions abutting the spine, subclavian vessels, or brachial plexus.
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Nuiance 9:

>5 cm </= 7 cm

Or Invasion
Parietal Pleura,
Pericardium
Phrenic nerve
Azygous vein
Thoracic nerve roots (T1, T2)
Satellite ganglion
Or
Separate nodules in same lobe

Chest wall
Superior sulcus tumor

Or if bulky disease with respect to lung volume -NACT

CT-RT

Palliative RT/
Hypofractionated RT
Only

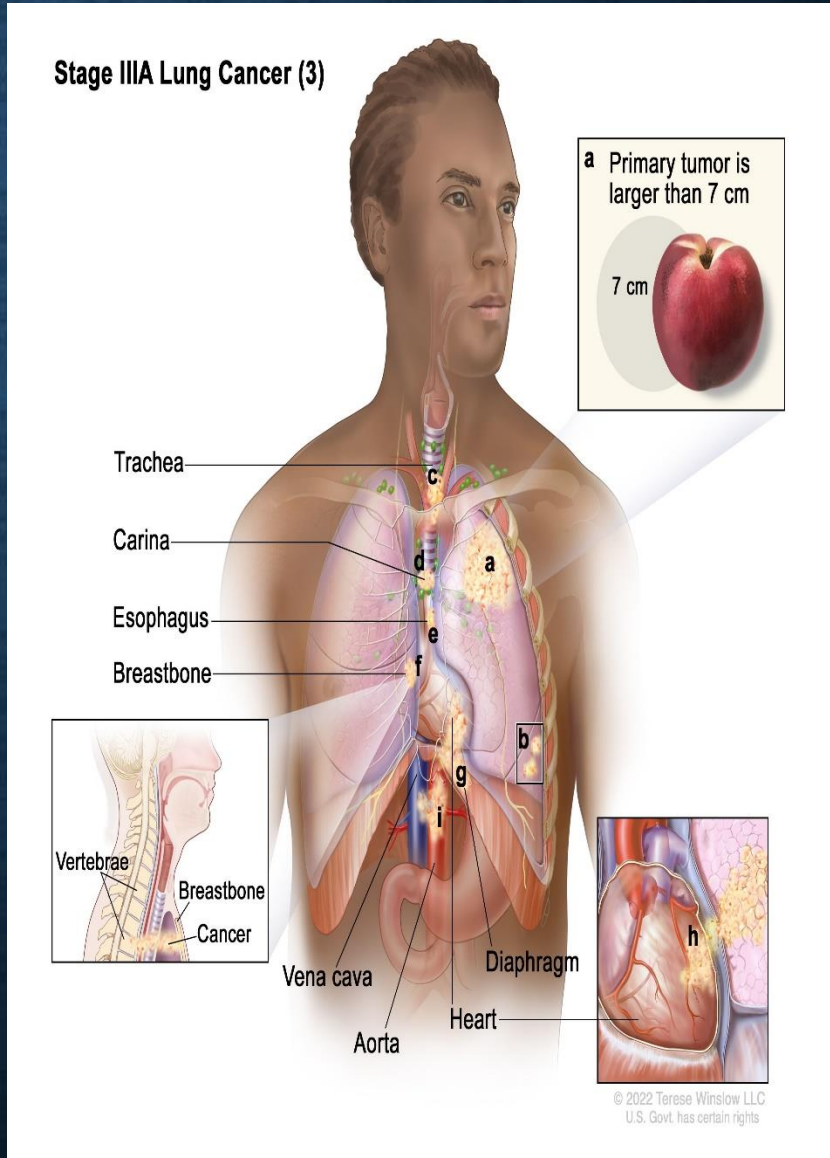
T4

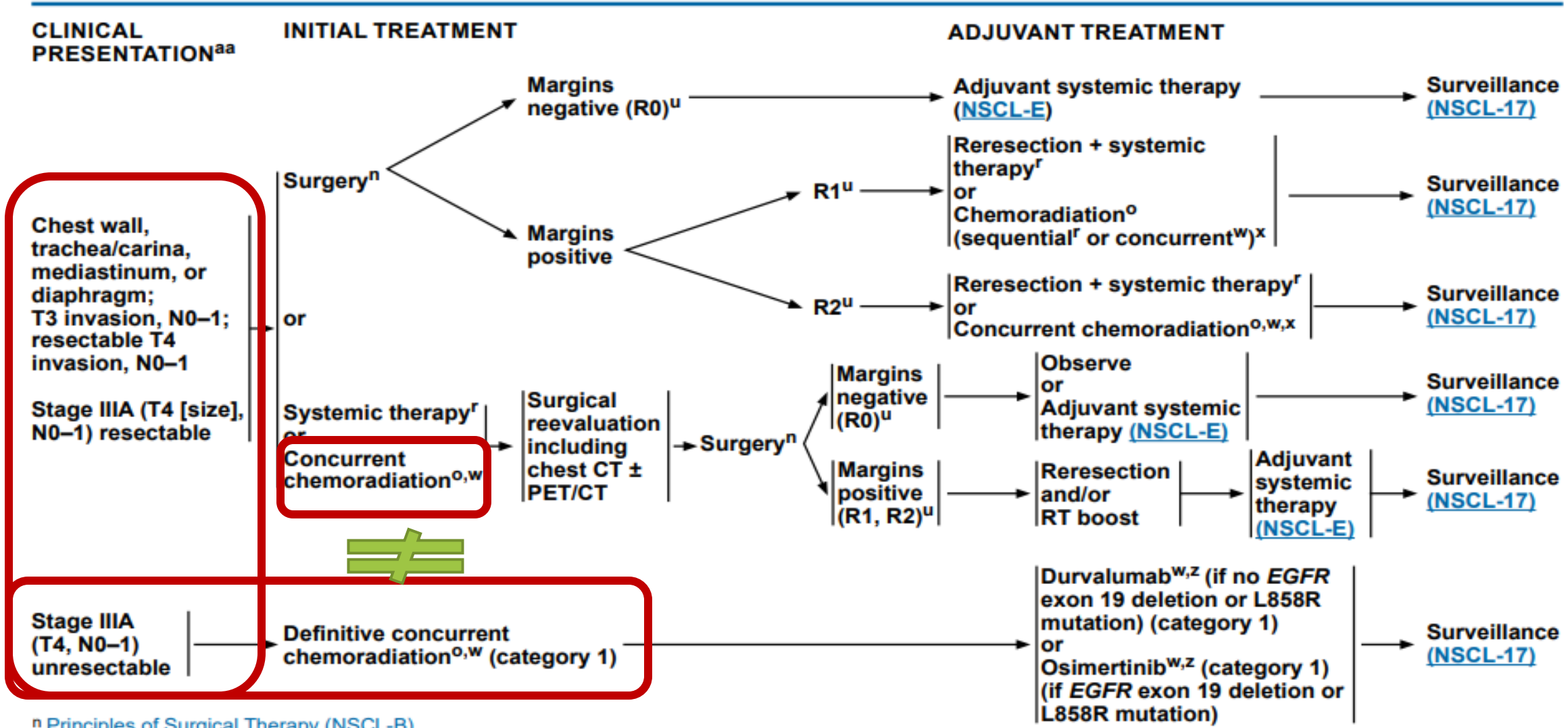
