Lung Nodule evaluation - Update

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Respiratory (Interventional Pulmonologist) Physician

General Physician

Introduction

- Graduated from Manipal University, India in 2007
- FRACP Acute and general Medicine in 2017
- FRACP Respiratory Medicine in 2018
  - Clinical research fellowship – SMAHS
  - 15/36 months – Lung cancer, Interventional pulmonology, Pleural diseases
- General Medicine Consultant at FSH 2018
- Procedural training, Italy in 2018
- Interventional pulmonology fellowship at SCGH in 2019
- WA Covid response team at JHC
- Currently work at the Mount hospital, SJOG Subiaco and RPH

Objective

- Demonstrate that lung nodules should be referred, preferably to a clinician with a specific interest – interventional pulmonologist
- Avoid a nihilistic view towards nodules for medically frail or elderly
- PET is not as good as we thought it was
- EBUS bronchoscopy safely offer diagnosis and staging in a single procedure

Lung Nodule evaluation - Update

Why?

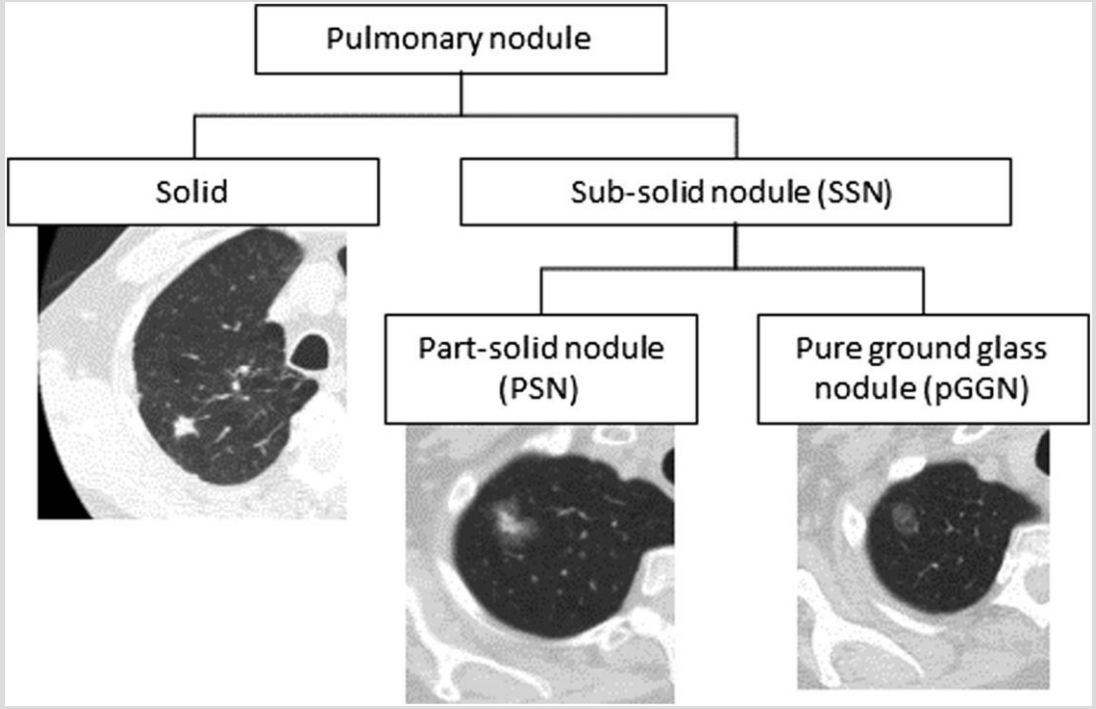
Impact of screening – **Stage shift, More nodules**

NLST trial LDCT arm - Stage I/II = 57.1%

NEJM 2011;365:395-409.

Pulmonary nodule

- Well defined pulmonary parenchymal opacity < 3cm in size
- Opacities > 3cm = mass



*Consolidation/other terminologies have specific radiological definitions

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017 MacMahon et al Radiology: Volume 284: Number 1—July 2017

Most patients with lung nodules are asymptomatic

Detection

→ Incidental finding on CXR, chest CT or partial CT

→Screen detected Chest CT scans*

Objective

→Exclude neoplastic process (primary lung or secondary)

