Radioanatomie Thoraciq

Voies aériennes
Poumons
Plèvre
Lymphatiques

Michel Montaudon

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Inserm

UNIVERSITE DE
BORDEAUX

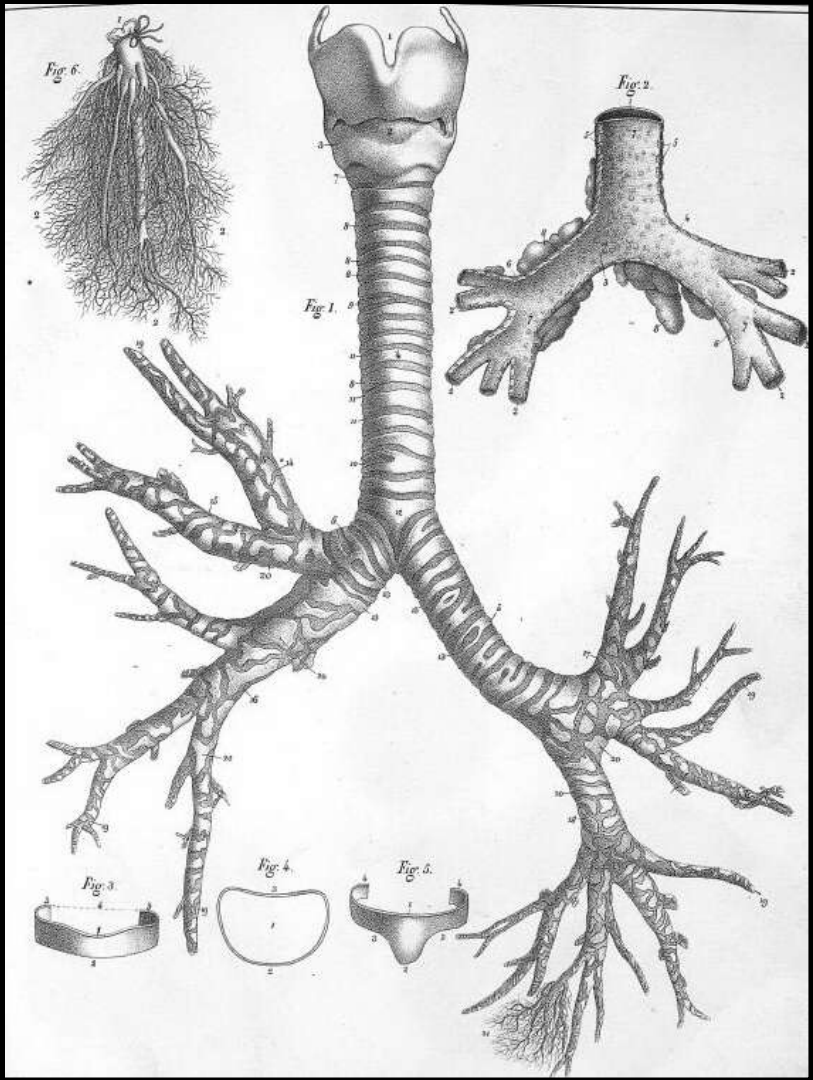
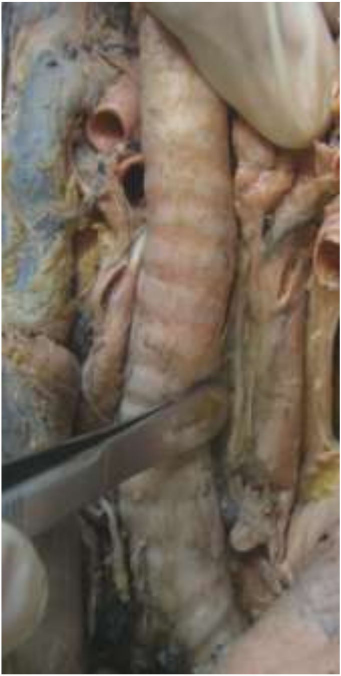


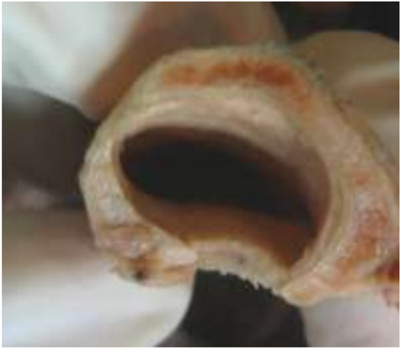
Fig. 6
Fig. 2
Fig. 1
Fig. 3
Fig. 4
Fig. 5

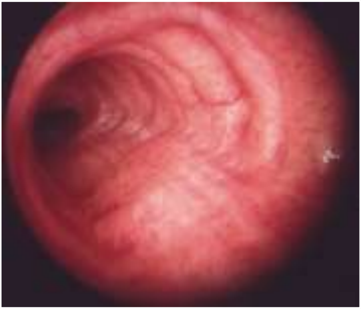
J. Cloquet, 1825

michel.montaudon@chu-bordeaux.fr

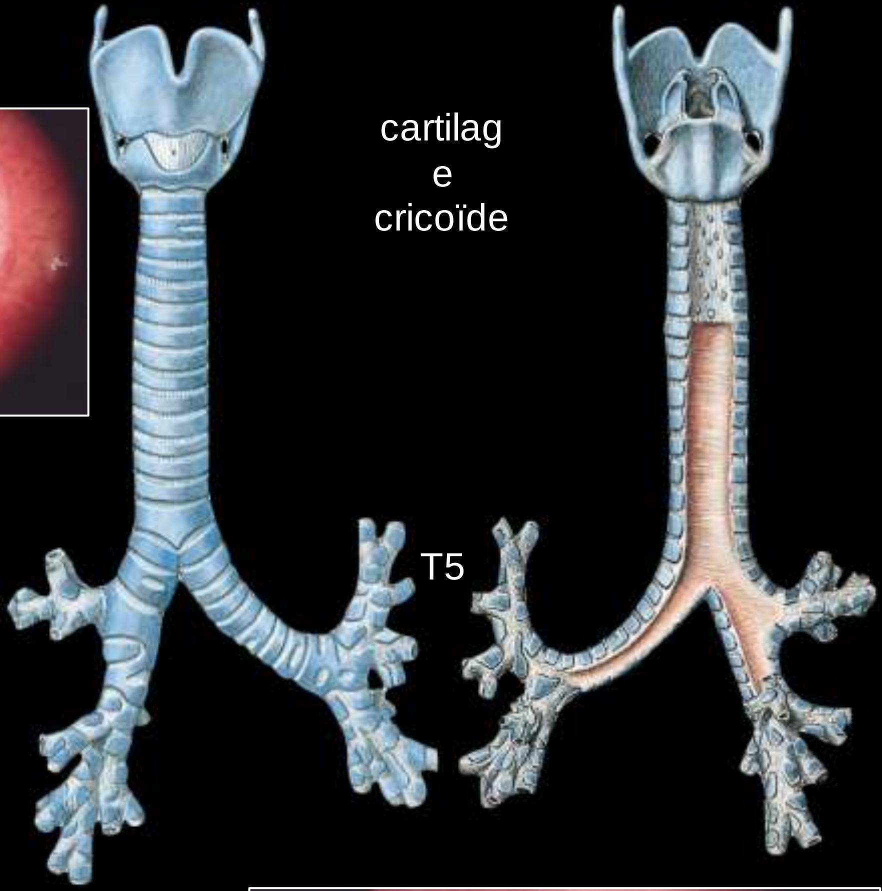
Voies aériennes

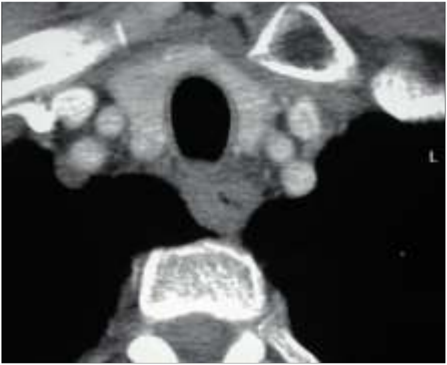


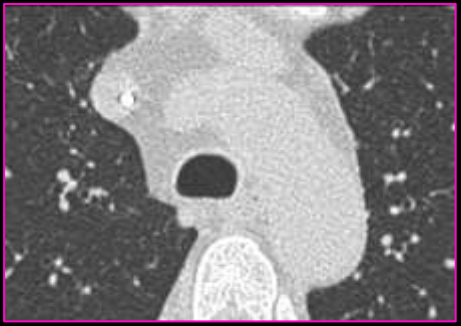


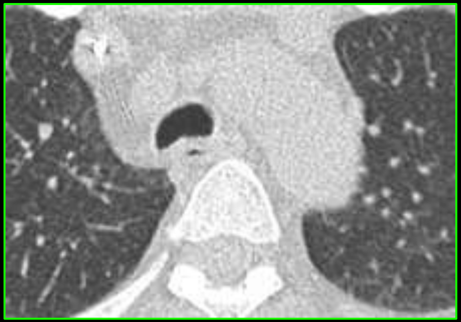


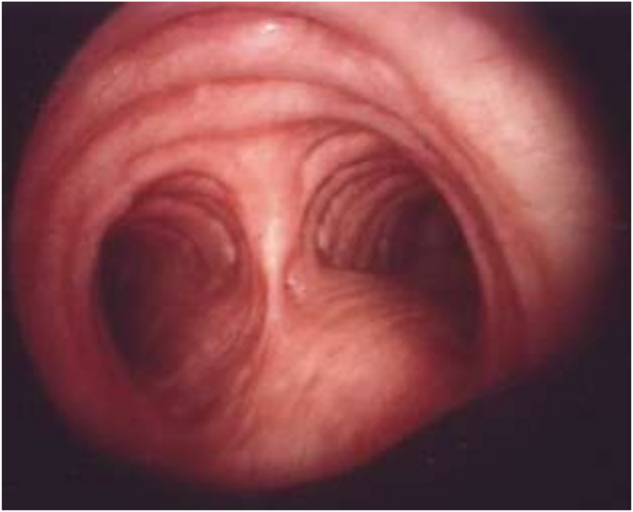
- 12 cm x 2 cm
- anneaux cartilagineux incomplets
- ligaments annulaires

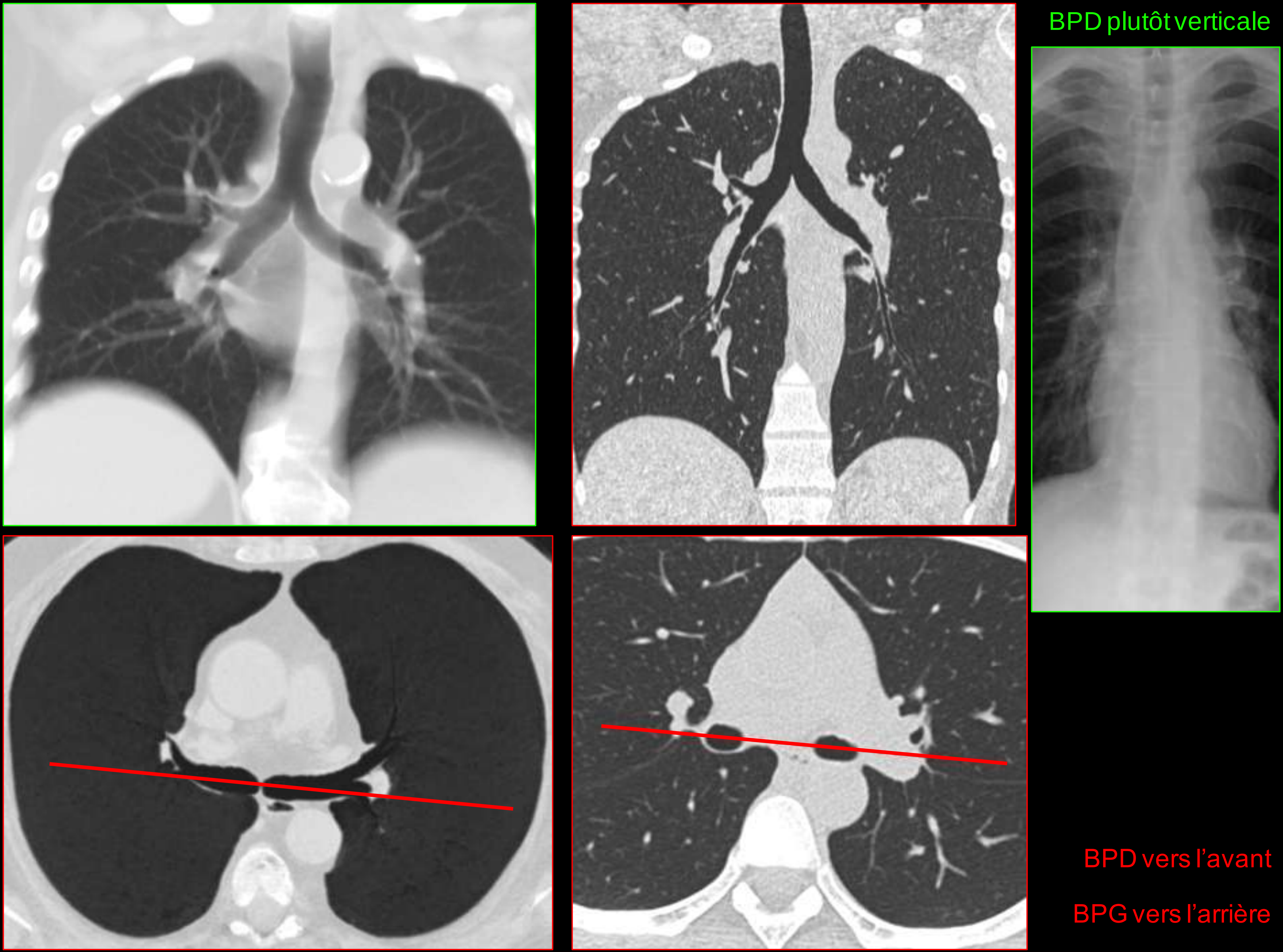

cartilage cricoïde
T5




inspiration


expiration





Systématisation

B1: apicale du LSD / culmen

B2: ventrale du LSD / culmen (B3 pour les anatomistes)

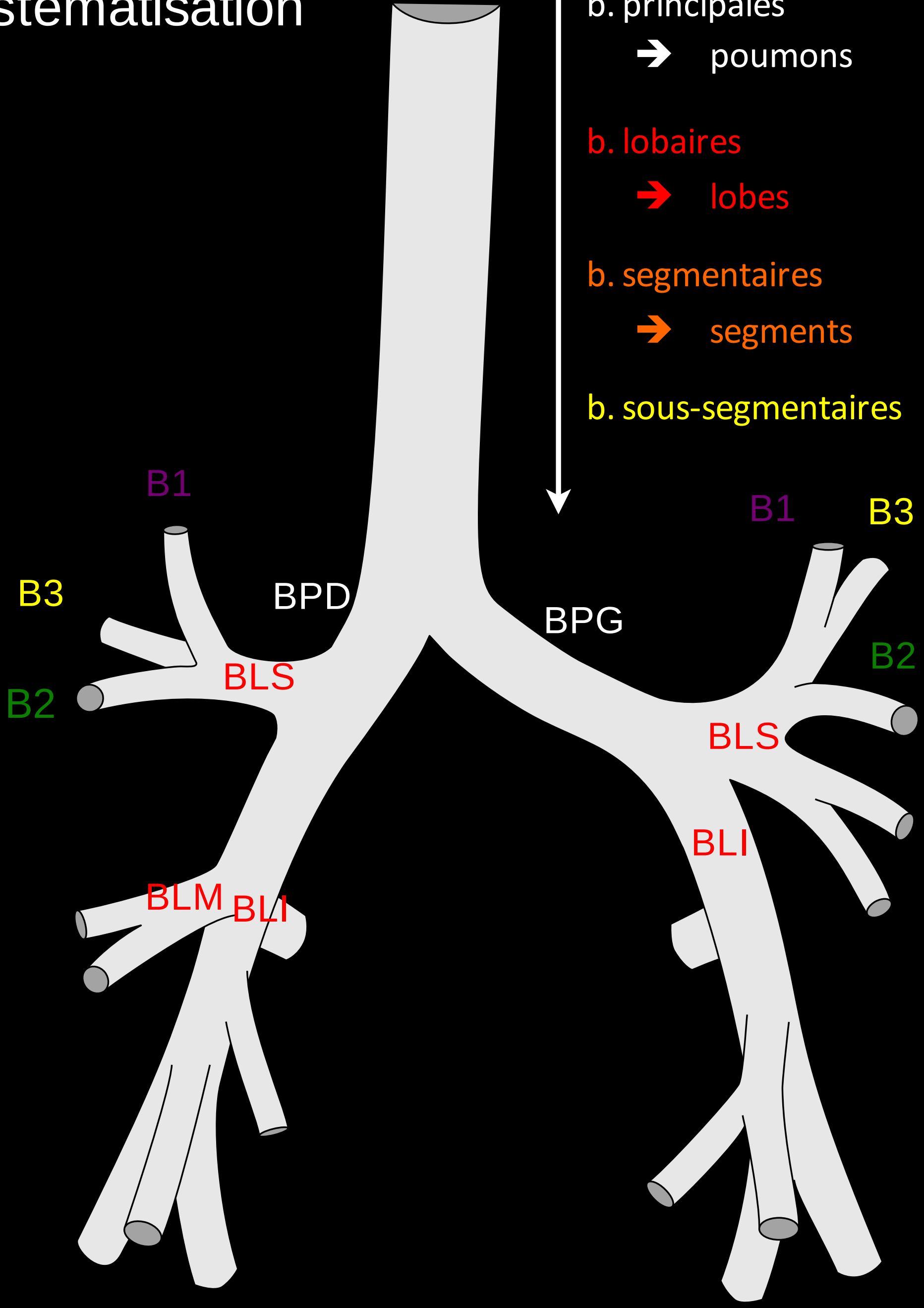
B3: dorsale du LSD / culmen (B2 pour les anatomistes)

b. principales
➔ poumons

b. lobaires
➔ lobes

b. segmentaires
➔ segments

b. sous-segmentaires


B1
B3
BPD
B2
BLS
BLM
BLI
BPG
B1
B3
B2
BLS
BLI

BLS: bronche lobaire supérieure

BLM: bronche lobaire moyenne

BLI: bronche lobaire inférieure

Systématisation

B1: apicale du LSD / culmen

B2: ventrale du LSD / culmen (B3 pour les anatomistes)

B3: dorsale du LSD / culmen (B2 pour les anatomistes)

B4: latérale du LM / supérieure de la lingula

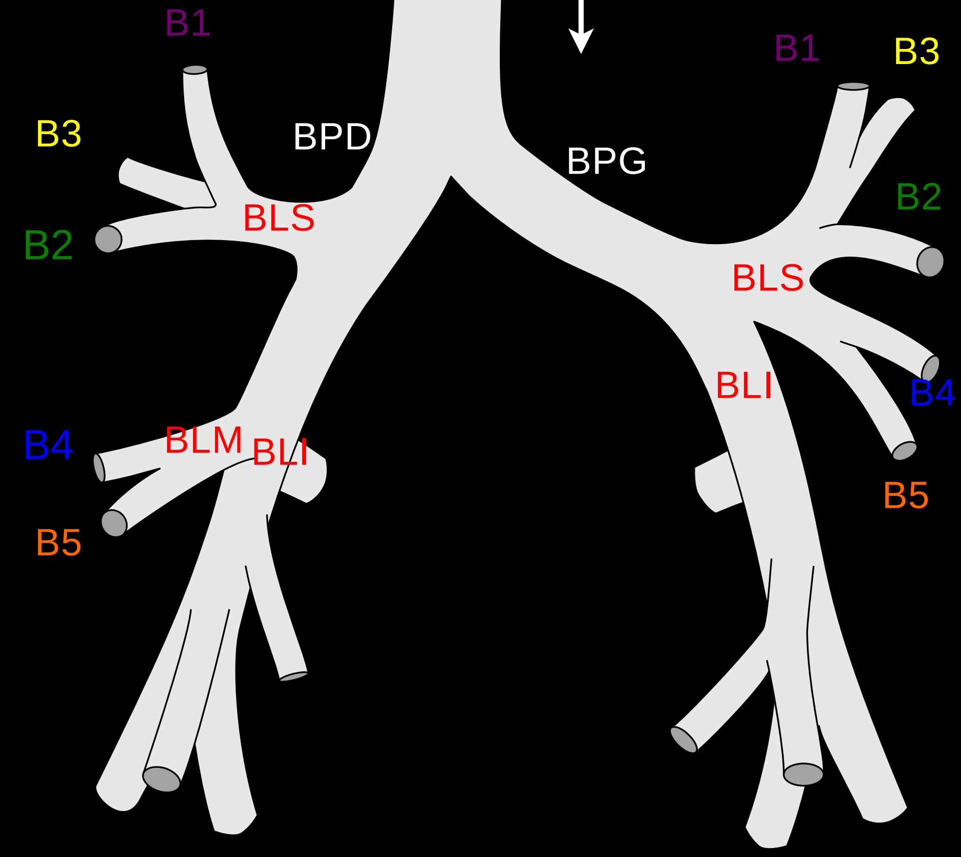
B5: médiale du LM / inférieure de la lingula

b. principales
➔ poumons

b. lobaires
➔ lobes

b. segmentaires
➔ segments

b. sous-segmentaires


B1
B3
BPD
B2
BLS
B4
BLM
BLI
B5
B1
B3
BPG
B2
BLS
BLI
B4
B5

BLS: bronche lobaire supérieure

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Systématisation

B1: apicale du LSD / culmen

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B4: latérale du LM / supérieure de la lingula

B5: médiale du LM / inférieure de la lingula

B6: apicale du LI (Nelson)

B7: médio-basale du LI (para-cardiaque)

B8: ventro-basale du LI

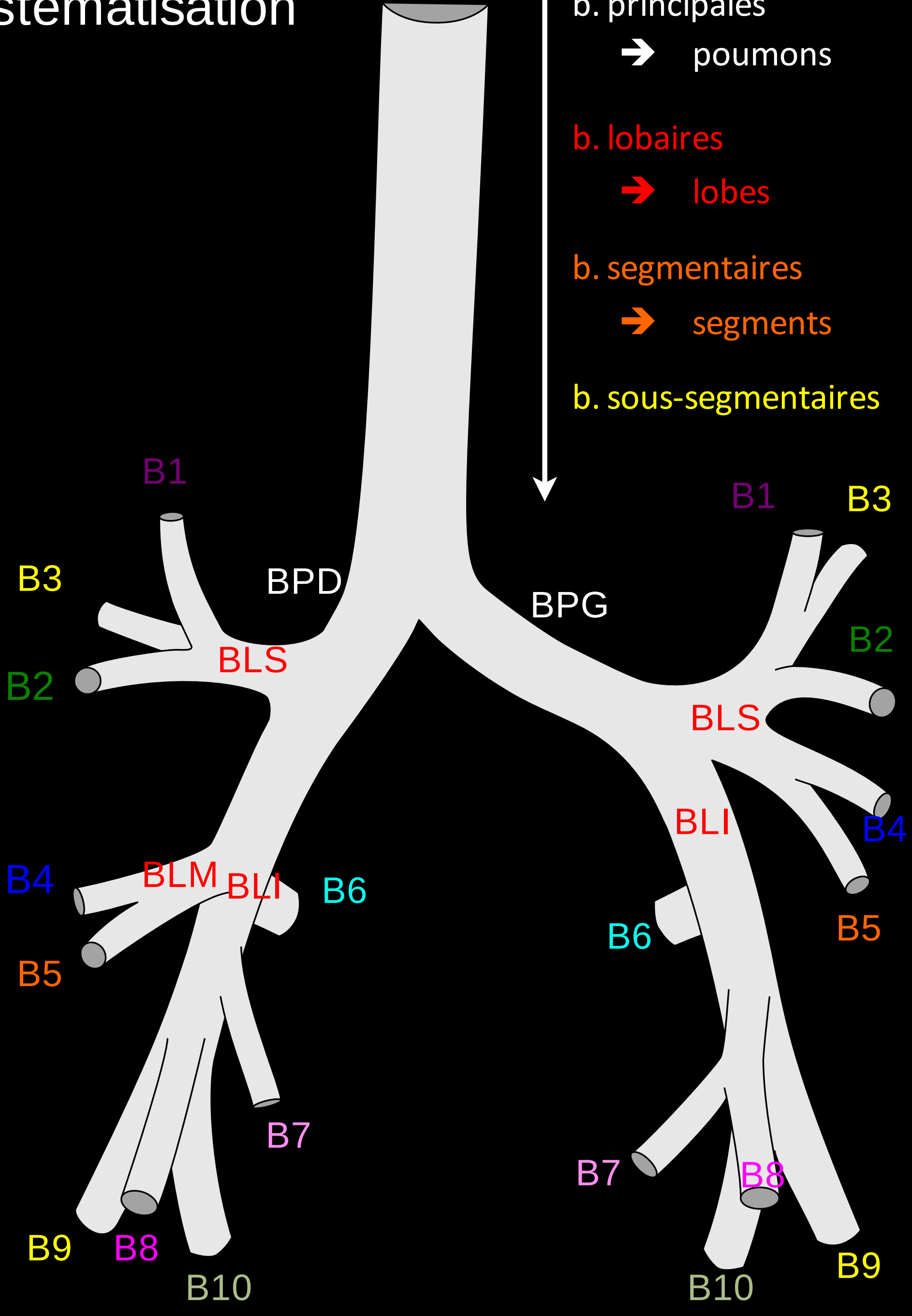
B9: latéro-basale du LI

B10: dorso-basale du LI

BLS: bronche lobaire supérieure

BLM: bronche lobaire moyenne

BLI: bronche lobaire inférieure



b. principales
➔ poumons

b. lobaires
➔ lobes

b. segmentaires
➔ segments

b. sous-segmentaires

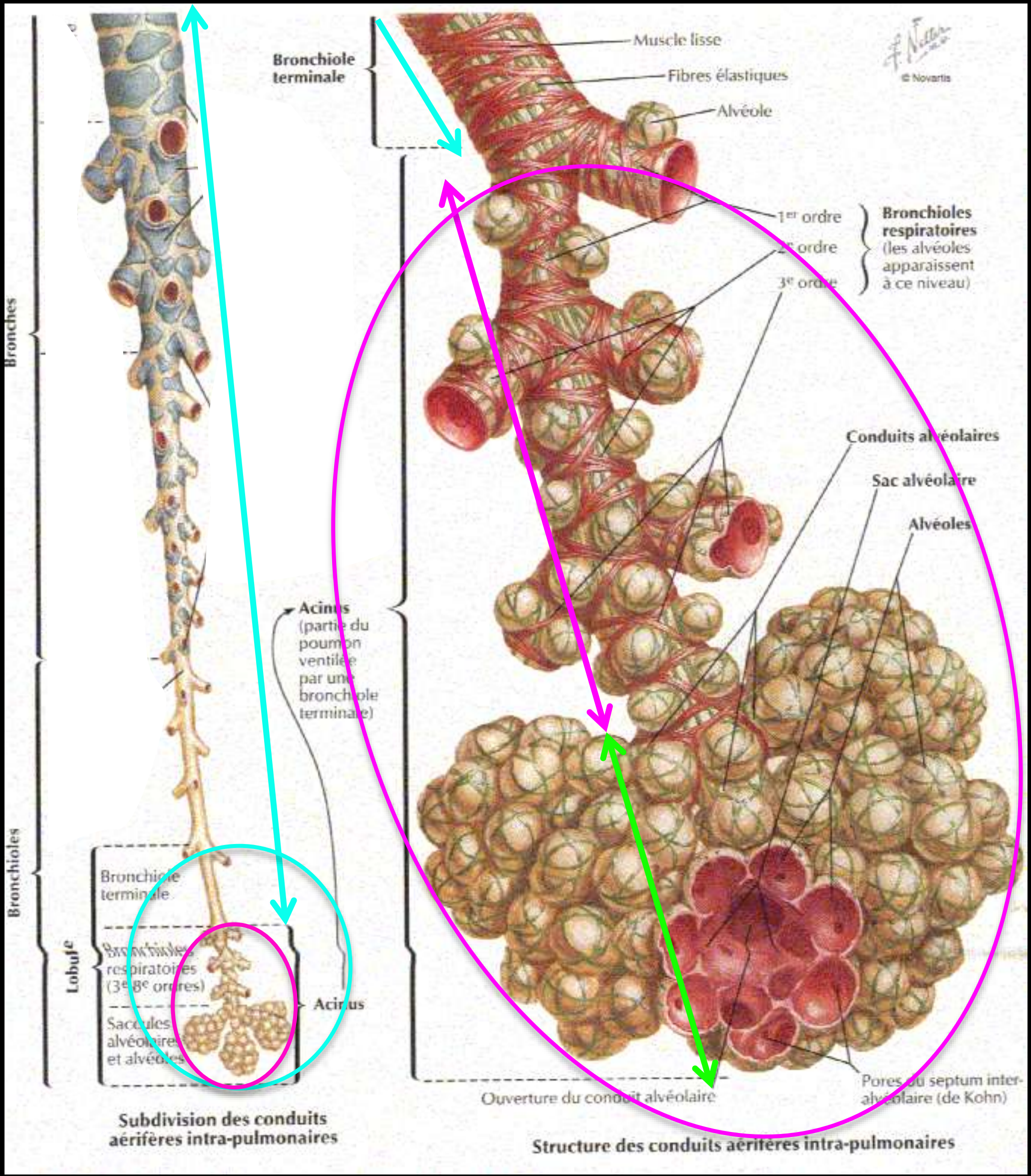
B1
B3
BPD
B2
BLS
B4
BLM
BLI
B6
B5
B7
B9
B8
B10
BPG
B1
B3
B2
BLS
BLI
B4
B6
B5
B7
B8
B10
B9

5 divisions successives en moyenne

- zone de conduction:
trachée   bronchioles terminales

- zone intermédiaire:
bronchioles respiratoires & canaux alvéolaires

- zone respiratoire (échanges): sacs alvéolaires et alvéoles

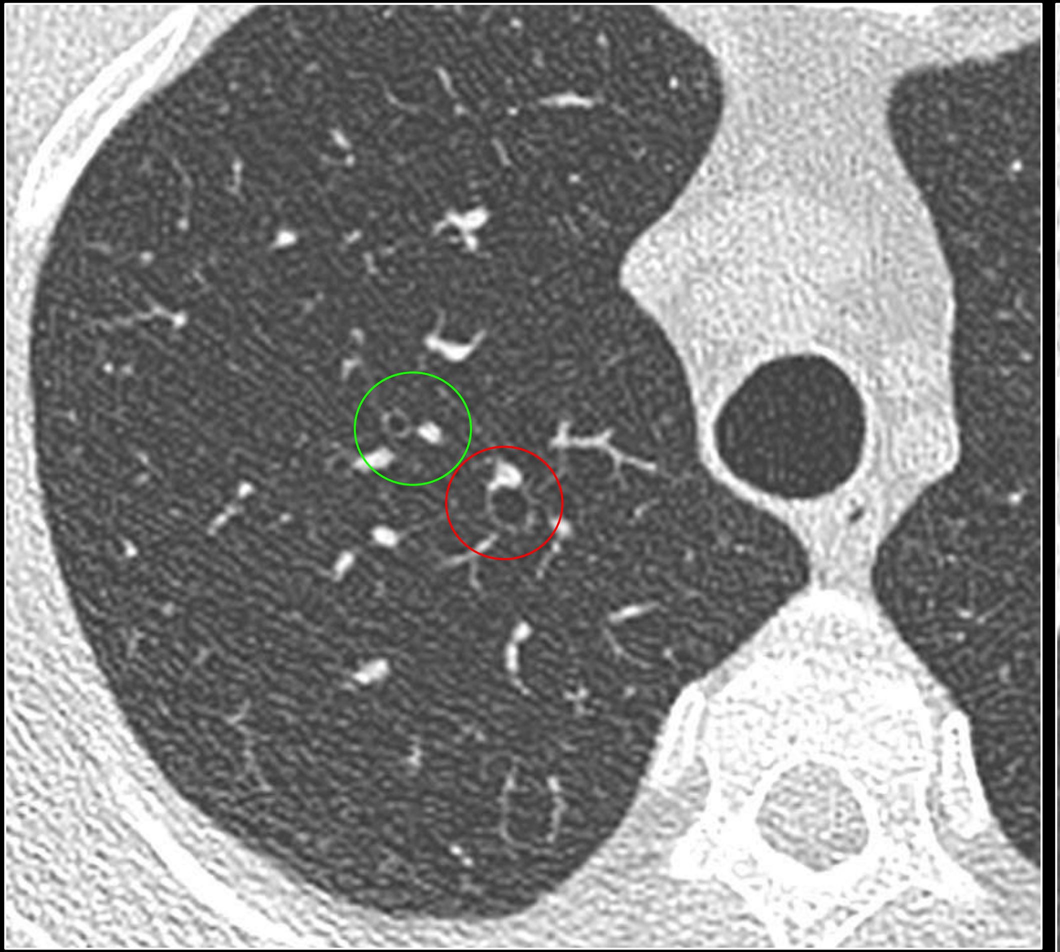

Bronches
Bronchioles
Lobule
Bronchiole terminale
Bronchioles respiratoires (3e-8e ordres)
Saccules alvéolaires et alvéoles
Acinus (partie du poumon ventilée par une bronchiole terminale)
Acinus
Bronchiole terminale
Muscle lisse
Fibres élastiques
Alvéole
1er ordre
2e ordre
3e ordre
Bronchioles respiratoires (les alvéoles apparaissent à ce niveau)
Conduits alvéolaires
Sac alvéolaire
Alvéoles
Ouverture du conduit alvéolaire
Pores du septum inter-alvéolaire (de Kohn)
F. Netter
© Novartis

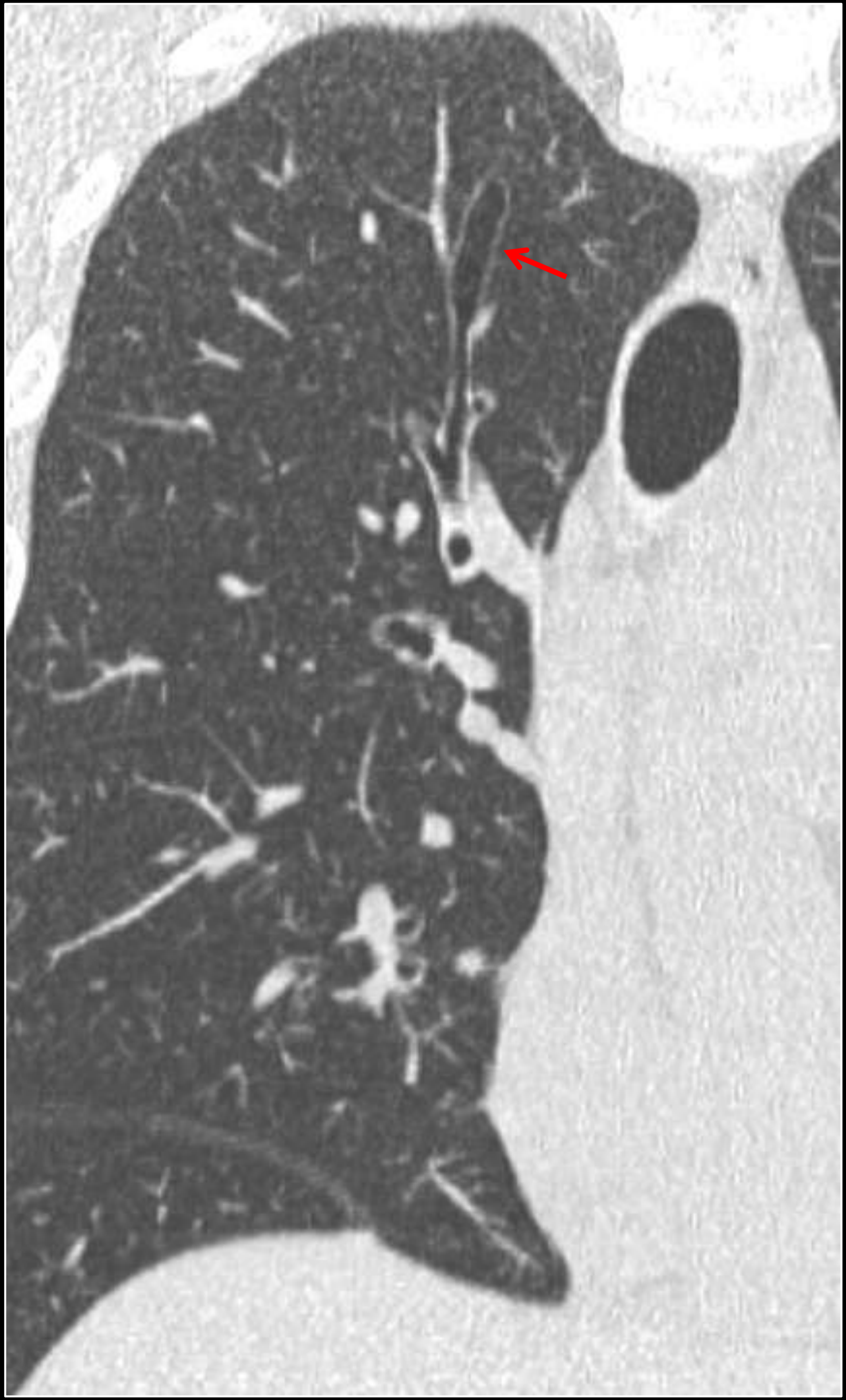
Subdivision des conduits aérifères intra-pulmonaires

Structure des conduits aérifères intra-pulmonaires

bronchiole terminale ➔ lobule pulmonaire

bronchiole respiratoire de 1^{er} ordre ➔ acinus



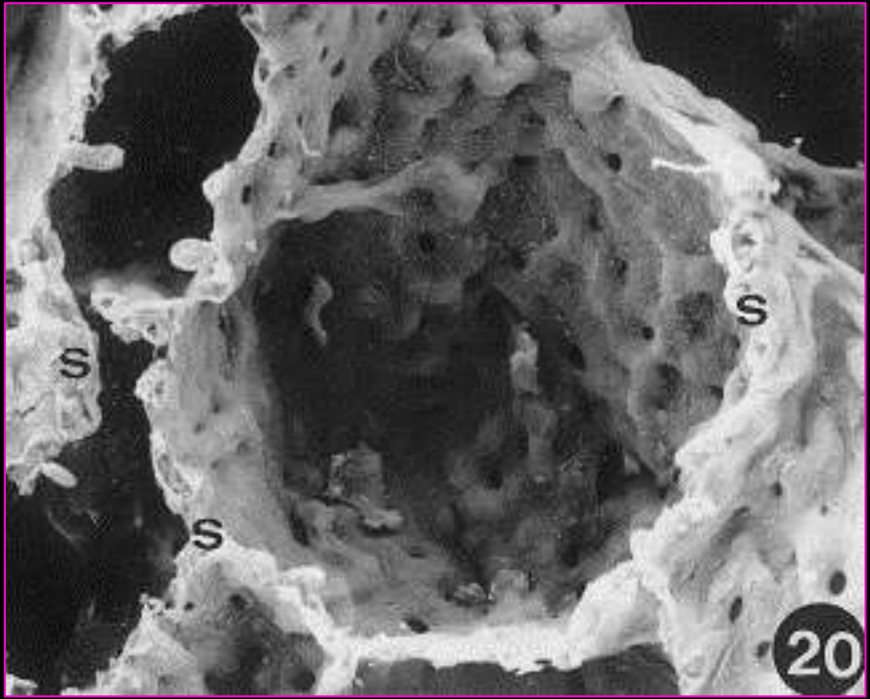


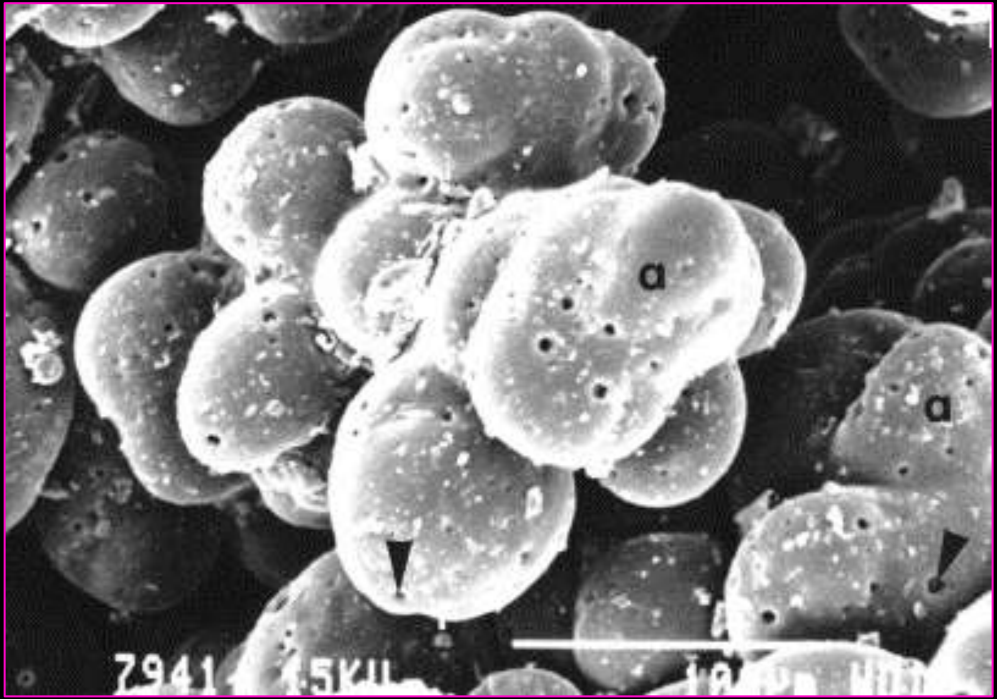
paroi fine

diamètre de lumière < 1,5 x artères

diminution progressive vers la périphérie

Collatéralité des voies aériennes

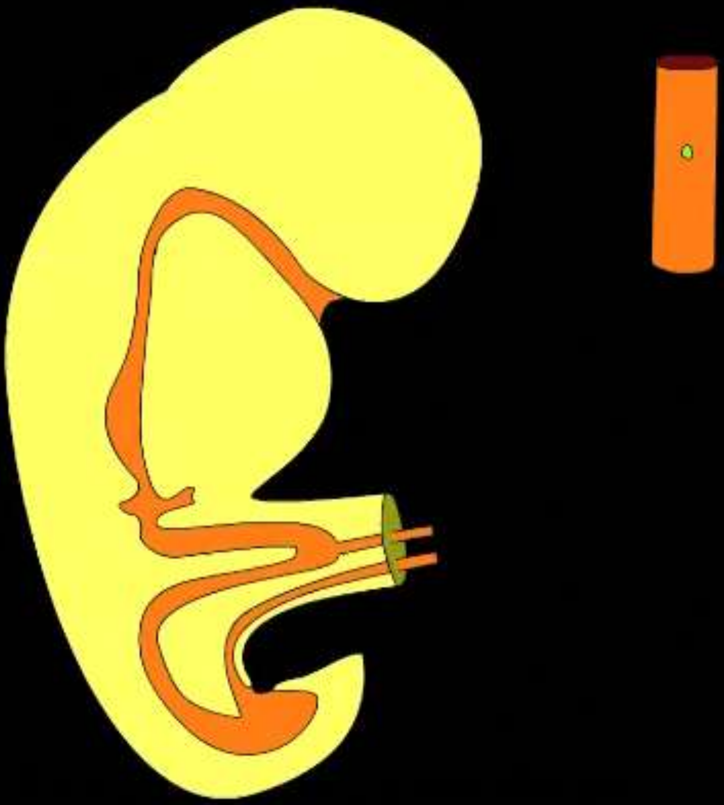




- communications inter-alvéolaires (pores de Kohn)

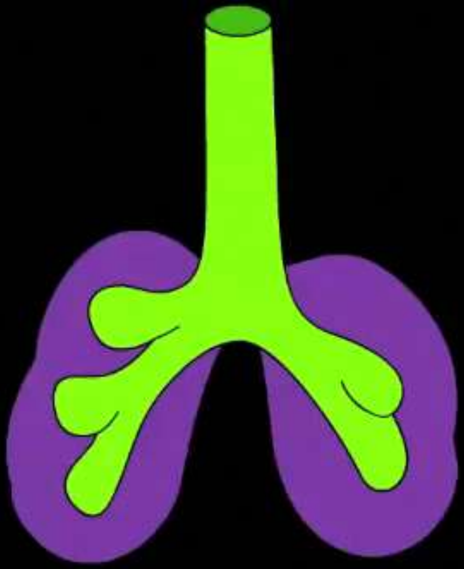
- communications bronchiolo-alvéolaires (canaux de Lambert)

