

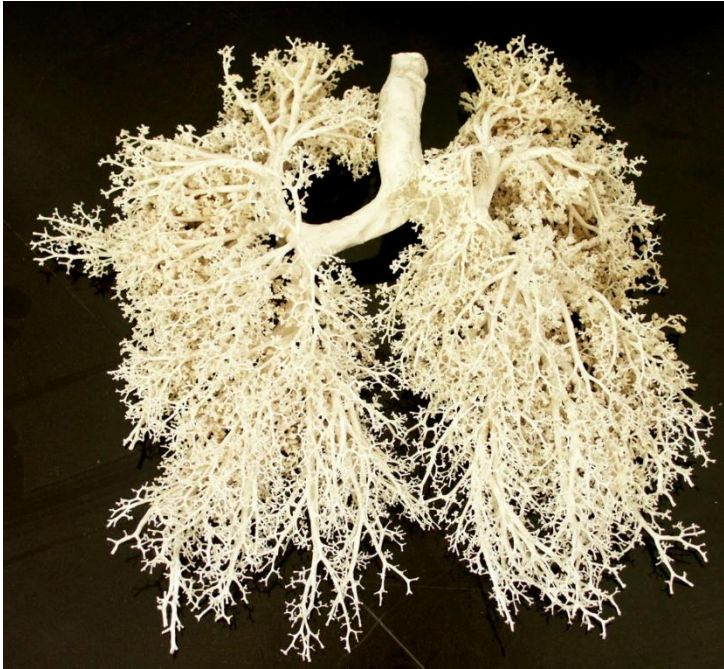
# Navigation to peripheral lung lesions without navigation modalities

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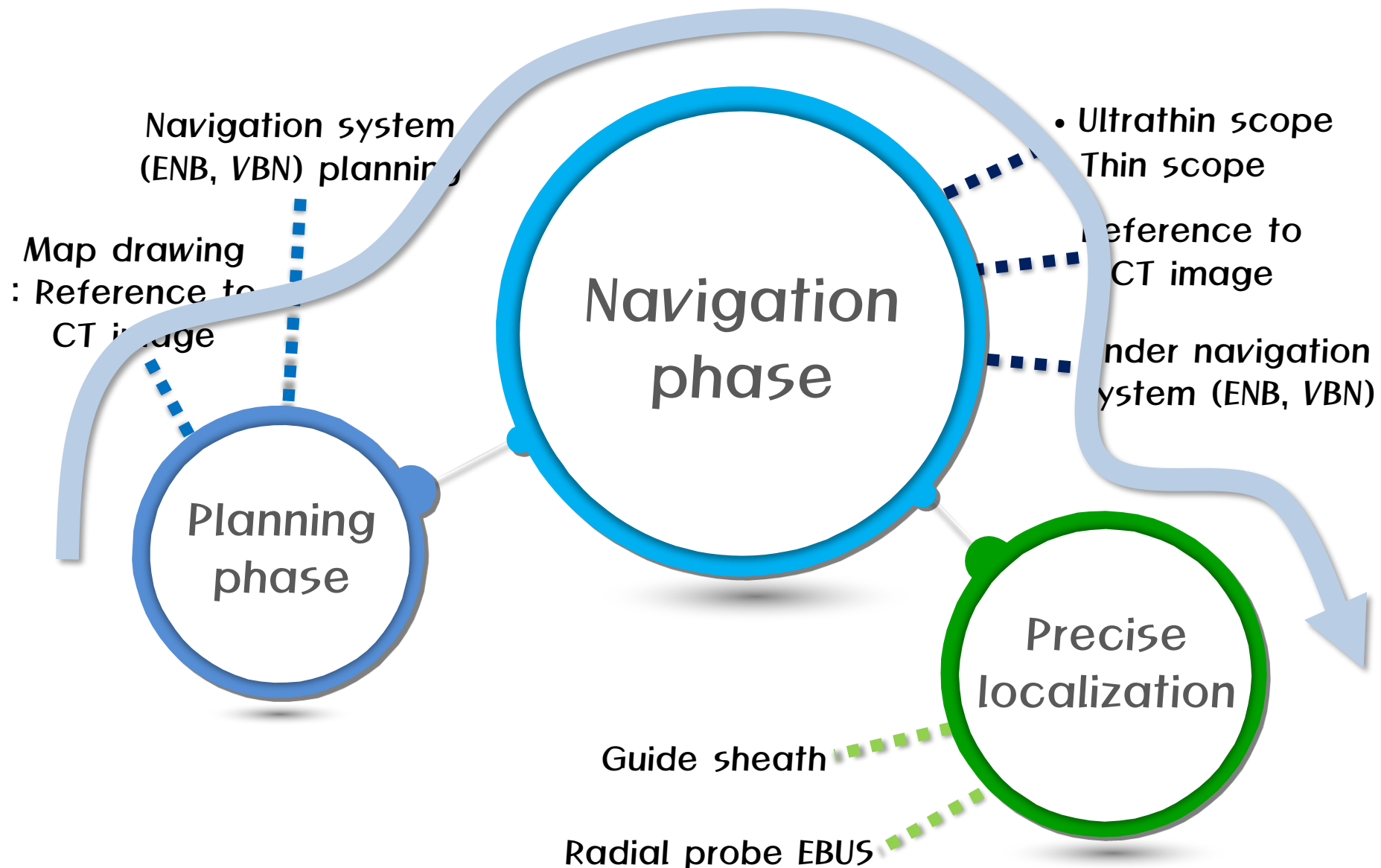
[ejspulm@pusan.ac.kr](mailto:ejspulm@pusan.ac.kr)

Background



기관지내시경을 어느  
방향으로 넣어야 하나?





ENB = electromagnetic navigation bronchoscopy  
 VBN = virtual bronchoscopy navigation

Noriaki Kurimoto  
Katsuhiko Morita

# Bronchial Branch Tracing

 Springer

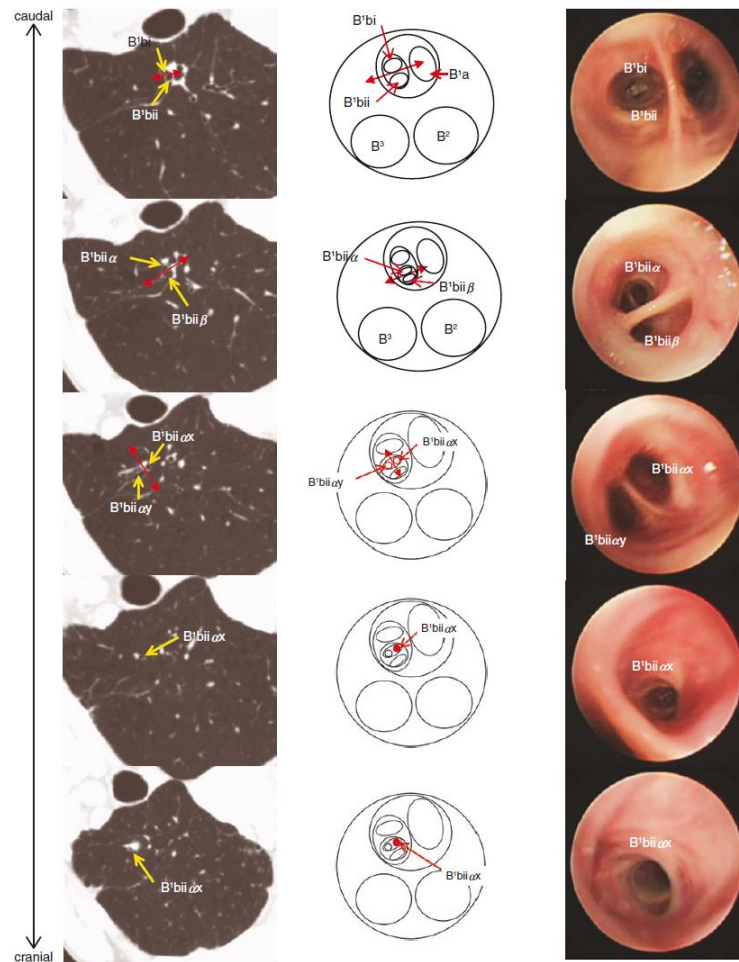
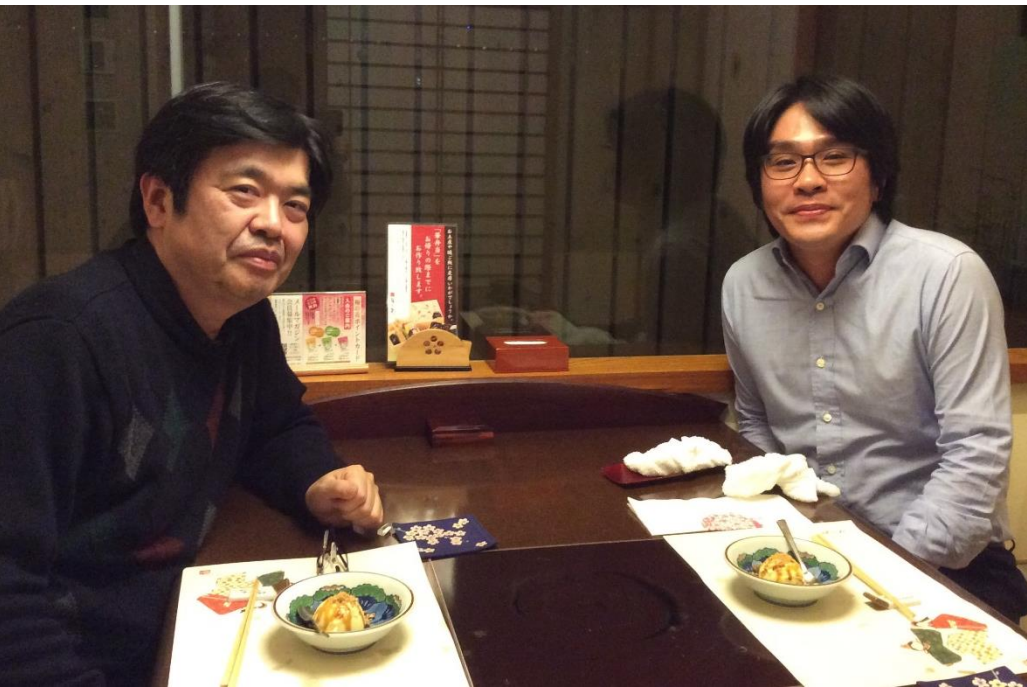
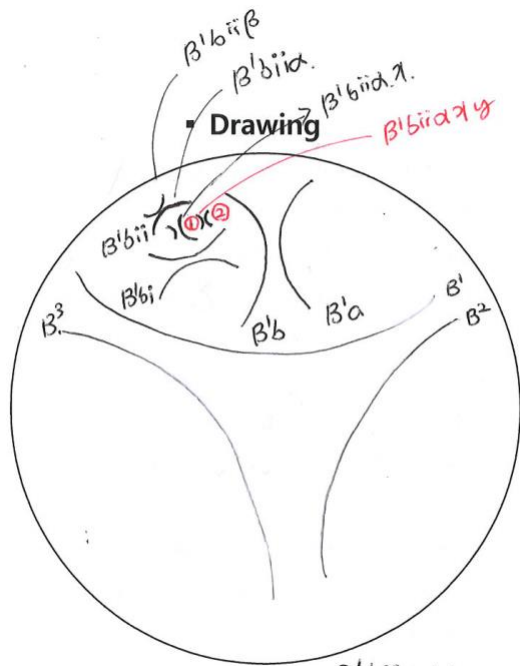


Fig. 2.20 CT, bronchial branch diagram and bronchoscopic findings

		Reading CT anatomy	Navigation system (VBN or ENB)
Accuracy	Proximal area	++	+++
	Peripheral area	++	+
Cost		Free	Expensive (VBN << ENB)
Learning		Trial and error during learning curve period	Easy

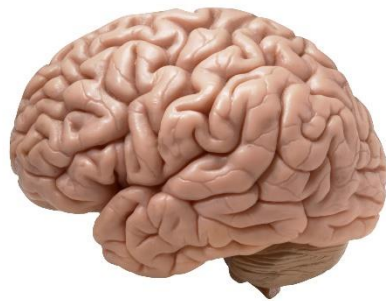
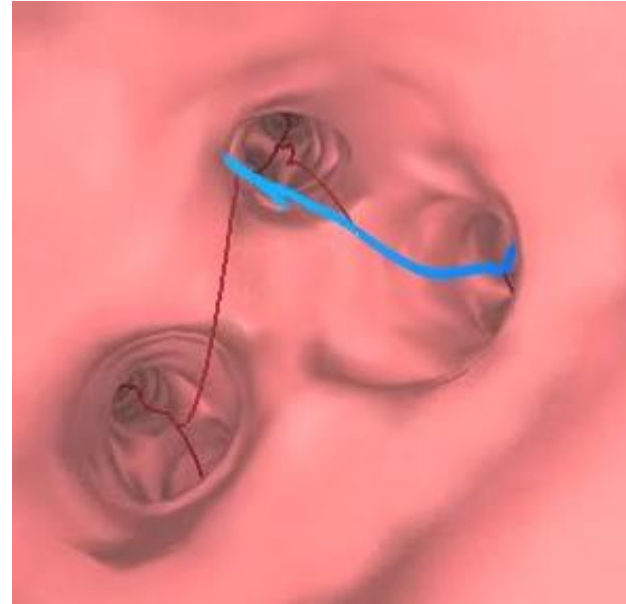




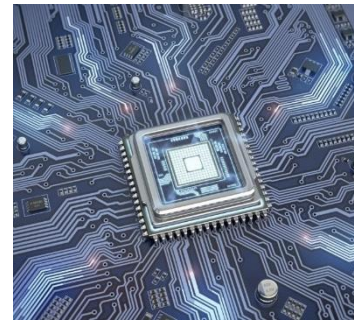


Target lesion 1:  $B'bi\alpha 1 y$

VS.



VS.