Lung cancer is a devastating diagnosis

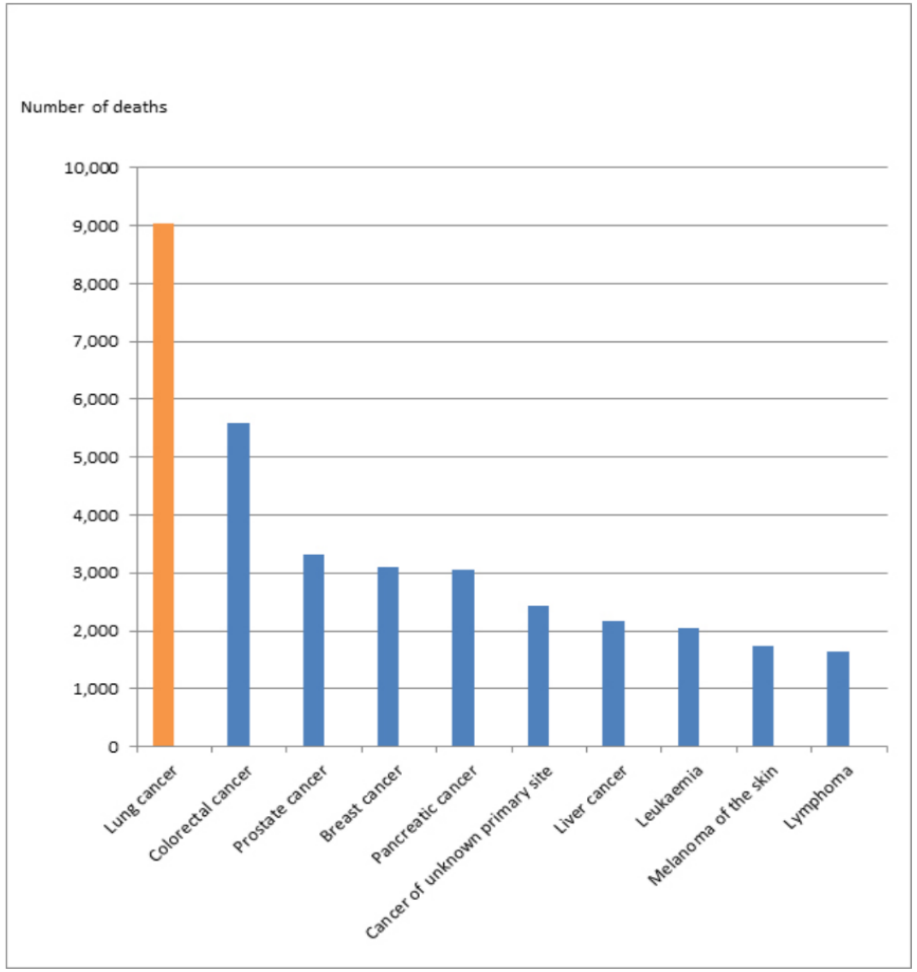


Figure 3. Estimated most common causes of cancer death, 2019

https://canceraustralia.gov.au/node/5941

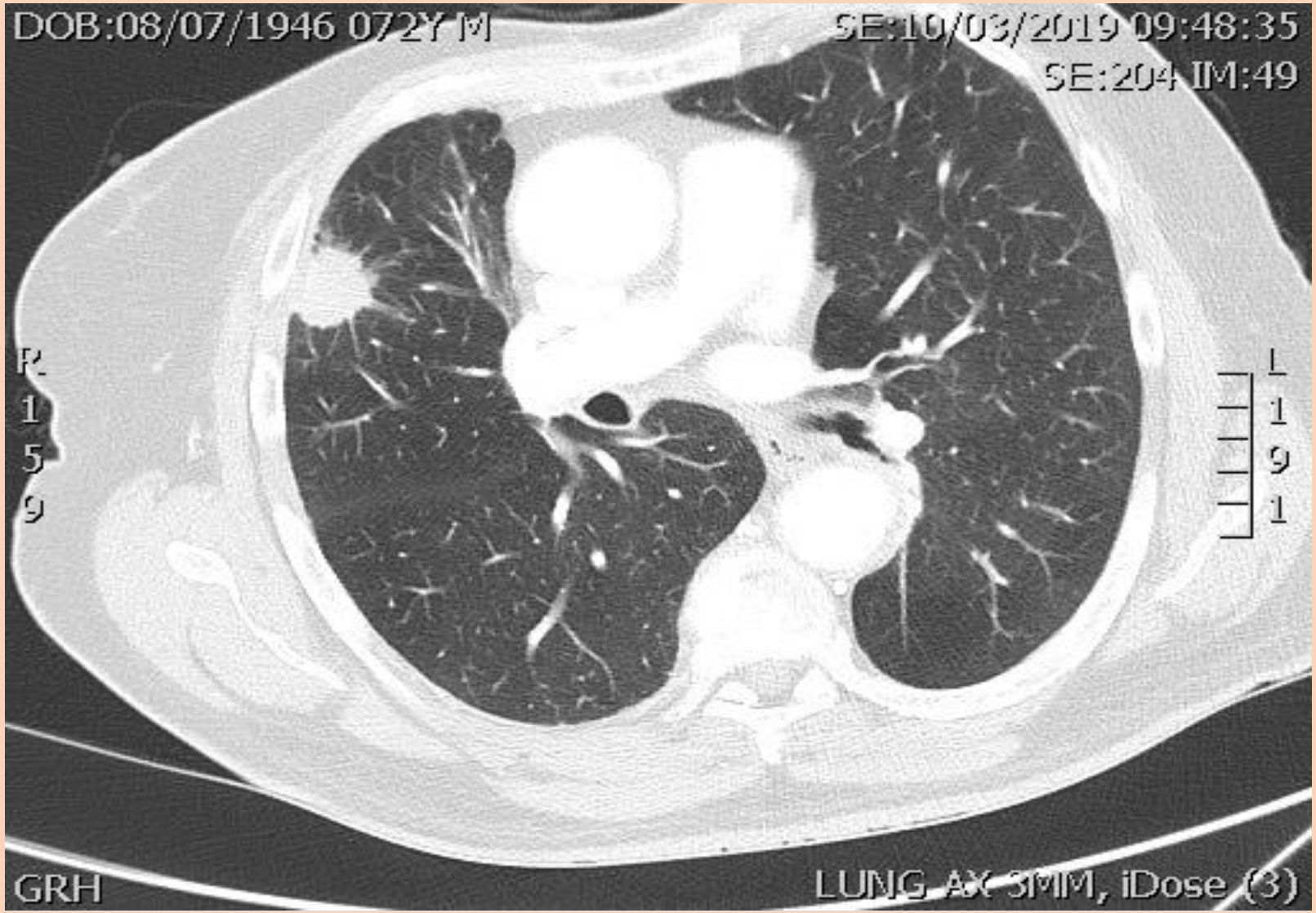
A lung cancer detected as a nodule is an opportunity for cure!

With Surgical Resection*

SBRT offers curative treatment for the frail

Case: **73yo M, ECOG 0, Ex-smoker,**

Lung function– Mild obstruction, normal gas transfer



Case: **73yo M, ECOG 0, Ex-smoker,**

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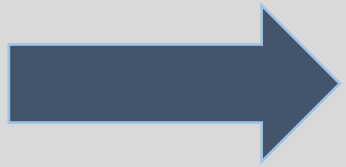
What would you do?

- Refer to Cardiothoracic surgeon for resection (Diagnosis/Treatment)
- Arrange a CT guided biopsy/FNA (Diagnosis)
- Arrange a PET scan (Staging)
- Refer to an Oncologist (Treatment)
- Refer to Respiratory physician (????)

→Go as per radiologist comment

Radiologist recommendation are based on radiological features

- Size >6mm
- Spiculation
- Persistence
- Enlargement
- Architectural distortion
- Lymphadenopathy