- communications bronchiolo-bronchiolaires (canaux de Martin)



J22: diverticule respiratoire

J26: bourgeons bronchopulmonaires



4S: lobes

4 à 6S: segments

6 à 16S: ramifications successive

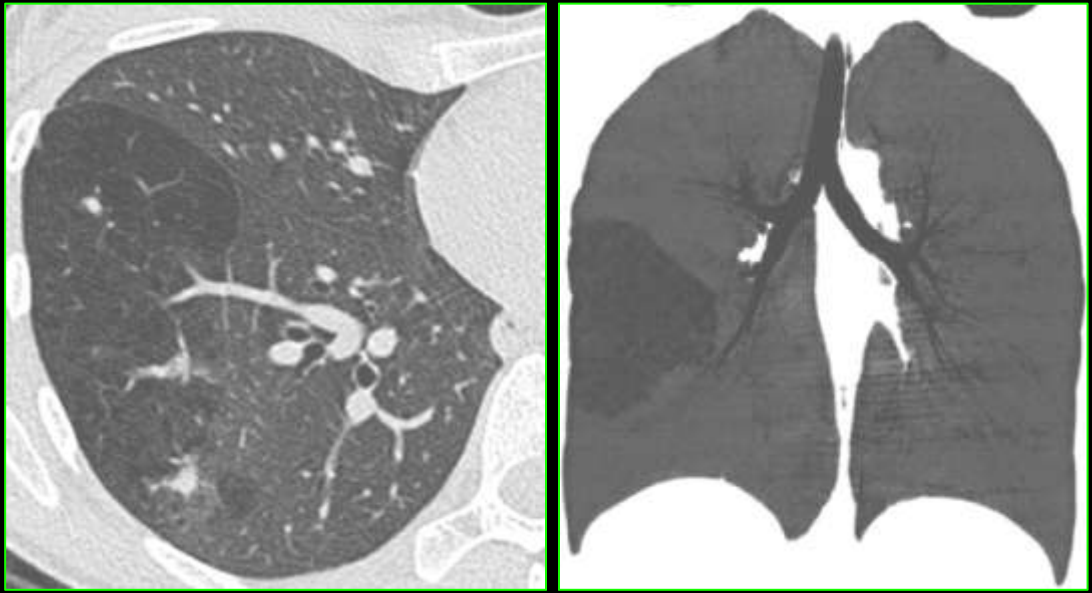
16S: bronchioles terminales

16 à 28S: ramifications successive

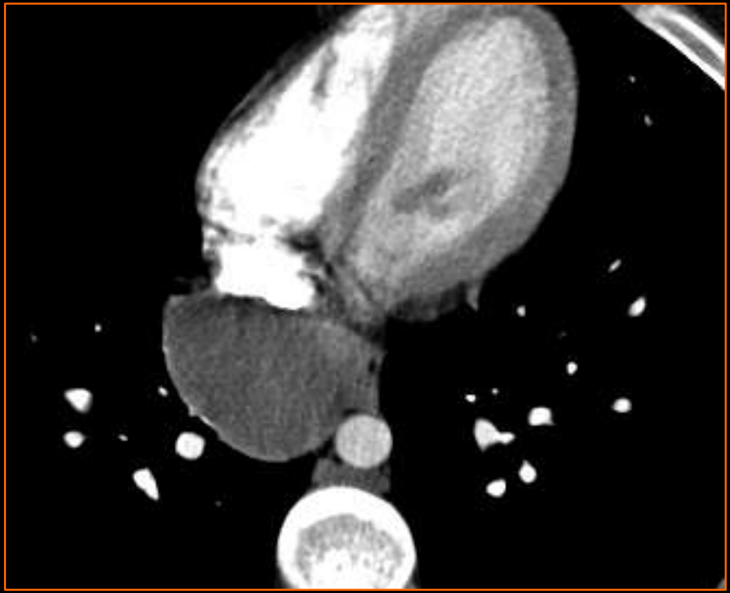
28S: bronchioles respiratoires

28 à 36S: alvéoles primitives

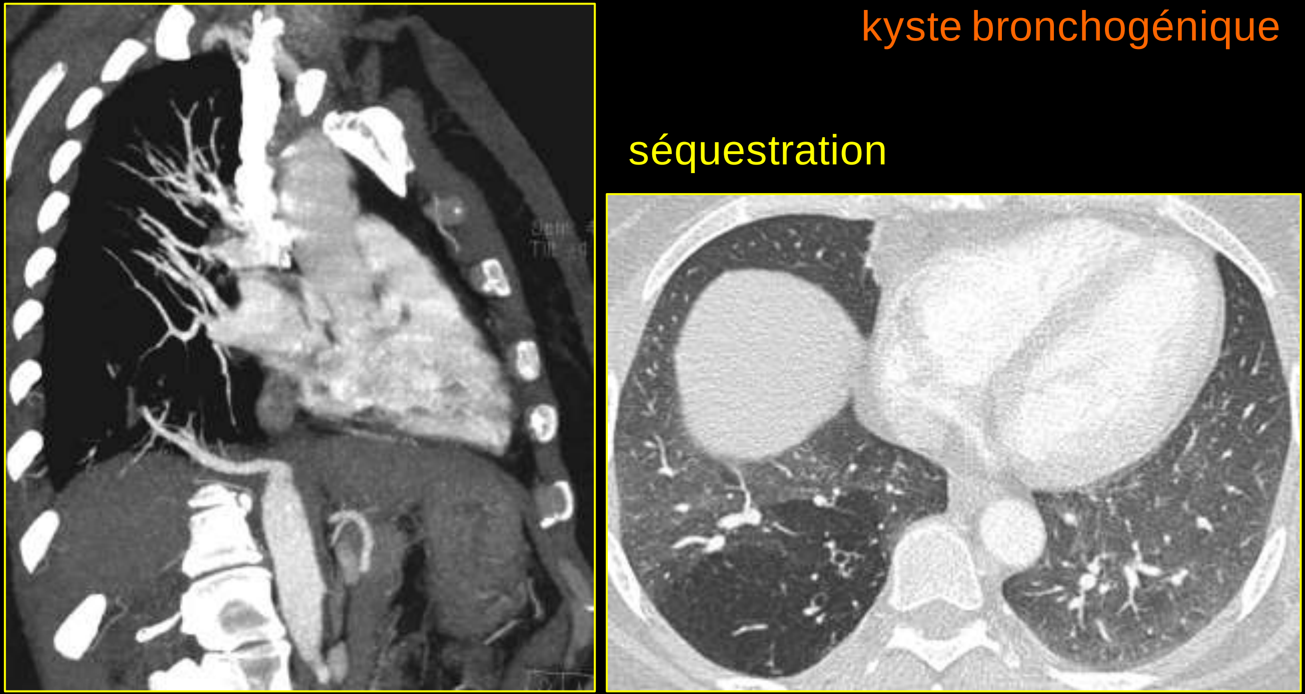
36S à 8 ans: alvéoles définitive



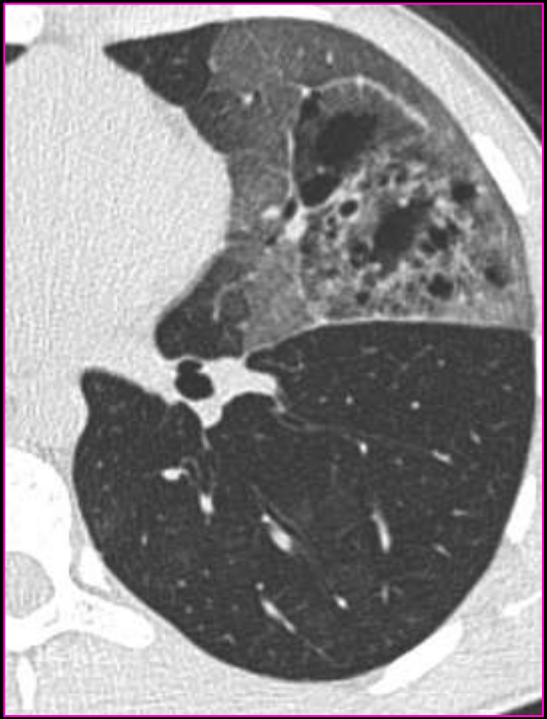
atrésie bronchique



kyste bronchogénique



séquestration



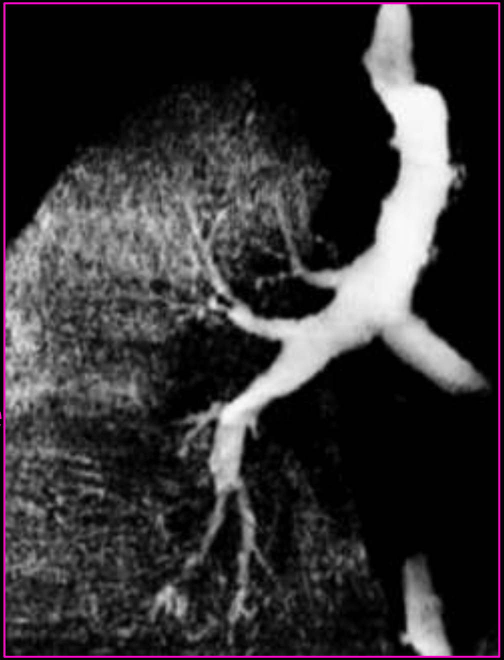
malformation adénomatoïde

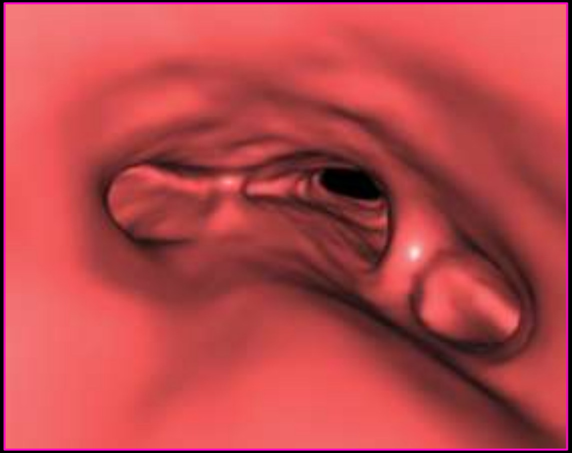
Variantes

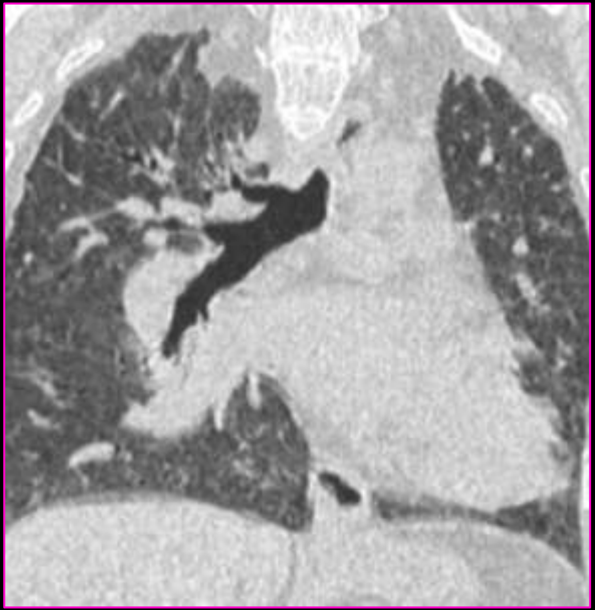
bronche surnuméraire

"glissement" bronchique

Bronche trachéale

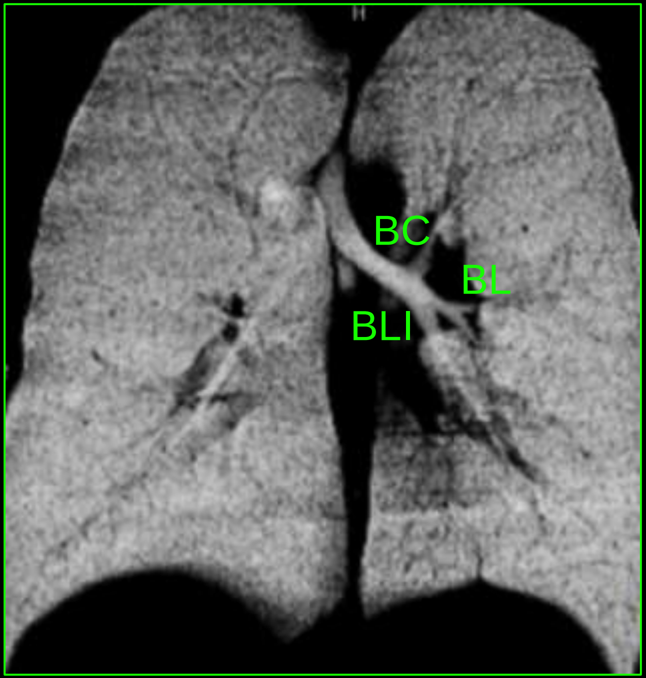


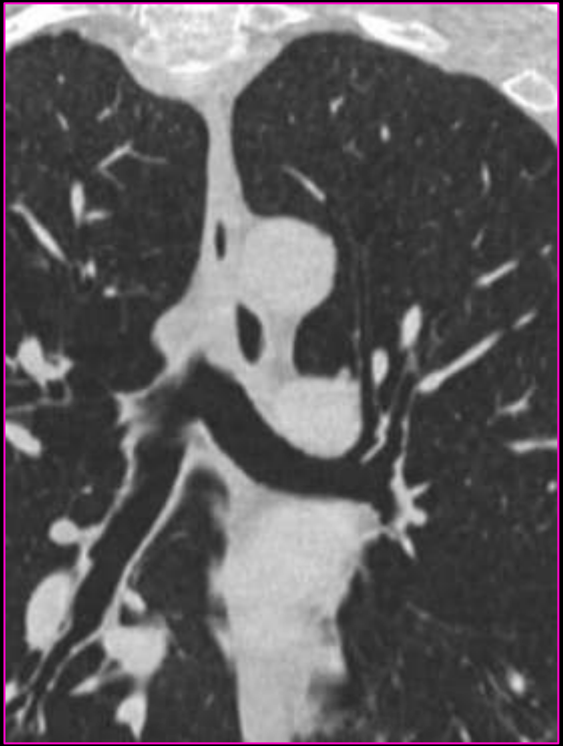




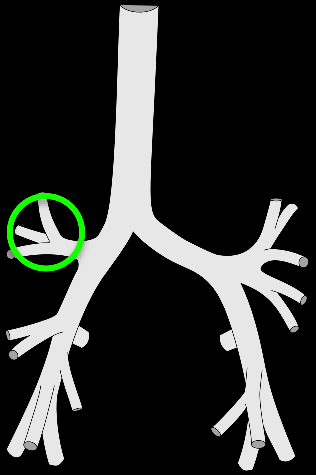
issue de la trachée: 23%

BL issue de BLI



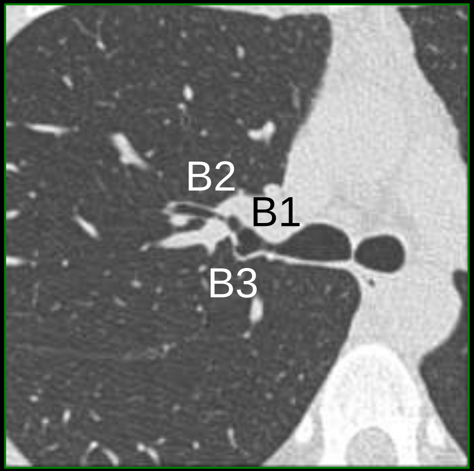


issue d'une bronche principale: 69



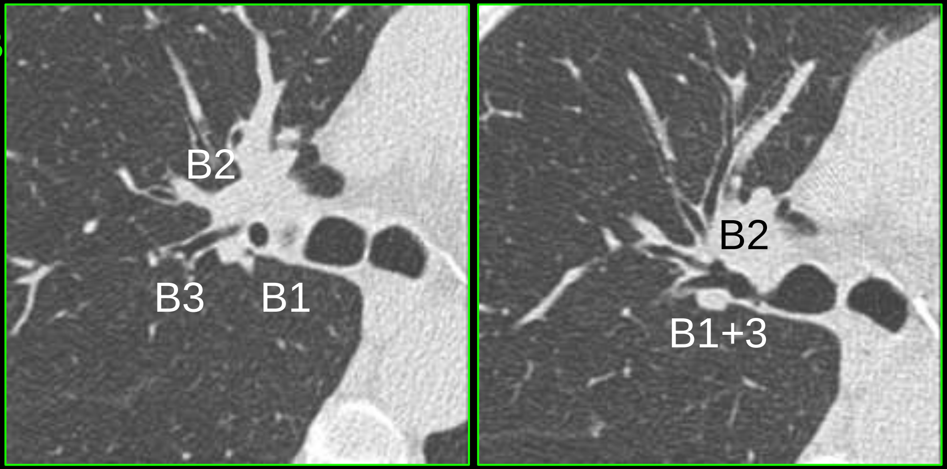
division de la BLSD

trifurcation 30%



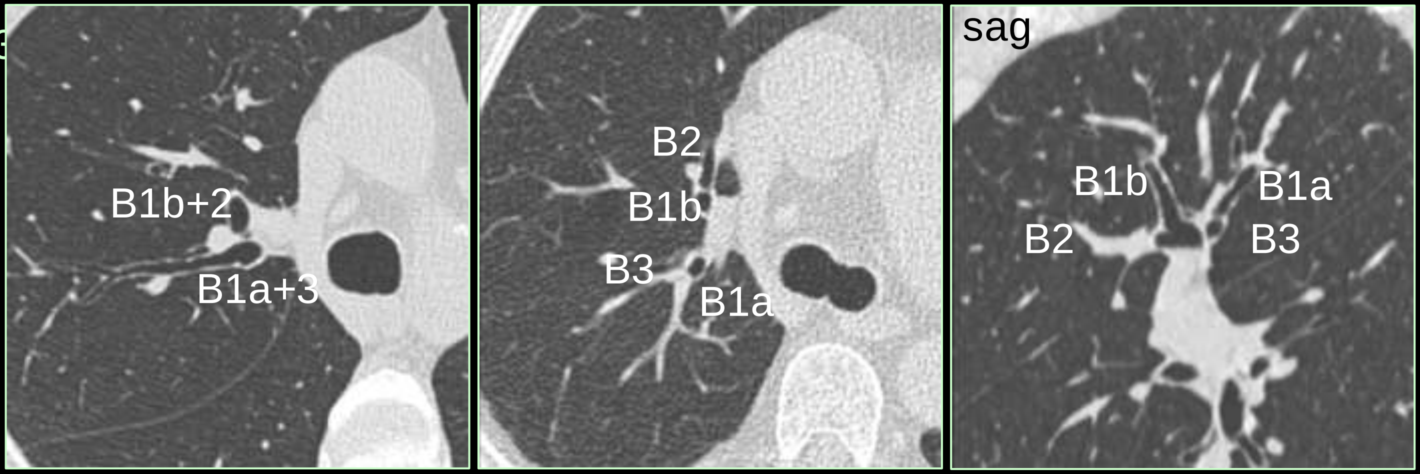
bifurcation B1+3, B

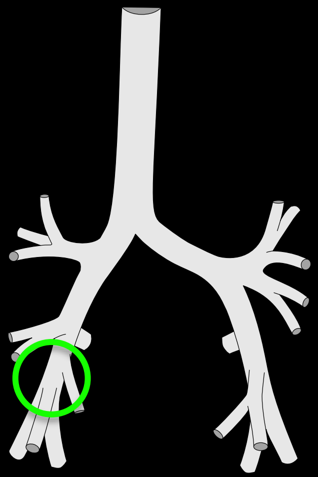
16%


B2
B3
B1
B2
B1+3

B1b+2, B1a+3

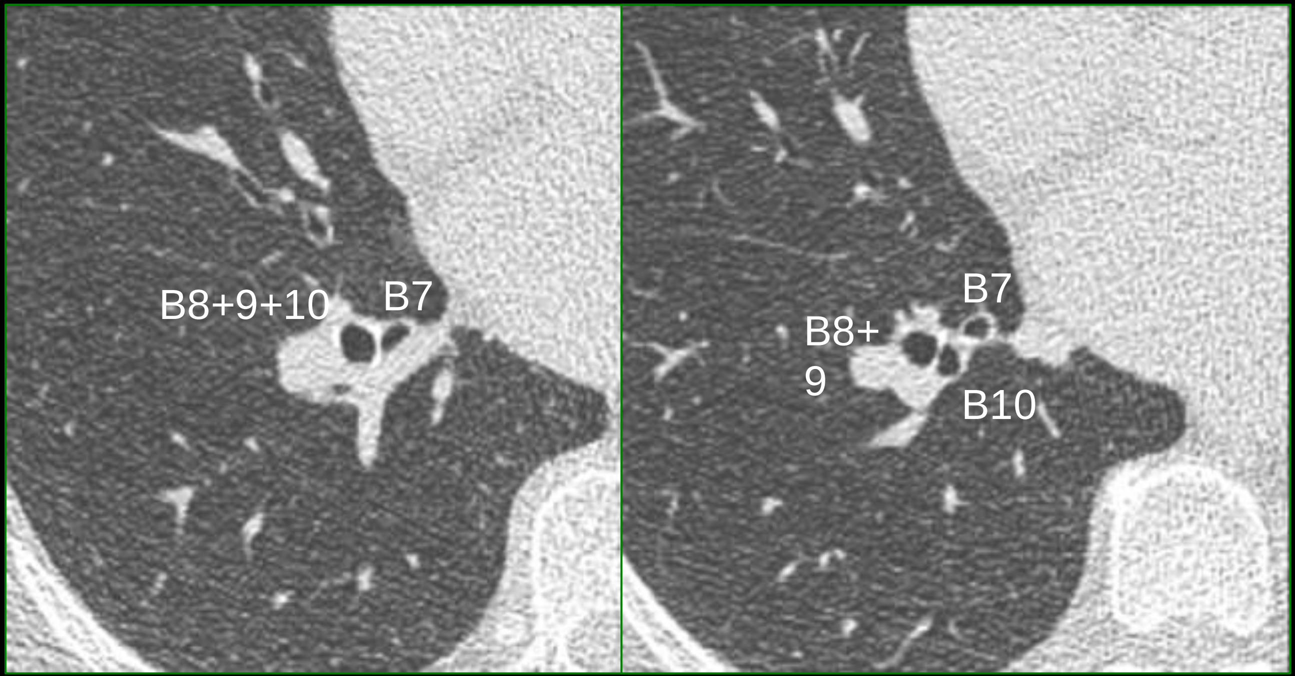
22%


B1b+2
B1a+3
B2
B1b
B3
B1a
sag
B1b
B1a
B2
B3

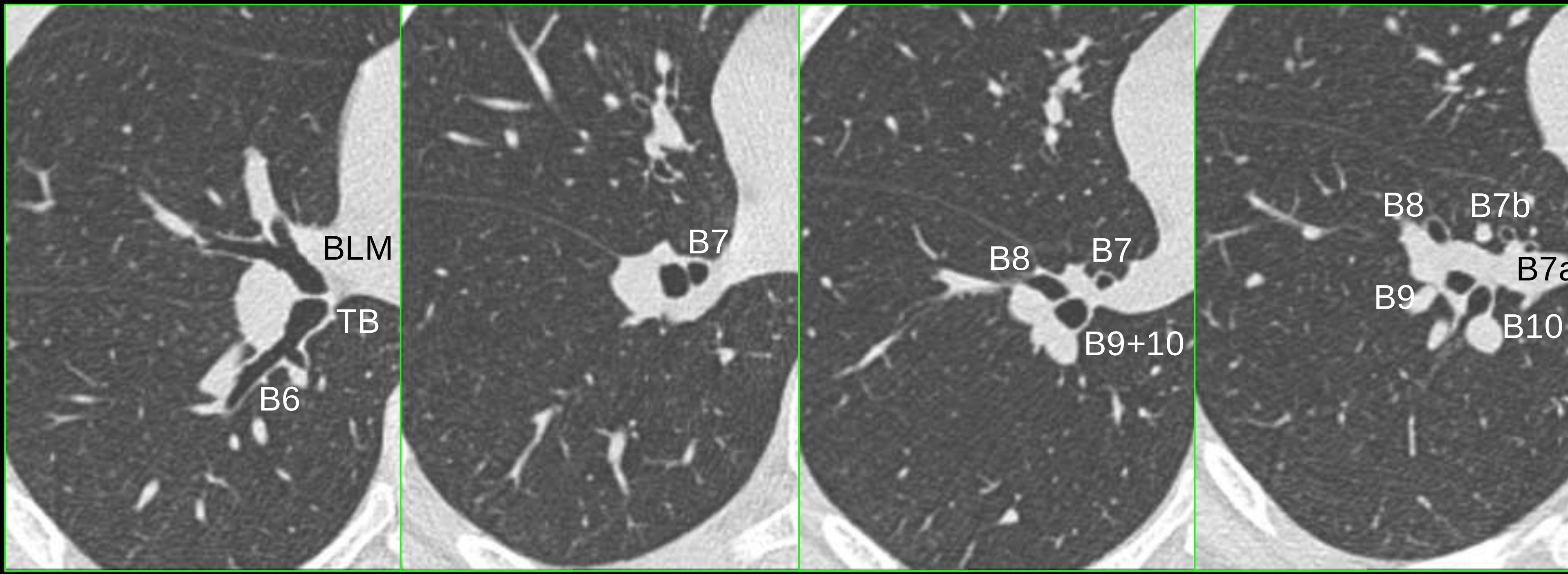


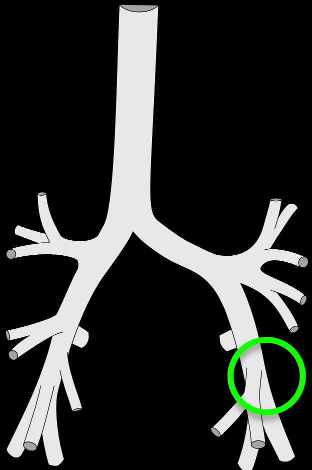
division du TB

B8+9
13%


B8+9+10
B7
B7
B8+
9
B10

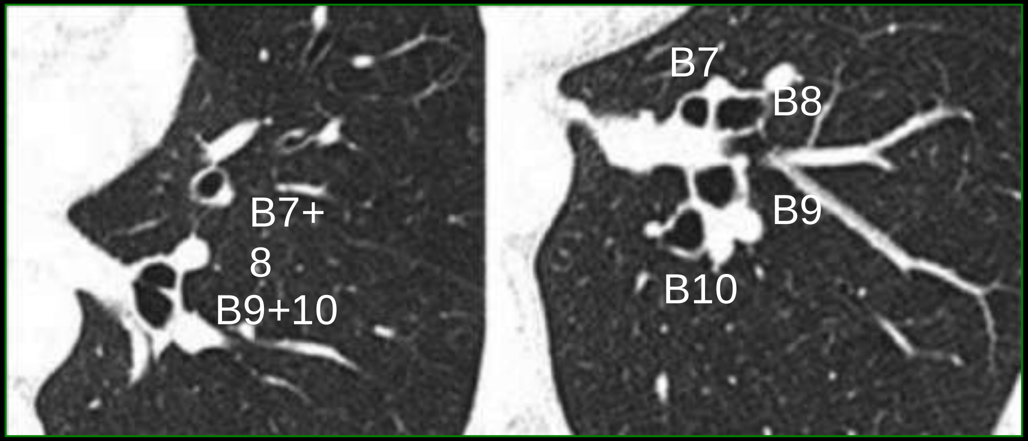
naissances successives, 68%


BLM
TB
B6
B7
B8
B7
B9+10
B8
B7b
B7a
B9
B10

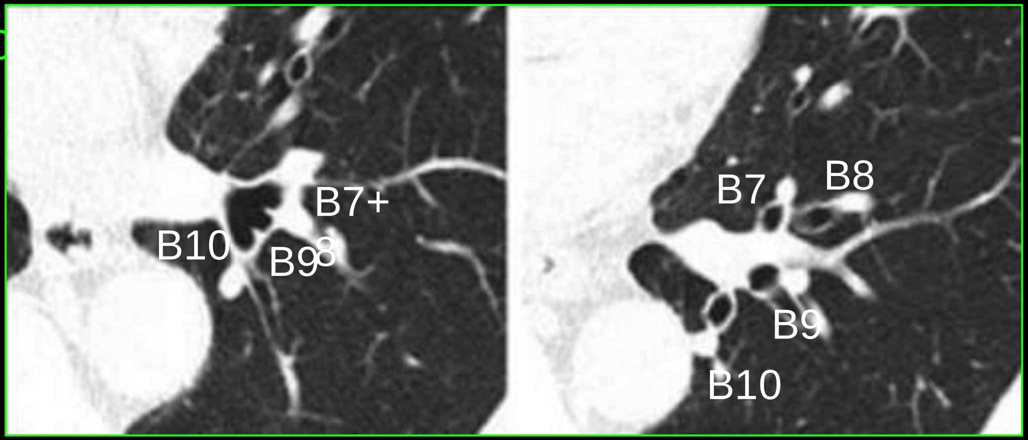


division du TB

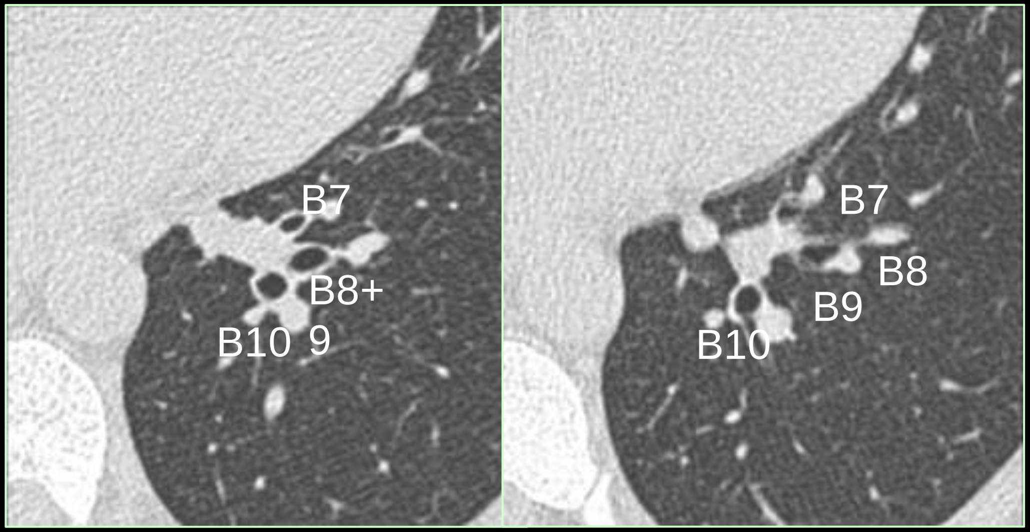
B7+8, B9+10
75%

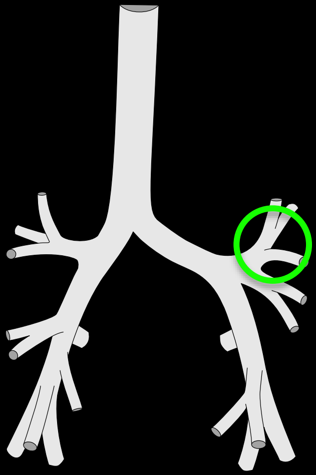

B7+
8
B9+10
B7
B8
B9
B10

B7+8, B9, B10
15%


B7+
8
B10
B9
B7
B8
B9
B10

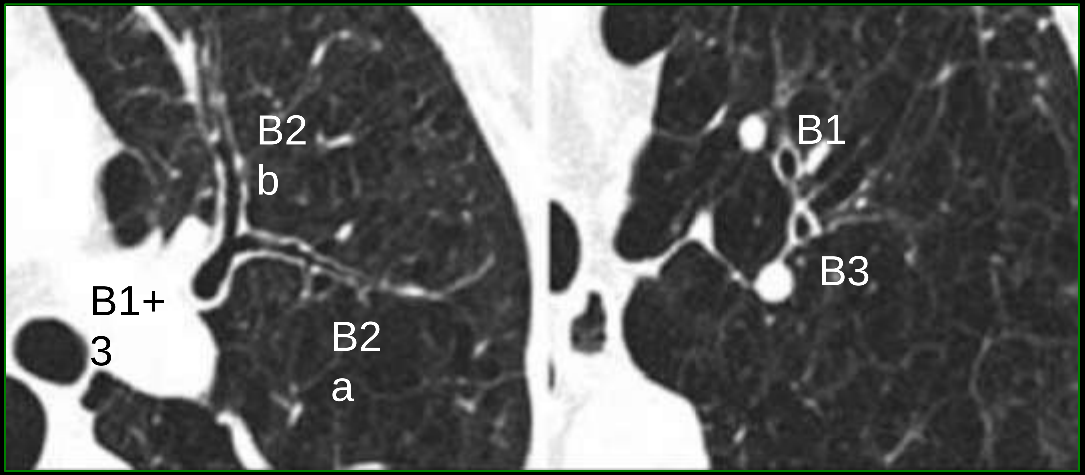
B7, B8+9,
B10


B7
B8+
9
B10
B7
B8
B9
B10

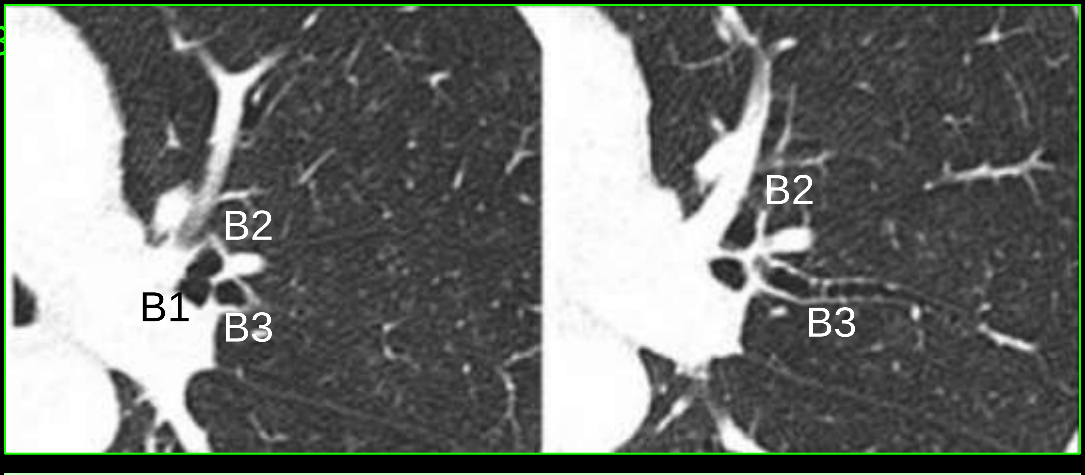


division de la BC

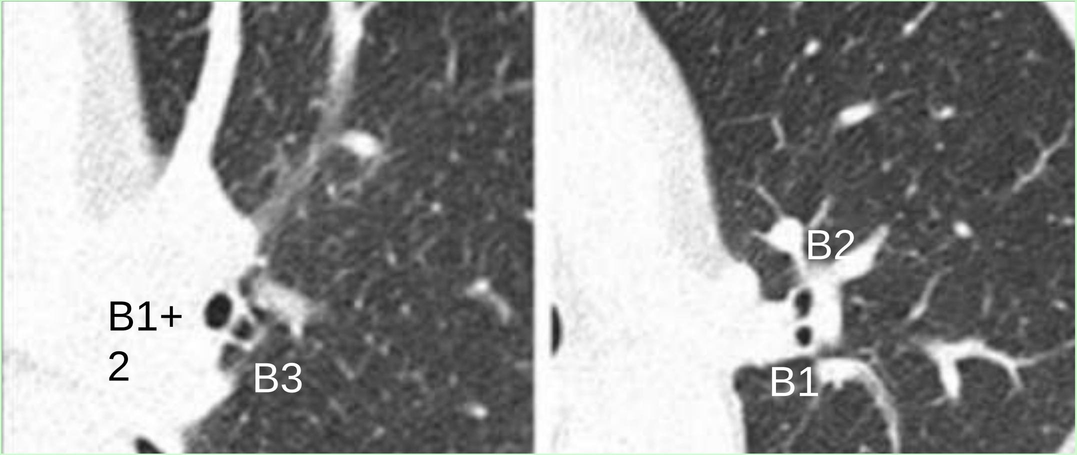
B1+3, B2
64%


B2
b
B1+
3
B2
a
B1
B3

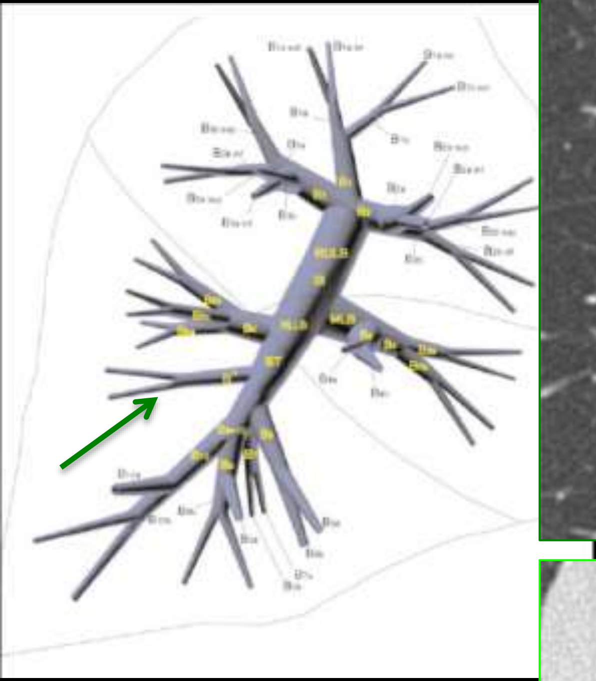
B1, B2, B3
23%

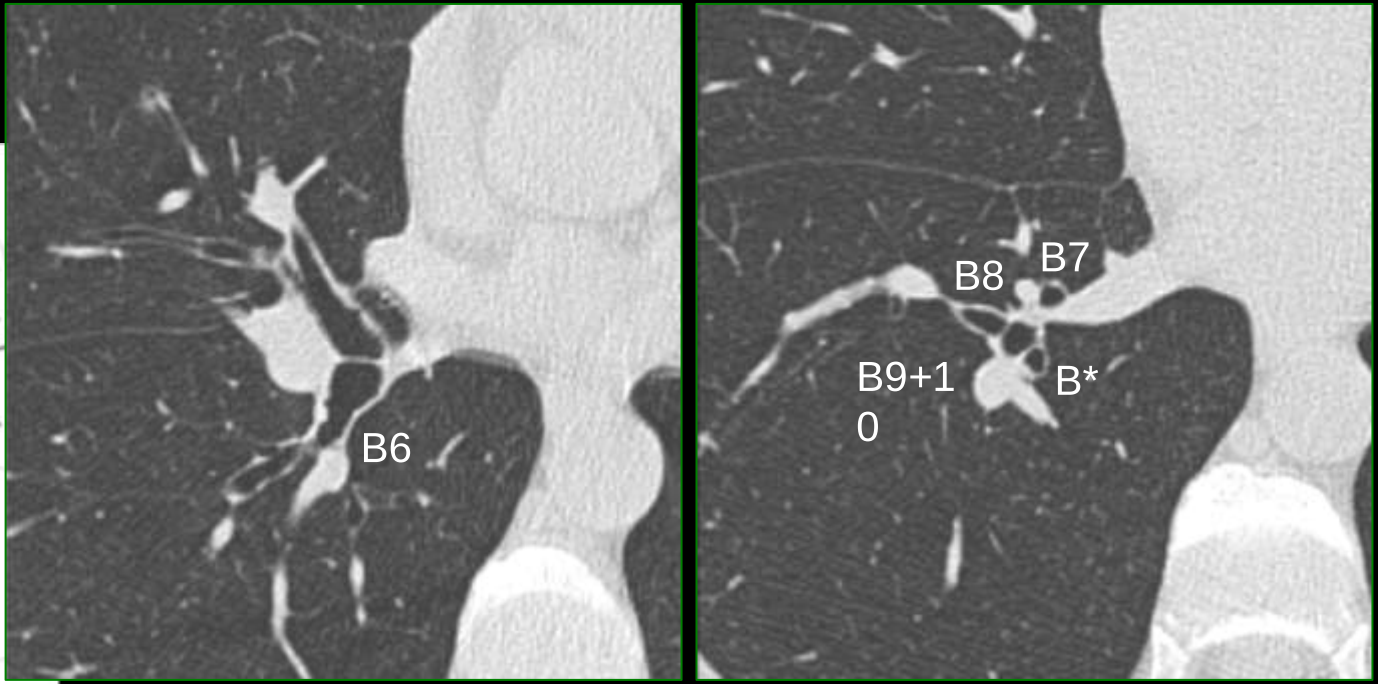

B2
B1
B3
B2
B3

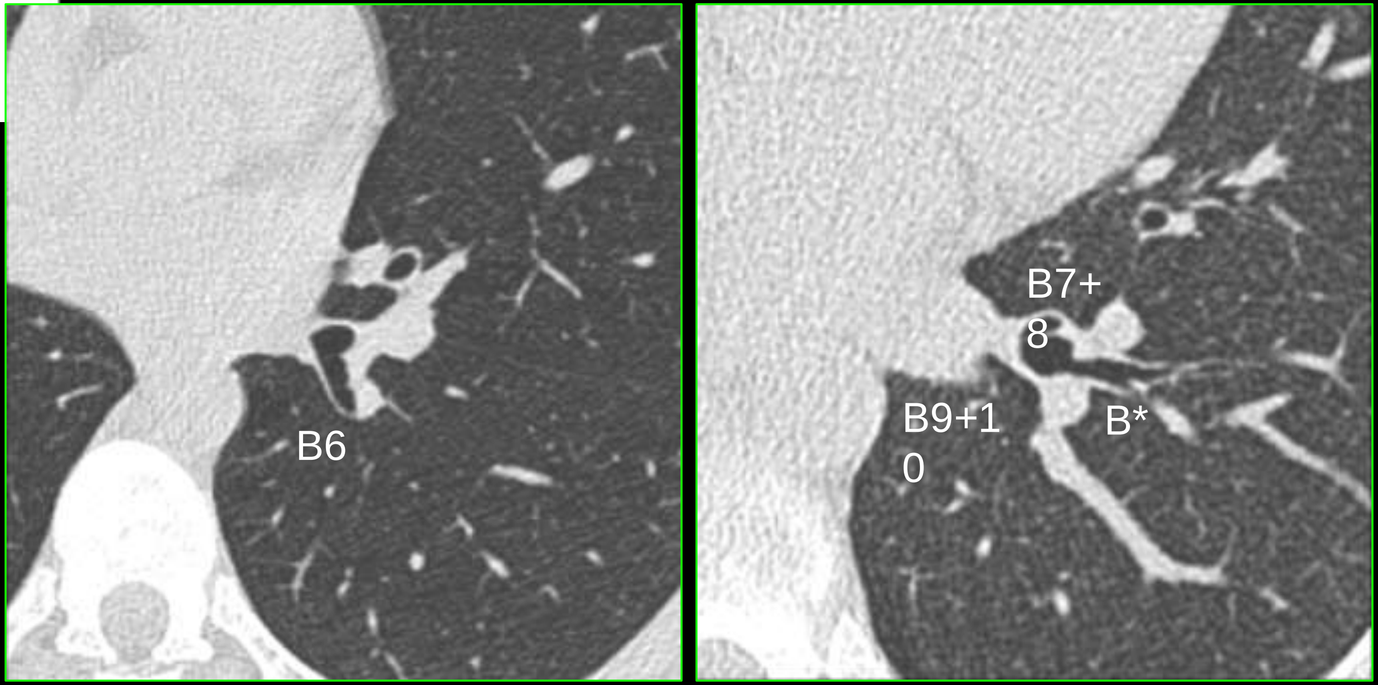
B1+2, B3
10%



B* D
56%



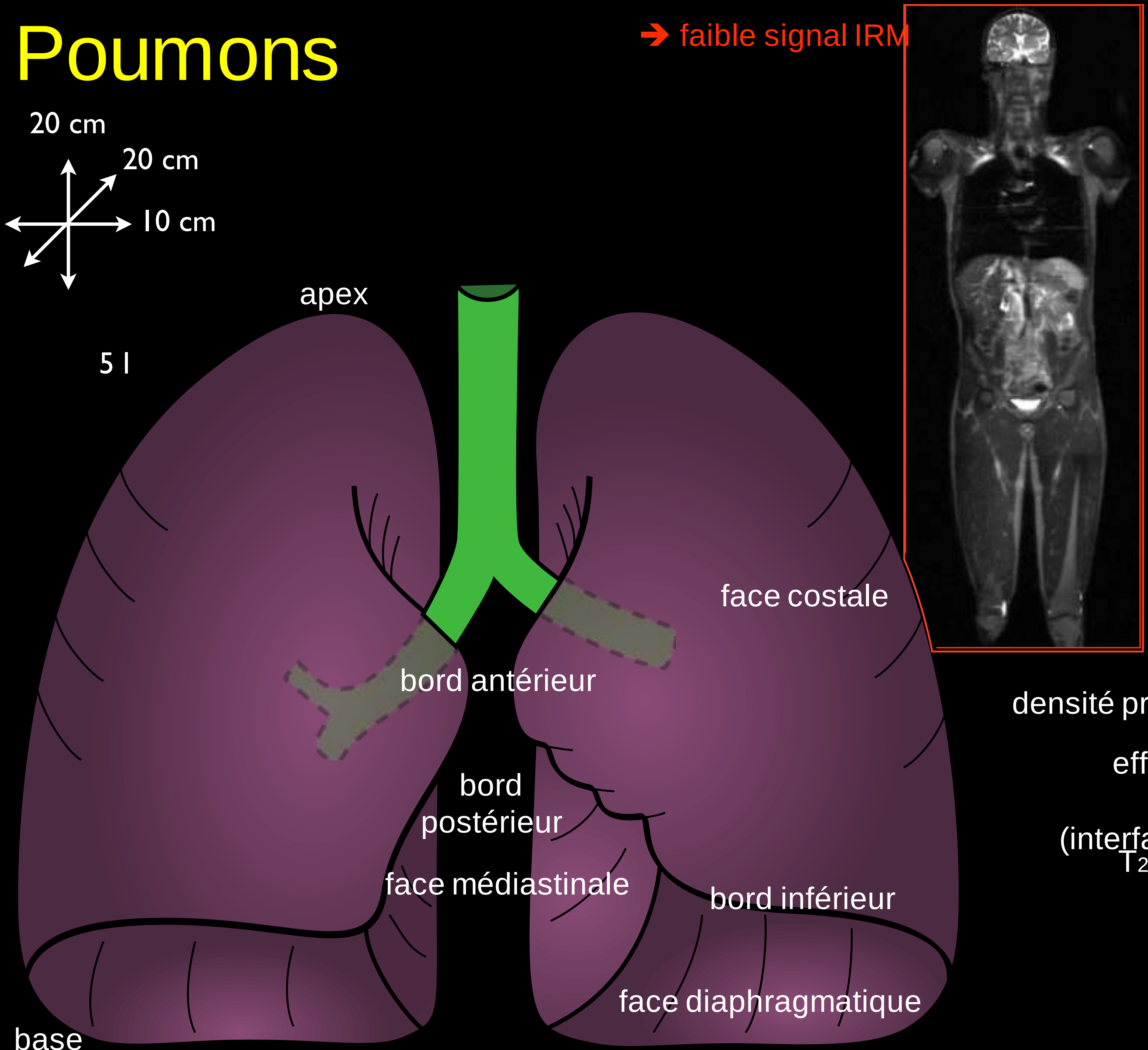

B6
B8
B7
B9+1
0
B*

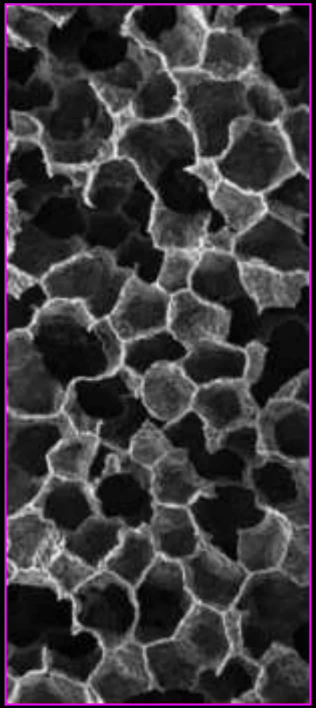

B6
B7+
8
B9+1
0
B*

B* G
25%

Poumons

➔ faible signal IRM


20 cm
20 cm
10 cm
apex
5 l
face costale
bord antérieur
bord
postérieur
face médiastinale
bord inférieur
face diaphragmatique
base



