

Démarche clinique et Secteur respiratoire

NODULES ET MASSES PULMONAIRES

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NODULE / MASSE / PSEUDO-NODULE

Définition: opacité pulmonaire focale, circonscrite, plus ou moins sphérique

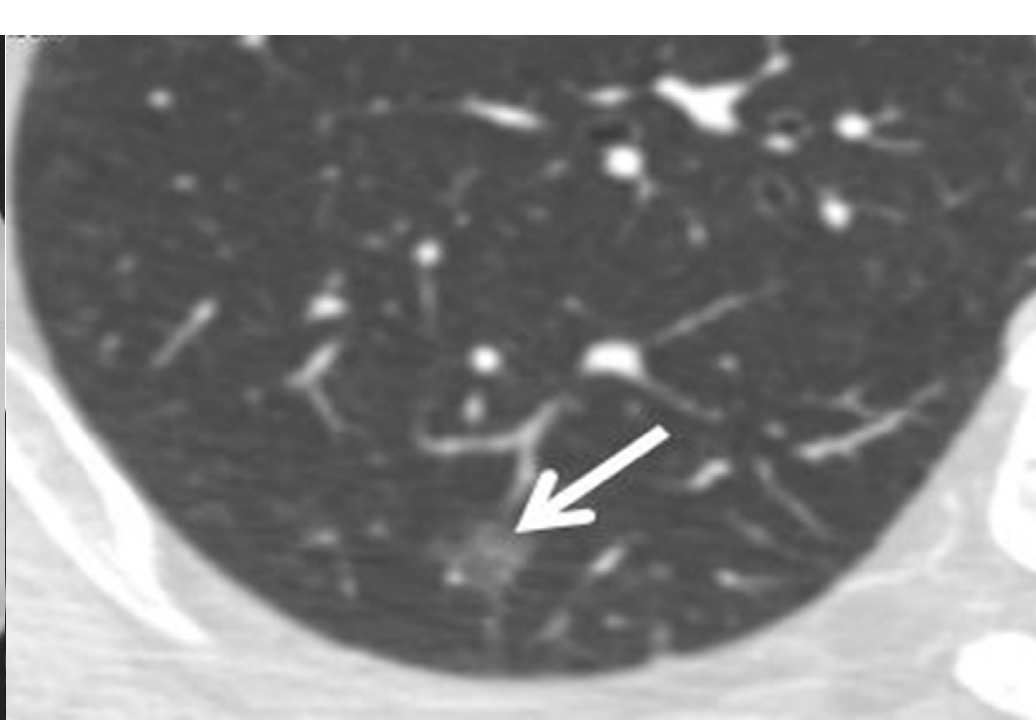
- Intra-pulmonaire
 - NODULE ($\leq 3\text{cm}$)
 - MASSE ($> 3\text{cm}$)
- Extra-pulmonaire - PSEUDO-NODULE

Nodule Pulmonaire: Définition

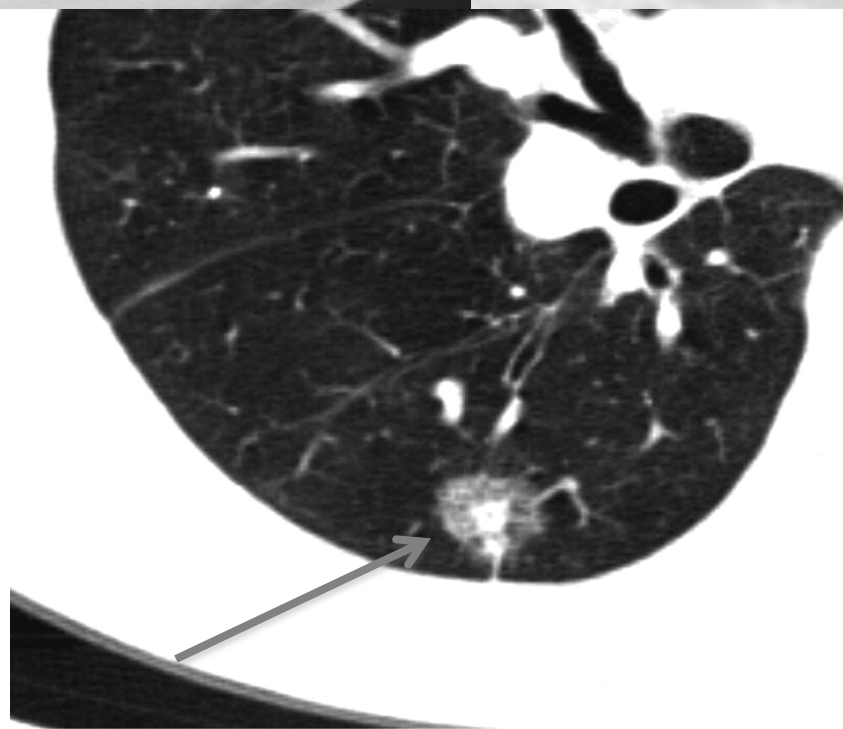
- Densité
- 3 catégories
 - Solide
 - Semi-solide
 - « verre dépoli »
- *Etude ELCAP (% cancer en fonction de la densité)*
- 7% nodules solides
- 18% nodules en « verre dépoli »
- 63% nodules semi-solides



Solid



Ground-glass



Semi-solid



MASSE (INTRA-) PULMONAIRE

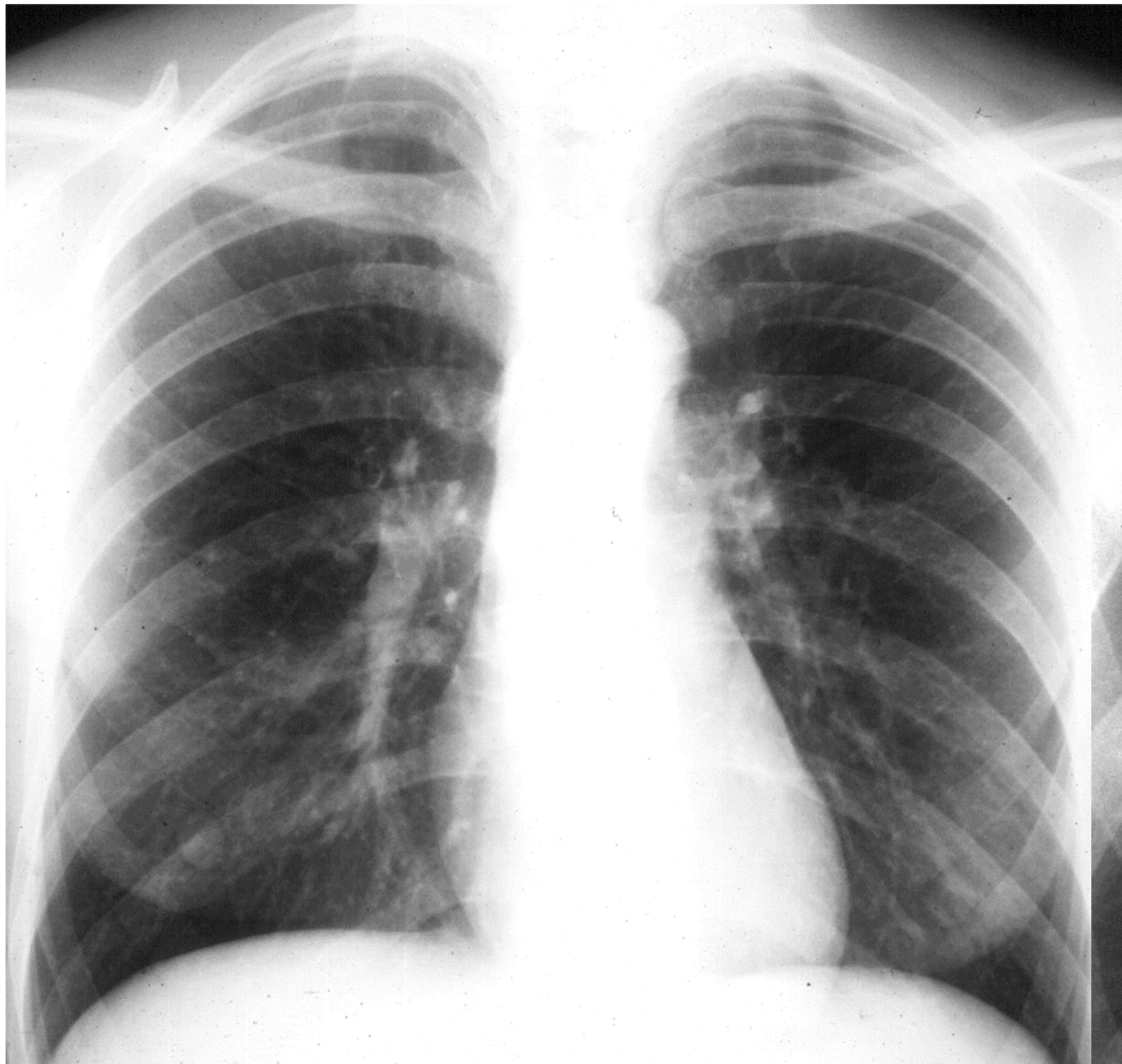
NODULE PULMONAIRE (**NP**)

- Découverte relativement fréquente :
3 à 4 observations / 100 examens **RT**
- Circonstance de découverte
 - fortuitement
 - dans un contexte clinique
(corrélations radio-cliniques)

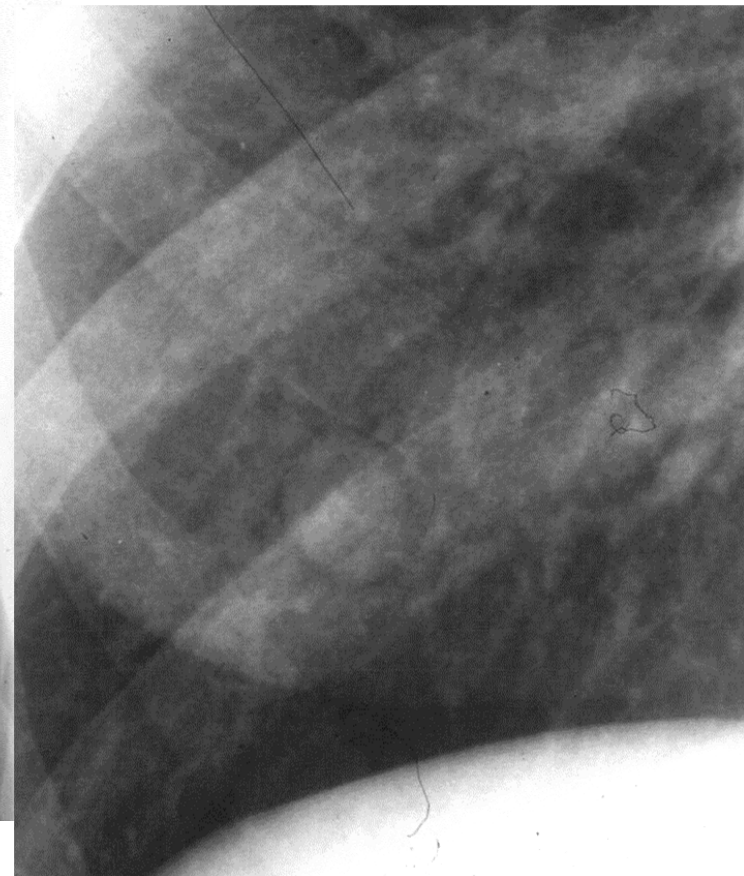
BENIN (60 %) et **MALIN** (40%)

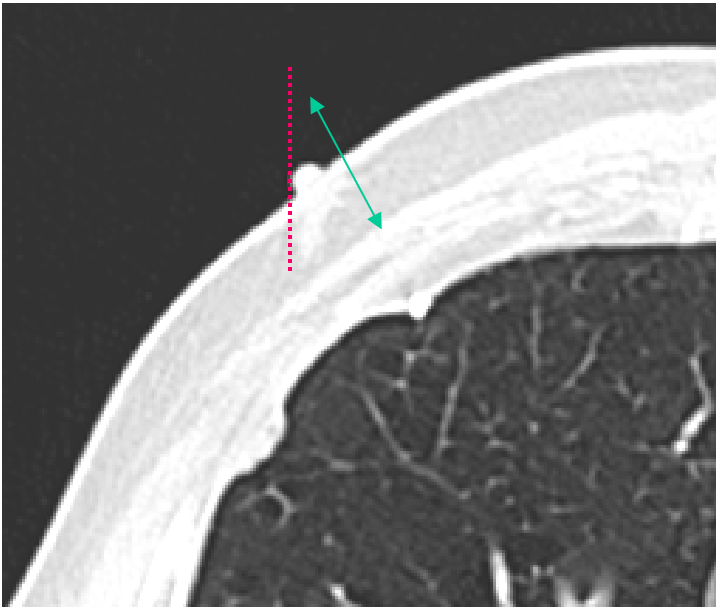
Sur Examen CT

- 50% des fumeurs ont au moins 1 nodule pulmonaire
- Nombre de nodules augmente avec les nouveaux CT
- 99% des nodules < 4 mm sont bénins



PSEUDO-NODULE
(mamelon)





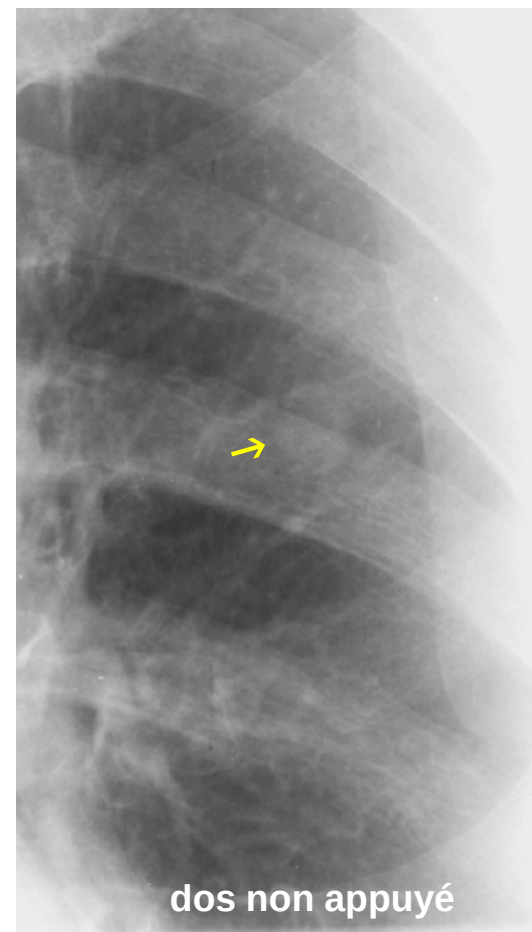
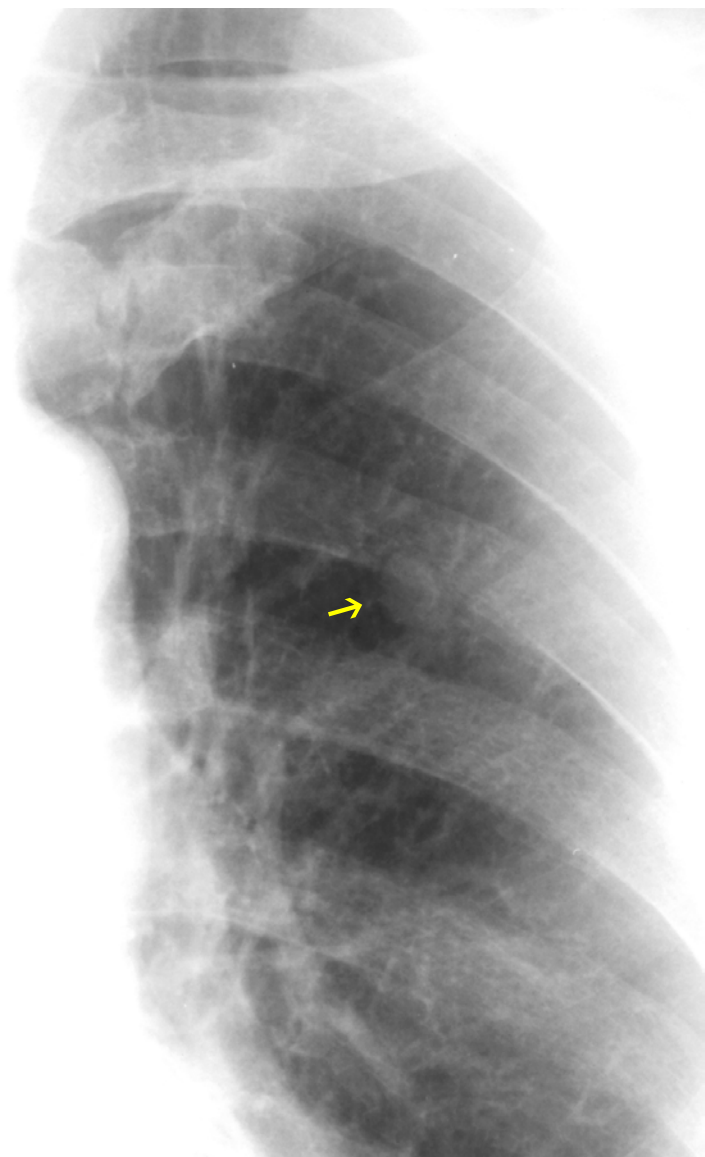
mamelon (pseudo-nodule)

 axe du mamelon
 tangence sur
 le contour
externe
 du mamelon

contours

- externe > net
- interne > flou

→ **signe du mamelon**



**NODULE
OU
PSEUDO-NODULE ?**

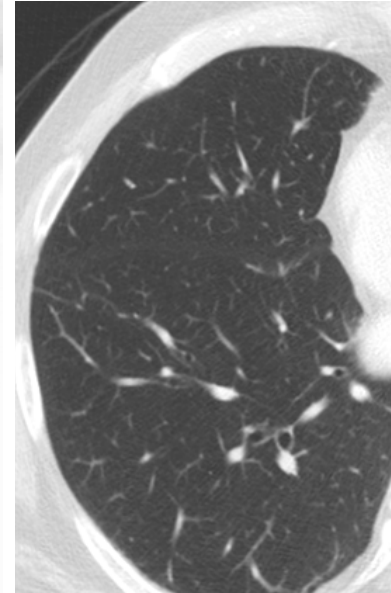


RADIOSCOPIE





10 ans auparavant



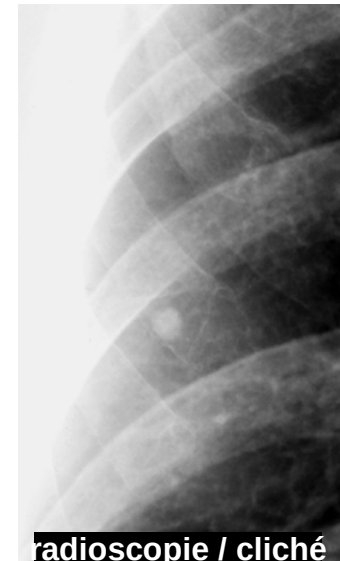
2 examens CT réalisés !!

respecter les algorithmes
diagnostiques diminue les
faux + et les investigations
inutiles.

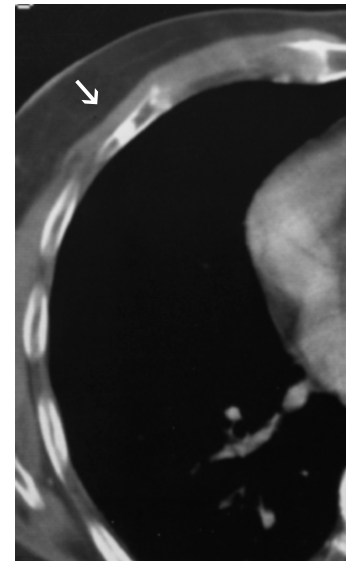
pseudo-nodule costal
(îlot osseux compact banal)

EXAMEN COMPLEMENTAIRE INITIAL = RADIOSCOPIE

15 à 20% des "nodules" sont en réalité
des **pseudo-nodules**

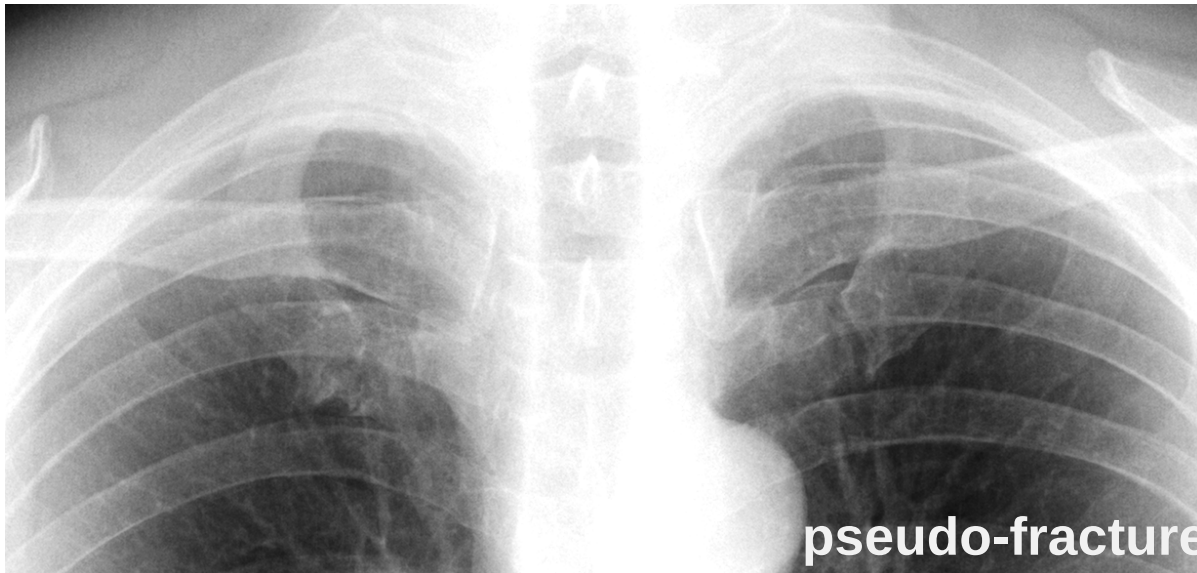


radioscopie / cliché

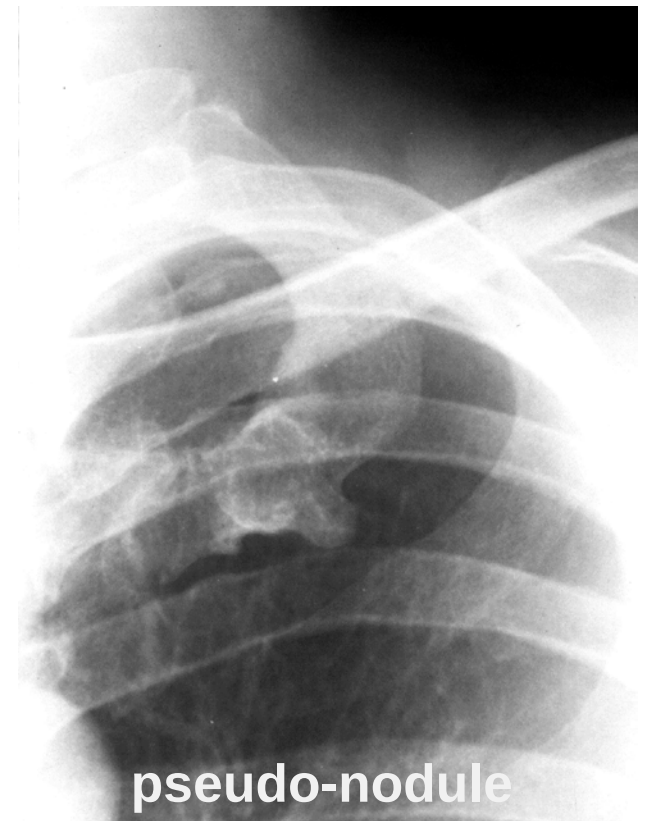




**calcification du cartilage
des 1ères côtes**



pseudo-fracture



pseudo-nodule

**calcifications des
cartilages costaux**

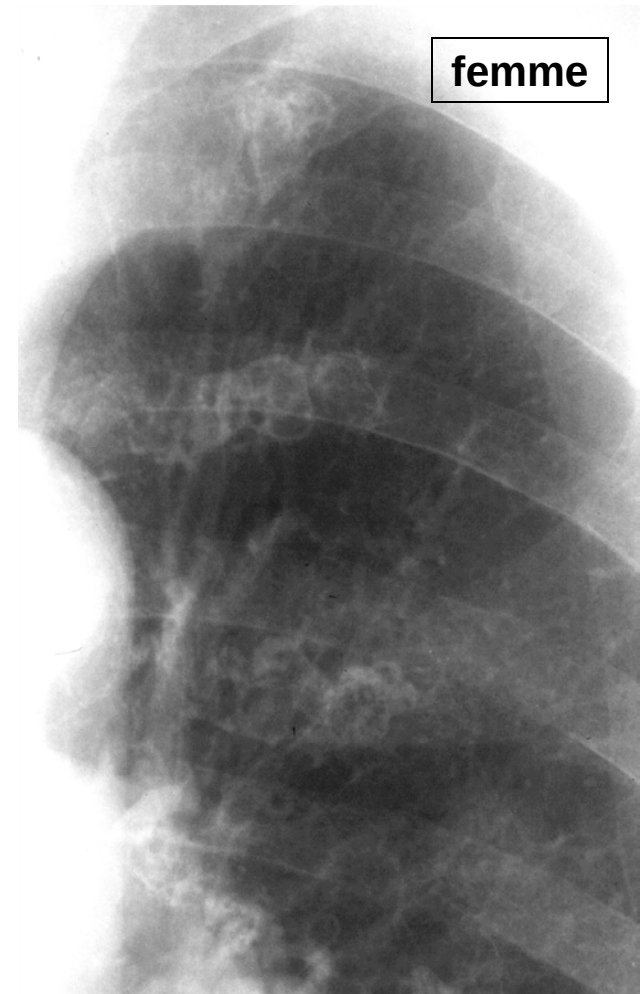
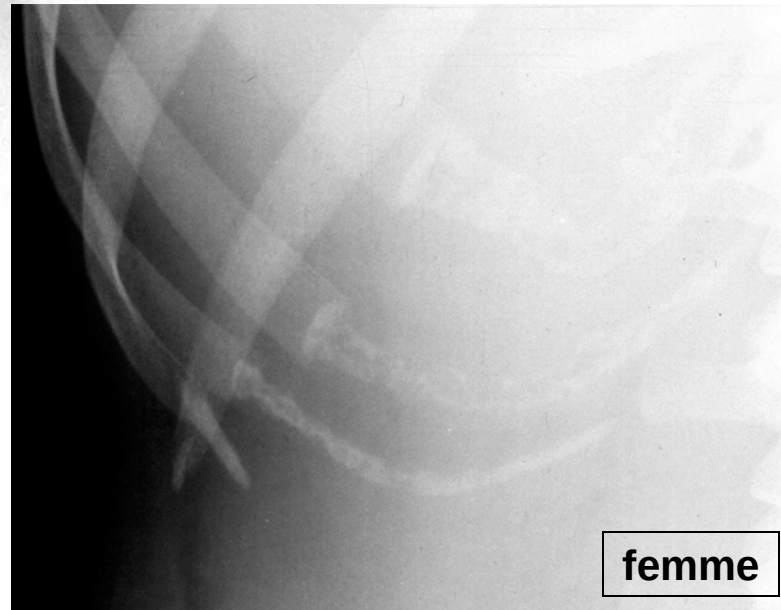
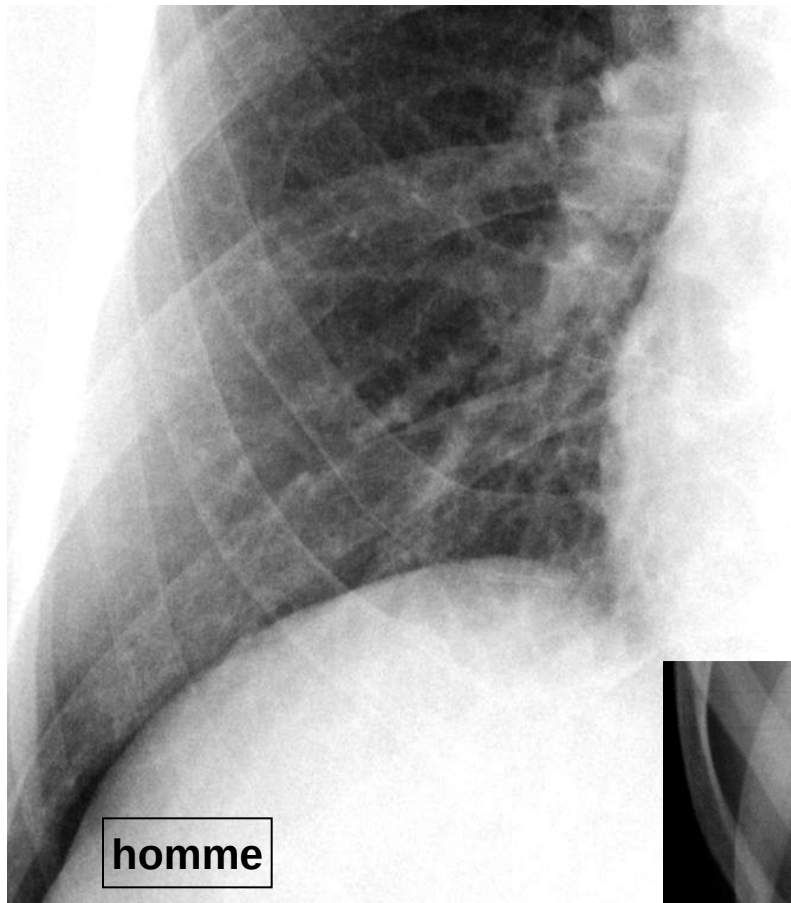
**centrales
annulaires**

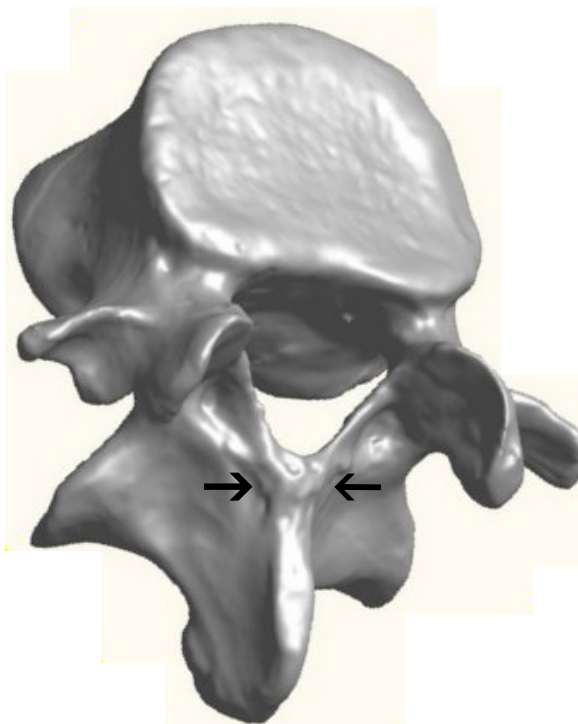
homme

femme

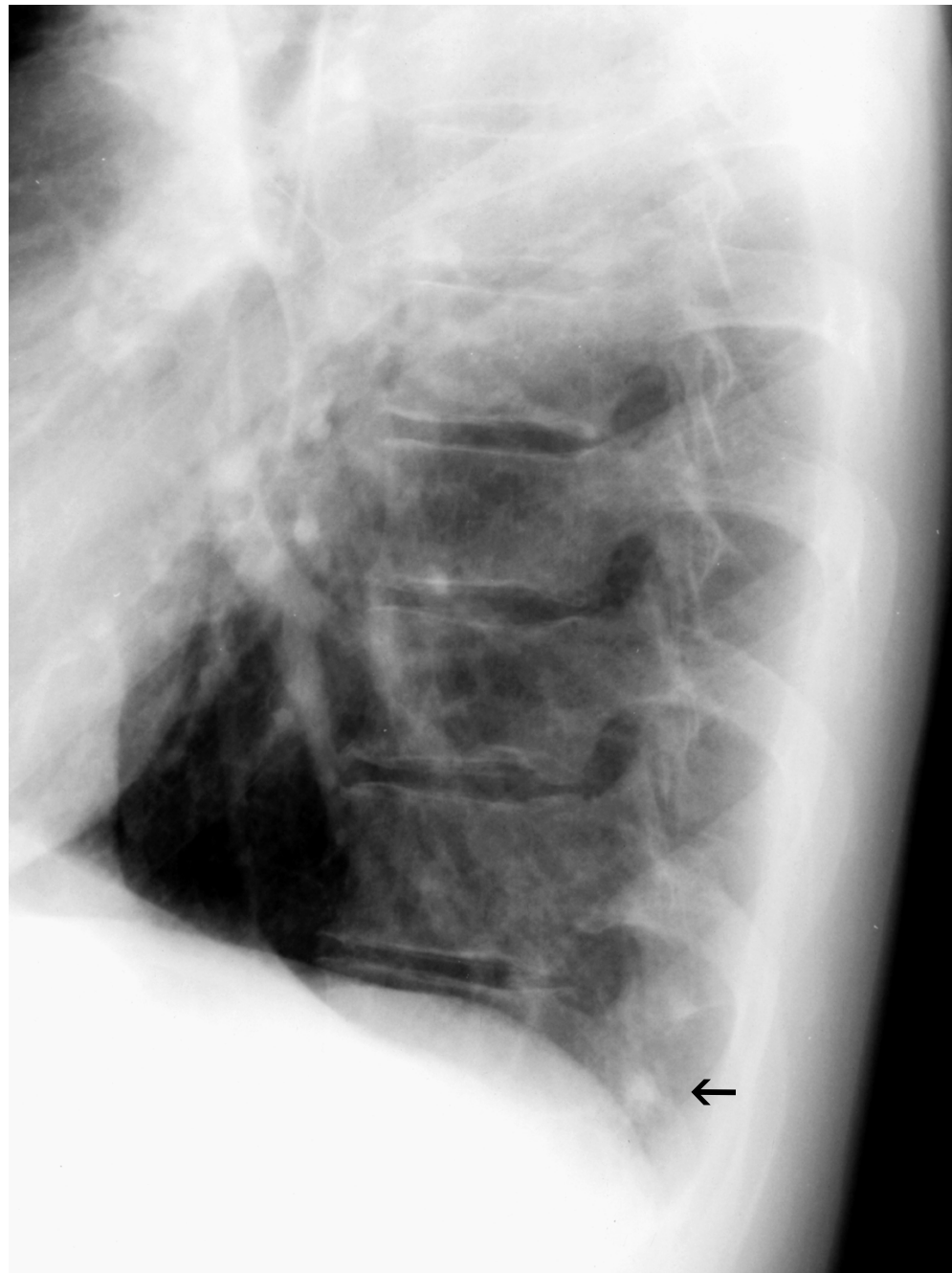
femme

sexe et cartilages costaux





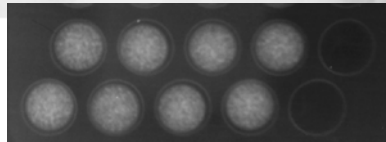
**pseudo-nodule vertébral (70%)
(D11 / D12 / L1)**



superposition d'objets divers



comprimés



superposition d'objets divers



EVALUATION INITIALE D'UN NP

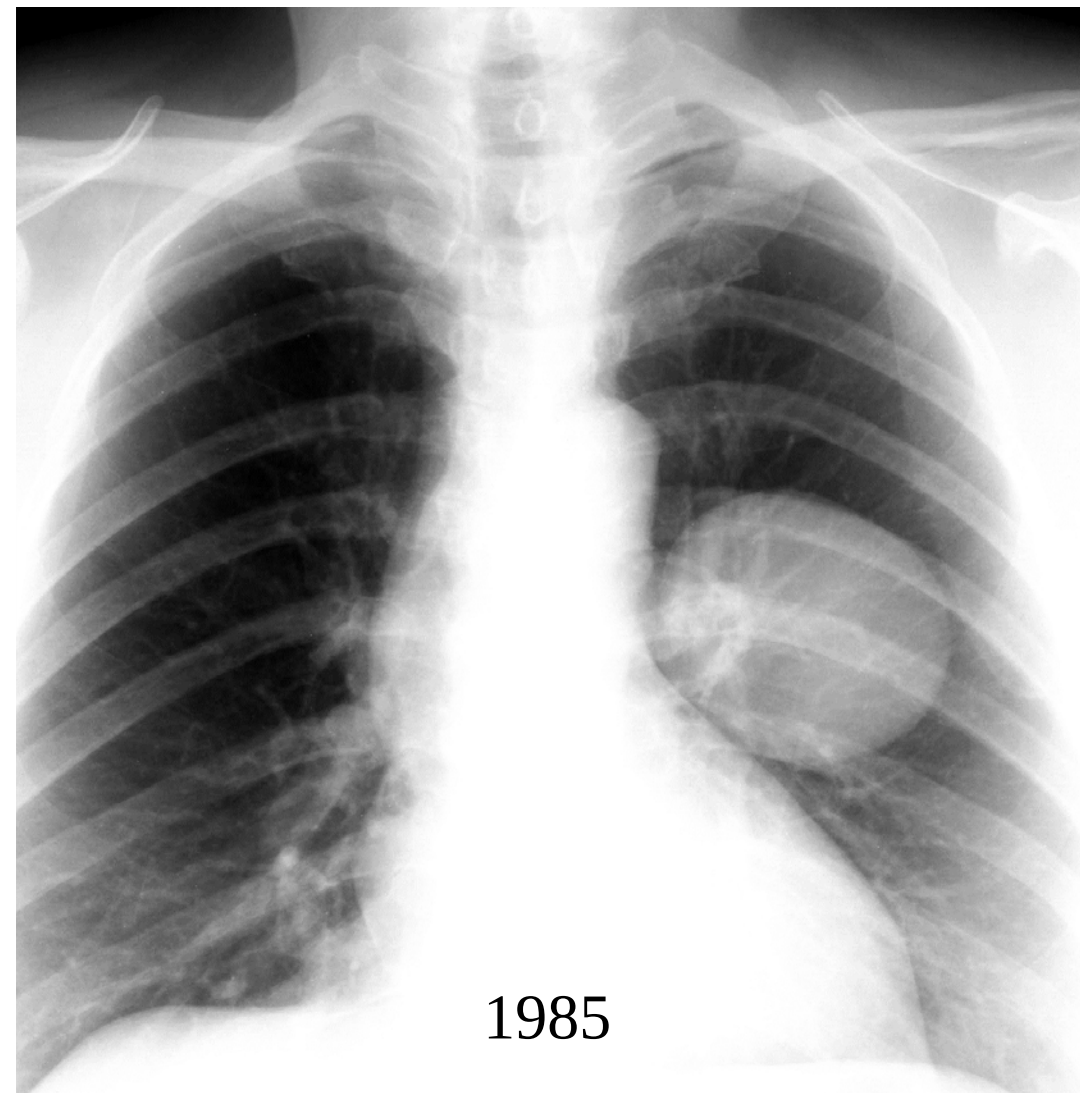
- NODULE (80 %) ou PSEUDO-NODULE (20 %)

➤ **RADIOSCOPIE** ⚡

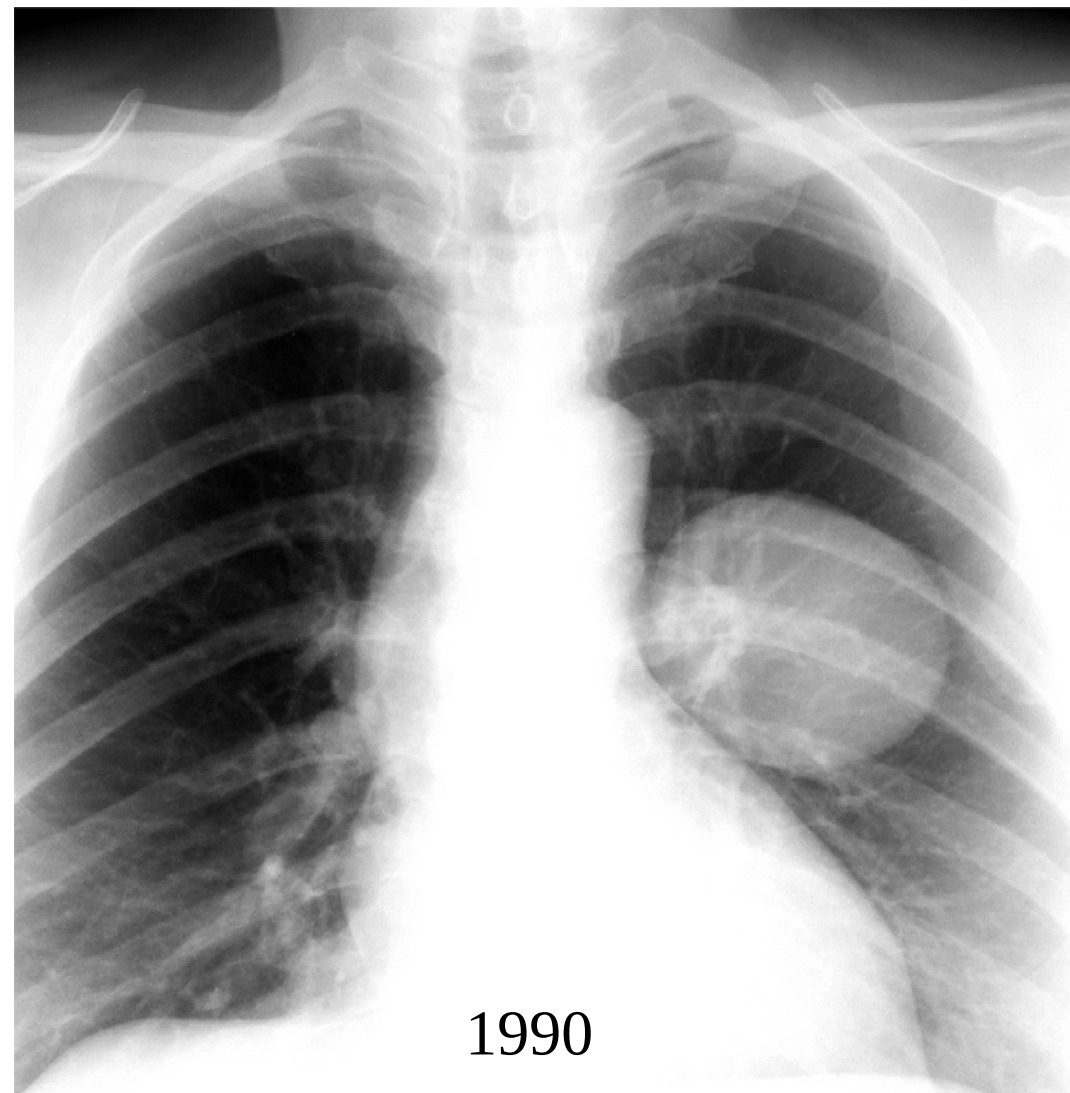
- NODULE : STABLE ? ou EVOLUTIF ?