# Branching patterns

# Three types of branching pattern

1. Vertical branch
2. Horizontal branch
3. Oblique branch

# Vertical branch

Going-up branch

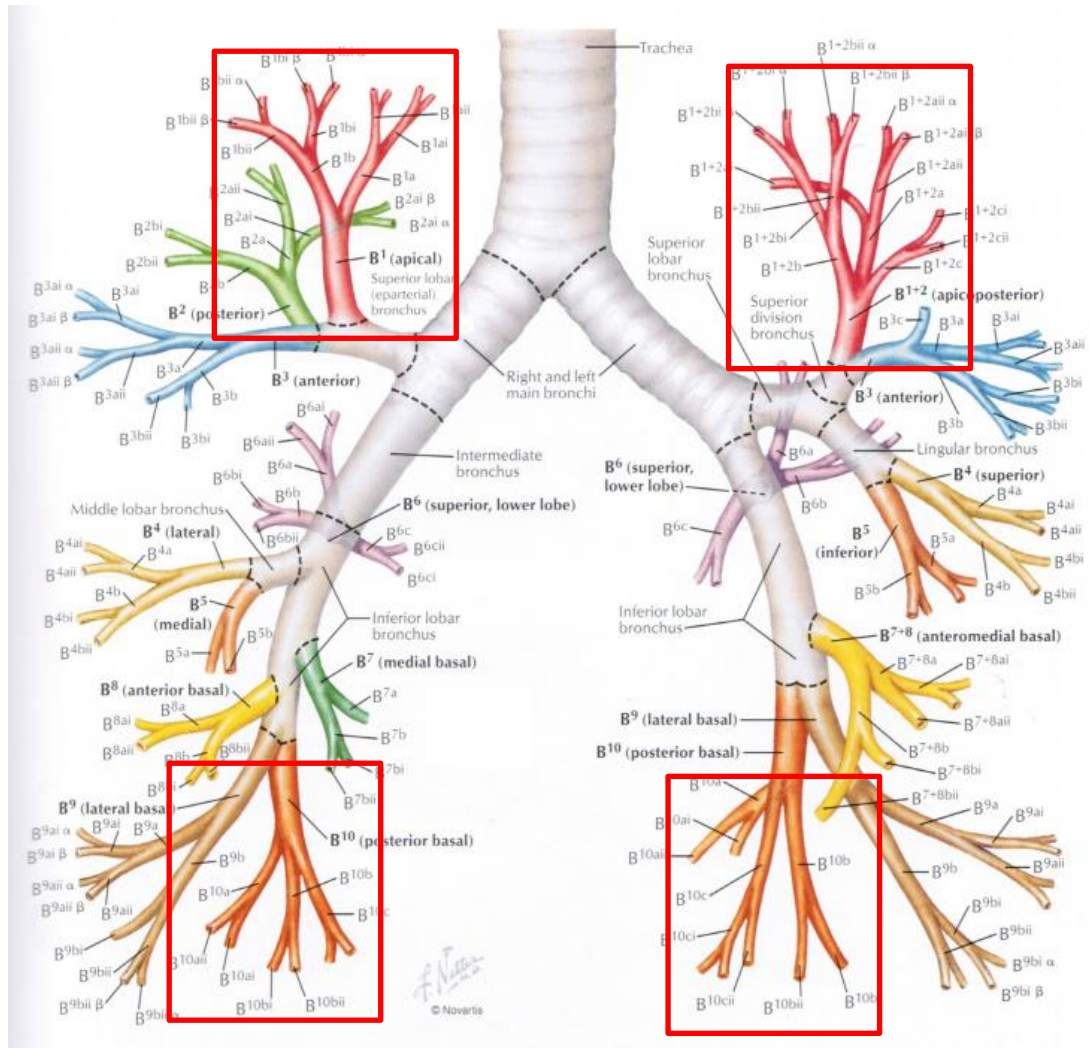


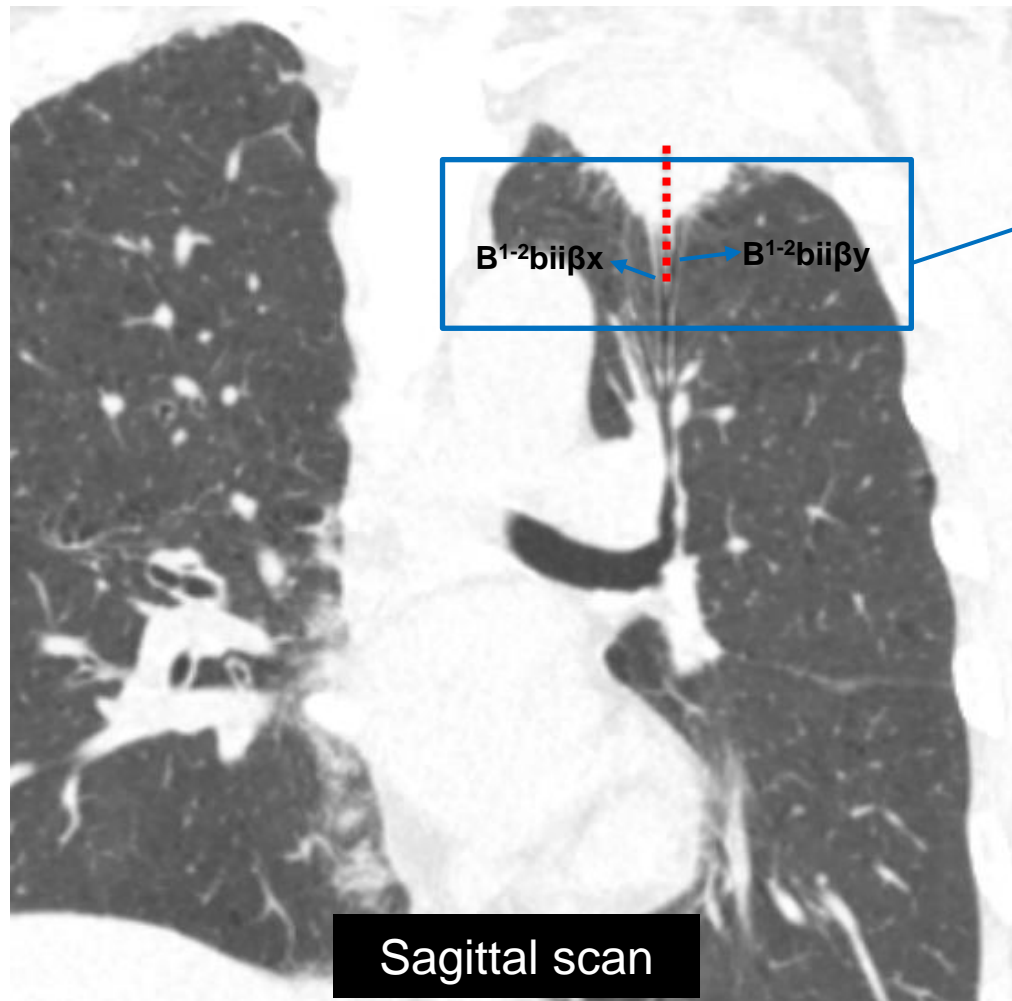
Going-down branch



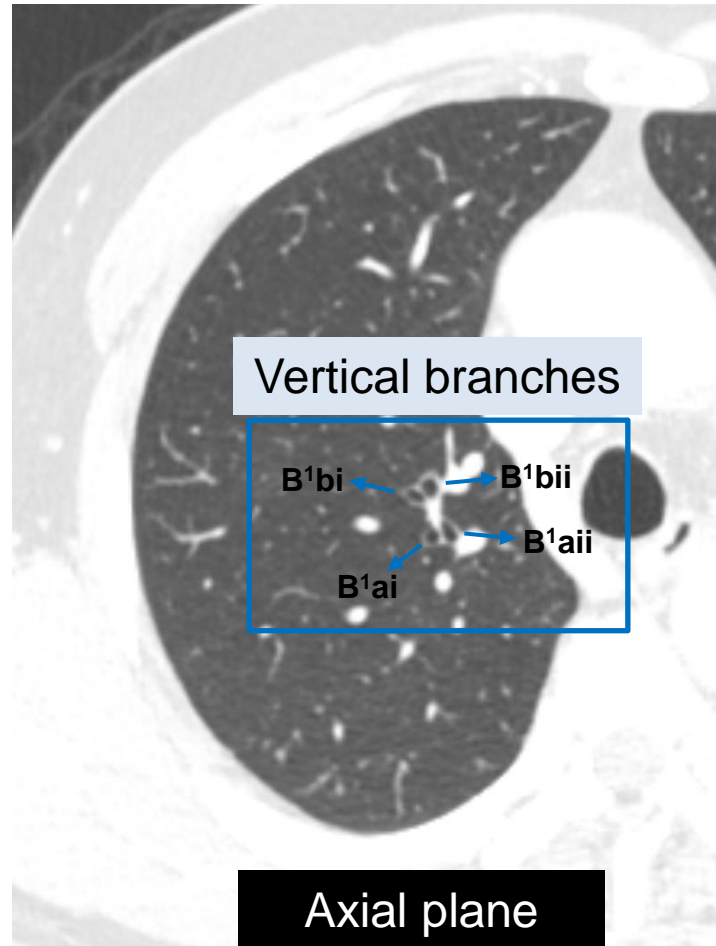
Vertical branch is the  
bronchi which head for  
upward or downward  
directions.







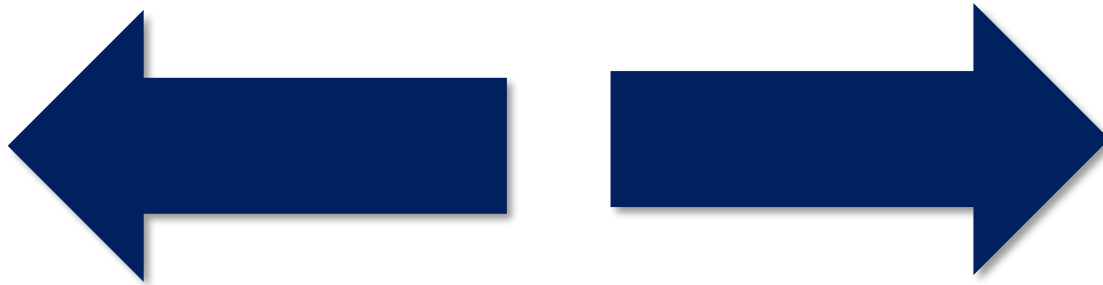
Lung mass on the apico-posterior segment  
of left upper division ( $B^{1+2}$ )



Apical segment of right upper division (B<sup>1</sup>)

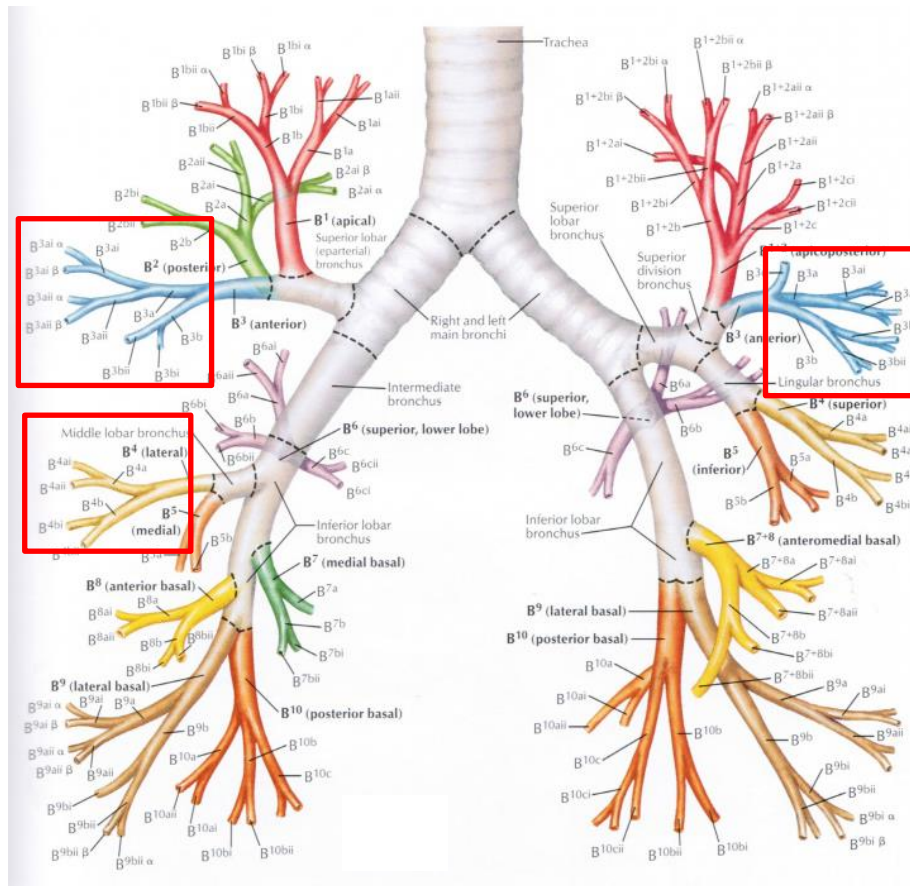
# Horizontal branch

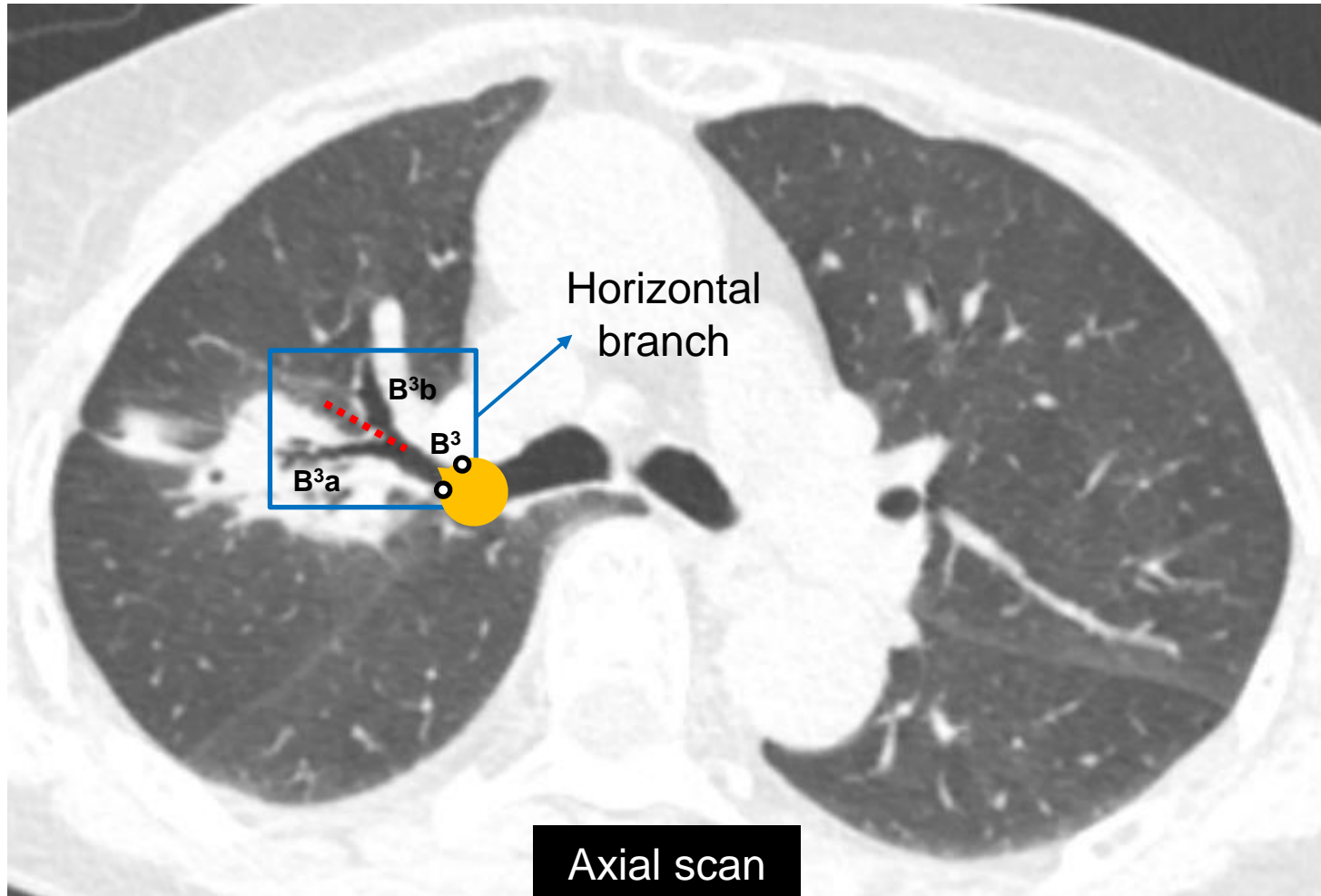
Transverse branches



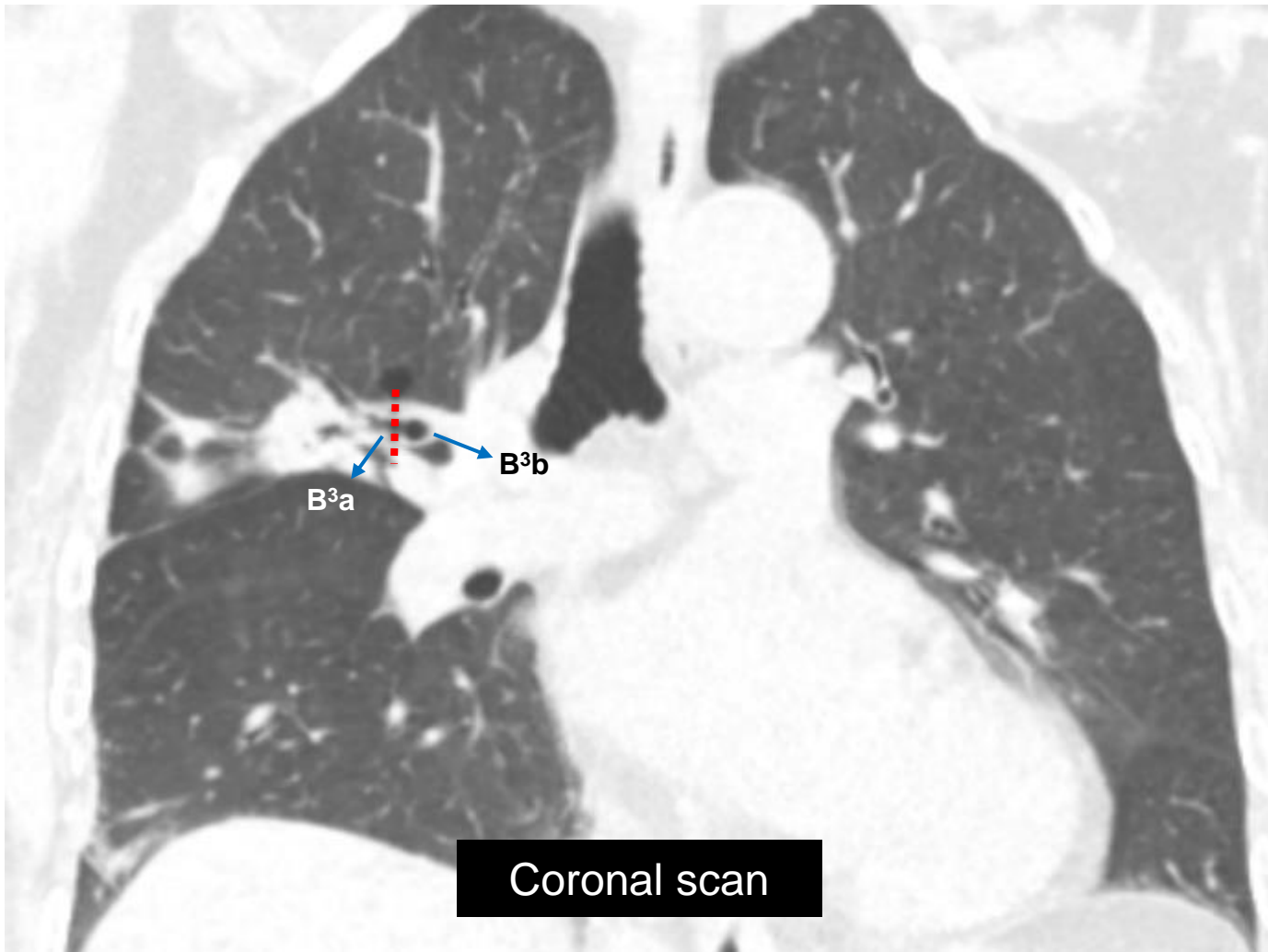
Horizontal branch is the bronchi which head for transverse directions.