5% tissu pulmonaire

5% vaisseaux

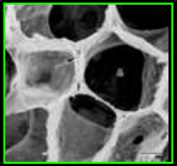
90% air

densité protonique = 0.2 g/ml

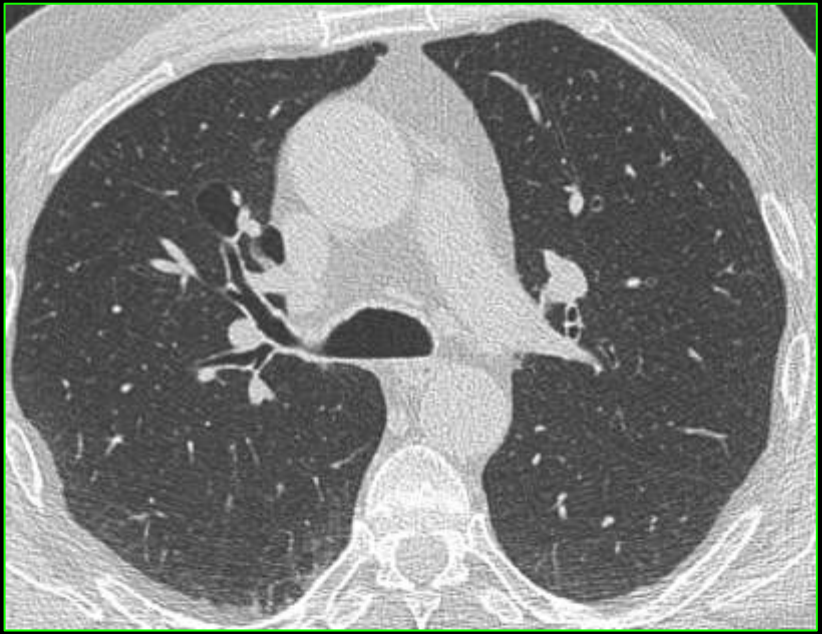
effet de susceptibilité magnétique

(interfaces air alvéolaire / tissus)

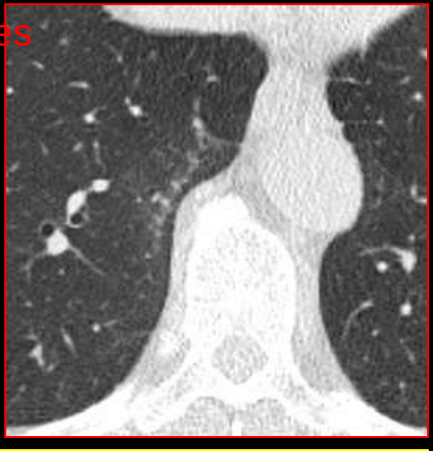
$T_2^* \sim$ 1-2 ms à 1.5 T

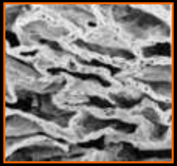


Inspiration

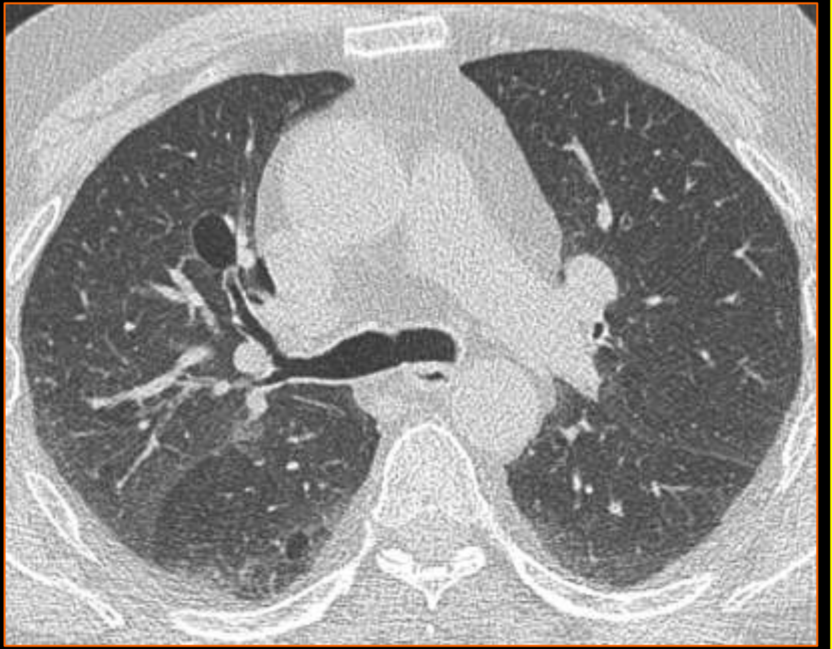


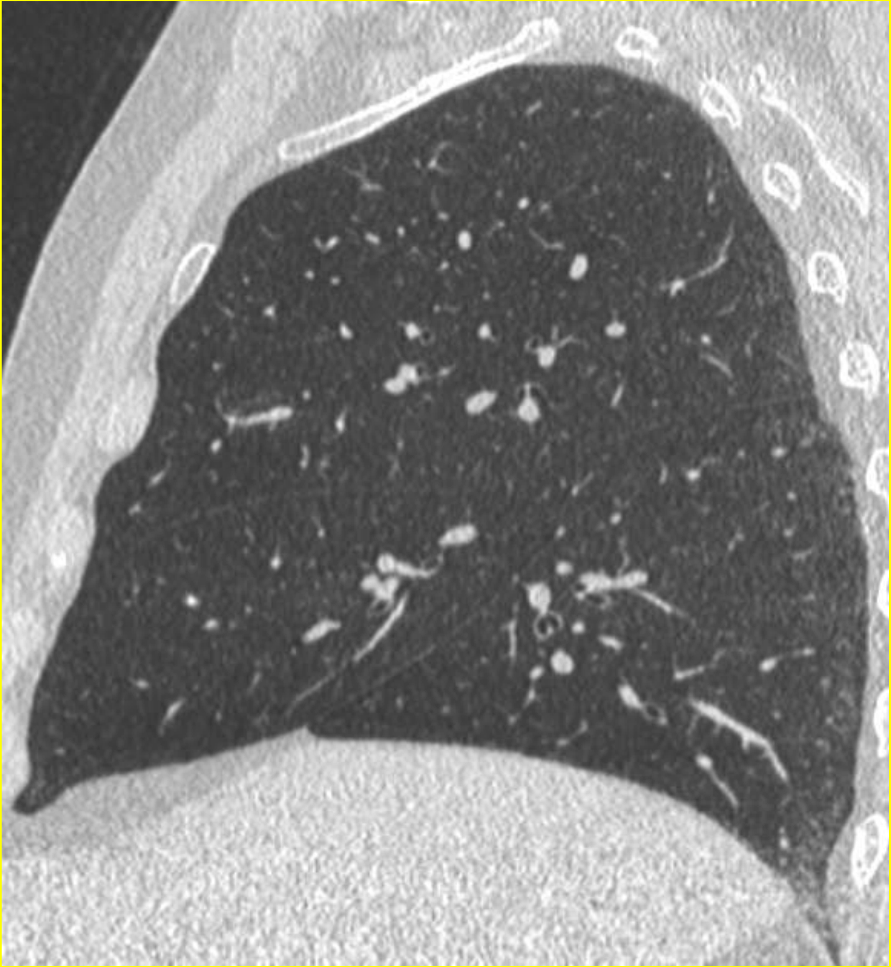
Micro-atélectasies
ostéophyte





Expiration

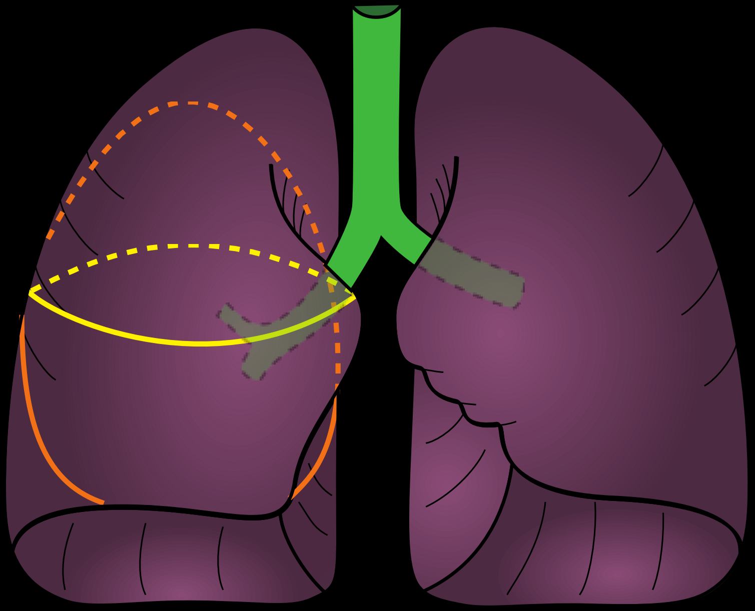


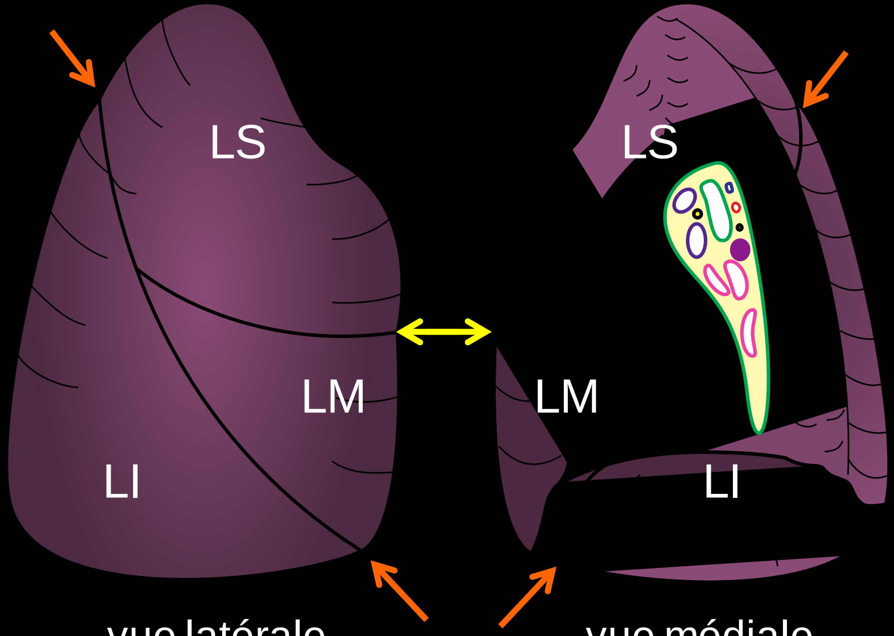


Gravité

- face costale interrompue par les scissures

. à droite: oblique (grande) et horizontale (petite)

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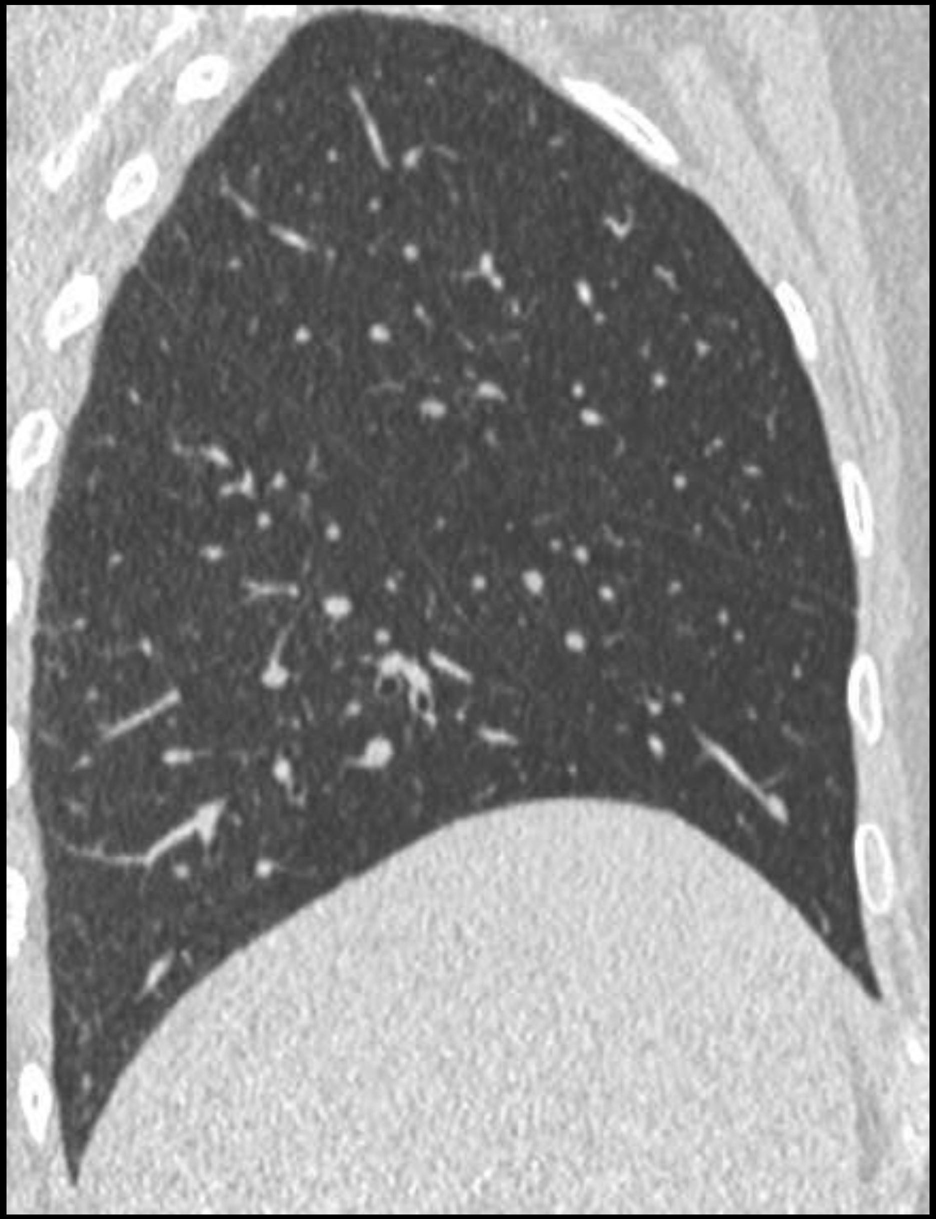
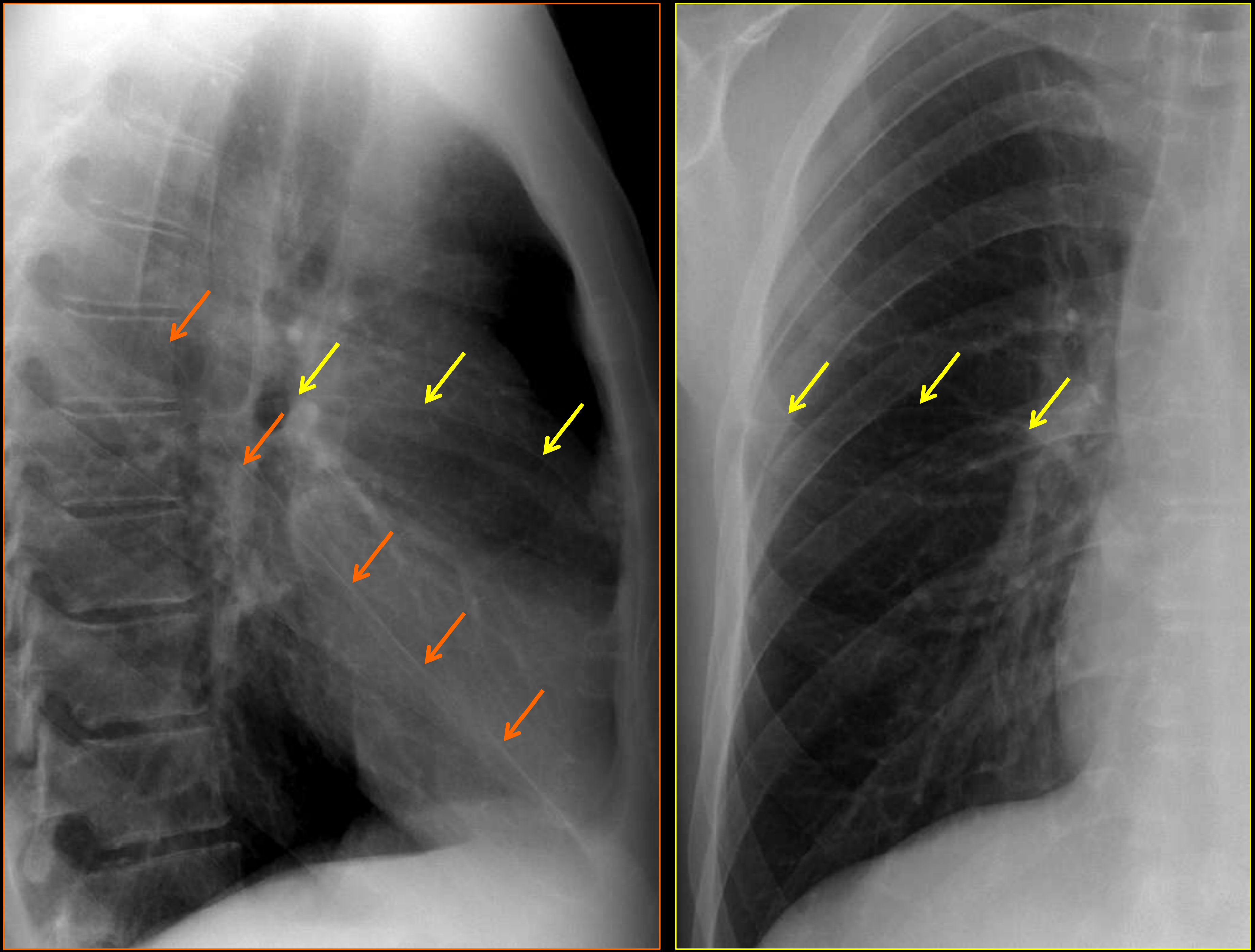
LI
LS
LM
LI

vue latérale

vue médiale

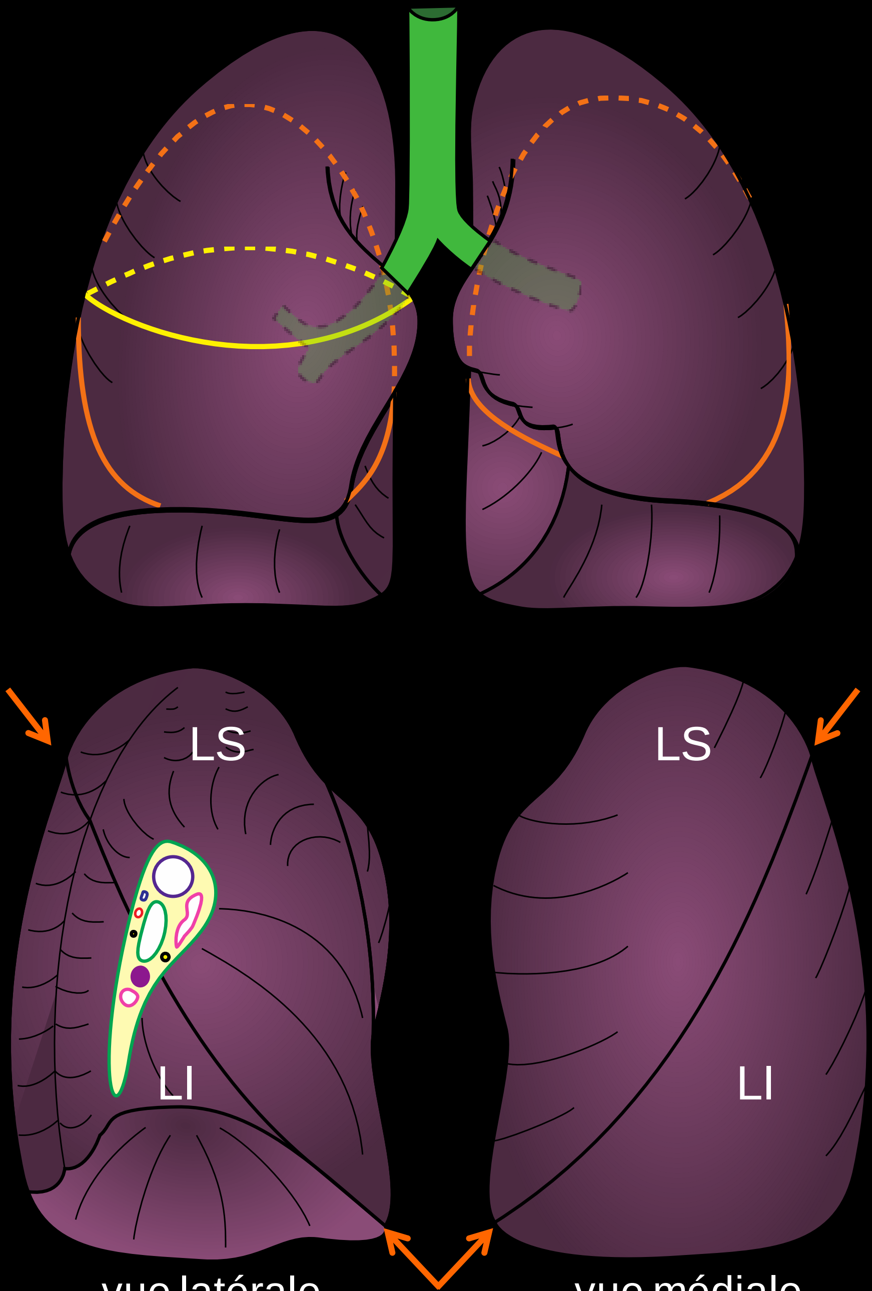




- face costale interrompue pas les scissures

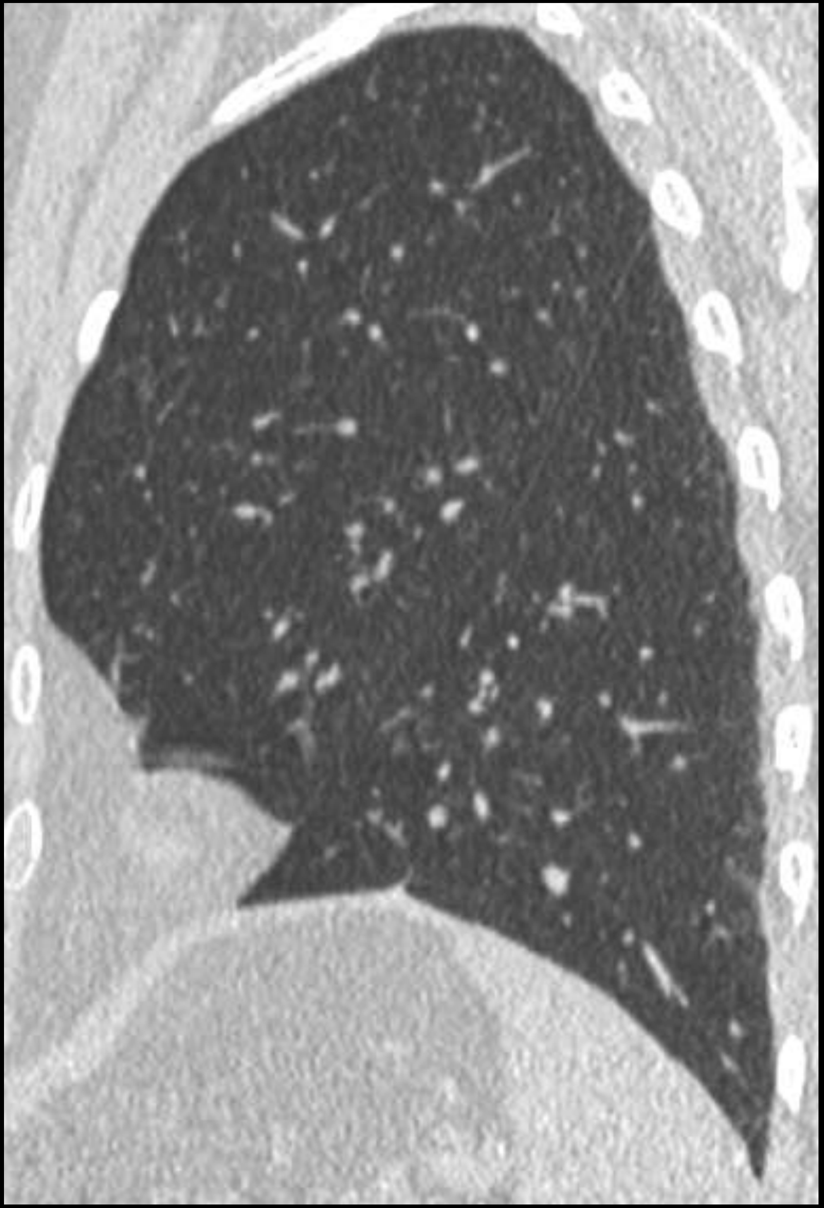
. à droite: oblique (grande) et horizontale (petite)

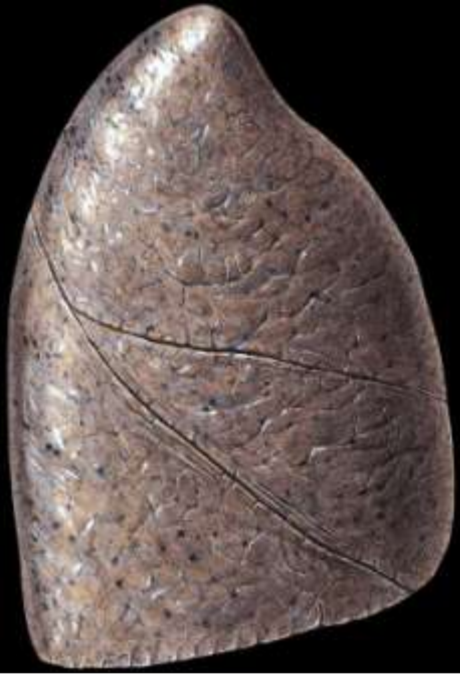
. à gauche: oblique (grande)