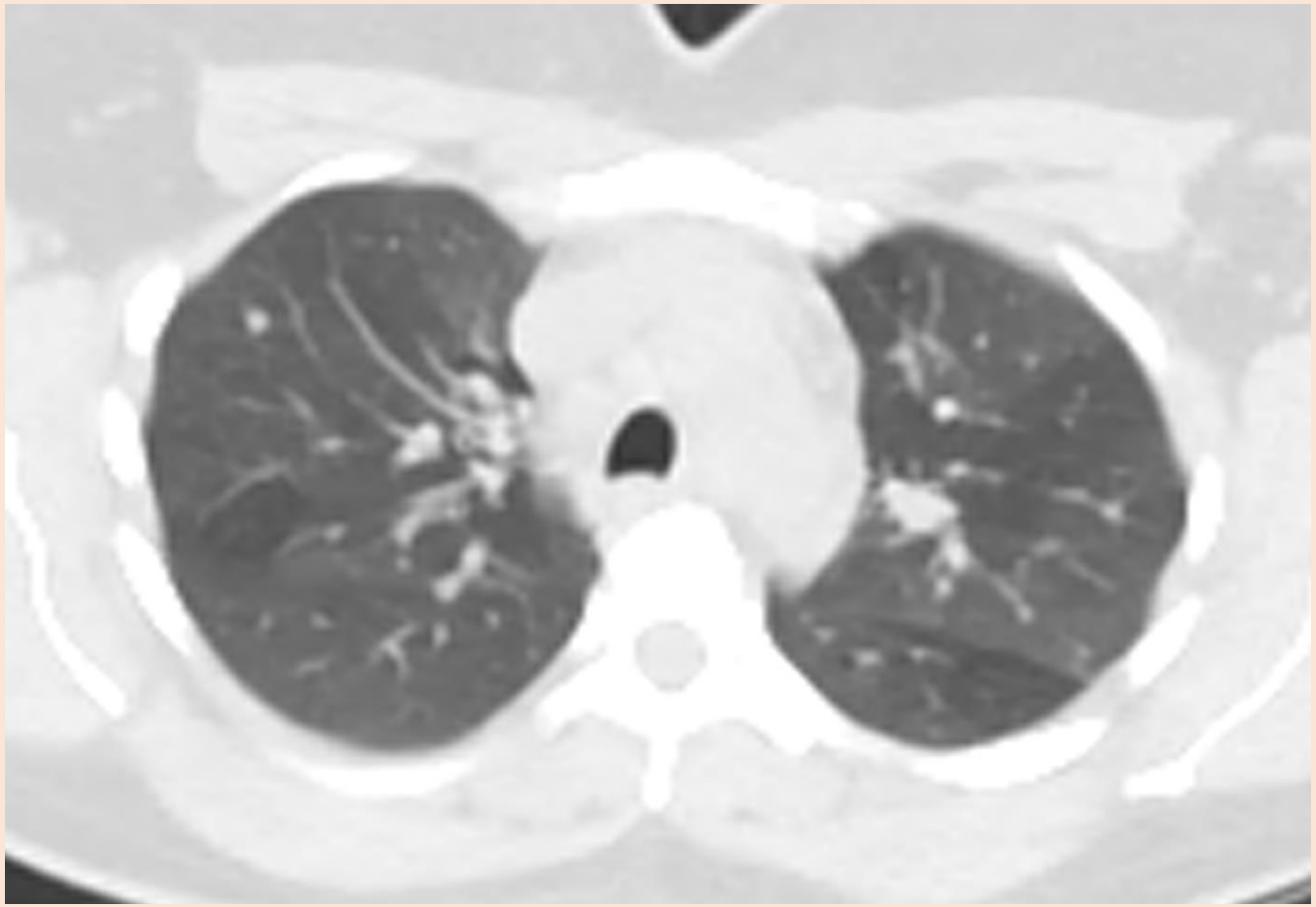


A. Benign nodule
B. Surveillance
C. Biopsy
D. Referral

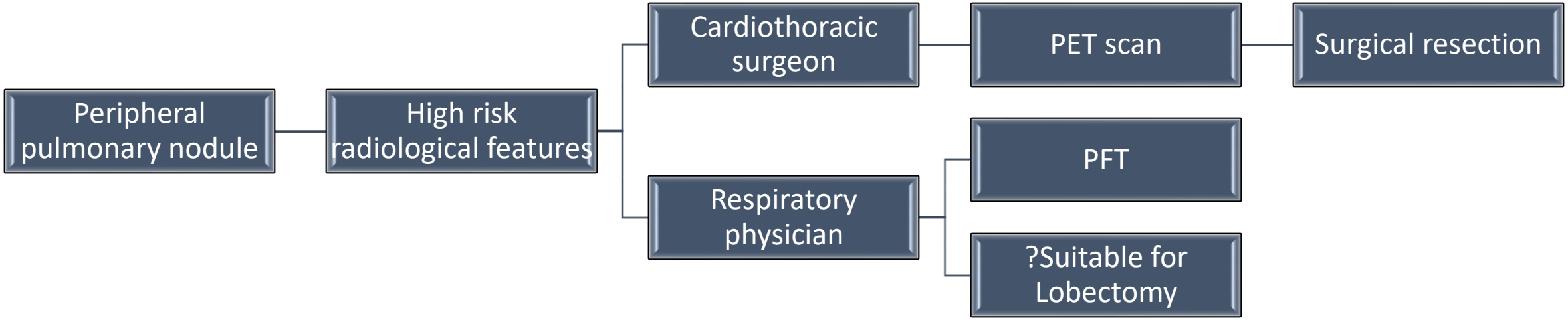
43yo F, Asymptomatic, Referred for incidental multiple pulmonary nodules

- CT reviewed in clinic – Extensive thoracic adenopathy
- Presented at MDT
  - Imaging reviewed by Thoracic radiologist – agrees
- FDG PET scan
- Proceeded to USG guided FNA single SC LN– non diagnostic
- EBUS – 3x LN – 1x granuloma

- Sarcoidosis



Conventional approach to lung nodules



- PET +ve tumour, PET -ve mediastinal nodes → no further tissue confirmation needed → Straight to surgery

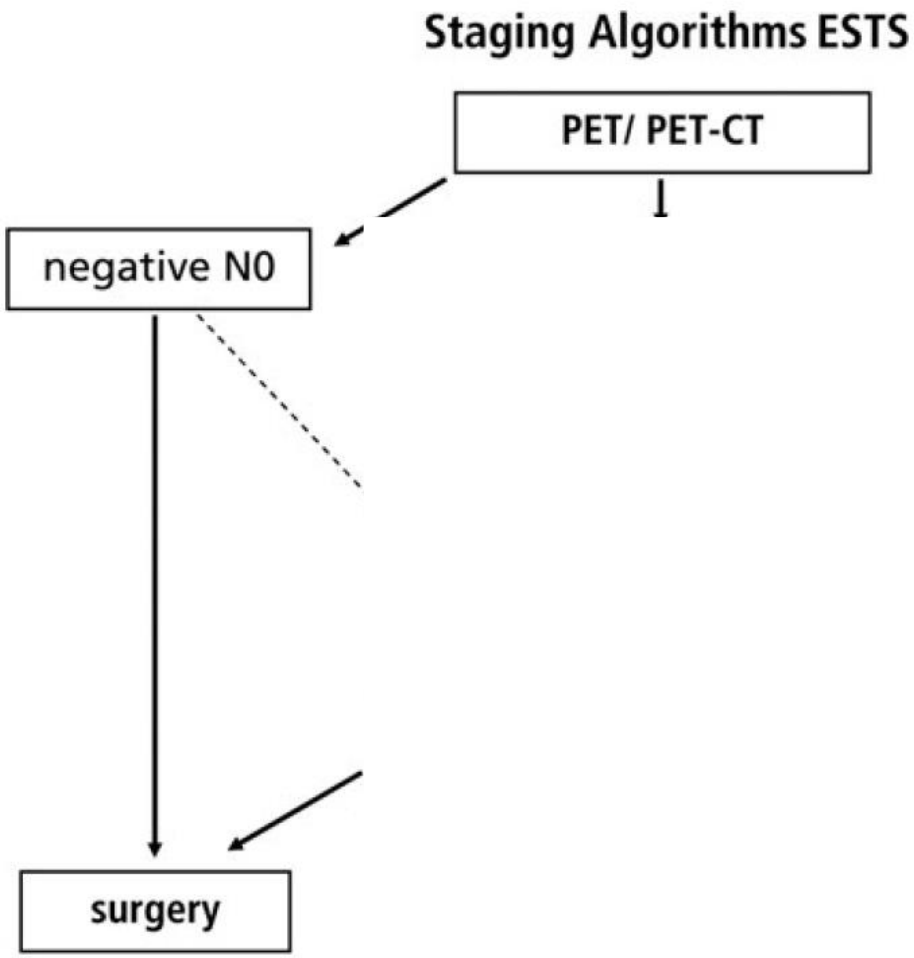
Weder et al Annals of Oncology 19 (Supplement 7): vii28–vii30, 2008

FDG PET-CT

- FDG avidity is a marker for ***glucose uptake*** not malignancy → Clinically significant false positives

- Attitude shift towards ***atleast attempt*** at tissue diagnosis before management decision

What about abnormal mediastinal lymph nodes?



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Progress in the last decade

A. **Understanding natural history of early stage lung cancer**
B. Understanding importance of accurate staging
C. Improved technology - EUS/EBUS/slimmer bronchoscopes
D. Understanding airway anatomy + Thin slice CT (</=1mm)

Natural history of early stage lung cancer

- Nodule Characteristics
  - Nodules are common
  - Clinical risk
  - Tumour doubling time
  - All cause anxiety amongst our patients
- Perifissural nodules are benign