Tumor size >7 cm

Or Invasion –
Mediastinum
Thymus
Carina
Trachea
Recurrent laryngeal nerve
Vagus
Oesophagus
Diaphragm

Or Invasion –
Heart
Great vessels
Intrapericardial pulmonary arteries/veins
Supraaortic arteries
Brachiocephalic veins
Subclavian vessels
Vertebral body
Lamina
Spincal canal
Cervical nerve roots
Brachial plexus
Or Separate nodules in different ipsilateral lobe

T4
N0-1





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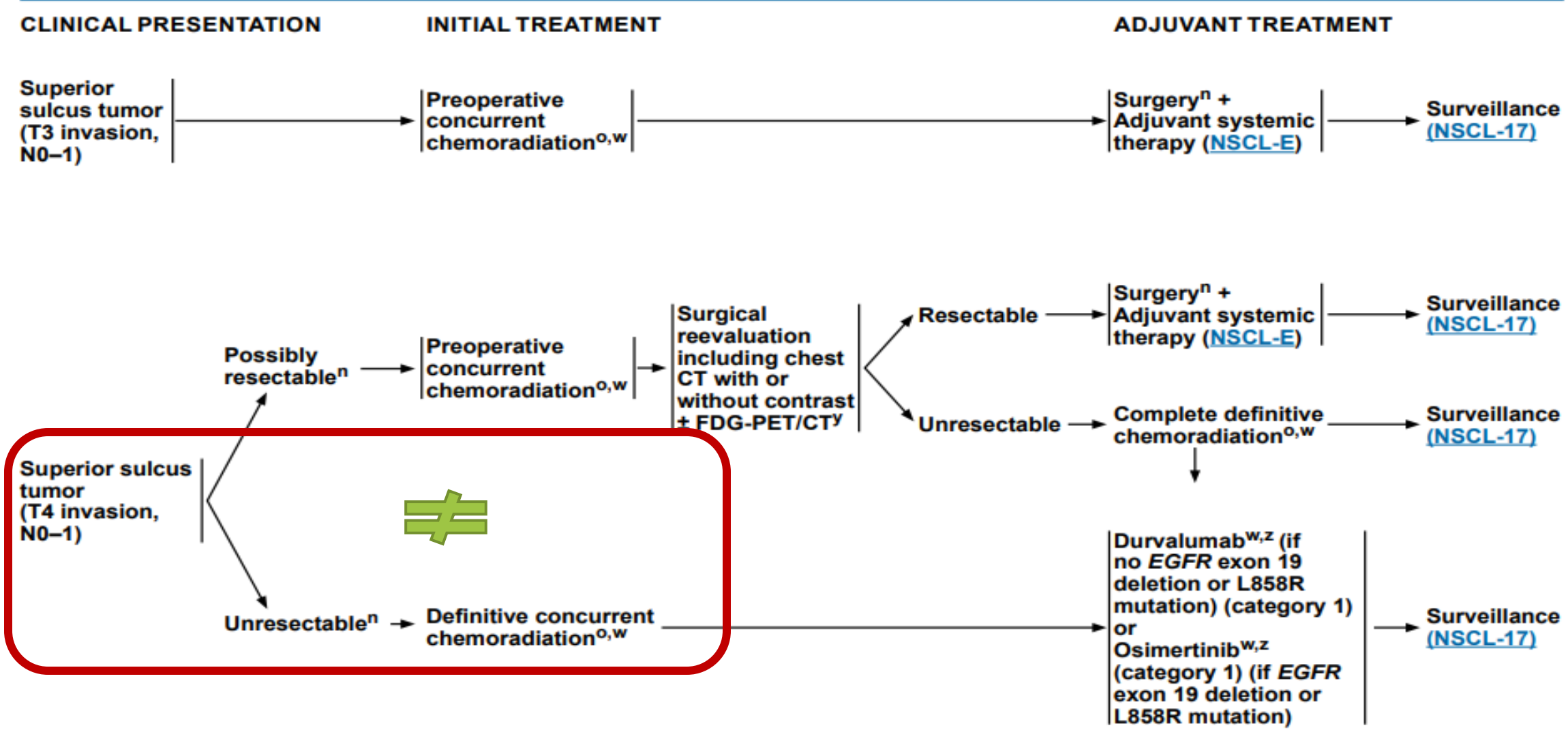