vue latérale

vue médiale

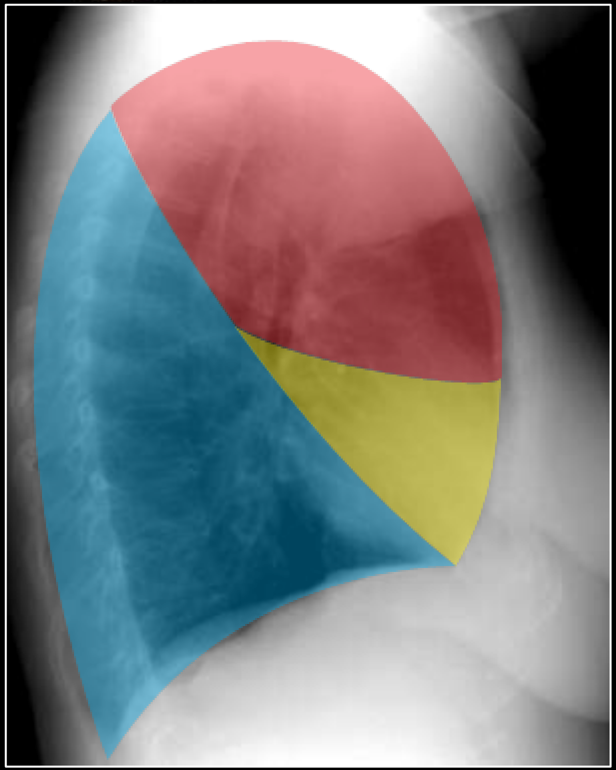


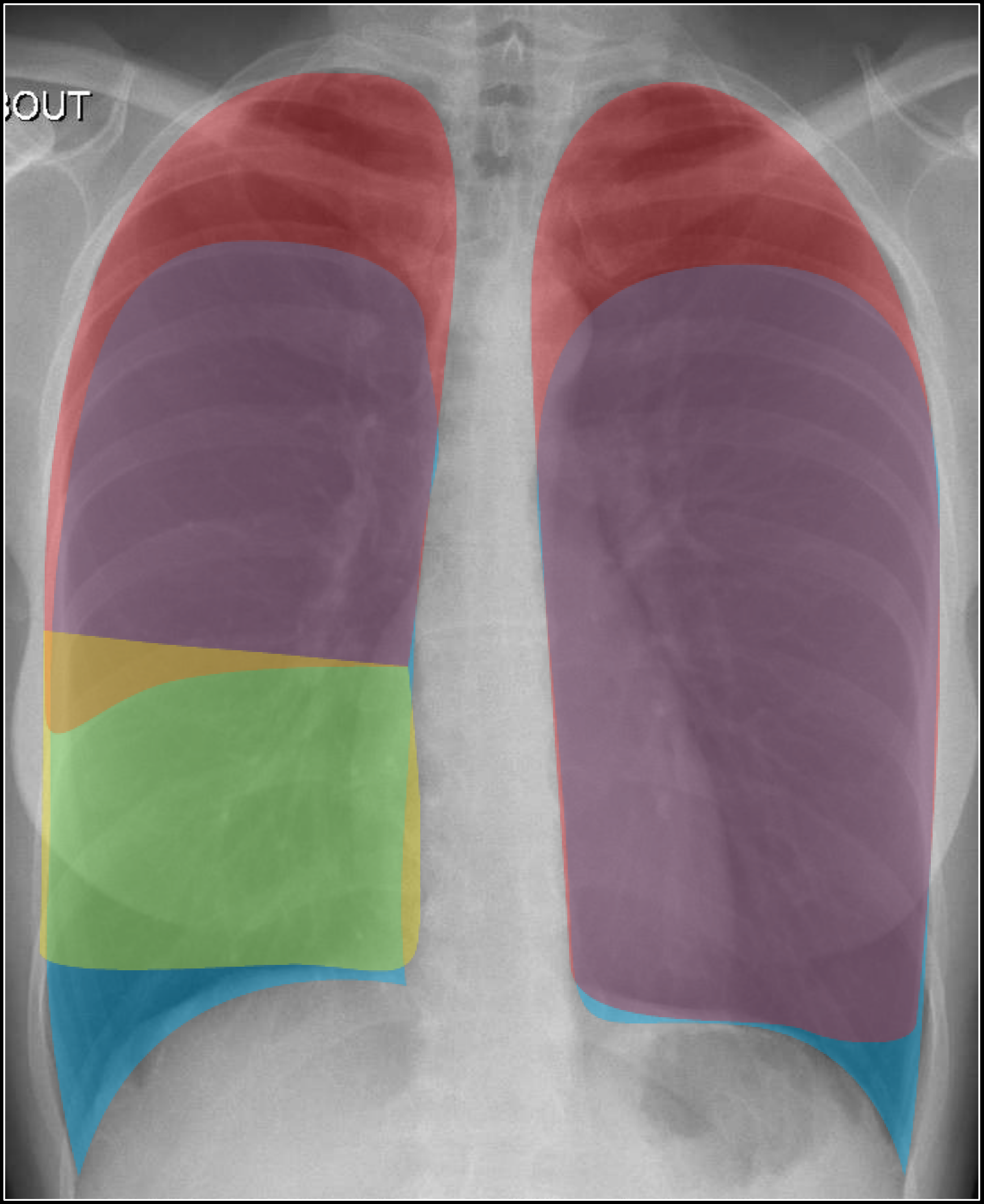


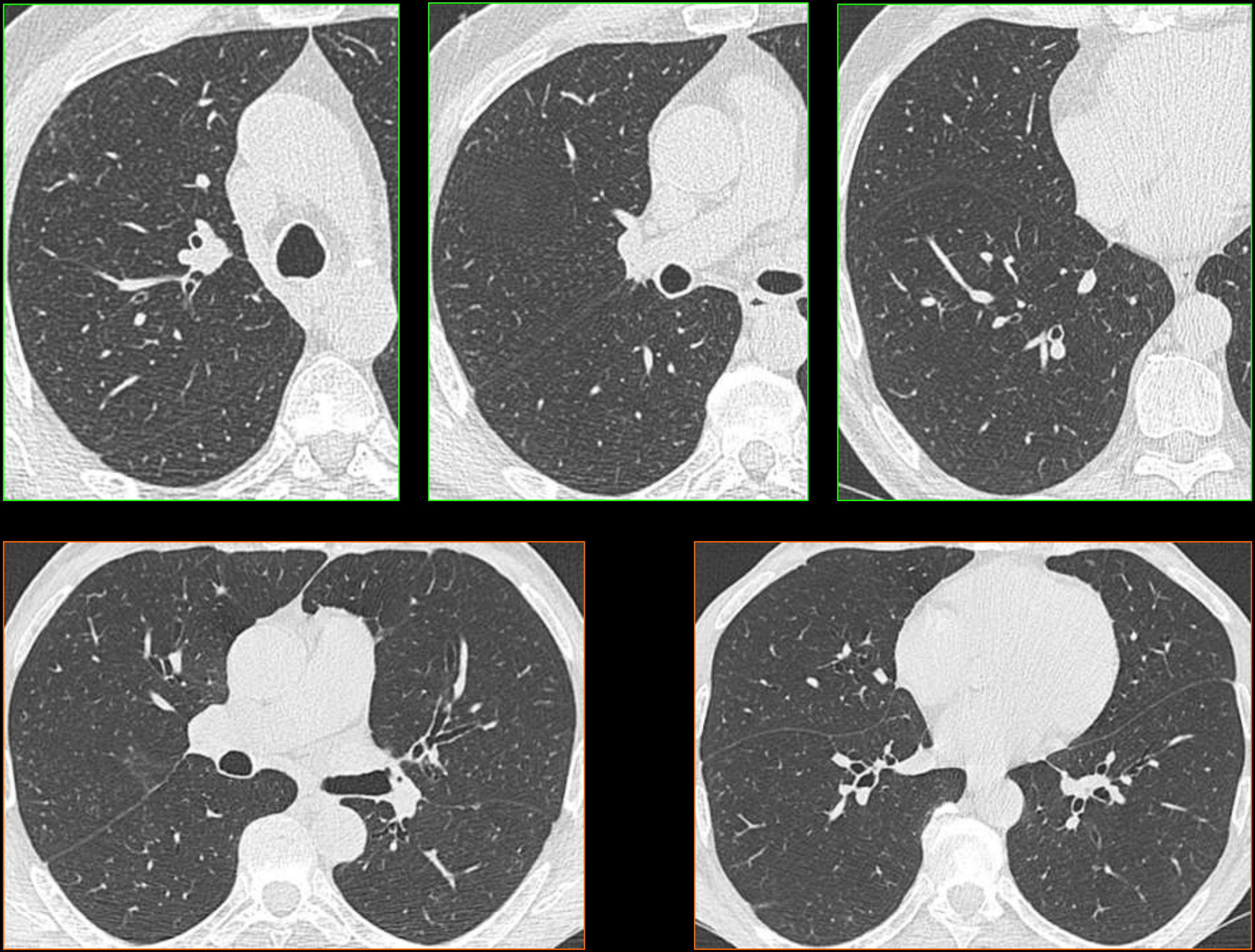
lobe supérieur

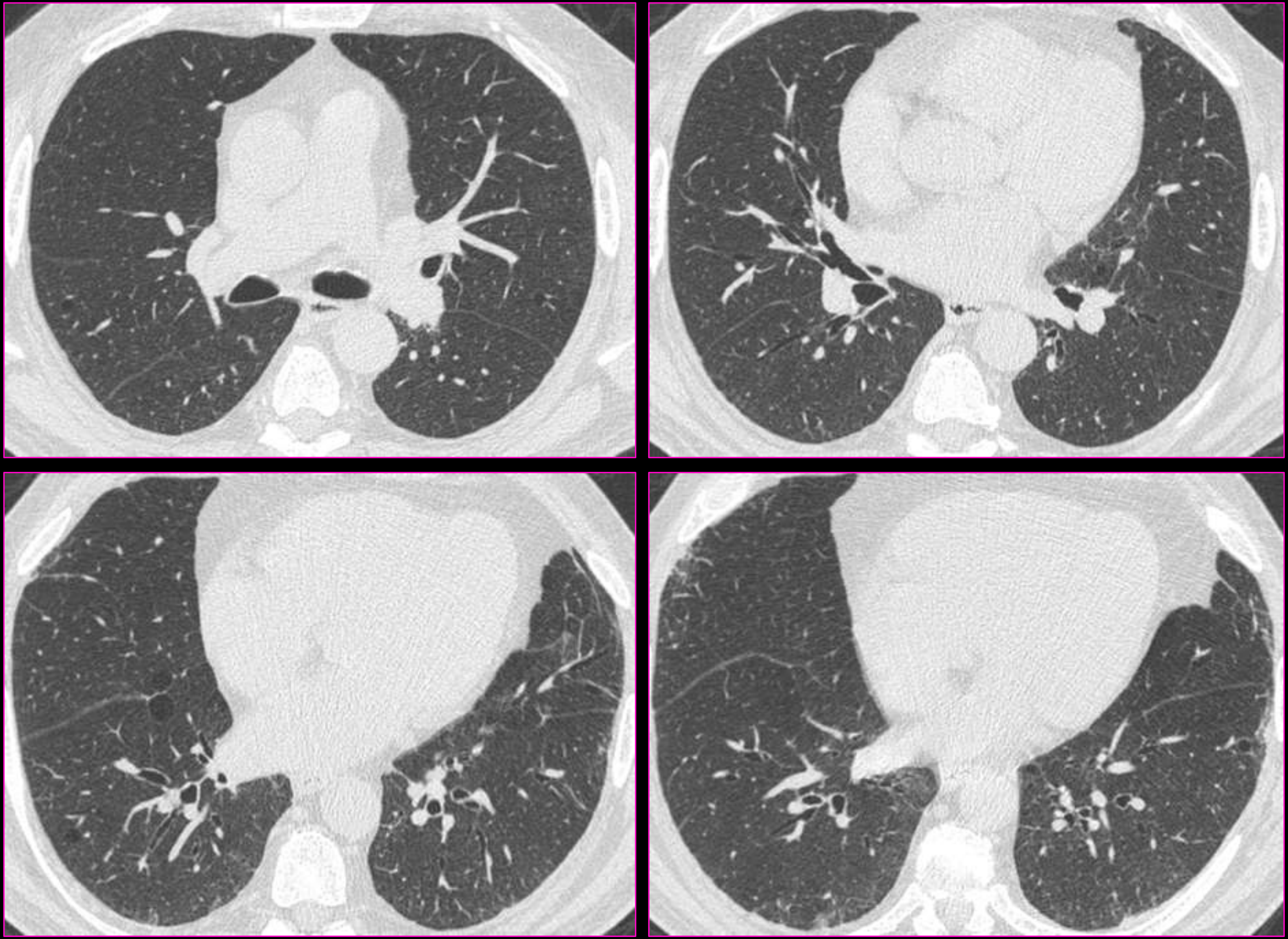
lobe moyen

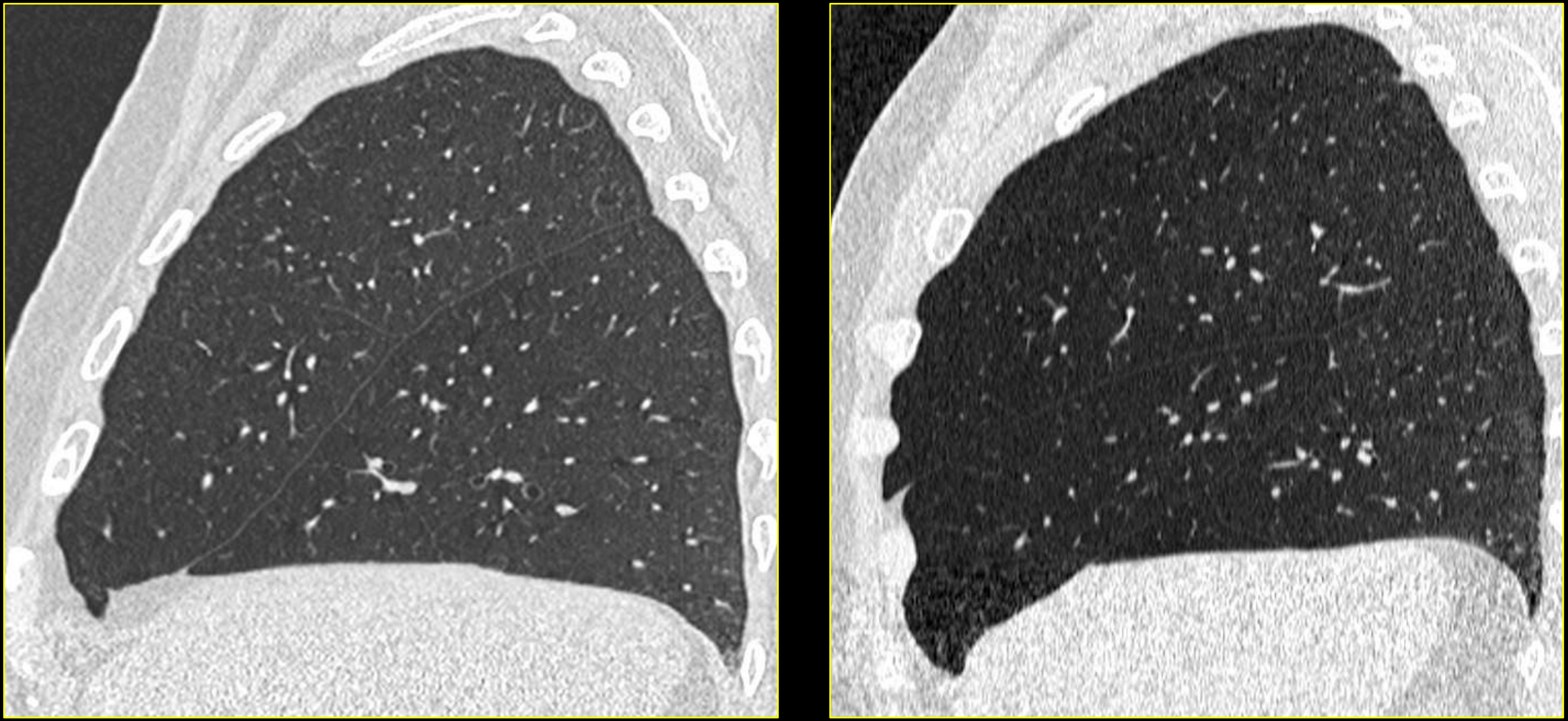
lobe inférieur

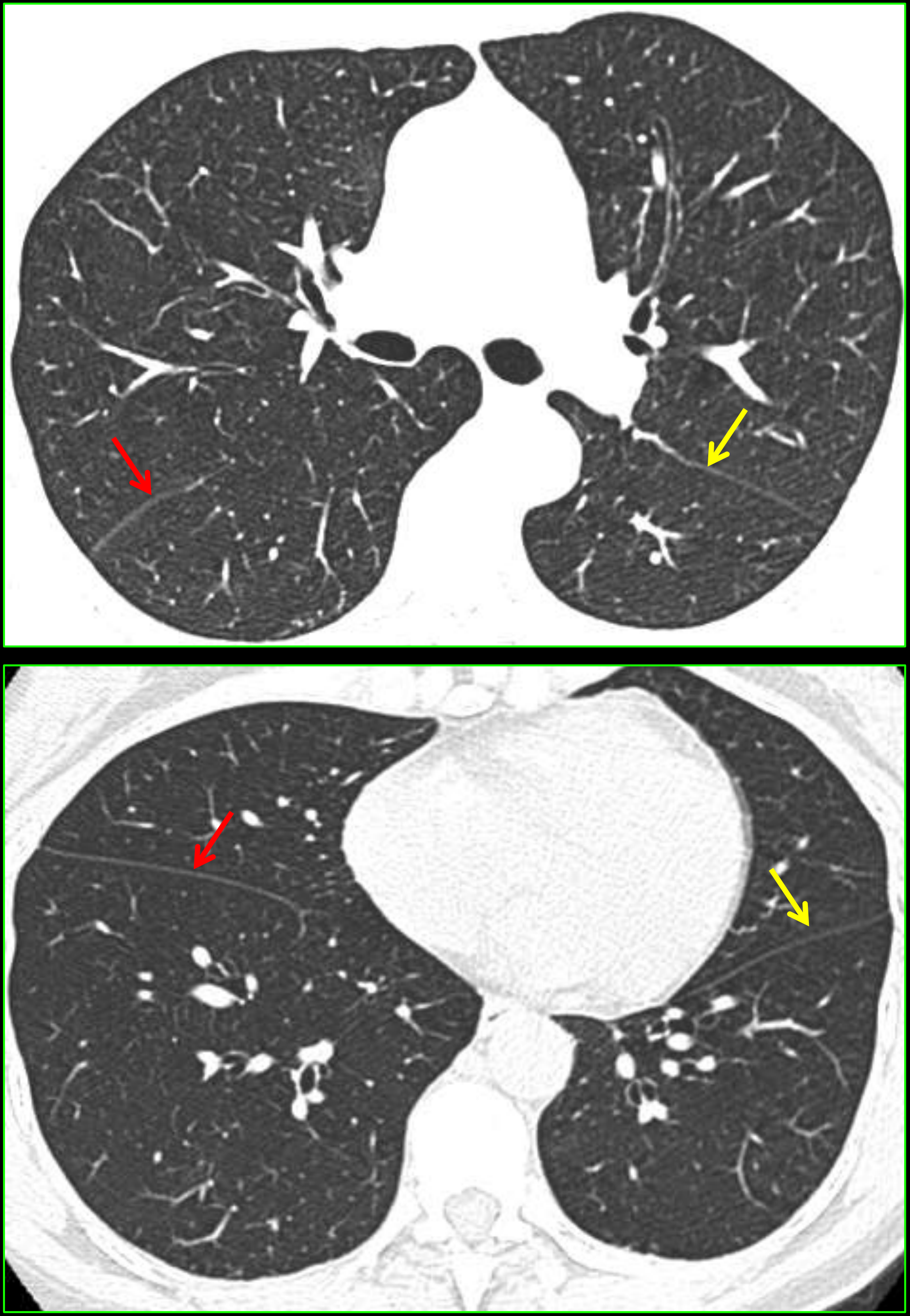


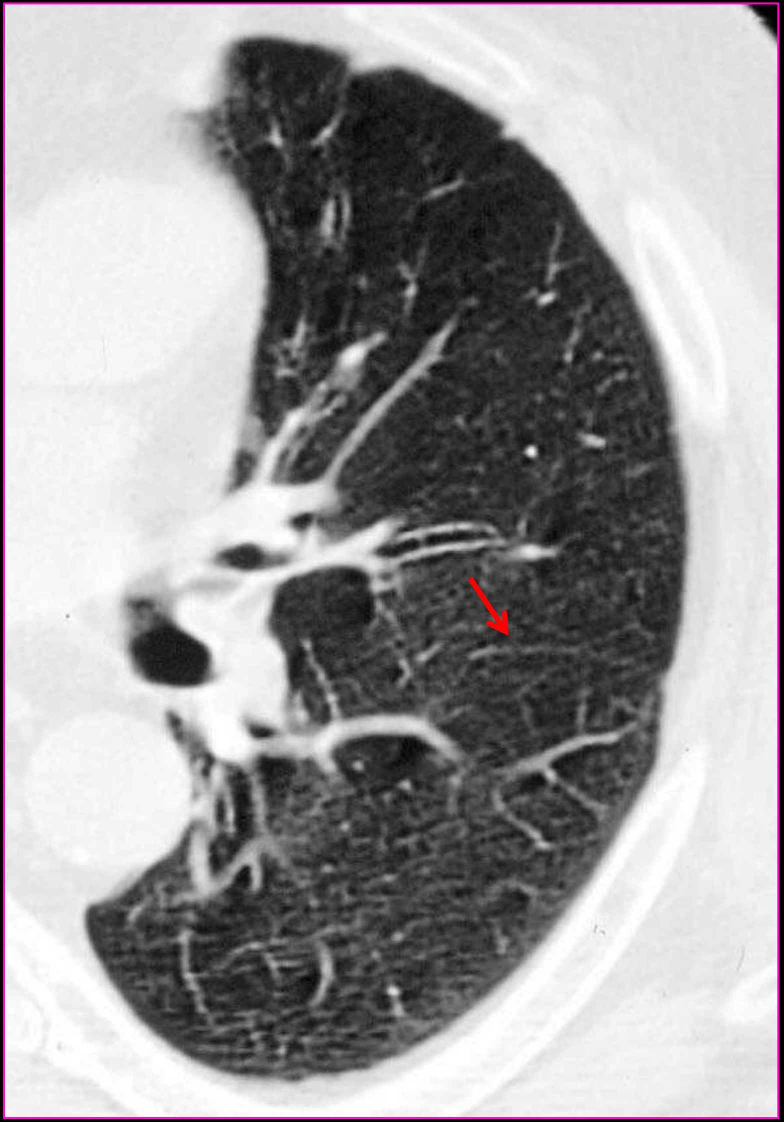








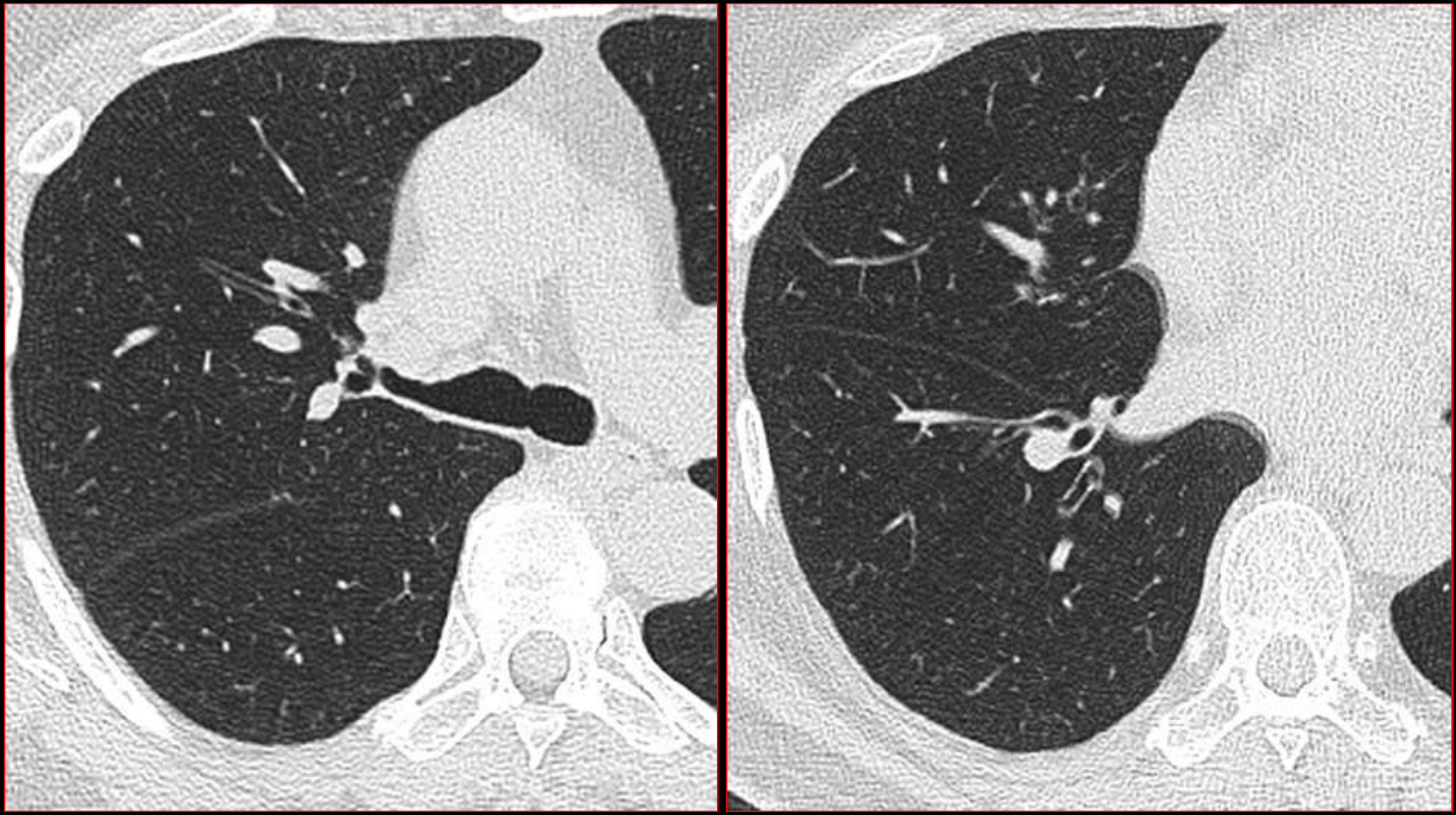


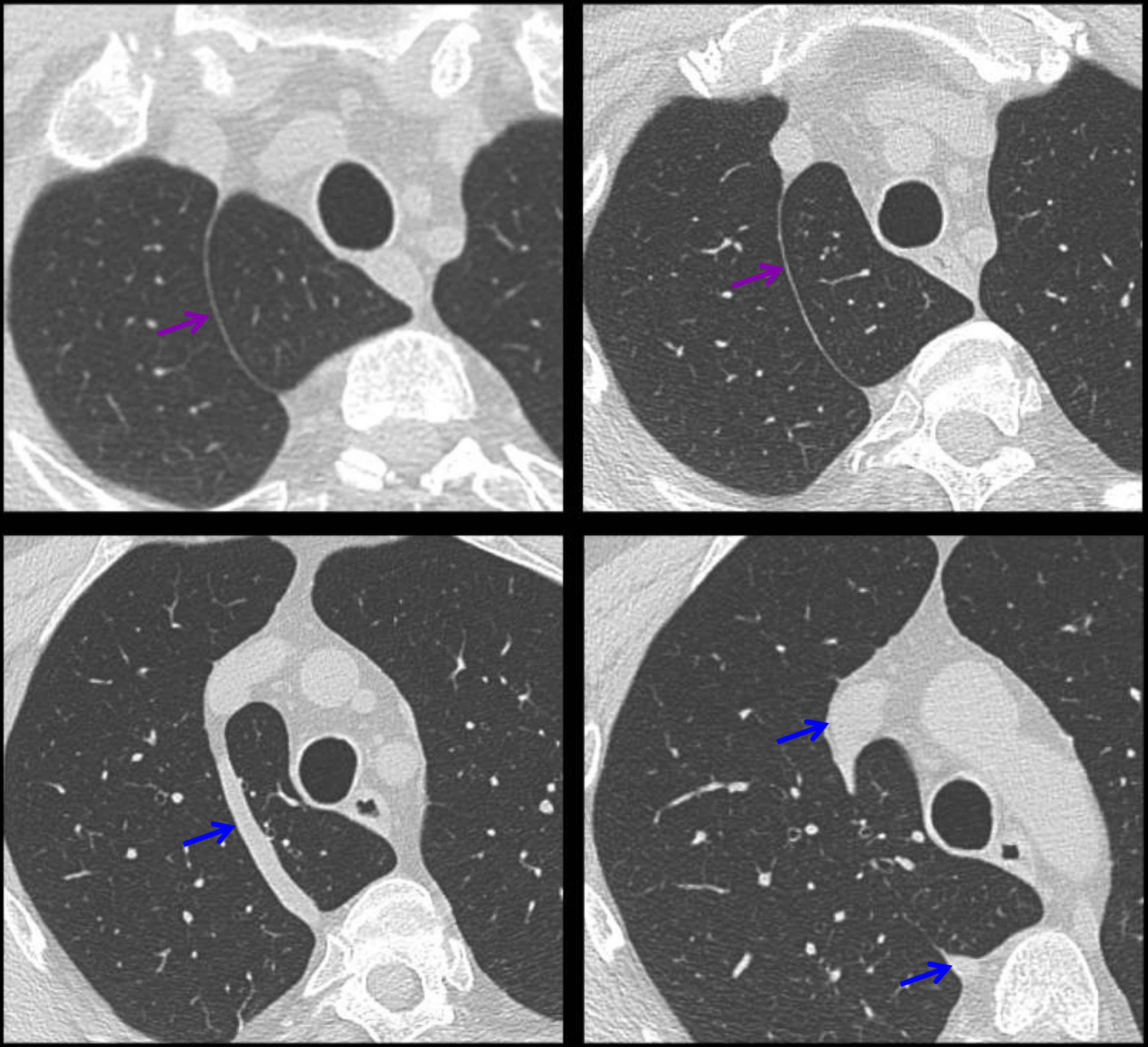


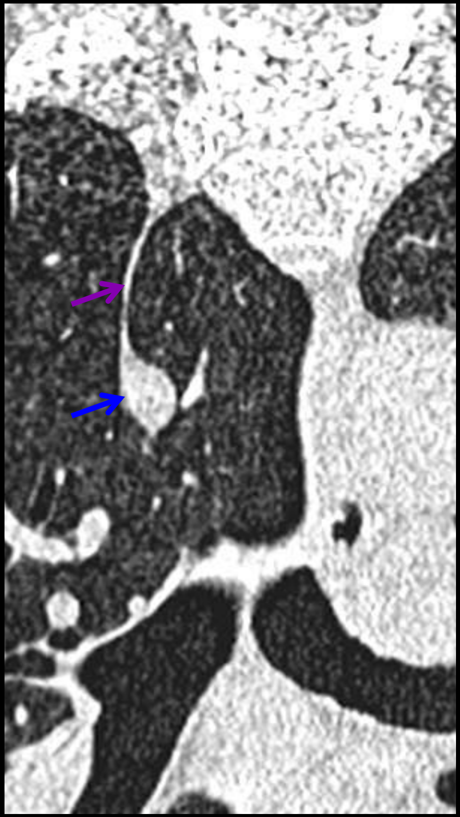
scissures complètes, incomplètes

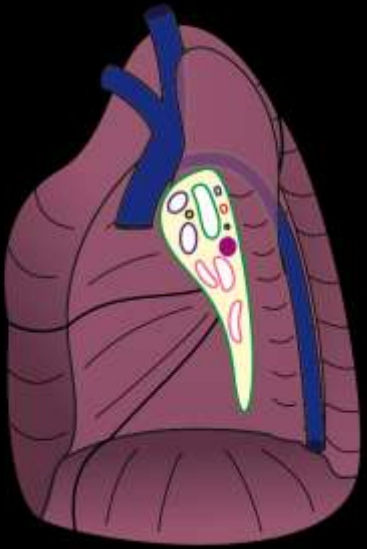
droite >>> gauche

importance lors des lobectomie



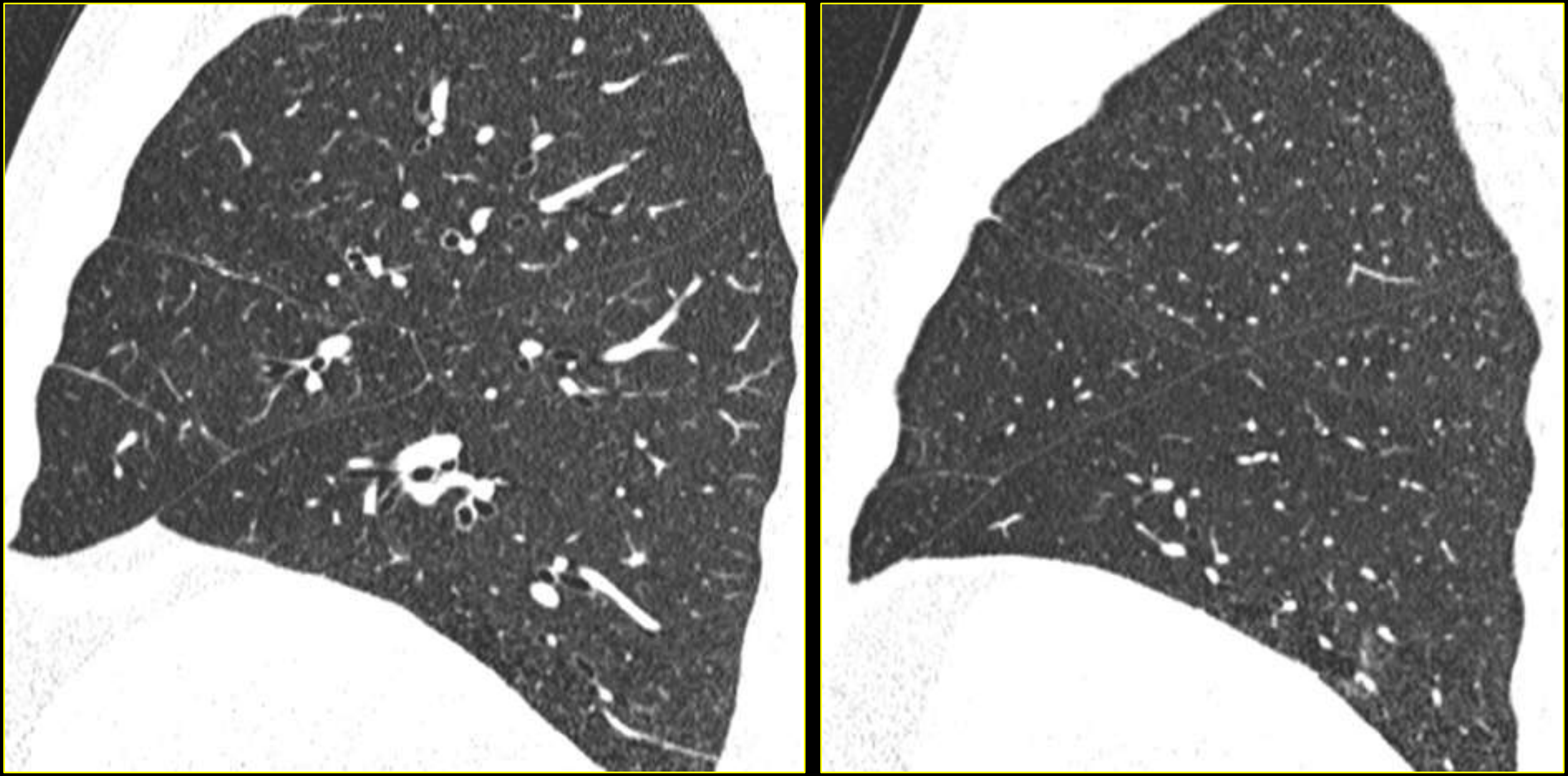




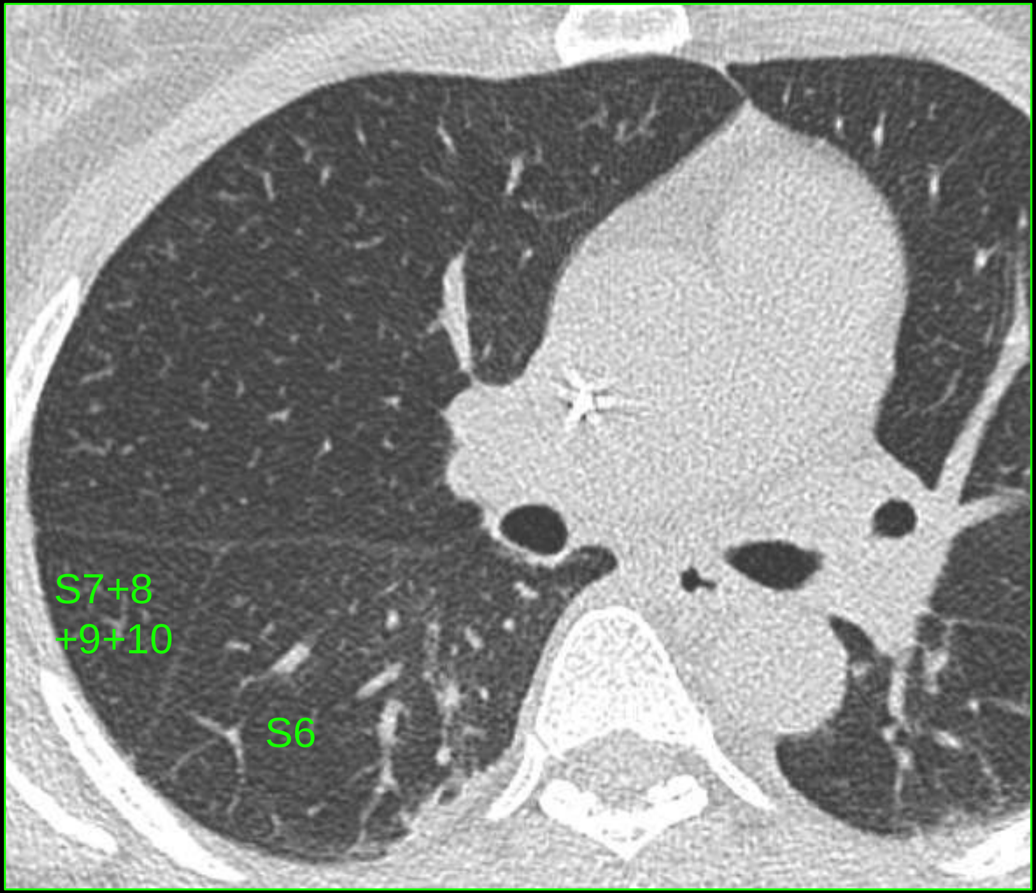


scissure azygos par erreur de migration du poumon autour de la crosse azygos

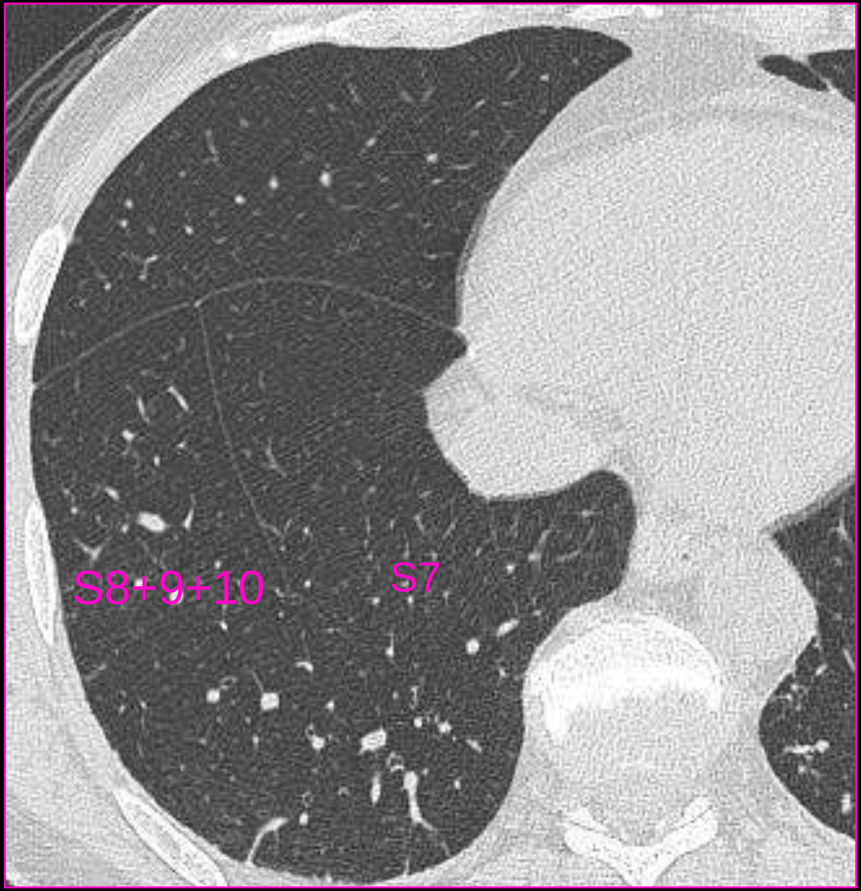
plèvre pulmonaire et plèvre pariétale



scissure accessoire du lobe moyen

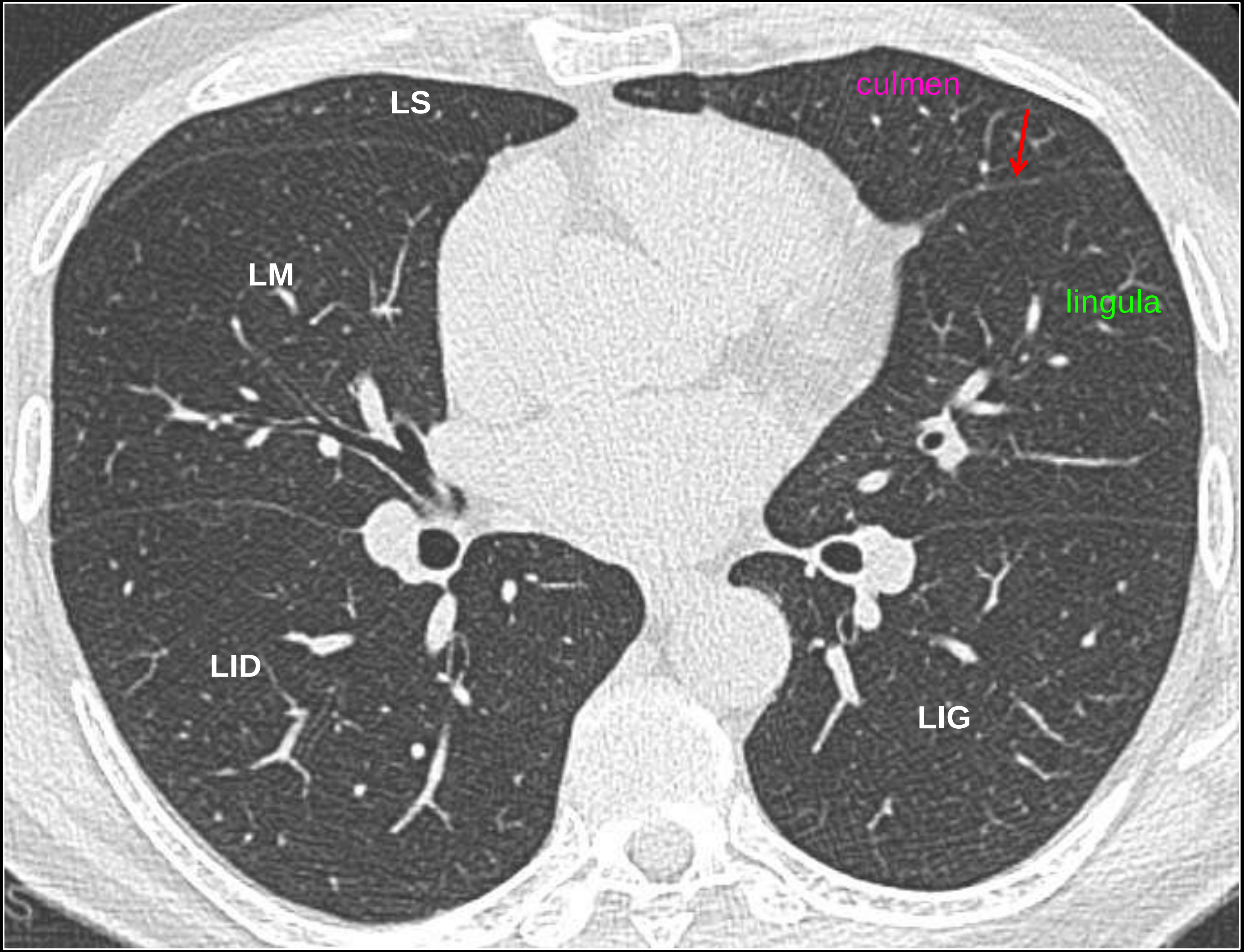


scissure de Devé: S6 / S7+8+9+10



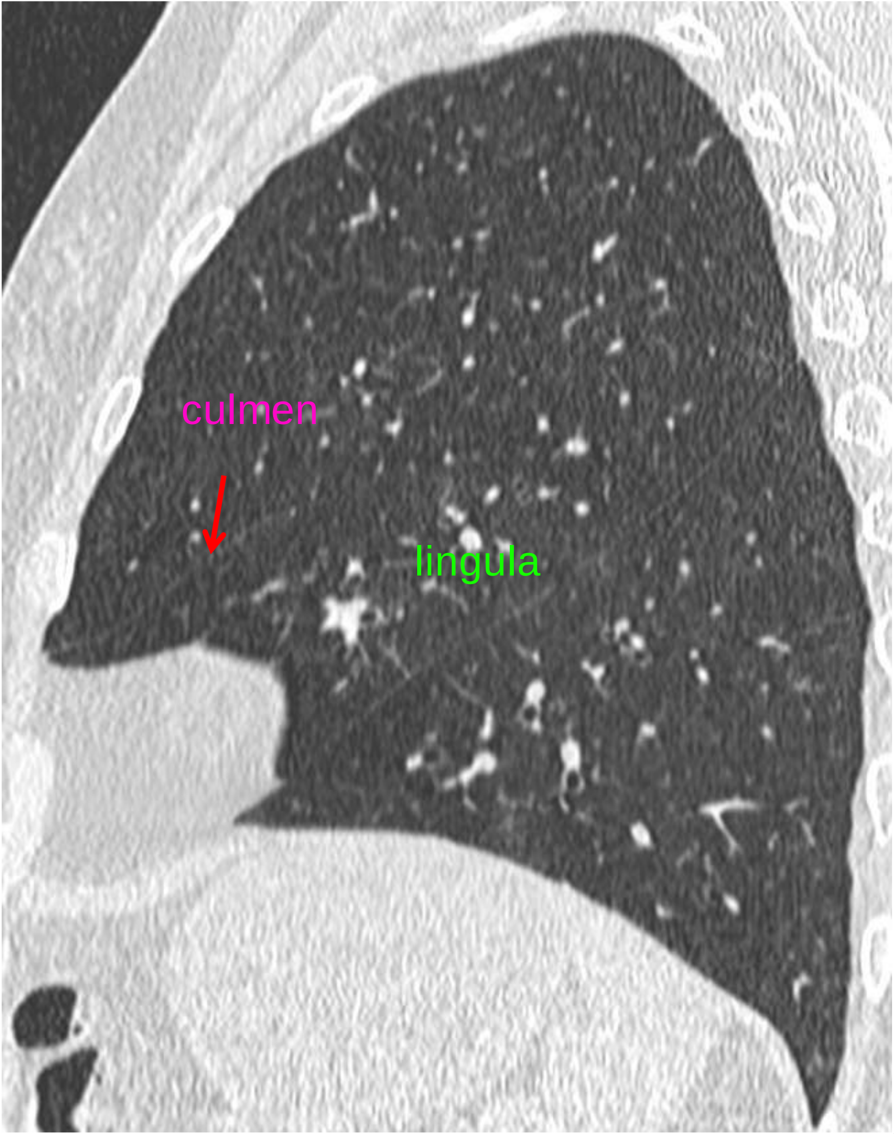
scissure paracardiaque: S7 / S8+9+10

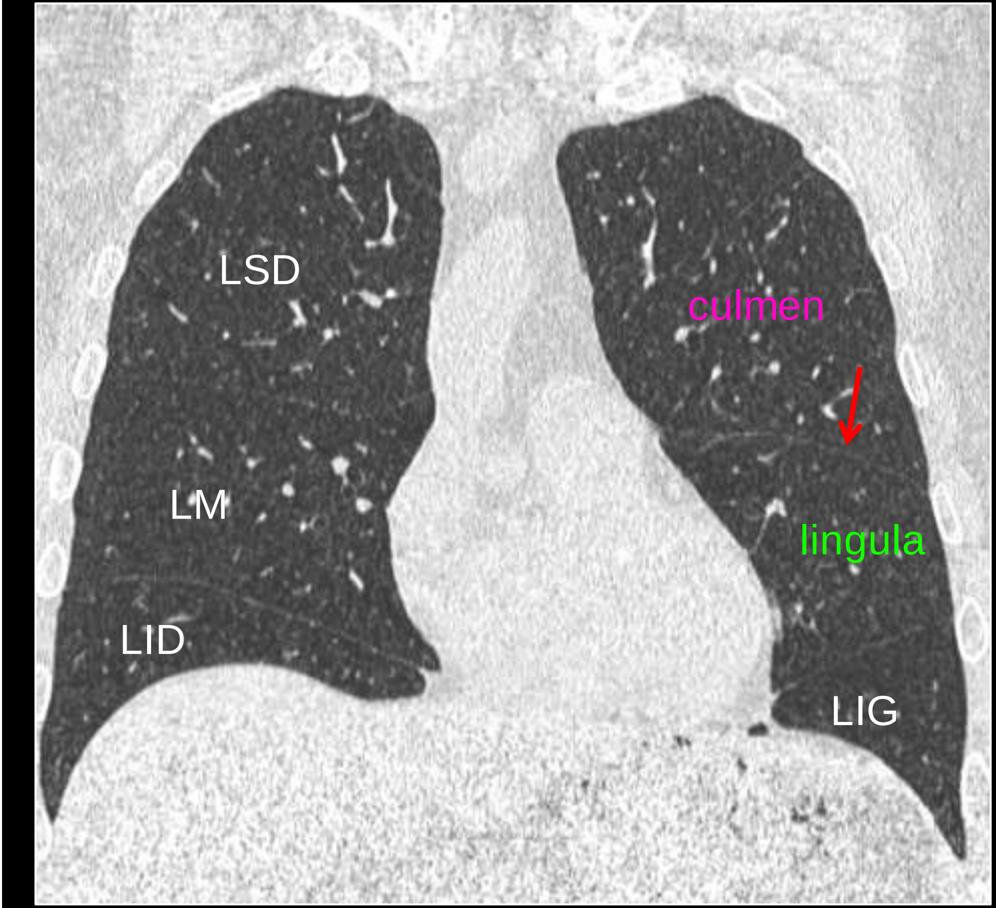
30 - 50% des poumons droits


LS
LM
LID
culmen
lingula
LIG

petite scissure gauche entre lingula et culmen

20% des sujets


culmen
lingula


LSD
culmen
LM
lingula
LID
LIG

Systématisation pulmonaire base de la chirurgie

Droite

Gauche

LSD

S1: apical

S2: ventral

S3: dorsal

culmen

LSG

LM

S4: latéral / supérieur

S5: médial / inferieur

lingula

S6: apical (Fowler)

LID

pyramide basale

S7: médio-basal (para-cardiaque)