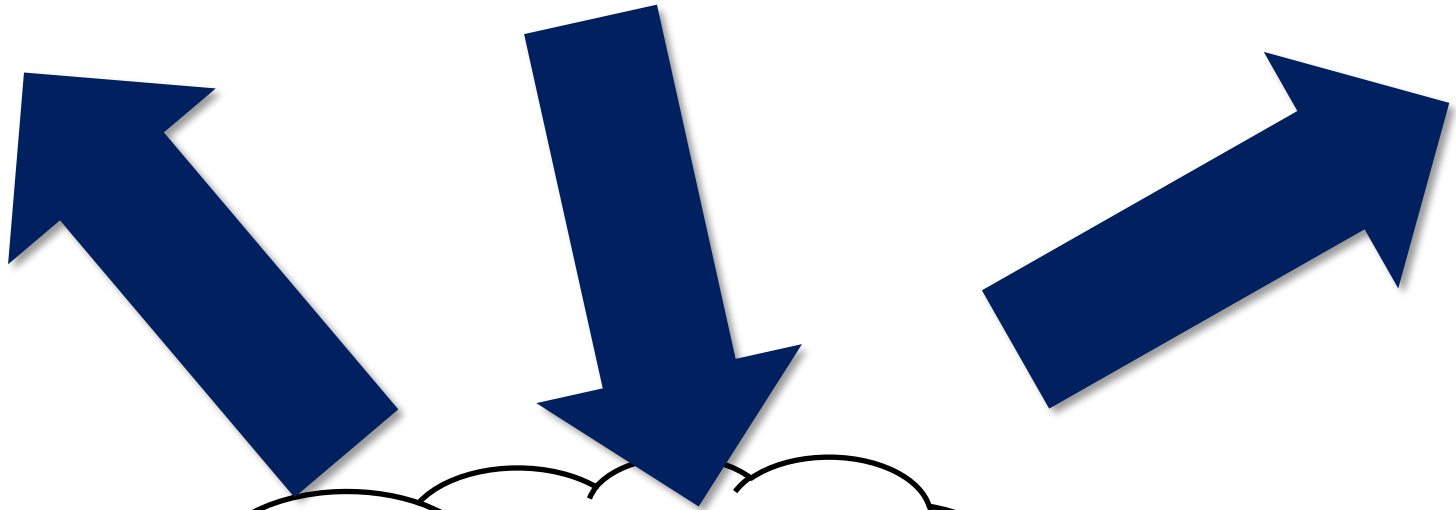
Lung mass on the anterior segment of right upper lobe (B3)



Lung mass on the anterior segment of  
right upper lobe (B3)

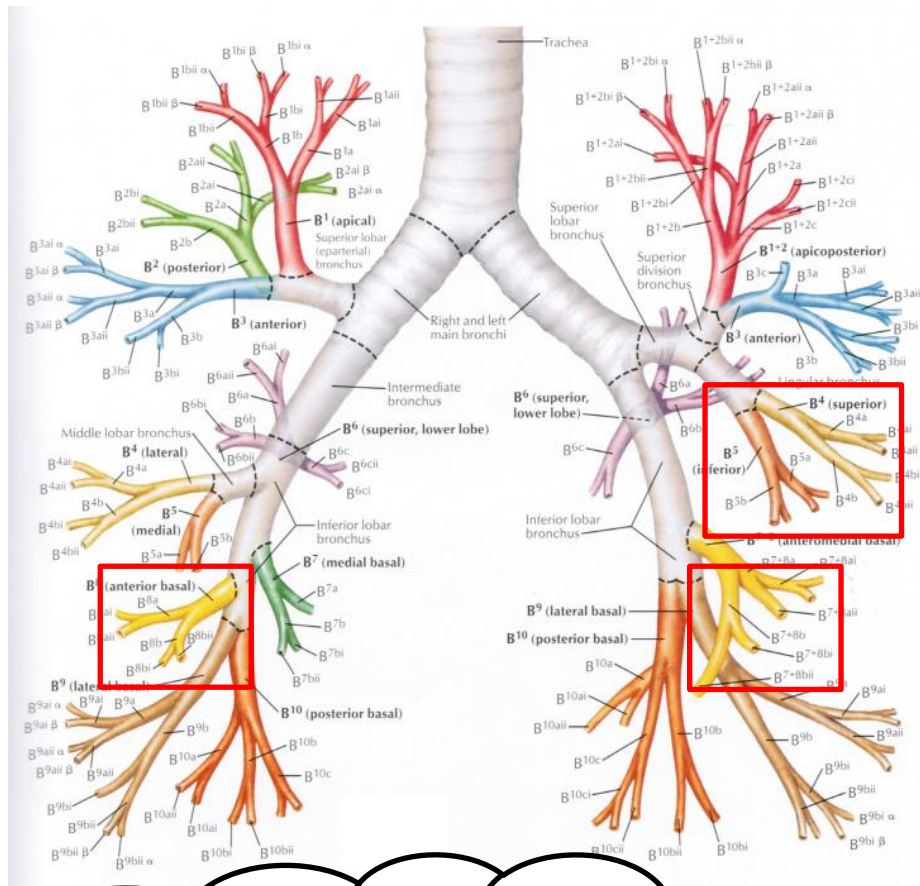
# Oblique branch

*Oblique branches*



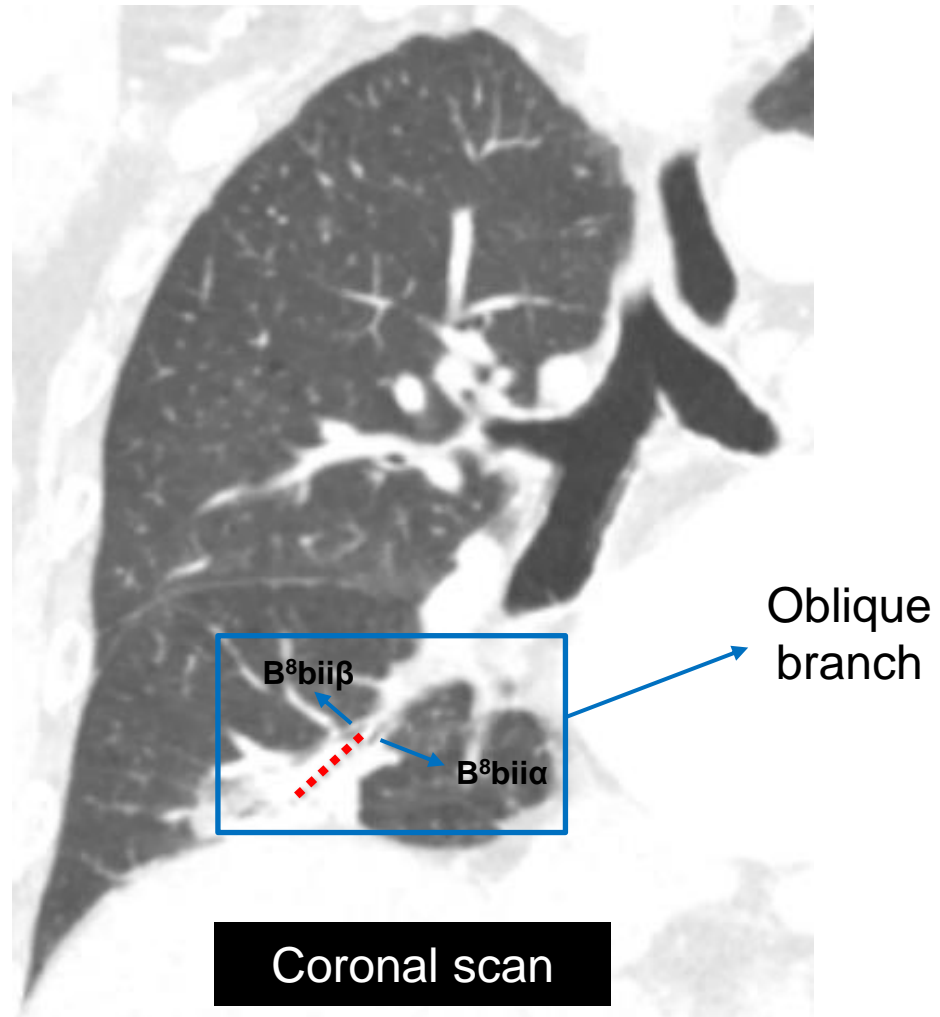
Oblique branch is the bronchi other than vertical and horizontal branches.





Actually, oblique branch is the most common pattern.





Lung mass on the anterobasal segment of right lower lobe ( $B^8$ )

CT protocol

# CT protocol

- ✓ Thickness < 1mm
- ✓ 3-dimensional reconstruction
  - Axial
  - Coronal
  - Sagittal





EBUS-GS를 하기 위해서는  
thin section으로 얇게 찍은  
CT가 필요하구나~



# Principles

1. Reconstructed thin section CT

2. Rotation of CT image

- Right upper lobe: counterclockwise 90° 
- Left upper lobe, upper division: clockwise 90° 
- Right middle lobe, left lingular division: flip 180° 
- Both lower lobes: flip 180° 

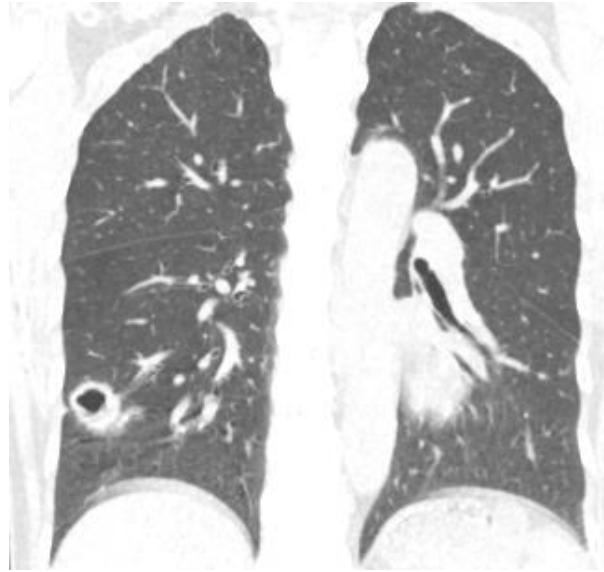
3. Magnification of CT image

4. Drawing a navigation map

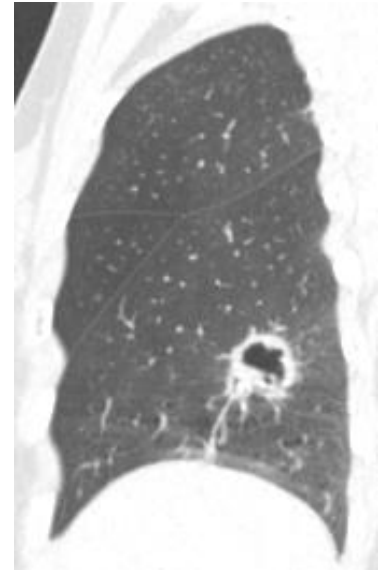
# 3-dimensional reconstruction



Axial scan



Coronal scan



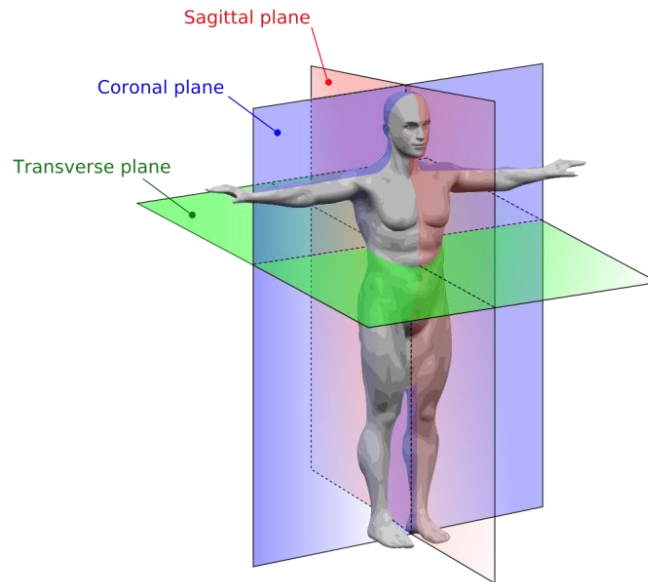
Sagittal scan



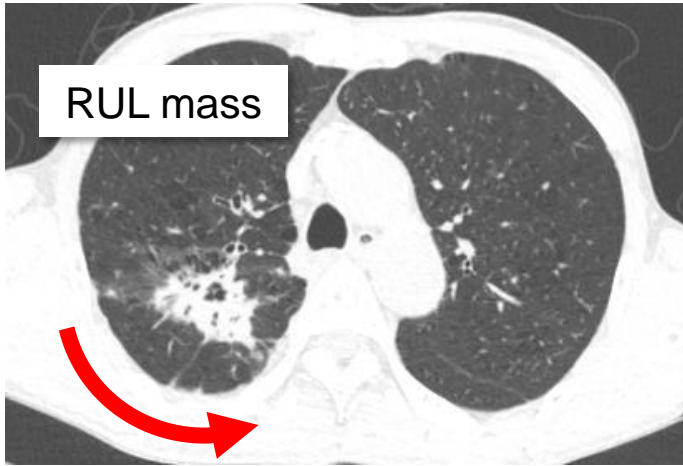
Axial CT로 navigation  
경로를 그린 뒤 coronal  
또는 sagittal CT로 확인  
하는 거냐!

# Recheck

- Both upper lobes – Sagittal plan
- Right middle lobes – Coronal plan
- Left lingular division – Coronal plane
- Both lower lobes – Axial plan

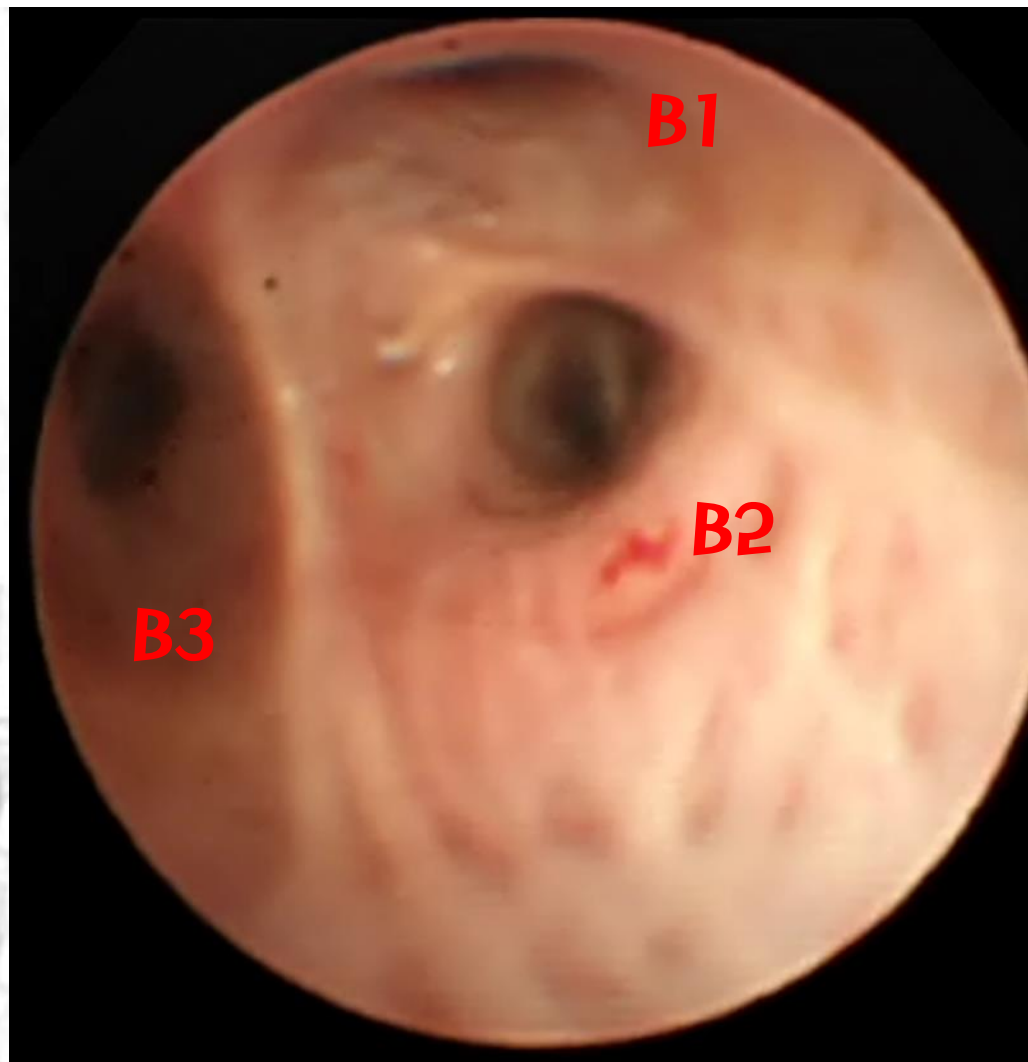
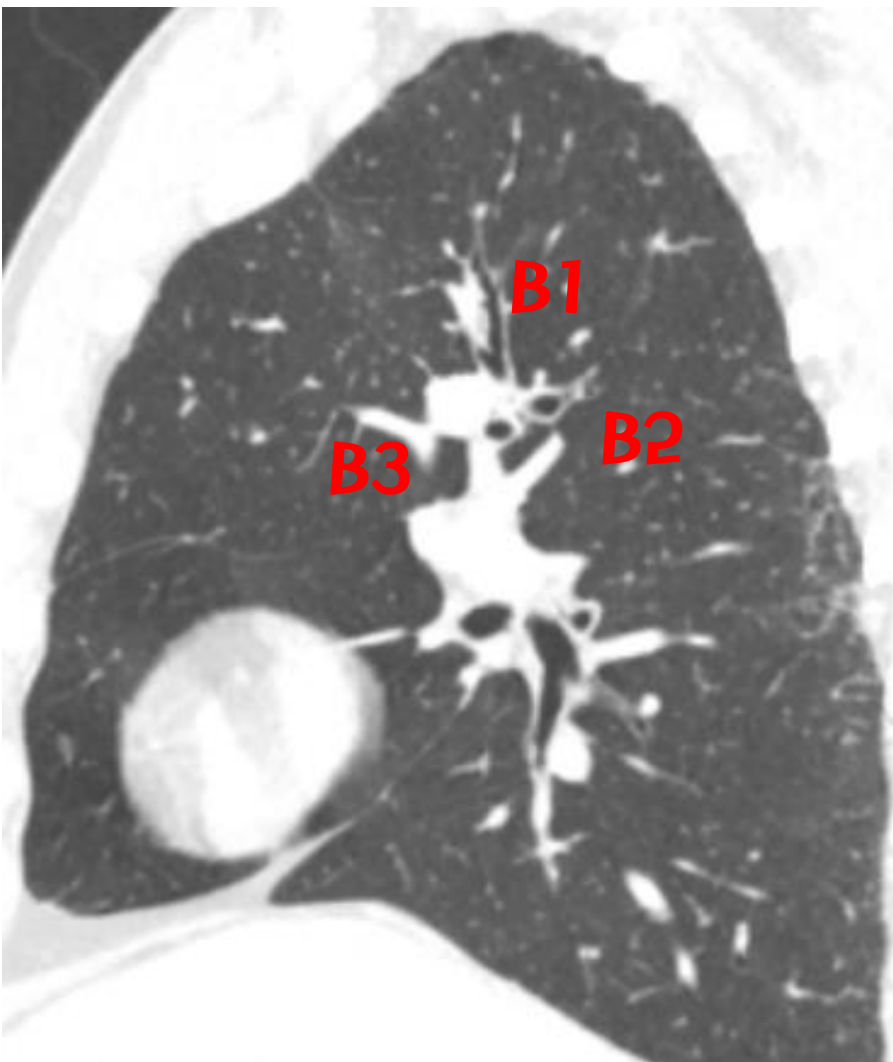


# Right upper lobe



우상엽 병변은 반시계  
방향으로 90도만큼 CT를  
회전시켜야 하는구나!