➤ **COMPARAISON** ⚡

AVEC CLICHES
ANTERIEURS



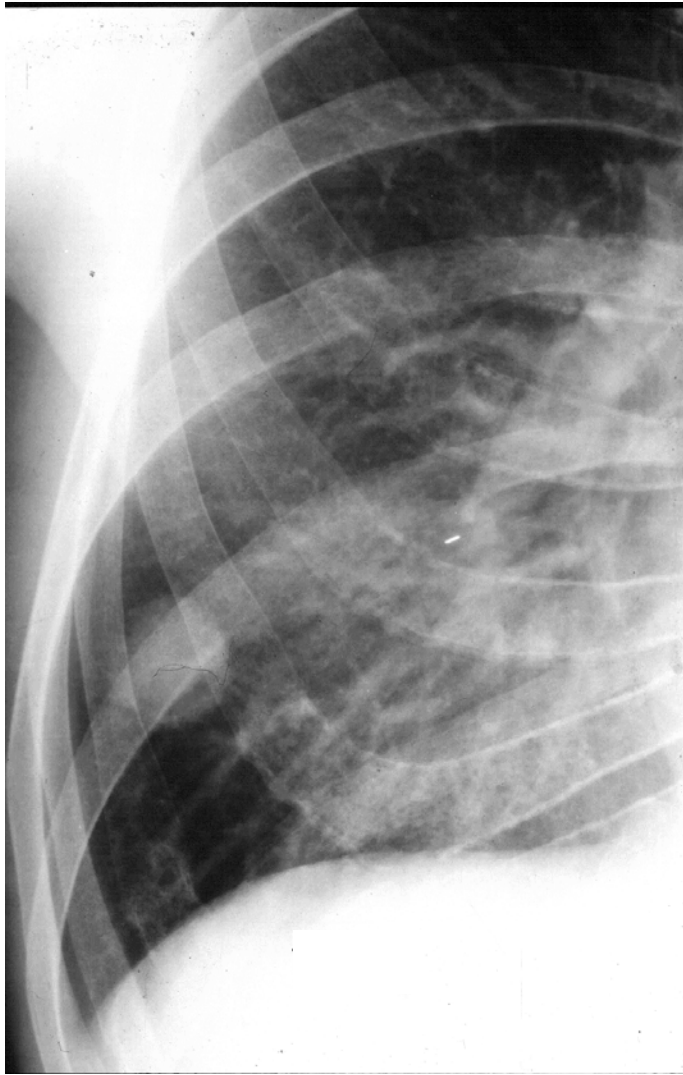
1985



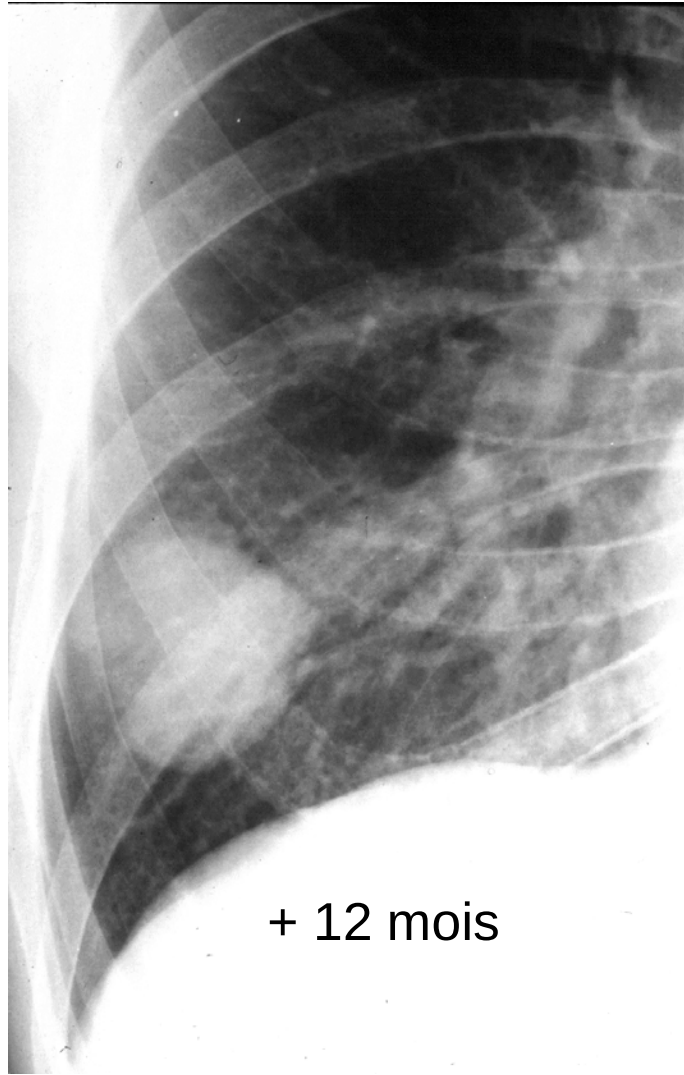
1990

LESION STABLE (HAMARTOME)

(≥ 2 années $\rightarrow$ lésion bénigne)

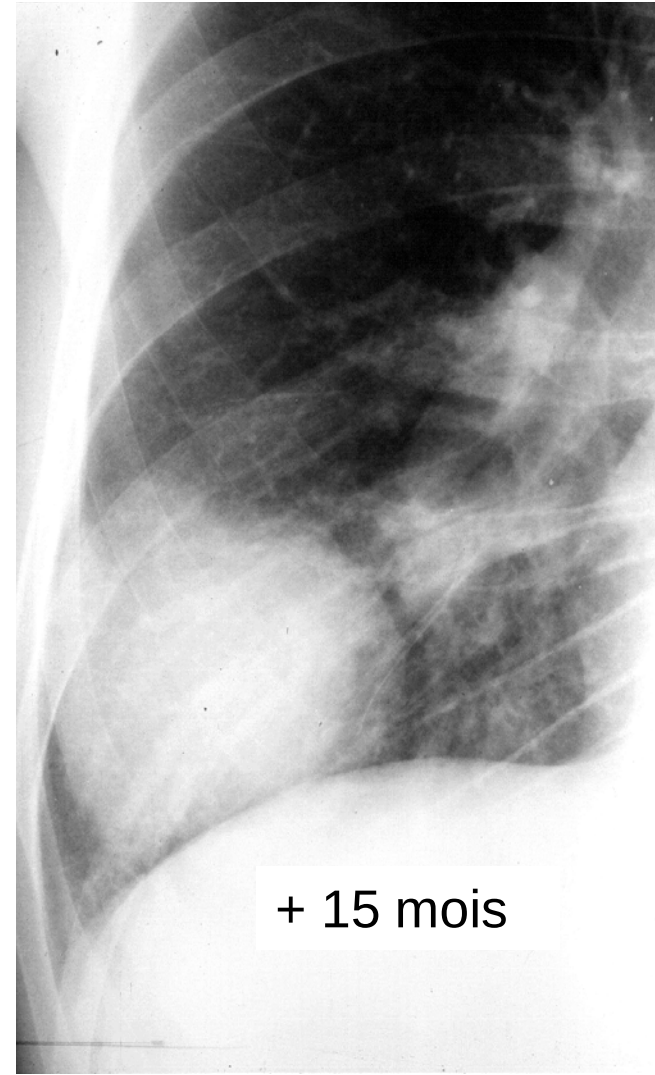


VOL : 7.2 cm³



+ 12 mois

58 cm³



+ 15 mois

195 cm³

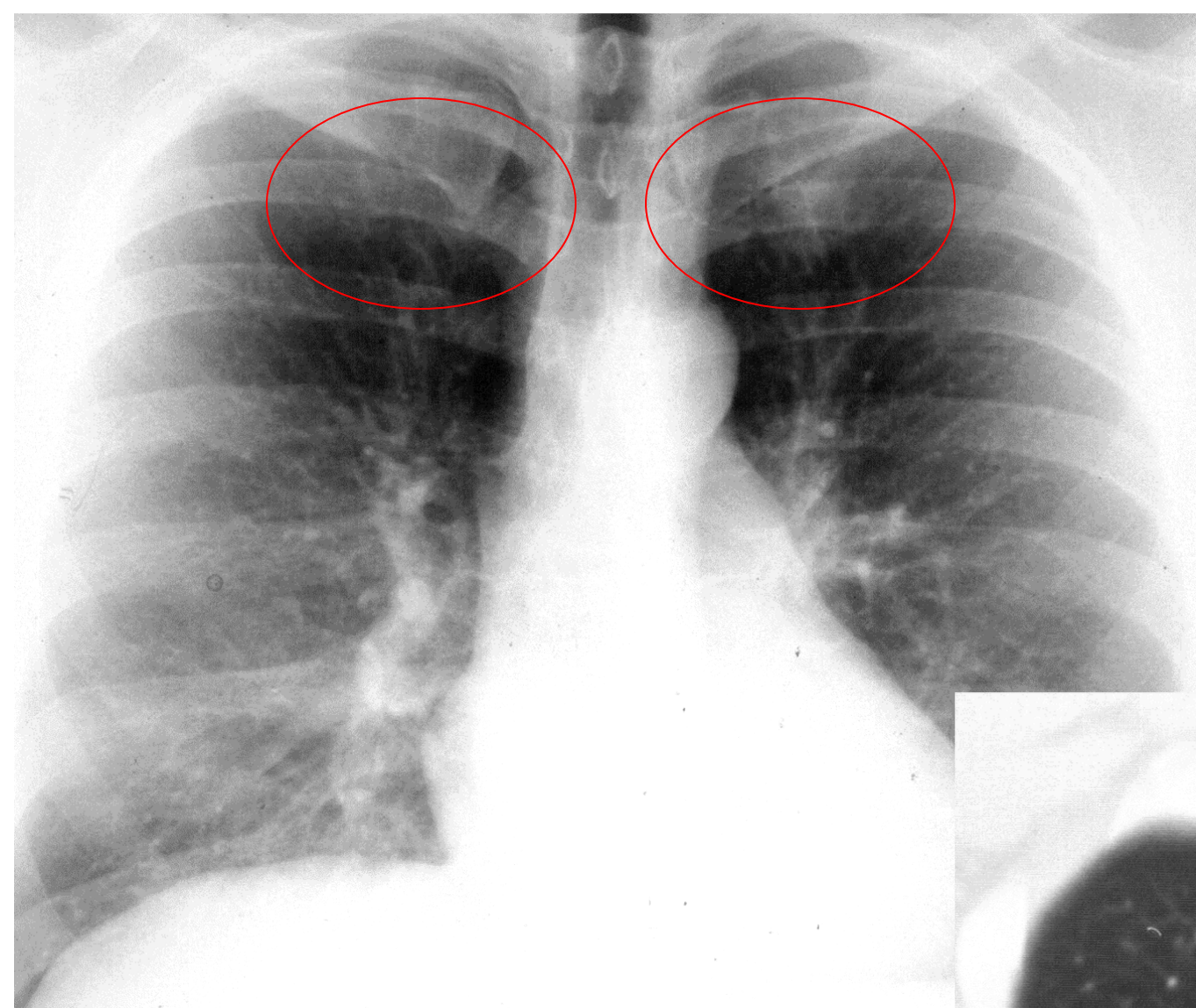
TEMPS DE DOUBLEMENT DE VOLUME : 120 JOURS
(CANCER BRONCHIQUE)

CANCER BRONCHIQUE

- TEMPS DE DOUBLEMENT DE VOLUME
1 à 6/7 MOIS (suivant type histologique)

		temps moyen de doublement (1x) (mois)	années nécessaires pour un diamètre de :		
			1 cm (30x)	3 cm (35x)	10 cm (45x)
adénocarcinome	(~50%)	6/7	13.2	15.4	17.6
épidermoïde	(~30%)	3	7.2	8.4	9.6
anaplasique à p.c.	(~15%)	1	2.4	2.8	3.2
anaplasique à g.c.	(~5%)	3	7.1	8.2	9.4

- $VOLUME = \frac{4}{3} \pi R^3 \rightarrow 25 \% \nearrow \text{ du diamètre}$
= VOLUME x 2

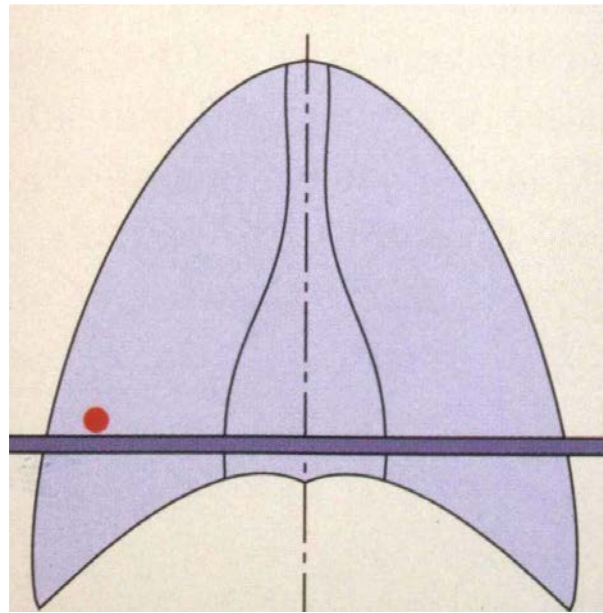
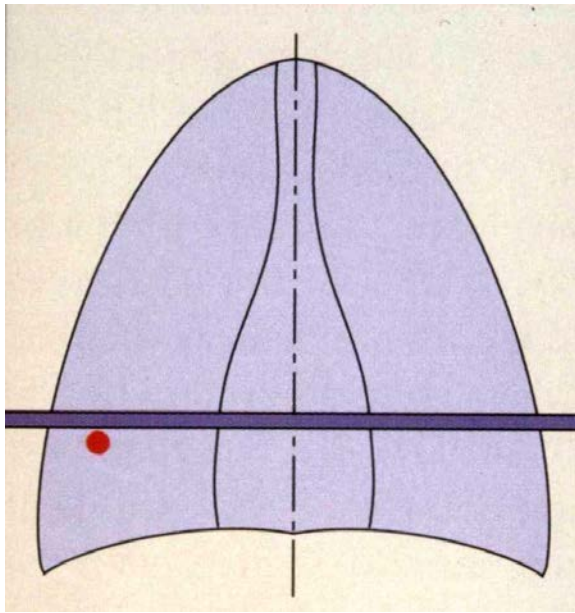


CANCER BR.

TDM > RT

NODULE ??



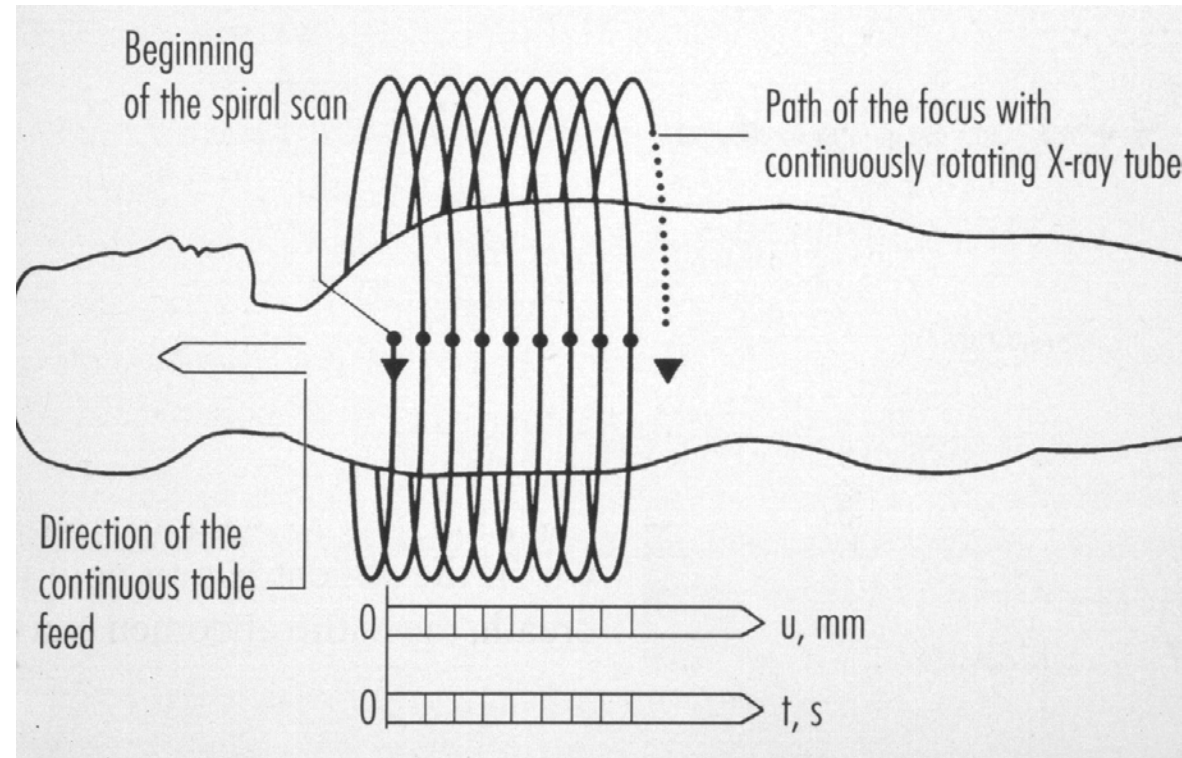


Degrés différents d'inspiration

~~LIMITE DE LA TDM
SEQUENTIELLE~~

TDM SPIRALEE →

- apnée unique
- acquisition volumique
- 50 % de nodules supplémentaires détectés

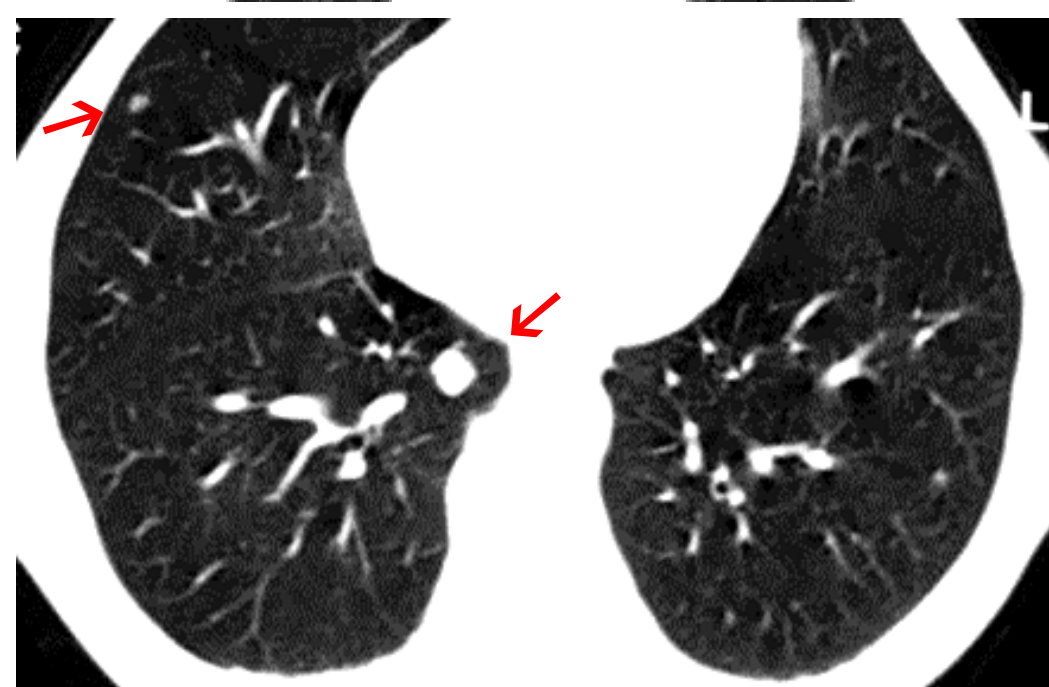
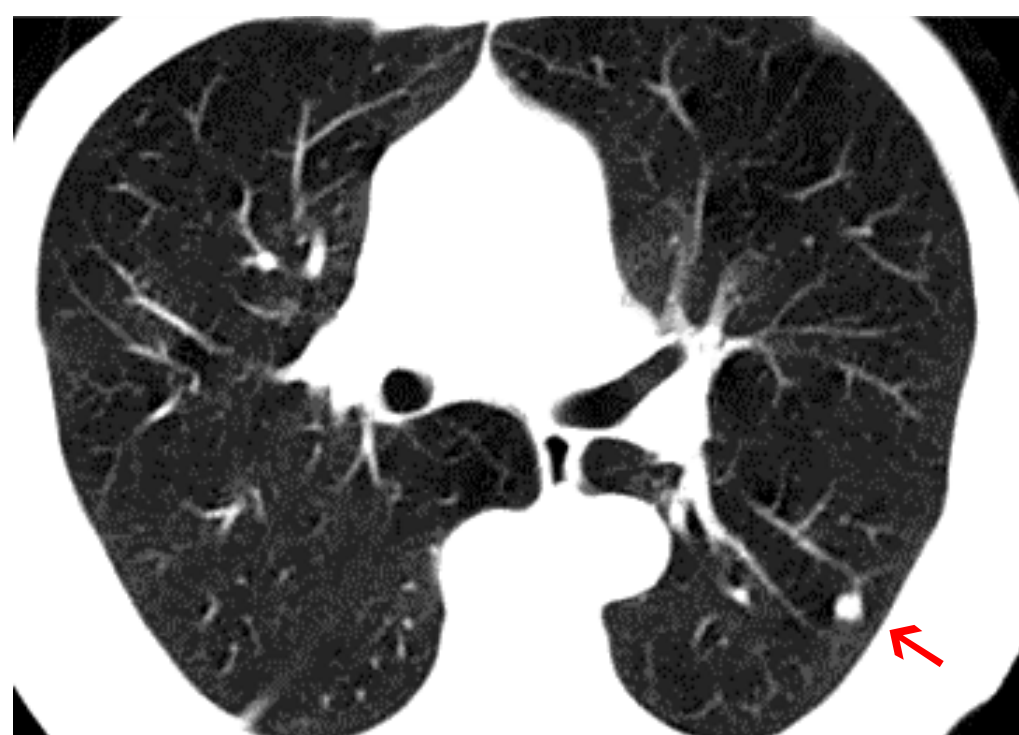
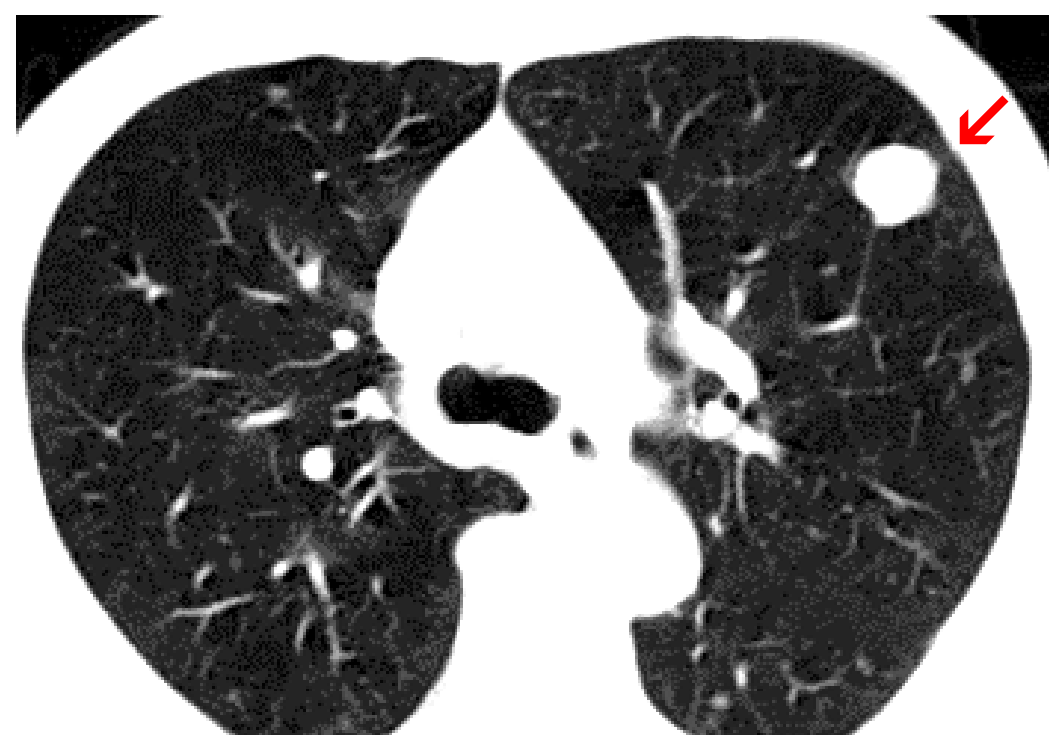


EVALUATION TDM DU NP

- DETECTION +++ > RADIOGRAPHIE TH. (RT)
 - CARACTERISATION +++ > RT
 - **TDM SPIRALEE** > TDM SEQUENTIELLE
(+ 50 % de NP)
- 



METASTASES



SIGNES MORPHOLOGIQUES

TDM D'UN NP

NODULE

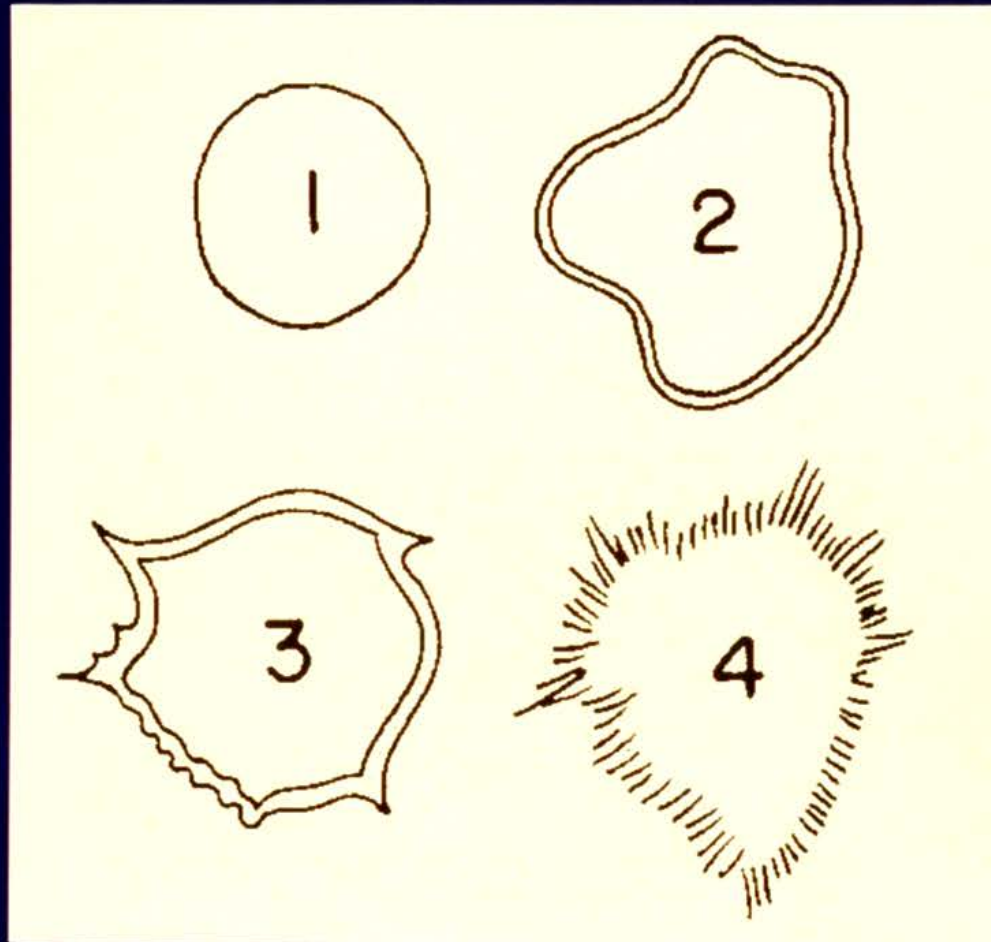
- CONTOURS
- CALCIFICATIONS
- DENSITES
- NECROSE / CAVITATION
- BRONCHOGRAMME
AERIQUE

ENVIRONNEMENT DU NODULE

- SIGNE DE LA BRANCHE
- SIGNE DU VAISSEAU
NOURRICIER
- CROISSANT AERIQUE
- SIGNE DU HALO
- SIGNE DE LA QUEUE
PLEURALE
- SIGNE DE LA BASE
PLEURALE

Figure 1 . ASPECTS DU CONTOUR D' UN NODULE PULMONAIRE

1. bénin
métastase
tum. carcinoïde

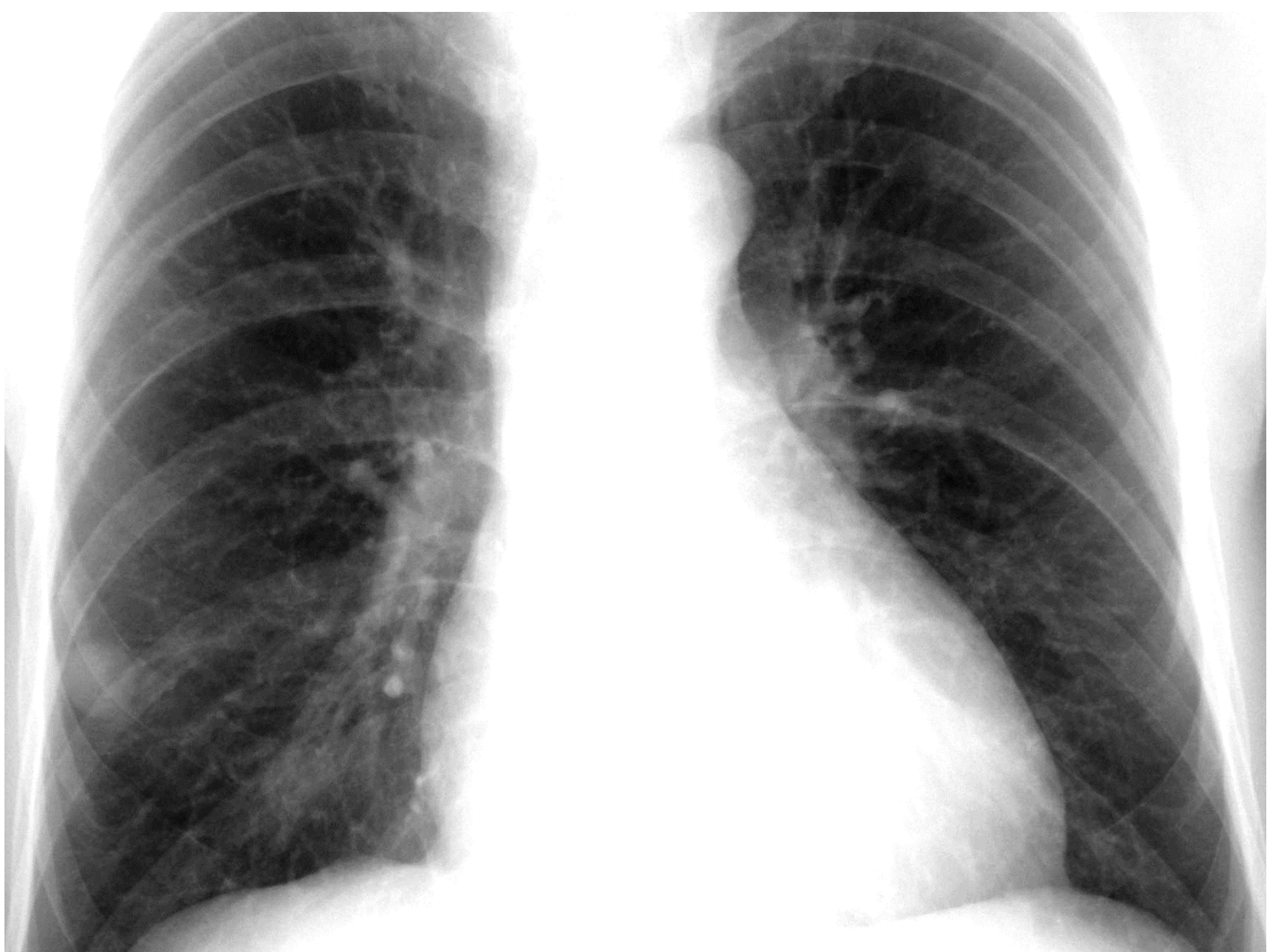


2. malin (75%)
bénin (25%)

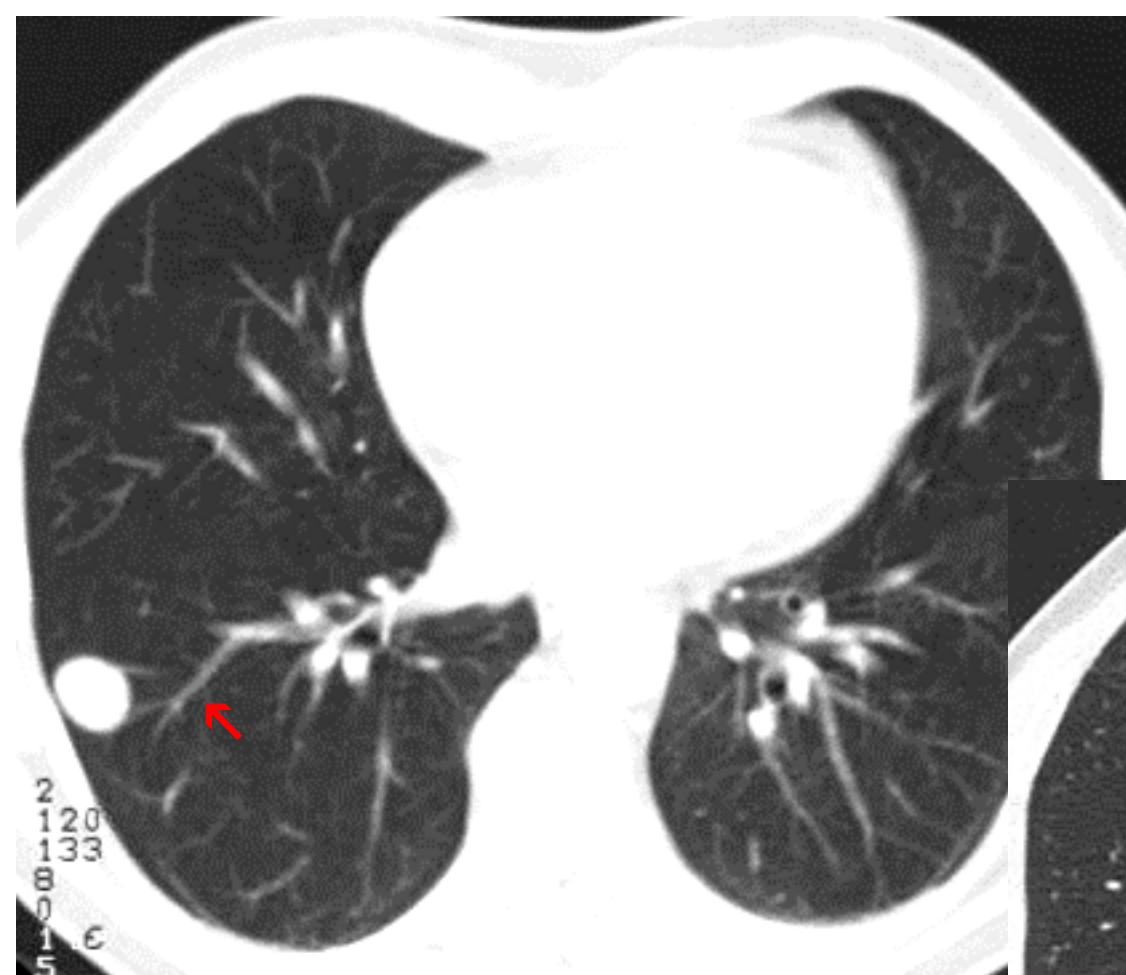
3. malin
(bénin)

4. malin

1. lisse 2. lobulé 3. irrégulier 4. spiculé



NP (antécédent de fibrosarcome)



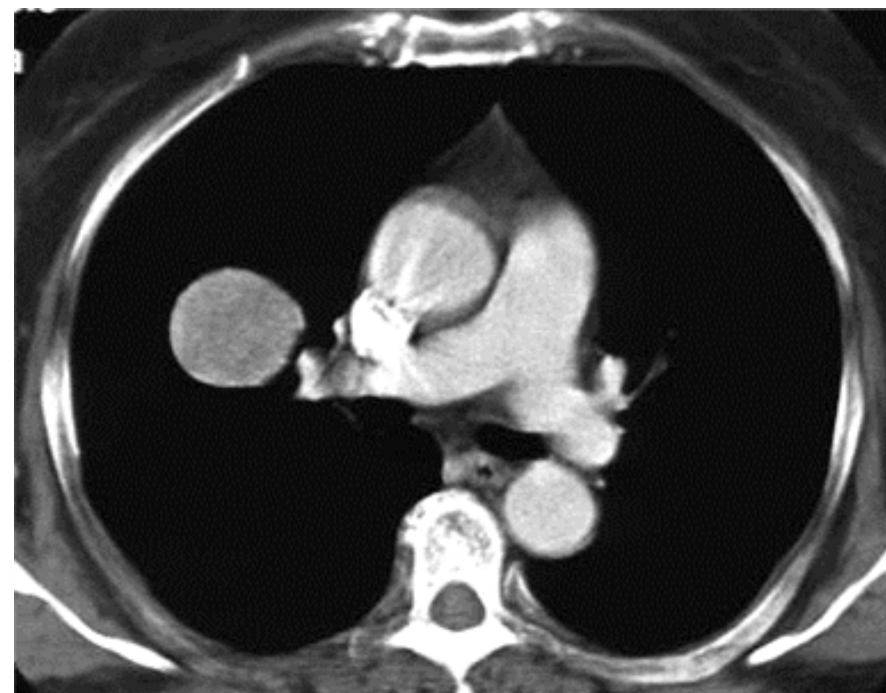
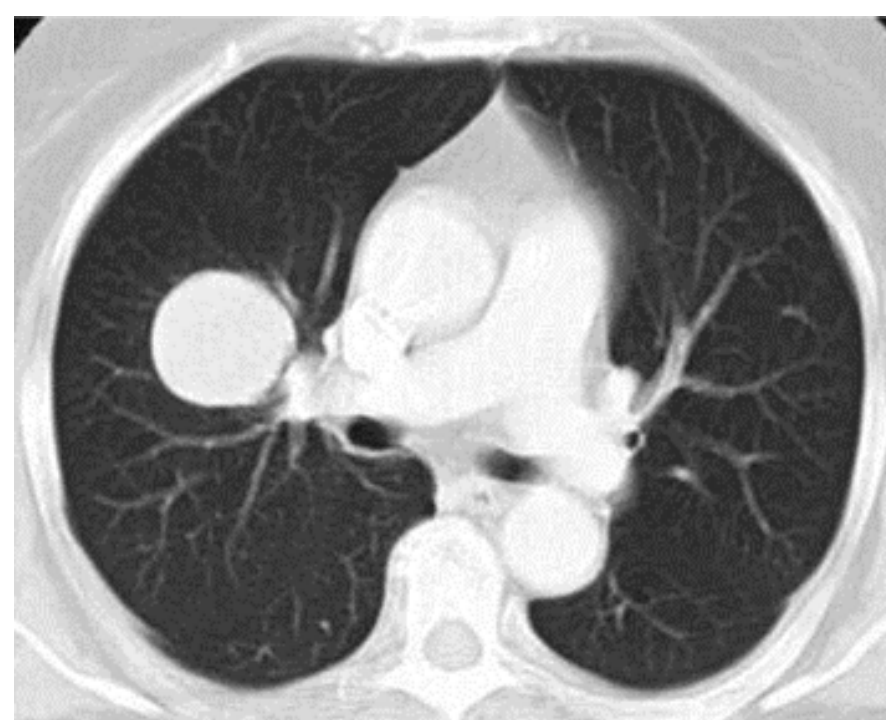
Coupe 8 mm