- Multidiscplinary cooperation

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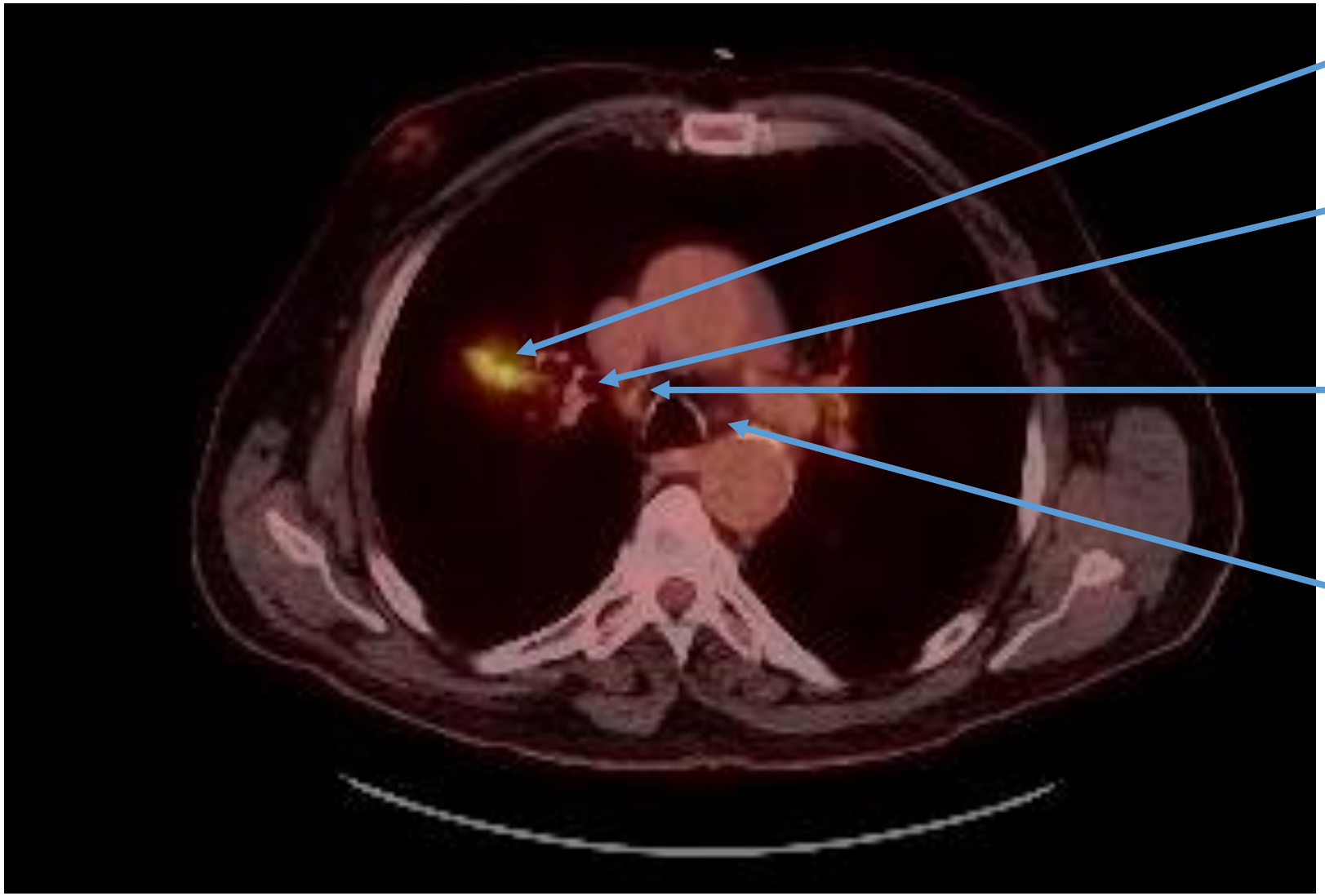
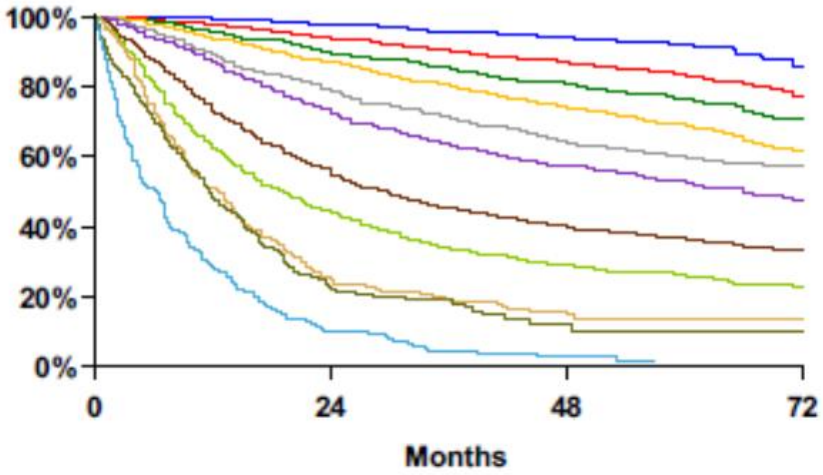
Importance of accurate staging



Lung Cancer Survival

- Stage I-IIA = Survival > 60%
- Stage IIB - IV = Survival </= 50%



Proposed	Events / N	MST	24 Month	60 Month
IA1	68 / 781	NR	97%	92%
IA2	505 / 3105	NR	94%	83%
IA3	546 / 2417	NR	90%	77%
IB	560 / 1928	NR	87%	68%
IIA	215 / 585	NR	79%	60%
IIB	605 / 1453	66.0	72%	53%
IIIA	2052 / 3200	29.3	55%	36%
IIIB	1551 / 2140	19.0	44%	26%
IIIC	831 / 986	12.6	24%	13%
IVA	336 / 484	11.5	23%	10%
IVB	328 / 398	6.0	10%	0%

CT/PET and Occult nodal metastasis

- PET/CT is associated with clinically **relevant false positive** lymph nodes
  - DDx Granulomatous disease (TB, Histoplasmosis, Sarcoidosis), Anthrasilicosis

Darling et al J Thorac Oncol. 2011;6: 1367–1372

Thoracic lymph node status is critically important and FDG PET alone is insufficient to stage NSCLCa

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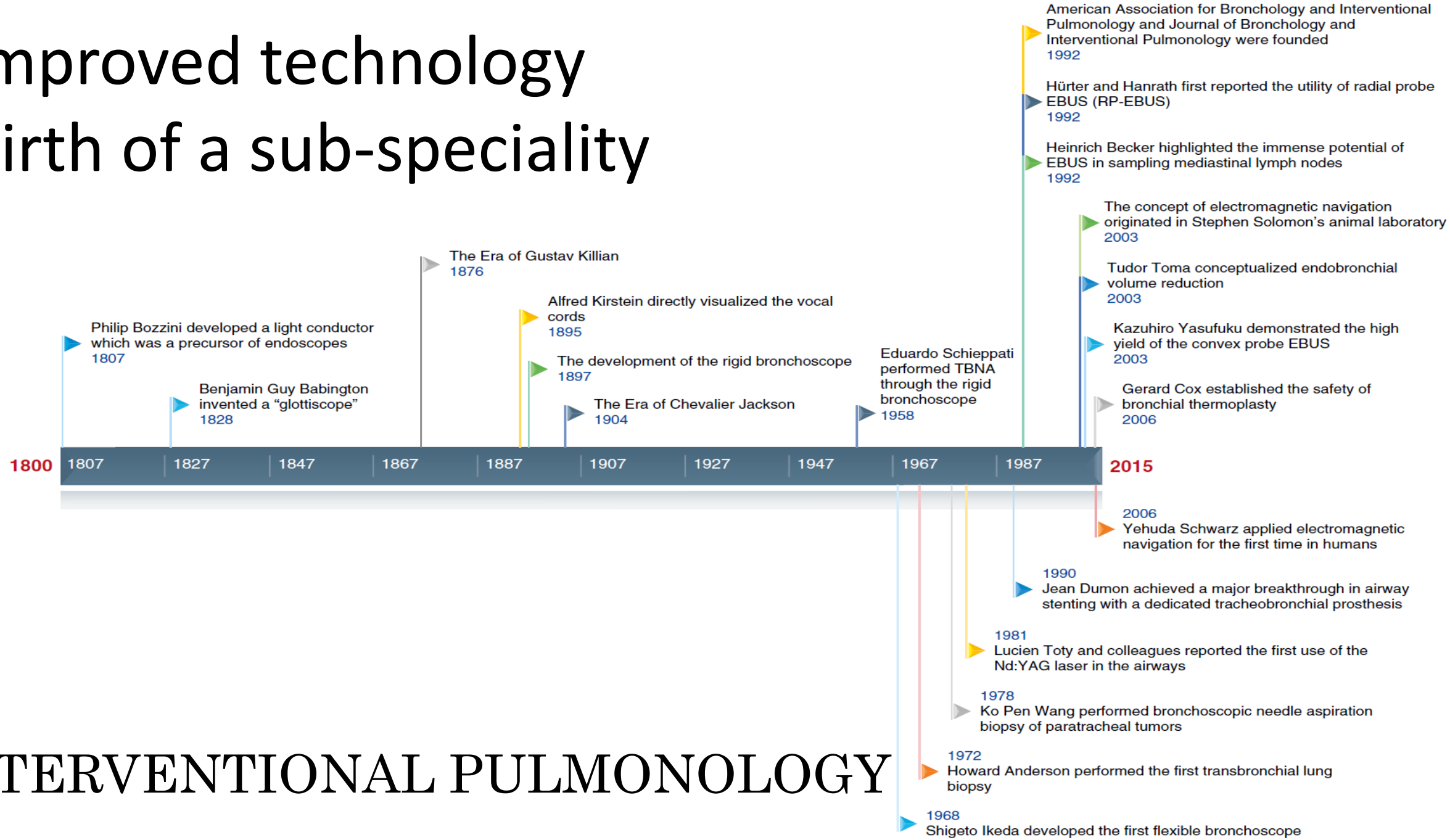
Improved technology
Birth of a sub-speciality