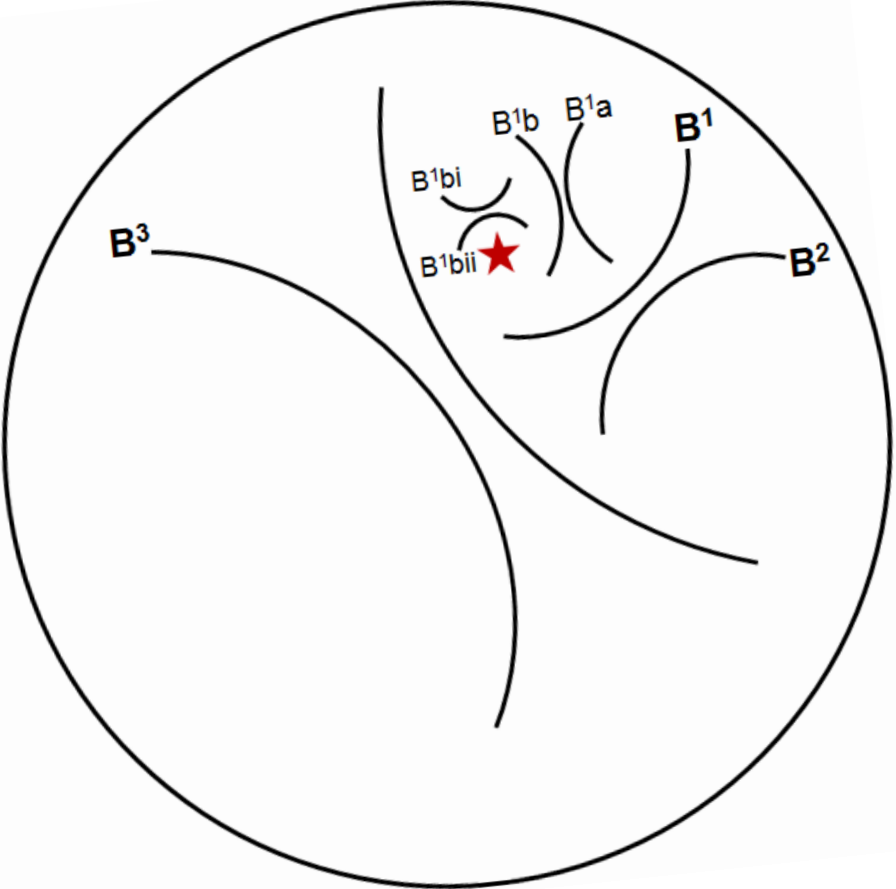


Anterior  
direction



Posterior  
direction

# Case 1 – RB1

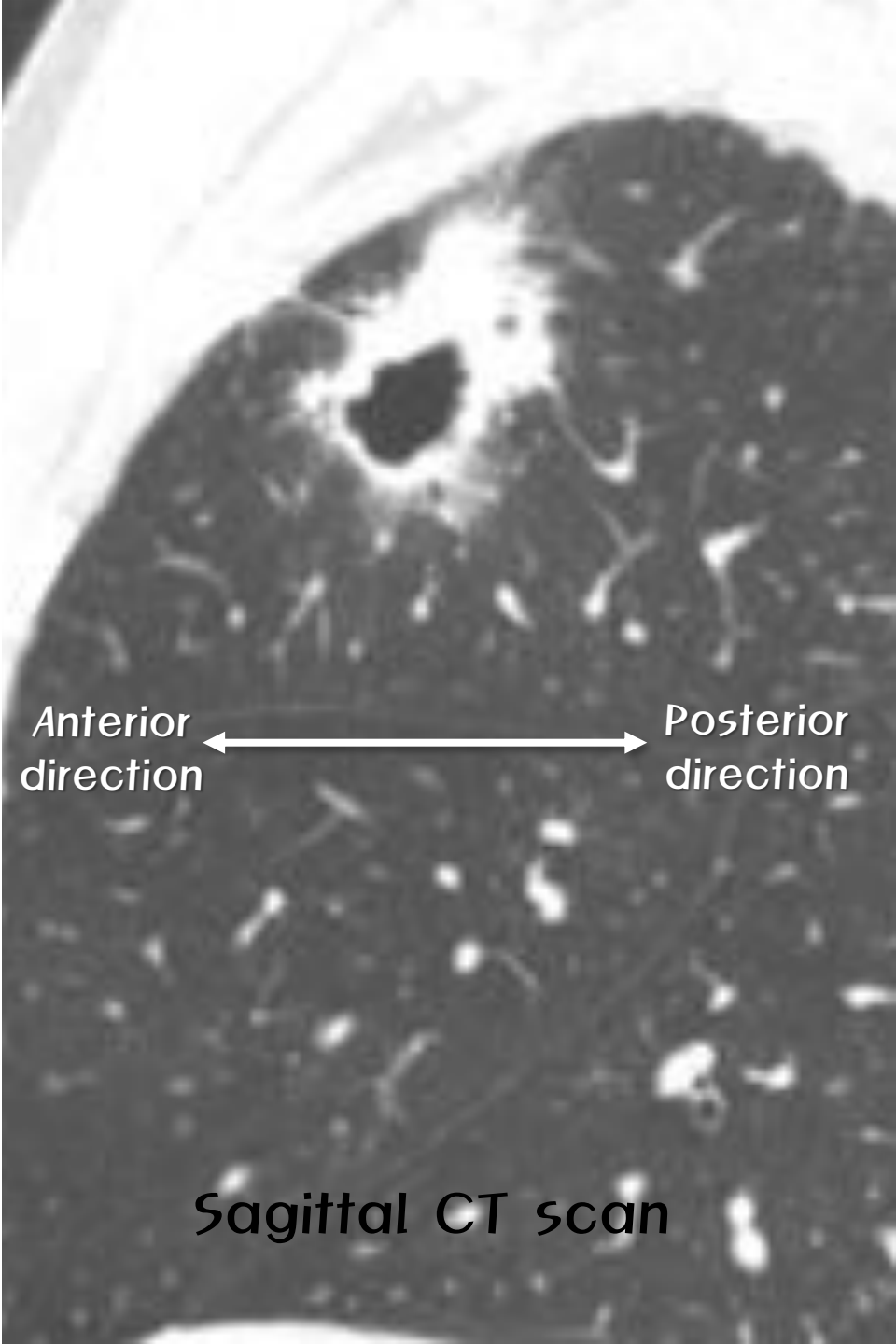
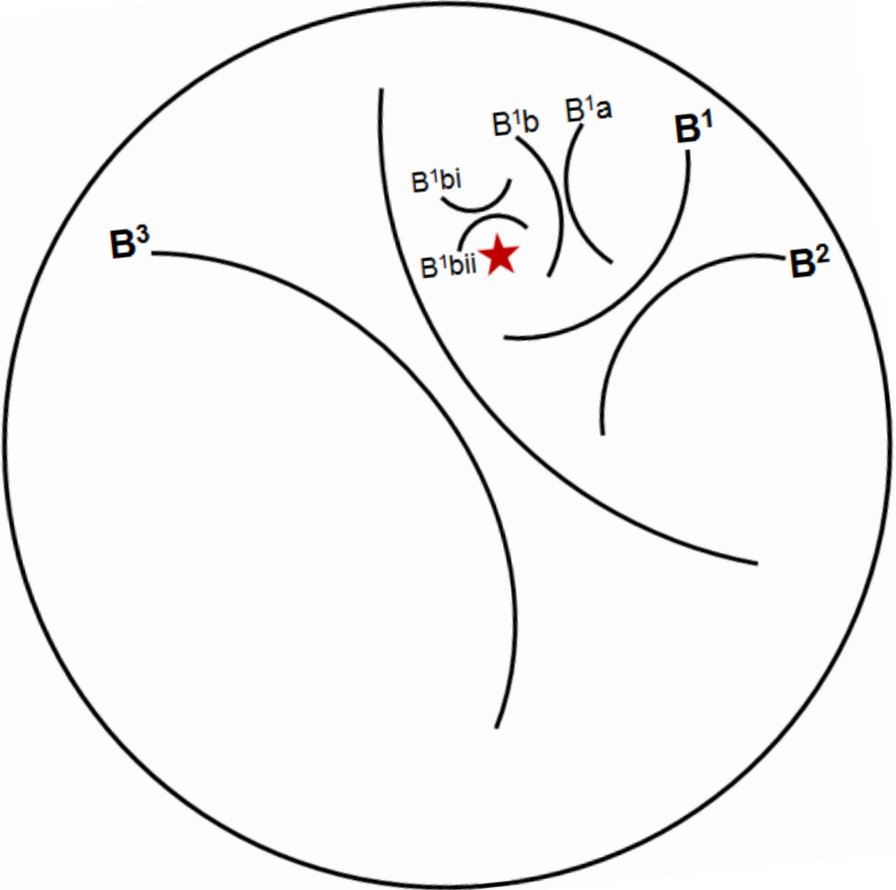


Anterior direction ← → Posterior direction



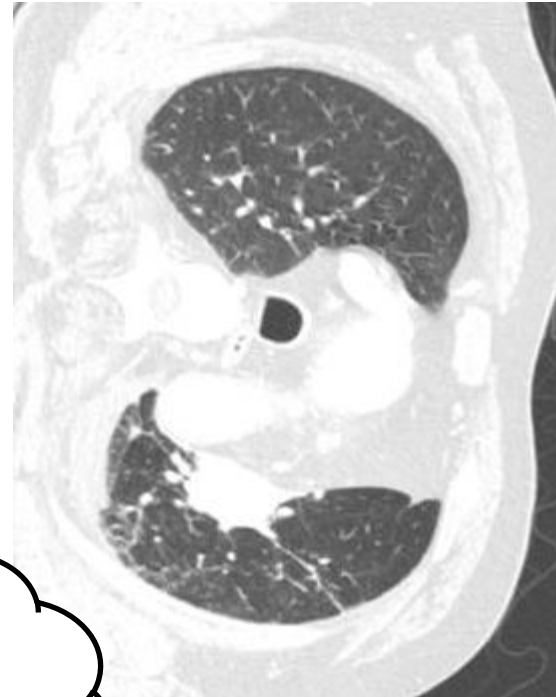
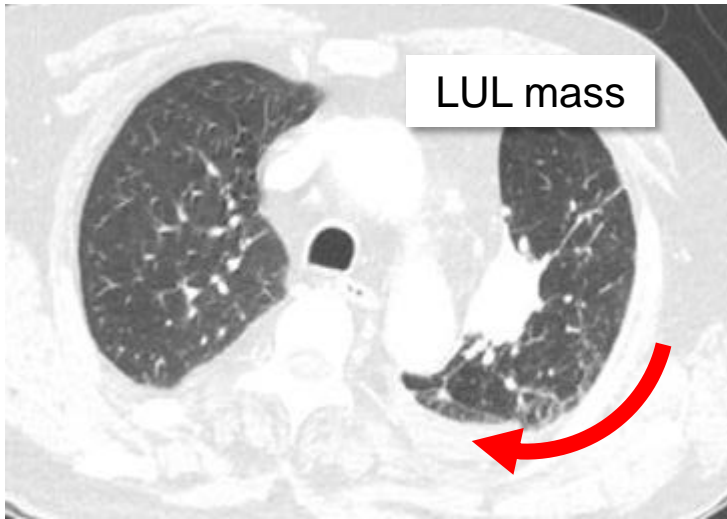
Counterclockwise 90 degree rotated-axial CT scan

# Case 1 – RB1



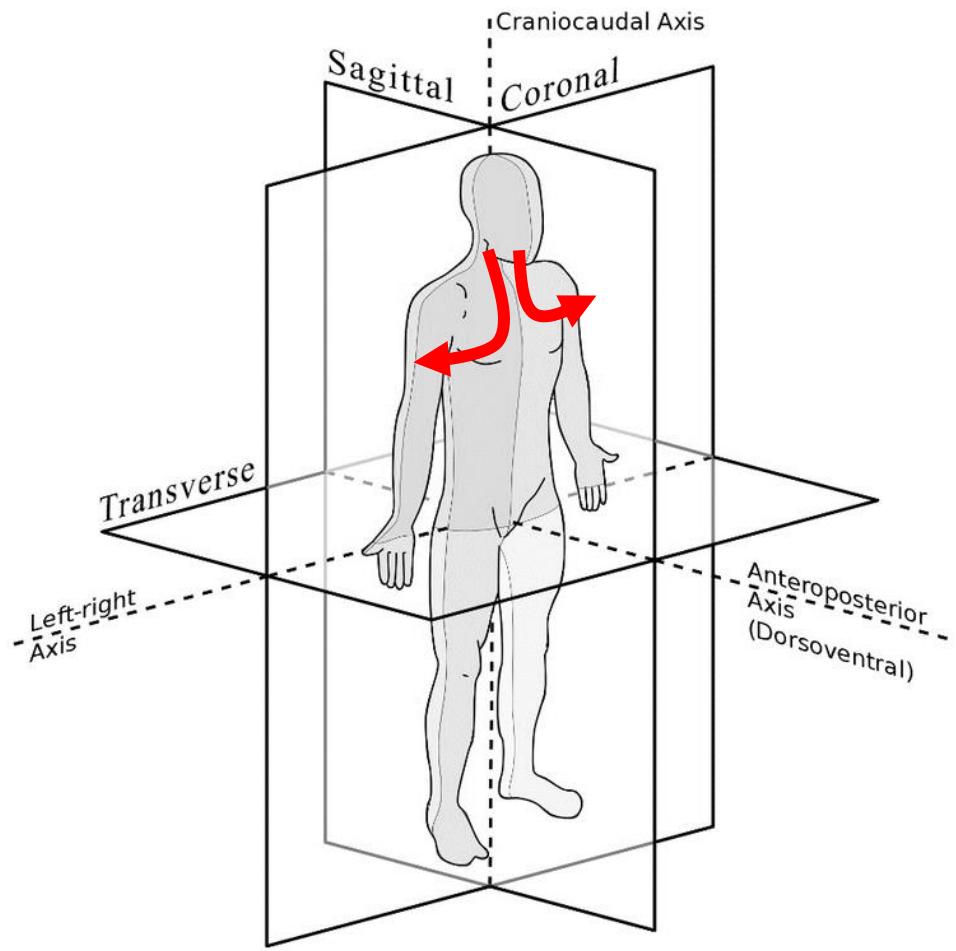
Sagittal CT scan

# Left upper division

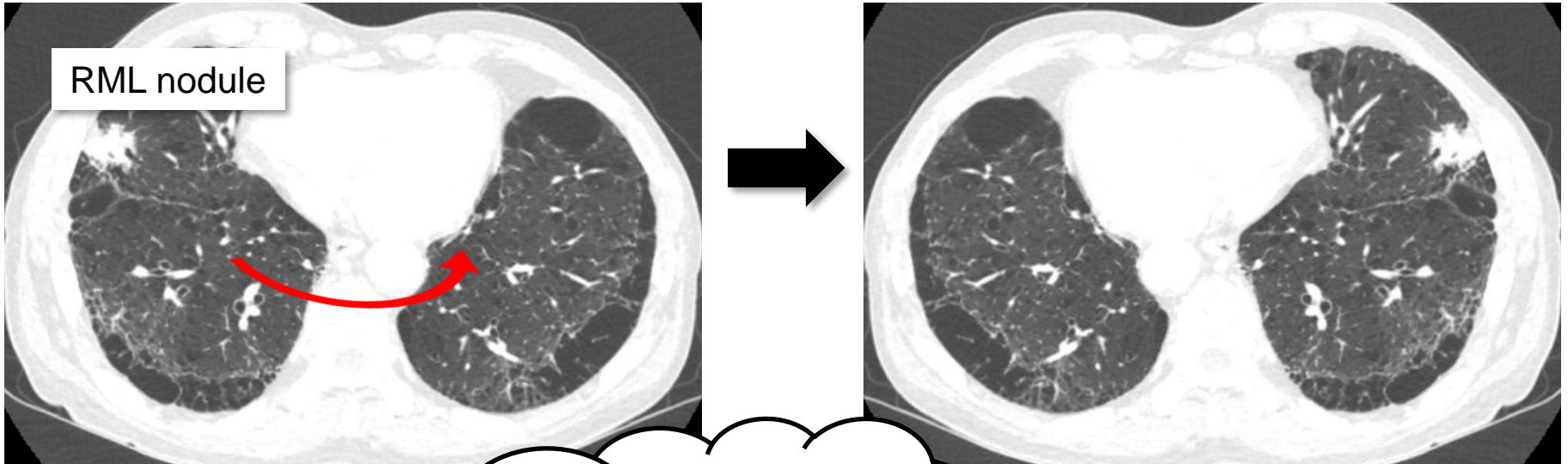


좌상엽 병변은 시계  
방향으로 90만큼 CT를  
회전시켜야 하는구나!