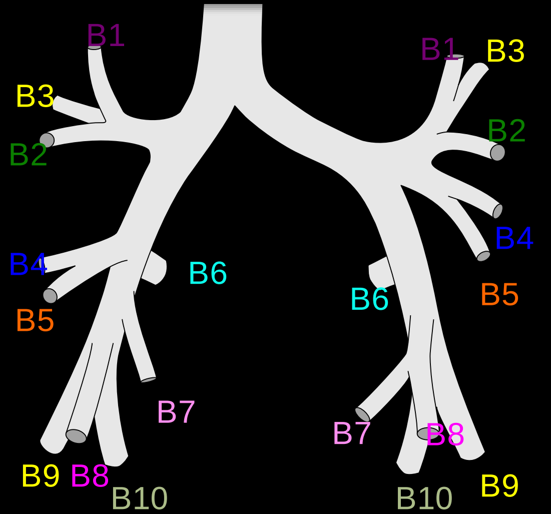
S8: ventro-basal

S9: latéro-basal

S10: dorso-basal

pyramide basale

LIG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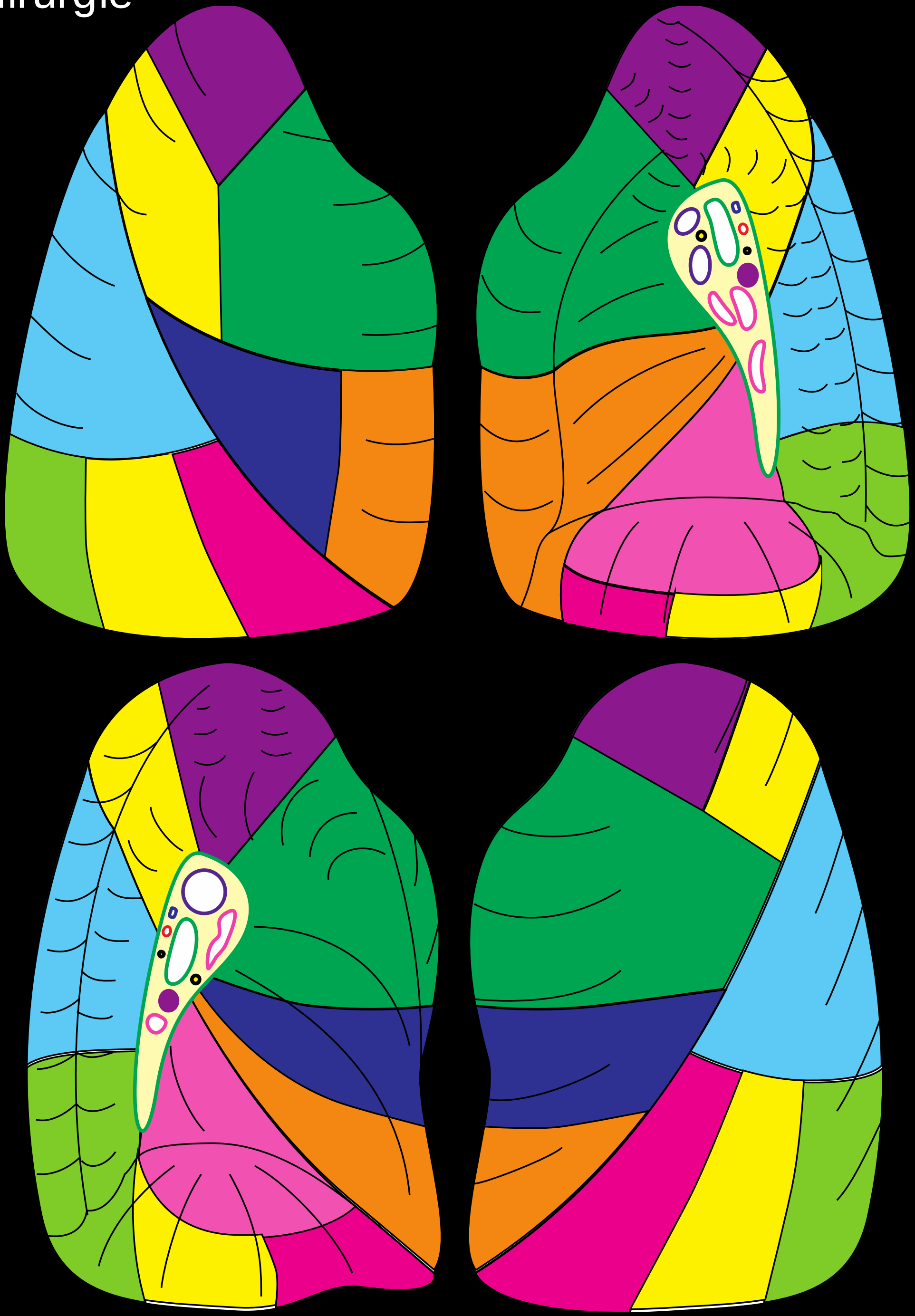
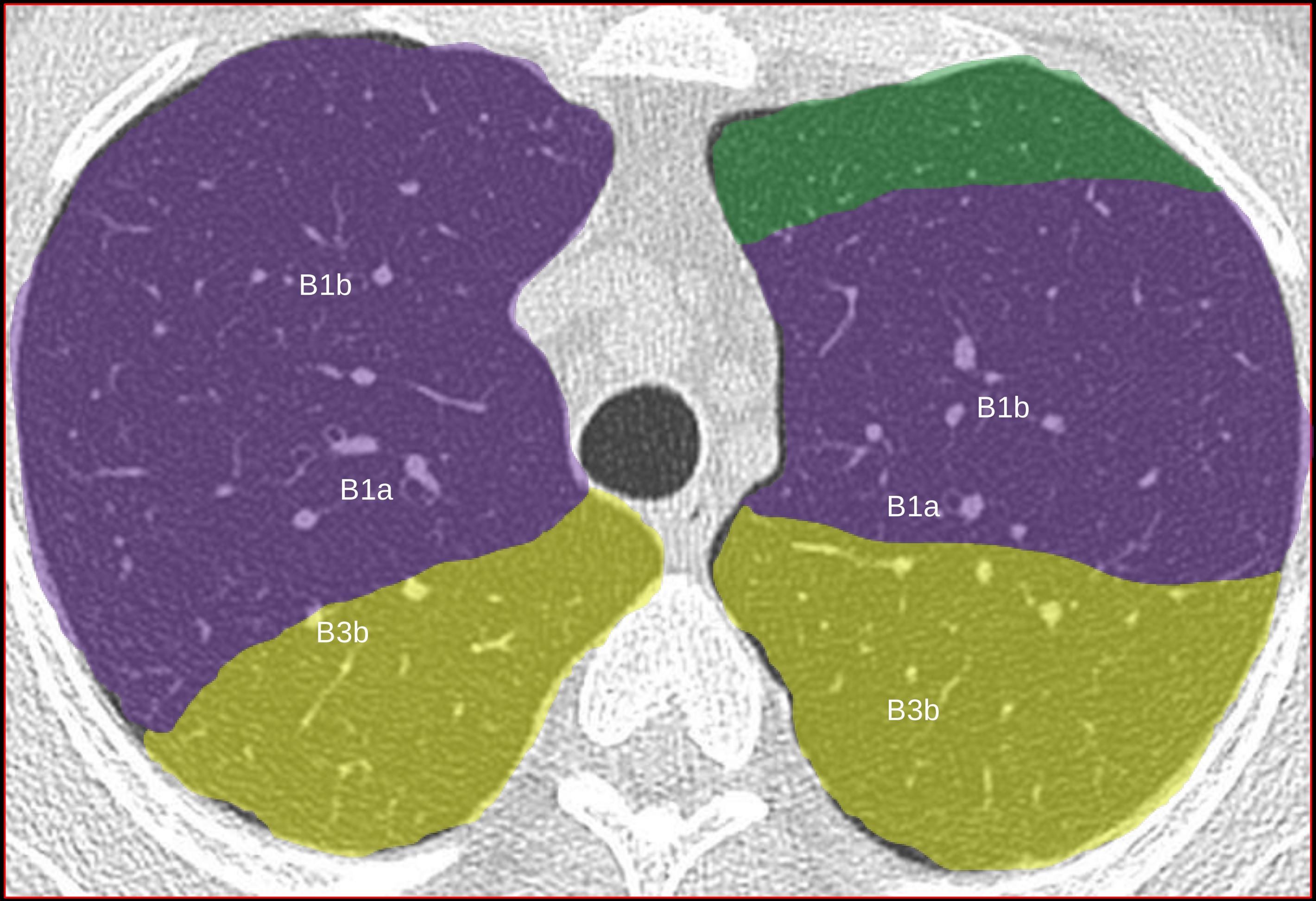
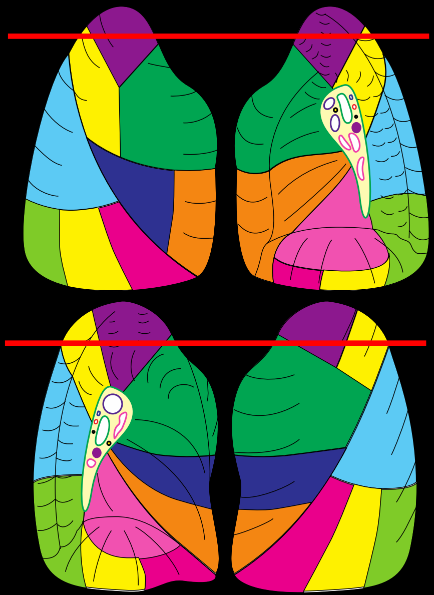
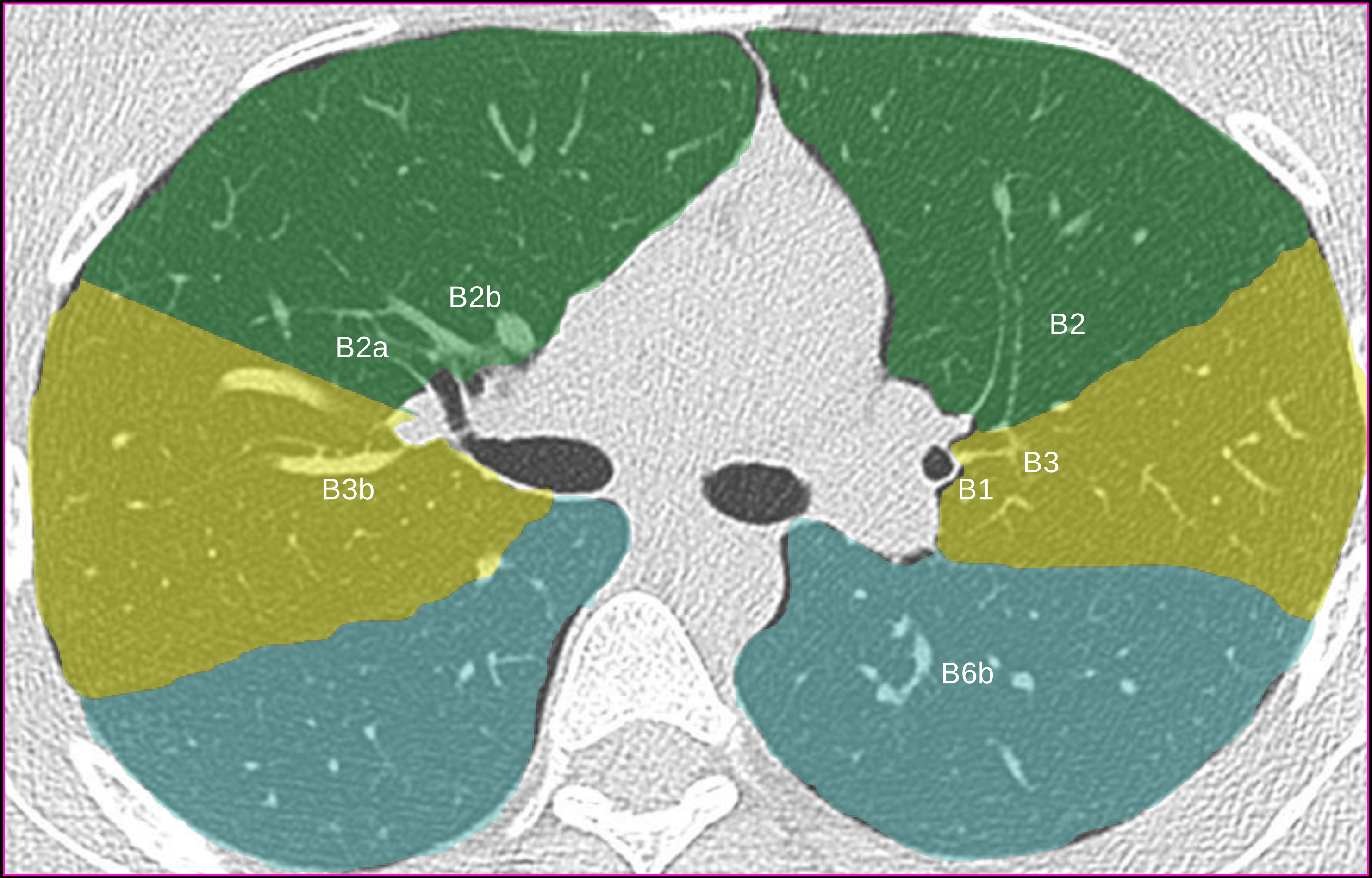



B1b
B1a
B3b
B1b
B1a
B3b

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B3b
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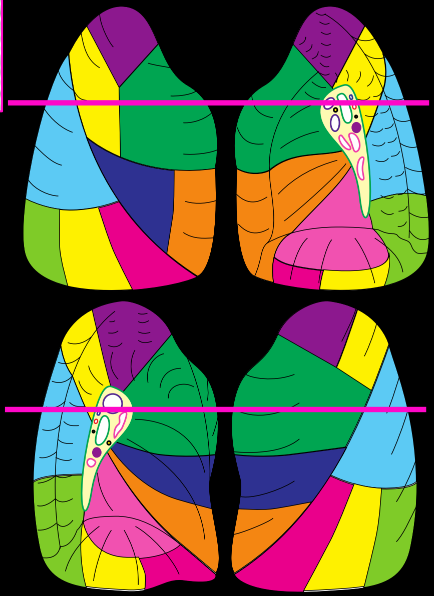
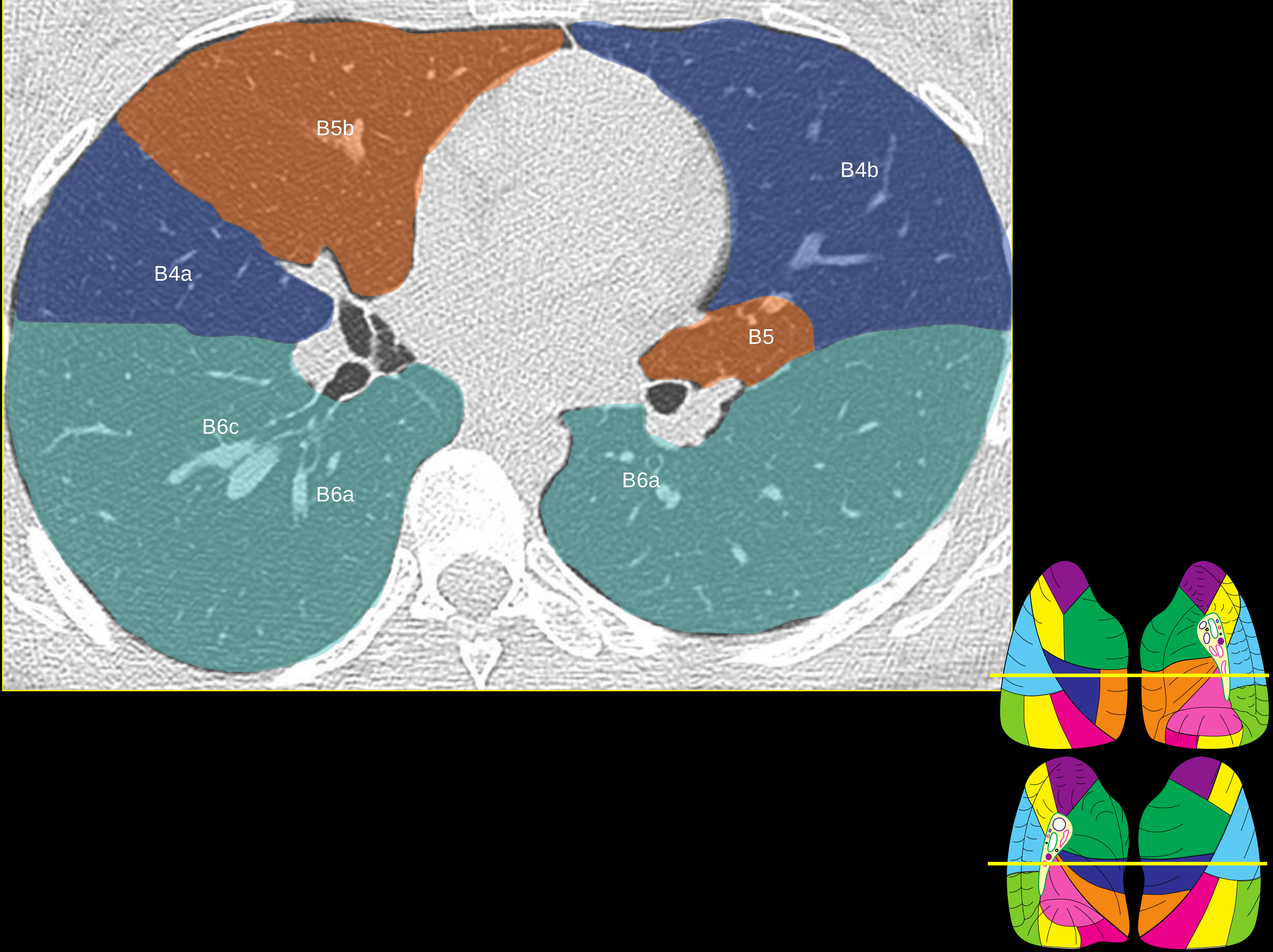
B6b

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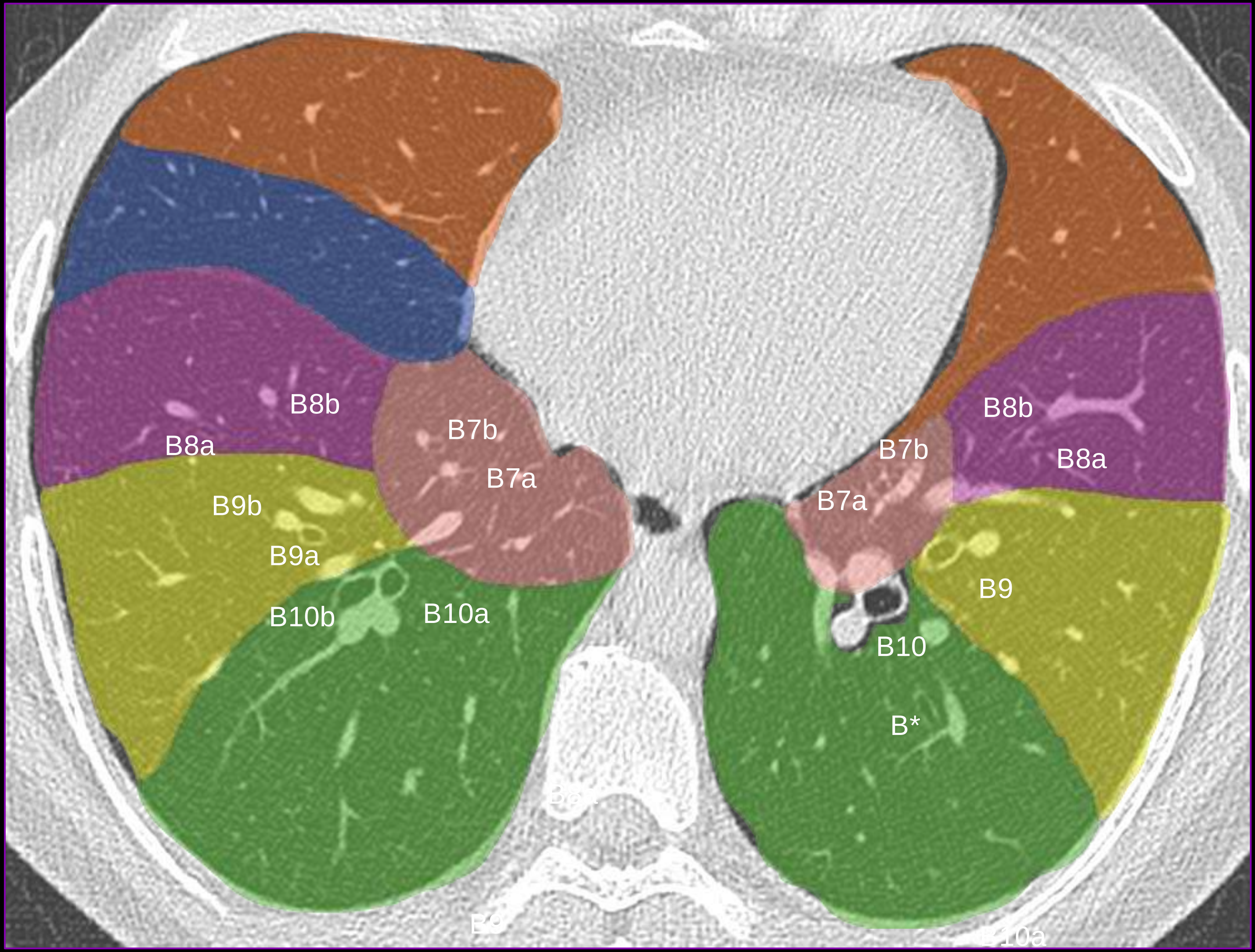
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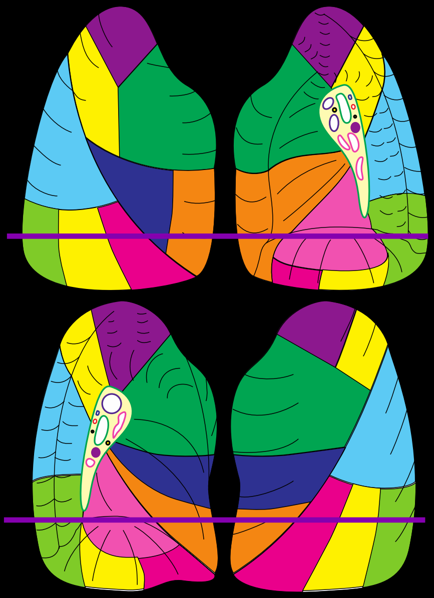

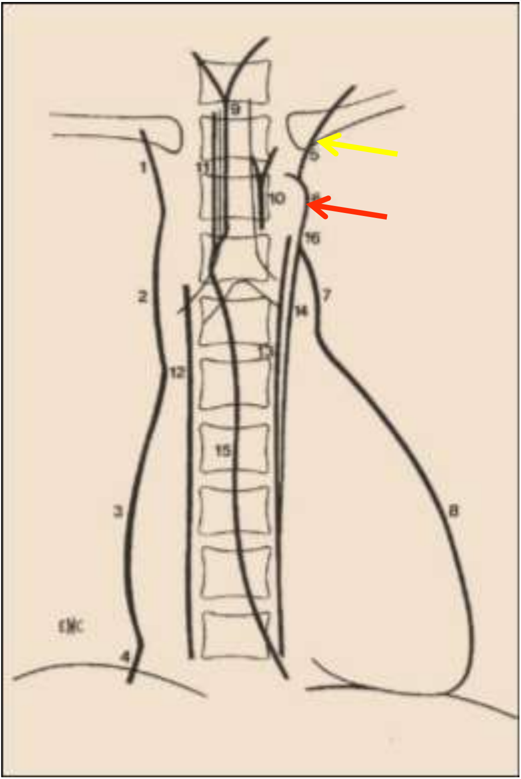
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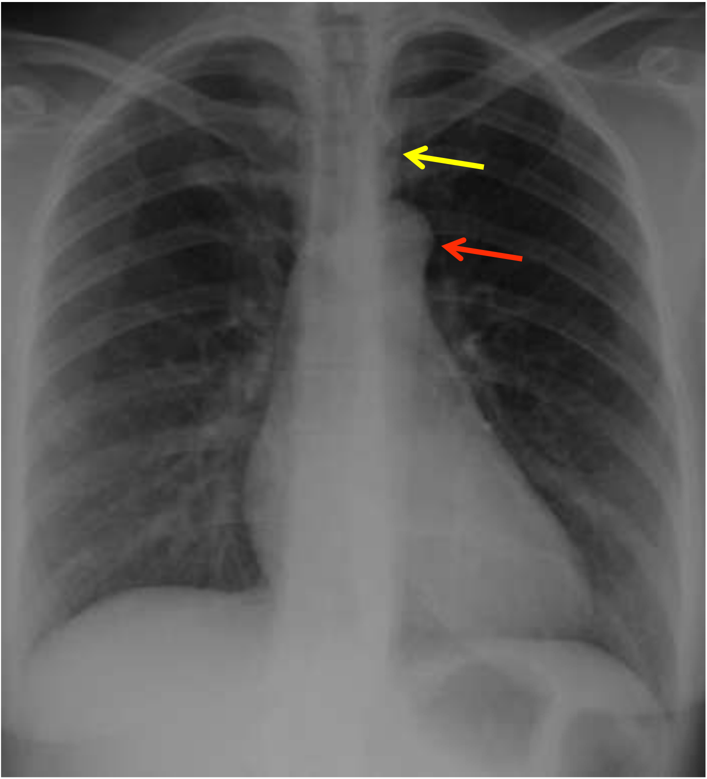
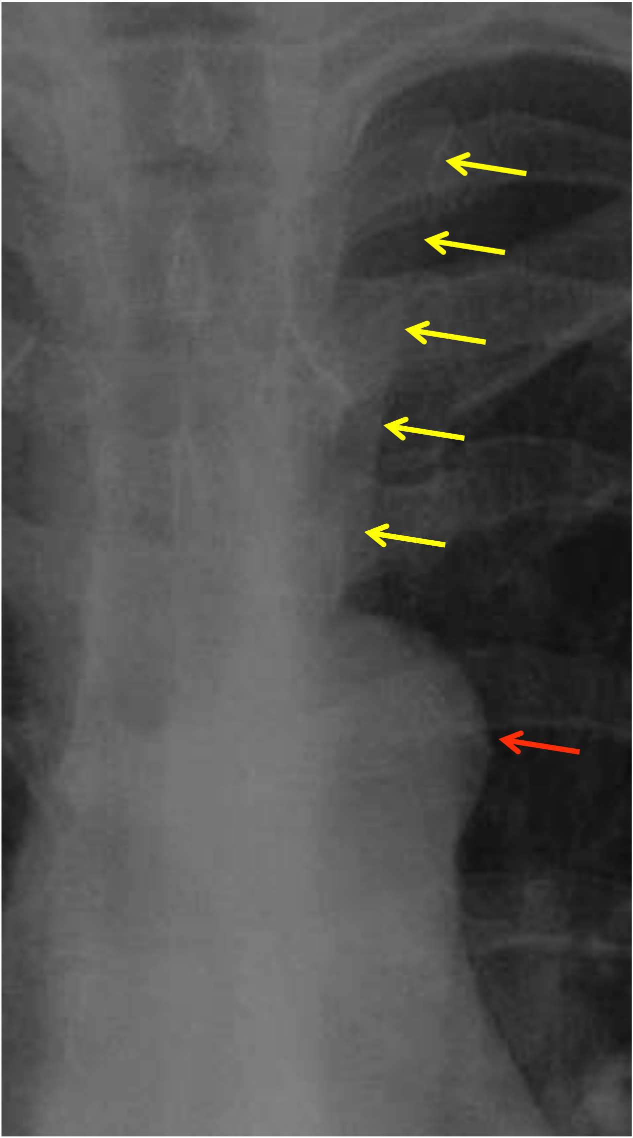
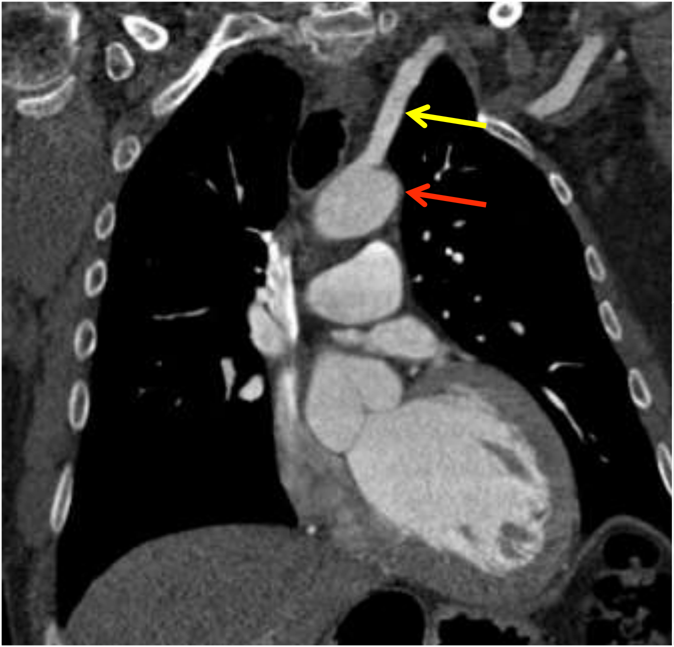
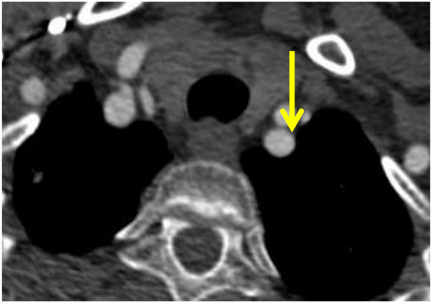
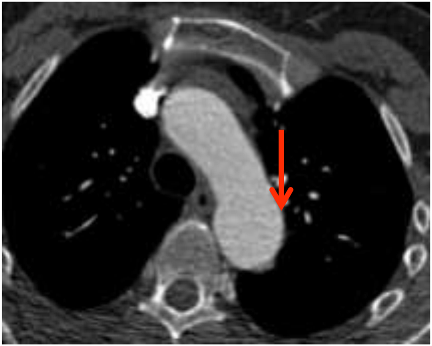




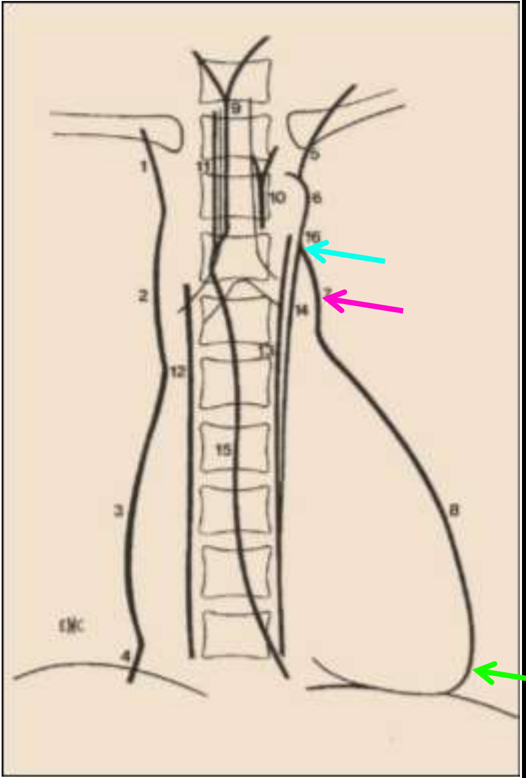






arc de l’aorte

ligne para-sub-clavière gauc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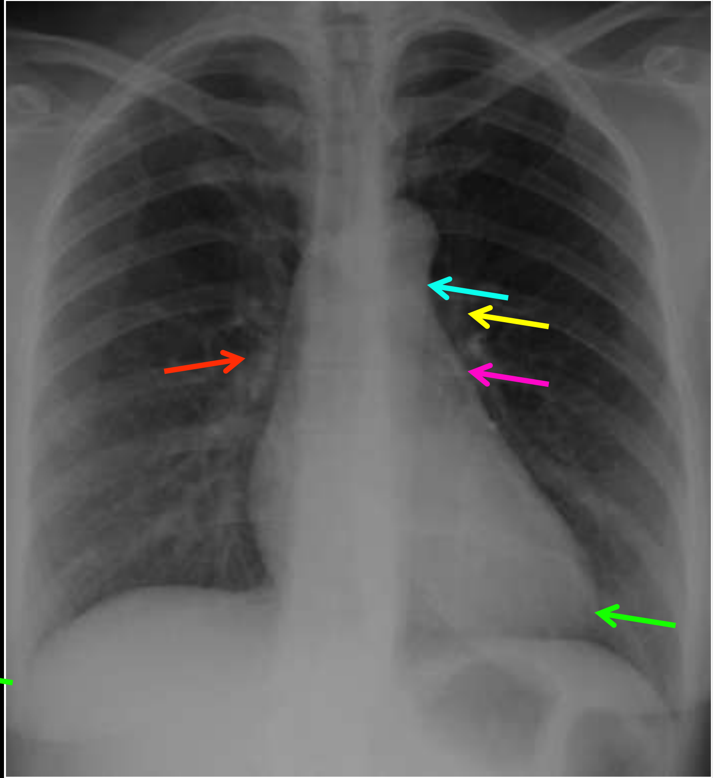
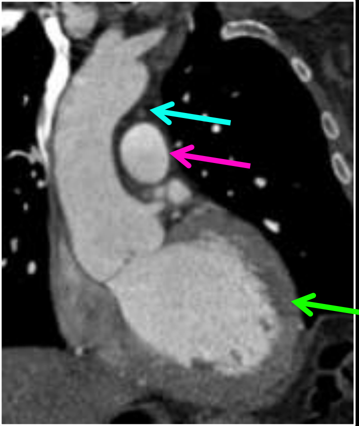
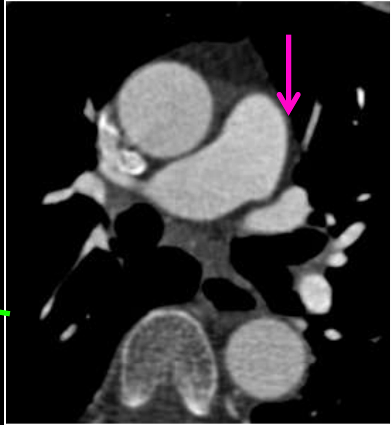
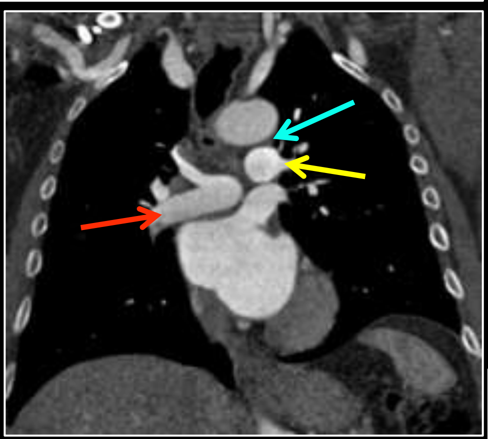
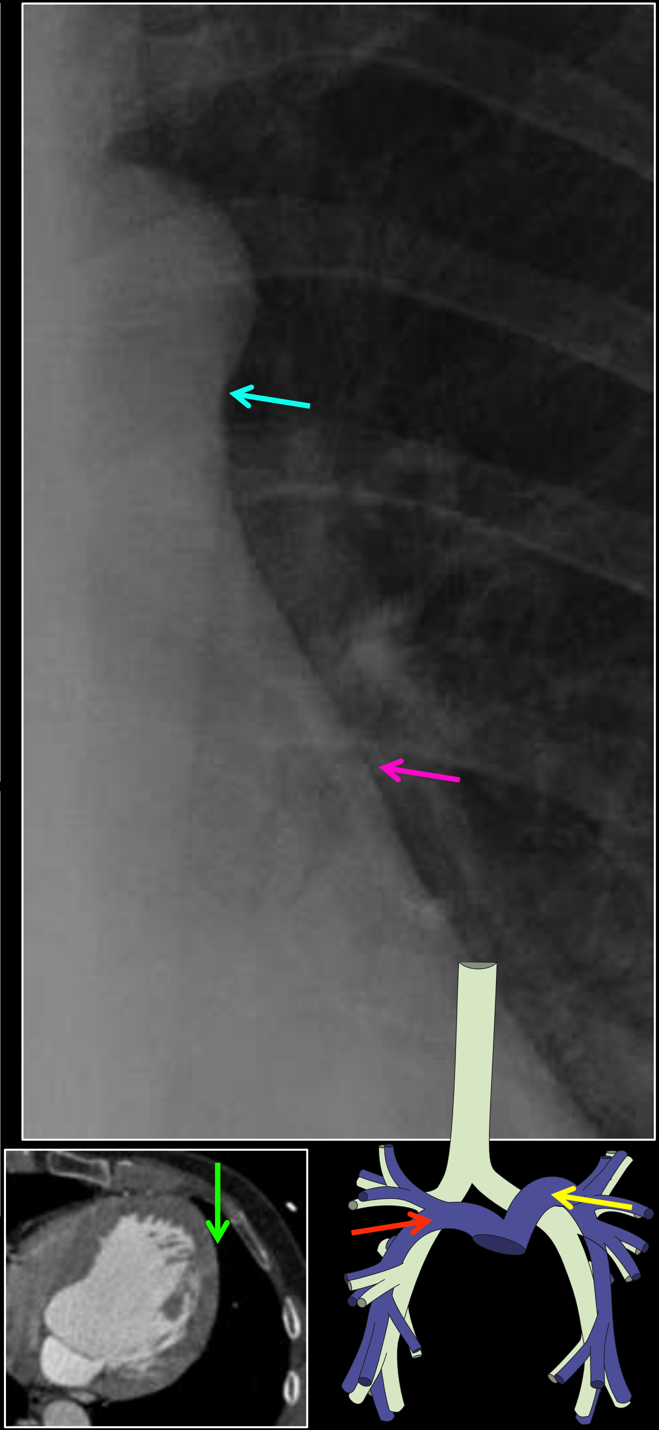








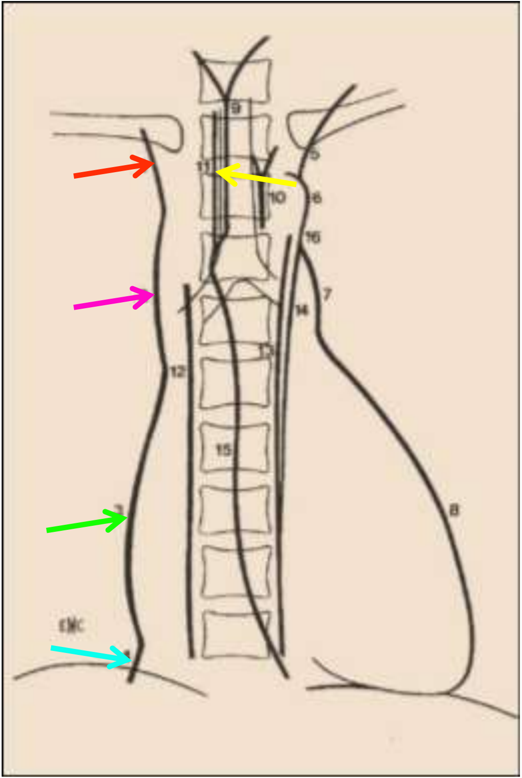


hiles pulmonaires G ≥ D

artère pulmonaire

fenêtre aorto-pulmonaire

ventricule gauche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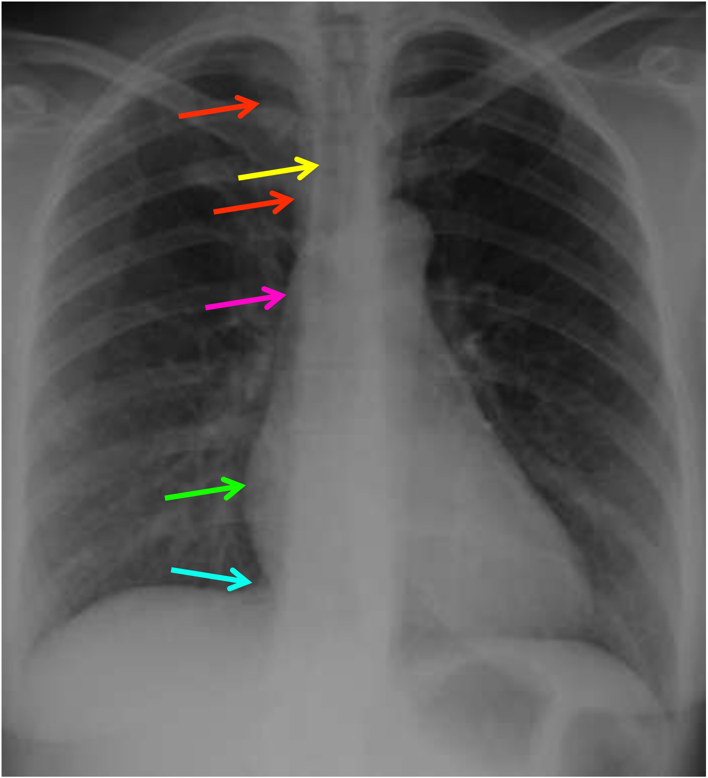
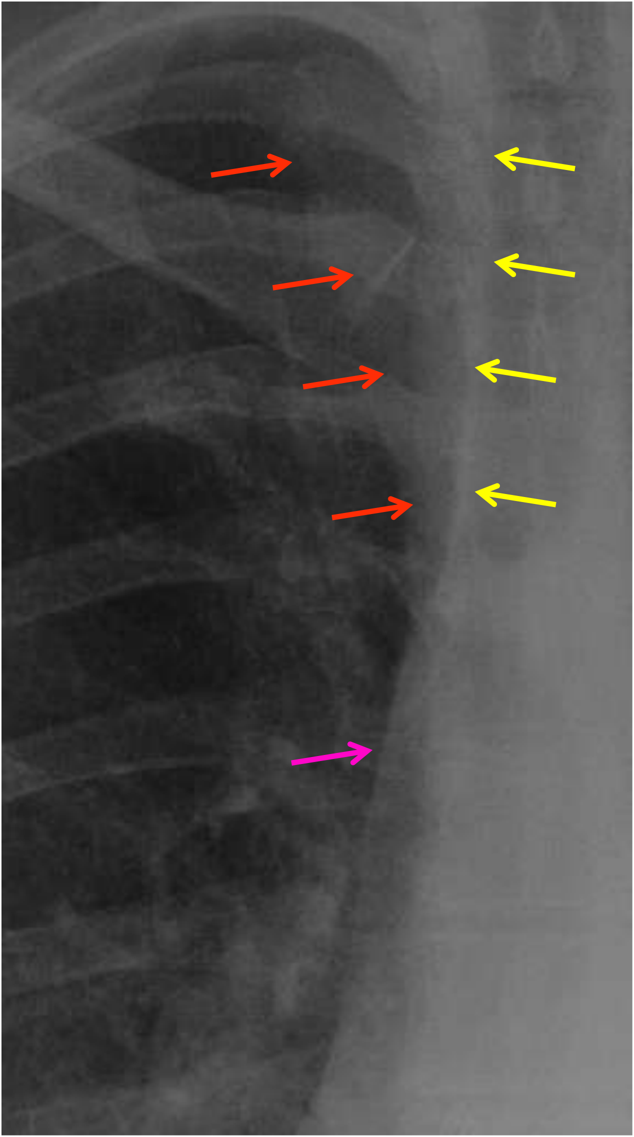
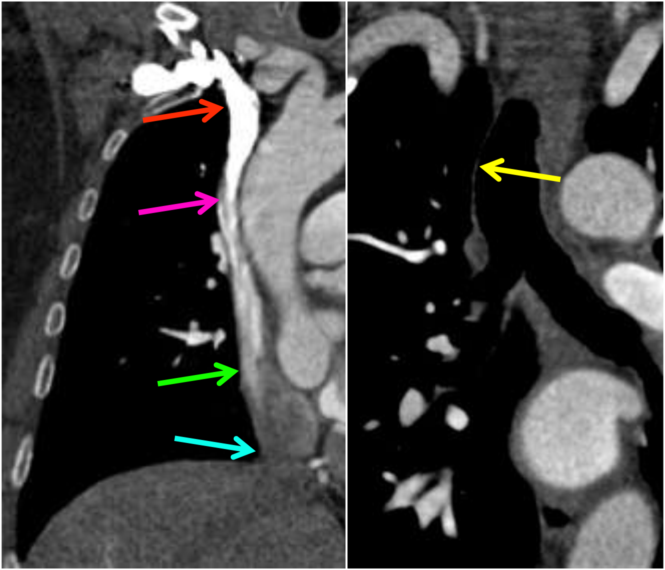
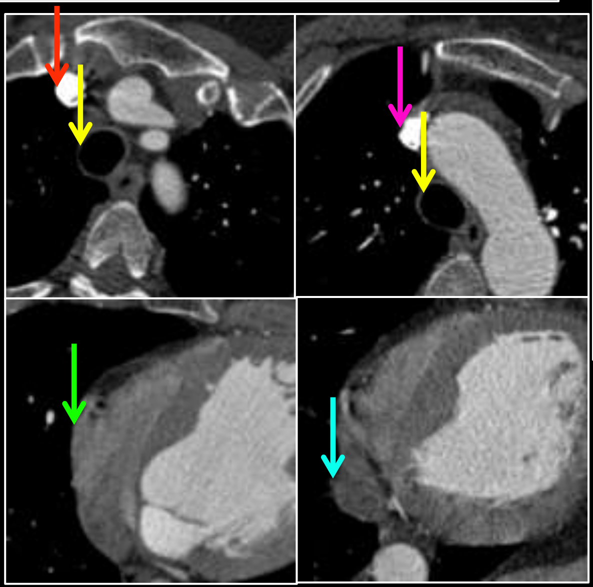