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Nuiance 10:

Tumor size >7 cm → CT-RT

Or if only bulky disease with respect to lung volume and no structural invasion -NACT

Or
Invasion –
Mediastinum
Thymus
Carina
Trachea
Recurrent laryngeal nerve
Vagus
Oesophagus
Diaphragm

Our Clinical Practice
Palliative RT/
Hypofractionated RT Only

Tumor size >7 cm → CT-RT

Or if only bulky disease with respect to lung volume and no structural invasion -NACT

Invasion –
Heart
Great vessels
Intrapericardial pulmonary arteries/veins
Supraaortic arteries
Brachiocephalic veins
Subclavian vessels
Vertebral body
Lamina
Spincal canal
Cervical nerve roots
Brachial plexus

Or Separate nodules in different ipsilateral lobe

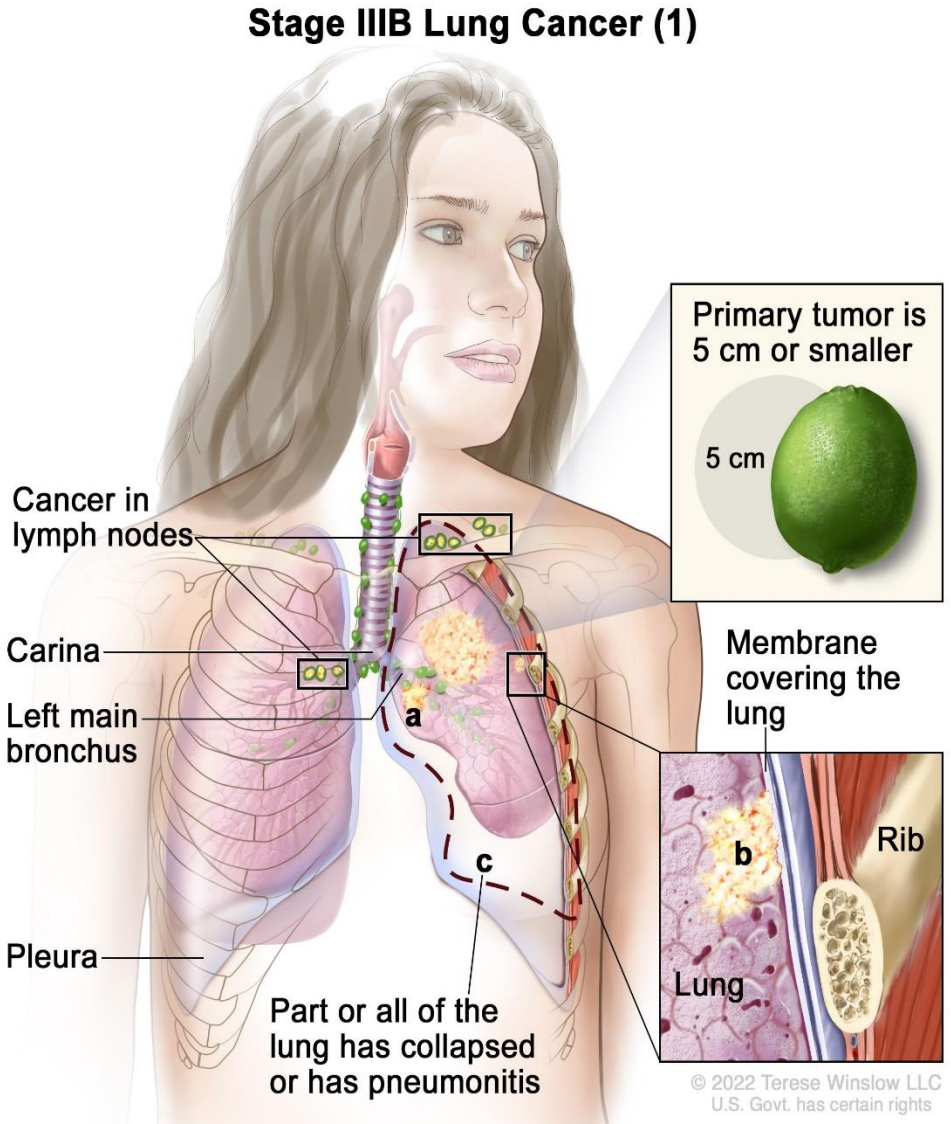
Our Clinical Practice

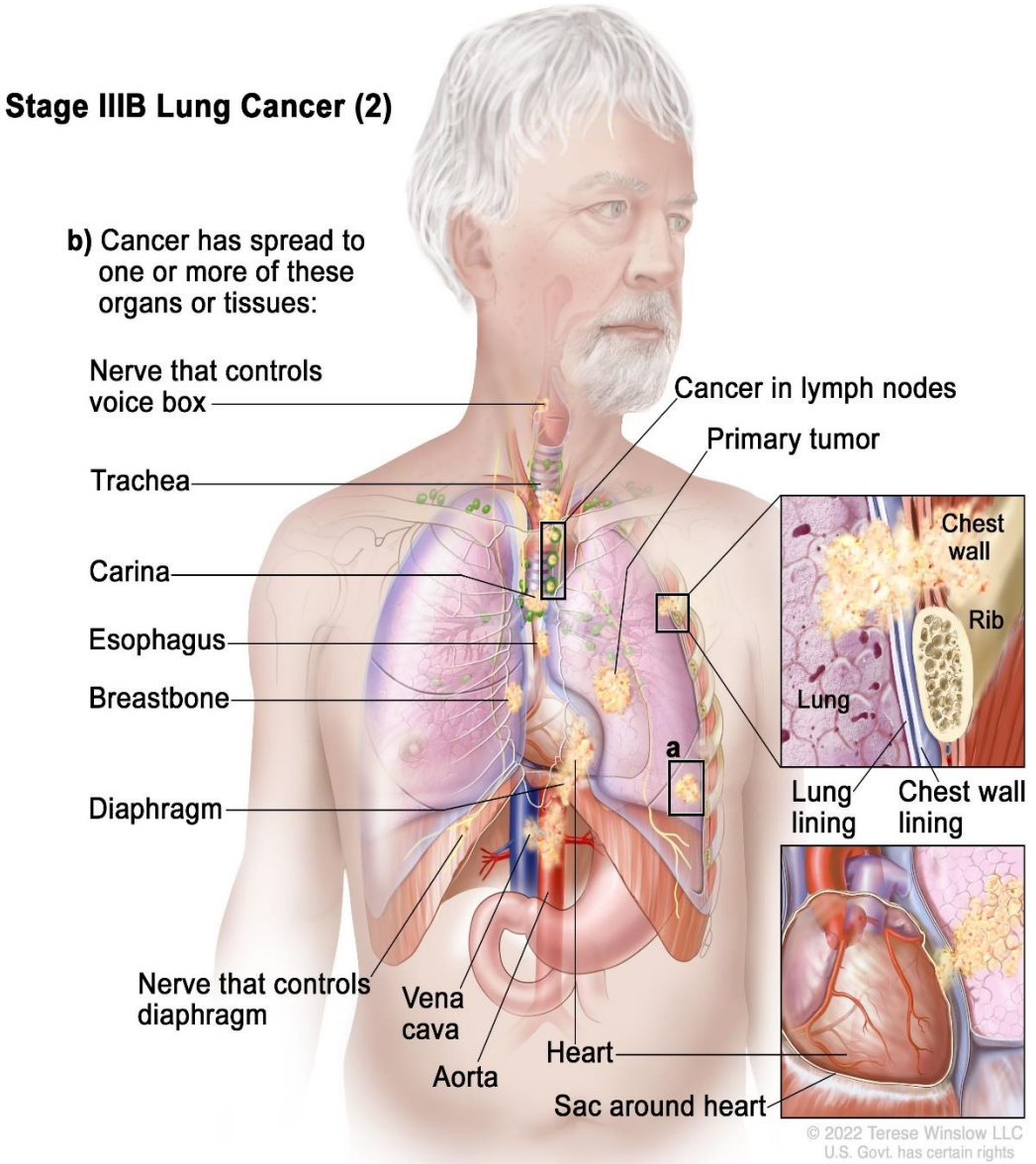
Palliative RT/
Hypofractionated RT
Only

T1a-c, T2a-b
N3 (C/L Mediastinal/Hilar
I/L or C/L scalene or Supraclavicular)

≠

T3-T4
N2
(Mediastinal/Subcarinal)





National Comprehensive Cancer Network®

NCCN Guidelines Version 6.2026
Non-Small Cell Lung Cancer

NCCN Guidelines Index
Table of Contents
Discussion

CLINICAL ASSESSMENT | **PRETREATMENT EVALUATION** | **INITIAL TREATMENT**

Stage IIIB (T1–2, N3)
Stage IIIC (T3, N3)

→ Pretreatment evaluation:
- Biomarker testing including *EGFR*
- PFTs (if not previously done)
- FDG-PET/CT scan[l] (if not previously done)