Coupe 1 mm



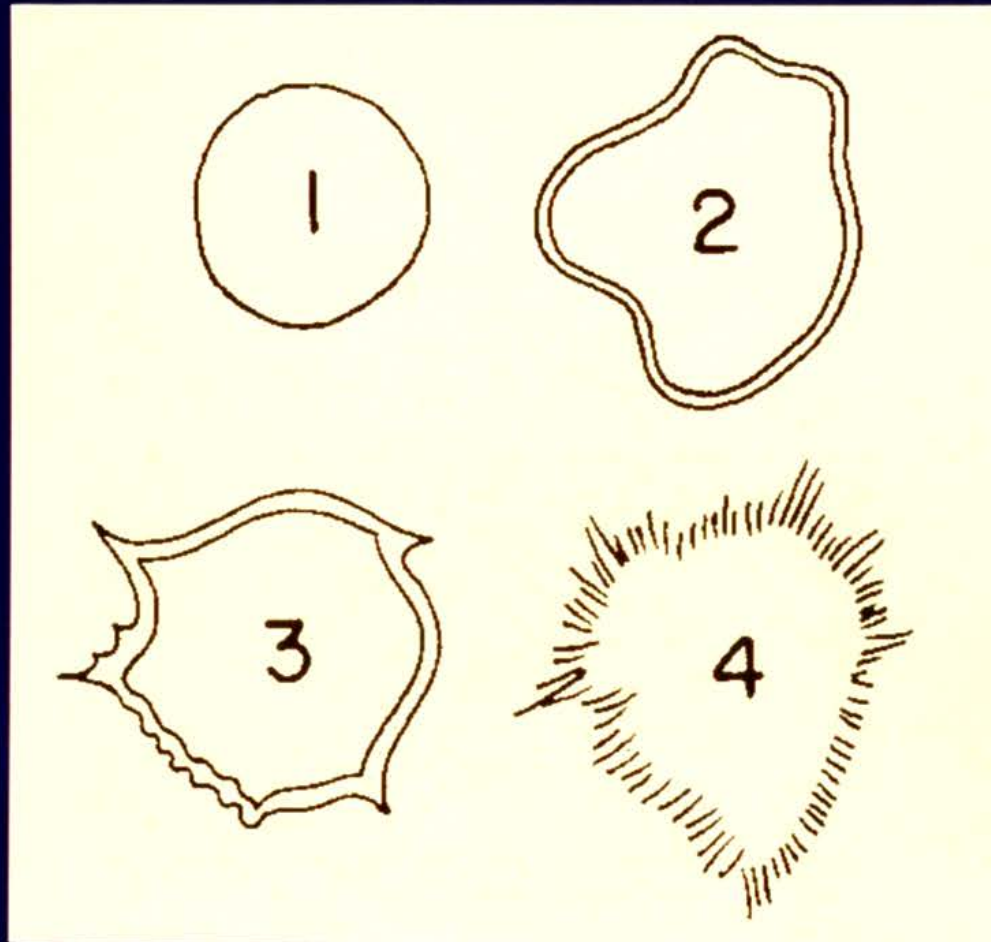
METASTASE UNIQUE
lisse , connexion vasculaire



TUMEUR CARCINOÏDE : lisse

Figure 1 . ASPECTS DU CONTOUR D' UN NODULE PULMONAIRE

1. bénin
métastase
tum. carcinoïde



2. malin (75%)
bénin (25%)

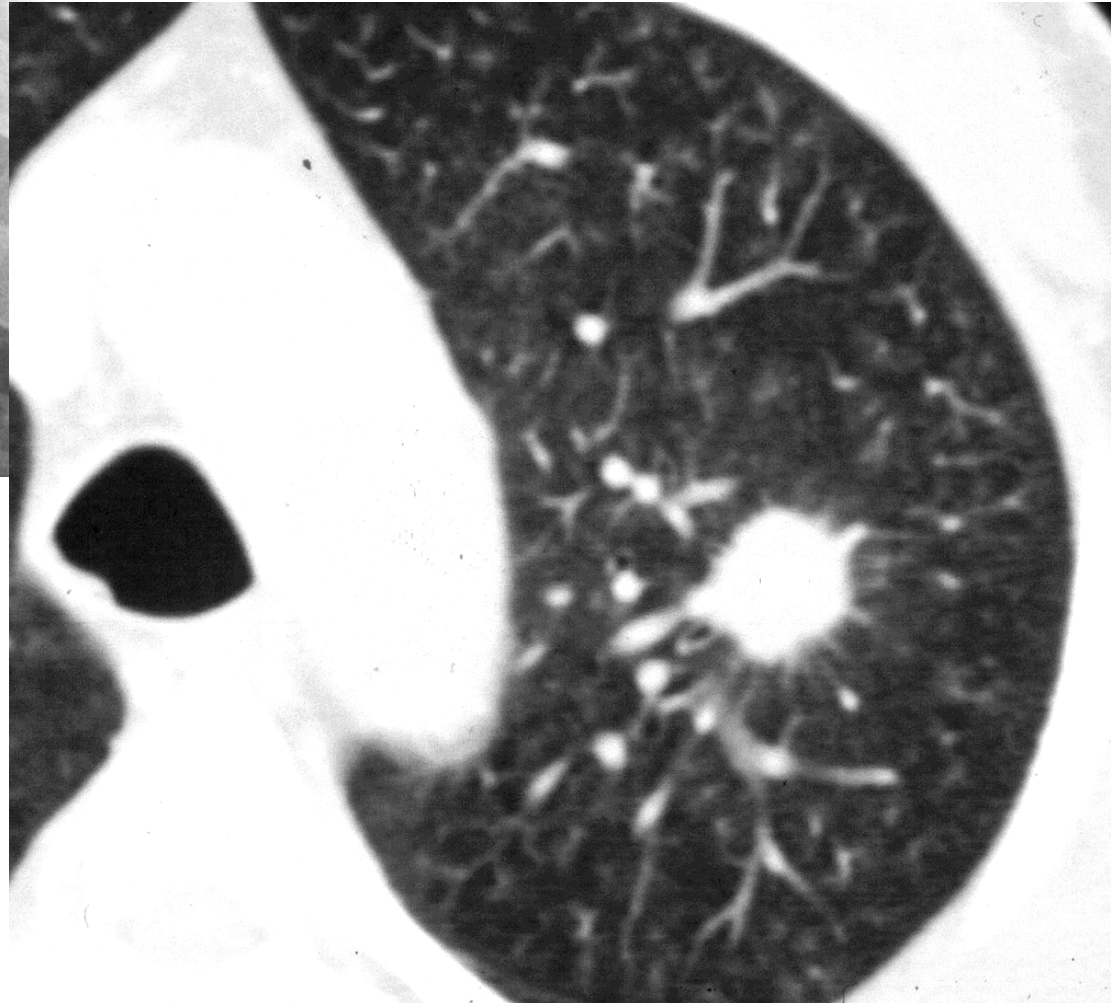
3. malin
(bénin)

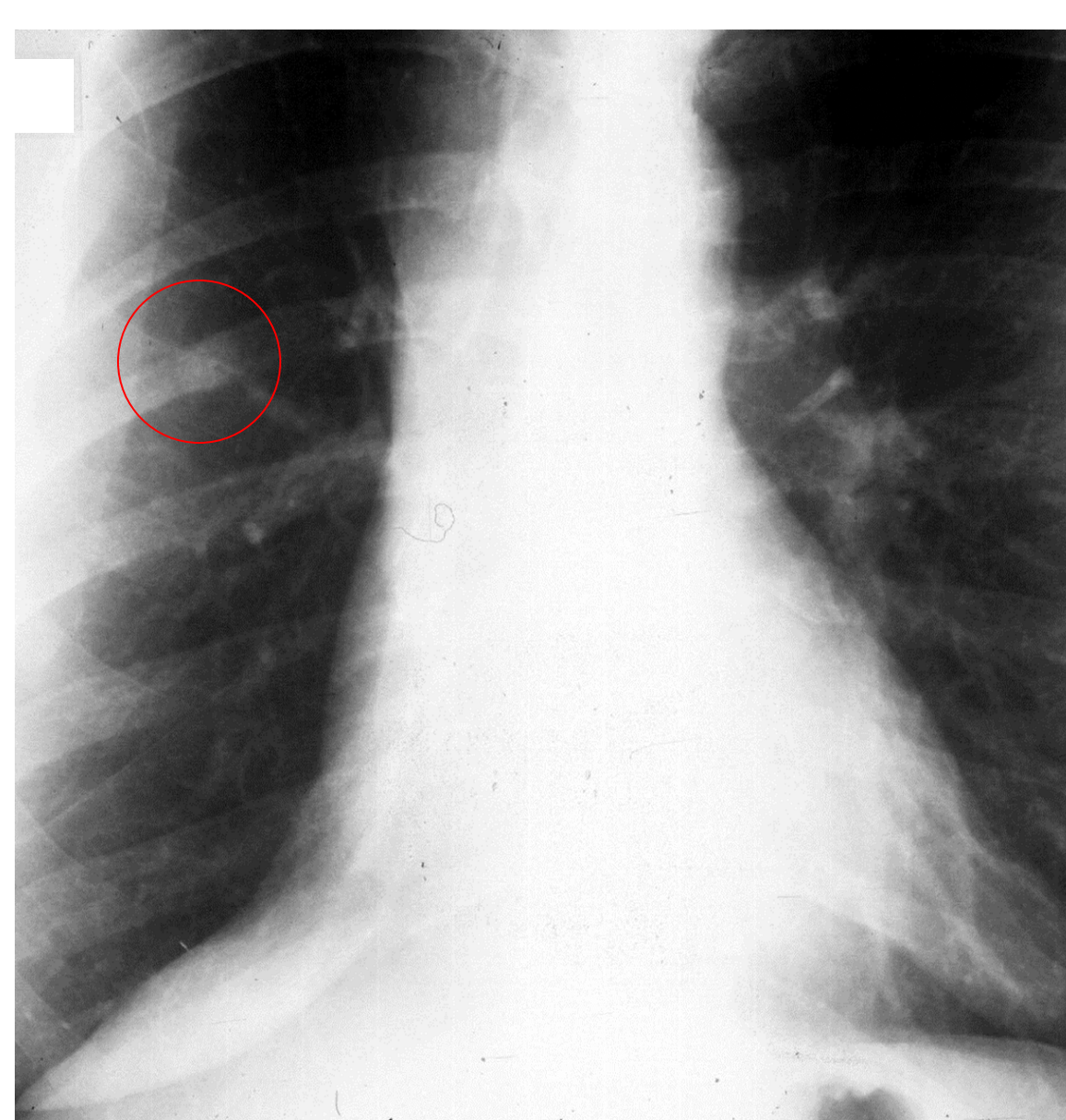
4. malin

1. lisse 2. lobulé 3. irrégulier 4. spiculé



CANCER BR. : spiculé
(corona radiata)





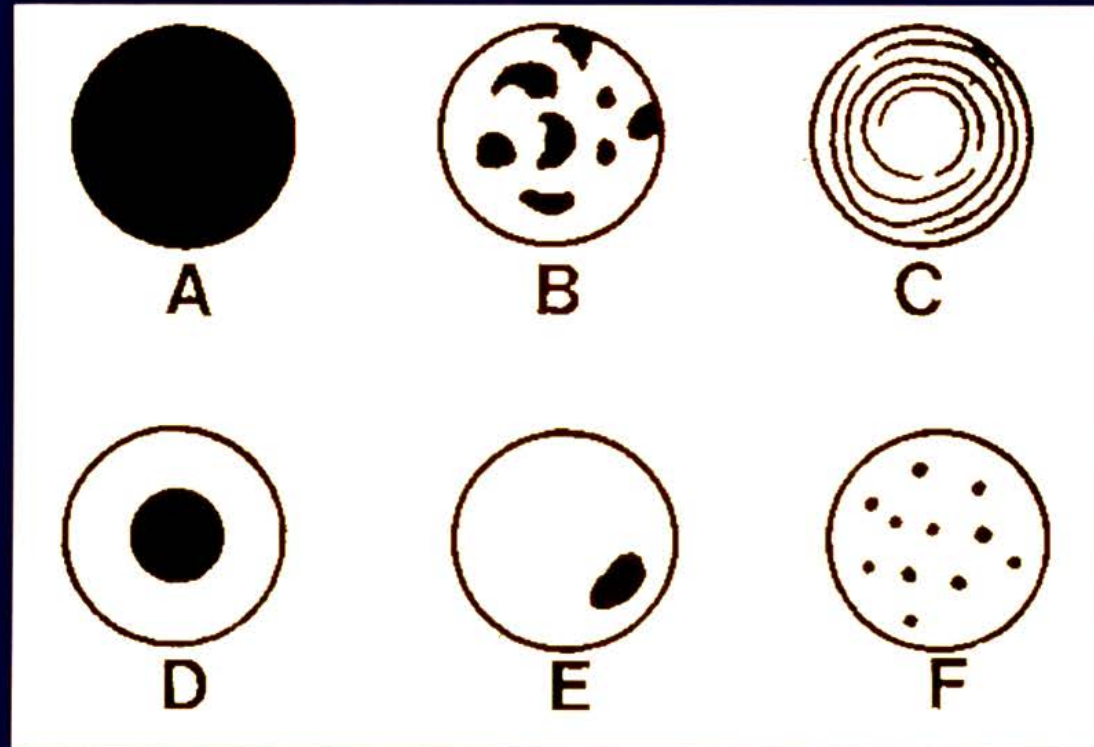
NP : peu visible sur la RT



TDM : lobulé / spiculé
CANCER BRONCHIQUE

Figure 2 . ASPECTS DES CALCIFICATIONS INTRANODULAIRES

A,B,C,D
bénin
(malin)



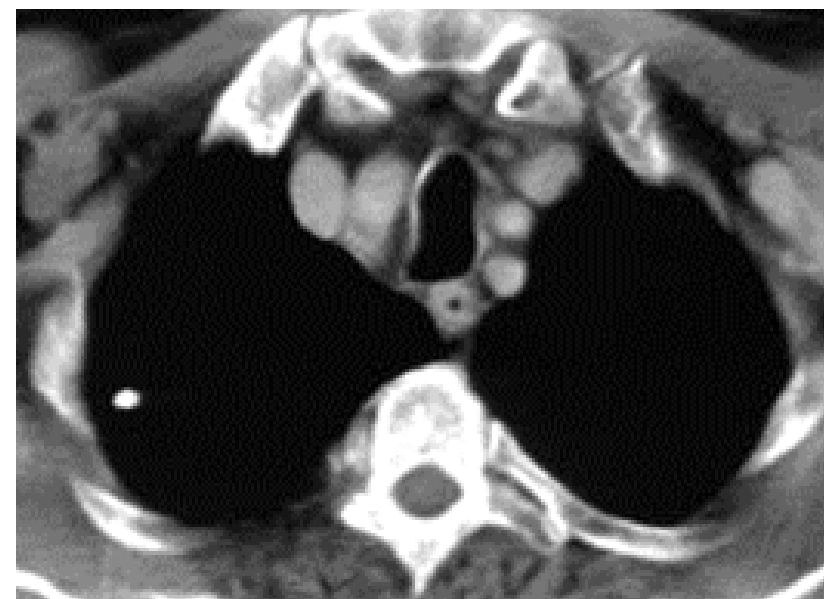
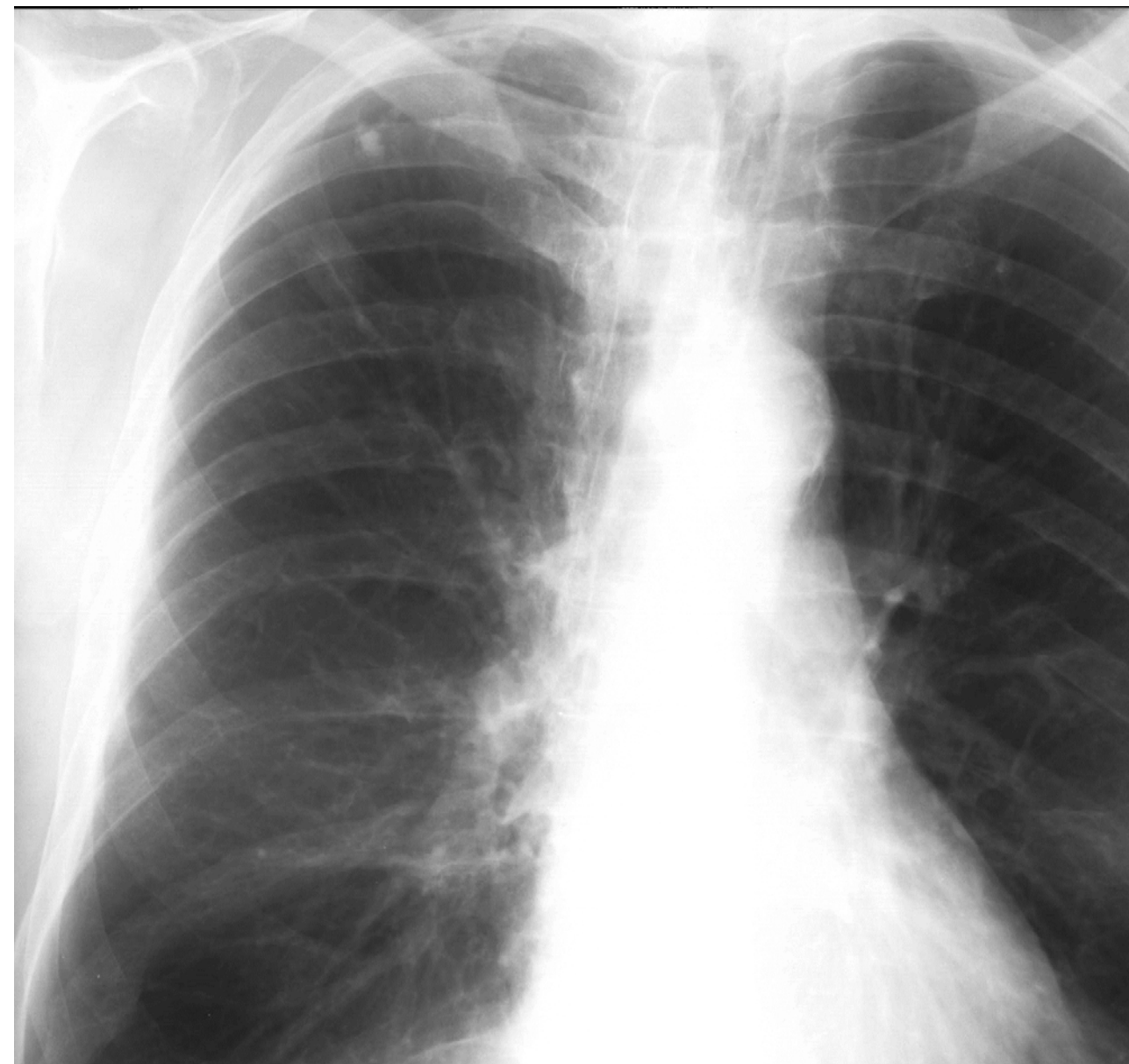
E,F
malin
(bénin)

A. diffus B. " en popcorn " C. laminé
D. central E. excentrique F. ponctué

CALCIFICATIONS INTRA-NODULAIRES

- **TYPES BENINS** (rarement MALINS)
 - A. DIFFUS - granulome tbc., métastase (ostéosarcome)
 - B. « EN POPCORN » - hamartome (15 %)
 - C. LAMINE - granulome tbc.
 - D. CENTRAL - granulome tbc., histoplasmose, métastase (ostéosarc.)
- **TYPES MALINS** (rarement BENINS)
 - E. EXCENTRIQUE - « scar carcinoma »
 - F. PONCTUE
 - cancer bronchique (6%)
 - tumeur carcinoïde (33%)
 - (hamartome)

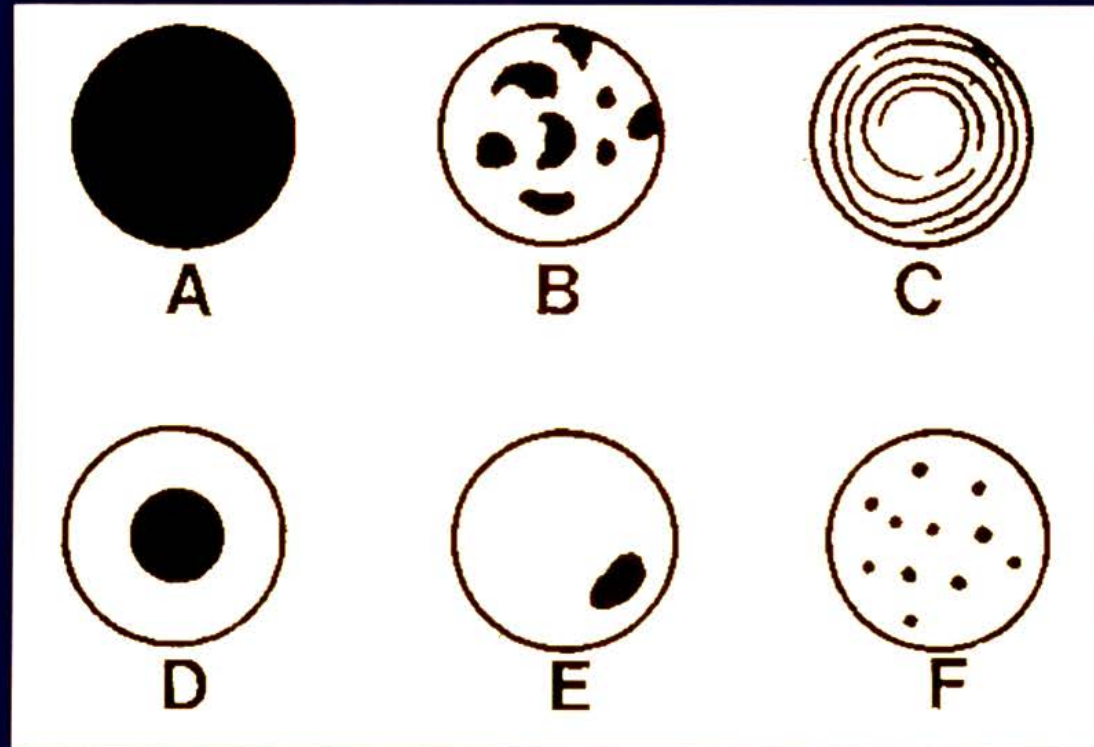
Hamartome: malformation tissulaire d'aspect tumoral composé d'éléments constitutifs présents dans l'organe dans lequel ils se développent



GRANULOME TBC CALCIFIE

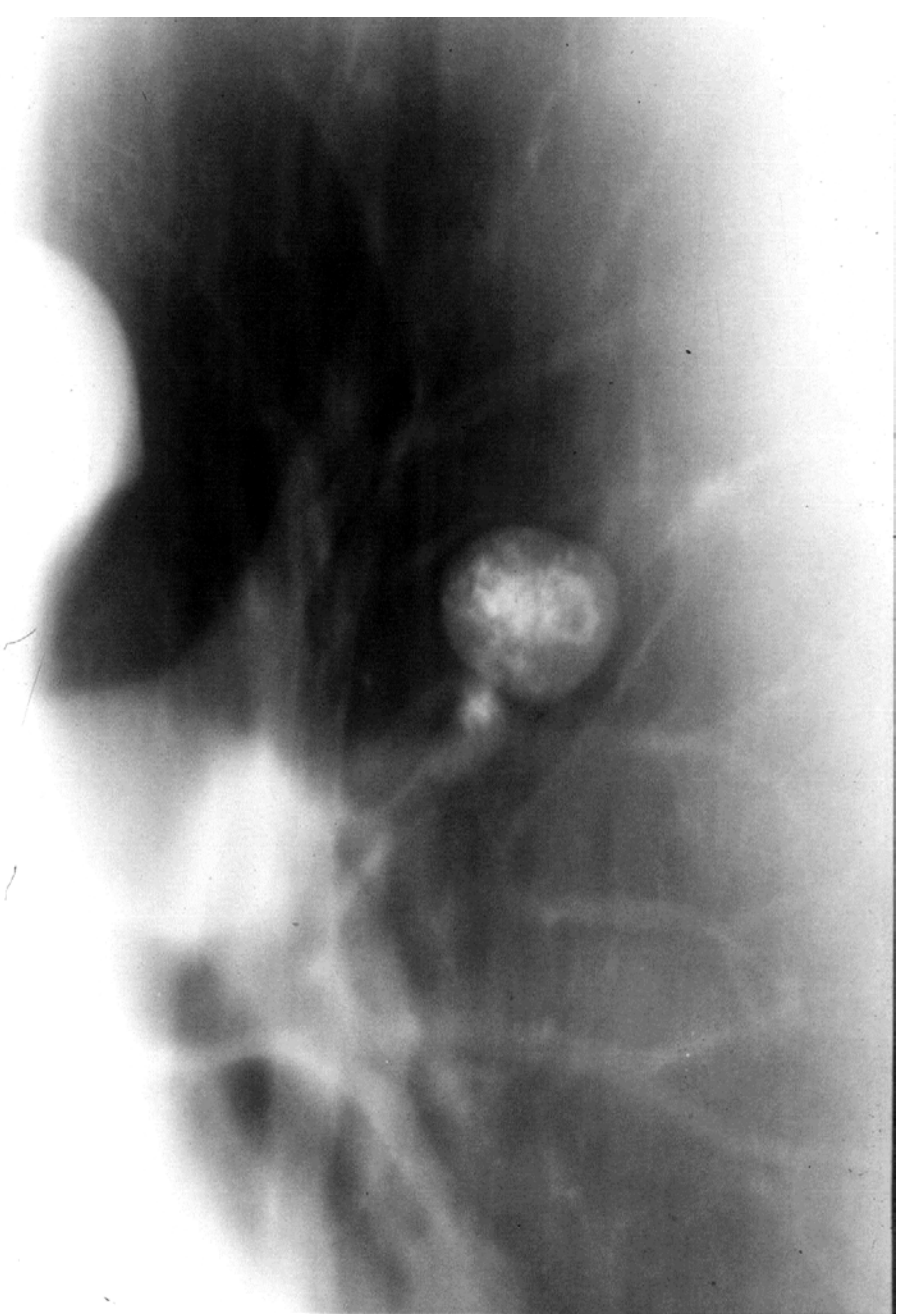
Figure 2 . ASPECTS DES CALCIFICATIONS INTRANODULAIRES

A,B,C,D
bénin
(malin)

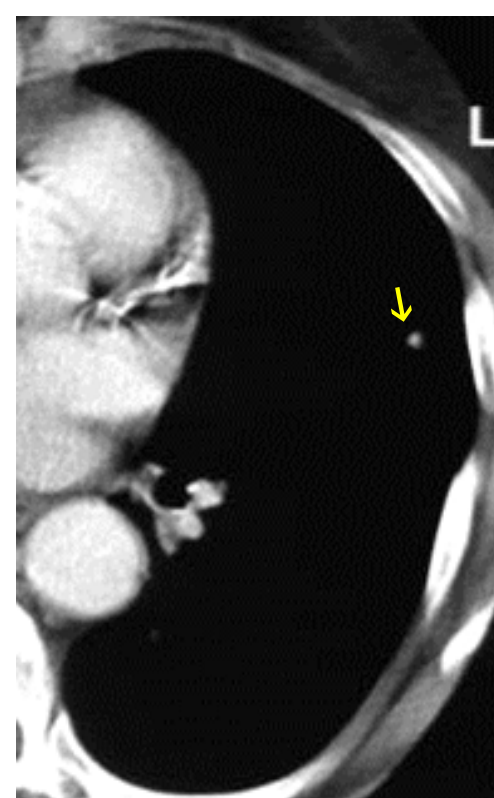
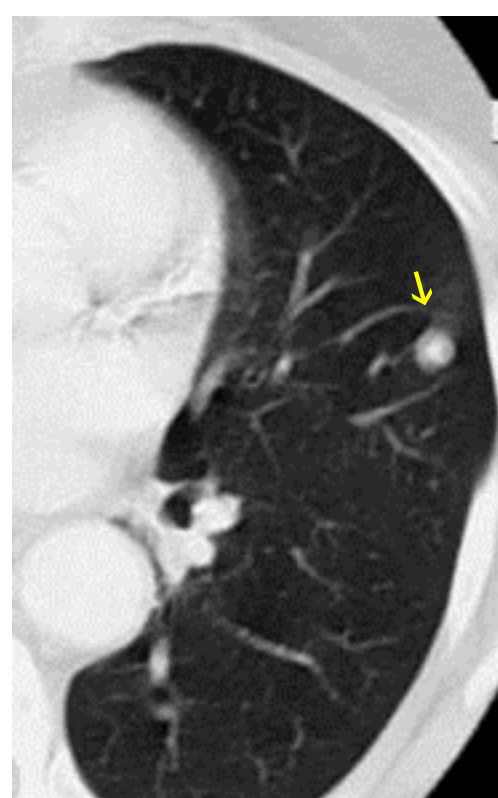


E,F
malin
(bénin)

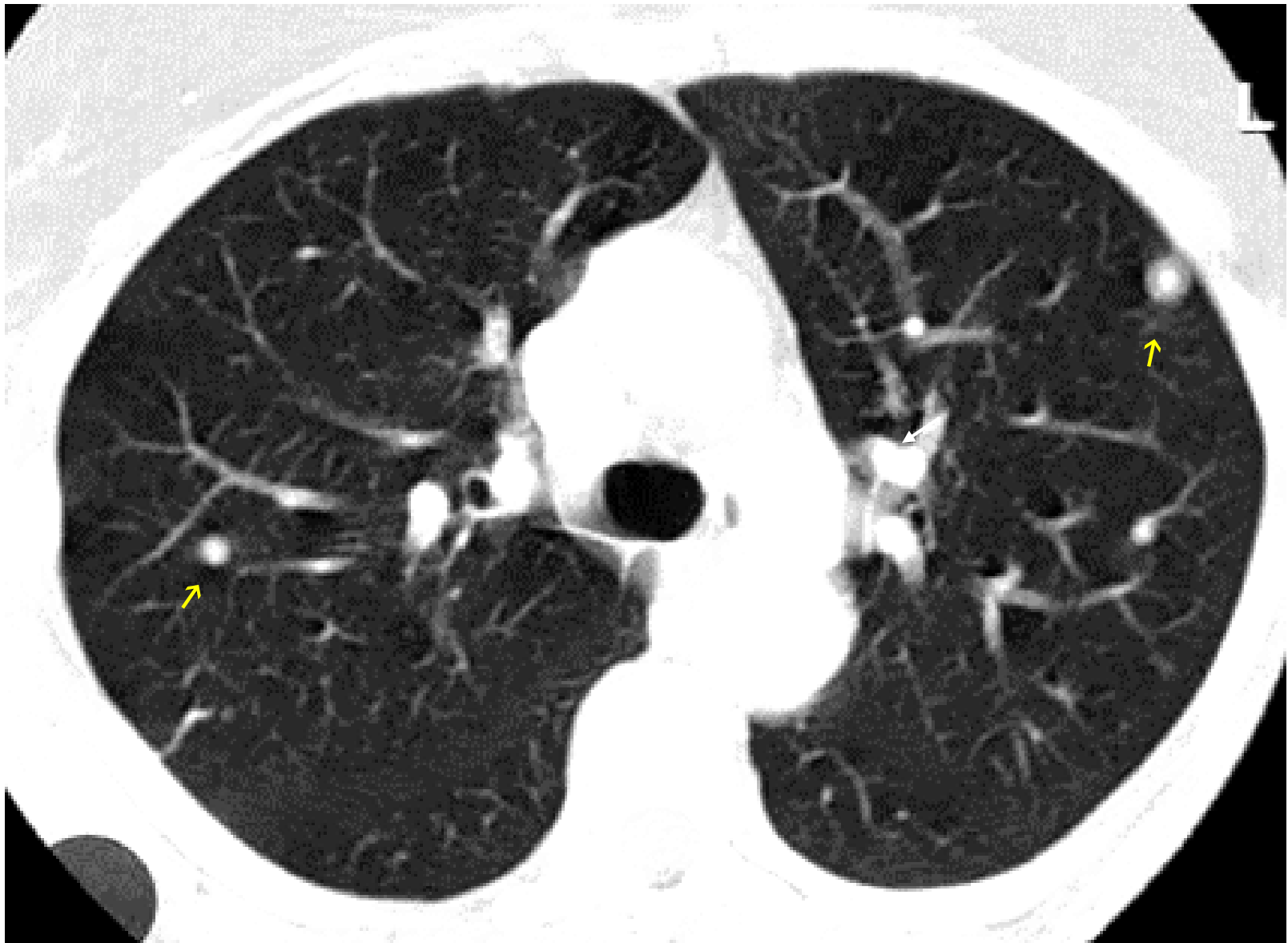
A. diffus B. " en popcorn " C. laminé
D. central E. excentrique F. ponctué



HAMARTOME : lisse , calc.en « popcorn »



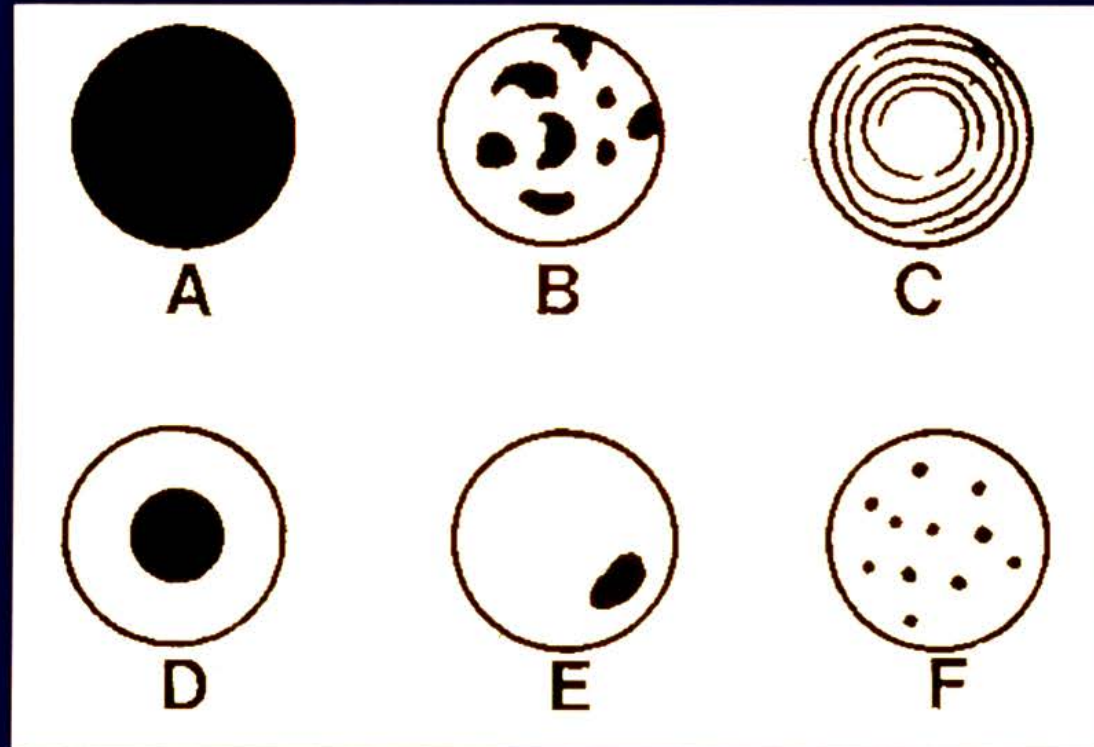
HISTOPLASMOSE : granulomes calc.