INTERVENTIONAL PULMONOLOGY

Endobronchial ultrasound (EBUS)

Linear/Convex Probe EBUS

- Flexible bronchoscope with a convex ultrasound probe on the tip in addition of traditional white light camera

Table 2 Published meta-analyses on endobronchial and oesophageal endosonography with fine needle aspiration for mediastinal nodal staging of lung cancer

Author	Year	Modality	Pts (N)	Pooled sens % (95% CI)	Pooled spec % (95% CI)	NLR
Micames, *et al*. (23)	2007	EUS	1,201	83 [78-87]	97 [96-98]	–
Gu, *et al*. (24)	2009	EBUS	1,298	93 [91-94]	100 [99-100]	–
Adams, *et al*. (25)	2009	EBUS	817	88 [79-94]	100 [92-100]	0.12
Chandra, *et al*. (26)	2012	EBUS	1,658*	92 [90-93]	100 [97-100]	0.13
Zhang, *et al*. (27)	2013	EUS + EBUS	823	86 [82-90]	100 [99-100]	0.15

N, number; CI, confidence intervals; EUS, esophageal endosonograph; EBUS, endobronchial endosonography; Pts, patients; Sens, sensitivity; Spec, specificity; NLR, negative likelihood ratio; *, some small series also included sarcoidosis.

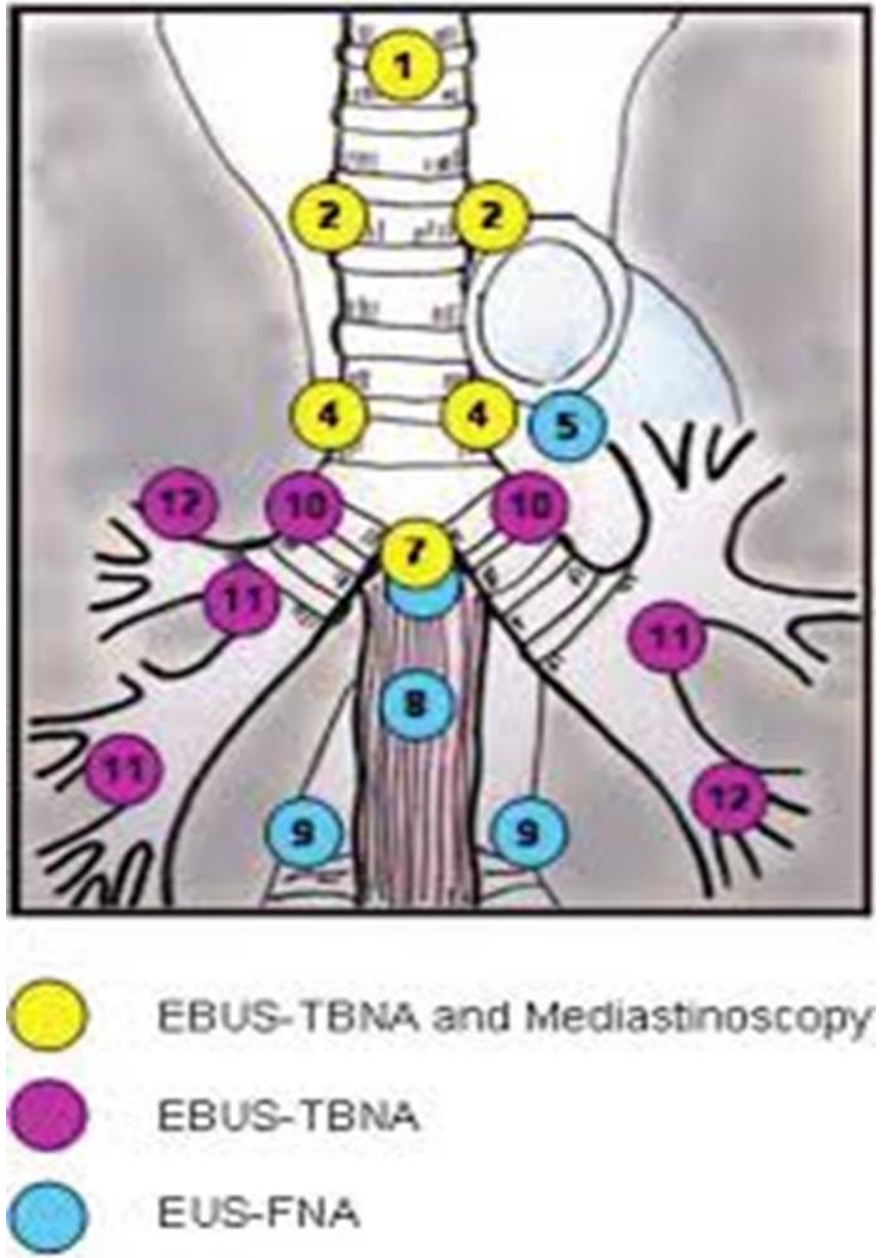
Technique	Sensitivity %	Specificity %	NPV %	PPV %
CT	57	82	83	56
PET	84	89	93	79
Blind TBNA	76	96	71	100
EUS–FNA	88	91	77	98
Mediastinoscopy	81	100	91	100

EBUS/EUS are reliable techniques for nodal staging

ESTS guidelines mediastinal staging De Leyn et al *Transl Lung Cancer Res* 2014;3(4):225-233
ESGE/ERS/ESTS Guideline Vilmann P et al, Endoscopy 2015, 47:545-559
Wader et al Annals of Oncology 19 (Supplement 7): vii28–vii30, 2008

Limitations of Mediastinoscopy

- Overnight stay
- GA
- Scar
- Limited Access



Combined endobronchial and esophageal endosonography for the diagnosis and staging of lung cancer: ESGE/ERS/ESTS Guideline 2015

- For mediastinal nodal staging in patients with suspected or proven NSCLCa with abnormal mediastinal and/or hilar nodes at CT or PET/CT endosonography is recommended over surgical staging as the initial procedure **(Recommendation grade A)**.