- Brain MRI with and without contrast[s]
- Pathologic confirmation of N3 disease by:
  - Mediastinoscopy
  - Supraclavicular lymph node biopsy
  - Thoracoscopy
  - Needle biopsy
  - Mediastinotomy
  - EUS biopsy
  - EBUS biopsy

→ **N3 negative** → Initial treatment for stage I–IIIA (NSCL-8)

≠

→ **N3 positive** → Definitive concurrent chemoradiation[o,w] (category 1) → Durvalumab[w,z] (if no *EGFR* exon 19 deletion or L858R mutation) (category 1) or Osimertinib[w,z] (if *EGFR* exon 19 deletion or L858R mutation) (category 1) → Surveillance (NSCL-17)

→ **Metastatic disease** → Treatment for Metastasis limited sites (NSCL-15) or distant disease (NSCL-18)

[l] FDG-PET/CT performed skull base to mid-thigh. Positive FDG-PET/CT scan findings for mediastinal nodal or distant disease need pathologic or other radiologic confirmation. If FDG-PET/CT scan is positive in the mediastinum, lymph node status needs pathologic confirmation.
[o] Principles of Radiation Therapy (NSCL-C).
[s] If MRI is not possible, CT of head with contrast.
[w] Concurrent Chemoradiation Regimens (NSCL-F).
[z] For patients who have received sequential chemoradiation, durvalumab can be considered as consolidation immunotherapy or, if *EGFR* exon 19 deletion or L858R mutation, osimertinib is recommended.

Note: All recommendations are category 2A unless otherwise indicated.