HISTOPLASMOSE ; GRANULOME : nidus central calcifié

Figure 2 . ASPECTS DES CALCIFICATIONS INTRANODULAIRES

A,B,C,D
bénin
(malin)



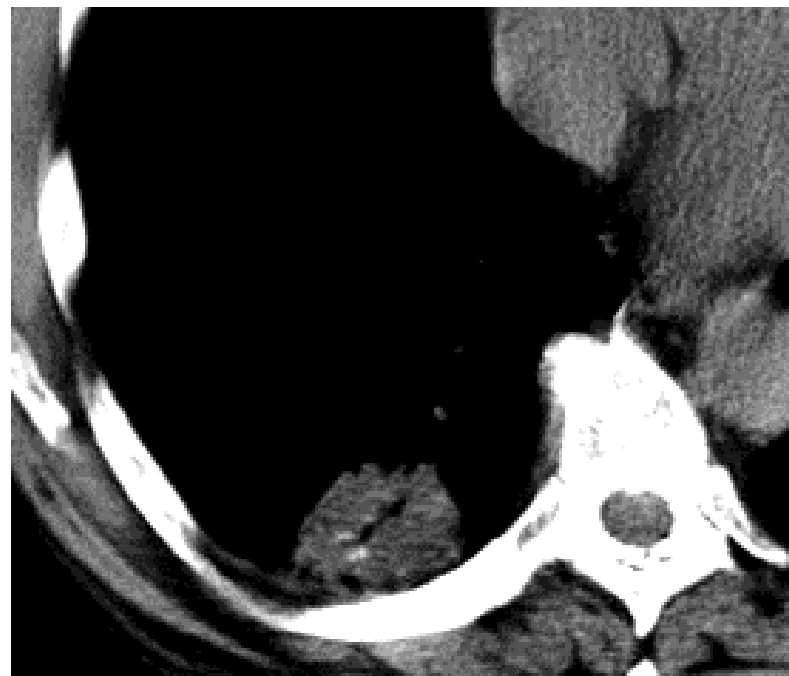
E,F
malin
(bénin)

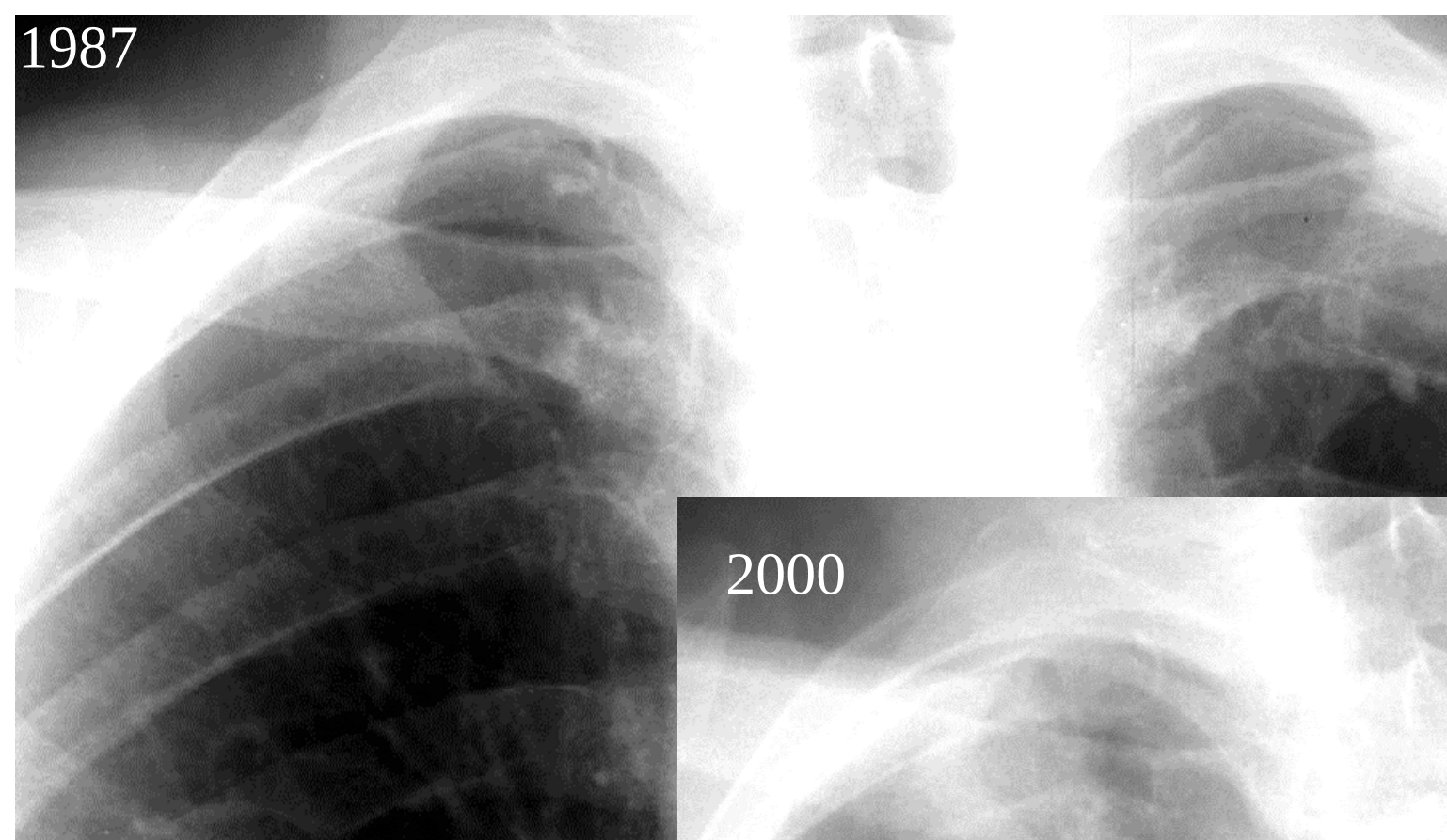
A. diffus B. " en popcorn " C. laminé
D. central E. excentrique F. ponctué



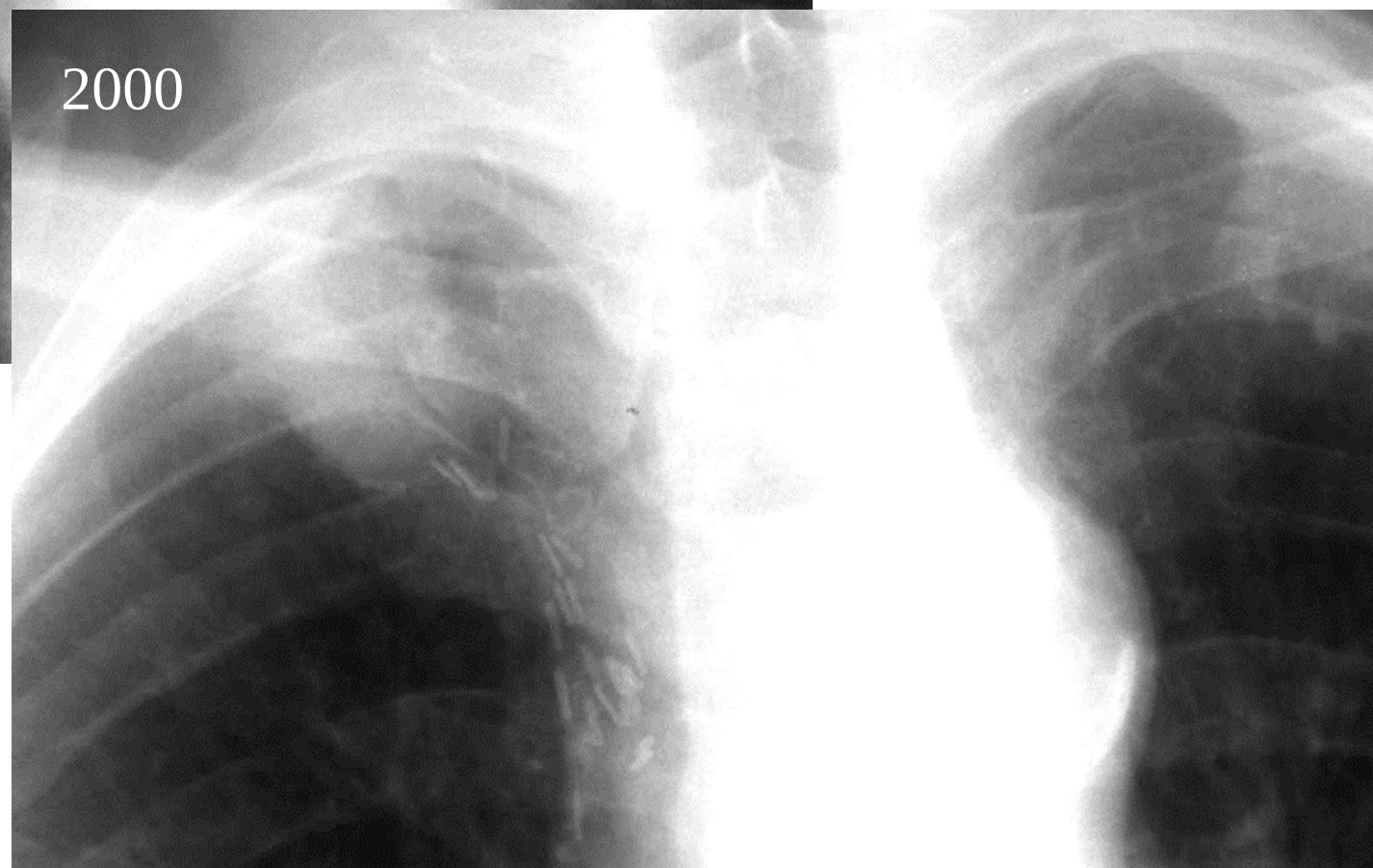
bronchogramme aérique , calcifications
ponctuées

Carcinome lépidique (BAC)



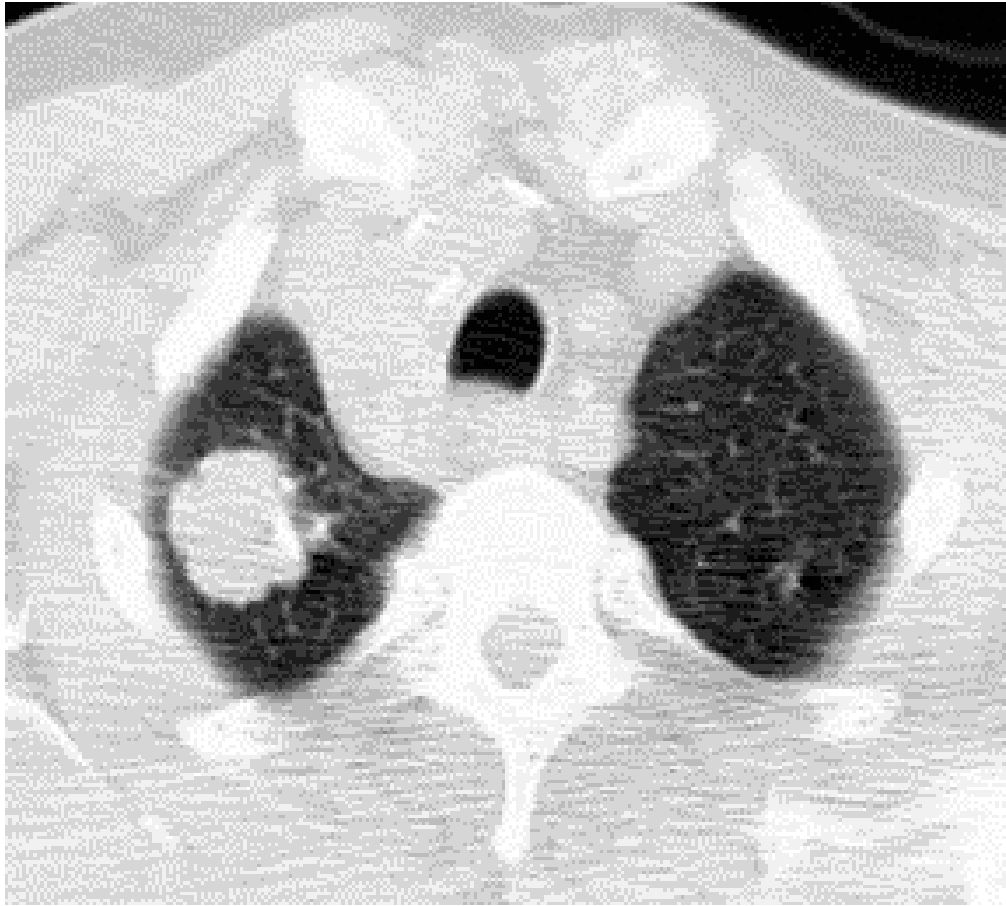


MICRO-GRANULOMES
TBC. CALCIFIES



" SCAR CARCINOMA "

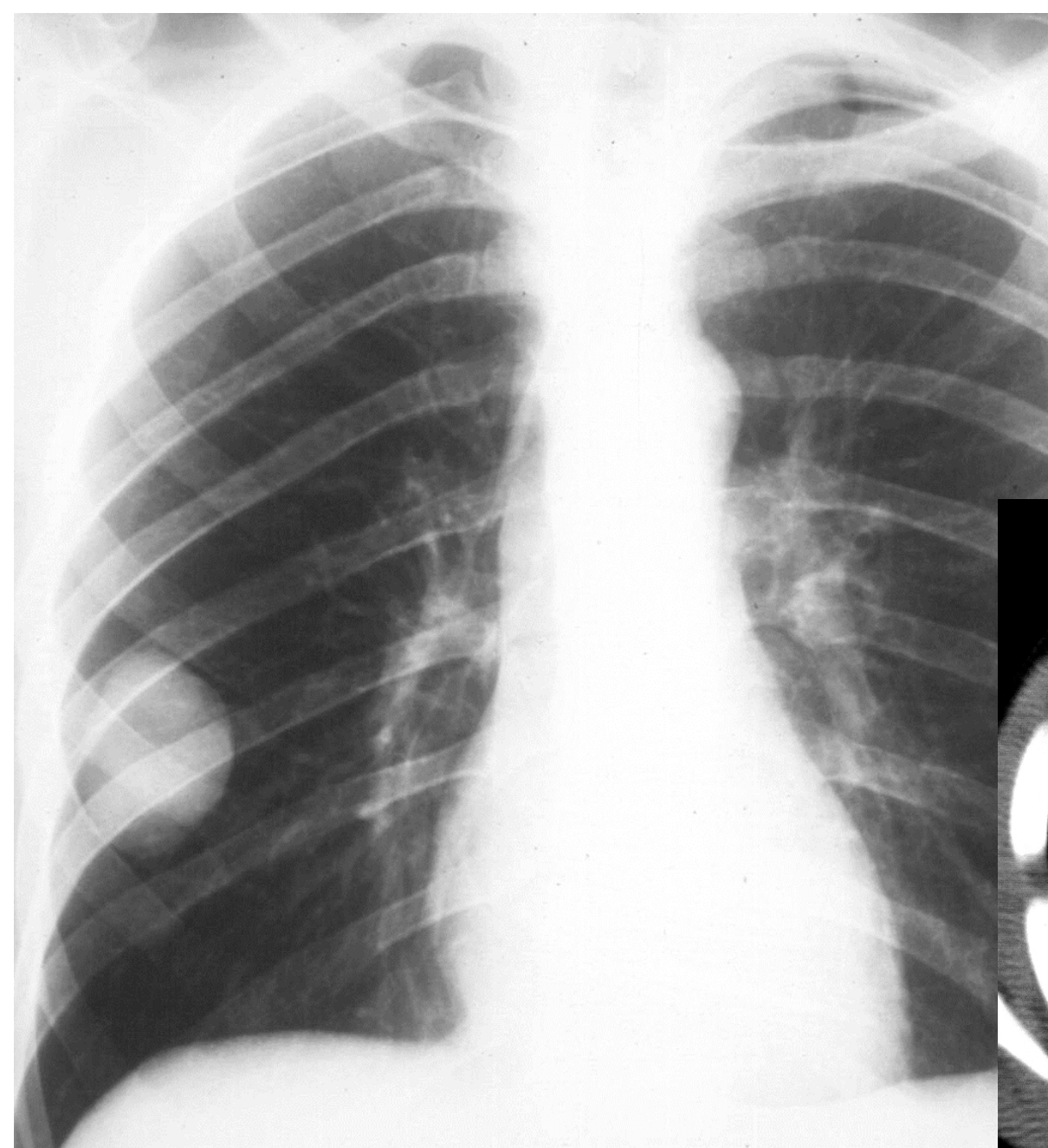




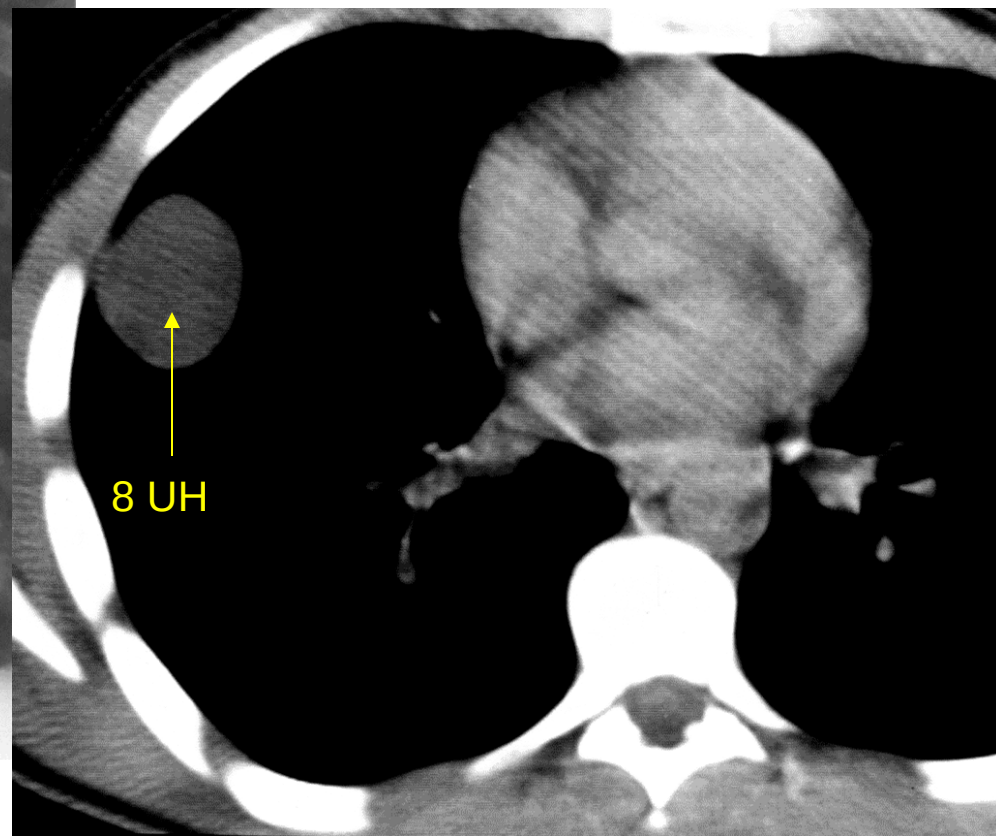
" SCAR CARCINOMA " : calcification excentrique

DENSITES INTRA-NODULAIRES

- CALCIQUE (> 250 UH) - BENIN
- (MALIN : CANCER BR.)
- TISSULAIRE (30-70 UH) - BENIN / MALIN
- HYDRIQUE (0-20 UH) - BENIN (KYTE HYDAT.)
- GRAISSEUSE (-80/-100 UH) - HAMARTOME (50%)

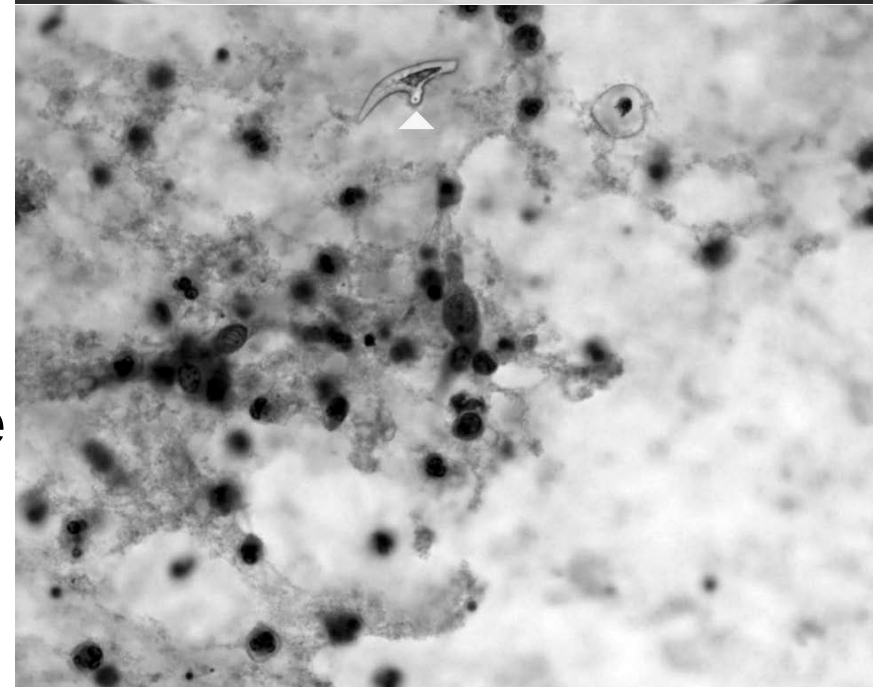
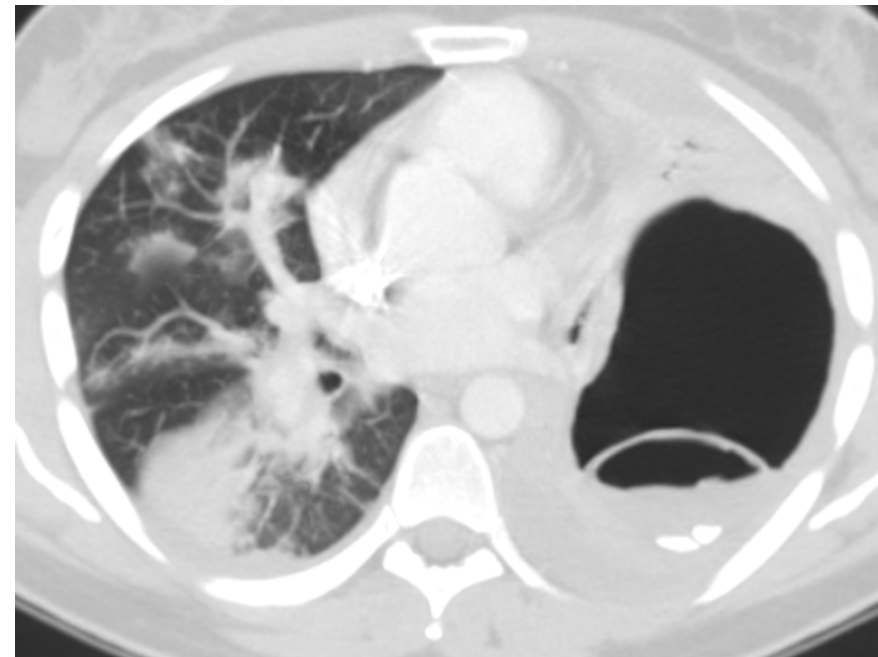
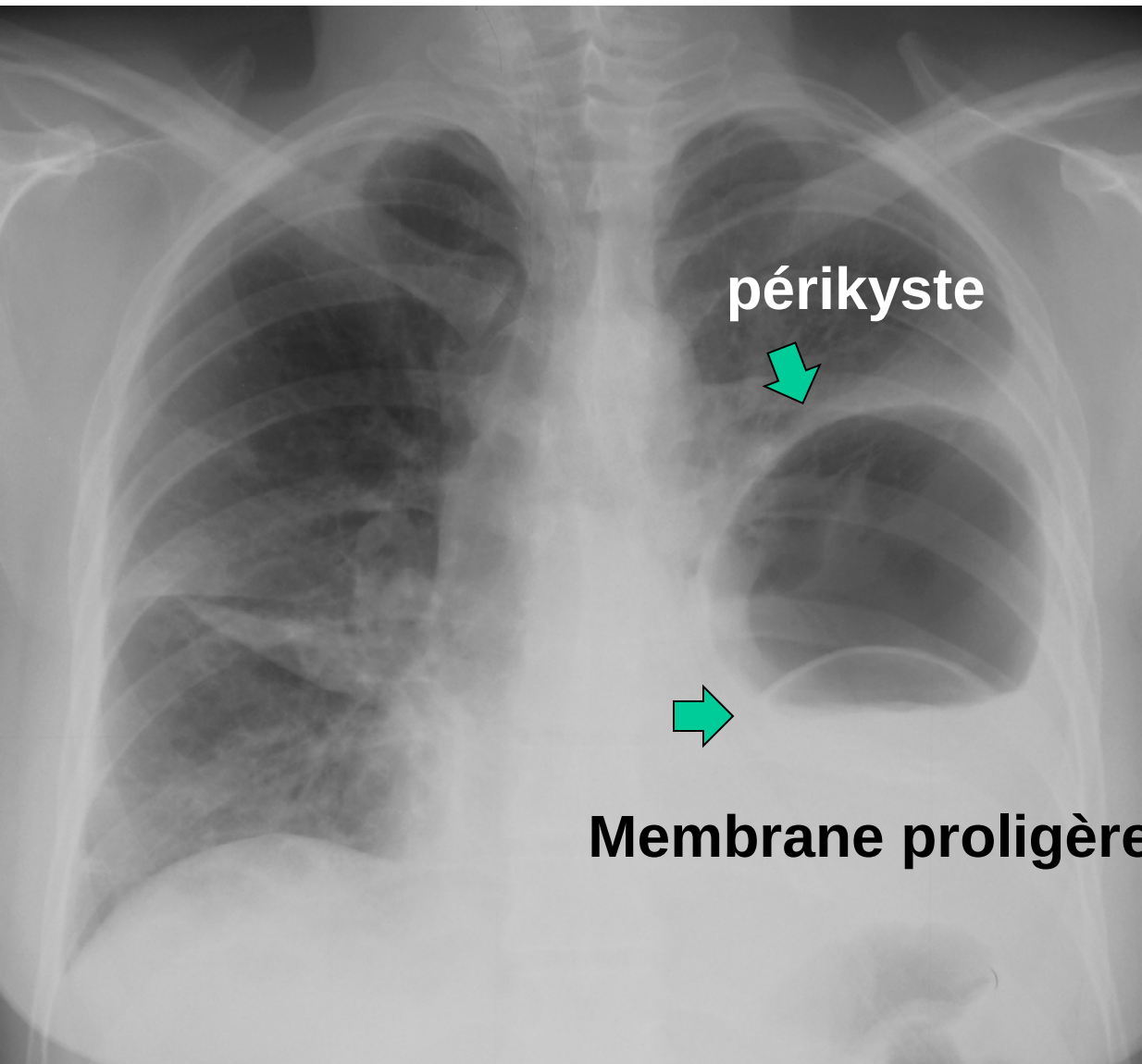


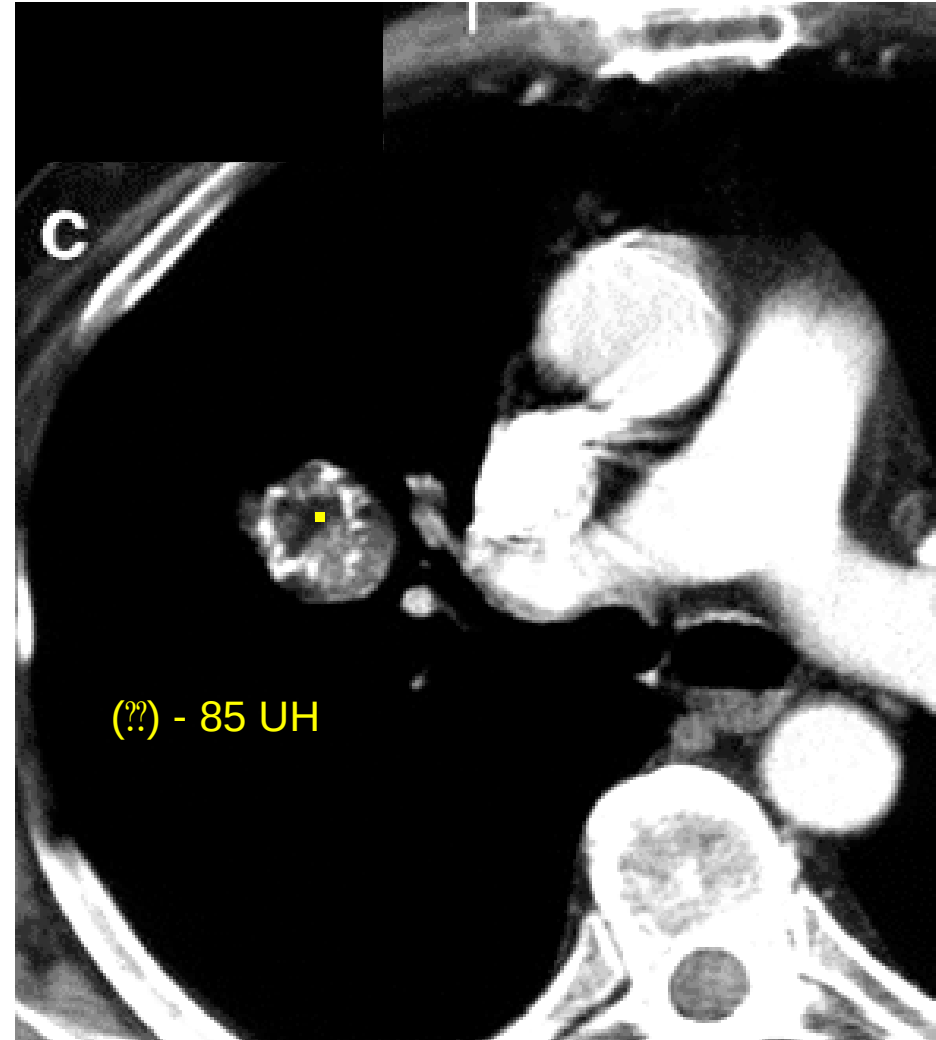
contour lisse , densité aqueuse



KYSTE HYDATIQUE

Niveau hydro-aérique

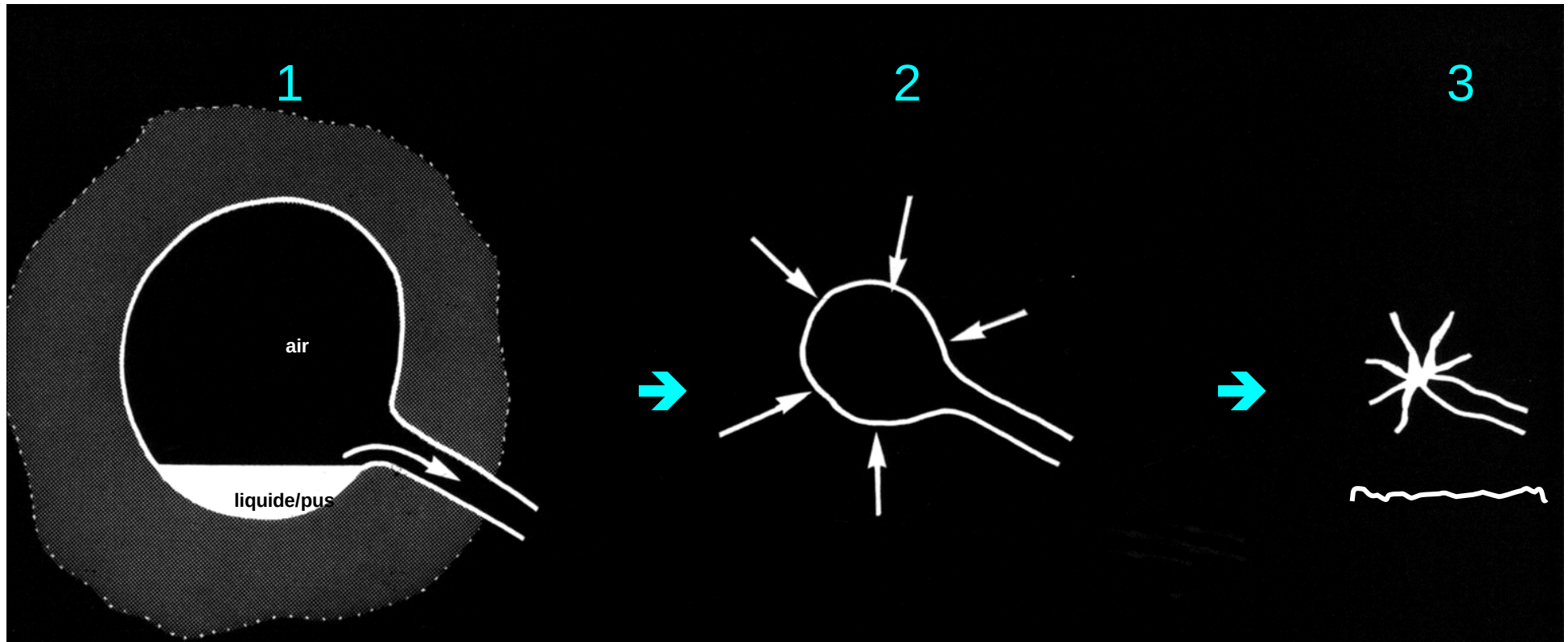




HAMARTOME (HAMARTOCHONDROME) : lisse , calcifications en
« popcorn » (15%) , graisse (50%)

NP : CAVITATION / NECROSE

- DENSITES MIXTES : LIQUIDES
ET TISSUS NECROSES : 20 à 80 UH
- DENSITE AERIQUE : - 800 UH
 - MALIN
 - CANCER BR.
 - METASTASE (CHIMIOOTHERAPIE)
 - BENIN
 - LESION tbc.
 - ABCES
 - INFARCTUS



EVOLUTION ABCES / CAVERNE TBC

- 1** cavitation (bronche de drainage)
- 2** détersion complète, diminution de volume
- 3** cicatrice stellaire ou linéaire



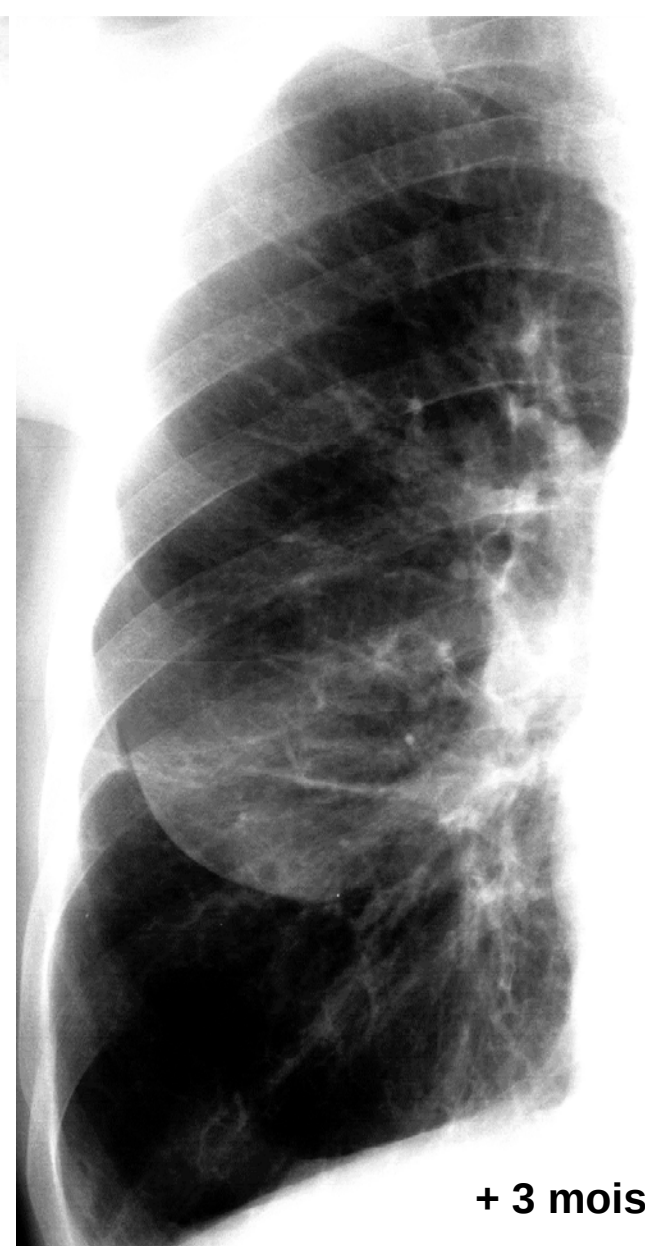
ABCES : évolution



+ 7 jours



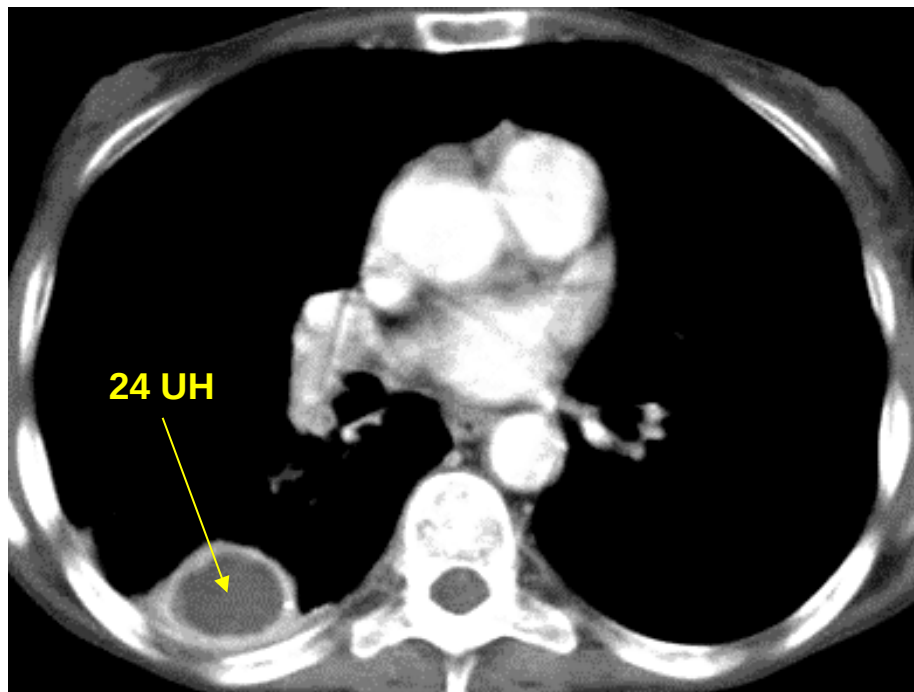
cavitation



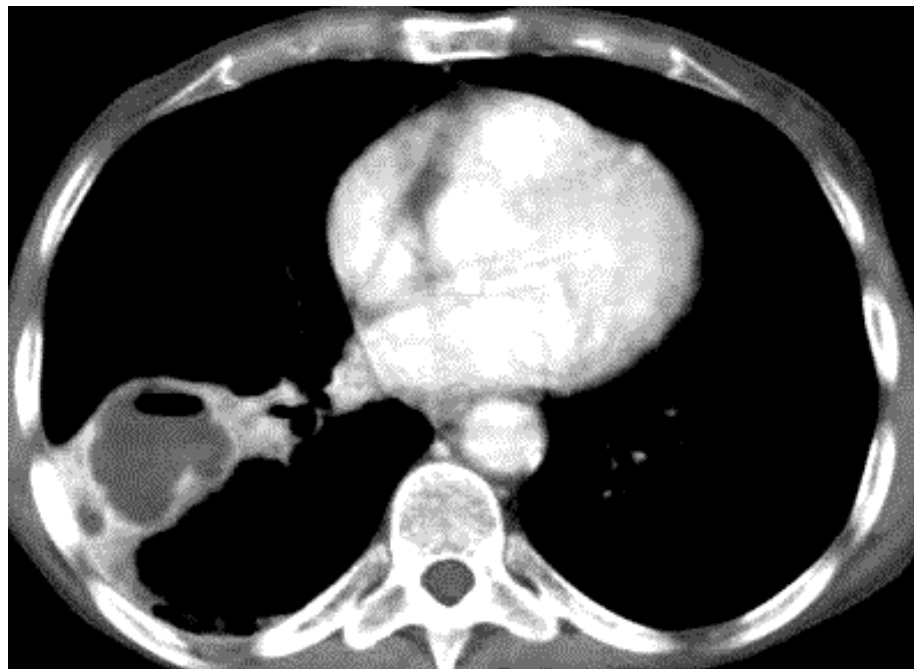
+ 3 mois



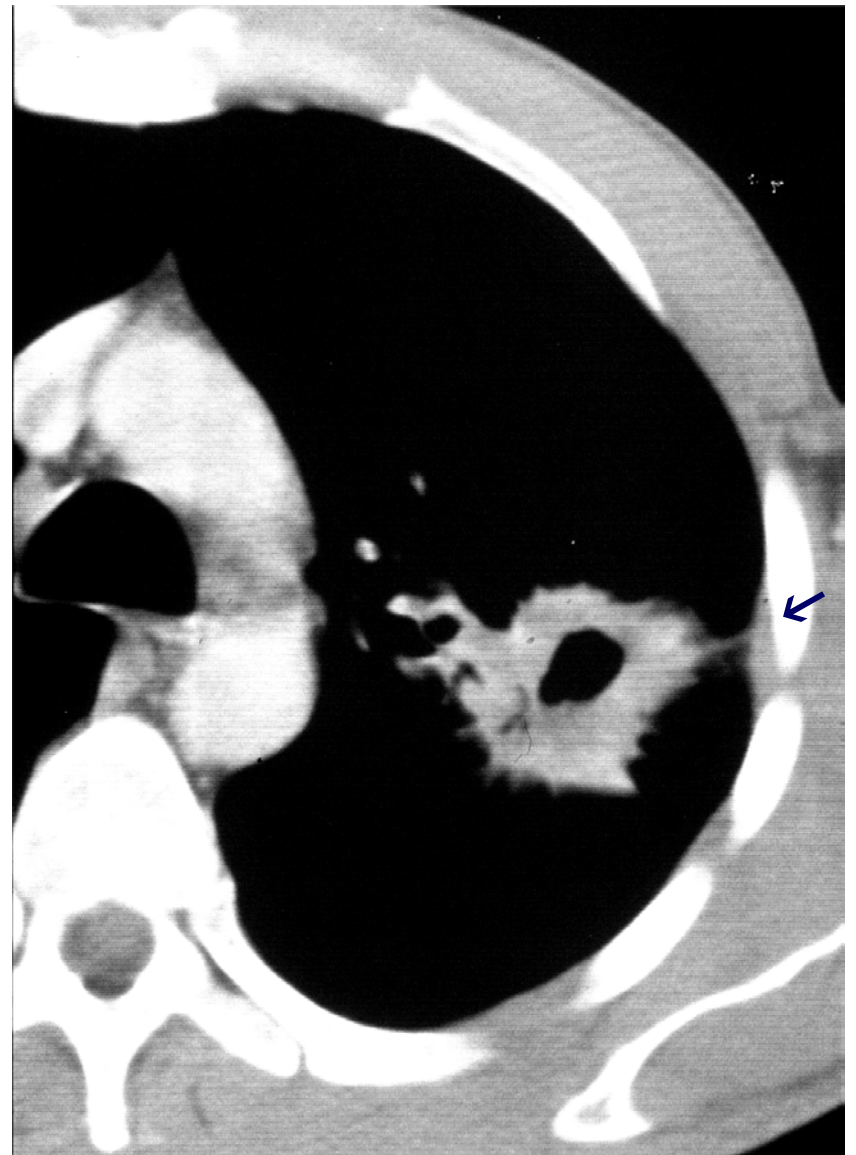
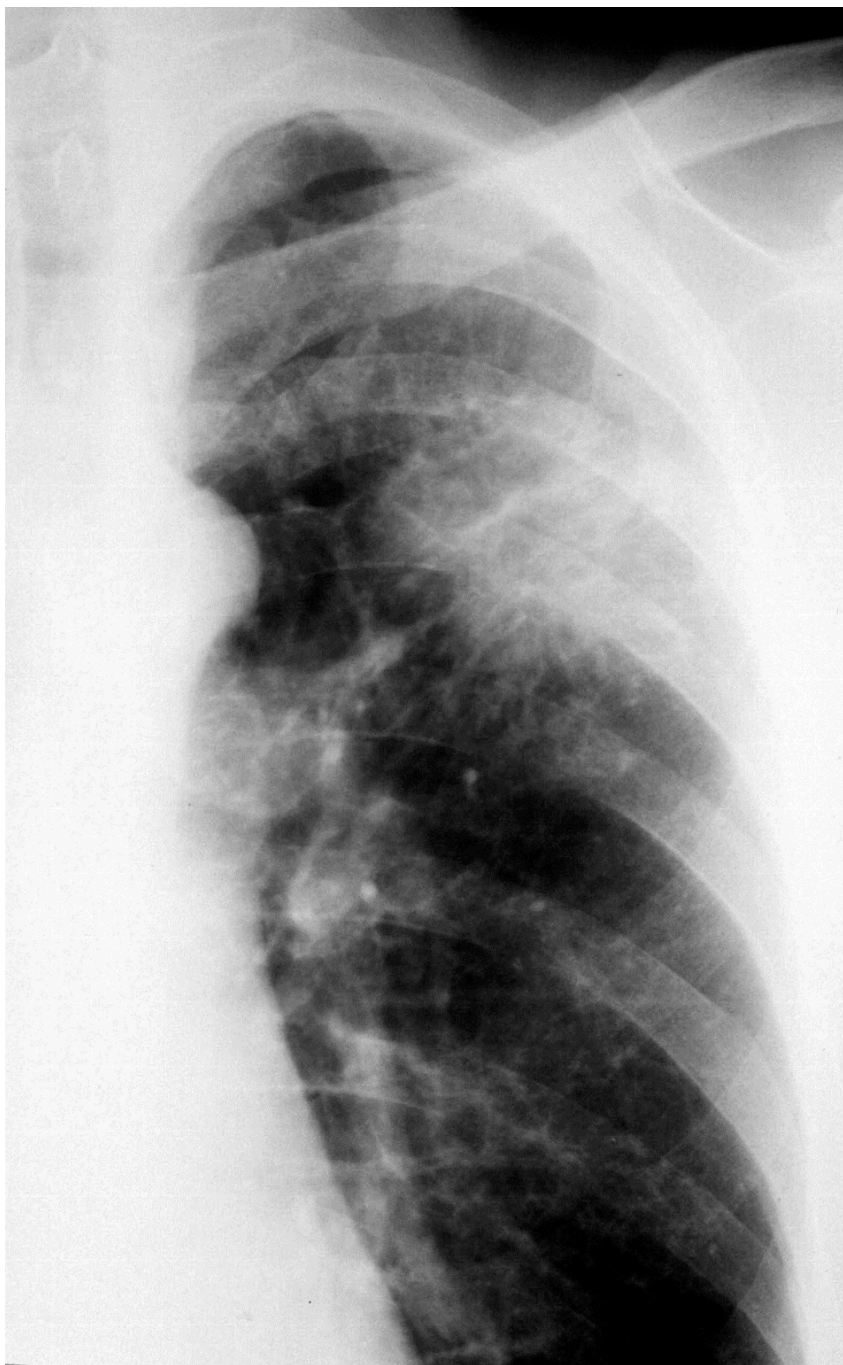
cicatrice