- EBUS + EUS/EUS-B, is preferred over either test alone **(Recommendation grade C).**

Vilmann P et al, Endoscopy 2015, 47:545-559

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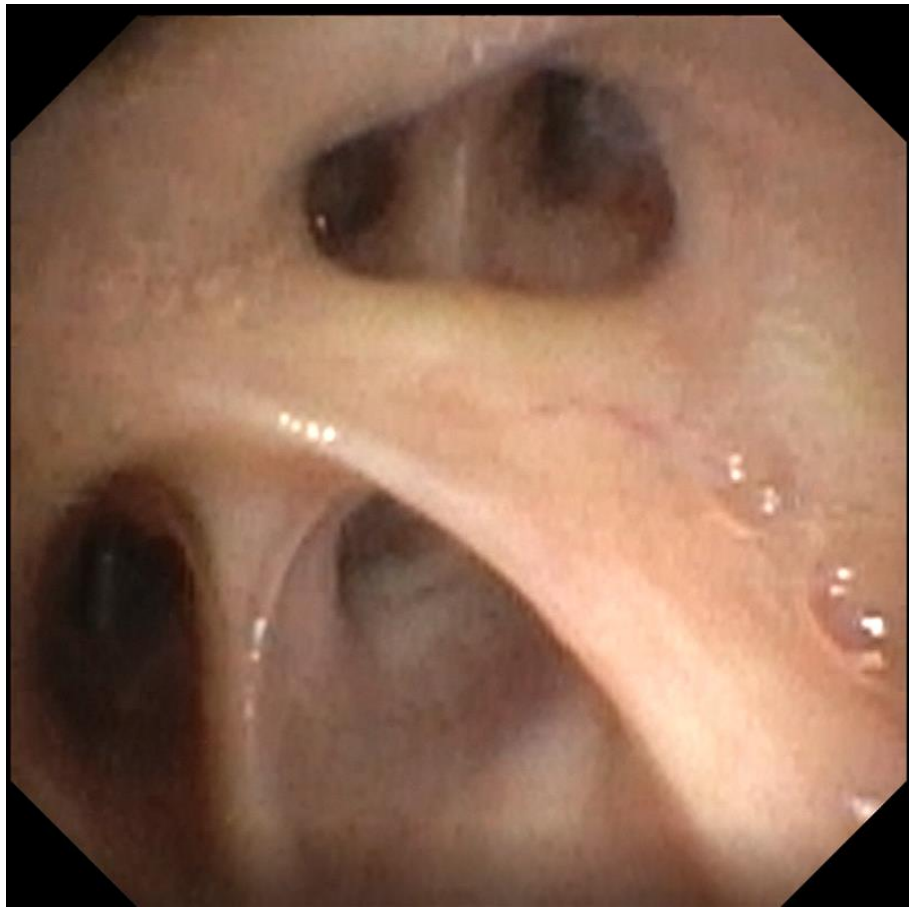
Airway anatomy & Thin slice CT Chest



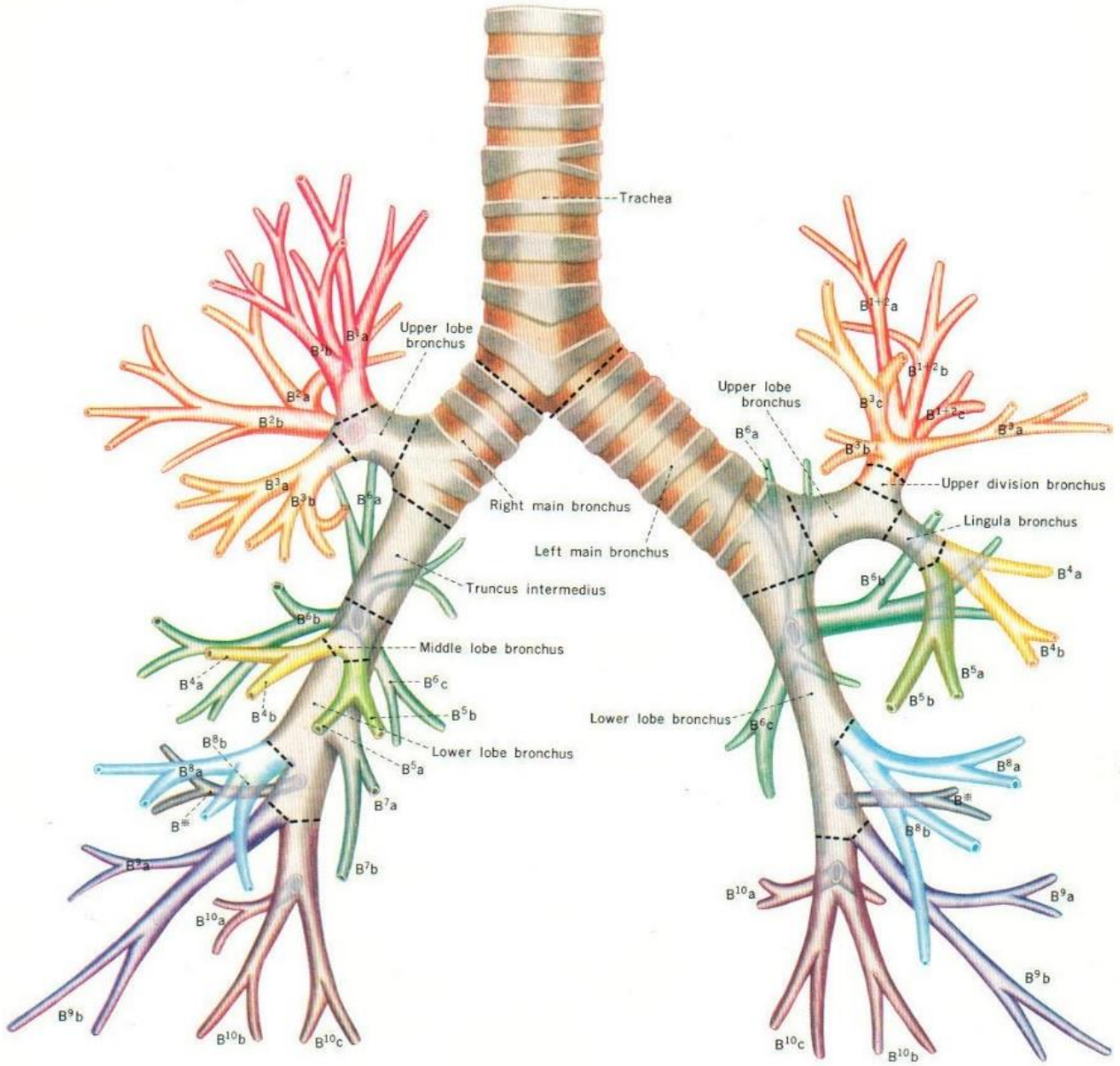
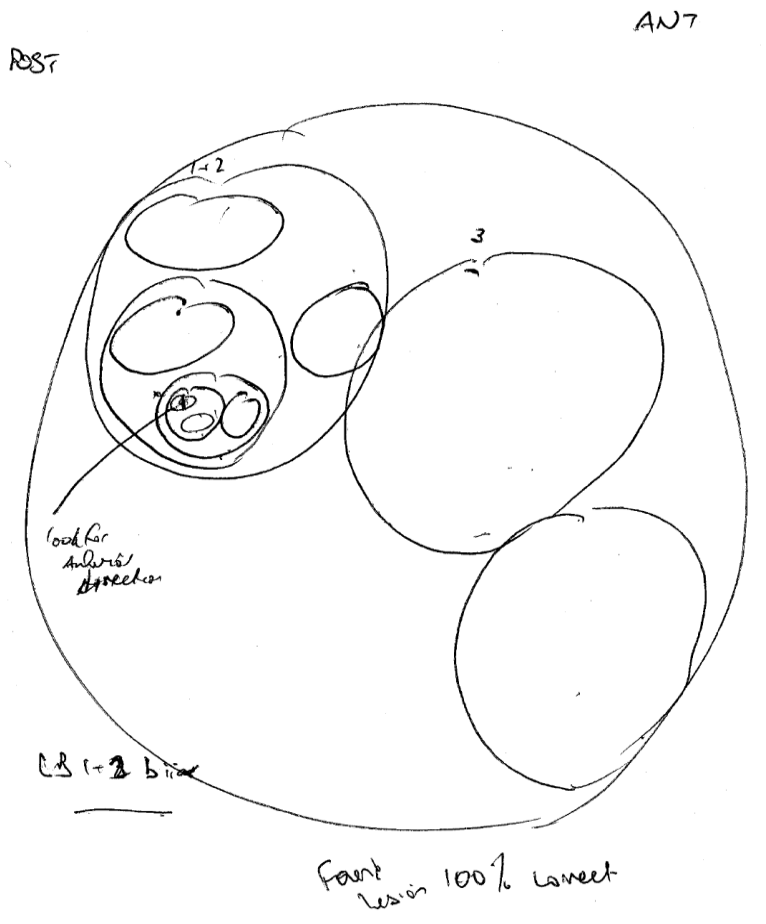


Fig. 115 The bronchial tree.