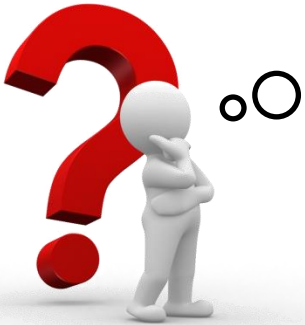




# Right middle lobe & Left lingular division

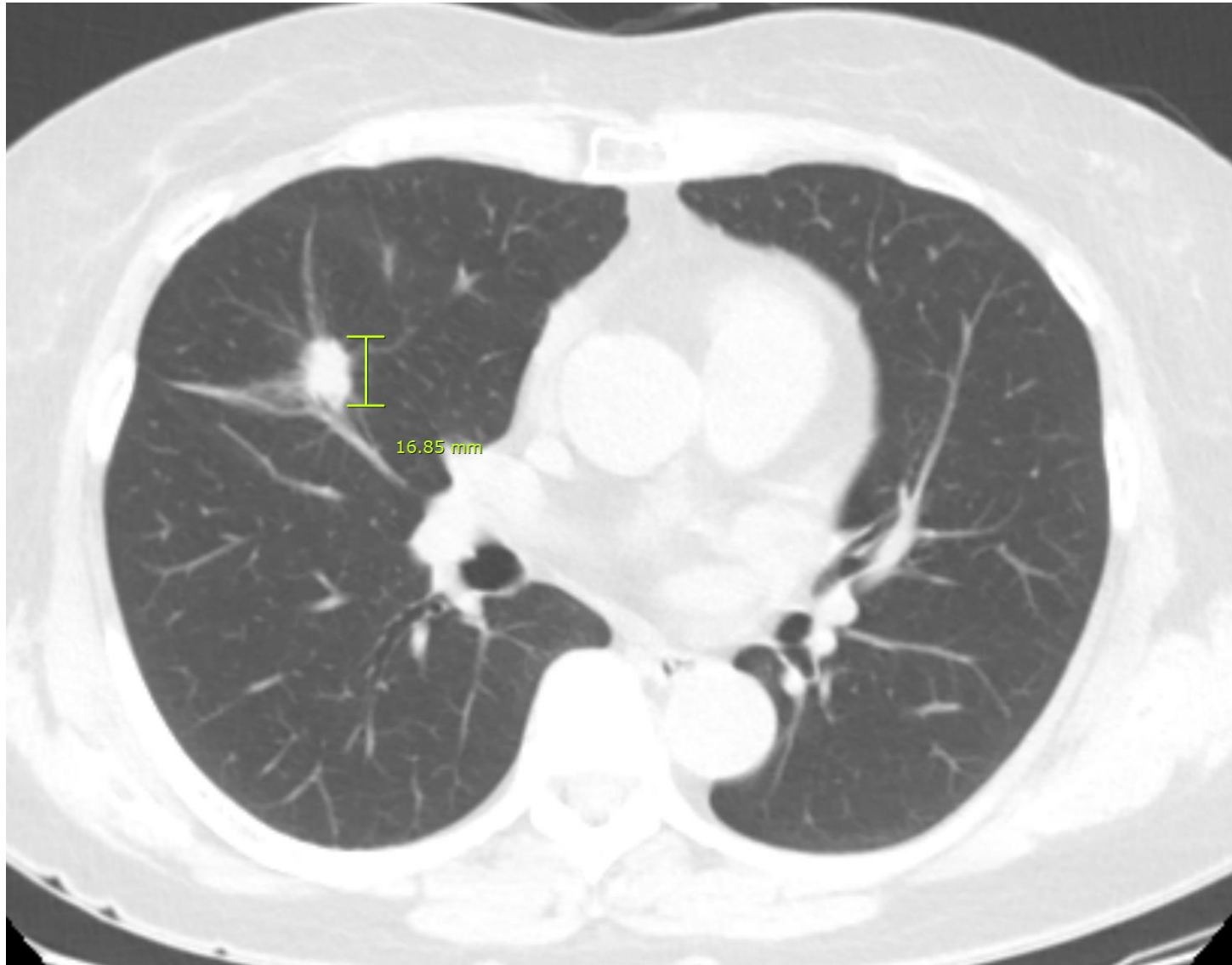


양측 상엽 외의 병변은  
좌우방향을 바꿔버리면  
되는구나



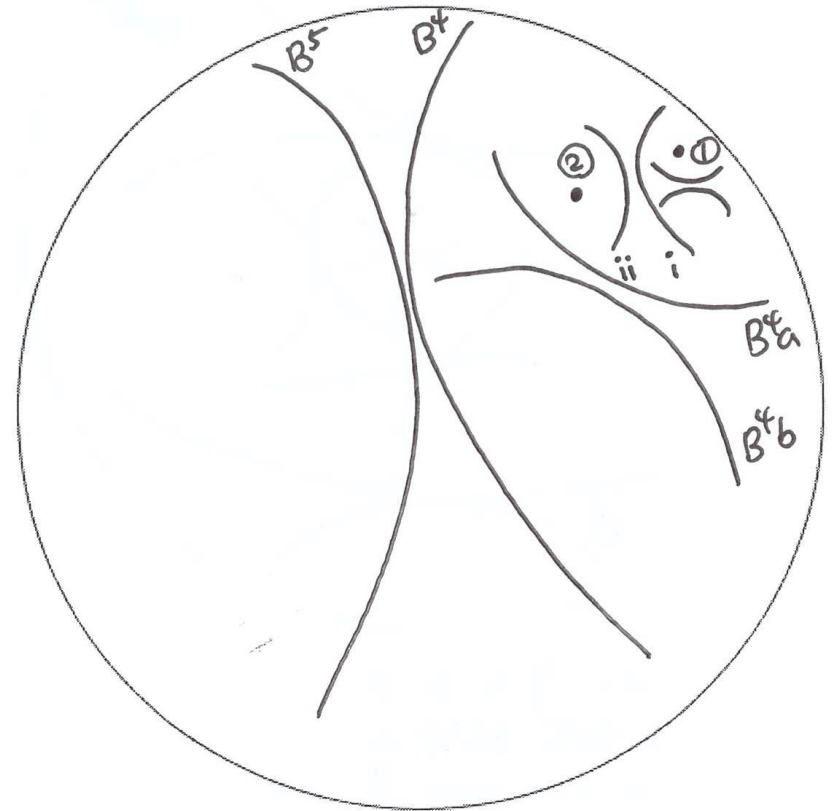
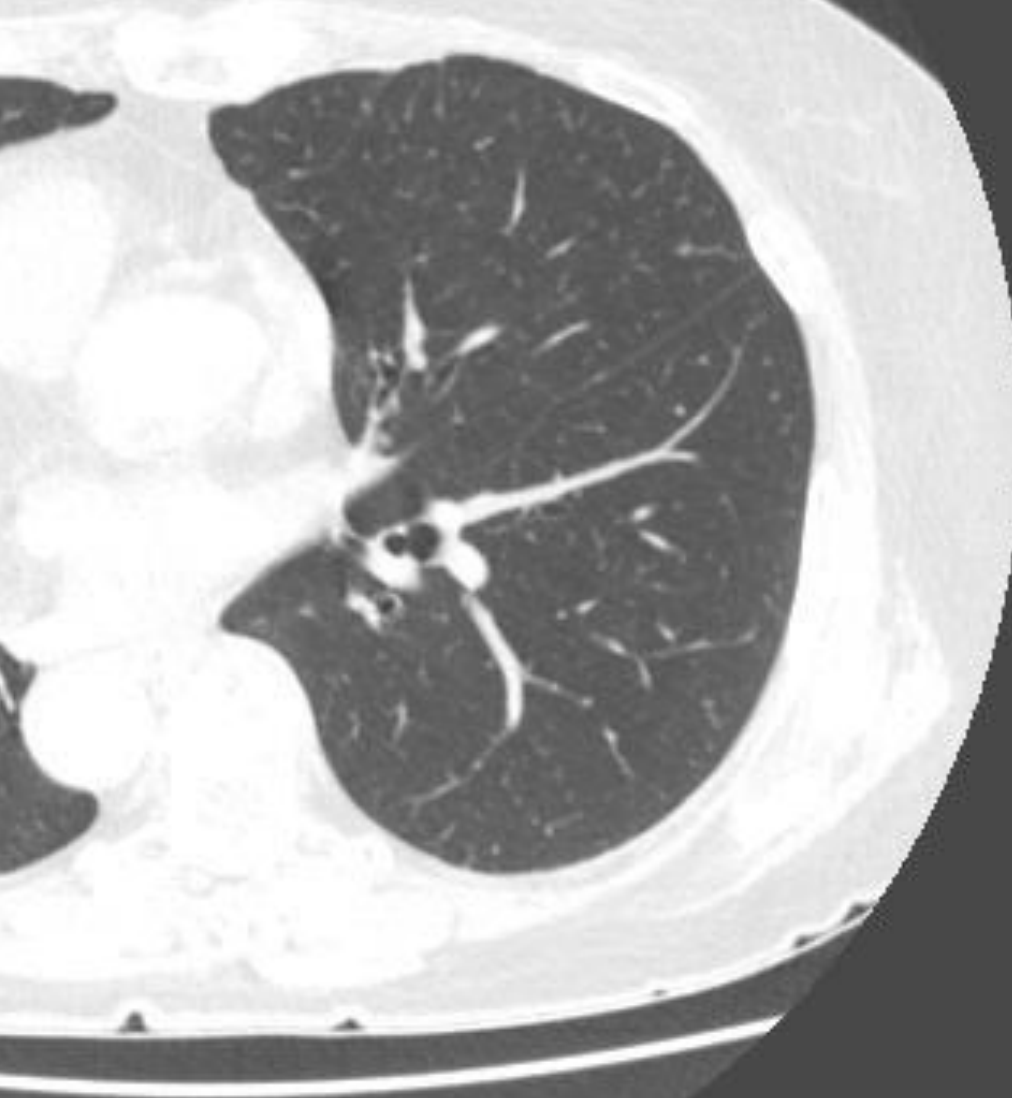


## Case 2 – RB4



Lung nodule on right middle lobe

## Case 2 – RB4



CT 시행일: 7 월 1 일

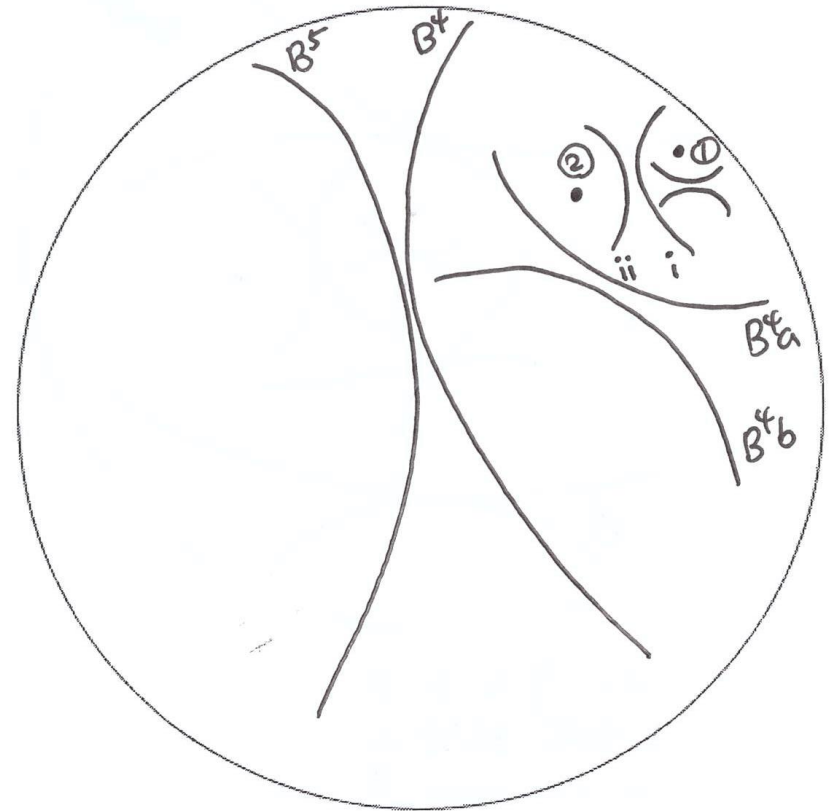
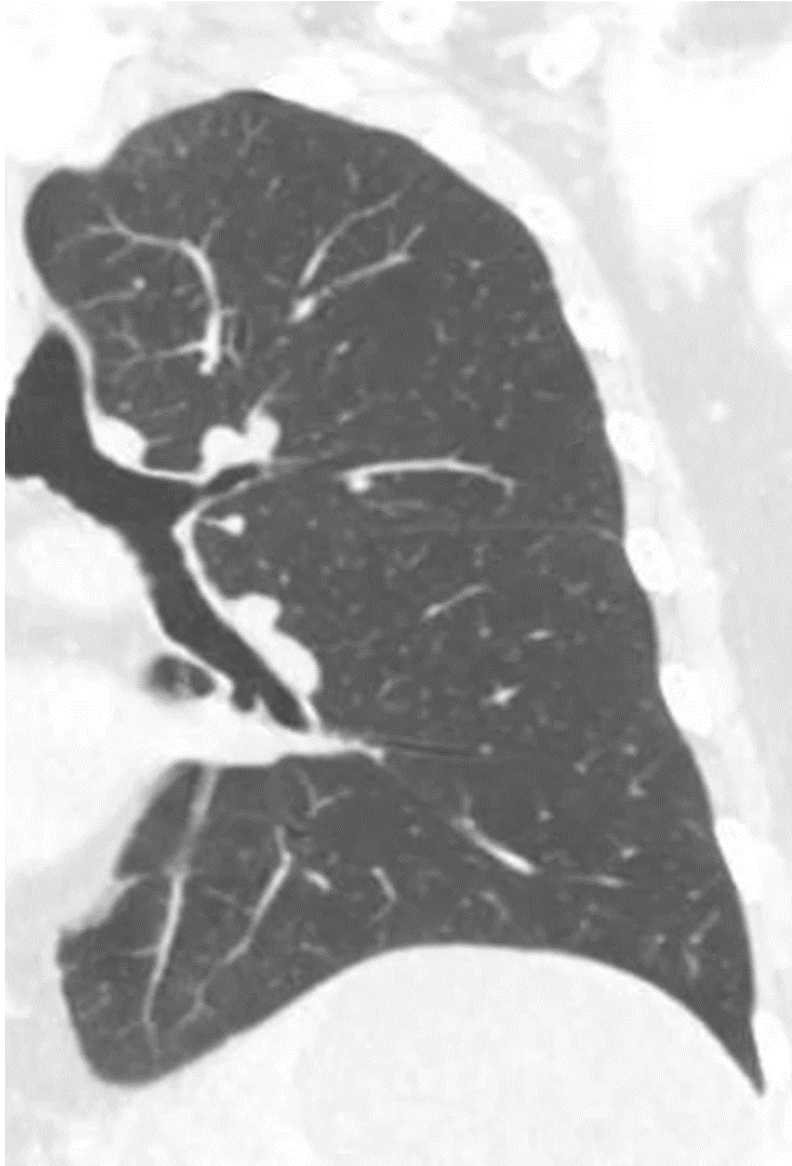
1. Size: 14.47 X 10.02 mm

2. Distant from pleura: 35.26 mm

3. Solid, Mixed, GGO lesion

4. BR sign: positive, negative, equivocal

# Case 2 – RB4



CT 시행일: 7 월 1 일

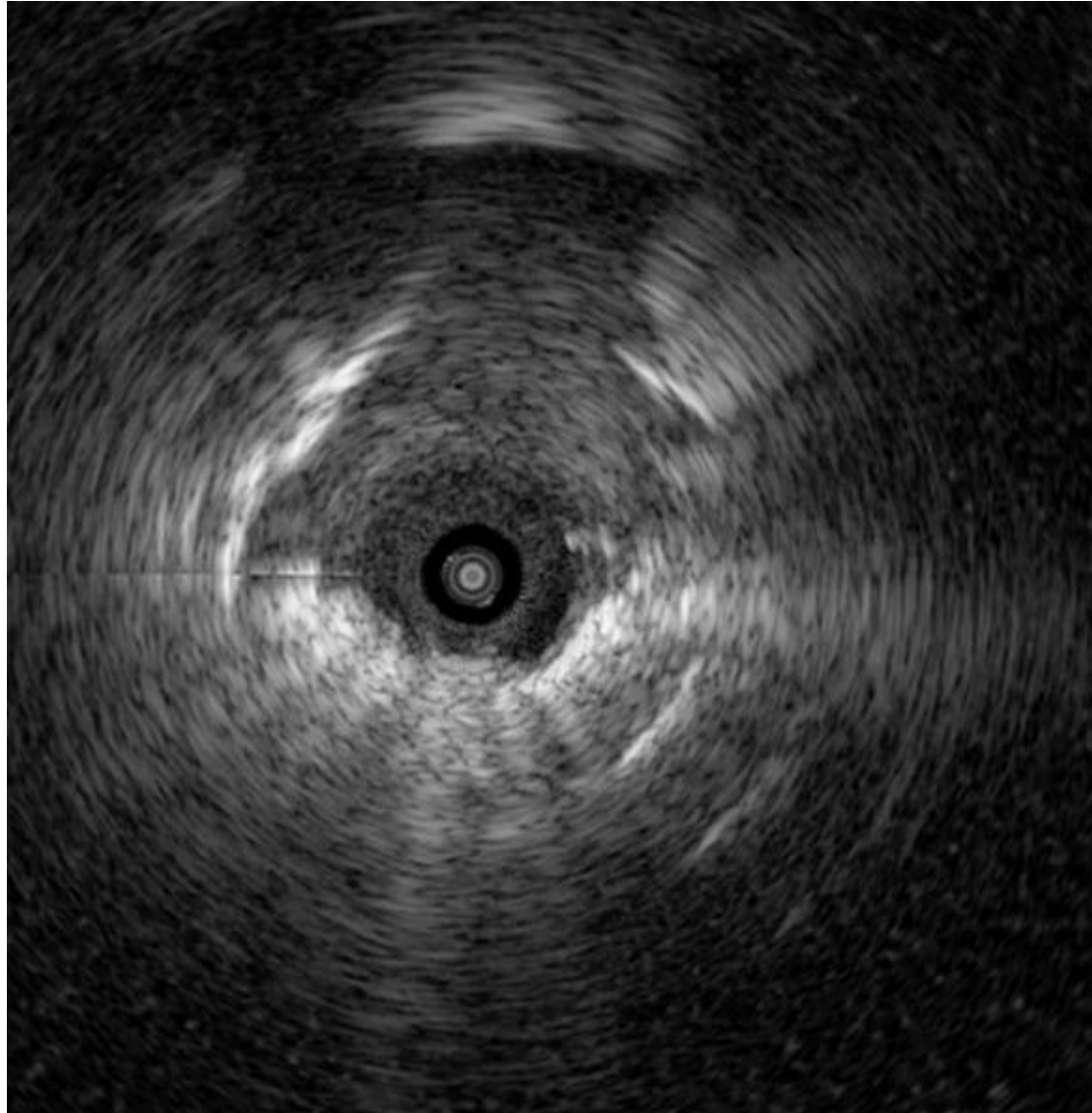
1. Size: 14.47 X 10.02 mm

2. Distant from pleura: 35.26 mm

3. Solid, Mixed, GGO lesion

4. BR sign: positive, negative, equivocal

## Case 2 – RB4



# Case 2 – RB4

## TBLB specimen

### 진단

Lung, middle lobe, lateral segment #1~6, right, EBUS-TBLB :  
Adenocarcinoma, suggestive of primary in the lung.  
Lung, middle lobe, lateral segment #7, right, EBUS-TBLB :  
Adenocarcinoma, suggestive of primary in the lung.