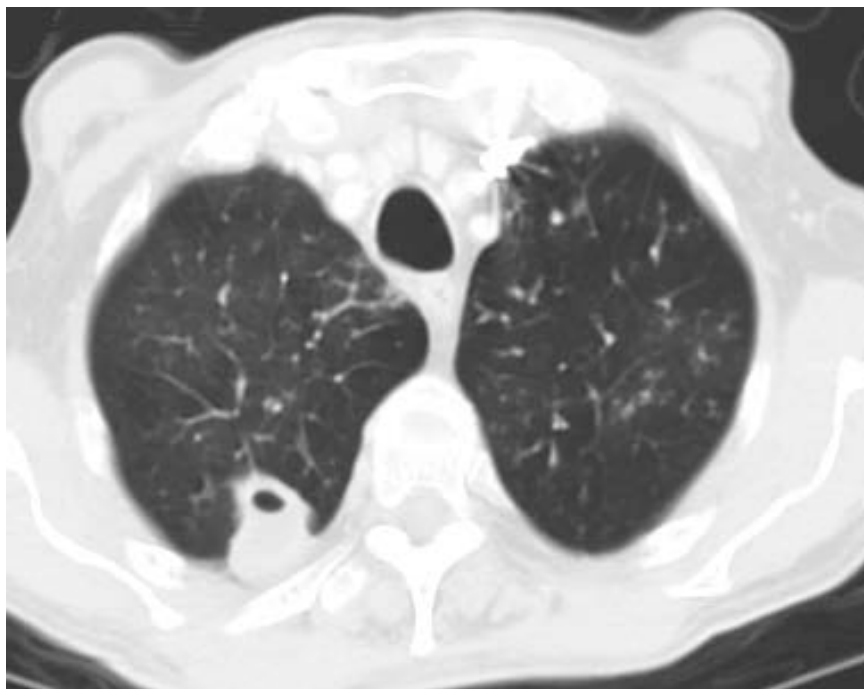
ABCES



- cavitation / nécrose
- rehaussement périphérique en couronne



CANCER BR. : cavitation , " pleural tag "

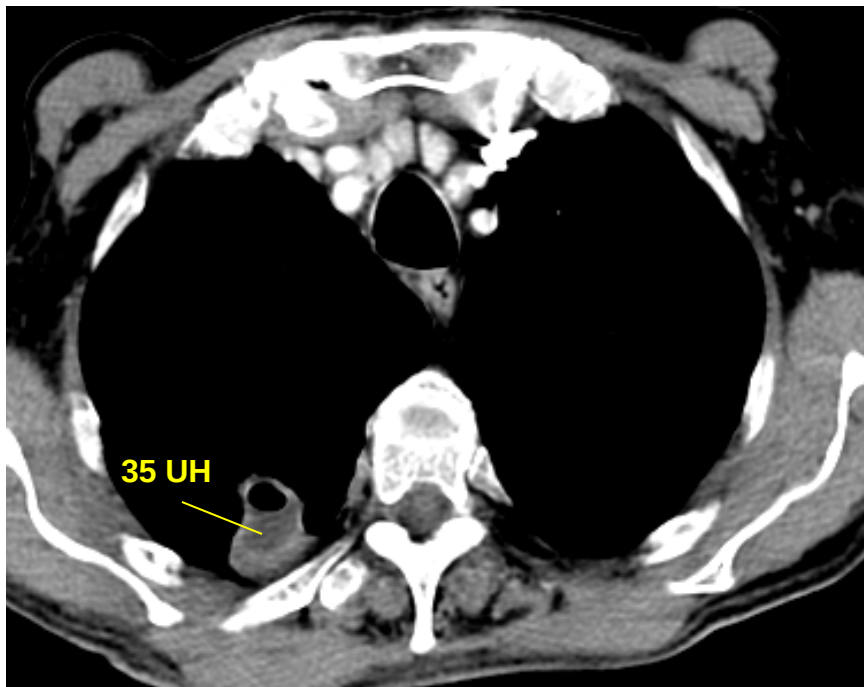


amaigrissement

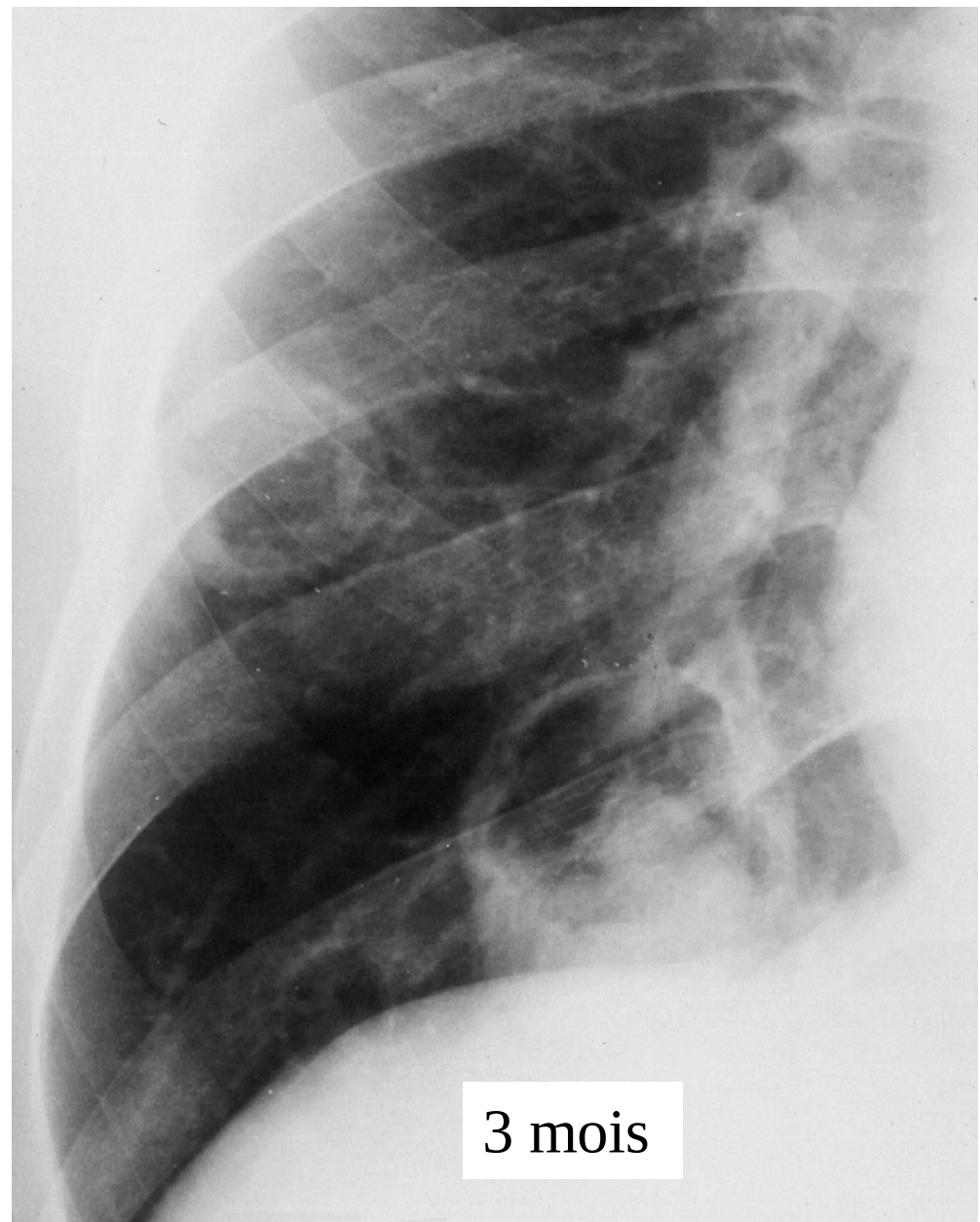
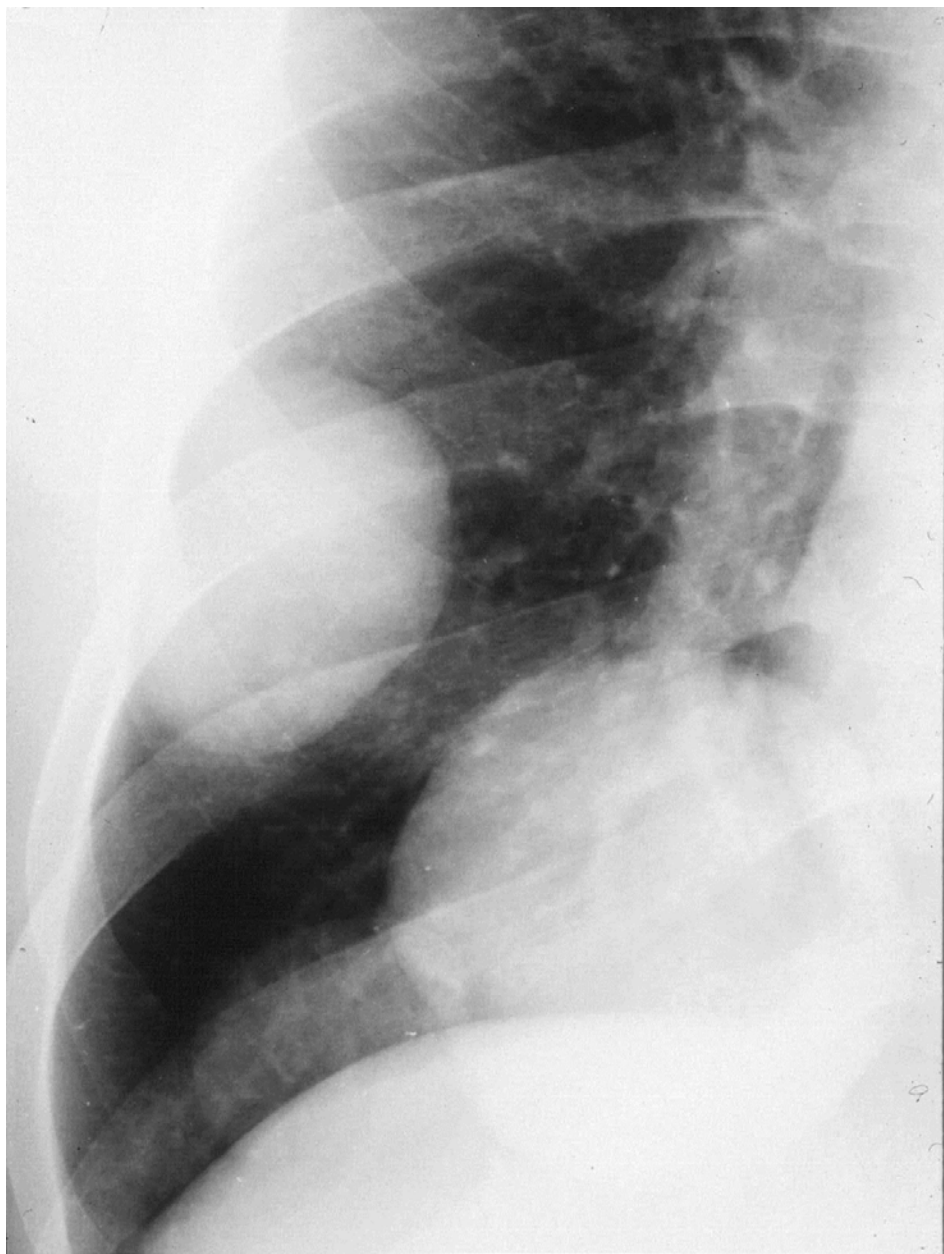
toux

sudations nocturnes

depuis 3 mois



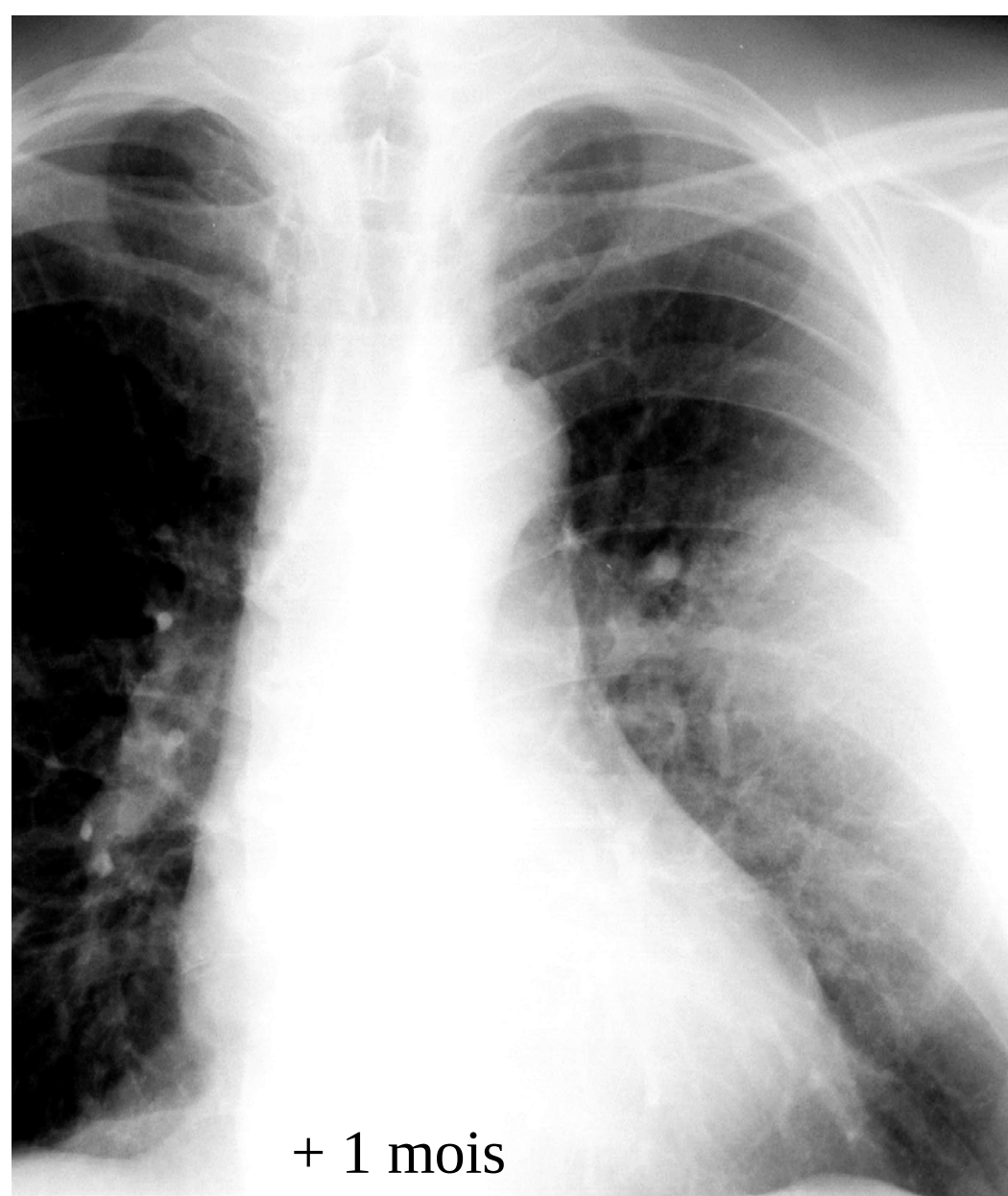
**lésion tuberculeuse
excavée**



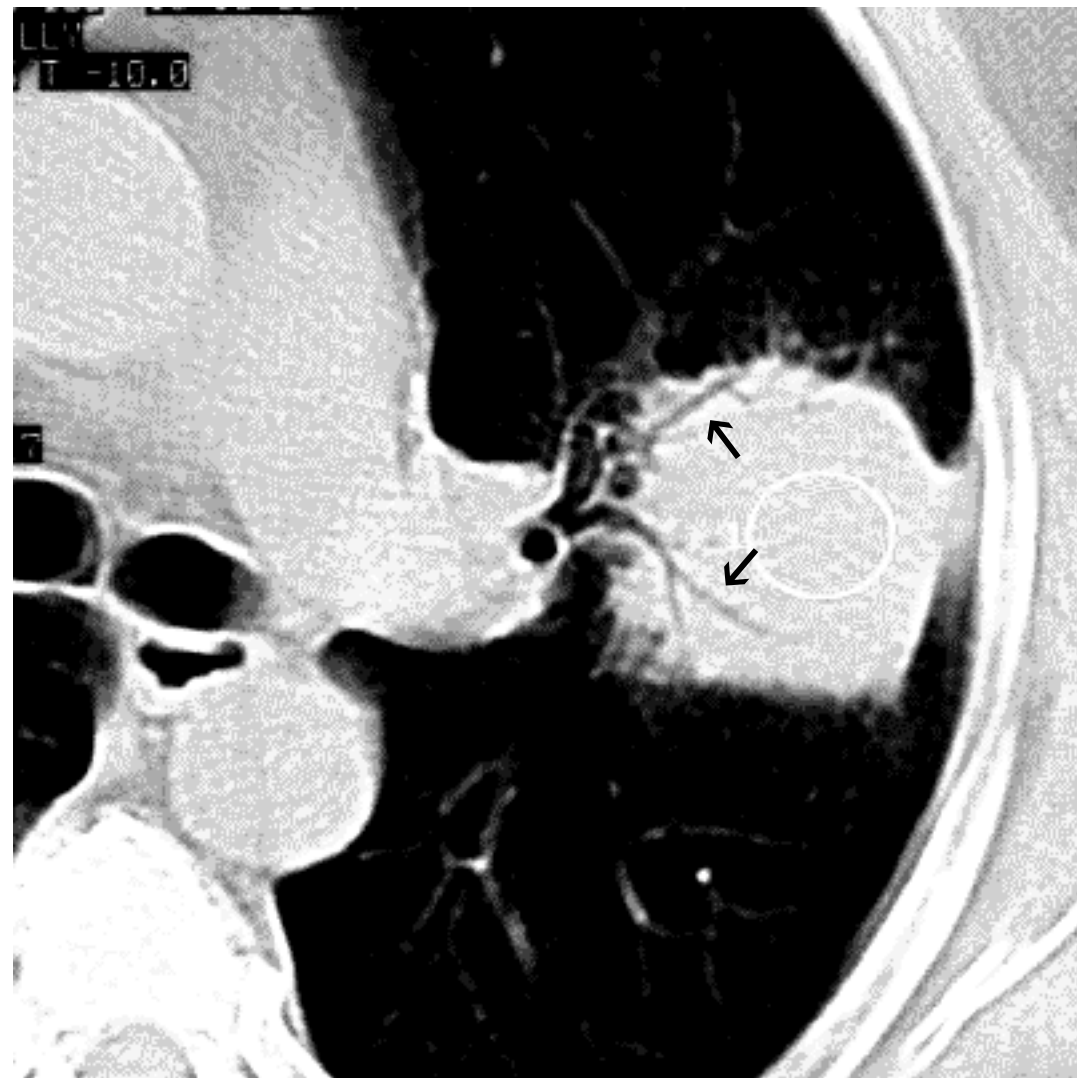
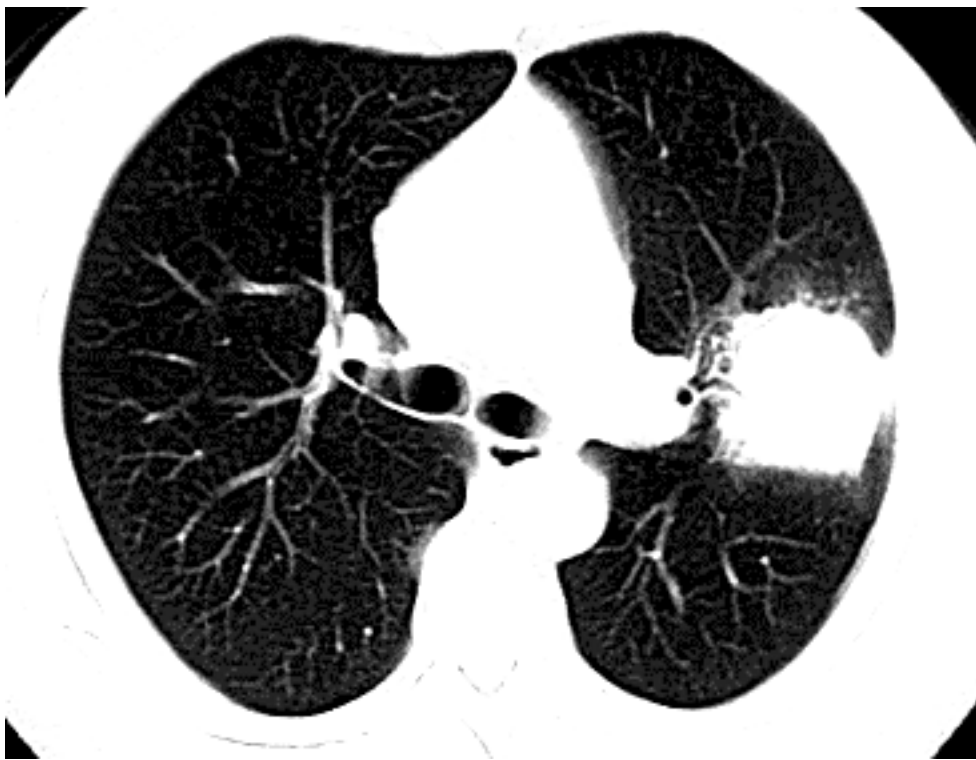
METASTASES → CAVITATION EN COURS DE CHIMIOOTHERAPIE

NP : BRONCHOGRAMME AERIQUE

- **CANCER LEPIDIQUE (CBA)**
 - **CROISSANCE LE LONG DES SEPTA**
 - **ALVEOLOGRAMME AERIQUE**
(PSEUDO-CAVITATION)
- **PNEUMONIE RONDE**
- **LYMPHOME PRIMITIF PULMONAIRE**

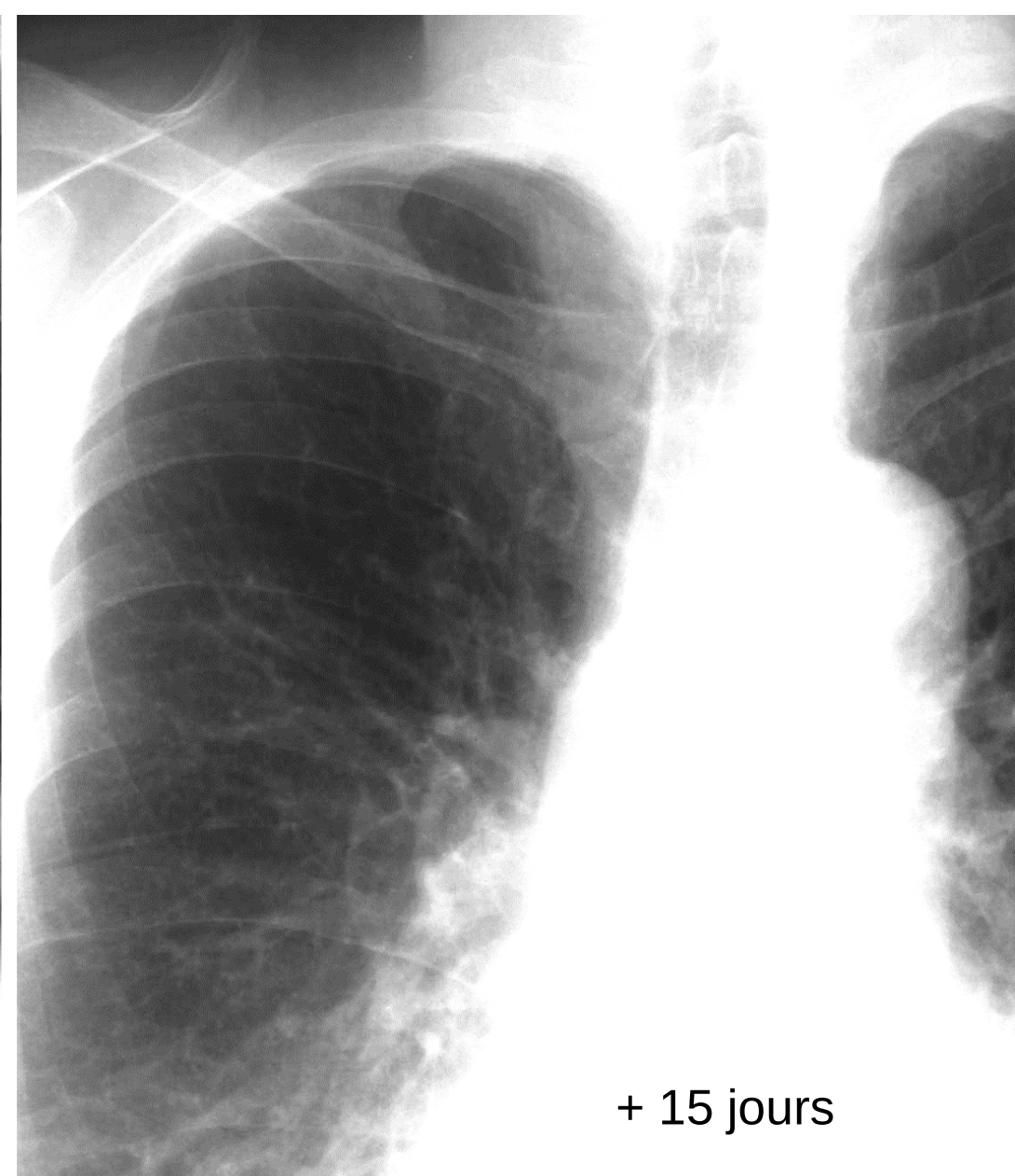


Cancer Lépidique

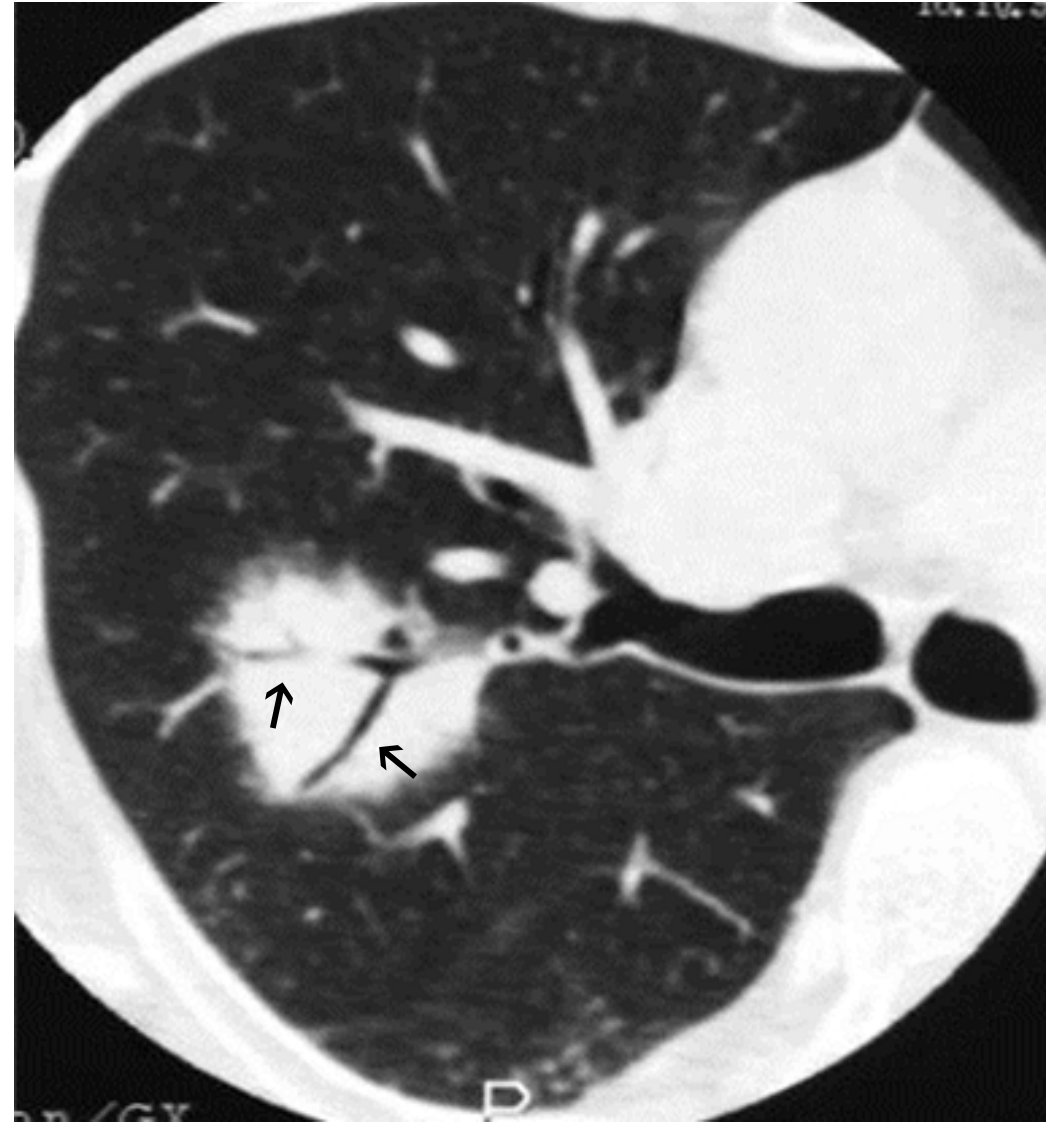
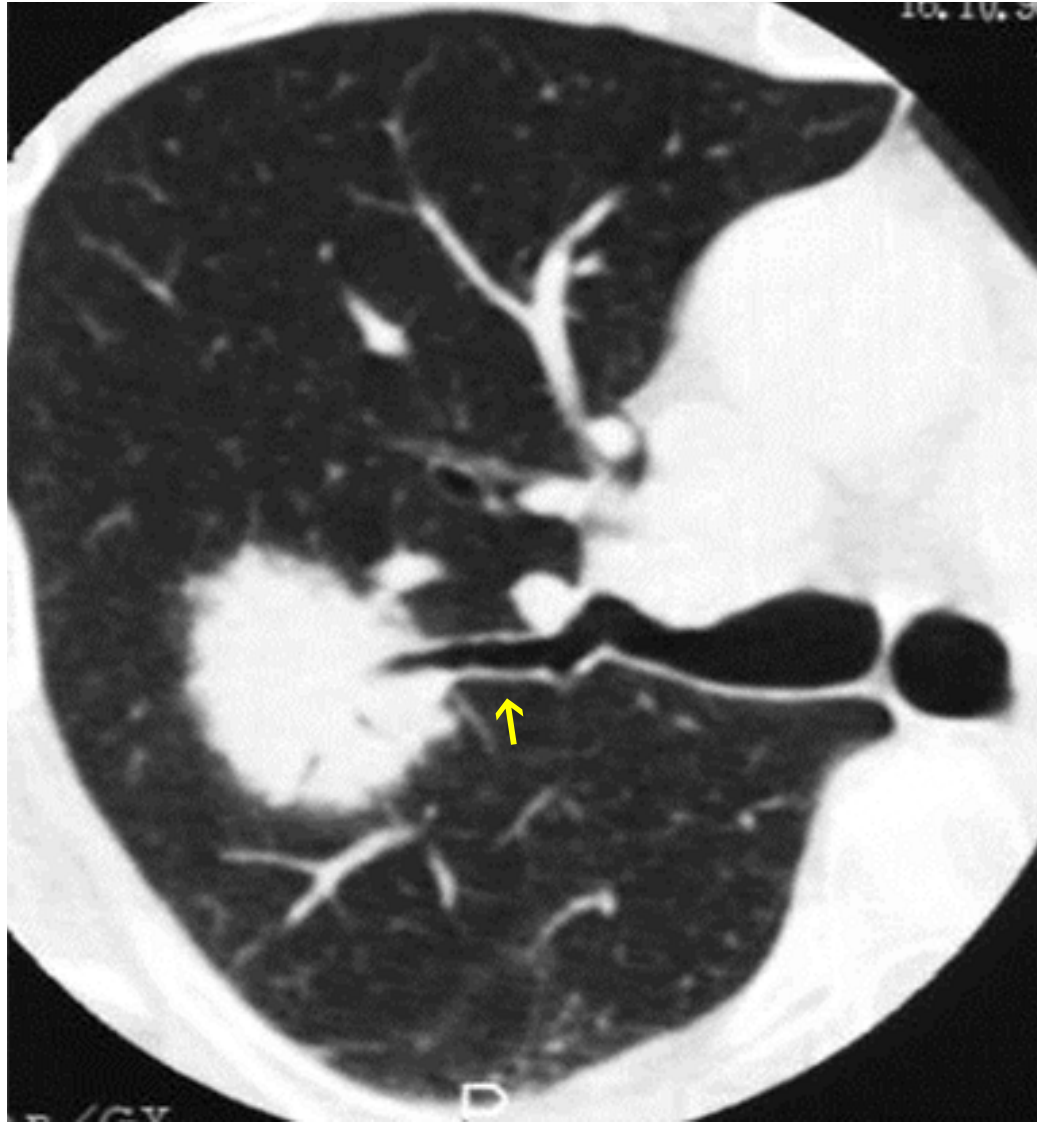


Cancer Lépidique

: BRONCHOGRAMME AERIQUE, "
PLEURAL TAGS "