≠

≠

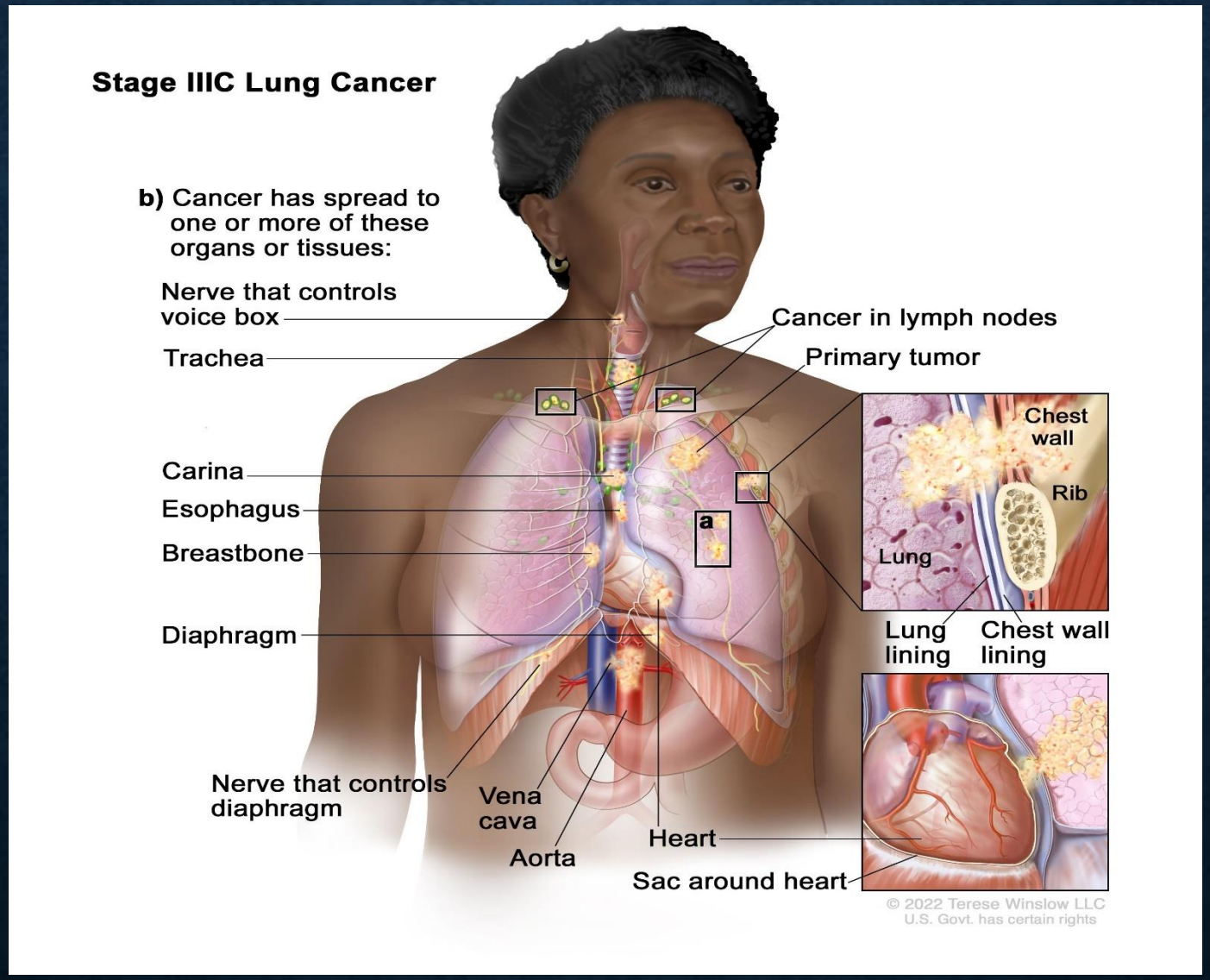
Nuiance 11:

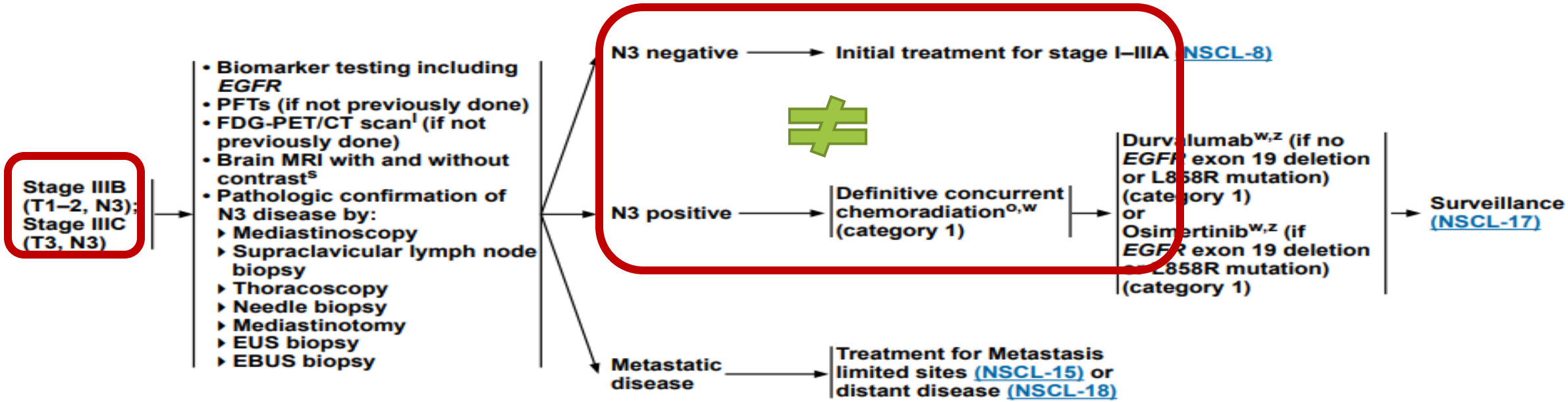
T1a-c, T2a-b
N3 (C/L Mediastinal/Hilar
I/L or C/L scalene or Supraclavicular)
T3-T4
N2
(Mediastinal/Subcarinal)