#### # Immunohistochemistry in section B

TTF-1, p63: negative  
Napsin A: positive  
ALK (D5F3 CDx Ventana): positive  
PD-L1 SP263 (Ventana) Tumor Expression: 0%  
PD-L1 22C3 (Dako, Seegene, 02-2218-9301) Tumor Proportion Score: 0%(2021.7.20)

# NOTE: The result of EGFR, ROS1 mutation will follow (section B).

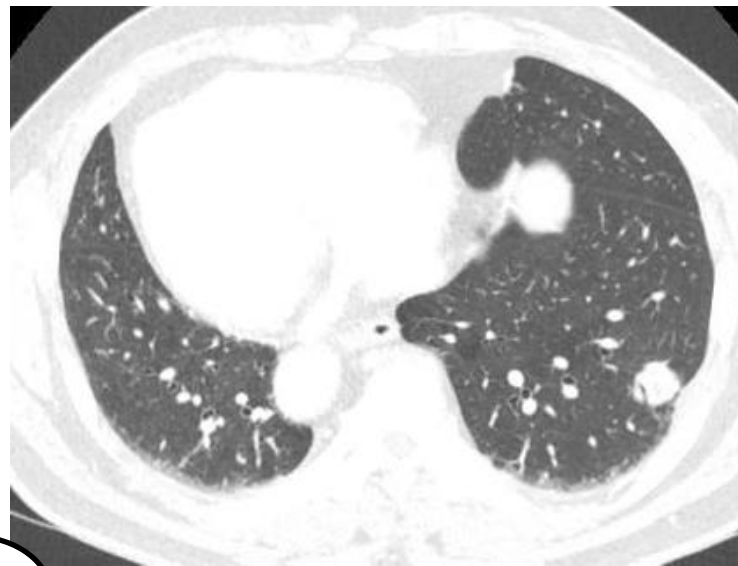
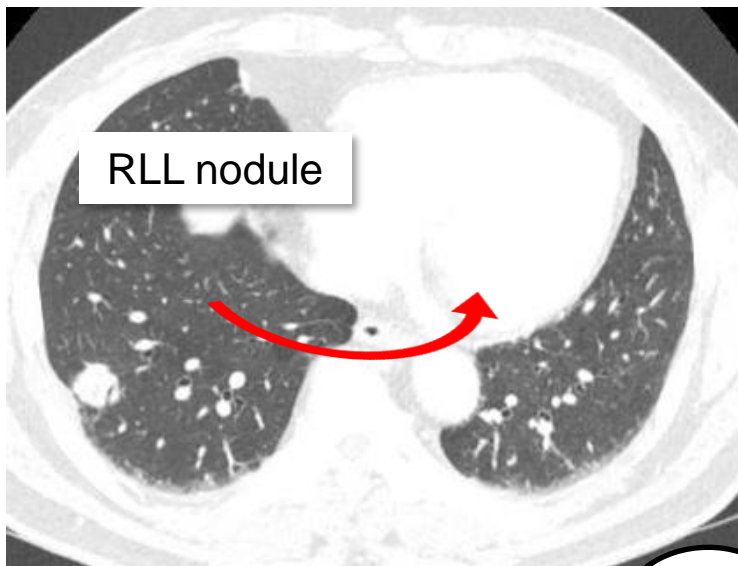
## Surgical specimen

### 진단

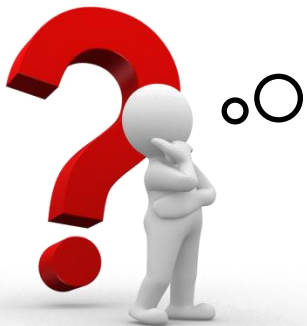
Lung, middle lobe, right, VATS lobectomy with mediastinal node dissection:

1. Histologic type: Adenocarcinoma, well to moderately differentiated, with predominantly acinar growth pattern (about 70%), lepidic growth pattern (less than 30%)
2. Location: right middle lobe
3. Dimensions: 1.8x1.5x0.8cm
4. Confined to lung parenchyma and no involvement of visceral pleura
5. Growth pattern: infiltrative growth pattern
6. Lymphovascular and perineural invasion: not identified
8. Lymph node status: no attached peribronchial lymph nodes
9. Status of resection margins
  - Bronchial margin: free from carcinoma (safety distance, 12 mm)
  - Parenchymal margin: free from carcinoma (safety distance, 11 mm in peribronchial parenchymal margin, 2 mm in clipped parenchymal resection margin #1 and 6 mm in clipped parenchymal resection margin #2)
  - Vascular margin: free from carcinoma
  - Chest wall margin: free from carcinoma
10. Partial pathologic TNM stage: pT1b pN0

# Lower lobes



양측 상엽 외의 병변은  
좌우방향을 바꿔버리면  
되는구나





Case 3 – RB8

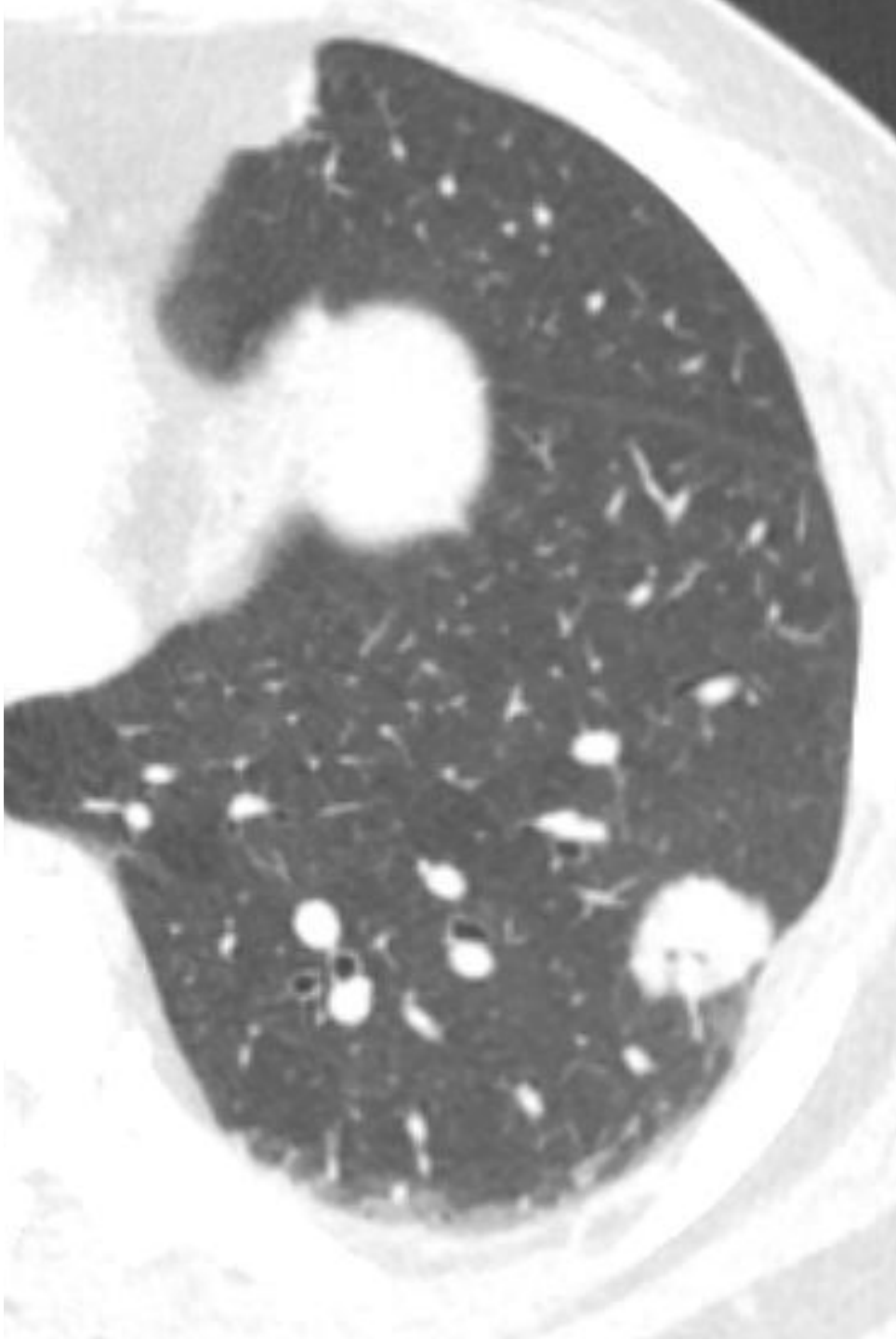
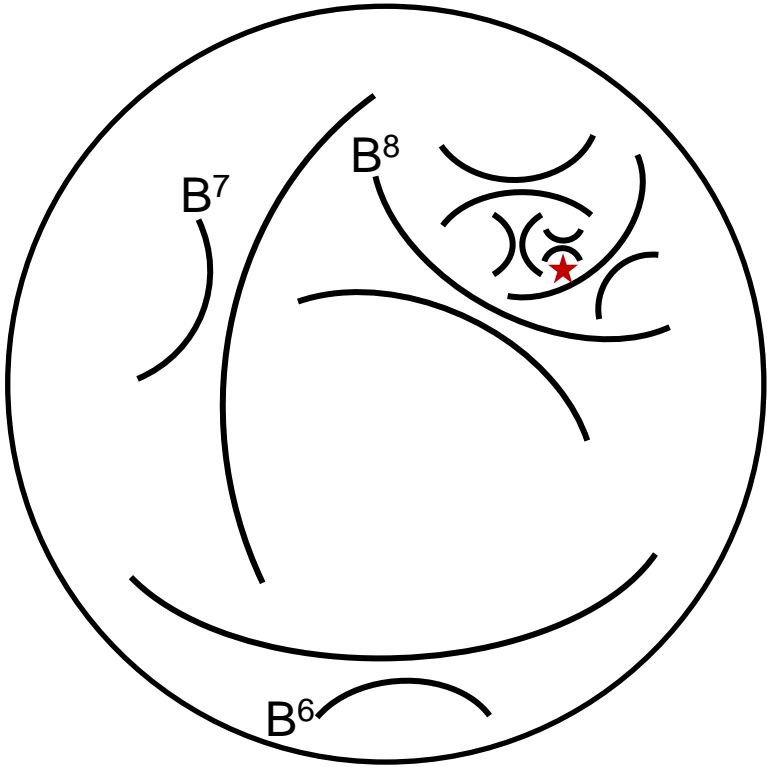


Bronchus sign

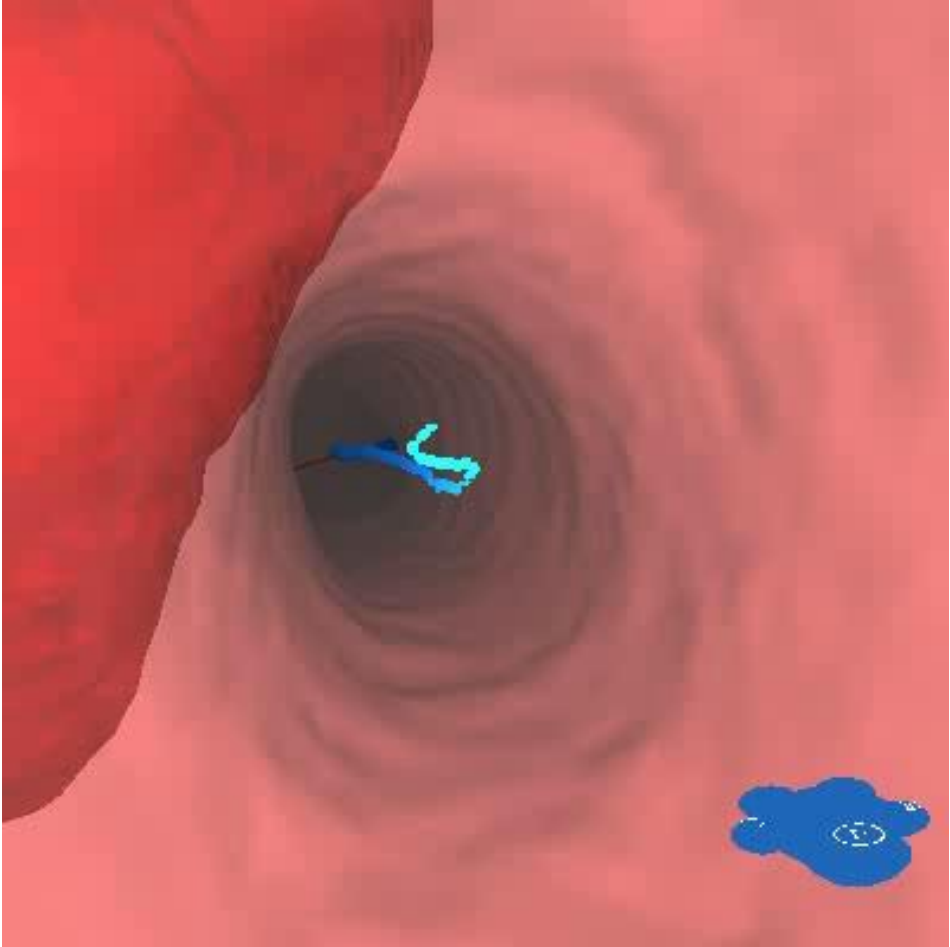
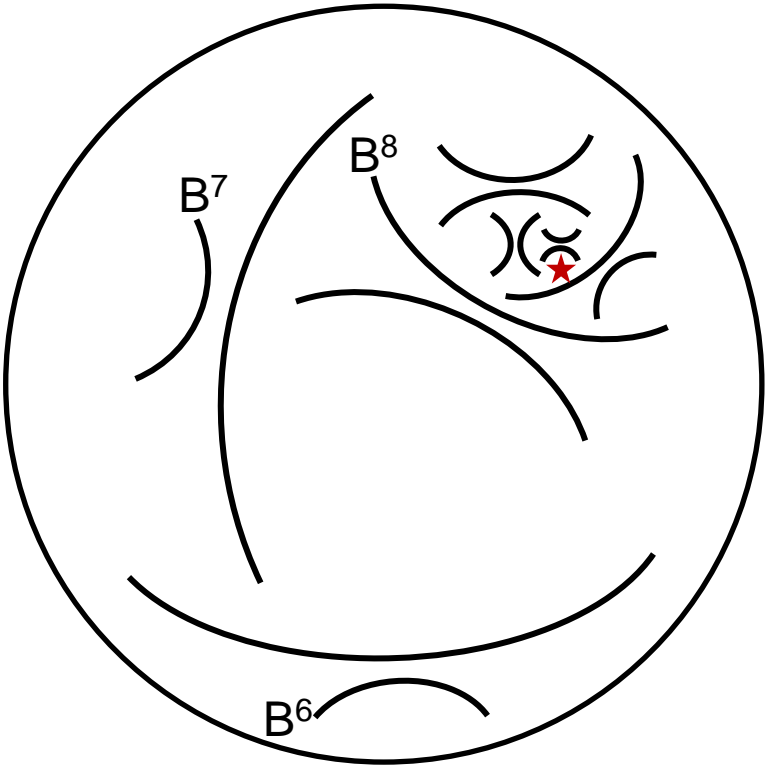
The image is an axial CT scan of the chest. The lung fields are dark, and the mediastinum and chest wall are lighter. A prominent, well-defined, rounded nodule is visible in the peripheral region of the right lung. A red arrow points to this nodule, which contains a small, branching structure representing a bronchus, a feature known as the bronchus sign. The nodule is located near the pleural surface.