Peripheral nodule mapped

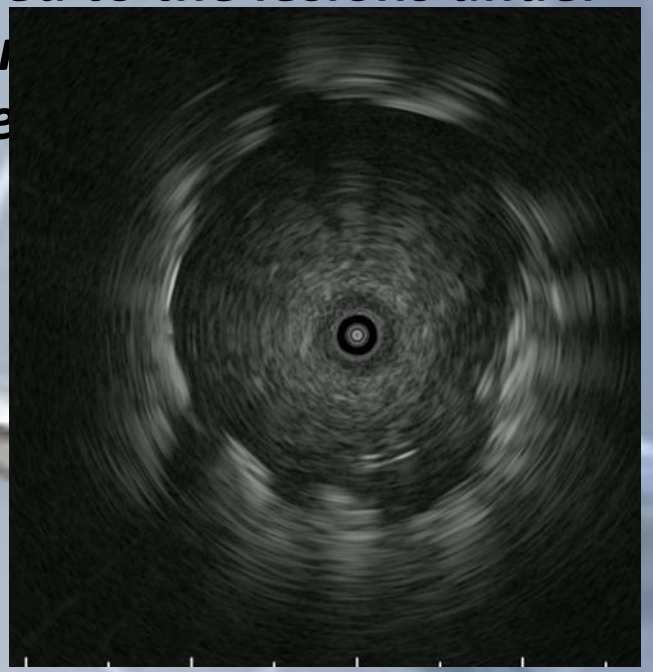


Endobronchial ultrasound (EBUS)

Radial EBUS

- Thin (1.7mm) wire with 360° spinning ultrasound at distal tip

"Biopsy forceps covered with a GS can be moved to the lesions under EBUS guidance, after which biopsy and brushi
sequentially obtained by keeping the GS in the



Eur Respir J 2004; 24: 533–537.

Safety: Radial EBUS

- Meta-analysis, studies from 2002-2016: 57 studies, 7872 lesions

	Radial EBUS
Diagnostic yield	70%
Safety: Pneumothorax ICC	 2.8% (All complications) 0.2%

Radial endobronchial ultrasound for the diagnosis of peripheral pulmonary lesions: A systematic review and metaanalysis Ali et al *Respirology* (2017)

Current approach to lung nodules

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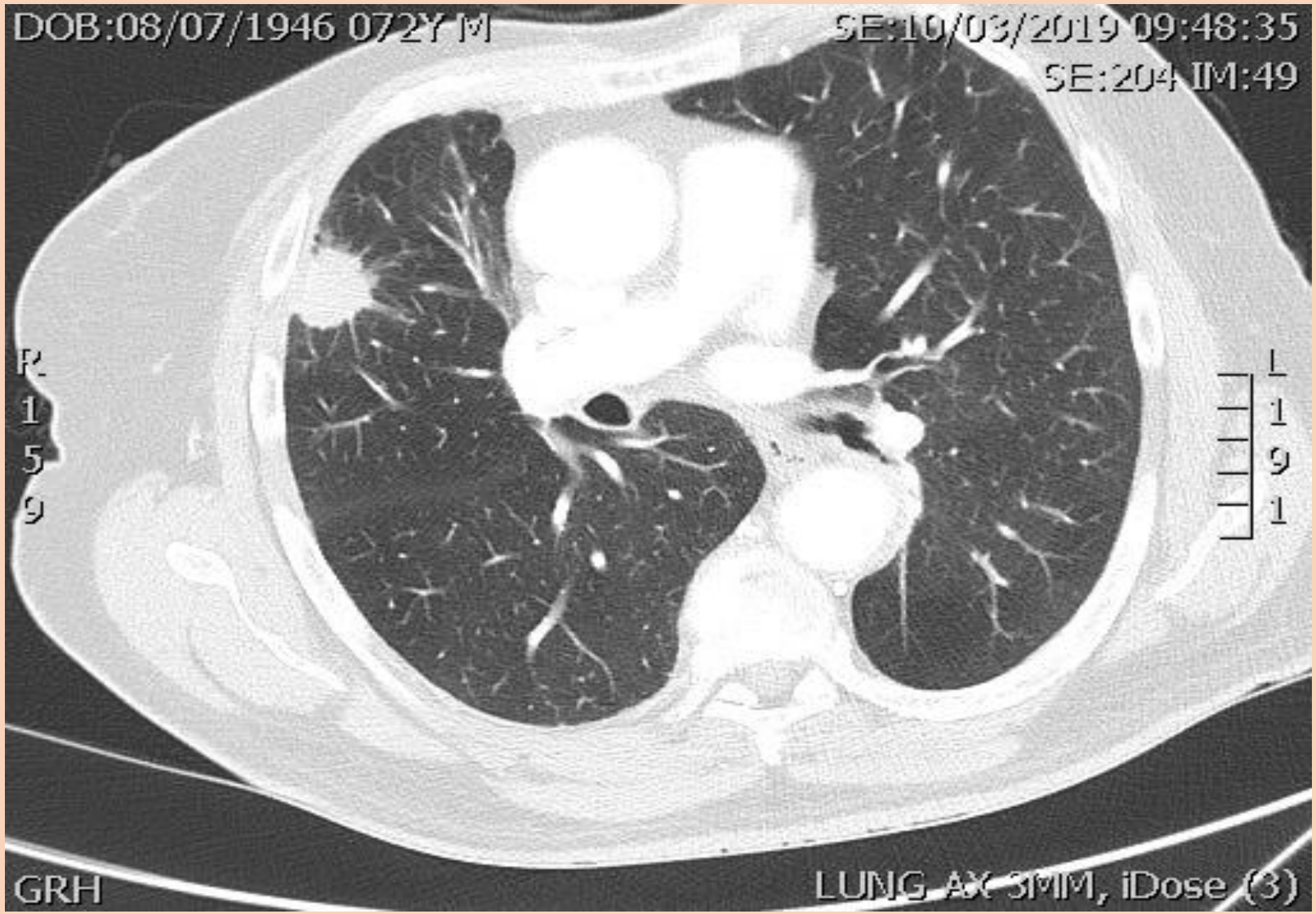

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- Arrange a PET scan (Staging)
- Refer to an Oncologist (Treatment)
- Refer to Respiratory physician (????)