<u>OUR CLINICAL PRACTICE</u>

1) Supraclavicular Node positive –Palliative RT. Only in upper lobe if Supraclavicular positive but very small, we may think for Curative RT
2) C/L node positive –Palliative RT
3) In all above conditions first sent for NACT
4) ONLY IN PRIMARY SMALL TUMORS WITH I/L scalene or small supraclavicular – CT RT can be used.
5) In Bulky T3-T4 with mediastinal/subcarinal node first sent for NACT then assess for response.

T3-T4
N3 (C/L Mediastinal/Hilar
I/L or C/L scalene or Supraclavicular)





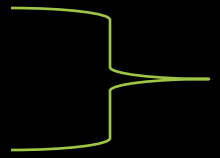
[l] FDG-PET/CT performed skull base to mid-thigh. Positive FDG-PET/CT scan findings for mediastinal nodal or distant disease need pathologic or other radiologic confirmation. If FDG-PET/CT scan is positive in the mediastinum, lymph node status needs pathologic confirmation.
[o] Principles of Radiation Therapy (NSCL-C).
[s] If MRI is not possible, CT of head with contrast.
[w] Concurrent Chemoradiation Regimens (NSCL-F).
[z] For patients who have received sequential chemoradiation, durvalumab can be considered as consolidation immunotherapy or, if *EGFR* exon 19 deletion or L858R mutation, osimertinib is recommended.

Note: All recommendations are category 2A unless otherwise indicated.

≠

Nuiance 12:

T3-4
N3



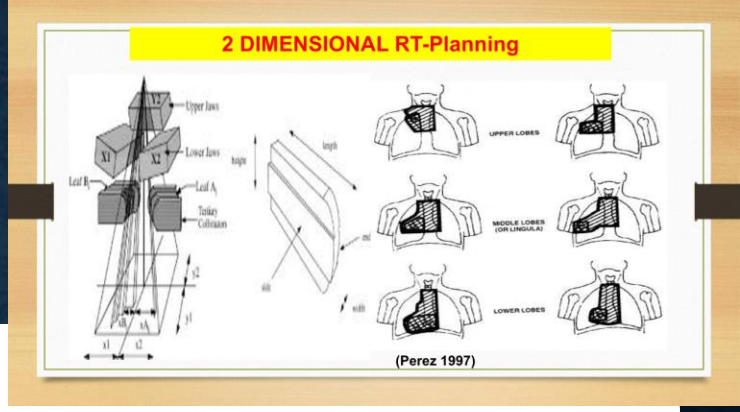
OUR CLINICAL PRACTICE

1) Supraclavicular Node positive – Palliative RT.
Only in upper lobe if Supraclavicular positive but very small, we may think for Curative RT

2) Sent for NACT

≠ Nuance 13 (Related to Technique)

CONCURRENT CHEMORADIATION



3DCRT

(60 Gy/30#)

VMAT/RAPIDARC

(60 Gy/30#)

OVERALL SURVIVAL IS SAME

(But, recent studies are expecting OS is good in IMRT artm

IMRT

(60 Gy/30#)

(Non inferior to 3DCRT, but, it significantly reduces risk of radiation pneumonitis and increases risk of Radiation oesophagitis)

IGRT/Motion Management

PLOS | ONE

RESEARCH ARTICLE

Is IMRT Superior or Inferior to 3DCRT in Radiotherapy for NSCLC? A Meta-Analysis

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Abstract

Introduction

There are no adequate data to determine whether intensity-modulated radiotherapy (IMRT) is superior to three-dimensional conformal radiotherapy (3DCRT) in the treatment of non-small cell lung cancer (NSCLC). This meta-analysis was conducted to compare the clinical outcomes of IMRT and 3DCRT in the treatment of NSCLC.

Methods

No exclusions were made based on types of study design. We performed a literature search

CHEMOTHERAPY GIVEN

- Weekly Paclitaxel + Carboplatin

Nuance 14

Durvalumab after concurrent CRT (PACIFIC Paradigm)

Check for eligibility in MDT

VALIDATION OF OUR CLINICAL PRACTICE

THE GUJARAT CANCER & RESEARCH INSTITUTE, AHMEDABAD, GUJARAT

(1) LUNG CANCER IN INDIA NAVNEET SINGH ET AL. JOURNAL OF THORACIC ONCOLOGY VOL. 16 NO. 8: 1250-1266

Table 4. Review of Retrospective and Prospective Studies on Chemoradiation in Lung Cancer From India