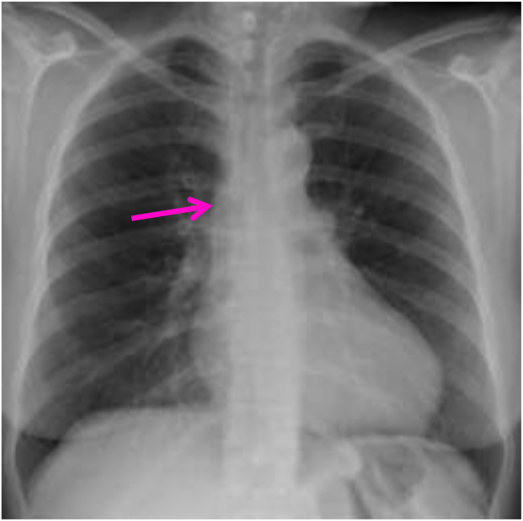
ligne para-trachéale droite

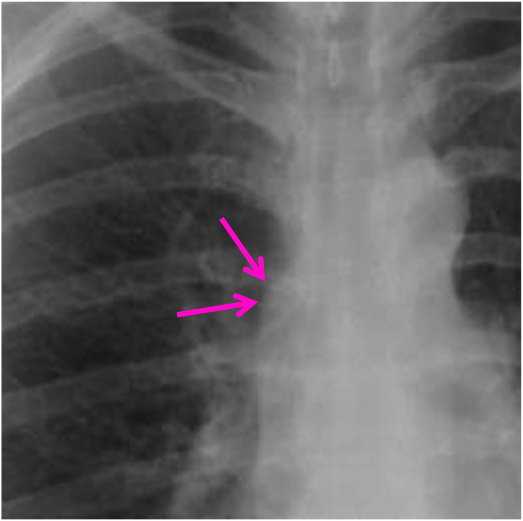
ligne para-sub-clavière droite

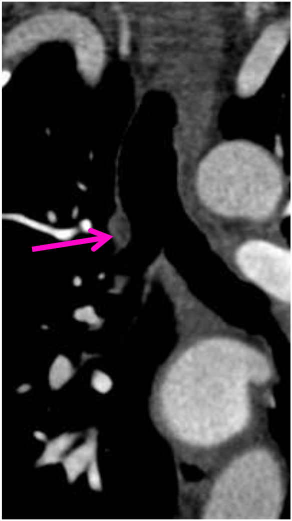
ligne para-cave supérieure

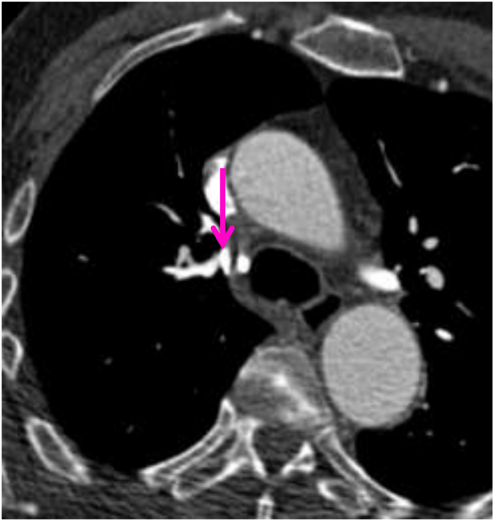
atrium droit

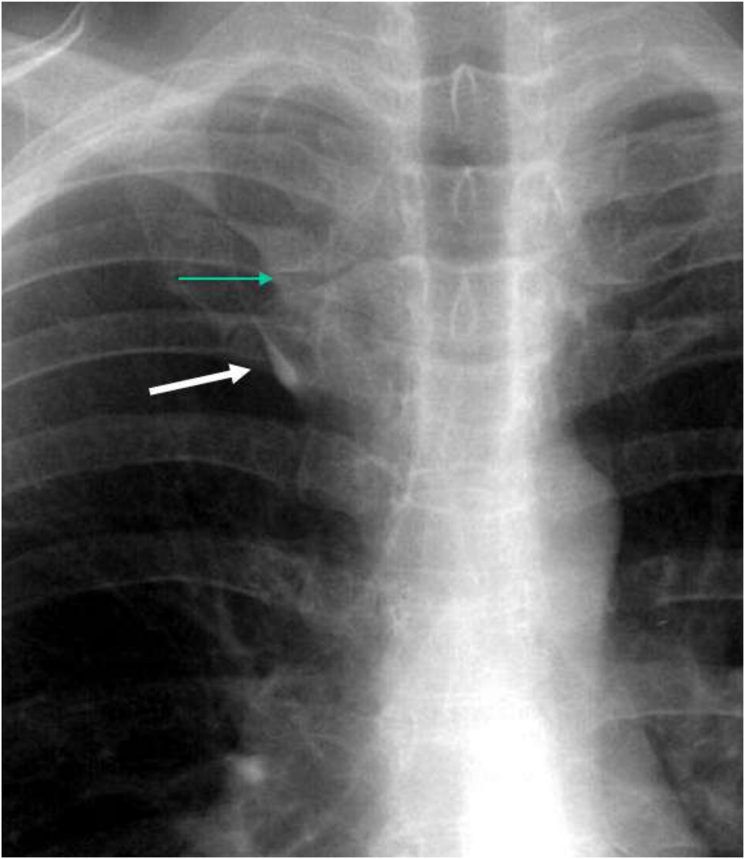
ligne para-cave inférieure



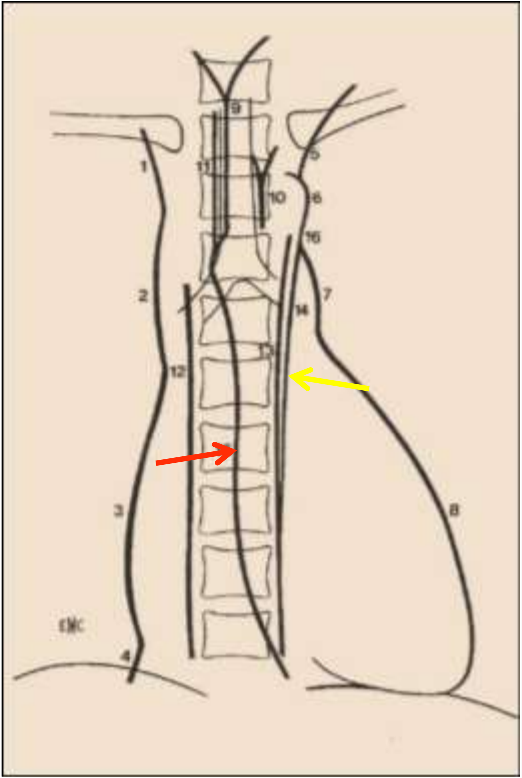








ligne para-azygos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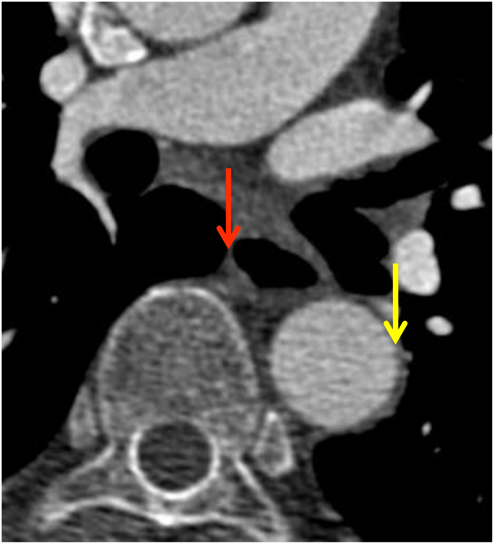
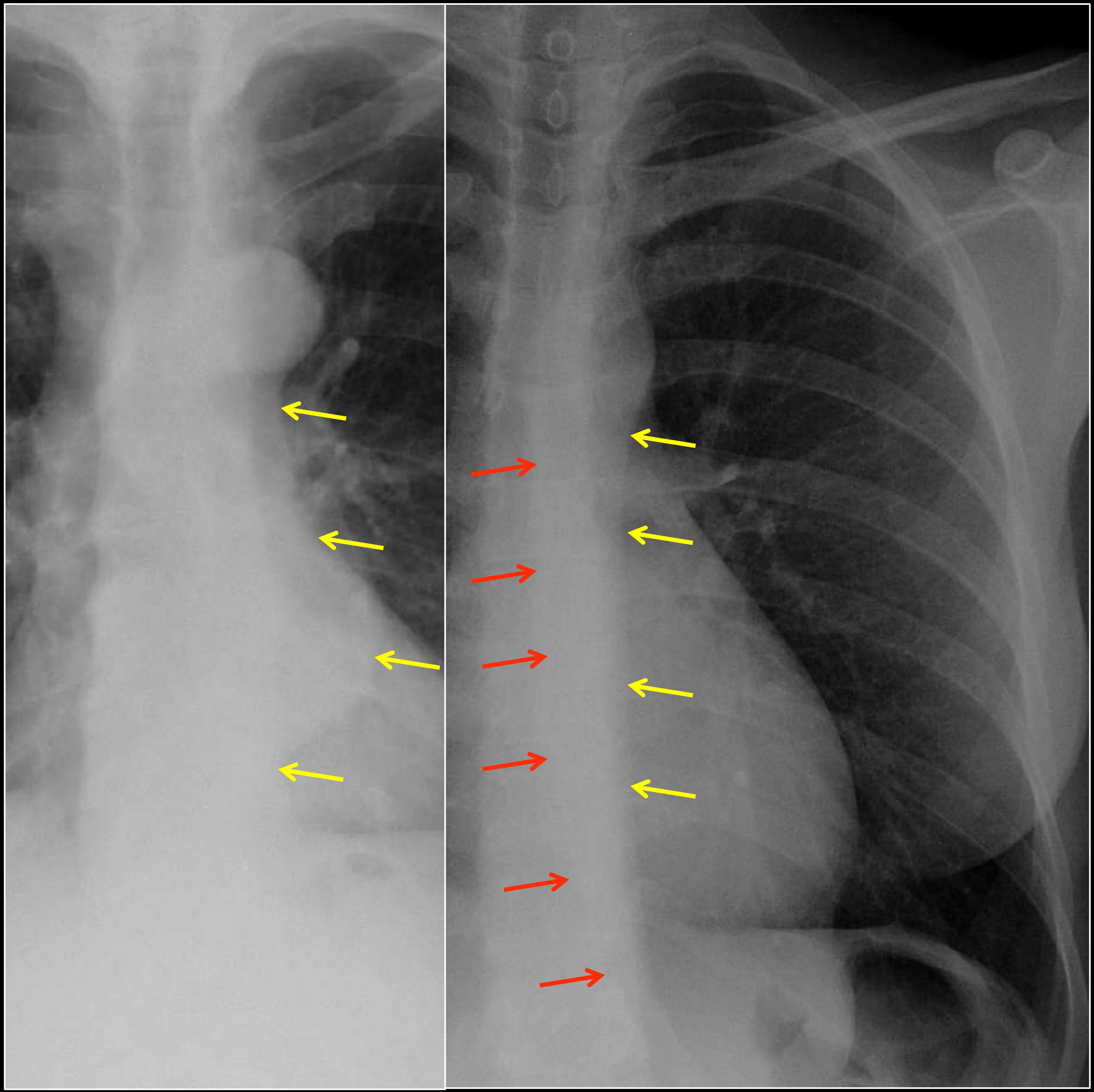
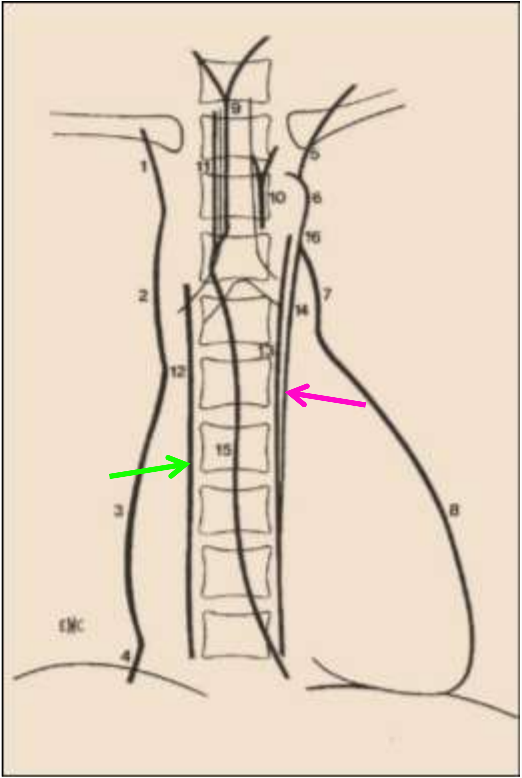




ligne para azygo-oesophagienne

ligne para-aortique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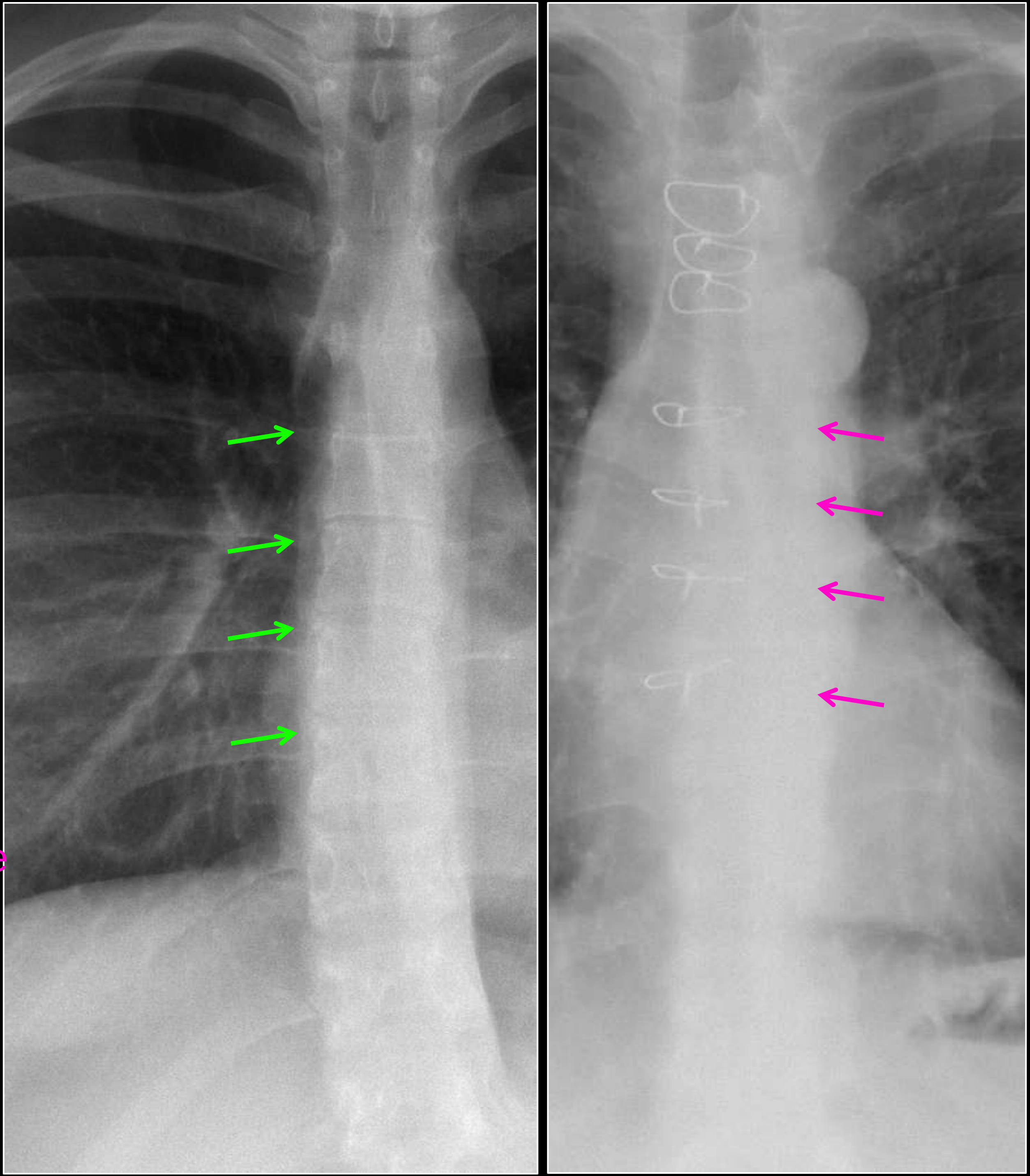
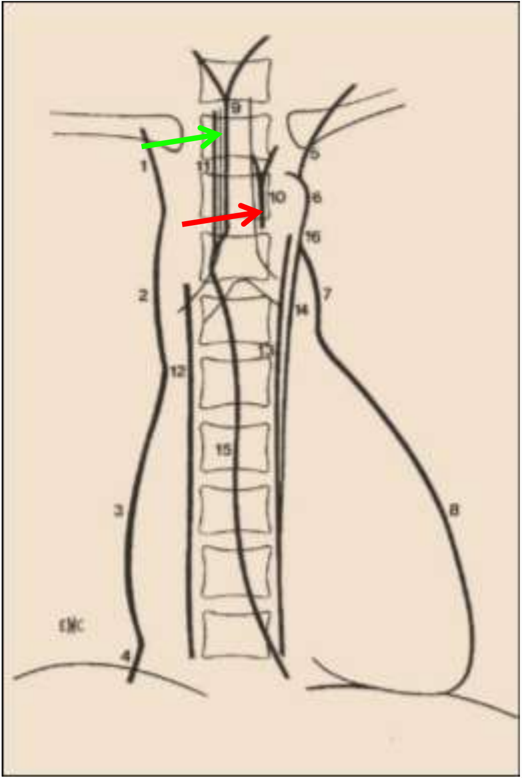


ligne para rachidienne droite

ligne para rachidienne gauche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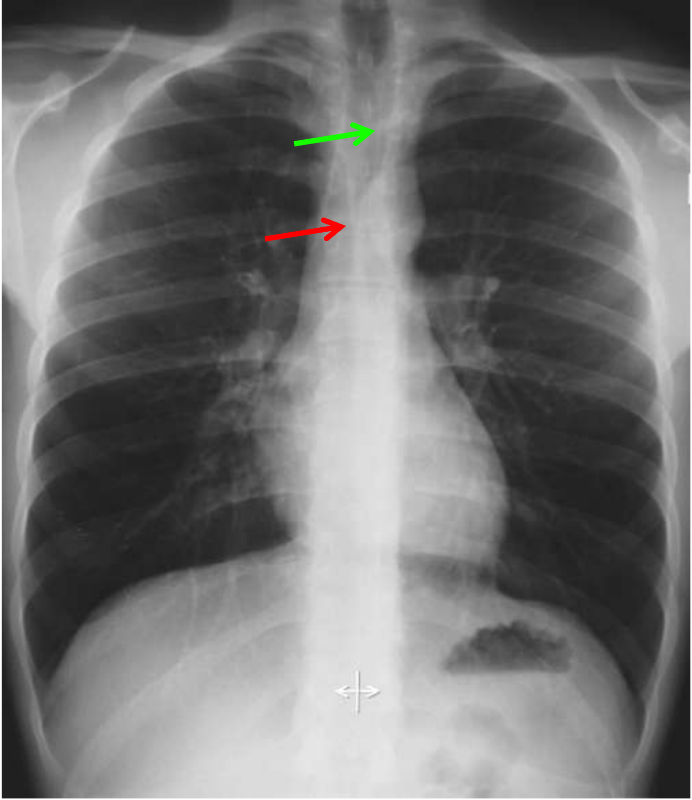
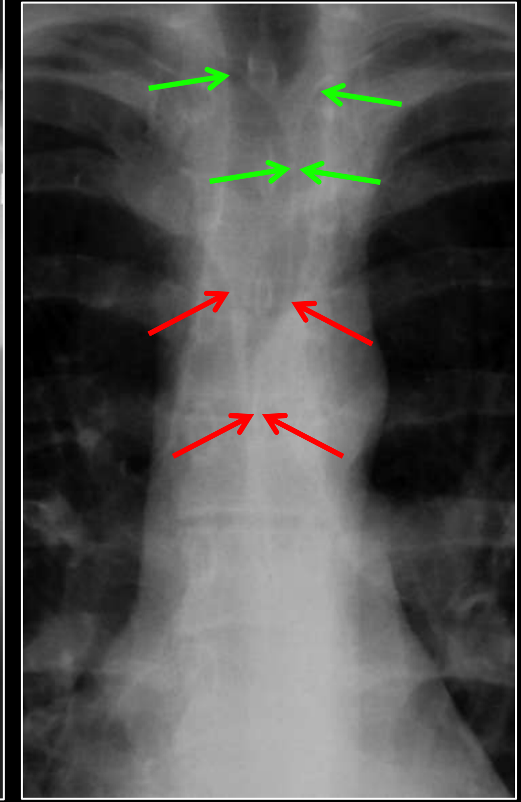
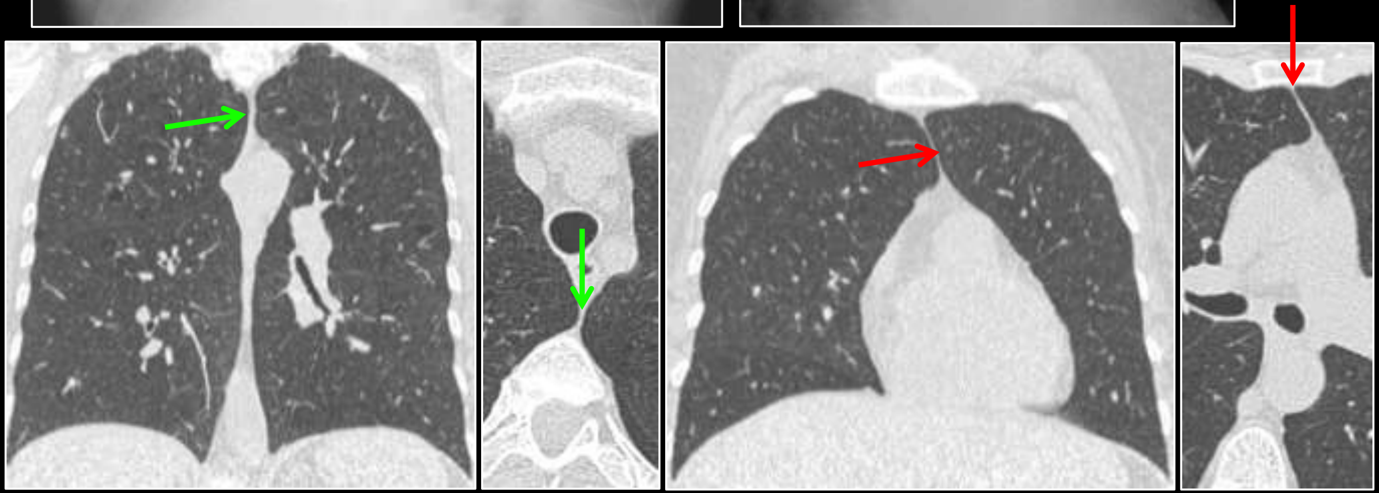






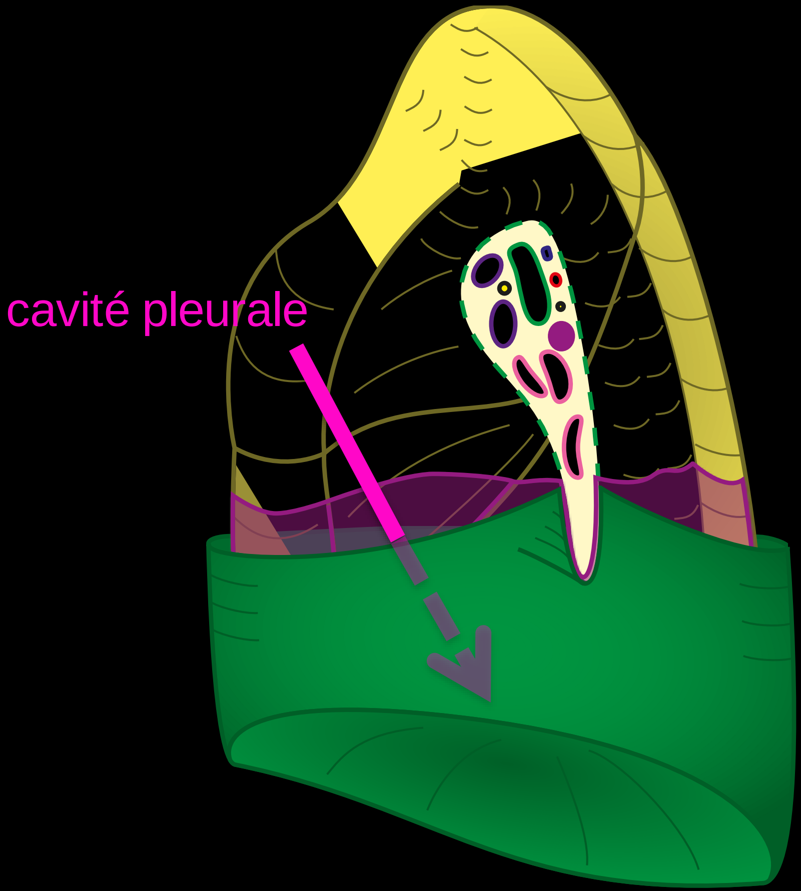
ligne médiastinale postérieure

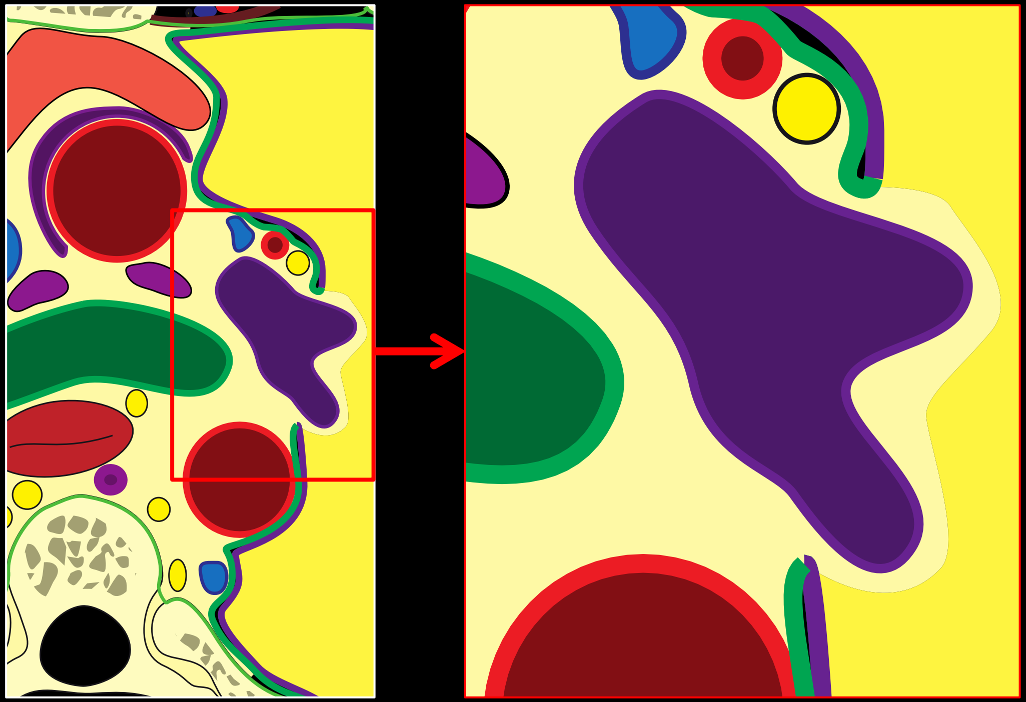
ligne médiastinale antérieure

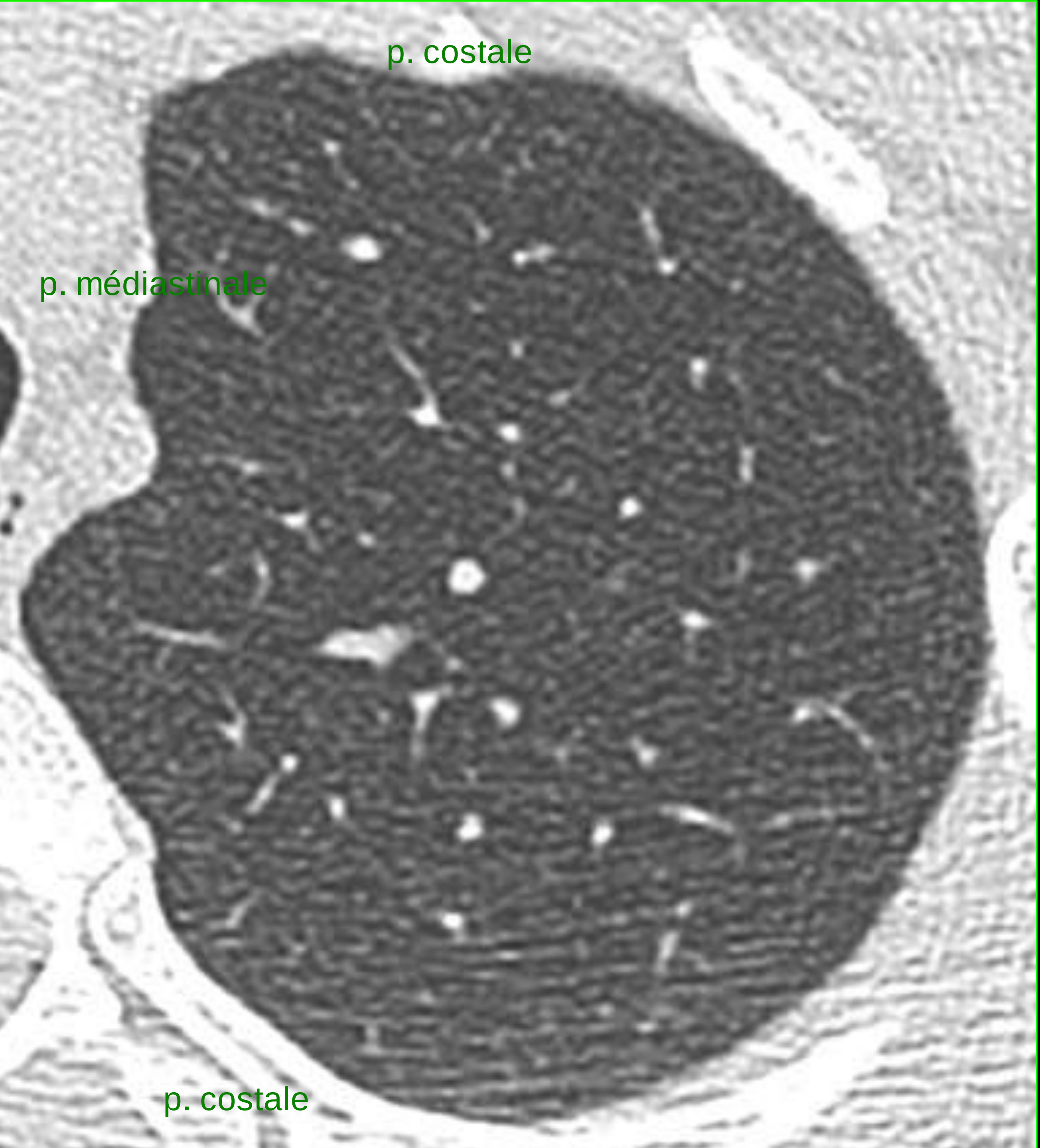
Plèvre

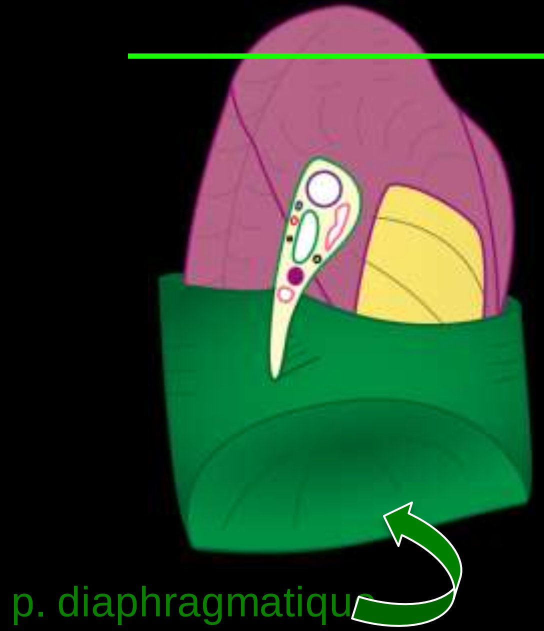
plèvre pulmonaire: membrane séreuse adhérente au poumon

plèvre pariétale: membrane fibreuse
adhérente
au fascia endo-thoracique


cavité pleurale

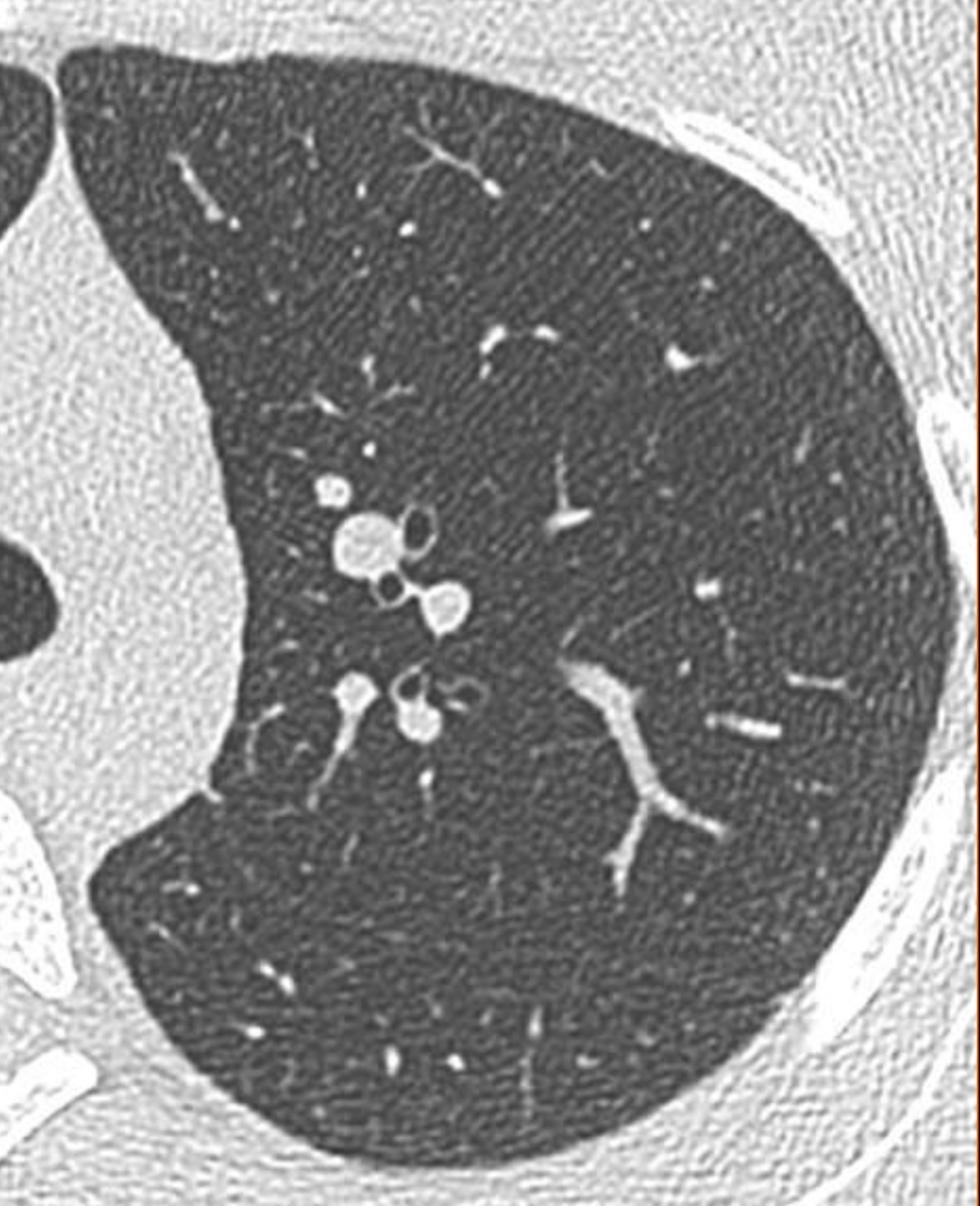


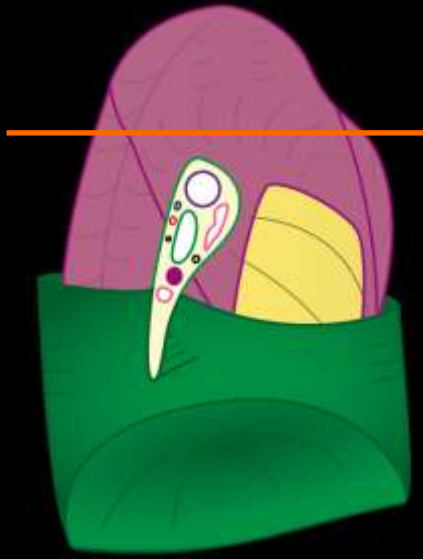

p. costale
p. médiastinale
p. costale

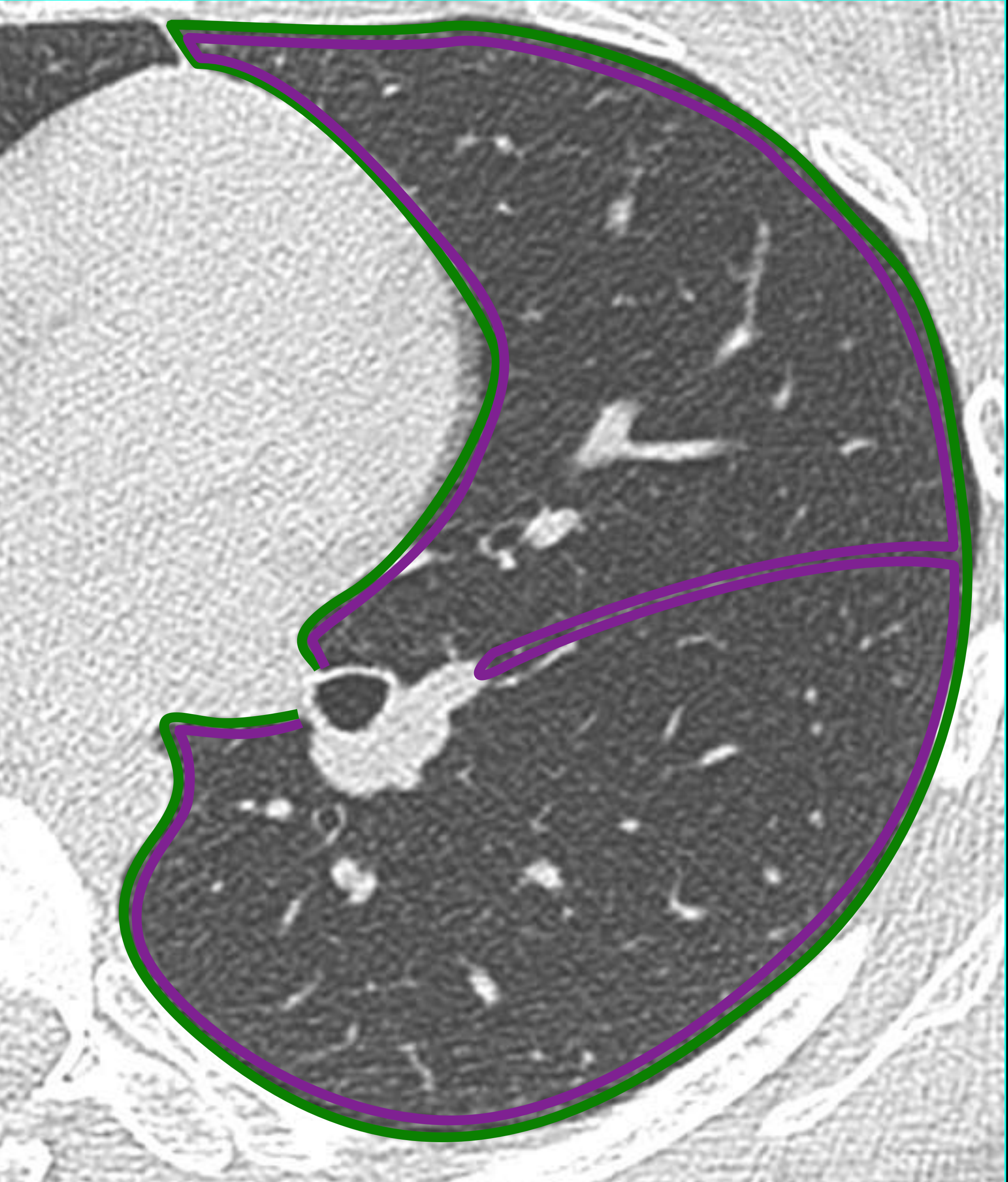

p. diaphragmatique

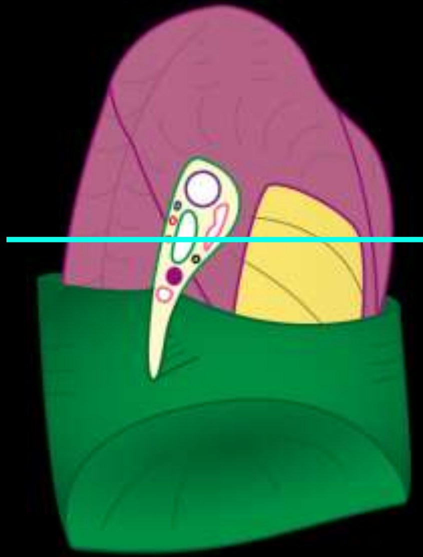
plèvre pariétale

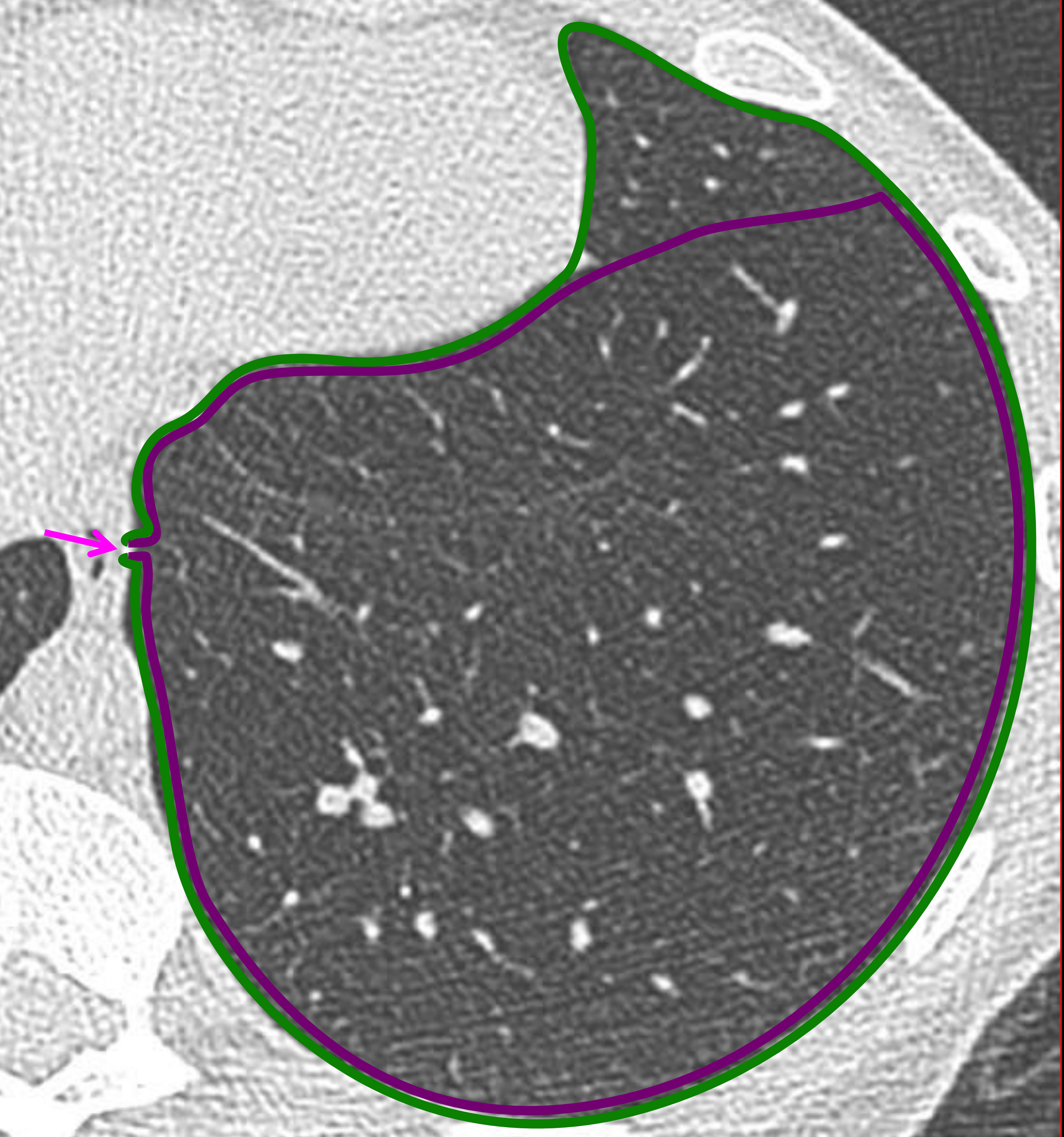
plèvre pulmonaire

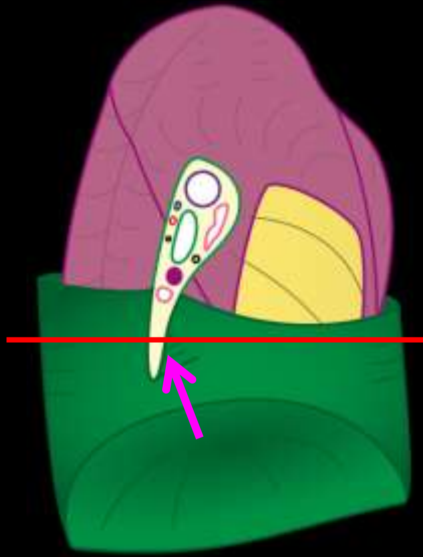




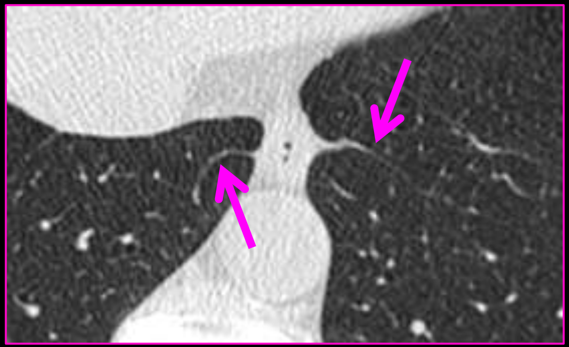


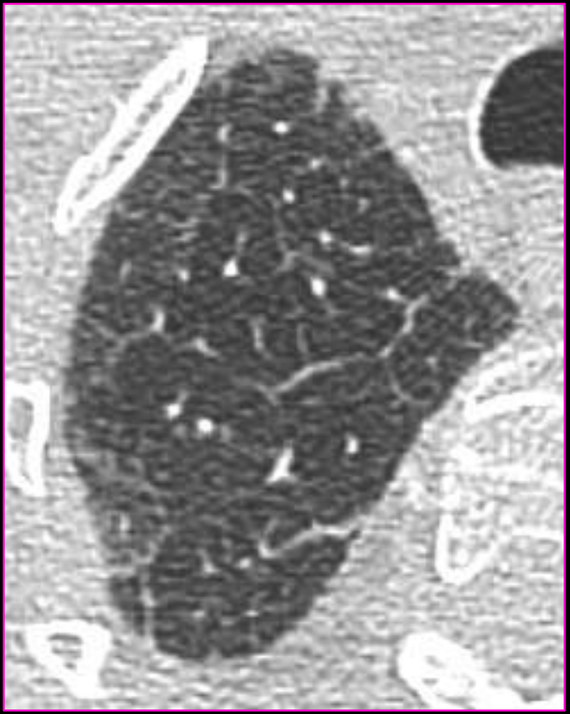


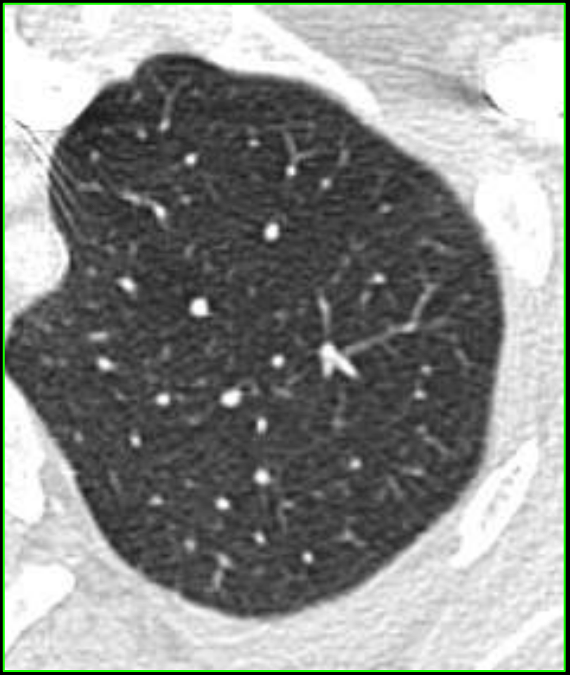


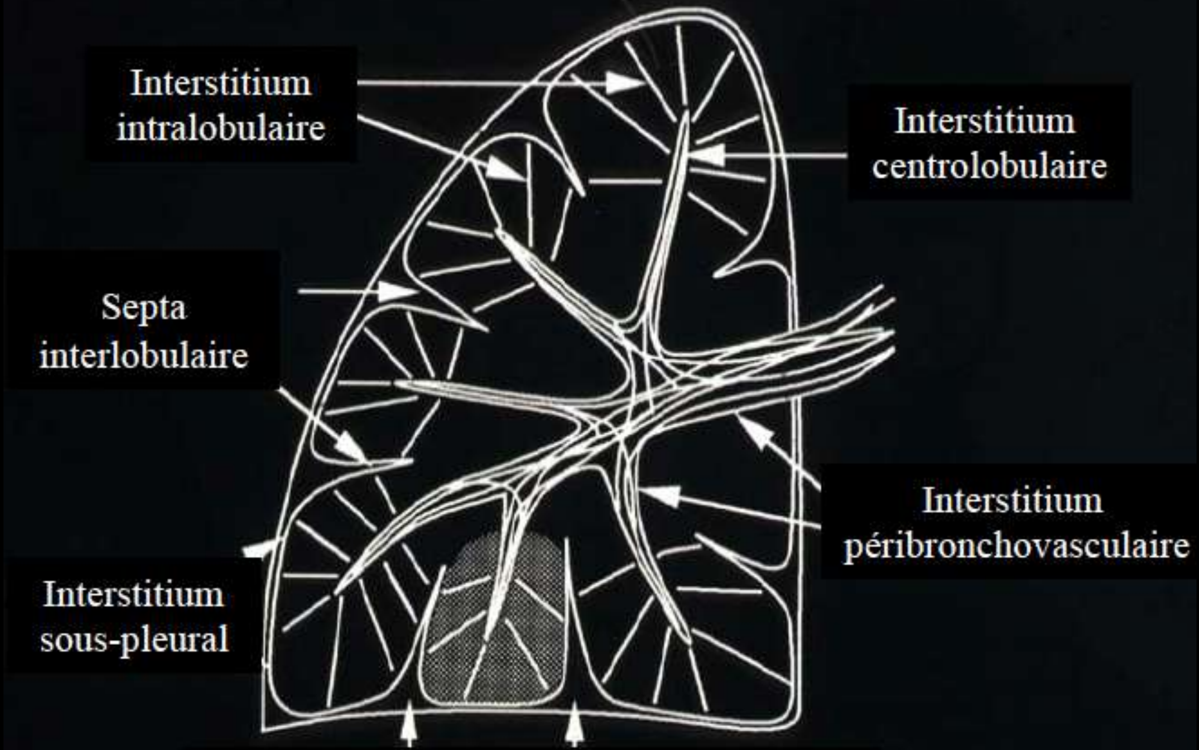


ligament pulmonaire







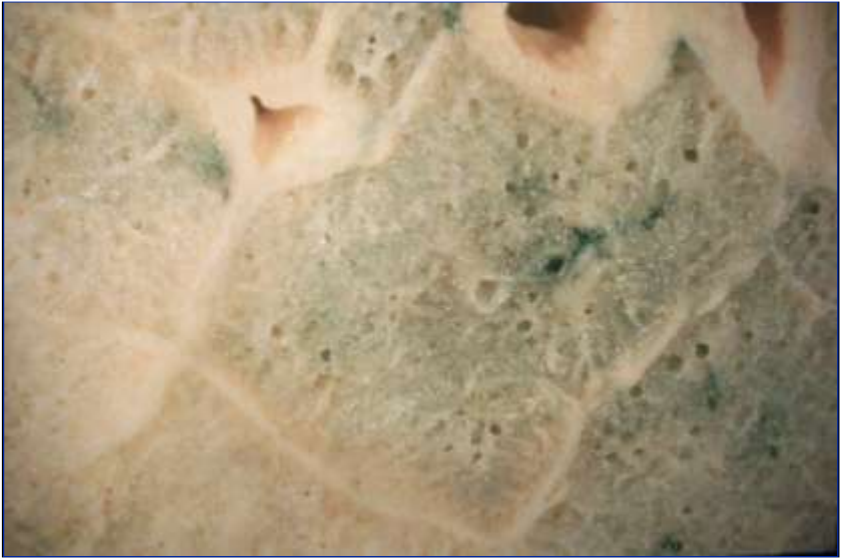

Interstitium intralobulaire
Interstitium centrolobulaire
Septa interlobulaire
Interstitium péribronchovasculaire
Interstitium sous-pleural