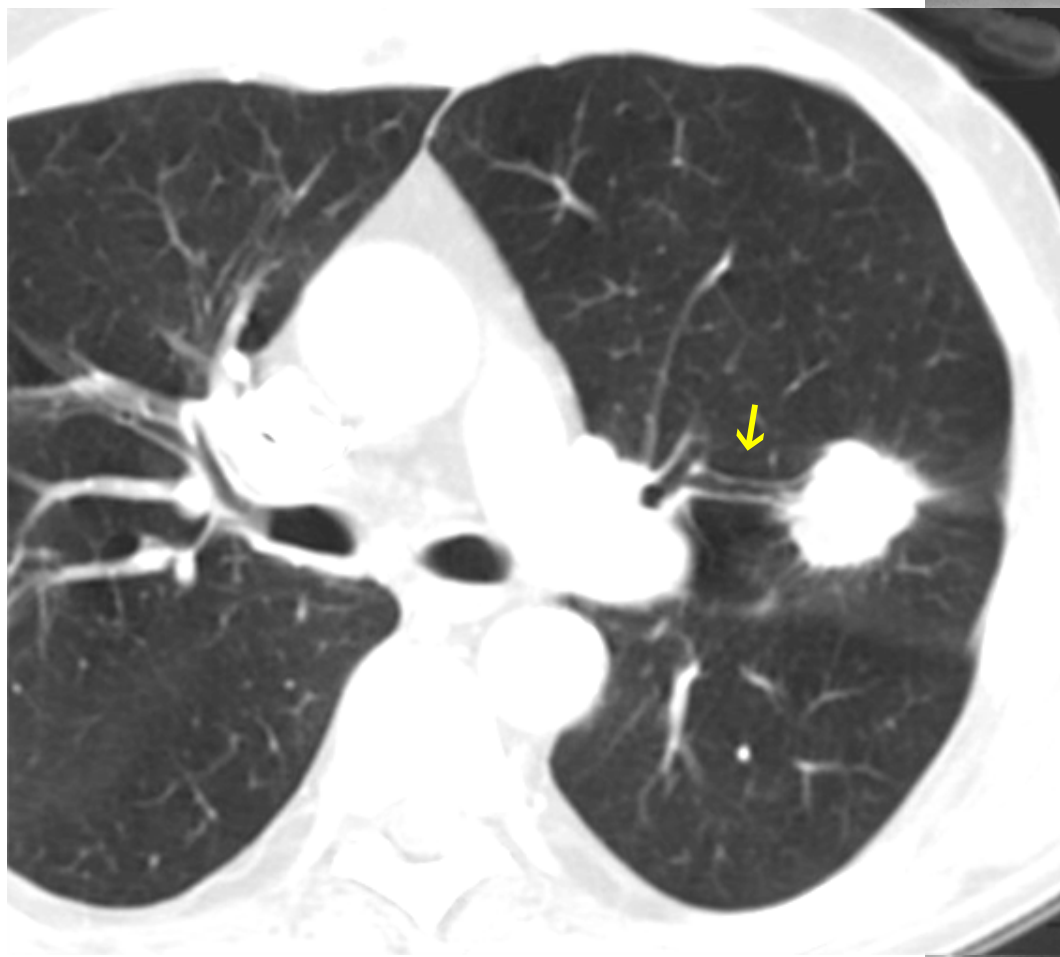
PNEUMONIE RONDE ➔ RESOLUTION



PNEUMONIE RONDE : SIGNE DE LA BRONCHE ,
BRONCHOGRAMME AERIQUE

NP : SIGNE DE LA BRONCHE

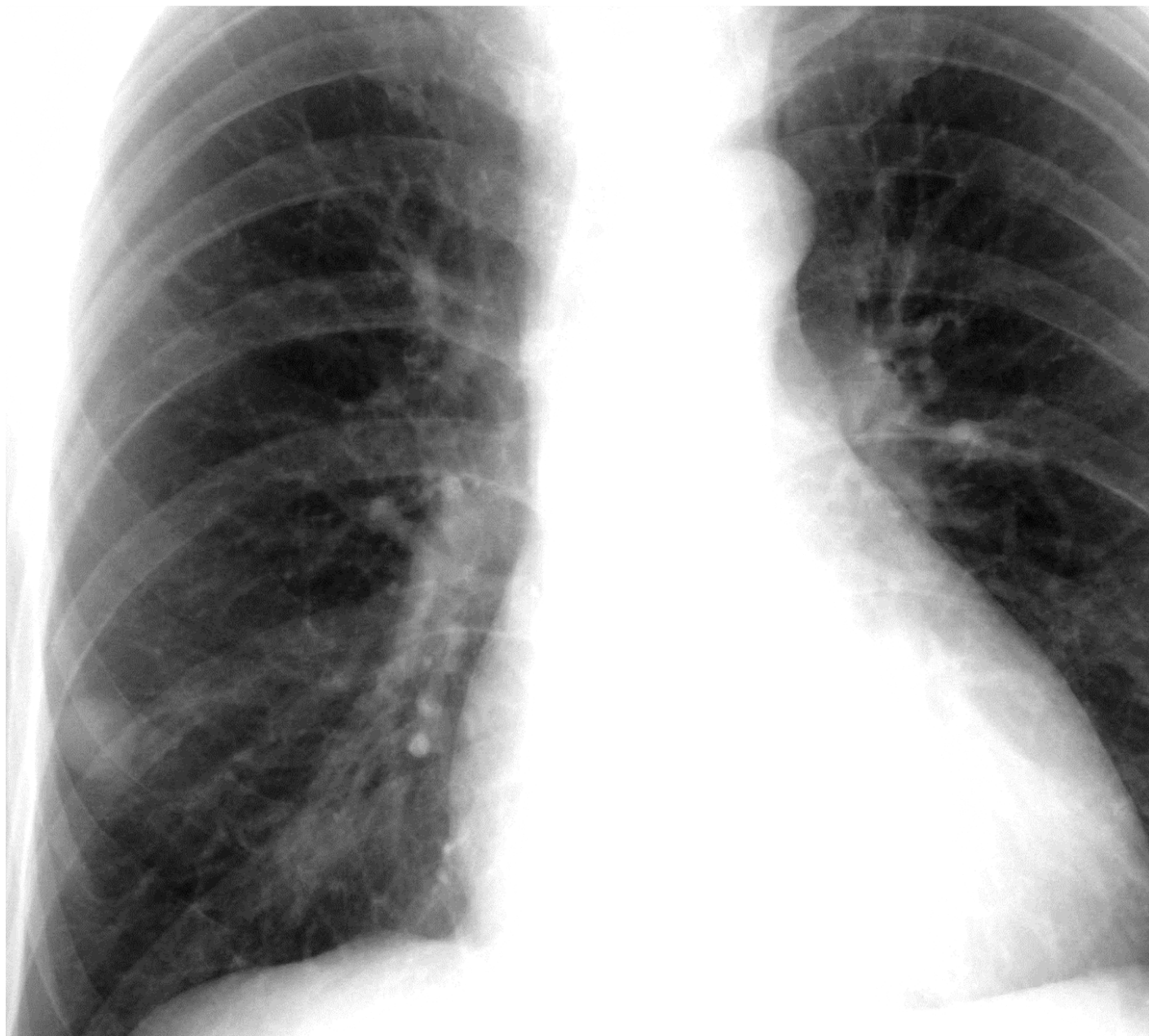
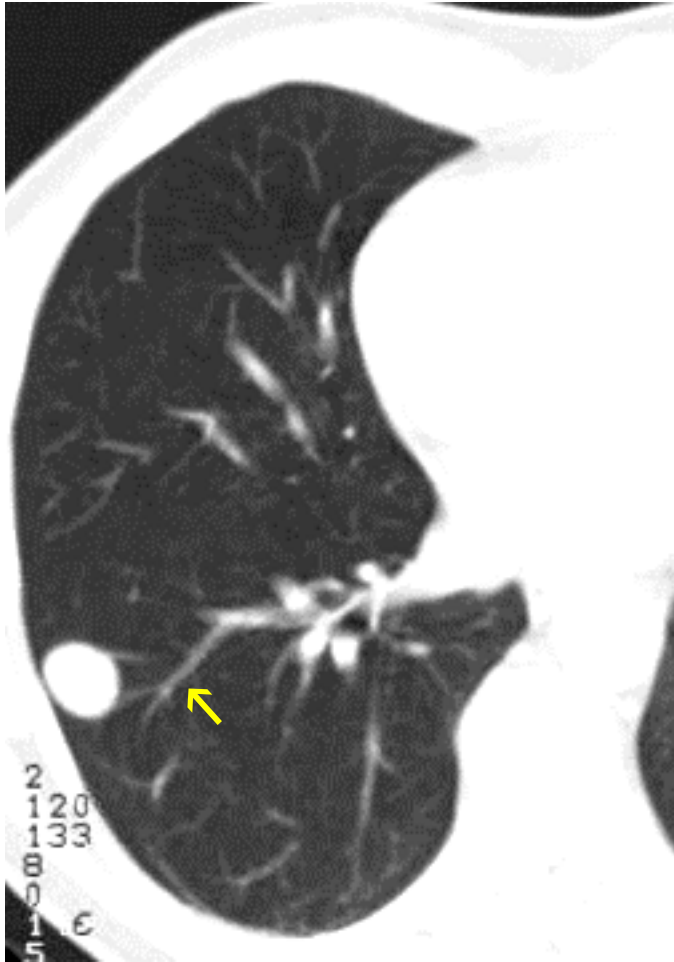
- INTERRUPTION OU PENETRATION BRONCHIQUE
- BENINS et MALINS
- ACCESSIBILE A LA BIOPSIE TRANSBRONCHIQUE



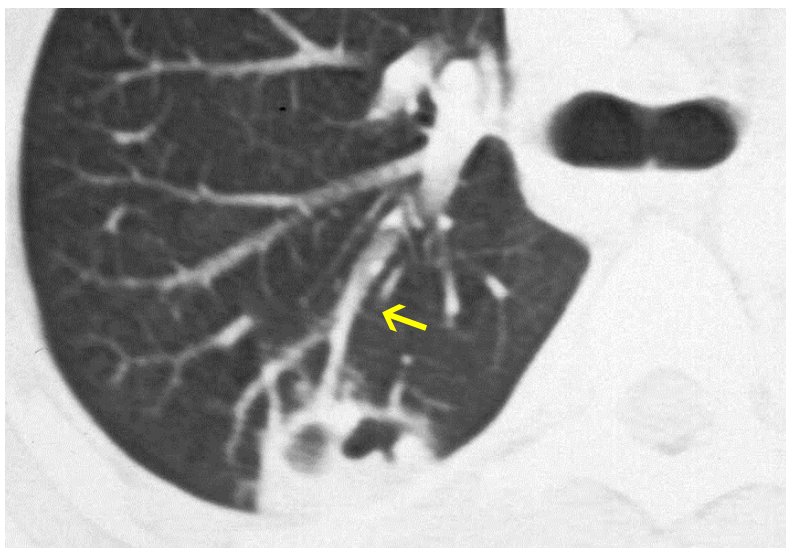
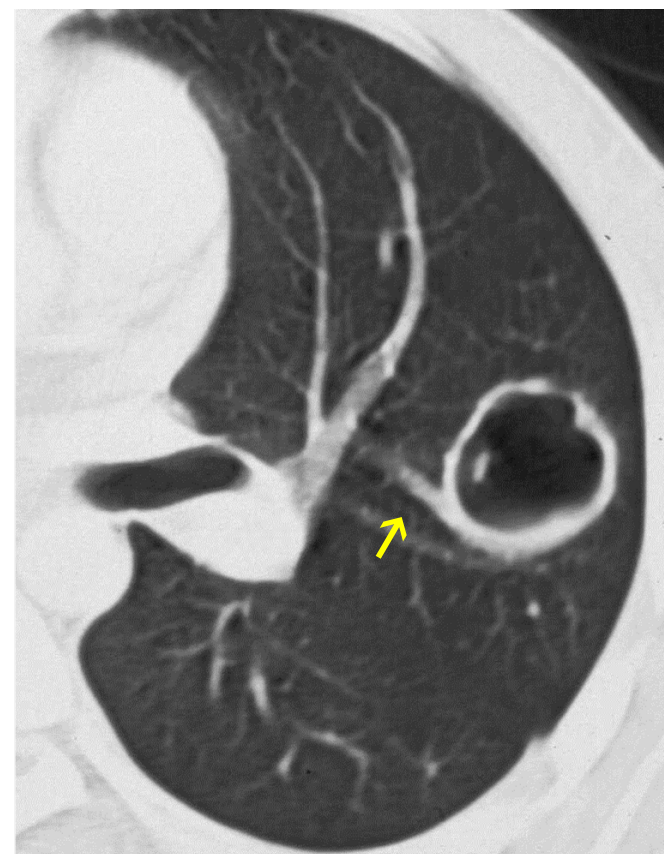
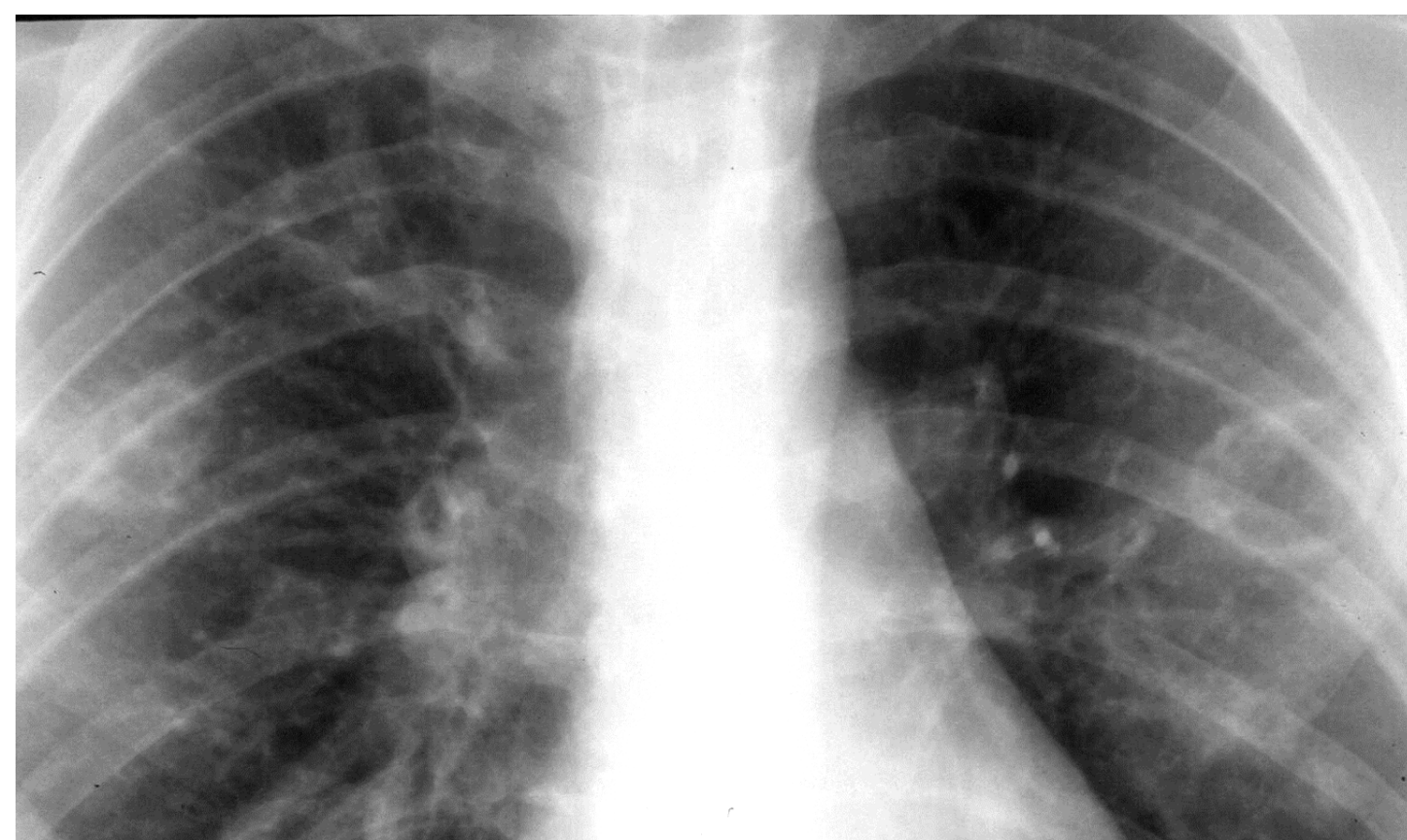
CANCER BR. : spiculé , signe de la bronche

NP : SIGNE VASCULAIRE

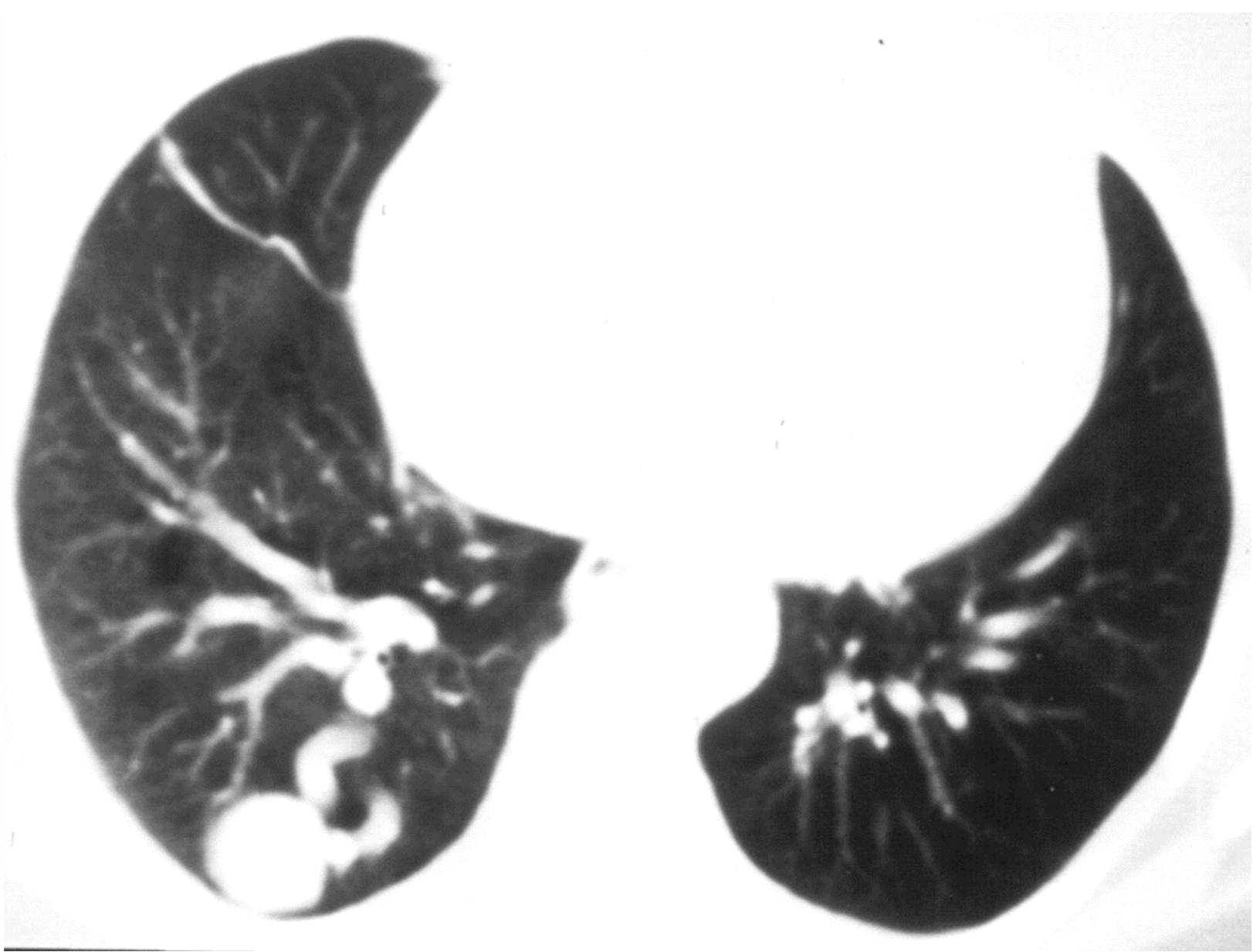
- **CONNEXION ARTERIELLE**
- **LESIONS HEMATOGENES**
 - METASTASES
 - EMBOLIES SEPTIQUES (ABCES)
 - INFARCTUS
 - ASPERGILLOSE
- **LESION VASCULAIRE**
 - MALFORMATION ARTERIO-VEINEUSE (MAV)
(image en " comète ")



METASTASE : " feeding vessel " (antécédent de fibrosarcome)



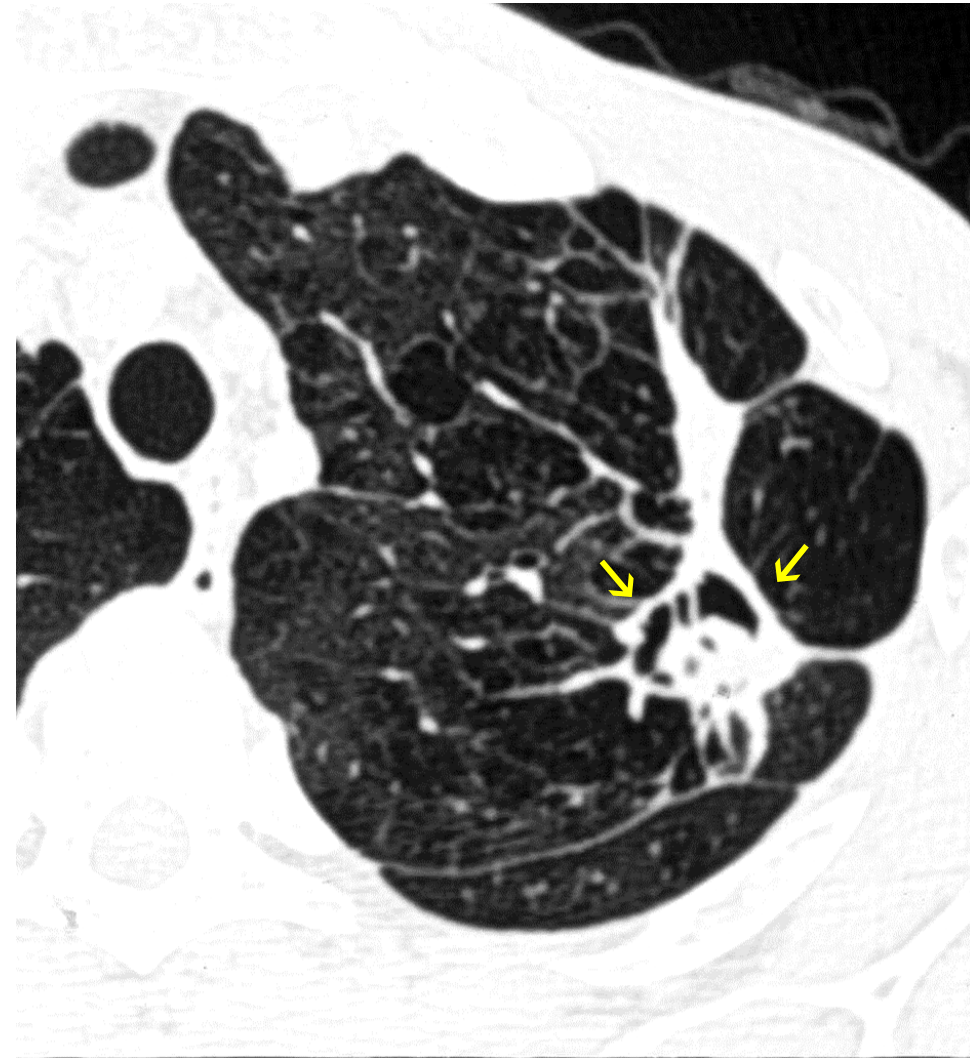
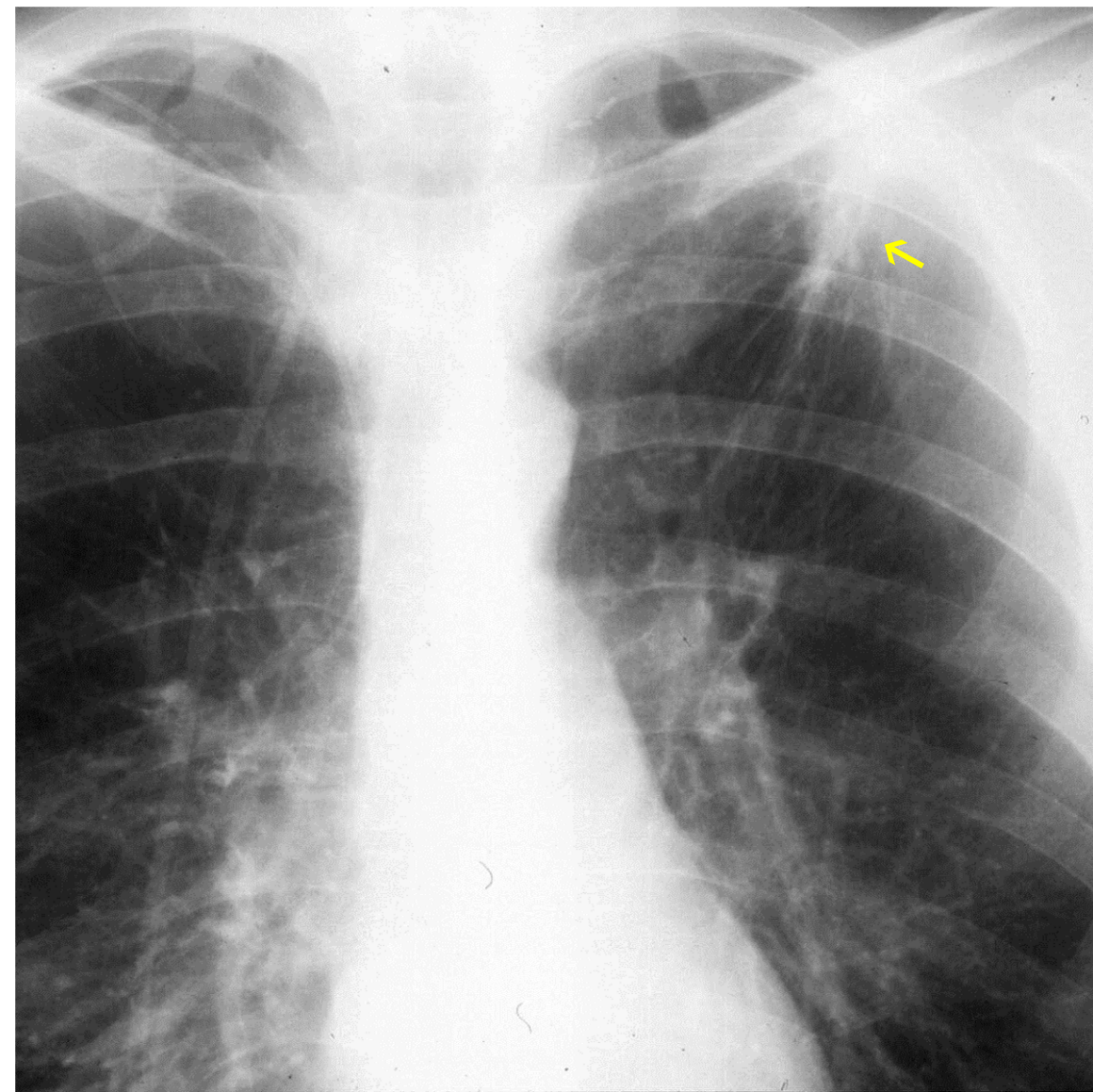
EMBOLIES SEPTIQUES (ABCES) :
cavitation , connexion vasculaire



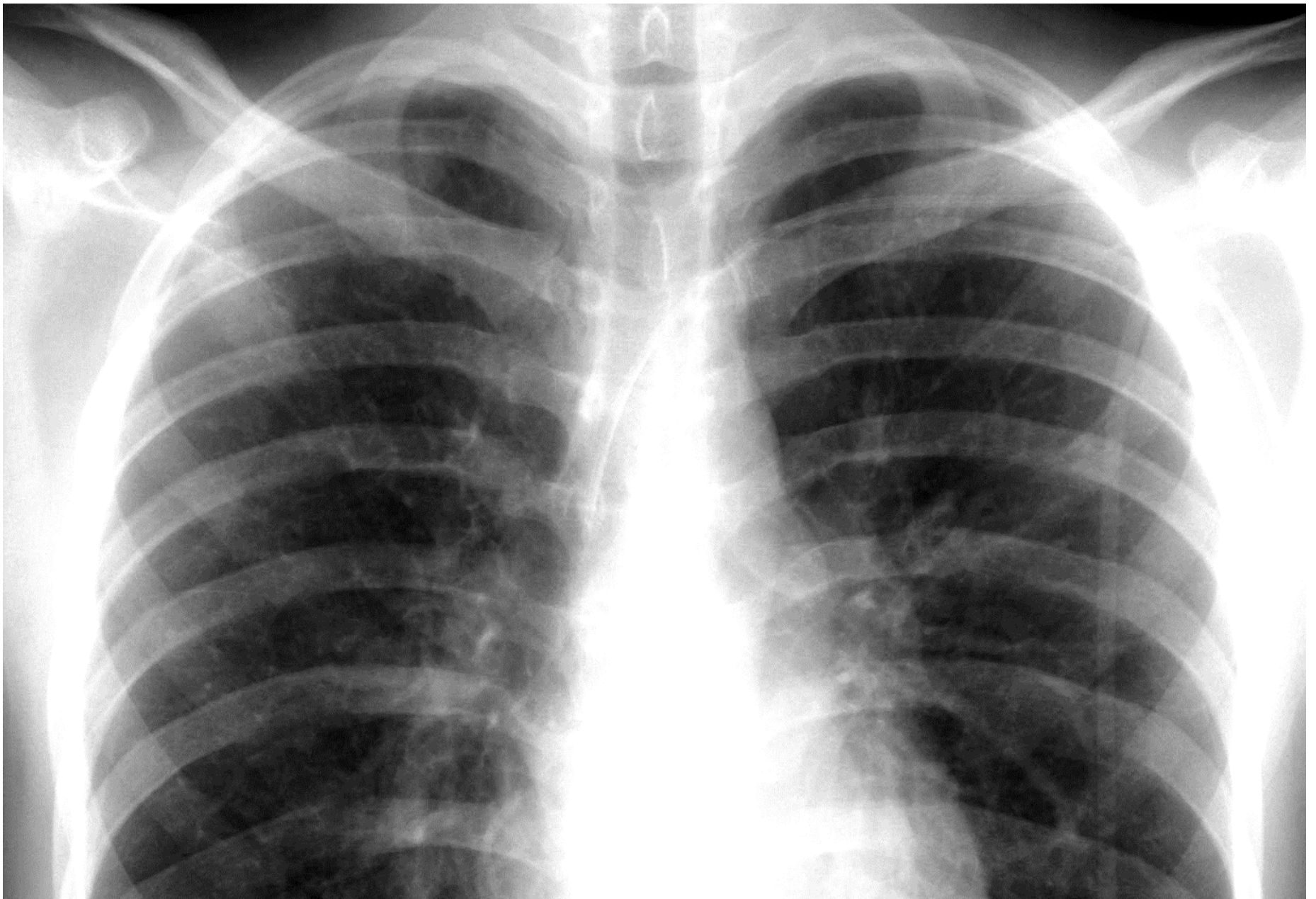
MALFORMATION A-V : image en " comète " , perfusion basale droite ➤

SIGNES PARENCHYMATEUX PERI-NP.

- **CROISSANT AERIQUE** - ASPERGILLOME
- **HALO**
 - ASPERGILLOSE
 - (METASTASE , CANCER)



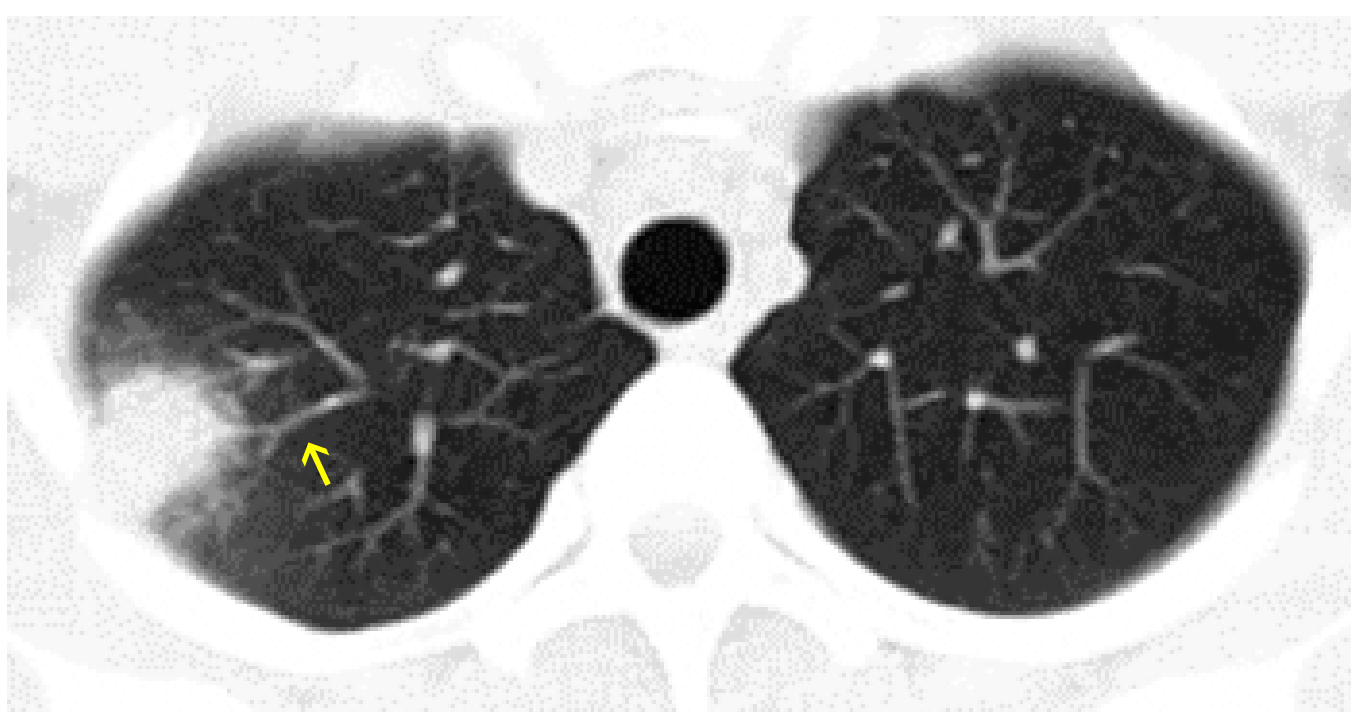
ASPERGILLOME INTRA-CAVITAIRE : signe du CROISSANT AERIQUE



NP (patient immunodéprimé , fébrile)

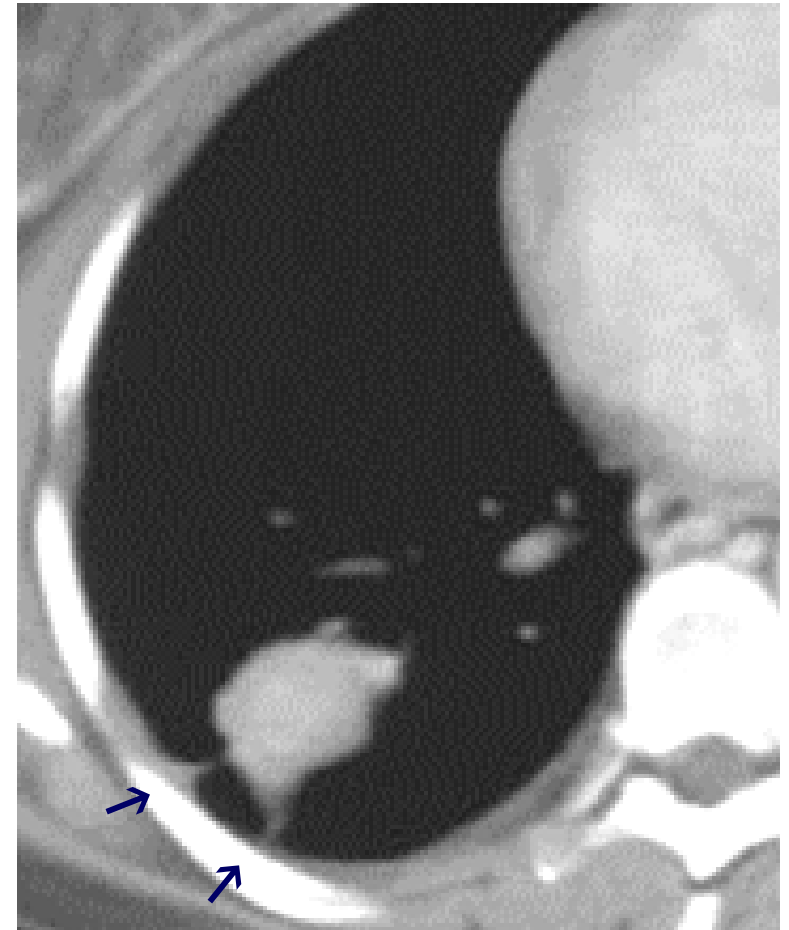
ASPERGILLOSE (invasive)

- Connexion vasculaire
- Signe du halo en " verre dépoli "



NP : SIGNES PLEURAUX

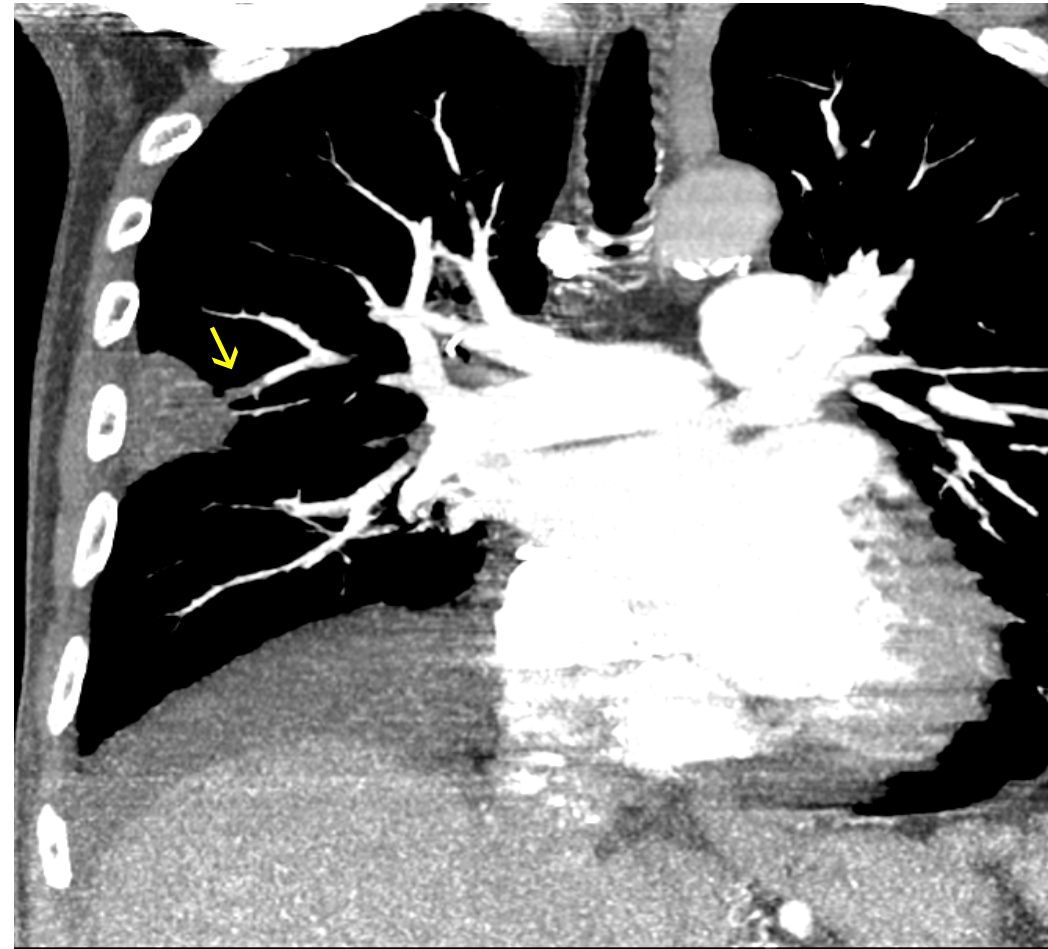
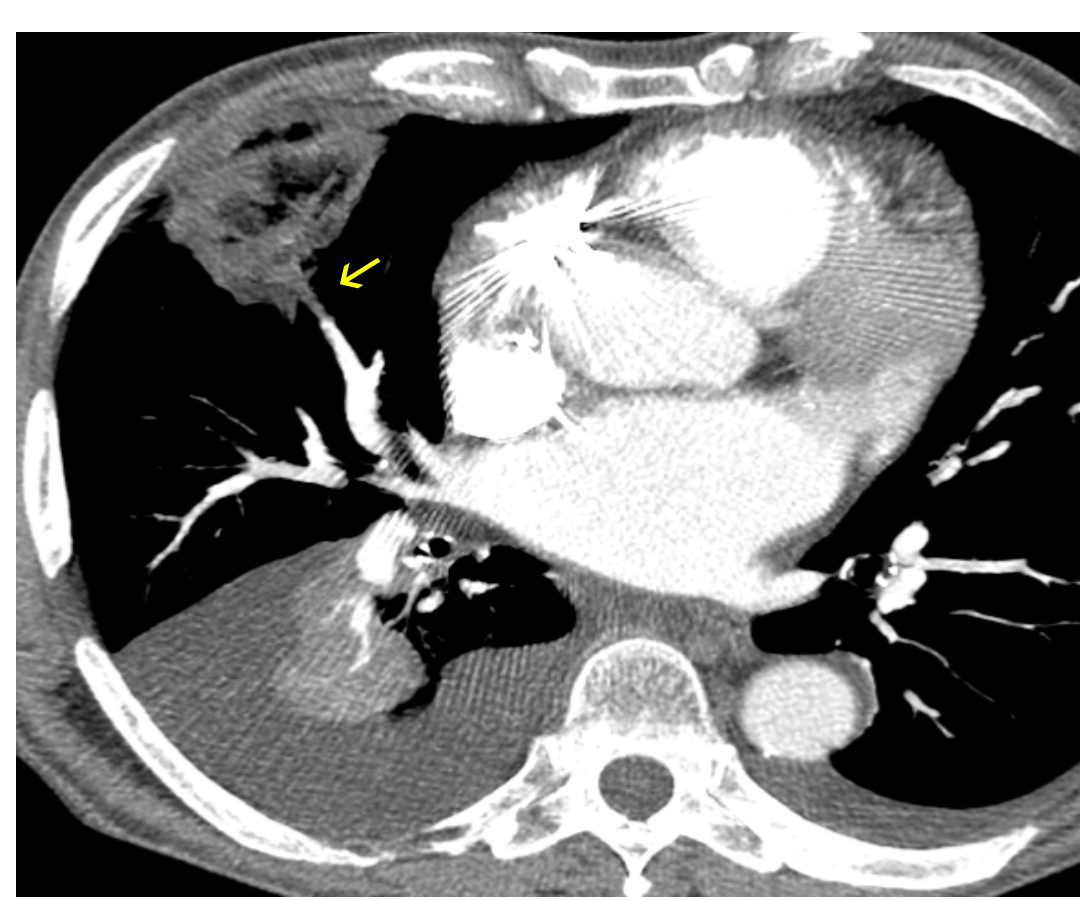
- **" PLEURAL TAGS "**
 - CANCER BRONCHIQUE
 - (GRANULOME TBC.)
- **BASE PEURALE**
 - INFARCTUS PULM.
 - HAMPTON'S HUMP
 - EMBOLE : TDM AVEC CONTRASTE IV