Author	Study	Study Period	n	Treatment	Radiotherapy Dose	Chemotherapy Regimen	Outcome
Sharma et al.[S18]	Prospective	1992-1996	506	SCRT (3 cycles CCT followed by RT) vs. RT	60 Gy/30 fractions	Cisplatin (50 mg/m^2), ifosfamide (2 g/m^2), mitomycin C (6 mg/m^2) q3 weekly	2-y survival —20% in SCRT arm and 7.4% in the RT arm
Dasgupta et al.[S19]	Prospective	NA	103	RT vs. SCRT vs. CCRT	RT arm—65 Gy/30 fractions SCRT—60 Gy/30 fractions CCRT—50 Gy/25 fractions	SCRT arm—3 cycles of cisplatin (80 mg/m^2 D1) and etoposide (120 mg/m^2 D1-3) q3 weekly before and after RT CCRT arm—cisplatin (20 mg/m^2 D1-5, D22-26) and etoposide (50 mg/m^2 D1-5, D22-26) concurrently with RT followed by two more cycles of same regimen	Statistically significant advantage in terms of OS in SCRT and CCRT arms compared with RT arm
Agrawal[S20]	Retrospective	2007-2011	55	CCRT vs. SCRT	45-66 Gy	CCRT—cisplatin (50 mg/m^2 on first and eighth d) and etoposide (50 mg/m^2 on d 1-5) of the first and last wk of radiation therapy SCRT—cisplatin (75 mg/m^2 on d 1) and etoposide (100 mg/m^2 on d 1-3) q3 weekly for four cycles followed by radical radiotherapy	Median survival—12 mo in both SCRT and CCRT
Agarwal et al.[S21]	Retrospective	2008-2012	171	NACT + CTRT—14.1% CTRT—56.7% CTRT + adjuvant—5.3% NACT/adjuvant—9.9%	Median RT dose—60 Gy/30 fractions	Platinum-based doublets	2-y DFS and OS for CTRT group was 18.8% and 61.5% vs. 29.8% and 68.8% for SCRT group ($p = 0.089$), respectively RT

					on d 1-3) q3 weekly for four cycles followed by radical radiotherapy	
Agarwal et al.[521]	Retrospective	2008-2012	171	NACT + CTRT–14.1% CTRT–56.7% CTRT + adjuvant–5.3% NACT/adjuvant–9.9% No chemotherapy –13.5%	Median RT dose–60 Gy/30 fractions	Platinum-based doublets	2-y DFS and OS for CTRT group was 18.8% and 61.5% vs. 29.8% and 68.8% for SCRT group ($p = 0.089$), respectively RT alone–2-y DFS and OS of 6.5% and 34.0%, respectively
Murali et al.[18]	Retrospective	2006-2015	Stage III–169 patients CCRT–36 SCRT–39	CCRT vs. SCRT as subgroup analysis	Details NA	Details NA	Better PFS (31% vs. 8%; $p = 0.29$) and OS (30% vs. 0%; $p = 0.51$) in CCRT as compared with SCRT
Shrimali et al.[522]	Retrospective	2011-2016	213	CCRT/SCRT/RT	CCRT–60 Gy/30 fractions SCRT/RT–55 Gy/20 fractions; 60 Gy/30 fractions; altered fractionation	Cisplatin (50 mg/m^2 on d 1, 8, 29, and 36) and etoposide (50 mg/m^2 on d 1-5 and 29-33)	Median survival–28 mo in CCRT and 13 mo in SCRT and RT ($p < 0.001$)

(continued)

Table 4. Continued

Author	Study	Study Period	n	Treatment	Radiotherapy Dose	Chemotherapy Regimen	Outcome
Srivastava et al.[S23]	Retrospective	2007-2015	114	CCRT vs. SCRT	Details NA	Details NA	Median survival—15 mo in CCRT and 16 mo in SCRT. The 1-, 3-, and 5-y OS were 56.2%, 20.6%, and 14.7%, in CCRT arm vs. 57.0%, 26.9%, and 21.2%, in SCRT arm, respectively
Kumar et al.[S24]	Prospective	2013-2014	60	NACT followed by CHARTWEL vs. NACT followed by CCRT	CHARTWEL—58.5 Gy/39 fractions (1.5 Gy for each fraction) in 17 d, three fractions a d (6 h apart) CCRT—66 Gy/33 fractions	NACT with inj. cisplatin 75 mg/m^2 divided into d 1 and d 2 and inj. paclitaxel 175 mg/m^2 intravenous on d 1 q3 weekly × 4 cycles in both arms	No statistical difference in grades of toxicities or OS/DFS between two arms
Sardar et al.[S25]	Prospective	2016-2017	44	CCRT vs. SCRT	66 Gy/33 fractions in both arms	CCRT—paclitaxel (50 mg/m^2), carboplatin (AUC-2) SCRT—2 cycles of paclitaxel (175 mg/m^2), carboplatin (AUC 5) followed by RT	DFS and PFS in the SCRT were numerically superior to CCRT but statistically not significant
Srinivasa et al.[S26]	Prospective	2013-2014	36	CTRT using paclitaxel and carboplatin (study arm) vs. CTRT using cisplatin and etoposide (control arm)	60 Gy/30 fractions	Control arm—cisplatin 20 mg/m^2/d and etoposide 50 mg/m^2/d i.v. on d 1-5 and d 29-33 concurrently with RT Study arm—paclitaxel—50 mg/m^2, AUC 2 weekly concurrently with RT	No statistical significant difference in the study or control arm

Note: Due to the reference restrictions in this journal, please find a separate reference list of the tables as supplementary materials at https://doi.org/10.1016/j.jtho.2021.02.004.

AUC, area under curve; CCRT, concurrent chemoradiation; CHARTWEL, continuous hyperfractionated accelerated radiotherapy week end-less; DFS, disease-free survival; i.v., intravenous; NA, not available; NACT, neoadjuvant chemotherapy; OS, overall survival; PFS, progression-free survival; RT, radiotherapy; SCRT, sequential chemoradiation.