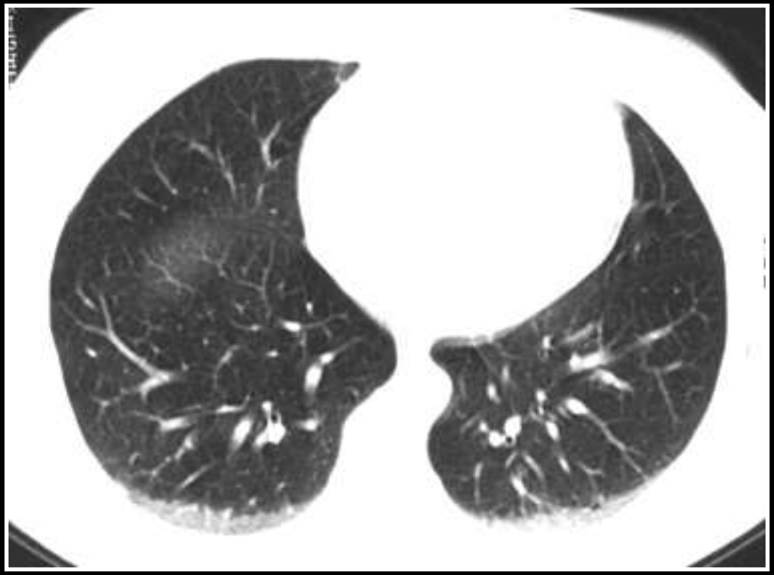
Lobule pulmonaire secondaire

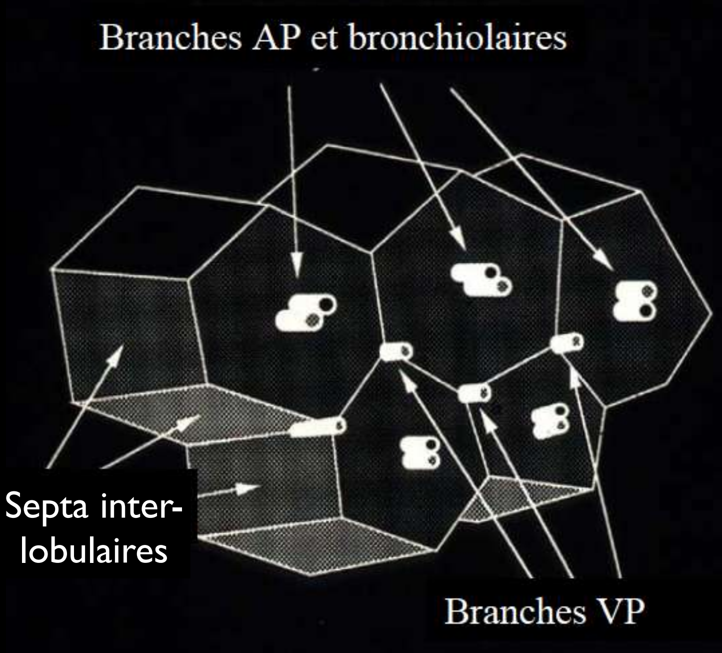
interstitium

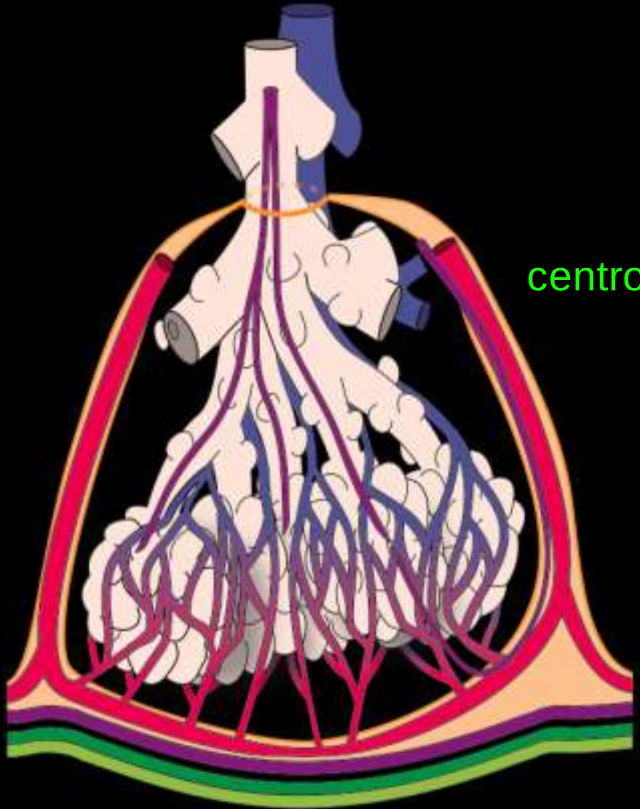
extension de la plèvre viscérale

tissu de soutien





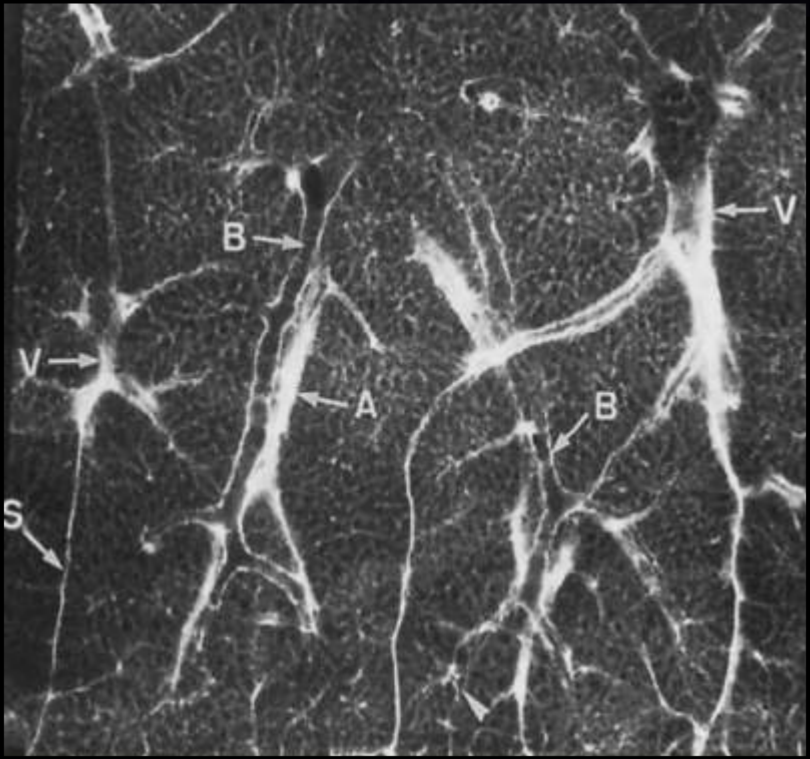

Branches AP et bronchiolaires
Septa inter-lobulaires
Branches VP

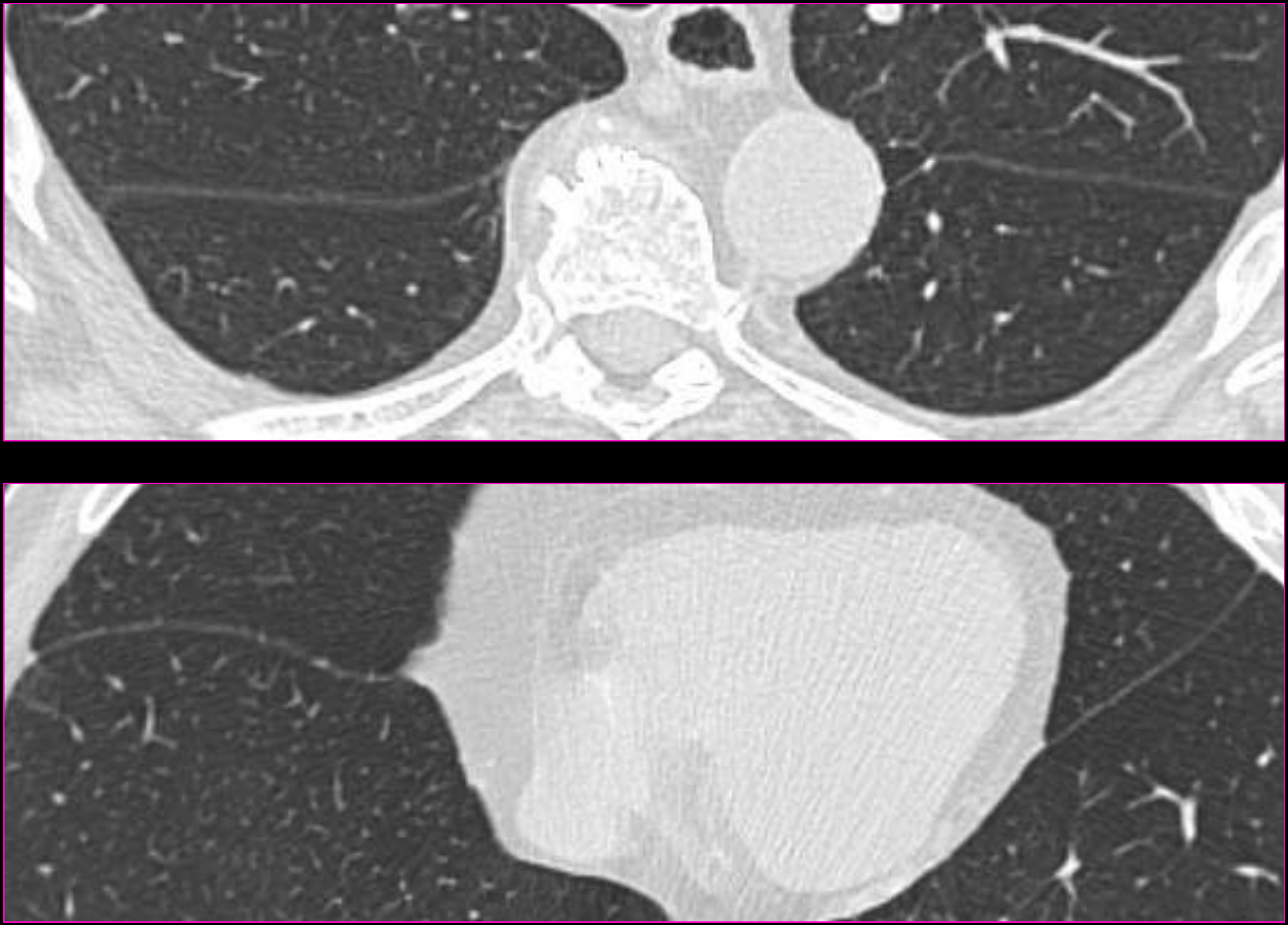


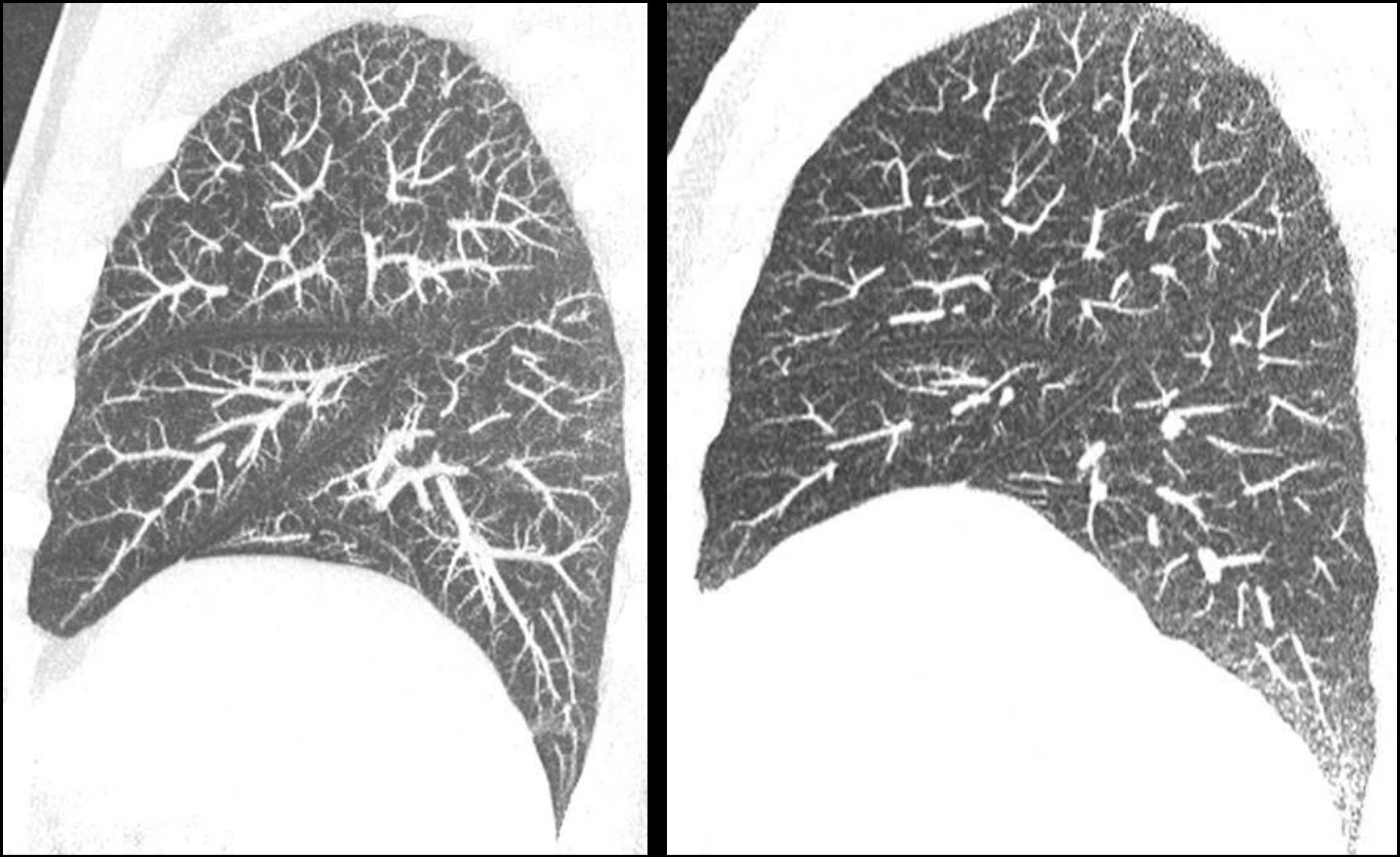
centroL

- Bronchiole
- Artères
- Lymphatiques
- Veines

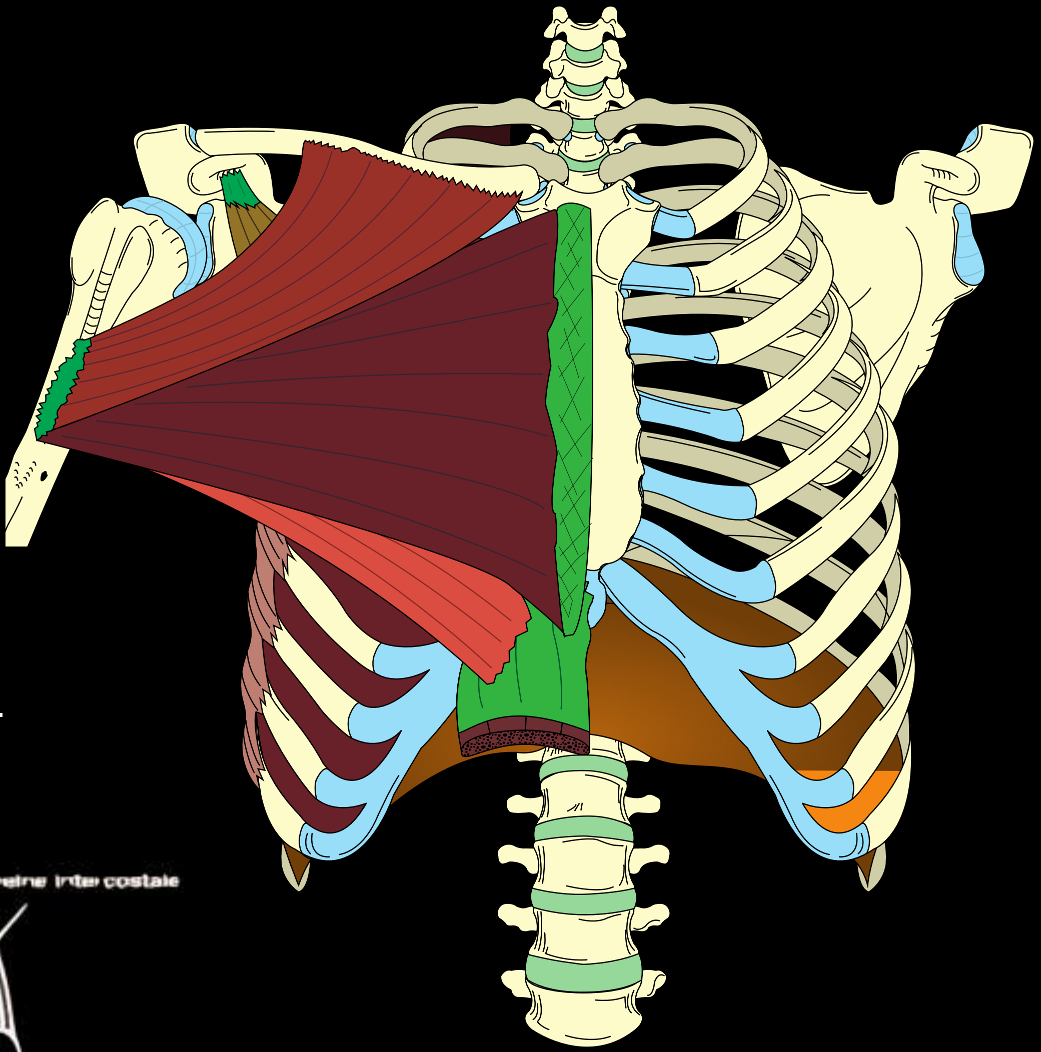
périL



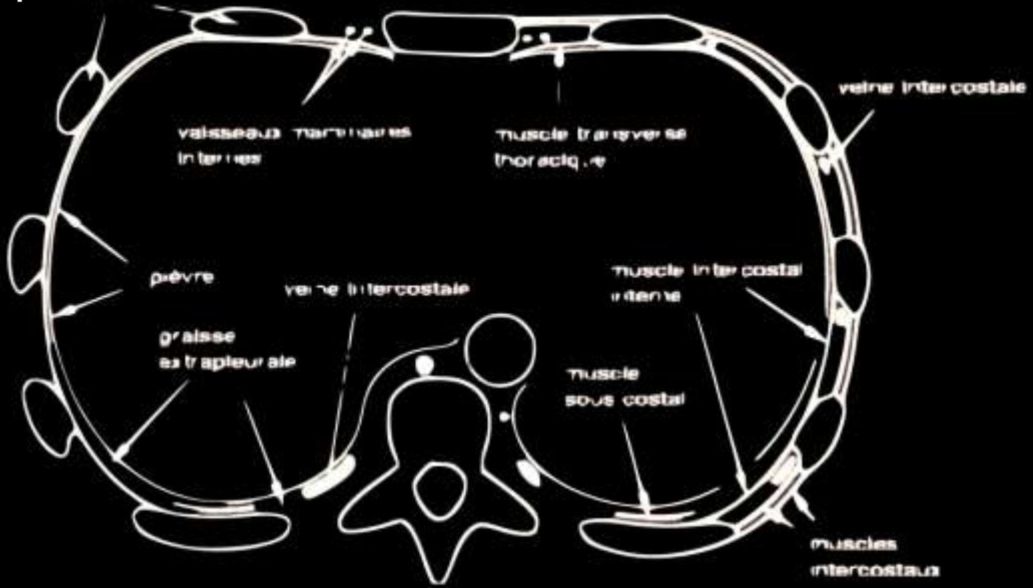


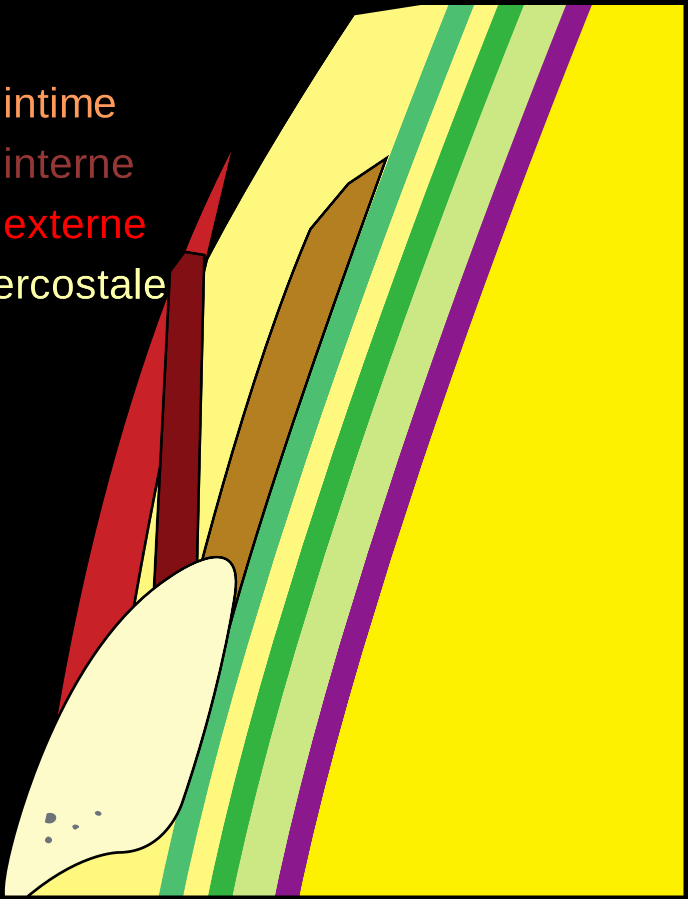


Paroi thoracique



Structures normales à l'interface paroi - poumon


veine intercostale
vaisseaux mammaires internes
muscle transverse thoracique
plèvre
veine intercostale
muscle intercostal interne
graisse extrapleurale
muscle sous costal
muscles intercostaux



côte

intercostal intime

intercostal interne

intercostal externe

graisse intercostale

poumon

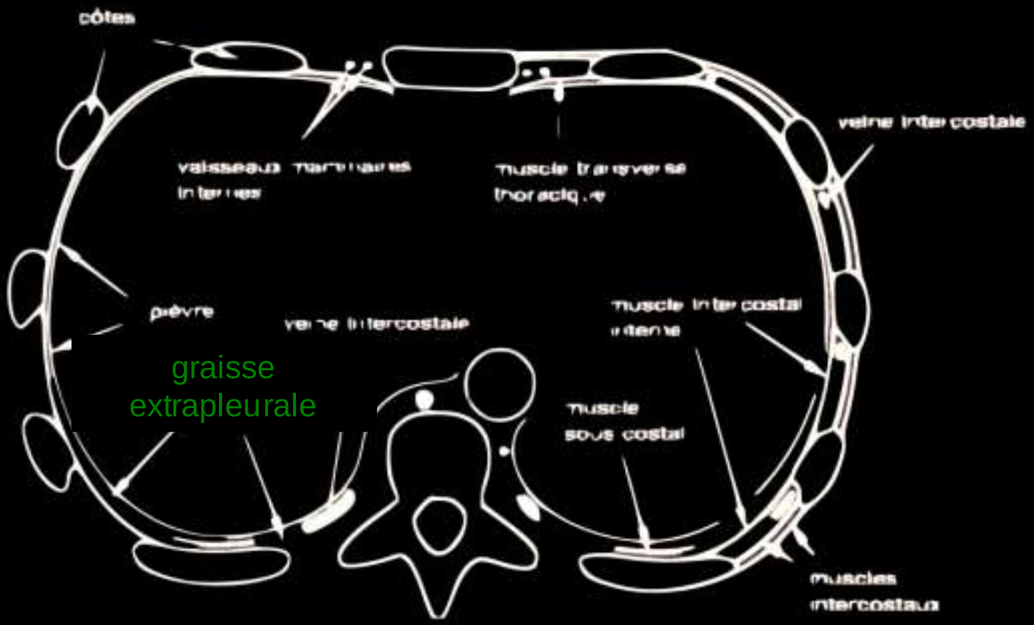
plèvre pulmonaire

cavité pleurale

plèvre pariétale

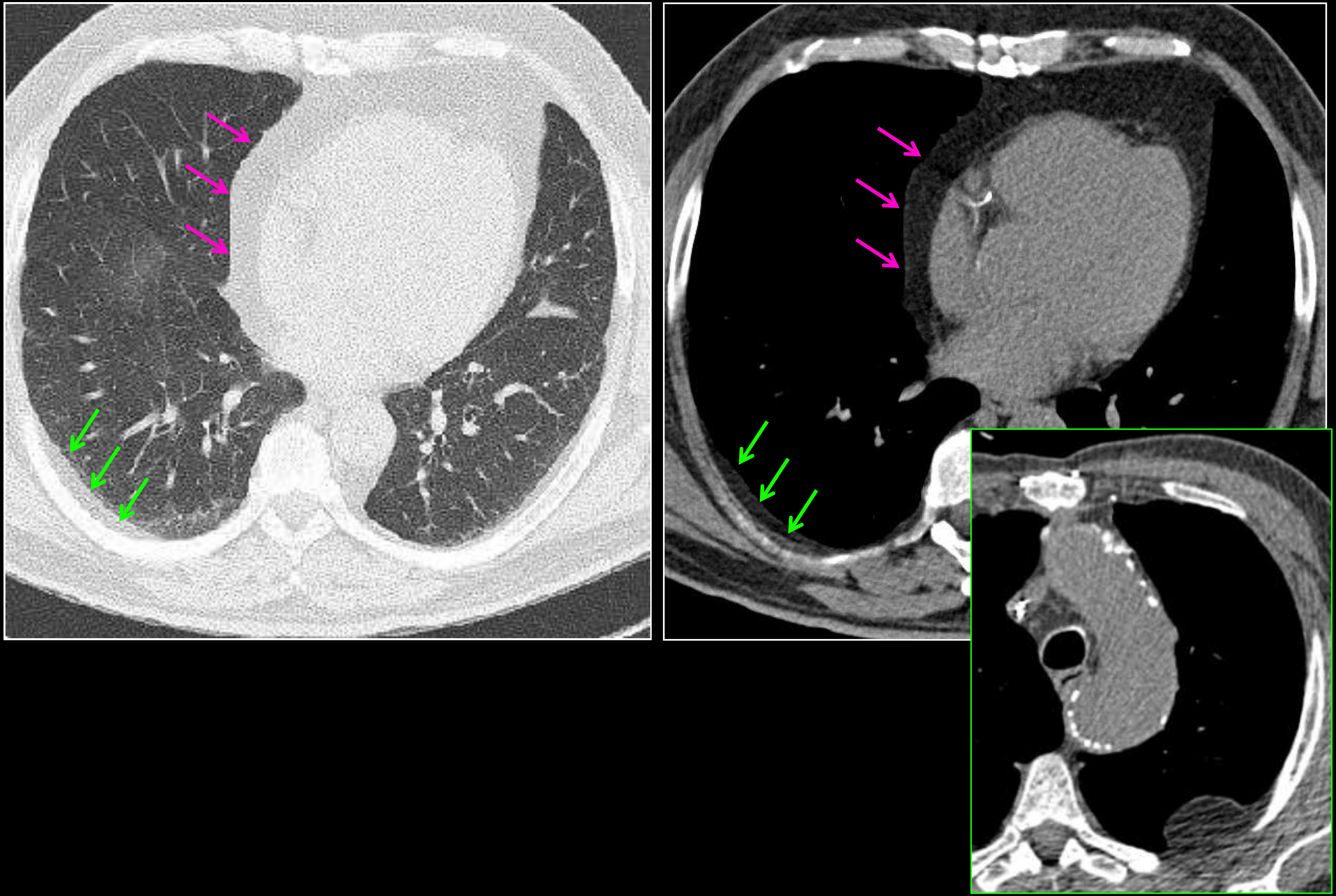
graisse extrapleurale

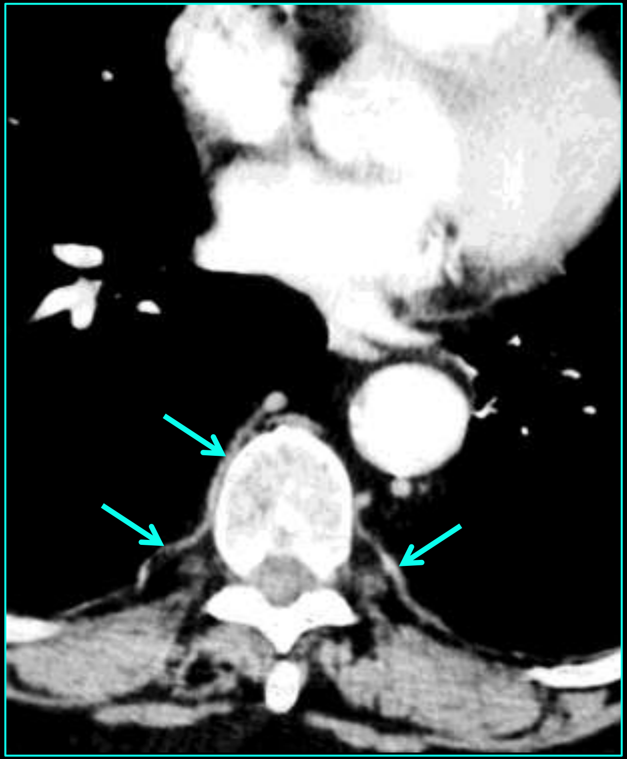
fascia endothoracique

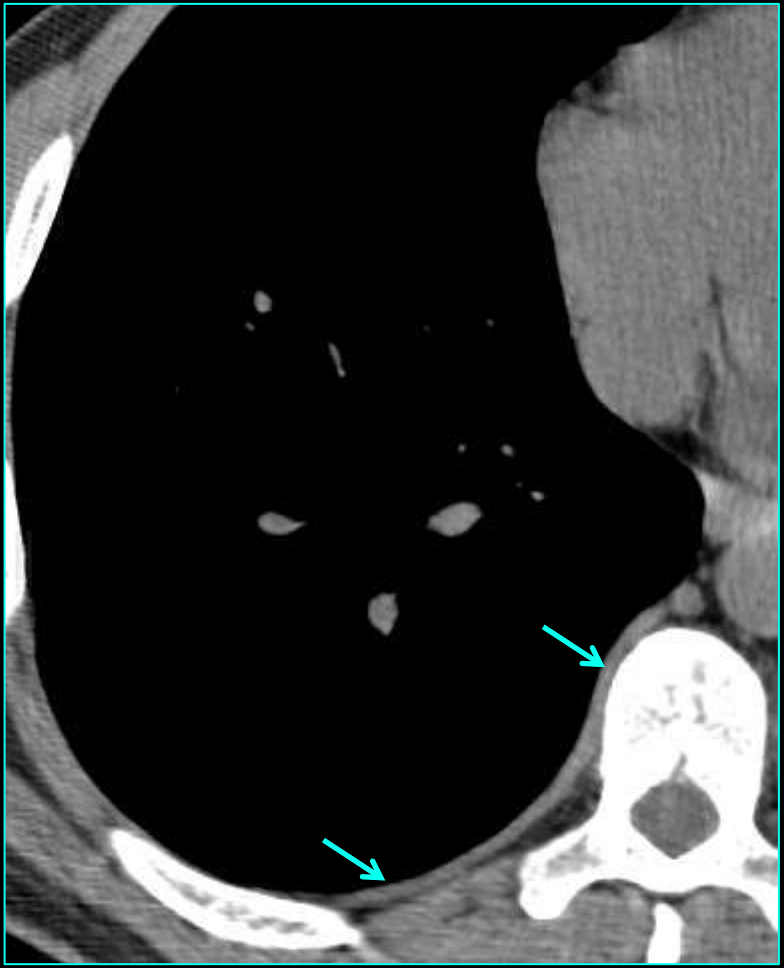

côtes
veine intercostale
vaisseaux mammaires internes
muscle transverse thoracique
plèvre
veine intercostale
muscle intercostal interne
muscle sous costal
muscles intercostaux

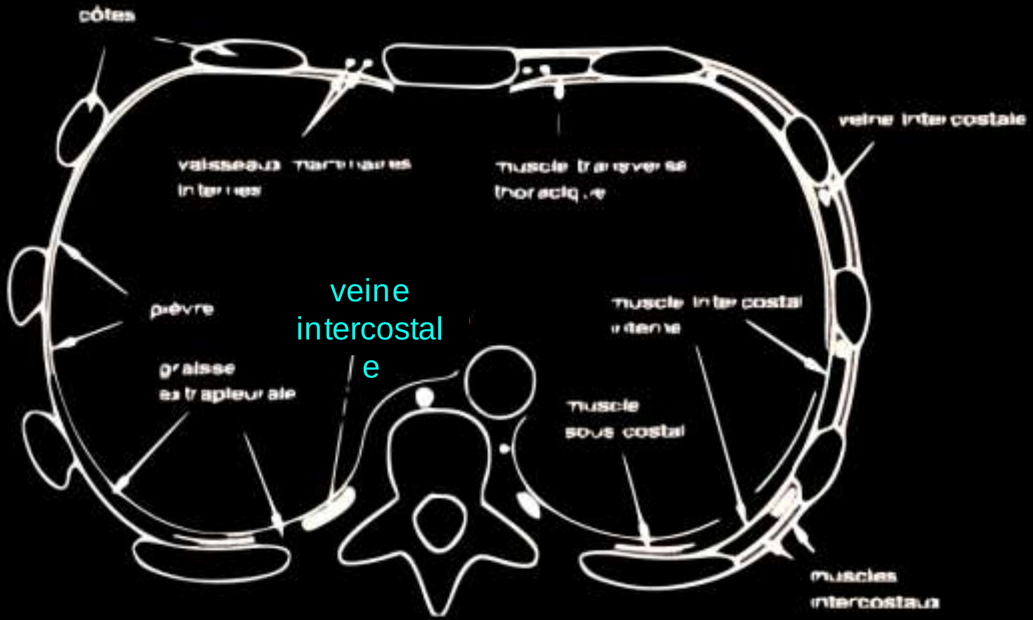
graisse extrapleurale

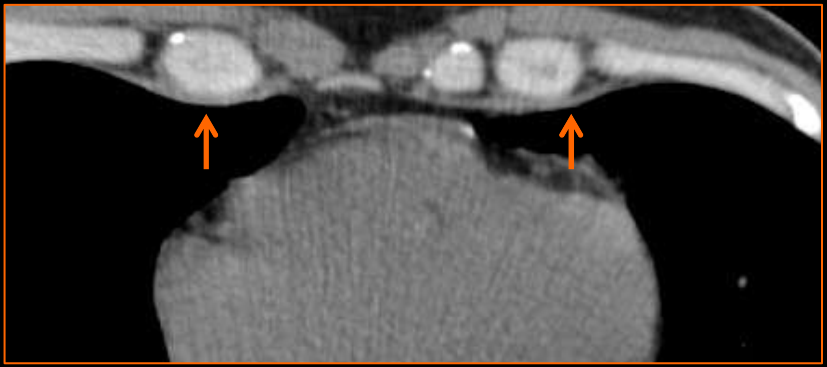
Graisse extrapleurale et mediastinale normale



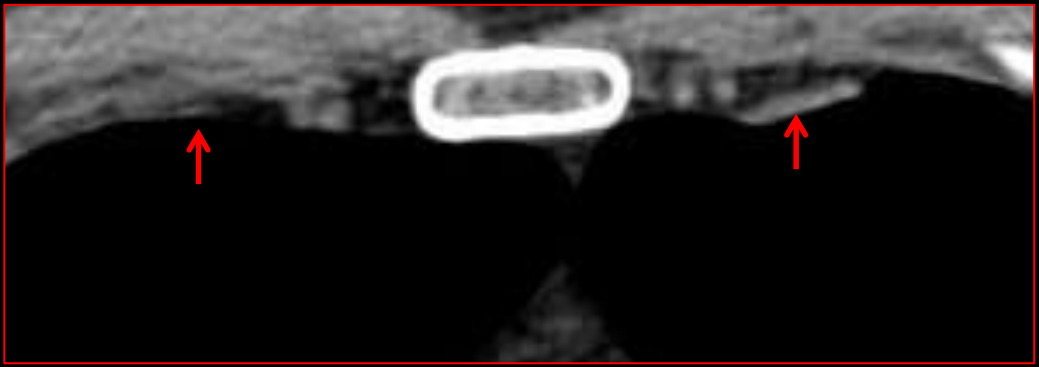




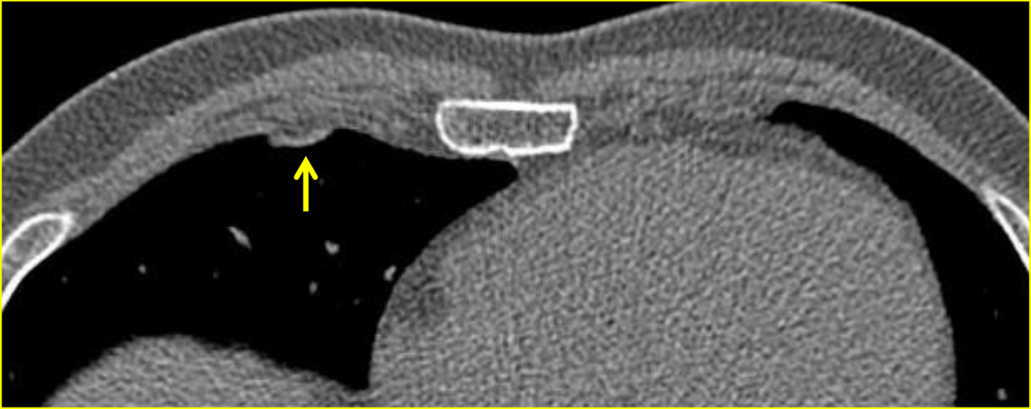

côtes
vaisseaux mammaires internes
muscle transverse thoracique
veine intercostale
plèvre
graisse extrapleurale
veine intercostale
muscle intercostal interne
muscle sous costal
muscles intercostaux