✓ Refer to an interventional pulmonologist

Case: 73yo M, ECOG 0, Ex-smoker,

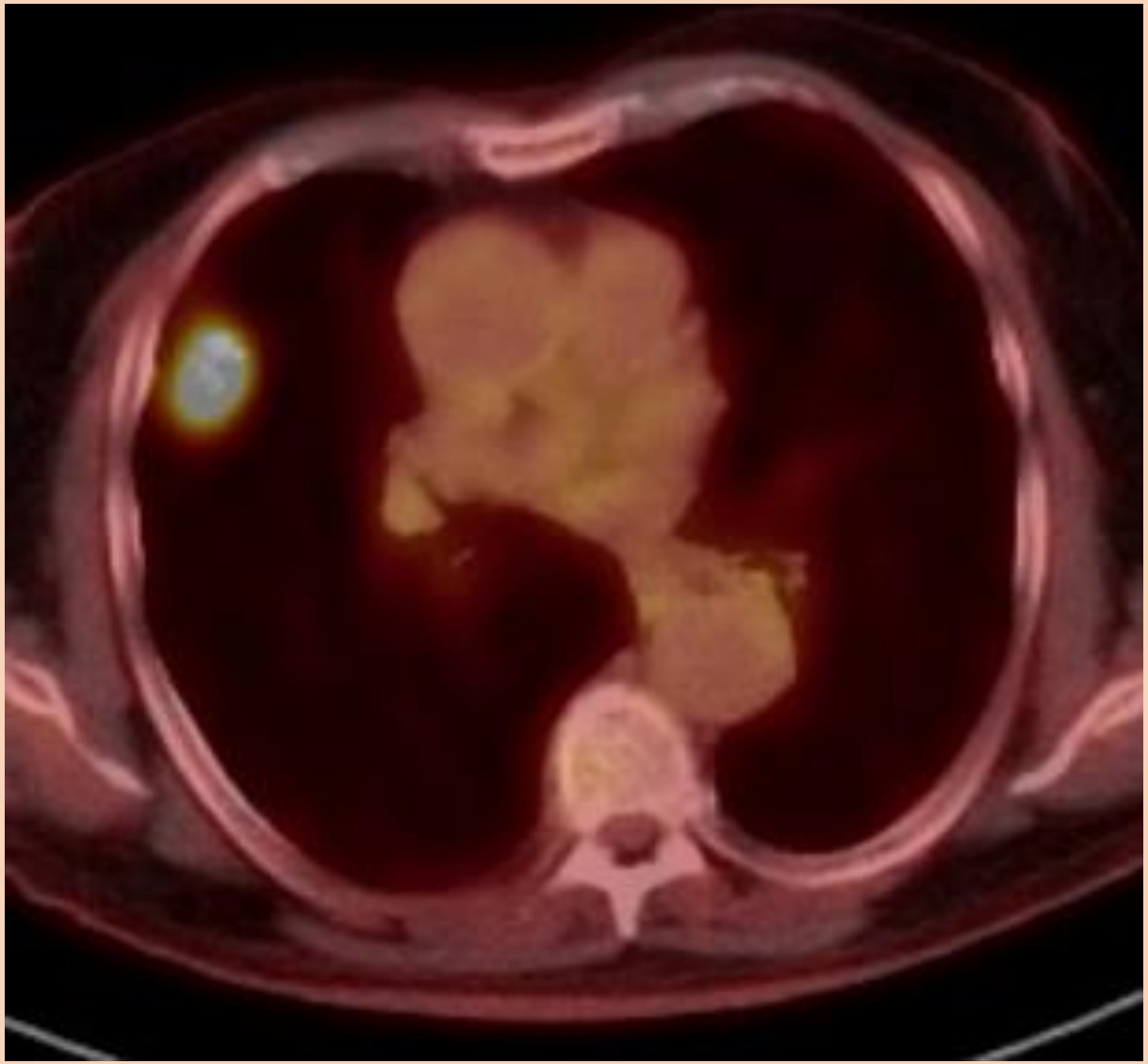
Lung function– Mild obstruction, normal gas transfer

Clinico-radiological nodule risk - High

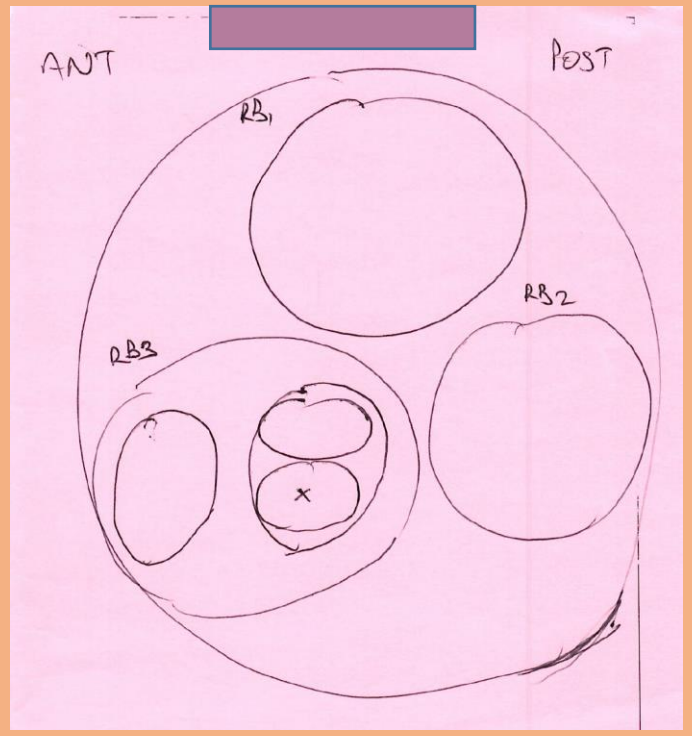
Risk of occult nodal metastasis - Intermediate

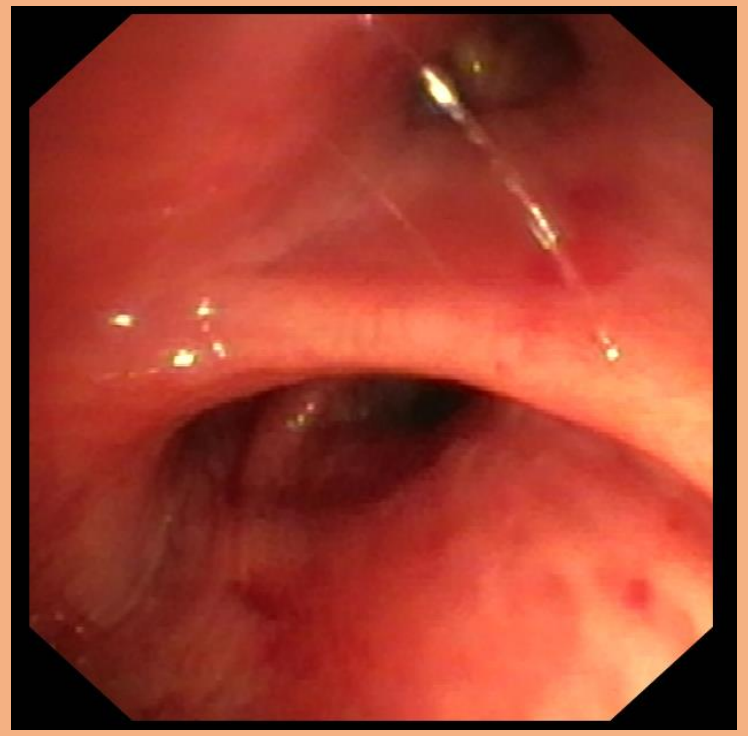
Decision: PET and proceed

PET image



Case Outcome





- Mapping – RB3aii
- Combined EBUS: LN - anthrasilicosis, RUL brush - NSCLCa
- Lung Cancer MDT: Stage 1A3 → RUL lobectomy

Key Message

- Majority of early stage Lung Ca can be approached with curative intent with either surgery or SBRT +/- adjuvant treatment if necessary
- FDG PET scans have clinically significant false positives for pulmonary nodules and mediastinal lymph nodes
- Linear EBUS bronchoscopsy has superseded mediastinoscopy for workup of lung cancers
- Together with radial EBUS, diagnosis and staging can be offered in the single procedure

thank you

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PRACTICE

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