23 X 17 mm sized-subpleural nodule on right lower lobe

# Case 3 – RB8

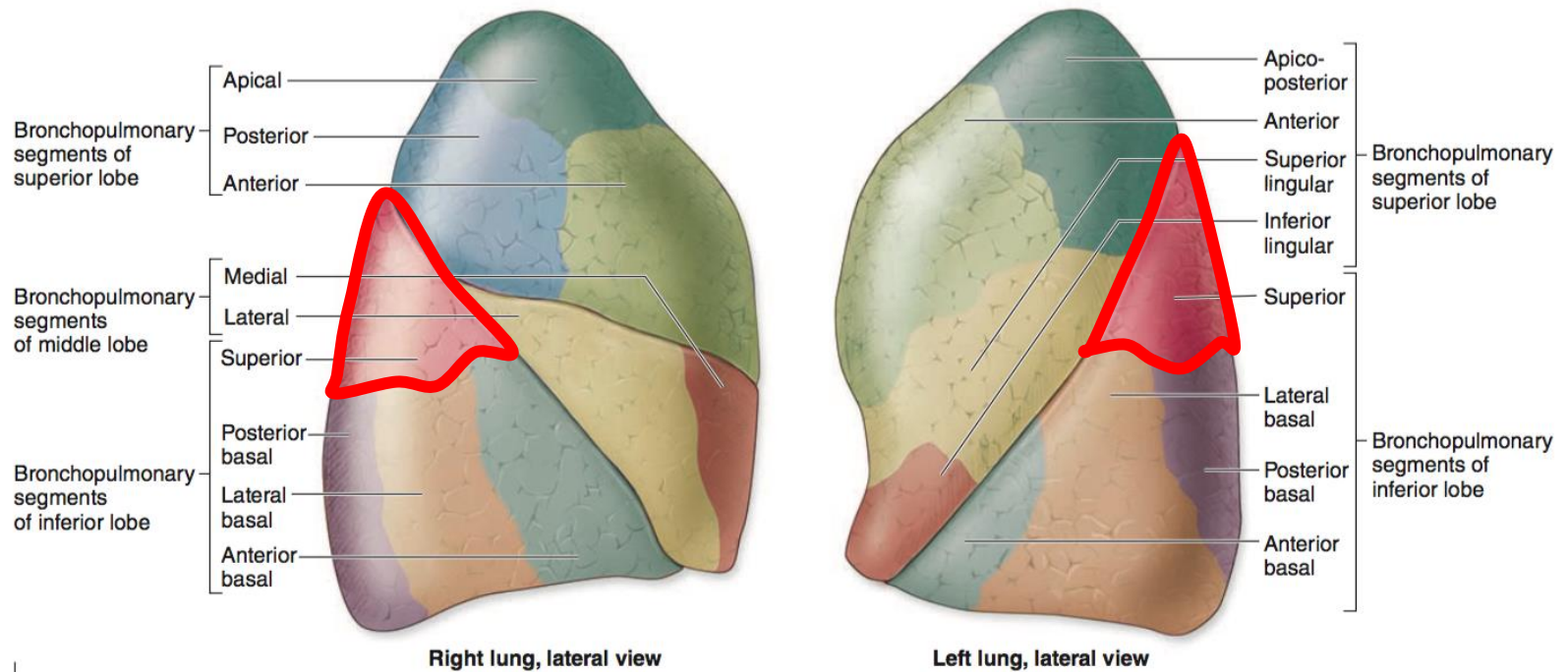


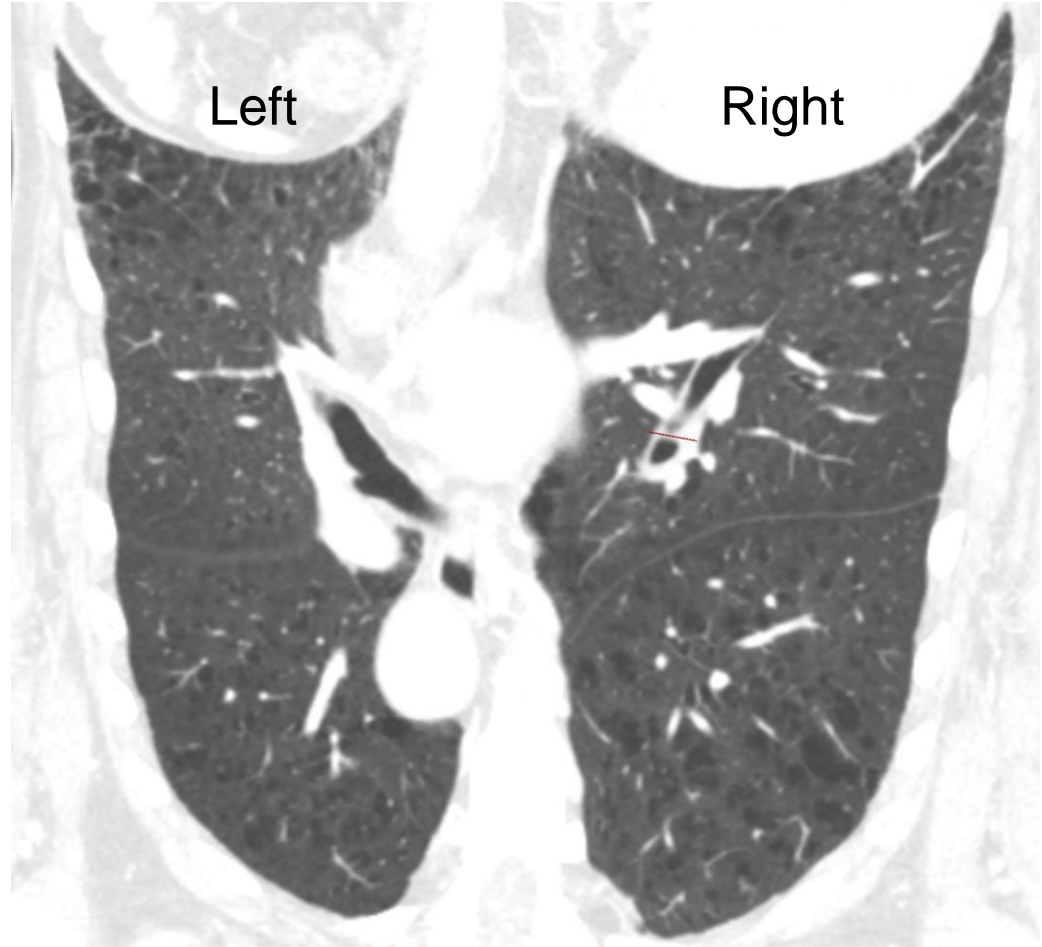
# Case 3 – RB8



# B<sup>6</sup>

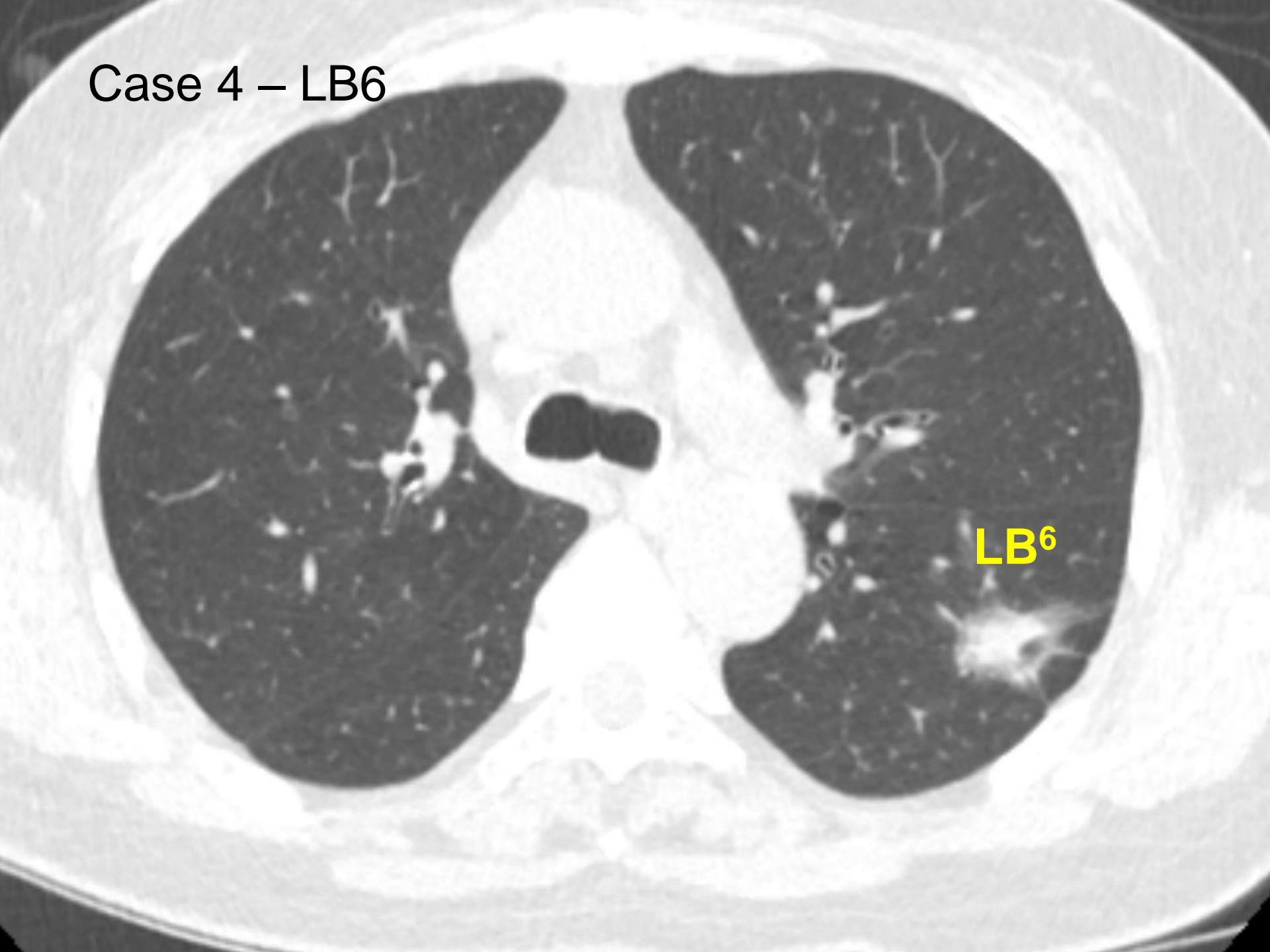
- Superior segment of both lower lobes
  - Most difficult site for drawing based on CT scan





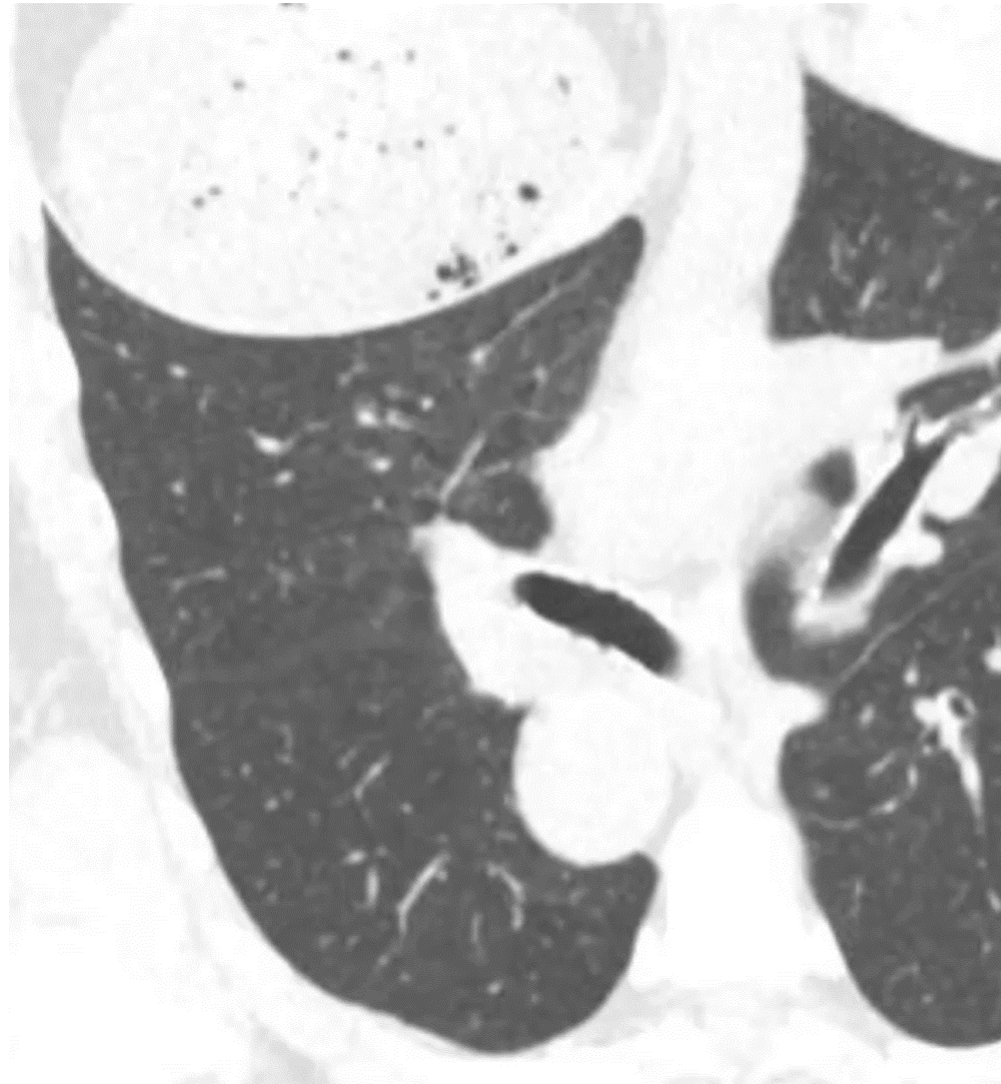
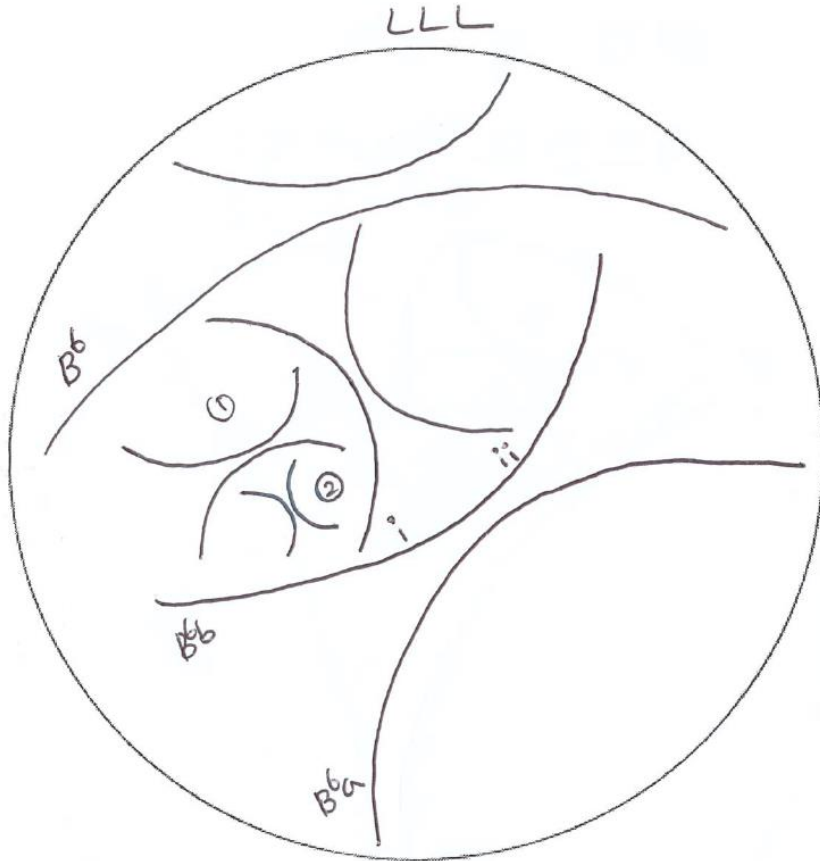
Hand-standing view

Case 4 – LB6



LB<sup>6</sup>

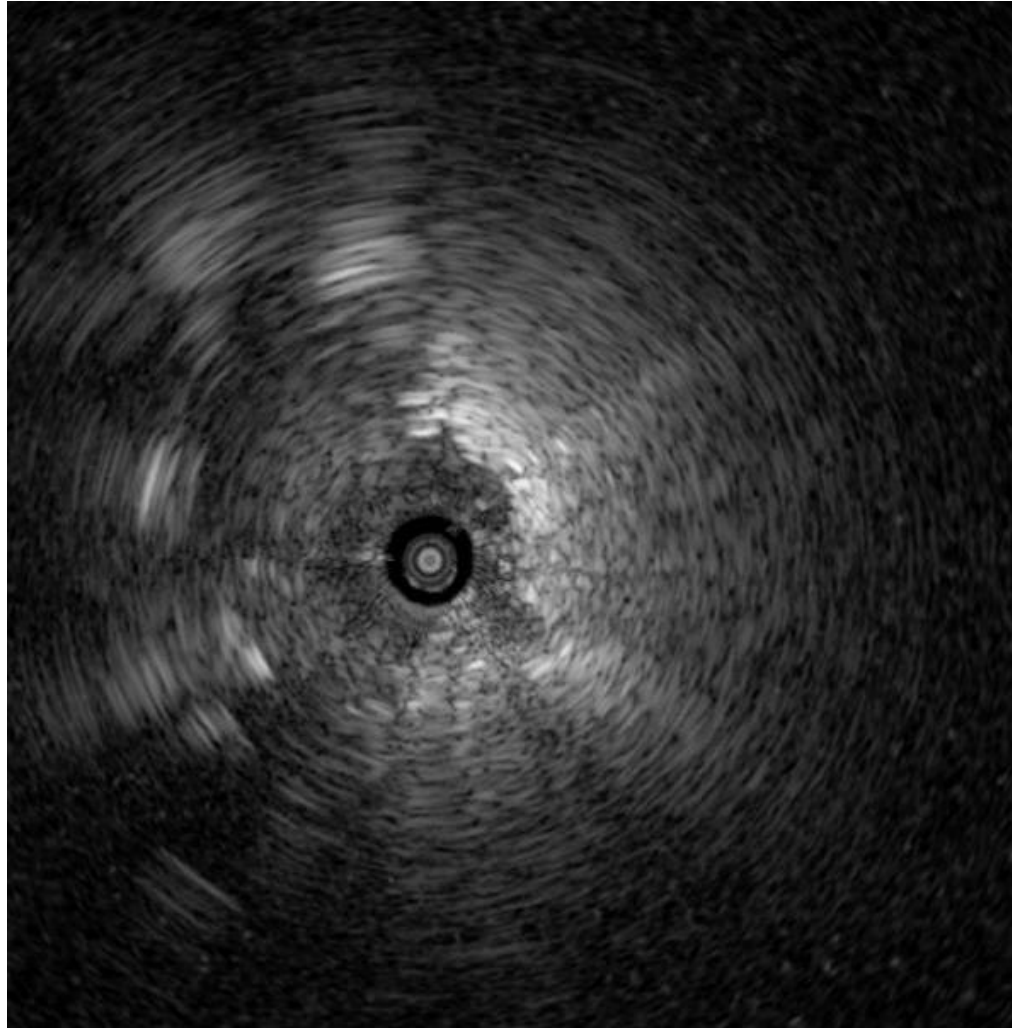
# Case 4 – LB6



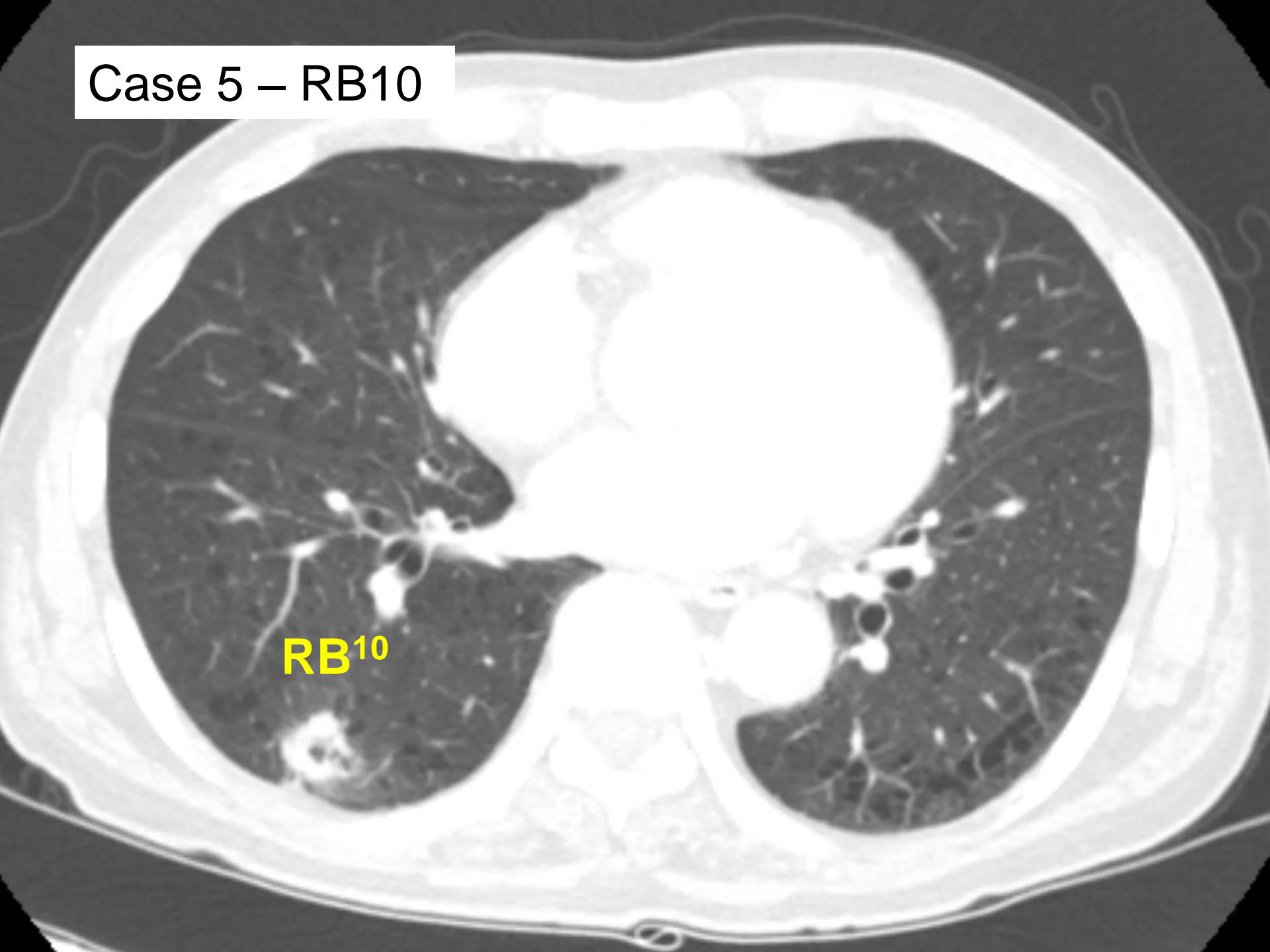
CT 시행일: 9 월 13 일

1. Size: 19.99 X 15.47 mm
2. Distant from pleura: 6.85 mm
3. Solid, Mixed, GGO lesion
4. BR sign: positive, negative, equivocal