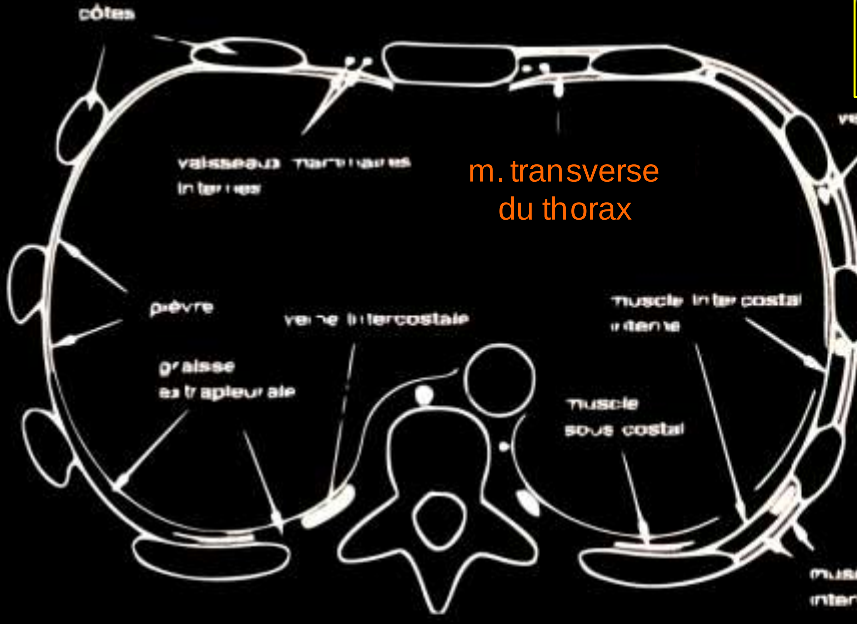
symétrique



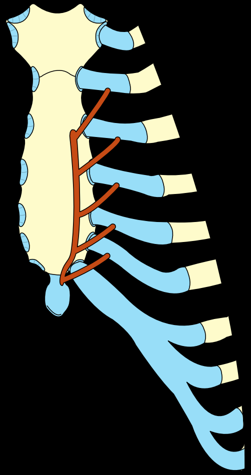
asymétrique



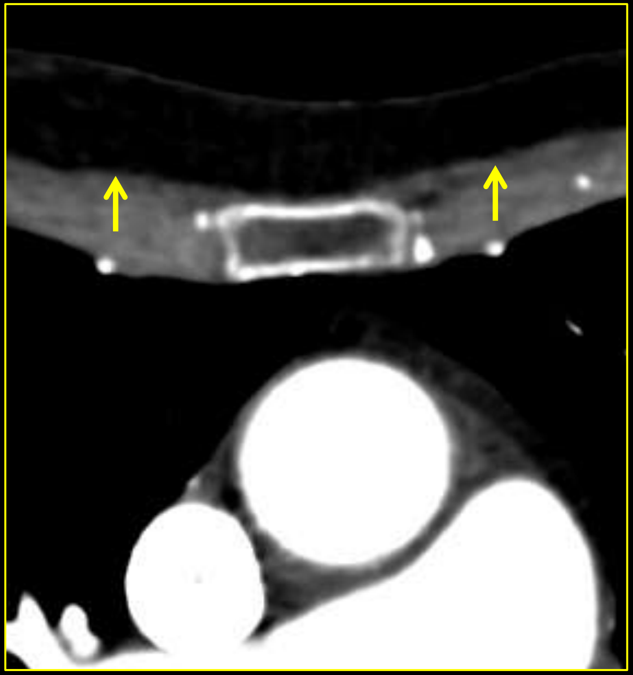
pseudo-plaque

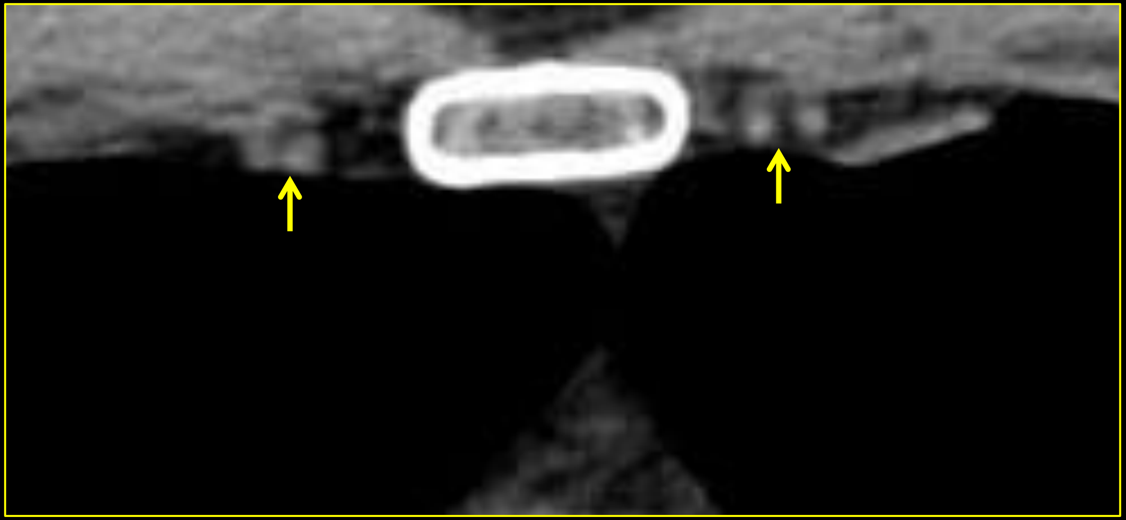

côtes
vaisseaux mammaires internes
veine inter costale
plèvre
veine intercostale
muscle inter costal interne
graisse extrapleurale
muscle sous costal
muscles intercostaux

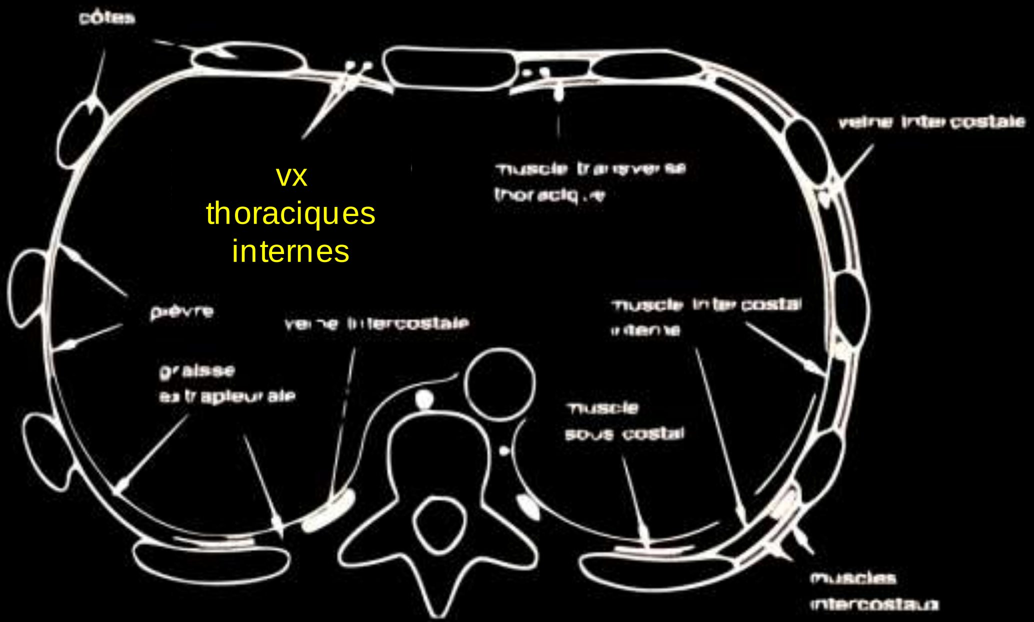
m. transverse du thorax

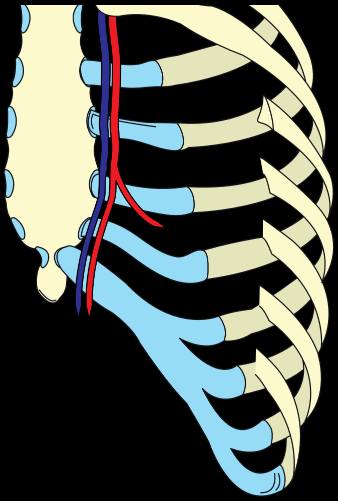


vue dorsale

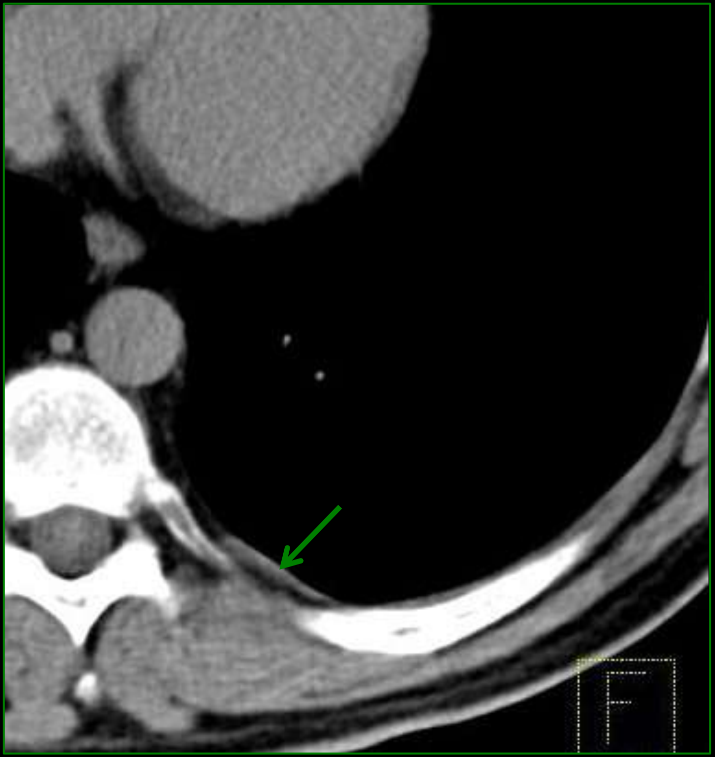





côtes
veine intercostale
vx thoraciques internes
muscle transverse thoracique
plèvre
veine intercostale
muscle intercostal interne
graisse extrapleurale
muscle sous costal
muscles intercostaux



vue dorsale



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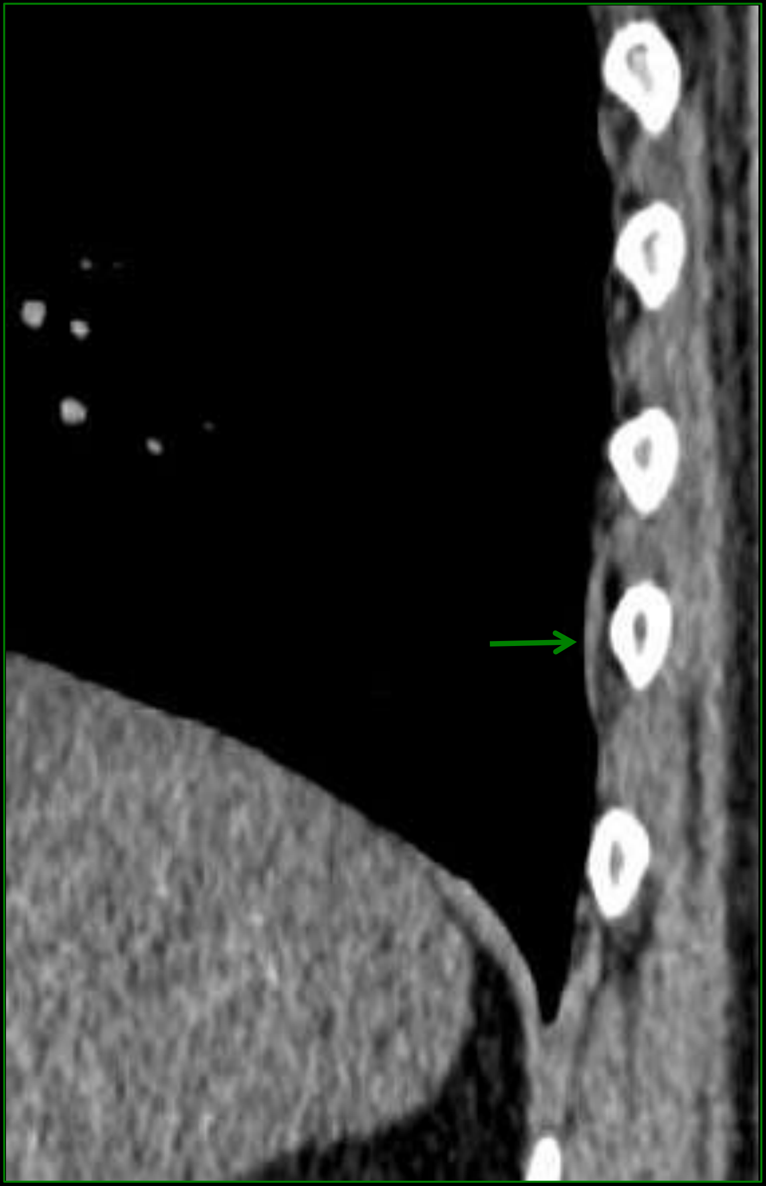
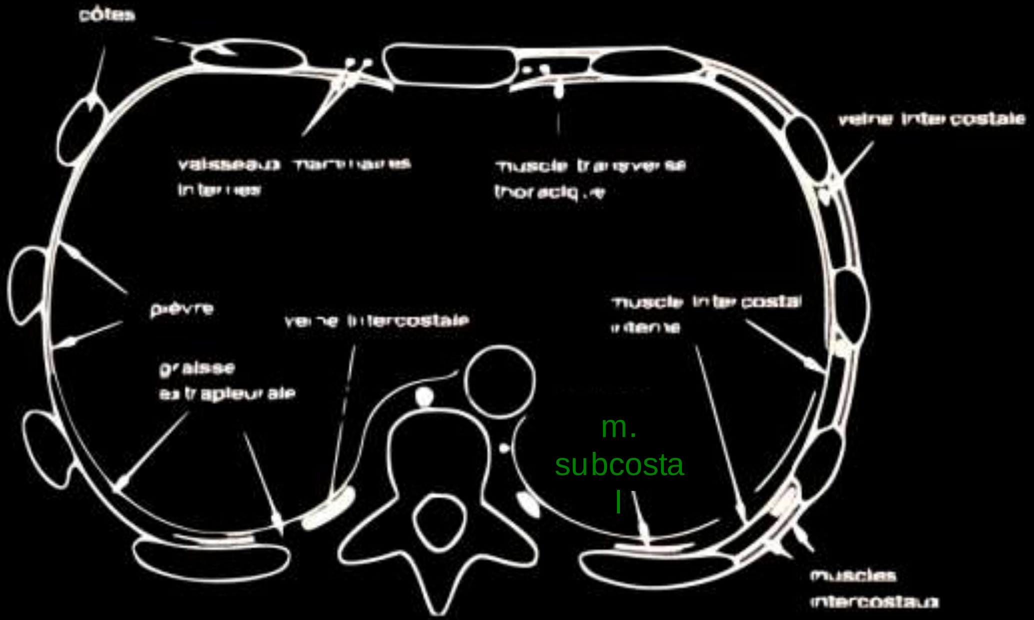
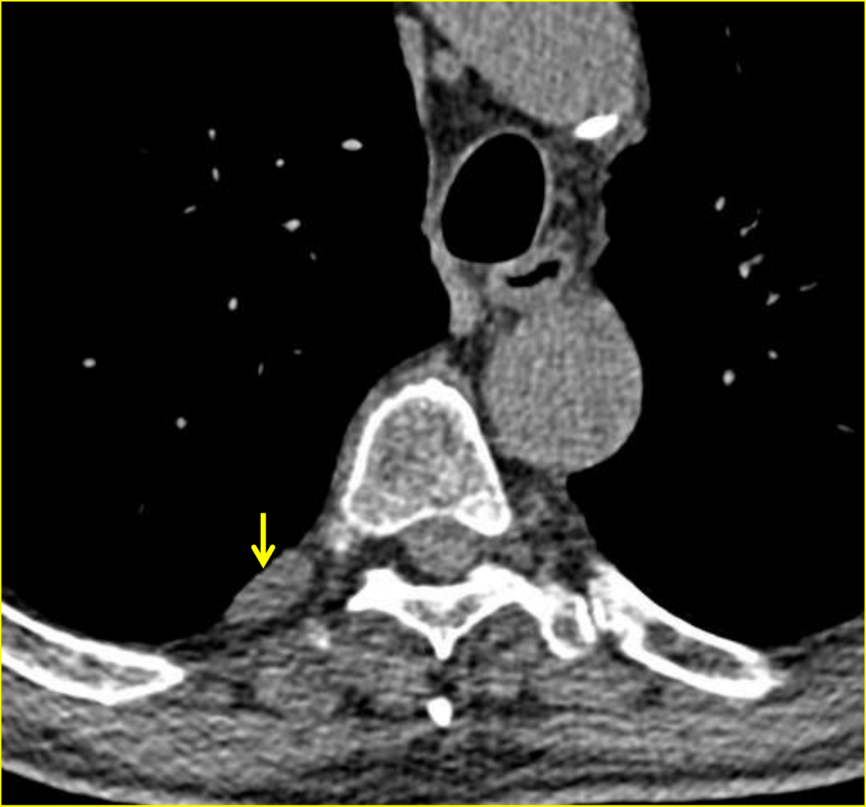
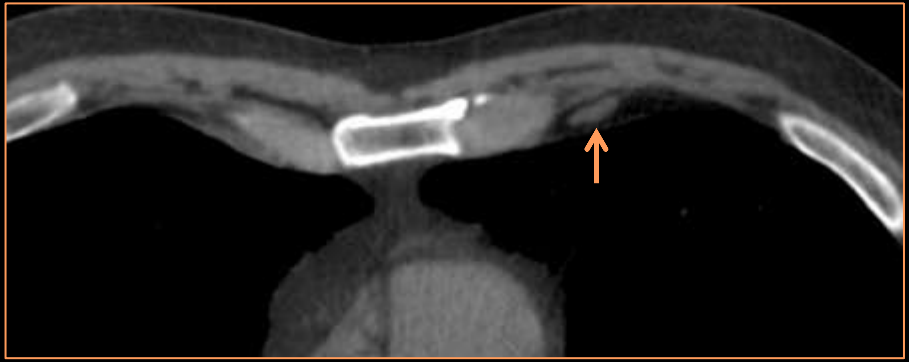




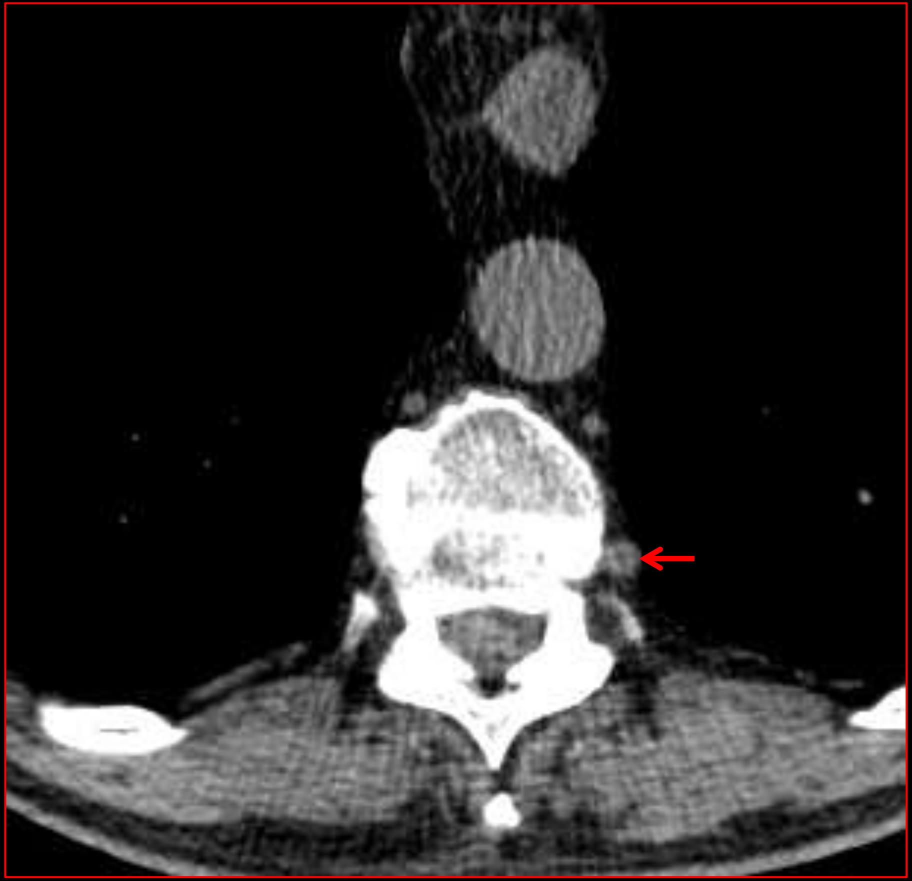
côtes
vaisseaux mammaires internes
muscle transverse thoracique
veine intercostale
plèvre
veine intercostale
muscle intercostal interne
graisse extrapleurale
m. subcostal
muscles intercostaux



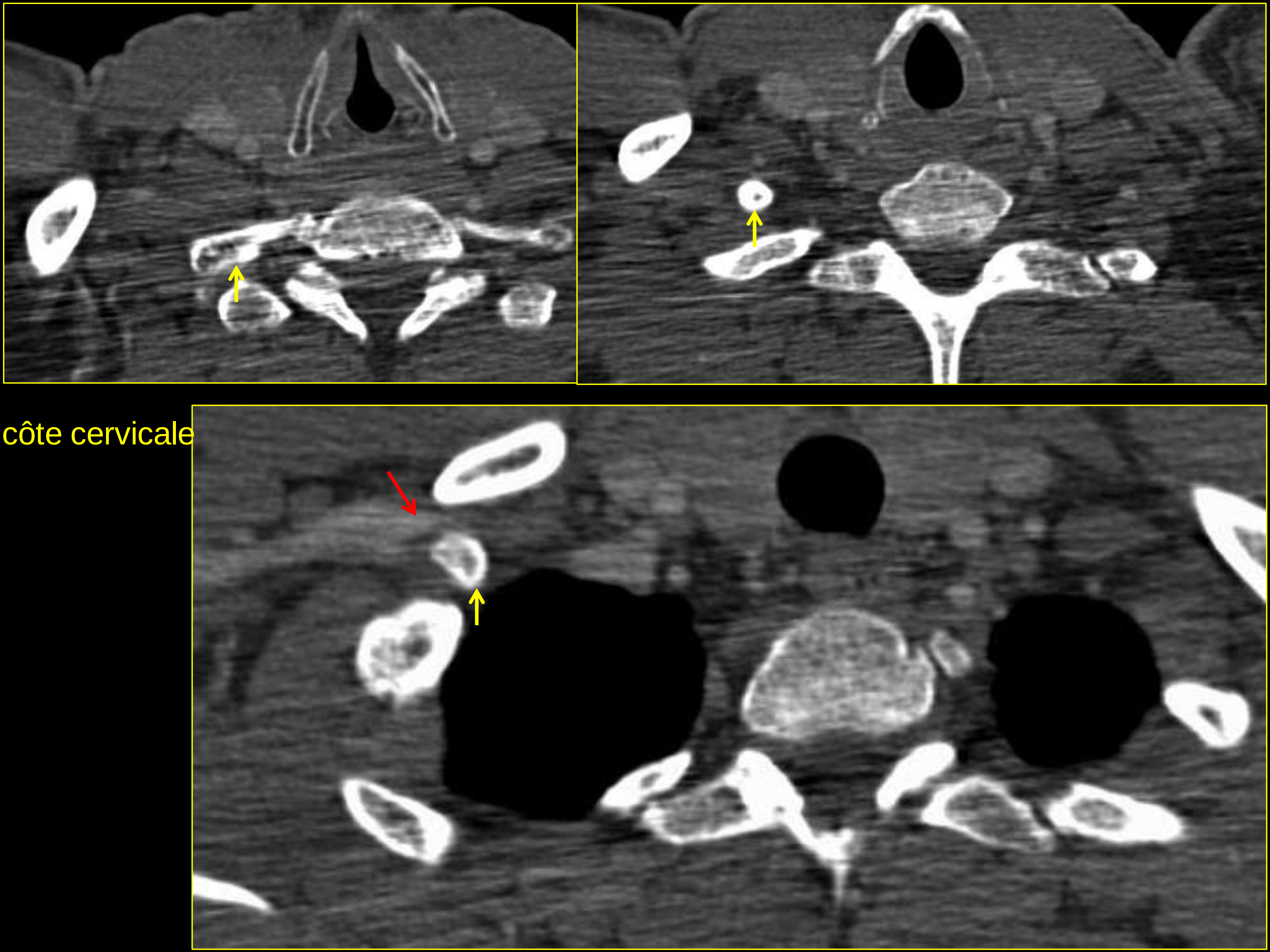
œud lymphatique intercostal postérieur



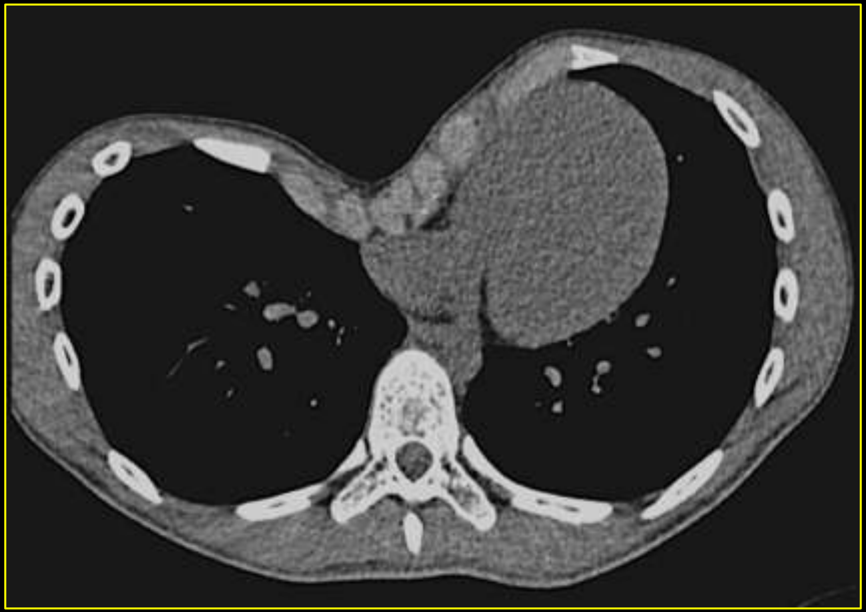
nœud lymphatique thoracique interne

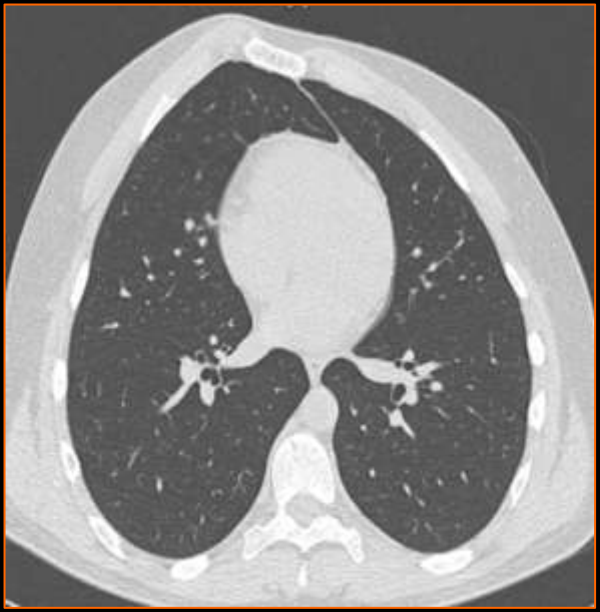


nœud lymphatique latéro-vertébral



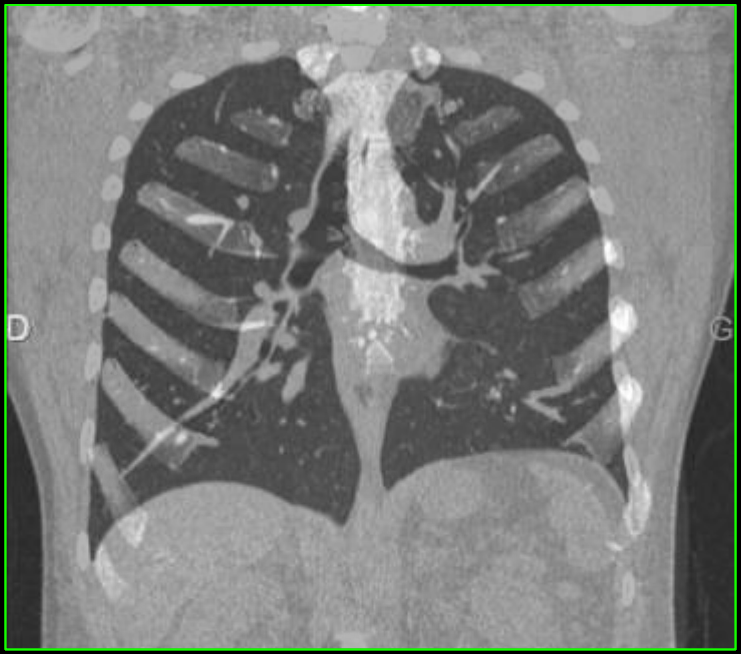
côte cervicale



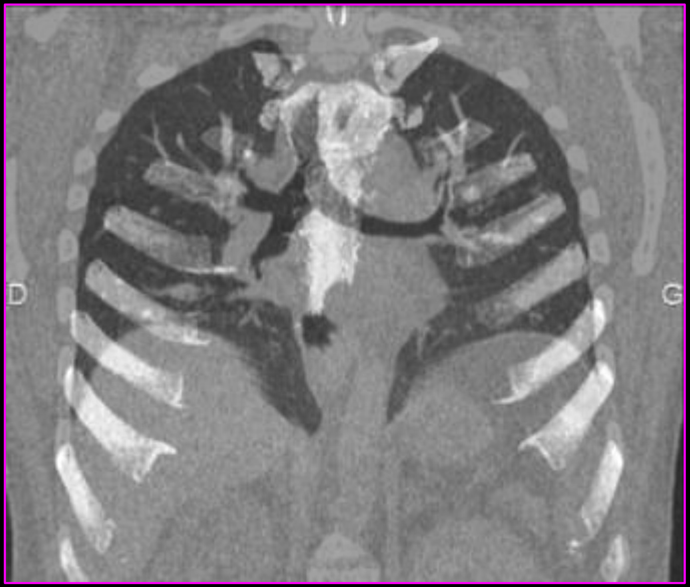


pectus excavatum

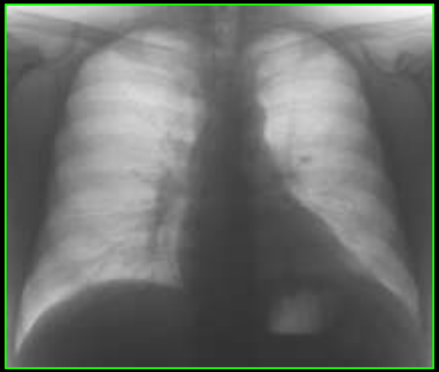
thorax en carène

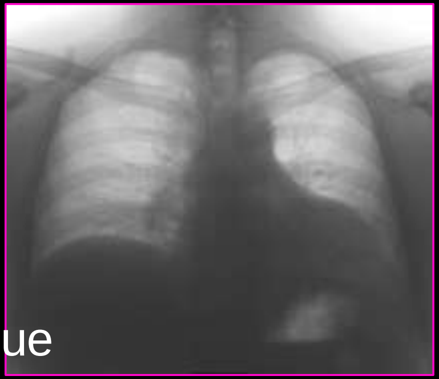


inspiration

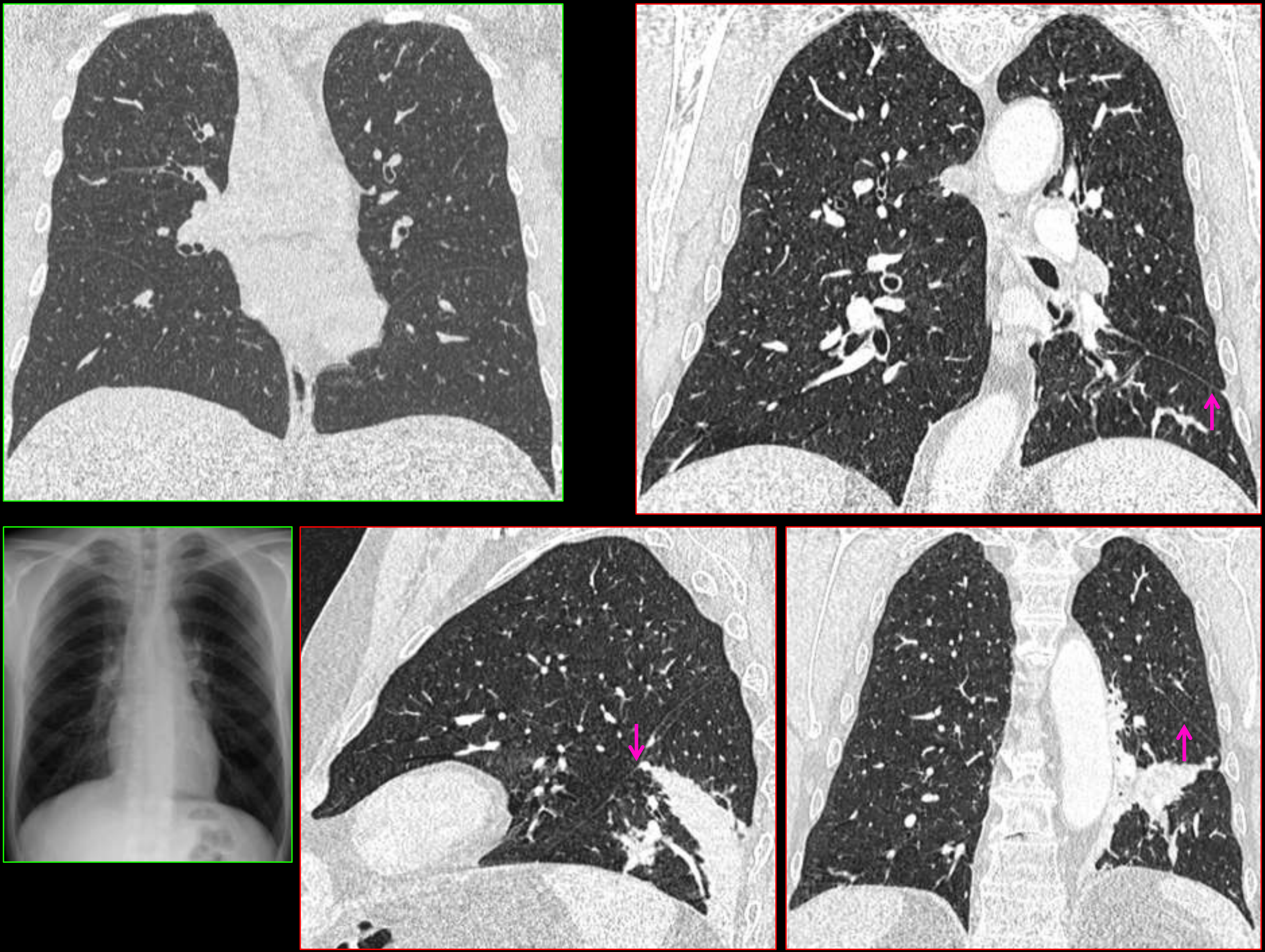


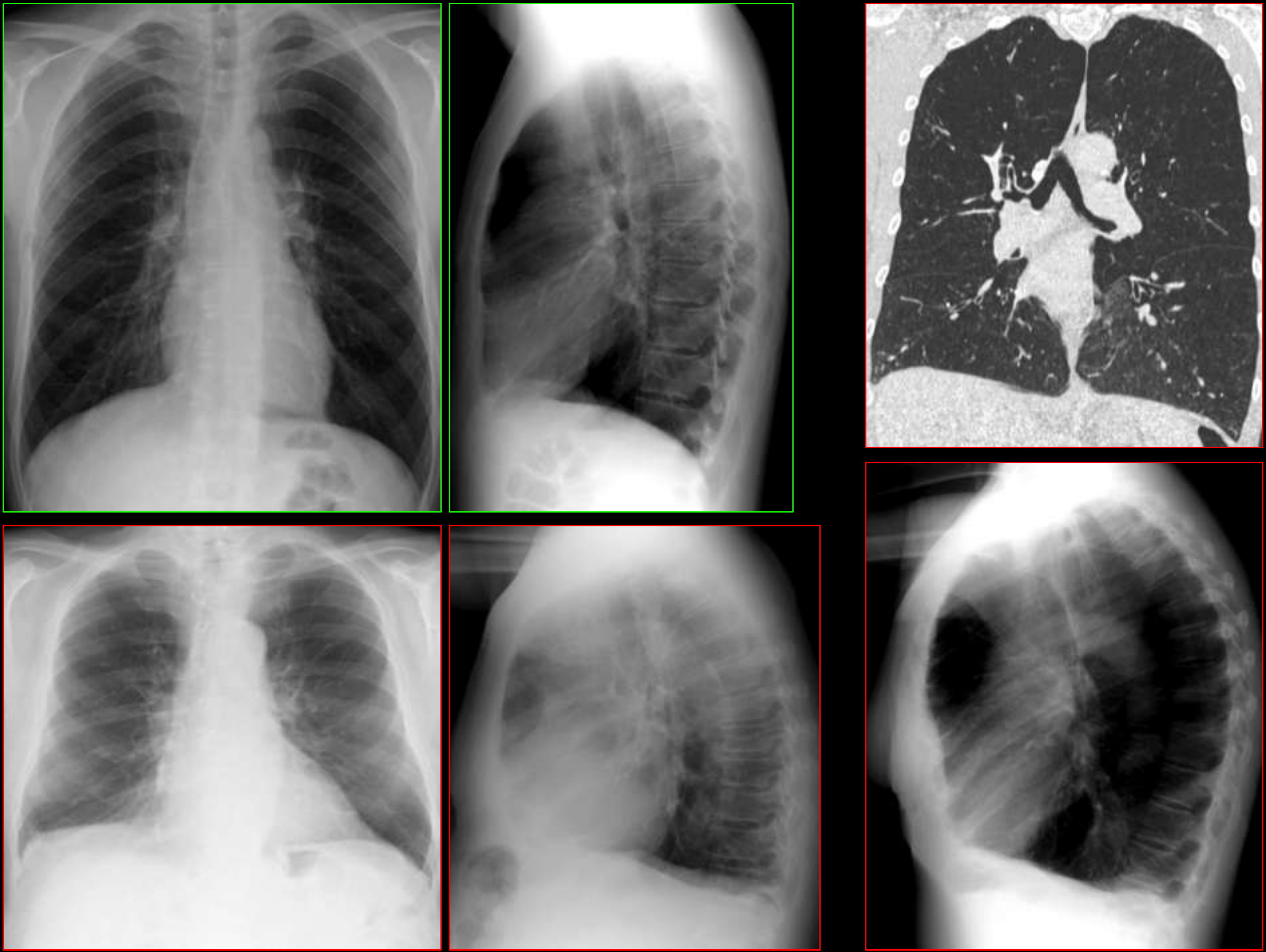
expiration



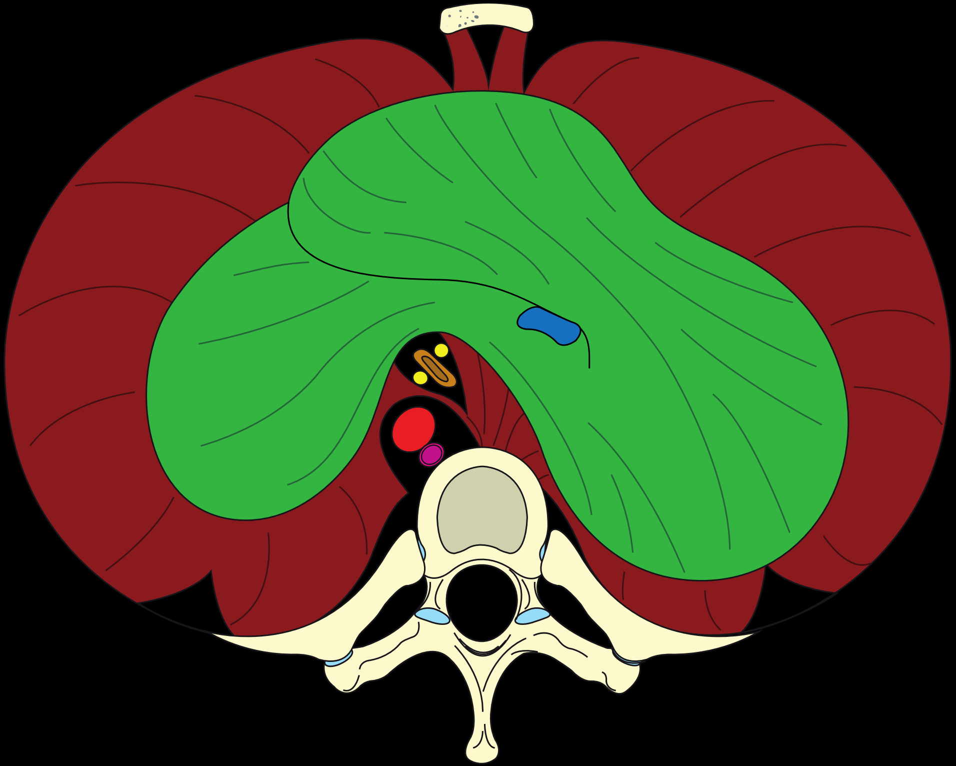


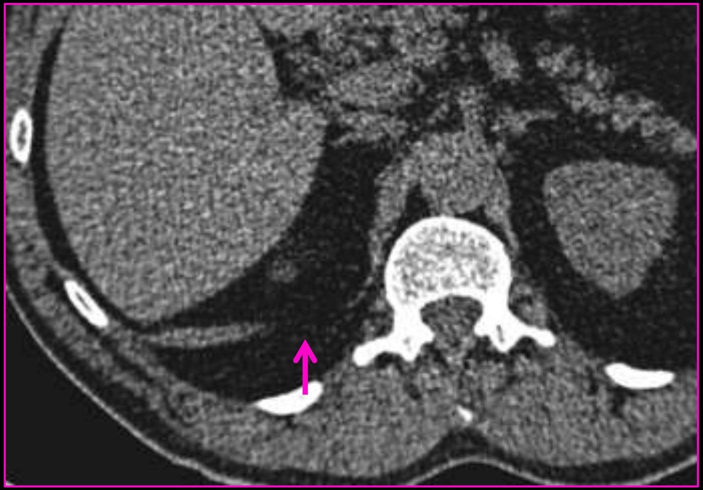
paralysie diaphragmatique

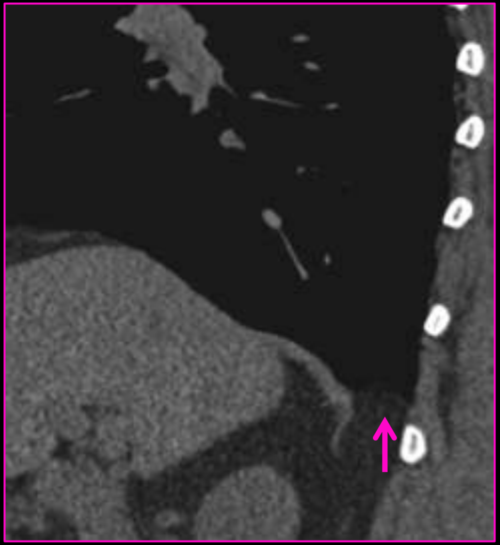


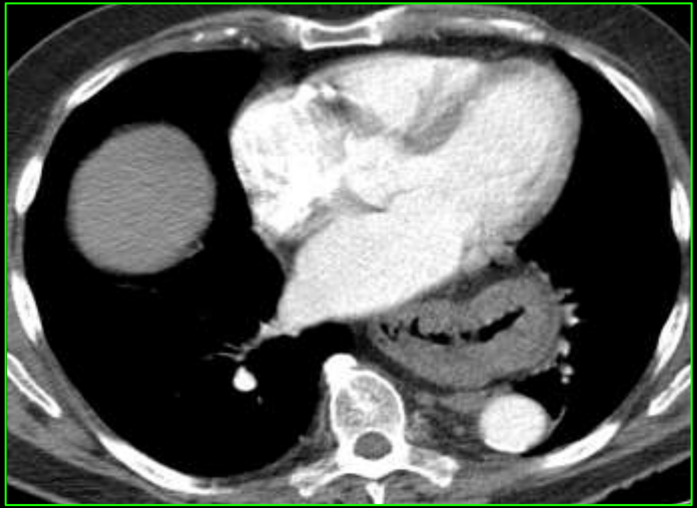


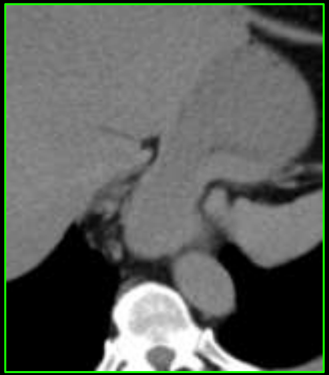
Hernie diaphragmatique











Congénitale	antérieure
	postérieure
Acquise	traumatique
	hiatale