CANCER BRONCHIQUE → "pleural tags"



Douleur brutale basi-thoracique bilatérale la veille + dyspnée progressive



MPR frontal

EMBOLIES PULM. → INFARCTUS

- base pleurale ("Hampton's hump")
- (cavitation)

ANGIO TDM
 → connexion vasc. + embole



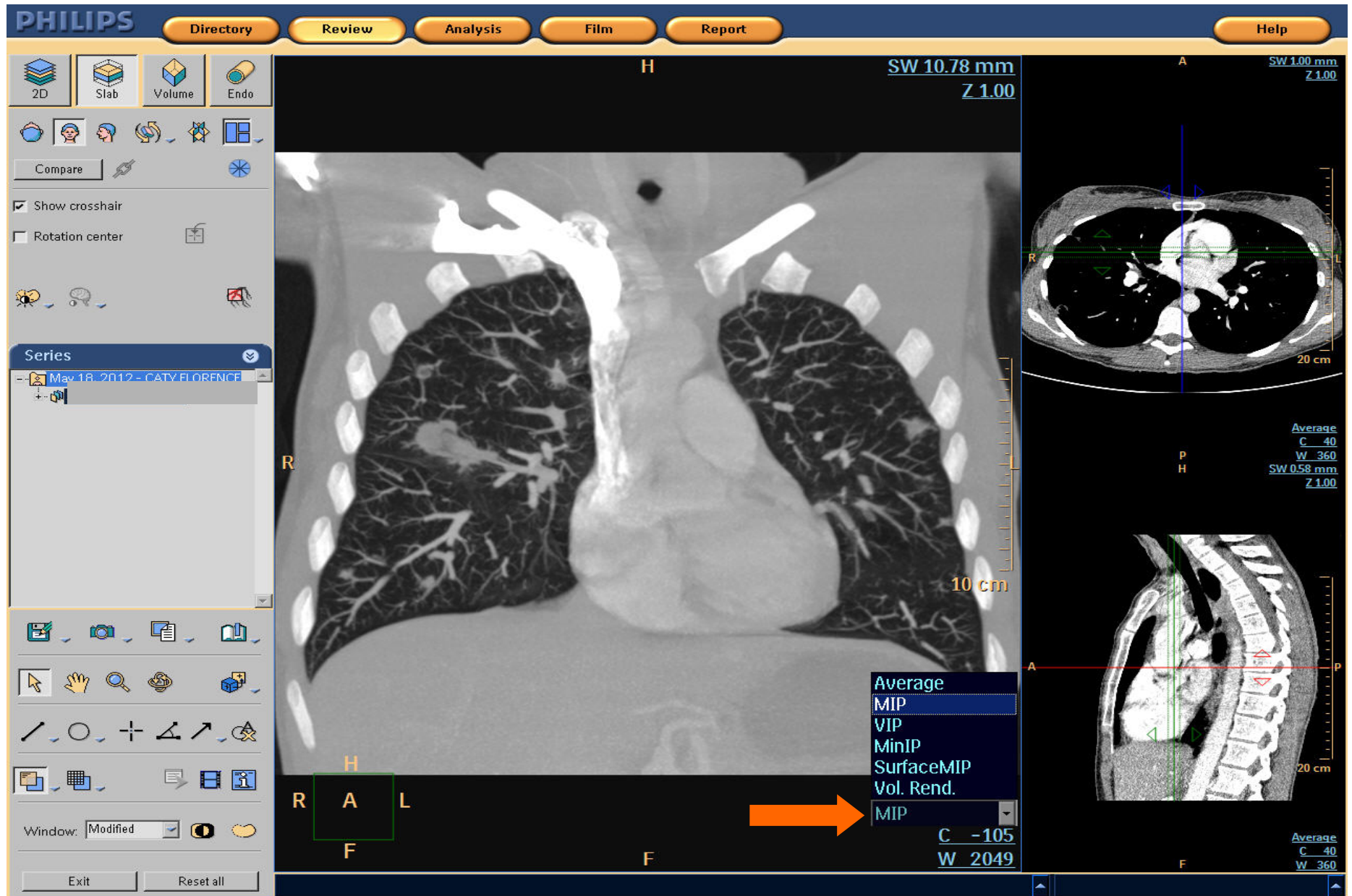




Performance du PET-FDG

		Nodules benins	Nodules malins	Sensibilité	Spécificité
• Kubota et al		12	10	83	90
• Duhaylongsod et al		59	28	97	81
• Bury et al.		33	17	100	88
• Knight et al.		32	16	100	63
• Gupta et al.		45	16	93	88
• Lowe et al.		120	7	96	77
• Lowe et al.		60	30	92	90
• Total	361	194	95	81	

Mode MIP



CAD: Détection et quantification

Review **Analysis**

CT Viewer Lung Nodule Assessment

Archive Manager

Delete Quick Film Copy To

Sub-selection

B40 CHEST USER MEETING 2012

AMET F/26Y

UCL ST.Luc
Philips, Brilliance 40
18 May, 2012 12:52:15.46
120 kV
FOV 343.0 mm
SW 5.00 mm
Z 118

10 cm

MIP
C -442
W 1969

1. Detection

☒ Show Lesions
☐ Rotation center

Detection Tools

☒ Show CAD Results

Edit Nodes:

Window: Modified

Max Diameter (mm)	
Effective Diameter (mm)	
Volume ± Error (mm ³)	
Max Area (mm ²)	
HU (Mean/Max/Min)	

Outils de segmentation

B40 CHEST USER MEETING 2012
AMET F/26Y
4

UCL ST.Luc
Philips, Brilliance 40
18 May, 2012 12:52:15.46
120 kV
FOV 343.0 mm
SW 5.00 mm
Z 1.18

10 cm

MIP
C -442
W 1969

Lesion 1

Lesion 1	
Max Diameter (mm)	19.6
Effective Diameter (mm)	12.8
Volume ± Error (mm ³)	1106.1 ± 111.9
Max Area (mm ²)	130.6
HU (Mean/Max/Min)	-63 / 597 / -1024

B40 CHEST USER MEE
AMET F/26Y
4

UCL ST.Luc
Philips, Brilliance 40
18 May, 2012 12:52:11.57
Z 5.00

3 cm

Volume (mm³) 1106.1
Angle Z: 22.99 deg
Vol. Rend.

Window: Default

Exit Reset all

Comparaison de nodules

2. Matching

Lower Lung Original Lower Lung Follow Up

18 mai 2012 31 juillet 2012

Lesion 1 Lesion 1

20 cm 20 cm

R A F L R A F L R A F L R A F L

P P P P

Volume (mm³) 10152 Volume (mm³) 4189

Window: Default

Exit Reset all

Detection Tools

Original	Follow Up
Lesion 1	Lesion 1
CAD 1	CAD 1
CAD 2	CAD 2
CAD 3	CAD 3

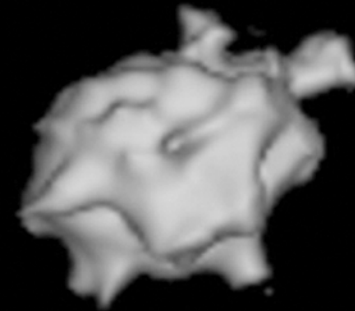
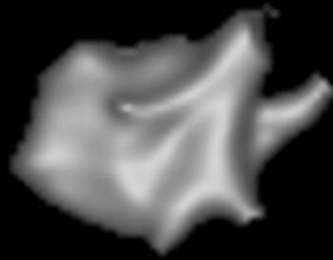
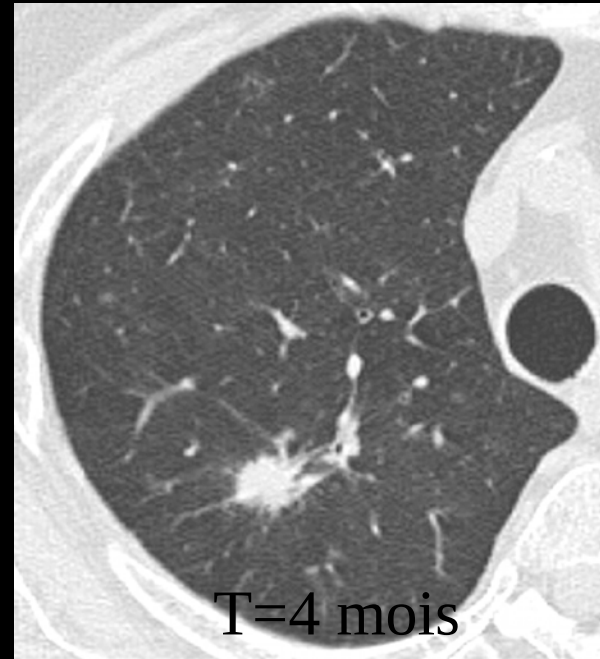
Show Lesions

Rotation center

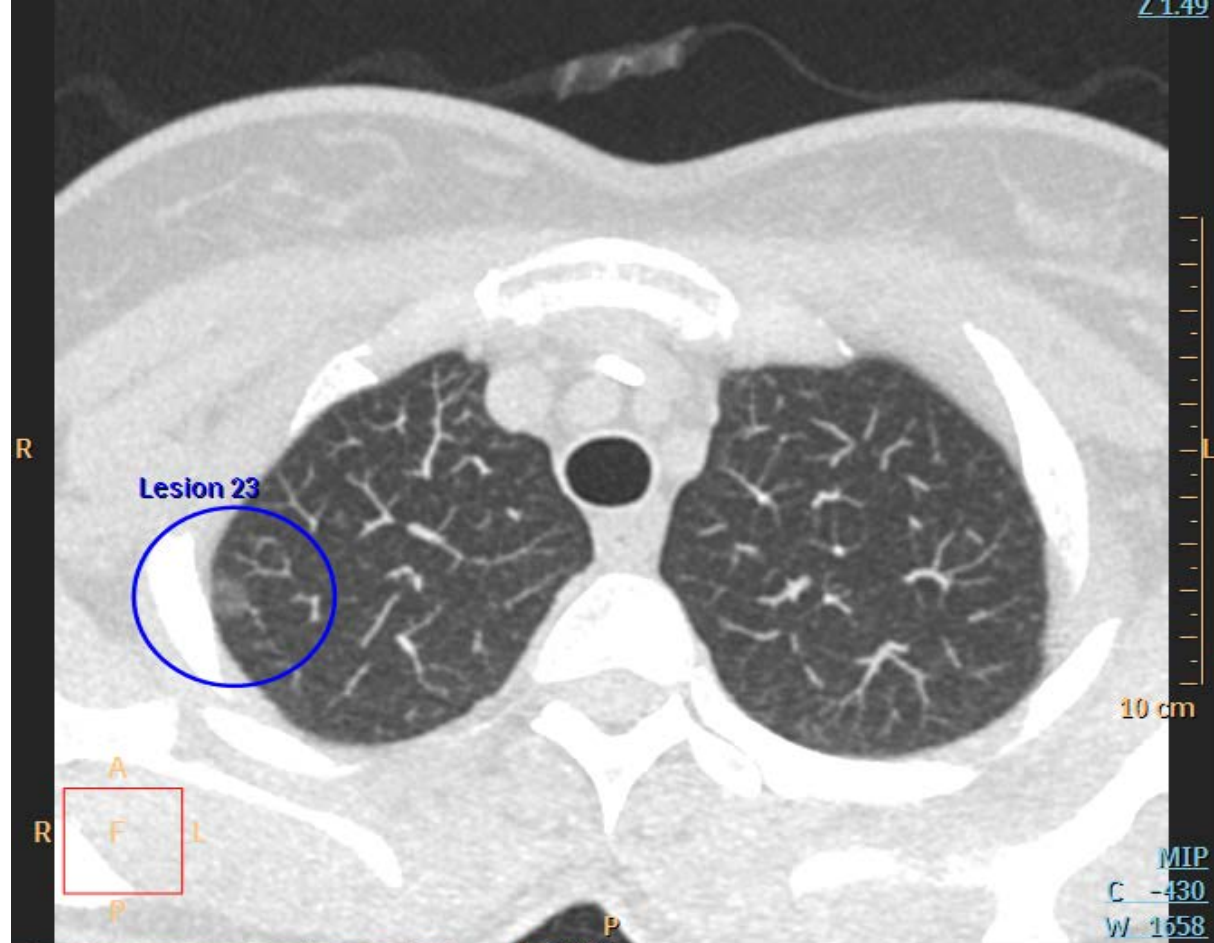
Show CAD Results

Edit Nodes:

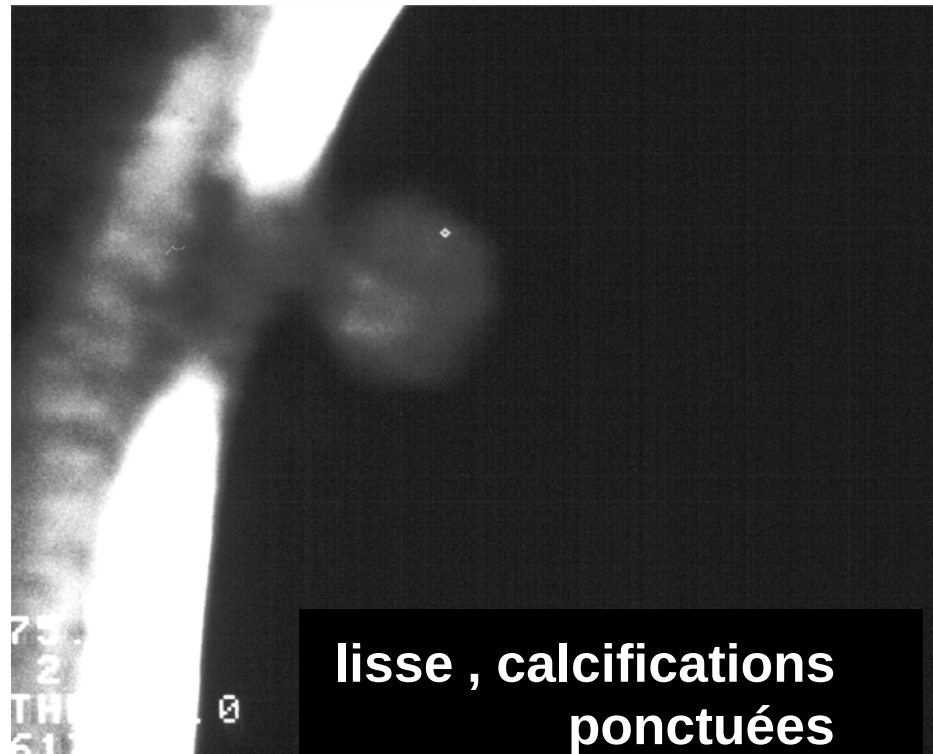
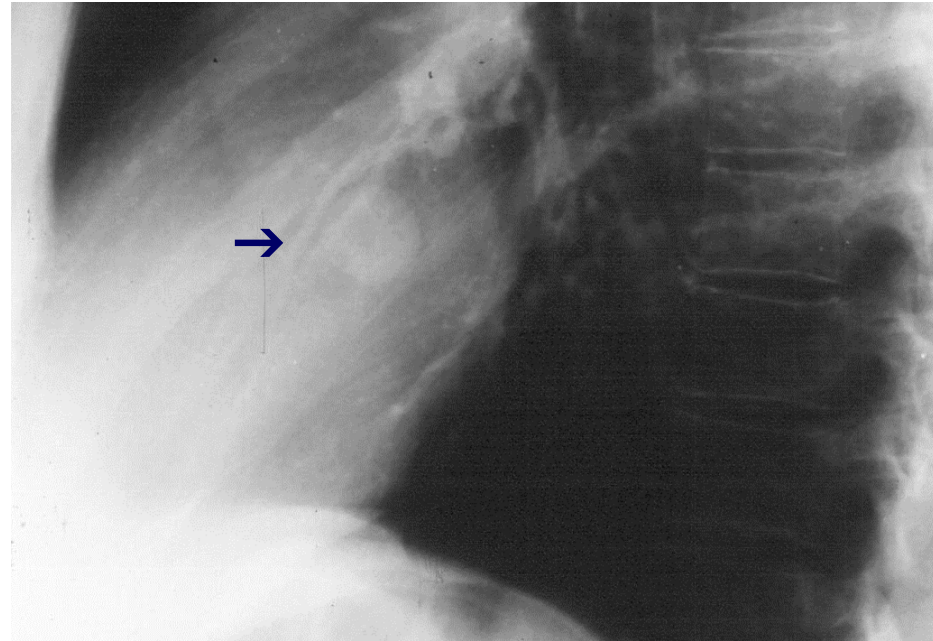
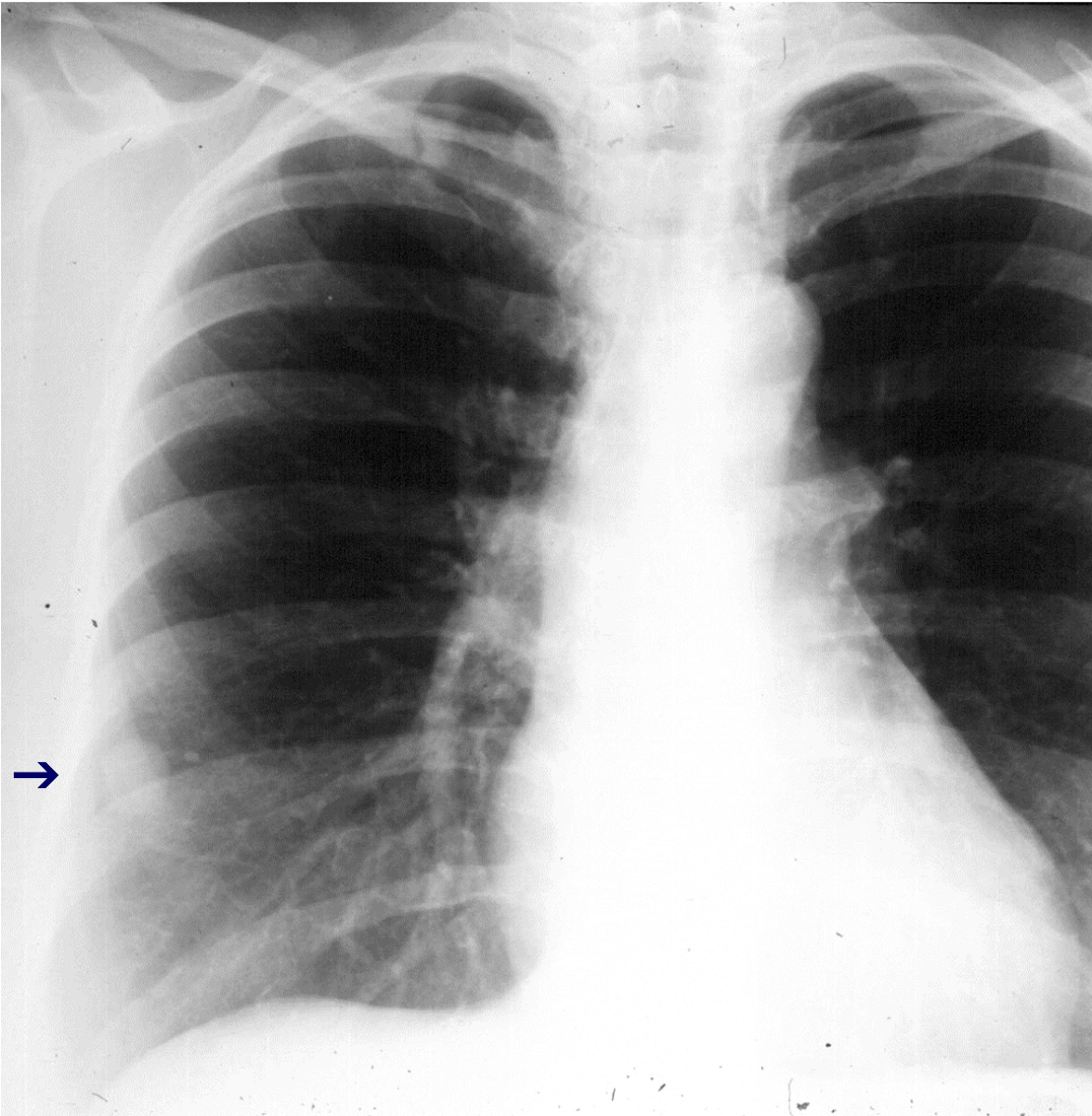
Lesion 1		Lesion 1	
Max Diameter (mm)	18.0	Max Diameter (mm)	12.8
Effective Diameter (mm)	12.5	Effective Diameter (mm)	9.3
Volume ± Error (mm ³)	1015.2 ± 202.3	Volume ± Error (mm ³)	418.9 ± 70.0
Max Area (mm ²)	120.3	Max Area (mm ²)	57.1
HU (Mean/Max/Min)	-195 / 88 / -520	HU (Mean/Max/Min)	-254 / 448 / -1024



Temps de doublement estimé à 154 jours

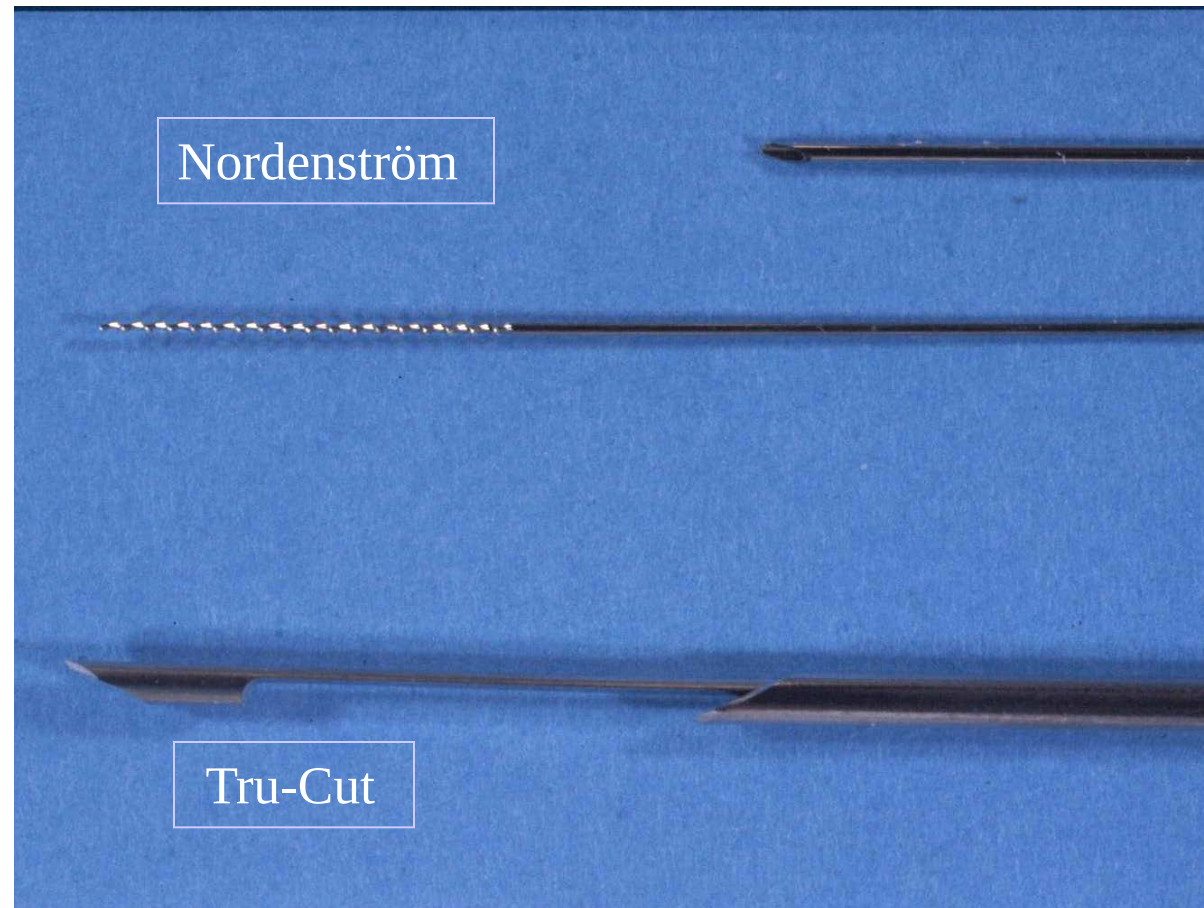
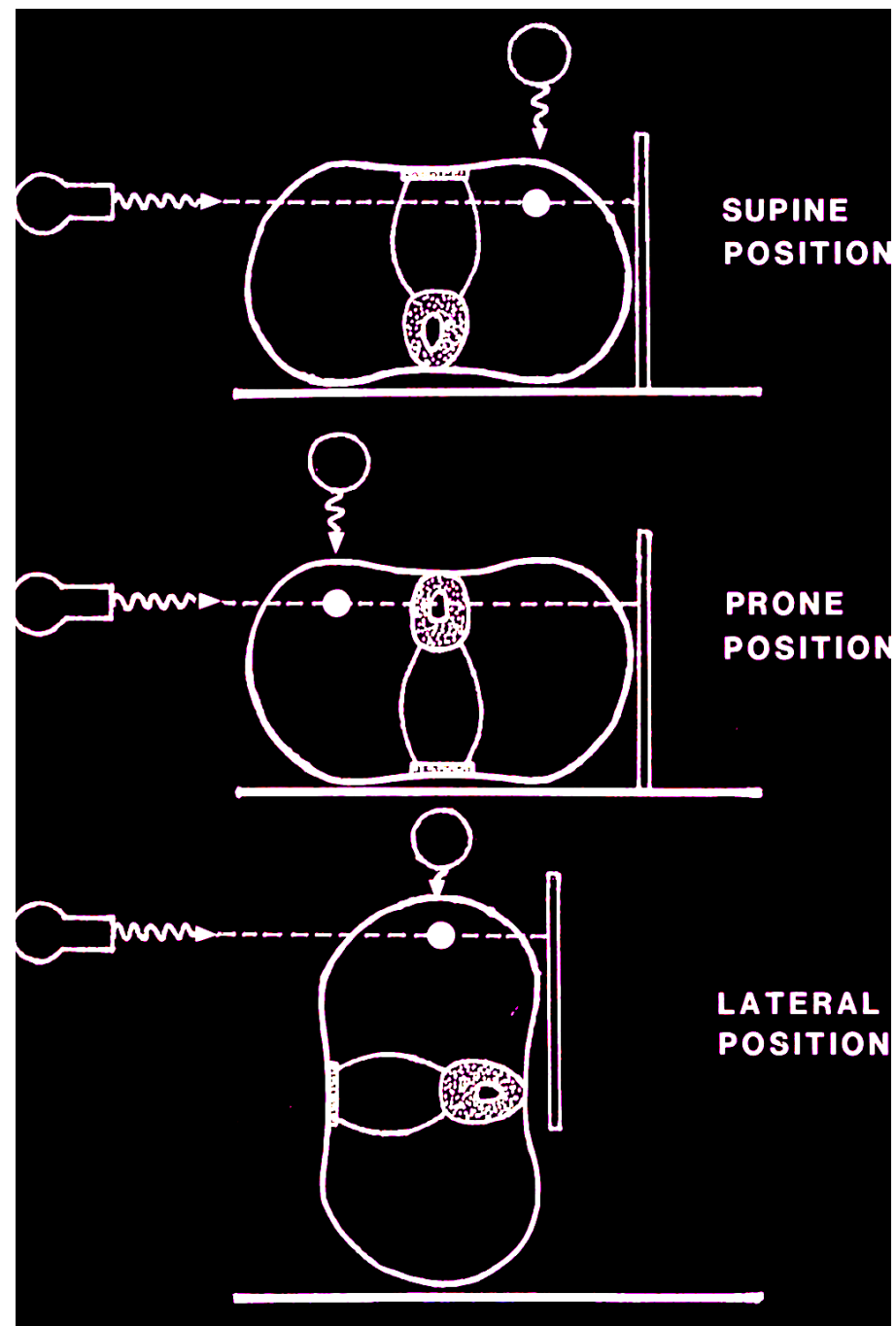


Lesion 23	
Max Diameter (mm)	14.5
Effective Diameter (mm)	10.2
Volume ± Error (mm ³)	554.0 ± 51.0
Max Area (mm ²)	104.0
HU (Mean/Max/Min)	-575 / 31 / -1024

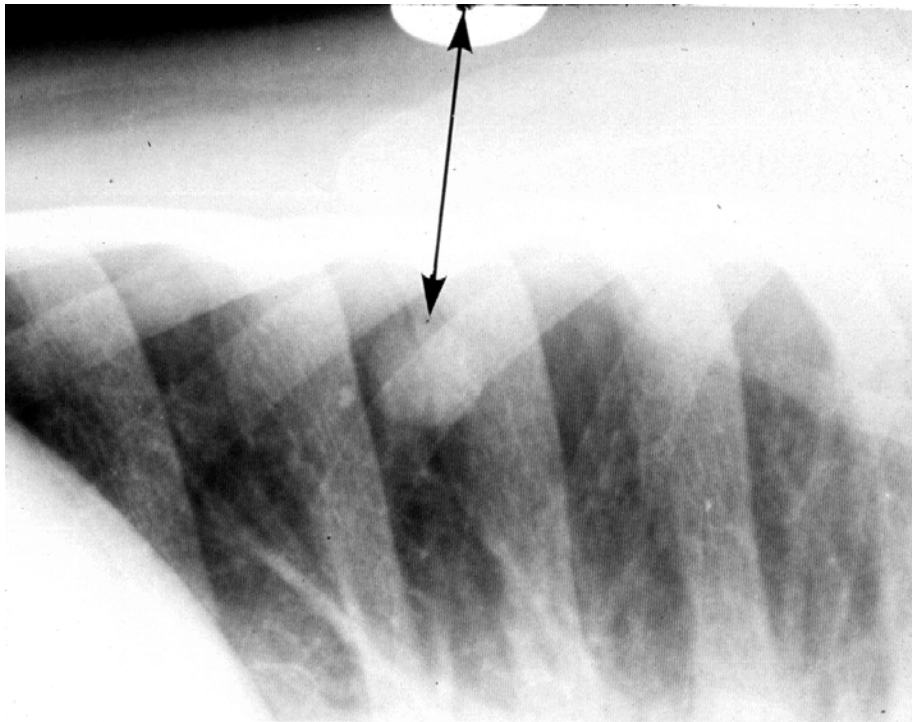


**CANCER BRONCHIQUE ?
TUMEUR CARCINOÏDE ?
HAMARTOME ?**

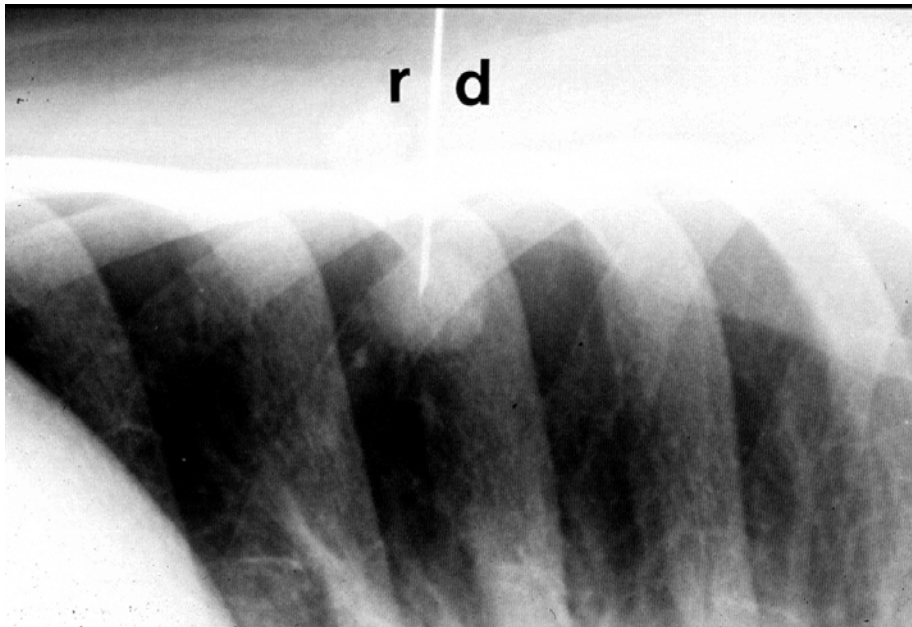
**lisse , calcifications
ponctuées**



PONCTION-BIOPSIE
TRANSTHORACIQUE
(PBTTH)



PBTTH : guidance fluoroscopique
(radioscopique)



cytologie

➔ HAMARTOME

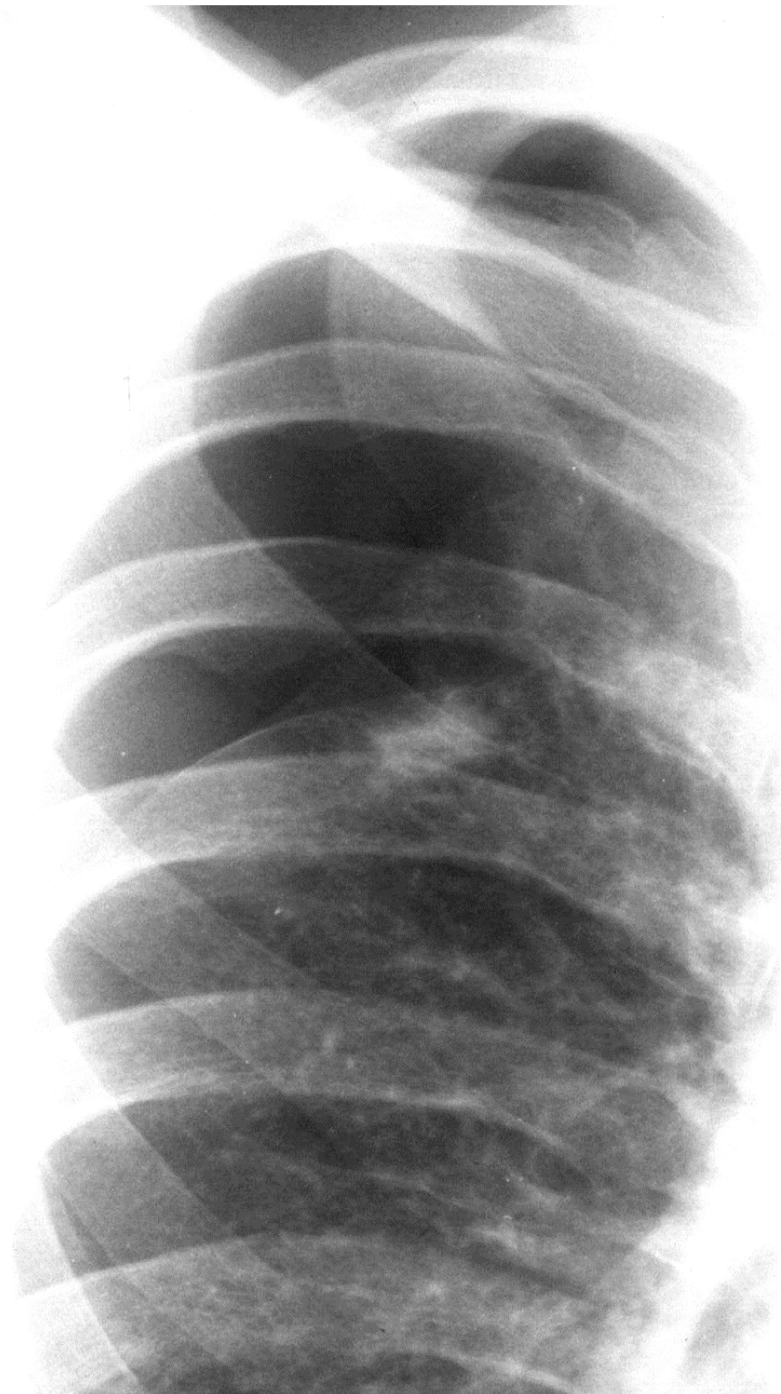
PONCTION-BIOPSIE TRANSTHORACIQUE

GUIDANCE TDM



après PBTTH

pneumothorax (10-20 %)



PONCTION-BIOPSIE TRANSTHORACIQUE (PBTTH)

- INDICATIONS
 - NODULE INDETERMINE
(NON ACCESSIBLE PAR VOIE TRANSBRONCHIQUE)
 - CANCER ← TYPE HISTOLOGIQUE
 - TYPAGE GENETIQUE: MUTATION EGFR
- PROCEDURE
 - GUIDANCE : FLUOROSCOPIE / TDM
 - AIGUILLE : VRILLE (NORDENSTRÖM)
COUPERET (TRU-CUT)
- COMPLICATIONS
 - PNO (10-20%) ← RT EN EXPIRATION
 - HEMOPTYSIE (1-10%)
 - (EMBOLIE GAZEUSE)
 - (ESSAIMAGE DU PRELEVEMENT)

CONCLUSION

- NODULE ← **RADIOSCOPIE** → PSEUDO-NODULE → STOP
- NP : BENIN (60%) ← **TDM** → MALIN (40%)
- EVOLUTIF ← **COMPARAISON** (ANCIENNES RT) → STABLE
STOP ET SURVEILLANCE (SCAR CARC.) ↙
- **CORRELATION** RT-CLIN. EVOQUANT NP BENIN → STOP
- TDM : DIAGNOSTIC PROBANT BENIN → STOP
- **BIOPSIE** TRANSBRONCHIQUE / **PBTTH**
 - NODULE INDETERMINE
 - CANCER (TYPE HISTO.)
- PLUSIEURS VOIES DIAGNOSTIQUES

Démarche clinique: Secteur respiratoire

TUMEURS PULMONAIRES MALIGNES ET BILAN D'EXTENSION

***Prof. Emmanuel Coche
Emmanuel.Coche@uclouvain.be***

Année Académique 2019-2020

CANCER BRONCHIQUE



- cancer le + létal chez ♂ (31 %) et chez ♀ (27 %)
- prévalence chez "heavy smokers" : 2.3 %
- 15 % des fumeurs développent un cancer bronchique
- autres facteurs de risque :
 - exposition à l'asbeste, au nickel, au chrome, uranium, radon ...
 - lésions cicatricielles pulm. ("scar carcinoma")
 - fibrose pulm.

- diagnostic retardé aggrave considérablement le pronostic :

- stades I traités	: 55-66 %	} survie à 5 ans
- stades II traités	: 35-43 %	
- tous stades traités	: 13 %	
- stades I non traités	: 5 %	
- stade I des NSCLC : résécables et potentiellement curables
→ intérêt de la détection précoce ??

Distribution cancer pulmonaire

Estimated New Cases*

			Males	Females			
Prostate	232,090	33%			Breast	211,240	32%
Lung and Bronchus	93,010	13%			Lung and Bronchus	79,560	12%
Colon and Rectum	71,820	10%			Colon and Rectum	73,470	11%
Urinary Bladder	47,010	7%			Uterine Corpus	40,880	6%
Melanoma of the Skin	33,580	5%			Non-Hodgkin Lymphoma	27,320	4%
Non-Hodgkin Lymphoma	29,070	4%			Melanoma of the Skin	26,000	4%
Kidney and Renal Pelvis	22,490	3%			Ovary	22,220	3%
Leukemia	19,640	3%			Thyroid	19,190	3%
Oral Cavity and Pharynx	19,100	3%			Urinary Bladder	16,200	2%
Pancreas	16,100	2%			Pancreas	16,080	2%
All Sites	710,040	100%			All Sites	662,870	100%

Estimated Deaths

			Males	Females			
Lung and Bronchus	90,490	31%			Lung and Bronchus	73,020	27%
Prostate	30,350	10%			Breast	40,410	15%
Colon and Rectum	28,540	10%			Colon and Rectum	25,750	10%
Pancreas	15,820	5%			Ovary	16,210	6%
Leukemia	12,540	4%			Pancreas	15,980	6%
Esophagus	10,530	4%			Leukemia	10,030	4%
Liver and Intrahepatic Bile Duct	10,330	3%			Non-Hodgkin Lymphoma	9,050	3%
Non-Hodgkin Lymphoma	10,150	3%			Uterine Corpus	7,310	3%
Urinary Bladder	8,970	3%			Multiple Myeloma	5,640	2%
Kidney and Renal Pelvis	8,020	3%			Brain and Other Nervous System	5,480	2%
All Sites	295,280	100%			All Sites	275,000	100%

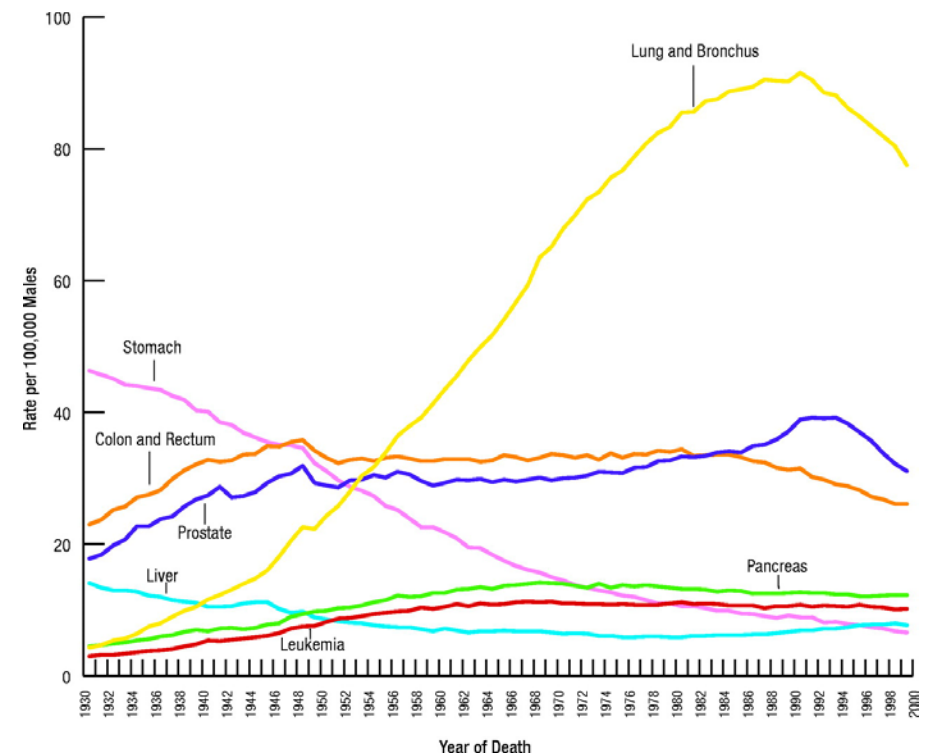


FIGURE 1 Ten Leading Cancer Types for the Estimated New Cancer Cases and Deaths, by Sex, US, 2005.