# Case 4 – LB6

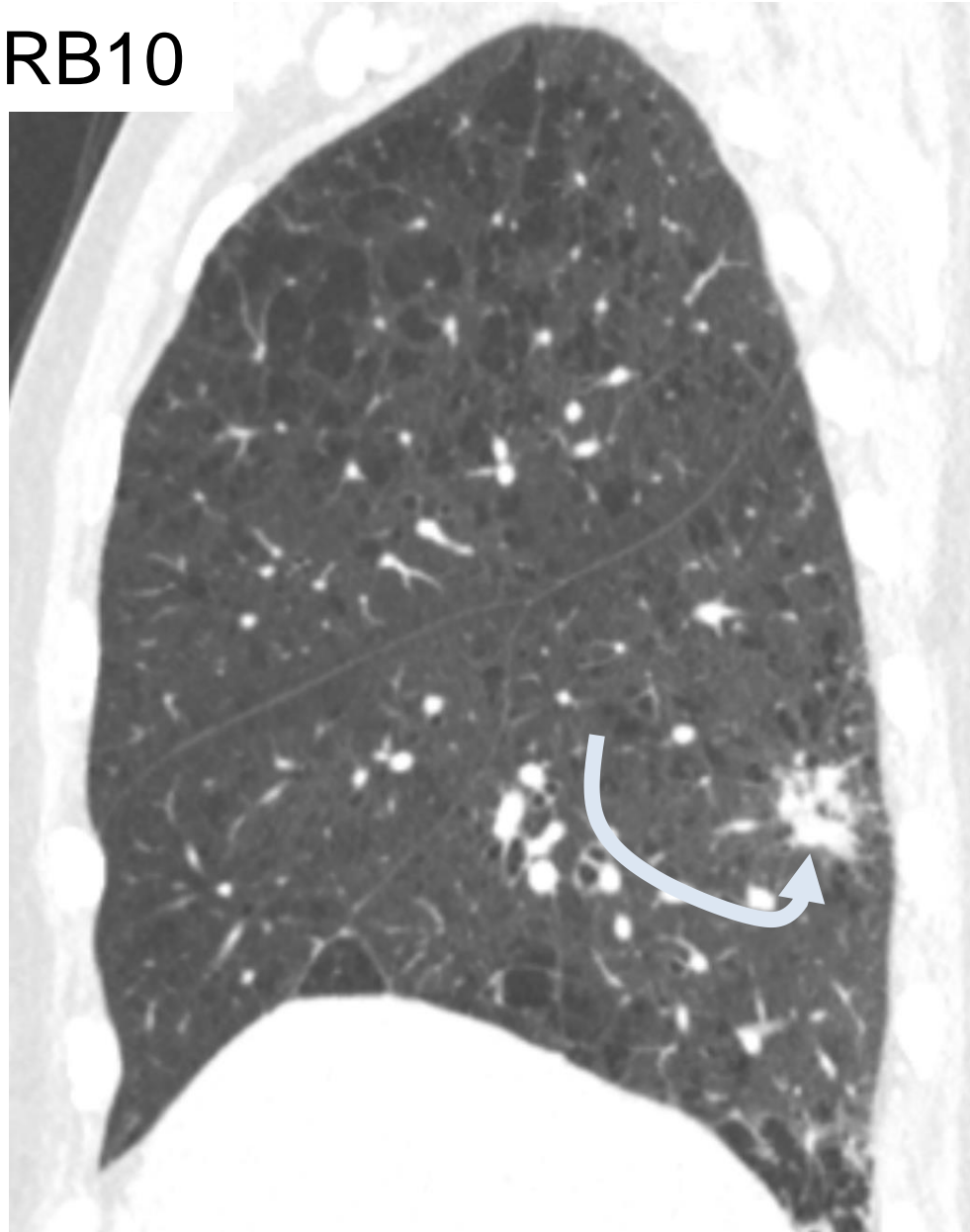


Case 5 – RB10

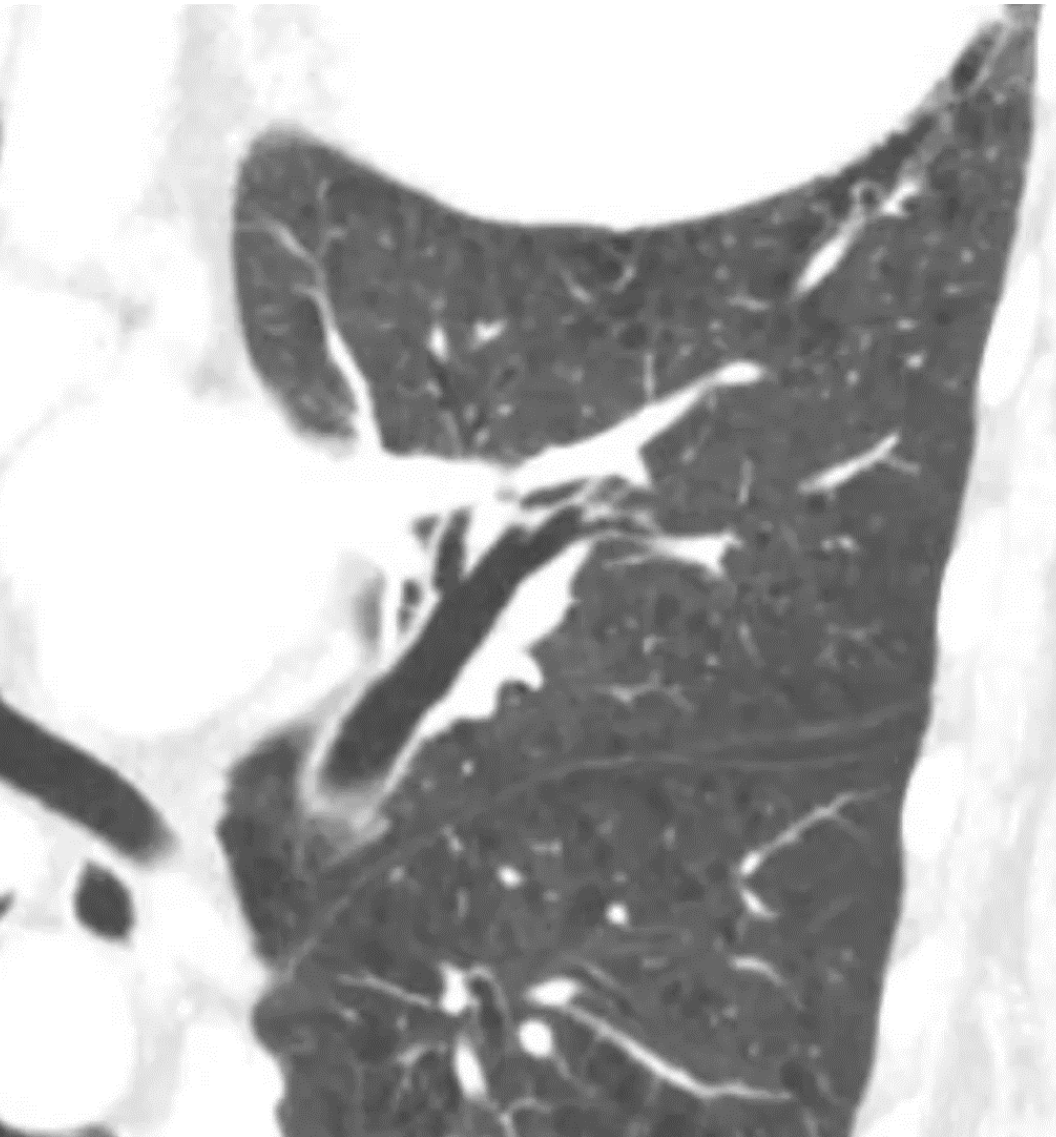


RB<sup>10</sup>

# Case 5 – RB10



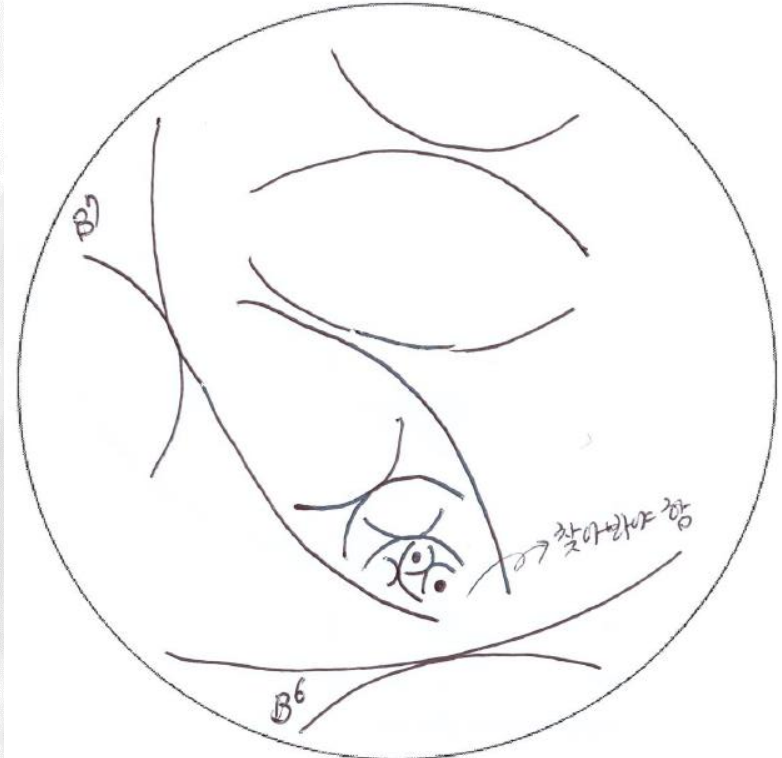
# Case 5 – RB10



환자:

차트번호:

RLL



CT 시행일: 11월 5일

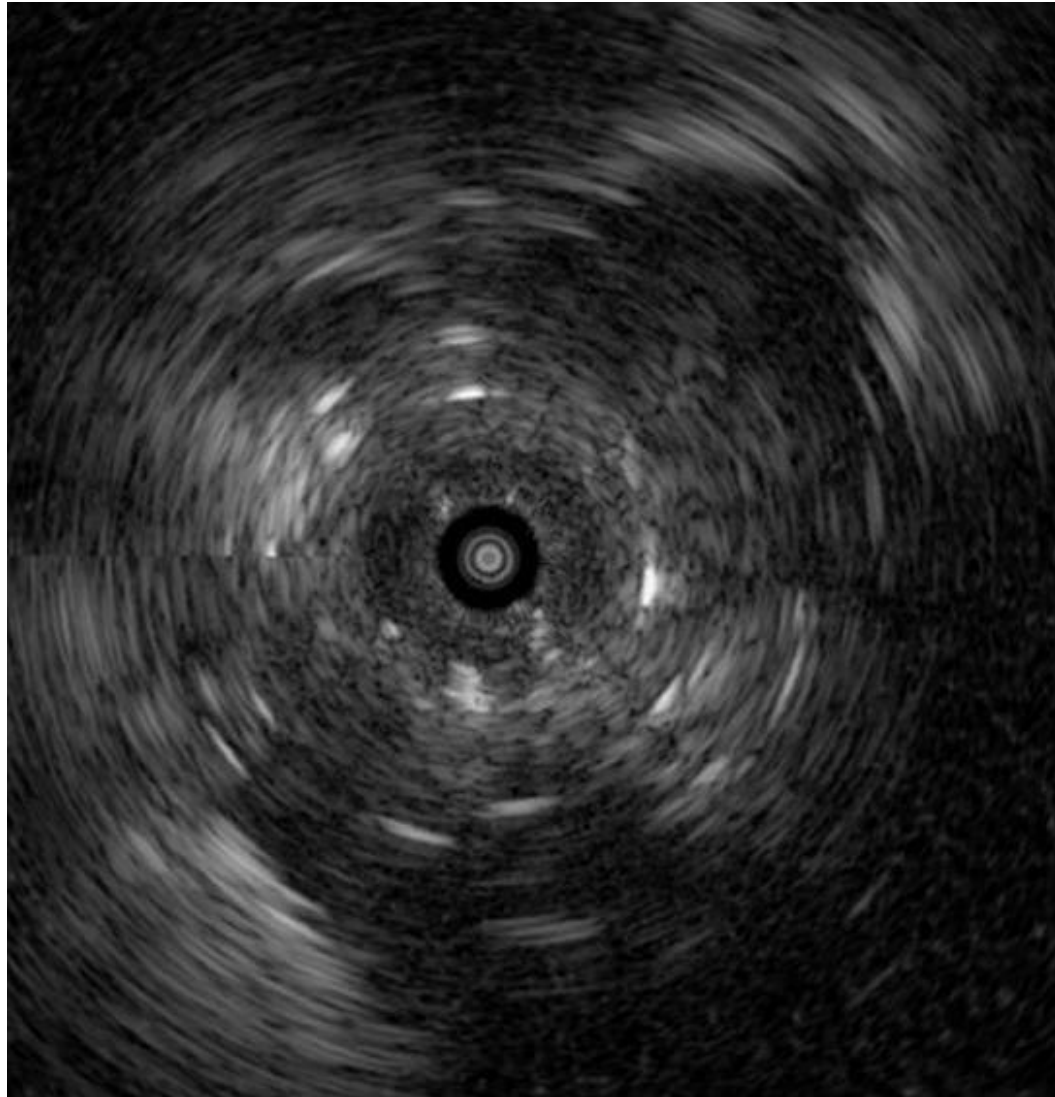
1. Size: 19.96 X 11.81 mm

2. Distant from pleura: 0 mm

3. Solid, Mixed, GGO lesion

4. BR sign: positive, negative, equivocal

# Case 5 – RB10



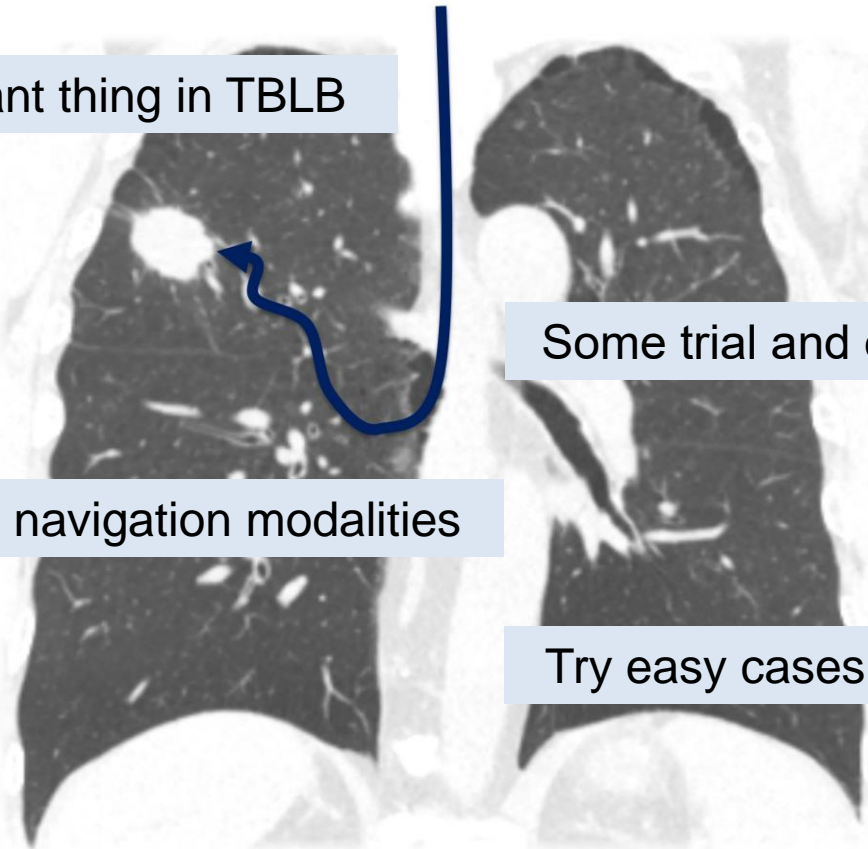
# Take-home Message

The most important thing in TBLB

Some trial and error → Expert

Possible without navigation modalities

Try easy cases at first!



# *Thank You!*



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[ejspulm@pusan.ac.kr](mailto:ejspulm@pusan.ac.kr)