(2) VOLUME DEFINITION IN RADIOTHERAPY PLANNING FOR LUNG CANCER

Cancer Imaging (2006) **6,** 116–123
DOI: 10.1102/1470-7330.2006.0019

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REVIEW

Volume definition in radiotherapy planning for lung cancer: how the radiologist can help

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Date accepted for publication 30 May 2006

Abstract

Effective treatment for carcinoma of the lung remains one of the biggest challenges in oncology. Radical radiotherapy may be a curative option for patients who are unsuitable for radical surgery either because of disease stage or because

Stage I, II or IIIa – unsuitable candidates for Surgery
Stage IIIb - depending on the size of tumor, and where neoadjuvant chemotherapy has been successful in reducing tumors to a volume where radical treatment is feasible

Review Article

Challenges in optimizing chemoradiation in locally advanced non small-cell lung cancers in India

Sushma Agrawal

Abstract

Data supporting use of concurrent chemoradiation in locally advanced lung cancers comes from clinical trials from developed countries. Applicability and outcomes of such schedules in developing countries is not widely reported. There are various challenges in delivering chemoradiation in locally advanced non small cell lung cancer in developing countries which is highlighted by an audit of patients treated with chemoradiation in our center. This article deals with the challenges in the context of a developing country. We conclude that sequential chemoradiotherapy is better tolerated than concurrent chemoradiation in Indian patients with locally advanced non-small cell lung cancers. Patients with stage IIIa, normal weight or overweight, and adequate baseline pulmonary function should be offered concurrent chemoradiation.

Key words: Locally advanced non-small cell Lung cancer, concurrent chemoradiation, developing countries, non-small-cell lung cancer, chemoradiation

Introduction

Lung cancer remains a major cause of death

meta-analysis have compared sequential and concomitant combinations directly, almost all of which showed a trend

Conclusion:
Sequential chemoradiotherapy is better tolerated than concurrent chemoradiation in Indian patients with locally advanced NSCLC. Patients with stage IIIA, normal weight or overweight, and adequate baseline pulmonary function should be offered concurrent chemoradiation.

HOW I DECIDE CONCURRENT CRT IN CLINIC

Clinical Presentation
&
All Optimum Ix Done according to Resource available

MDT

FIT
ECOG 0-1
PFT ACCEPTABLE
WEIGHT STABLE
NO ILD/SEVERE COPD

STAGE III
Unresectable, Non bulky, No adjacent structure invasion like heart, oseophagus, trachea, Chest wall, ribs, No pleural effusion

Concuurent CT-RT

IF NOT FIT IN ABOVE CRITERIA IN MDT
Sequential/NACT/Palliative

CONCURRENT CRT IN NSCLC
INDICATIONS AND PRACTICAL NUIANCES

	INDICATION INOPERABLE STAGE III NSCLC	NUANCES
1	Guidelines	Treatment principals only as guidelines and not cookbook for management of Ca Lung
2	Performance status	Limitations for frail patients. ECOG >/=2 can not tolerate. Not for elderly patients. Not for severe cardiac disease patients.
3	PFT	Not for pre-existing interstitial lung disease patients.
4	Weight loss	>5% from baseline is poor prognostic factor.
5	FDG PET-CT	Appprox. 850 functional PET-CT scanners in India. Majority in Metropolitan cities. 2750 in 2019 in USA. 2100 Europe
6	Mediastinoscopy/Thoracoscopy/ Mediastinotomy/EBUS Biopsy for Pathologic confirmation of nodal disease	Even in RCC, this procedure not done routinely
7	CT Scan Thorax + Upper abdomen with contrast	India has 31 CT Scanners per million people

	INDICATION INOP. STAGE III NSCLC	NUANCES
08	Stage IIIA T1a-c, T2a-b N2 (Mediastinal/Subcarinal)	If Performance status is good, no weight loss, baseline pulmonary function is good, Patietns are considered for concurrent chemoradiation in clinical practice.
09	Stage IIIA T3 N1 (Intrapulmonary/ Peribronchial/Hilar)	If bulky disease with respect to lung volume -NACT If Non-bulky disease, Performance status is good, no weight loss, baseline pulmonary function is good, Patietns are considered for concurrent chemoradiation in clinical practice. Invasion in to chest wall/superior sulcus tumor – Palliative RT/Hypofractionated RT
10	Stage IIIA T4 N0-1 Tumor size >7 cm No/N1 Invasion to adjacent structures	 CT-RT or If bulky disease with respect to lung volume -NACT Palliative RT/Hypofractionated RT

	INDICATION INOP. STAGE III NSCLC	NUANCES
11	Stage IIIB	1) Supraclavicular Node positive –Palliative RT. Only in upper lobe if Supraclavicular positive but very small, we may think for Curative RT 2) C/L node positive –Palliative RT 3) In all above conditions first sent for NACT 4) ONLY IN PRIMARY SMALL TUMORS WITH I/L scalene or small supraclavicular – CT RT can be used. In Bulky T3-T4 with mediastinal/subcarinal node first sent for NACT then assess for response
12	Stage IIIC	1) Supraclavicular Node positive –Palliative RT. Only in upper lobe if Supraclavicular positive but very small, we may think for Curative RT 2) Sent for NACT
13	Technique	IMRT or 3DCRT (60 Gy/30#) (IMRT is Non inferior to 3DCRT in terms of overall survival, but, it significantly reduces risk of radiation pneumonitis and increases risk of Radiation oesophagitis)

	INDICATION INOPERABLE STAGE III NSCLC	NUANCES
14	Post CT-RT	Durvalumab (Discuss in MDT for eligibility)


Thank
You!