*Excludes basal and squamous cell skin cancers and in situ carcinoma except urinary bladder. Estimates are rounded to the nearest 10.

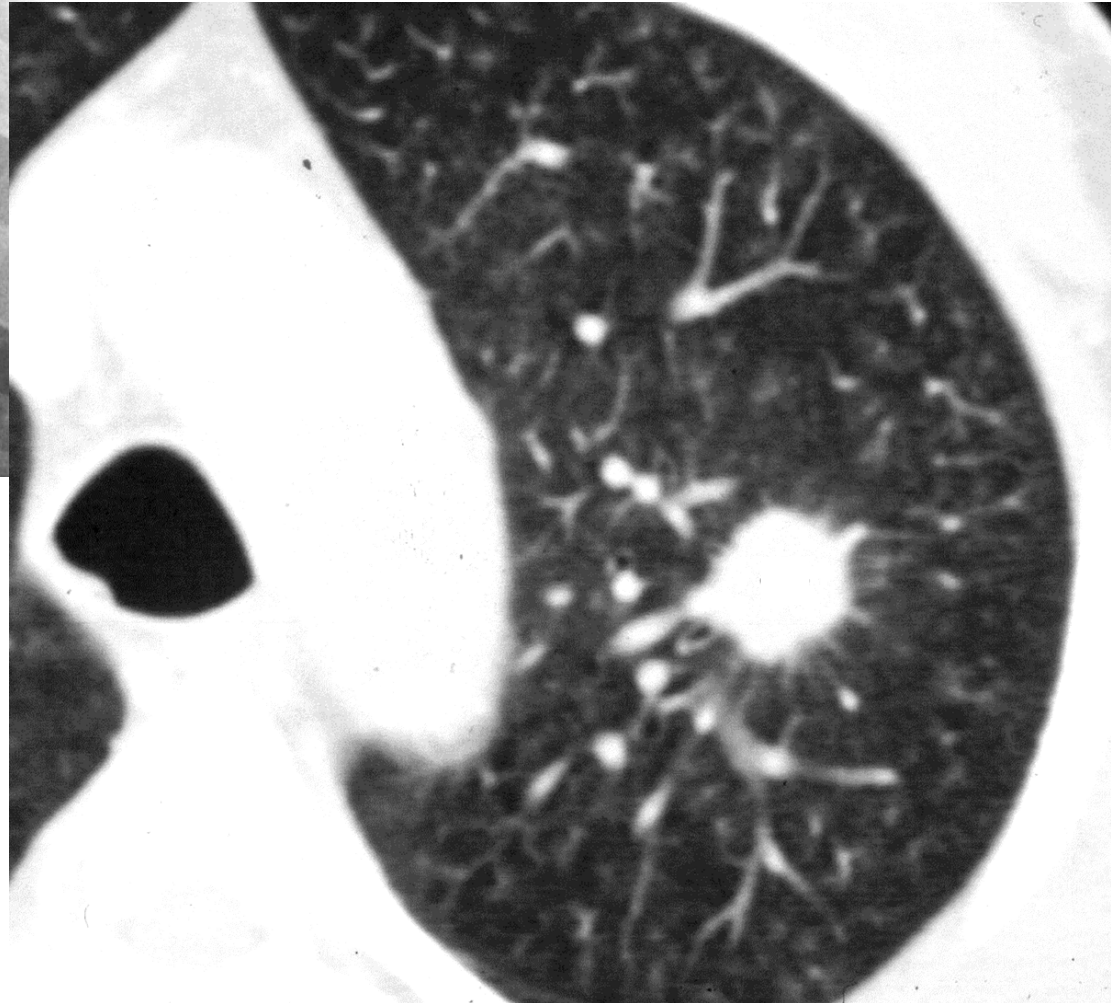
Note: Percentage may not total 100% due to rounding.

American Cancer Society, Surveillance Research, 2005

(CA Cancer J Clin 2005;55:10–30.)

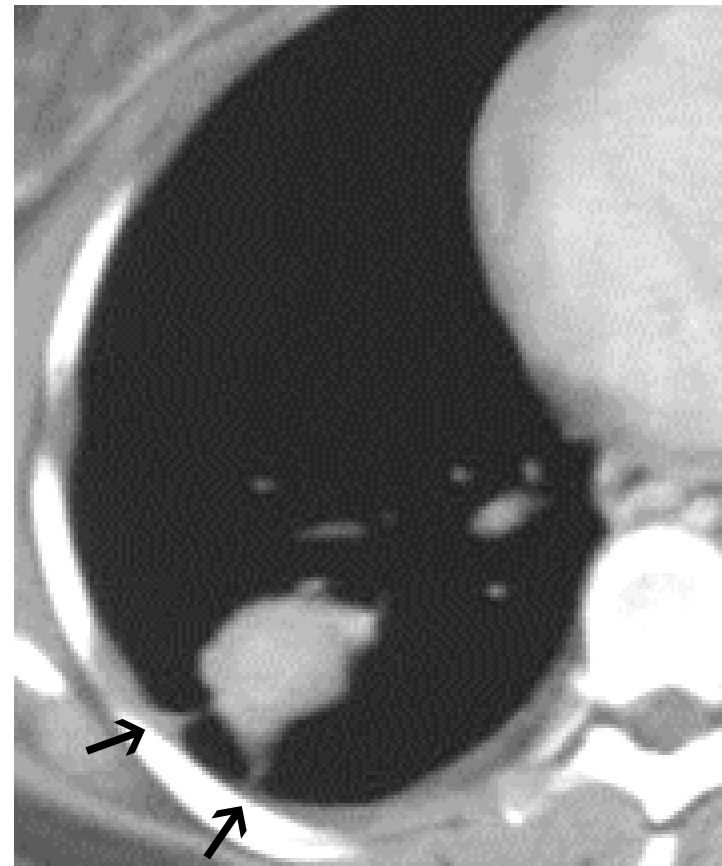
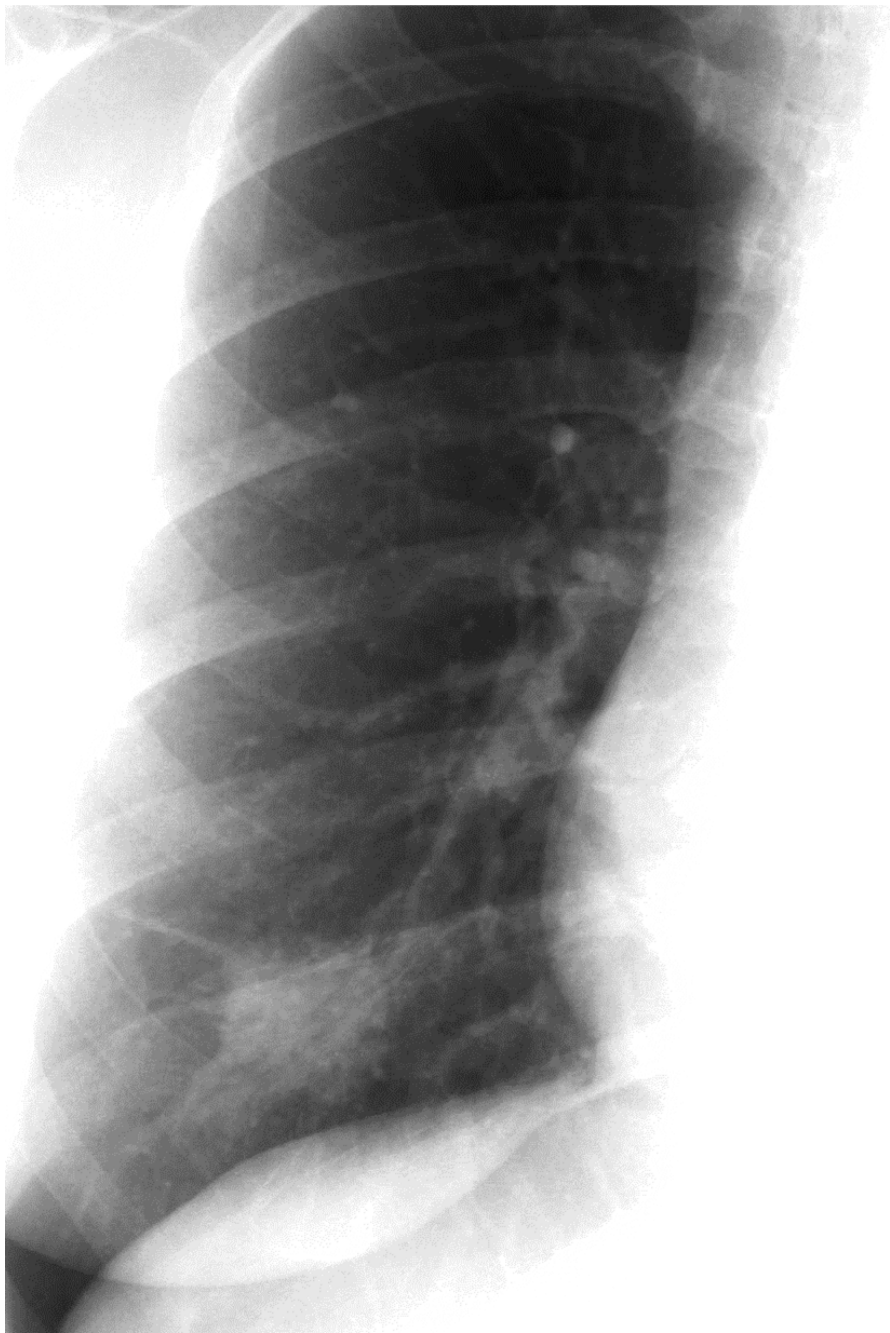
CANCER BRONCHIQUE

- Les signes classiques du CB
- Le « scar carcinoma », l'adénocarcinome mucineux de type lépidique
- Le bilan d'extension
- Quelques pièges et limites
- La détection précoce du cancer B



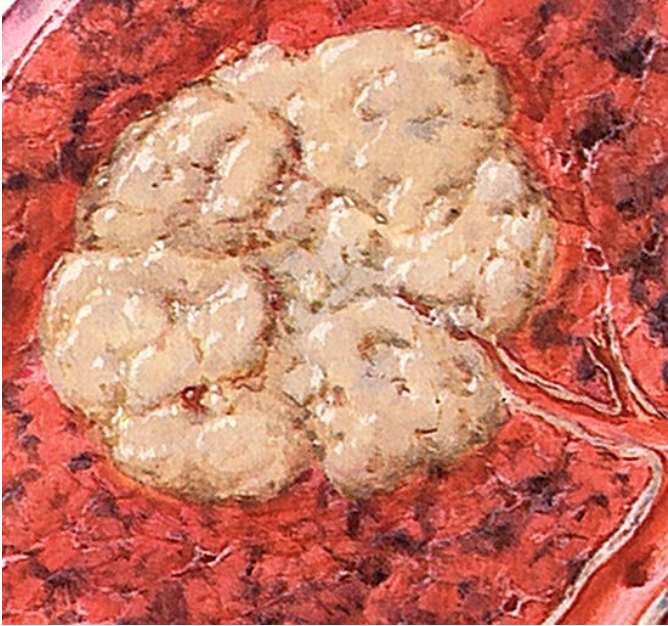
**CANCER BR. : spiculé
(corona radiata**

)



CANCER BR.
"TAGS" pleuraux
(septum I-L épaissi)

CANCER BRONCHIQUE



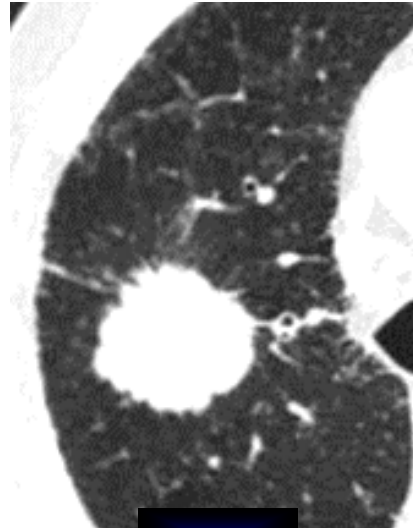
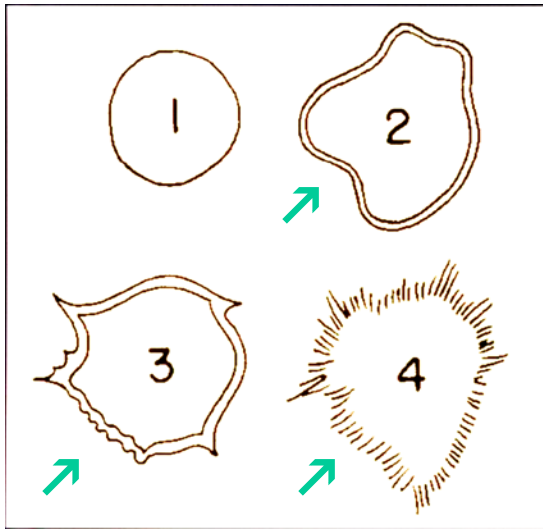
contours
lobulés



- desmoréaction (fibrose) dans la tumeur
- variations de la suppléance vasculaire en périphérie de la tumeur

CANCER BRONCHIQUE

CONTOURS



lobul

CALCIFICATIONS



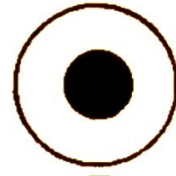
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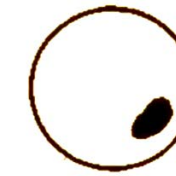
B



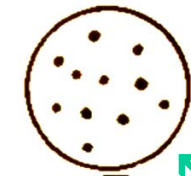
C



D



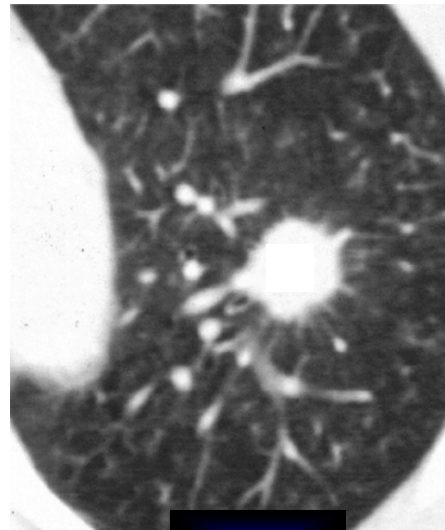
E



F



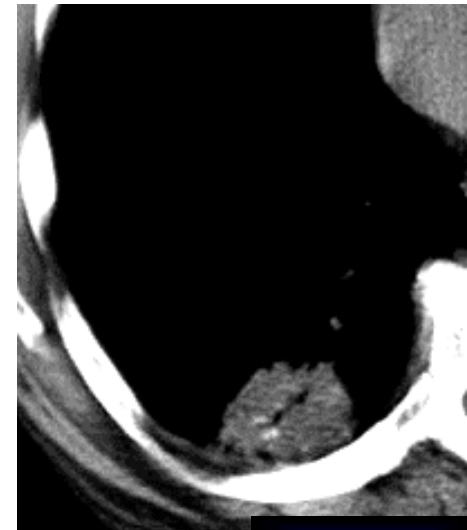
irrégulie



spicul



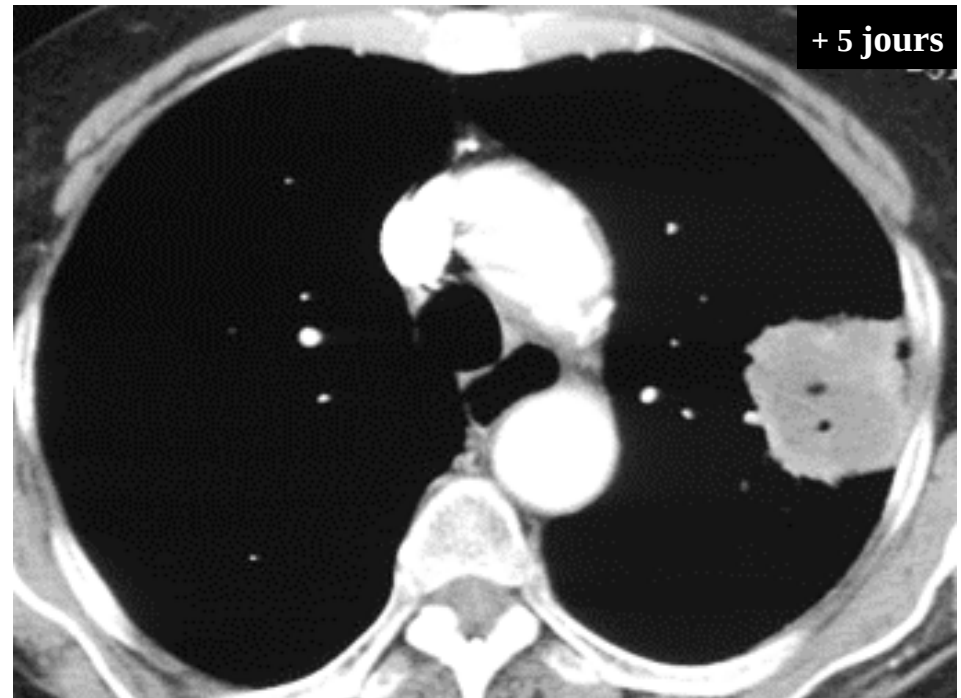
excentrique

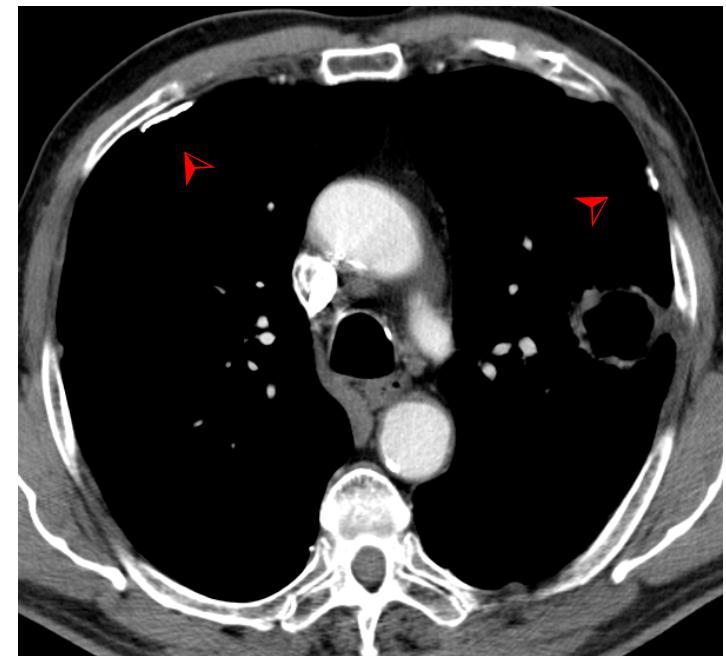
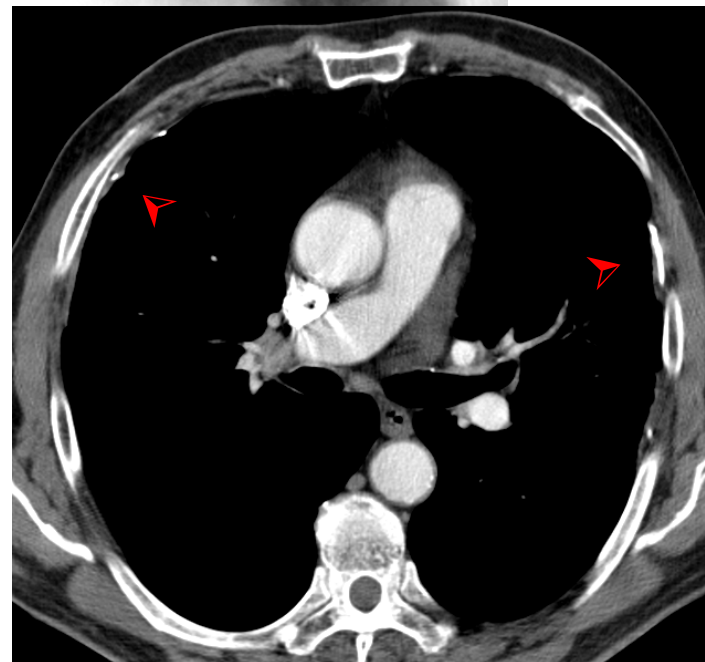
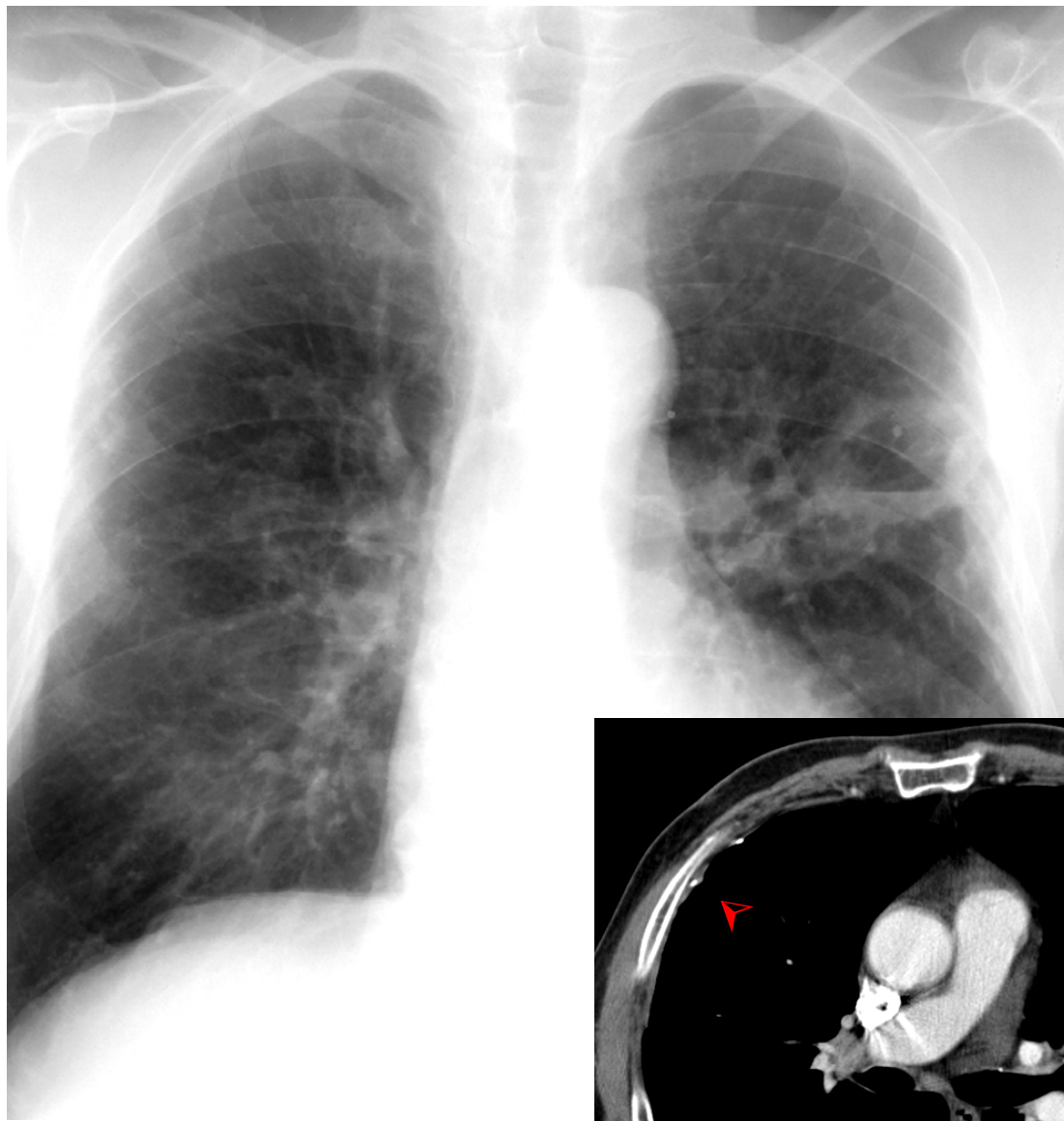


ponctué



cancer bronchique nécrosé
TDM : + hémorragie péri-
tumorale
+ emphysème c-l





CANCER EXCAVE
plaques pleurales calcifiées
(exposition à l'asbeste)

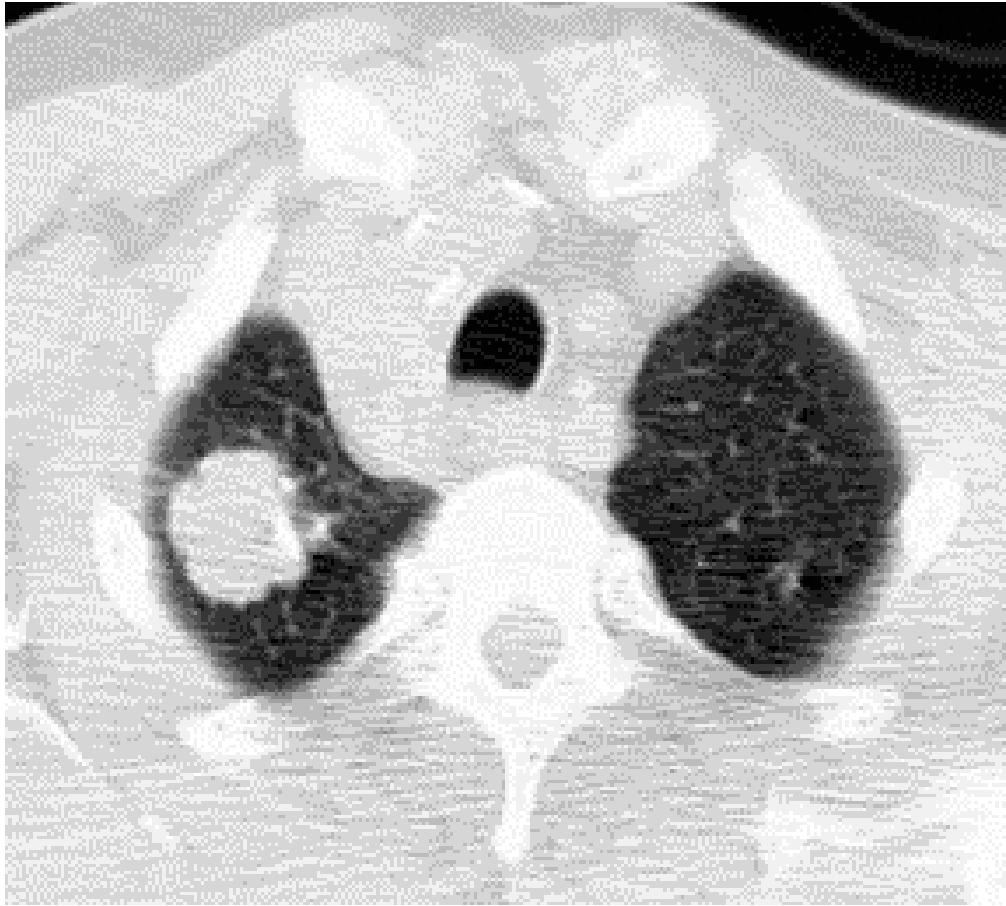
EXPOSITION A L'ASBESTE + CANCER BRONCHIQUE

fumeur	exp. asbeste	cancer
-	-	1
-	+	x 3 à 5
+	-	x 10 à 20
+	+	x 60 à 100

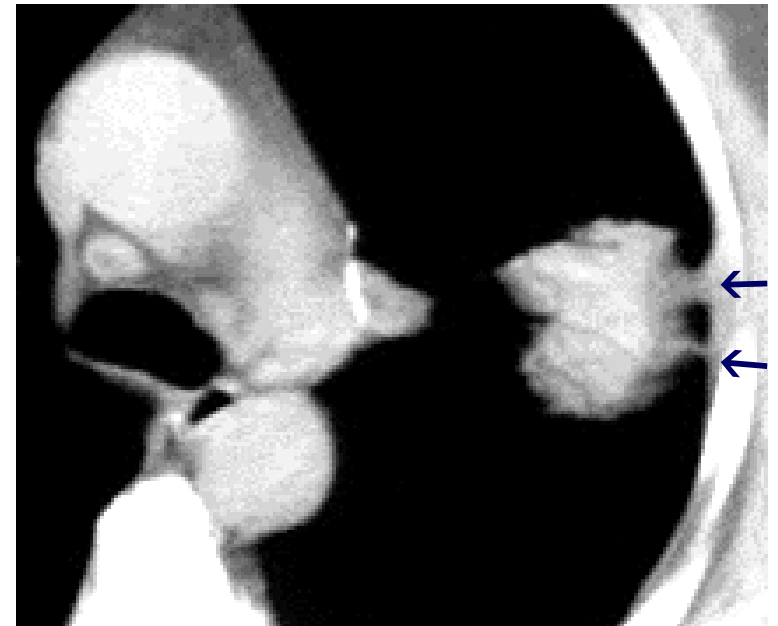
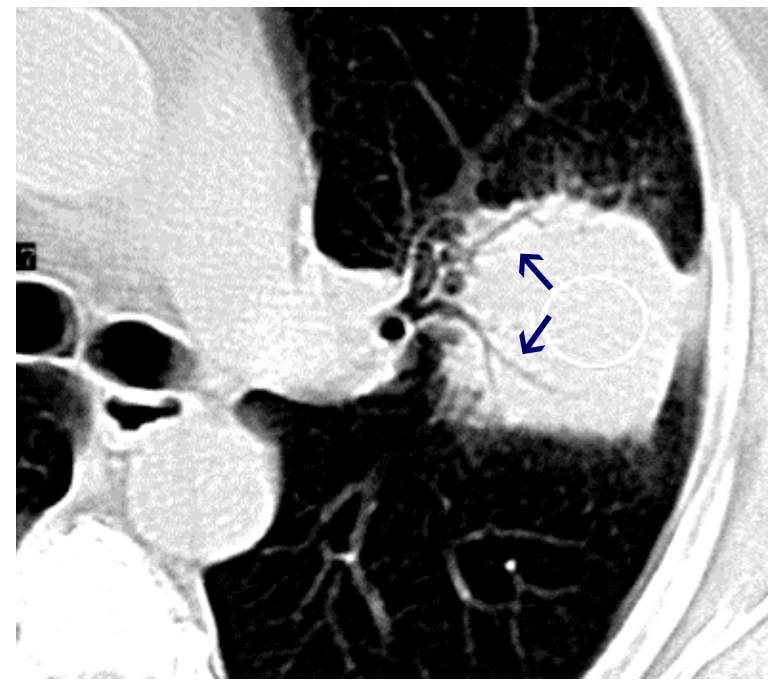
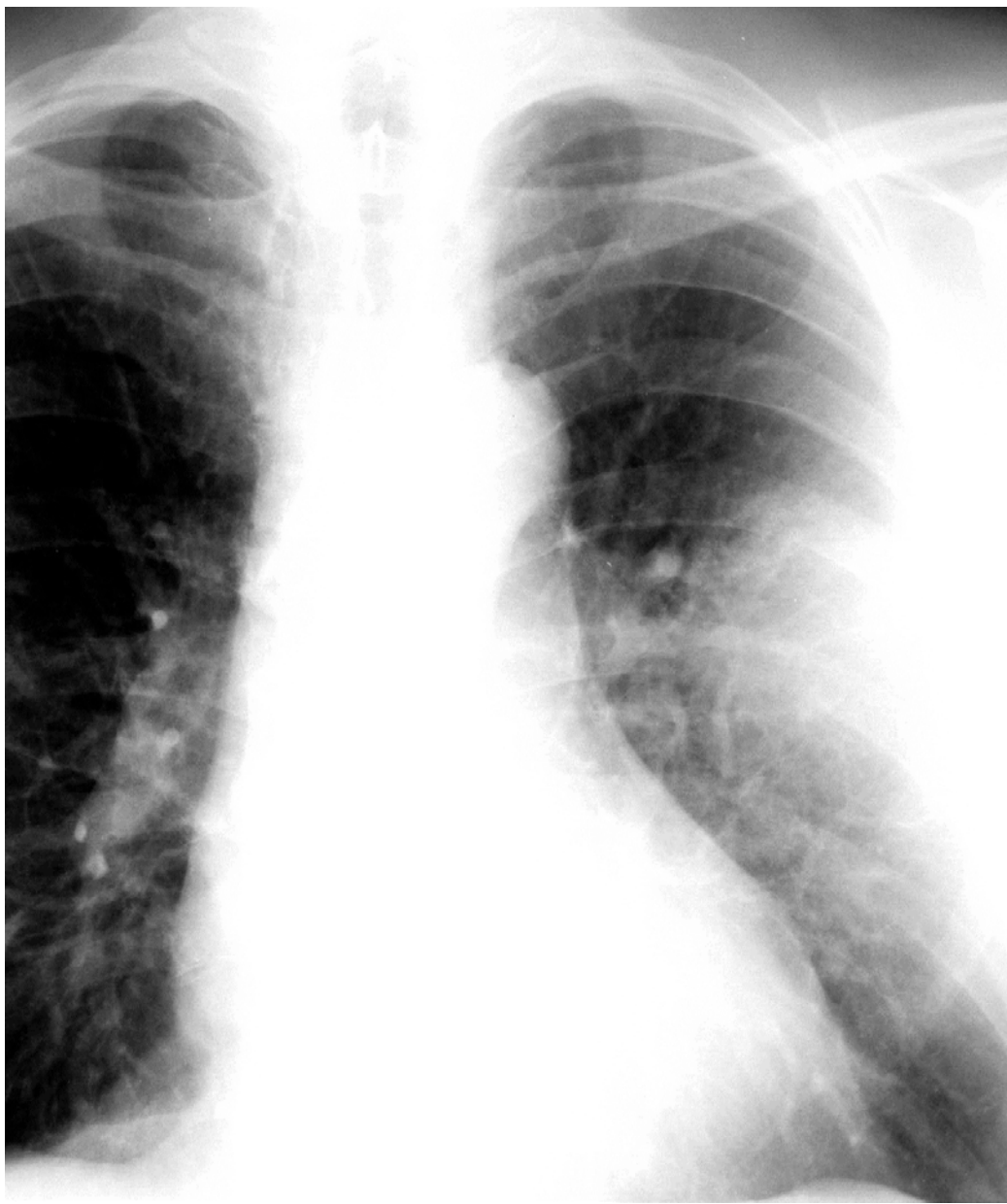
le potentiel carcinogène des fibres
d'asbeste
est nettement augmenté chez les

CANCER BRONCHIQUE

- Les signes classiques du CB
- Le « scar carcinoma », l'adénocarcinome mucineux de type lépidique
- Le bilan d'extension
- Quelques pièges et limites
- La détection précoce du cancer B

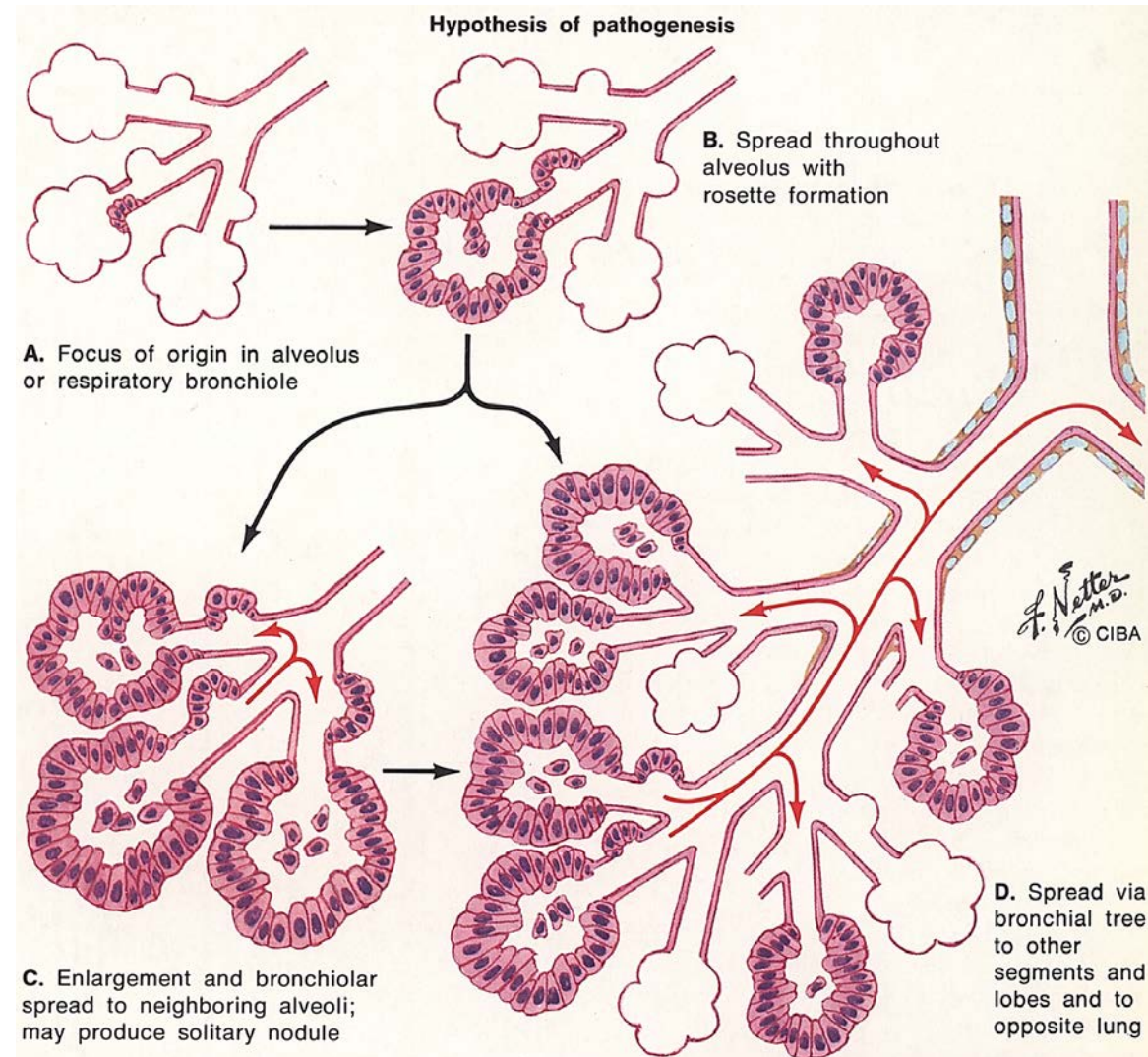


**" SCAR CARCINOMA " : calcification
excentrique**



**Adenocarcinome invasif de type lépidique
masse, bronchogramme aérique, "pleural tags"**

Adenocarcinome invasif de type lépidique (3-6 %

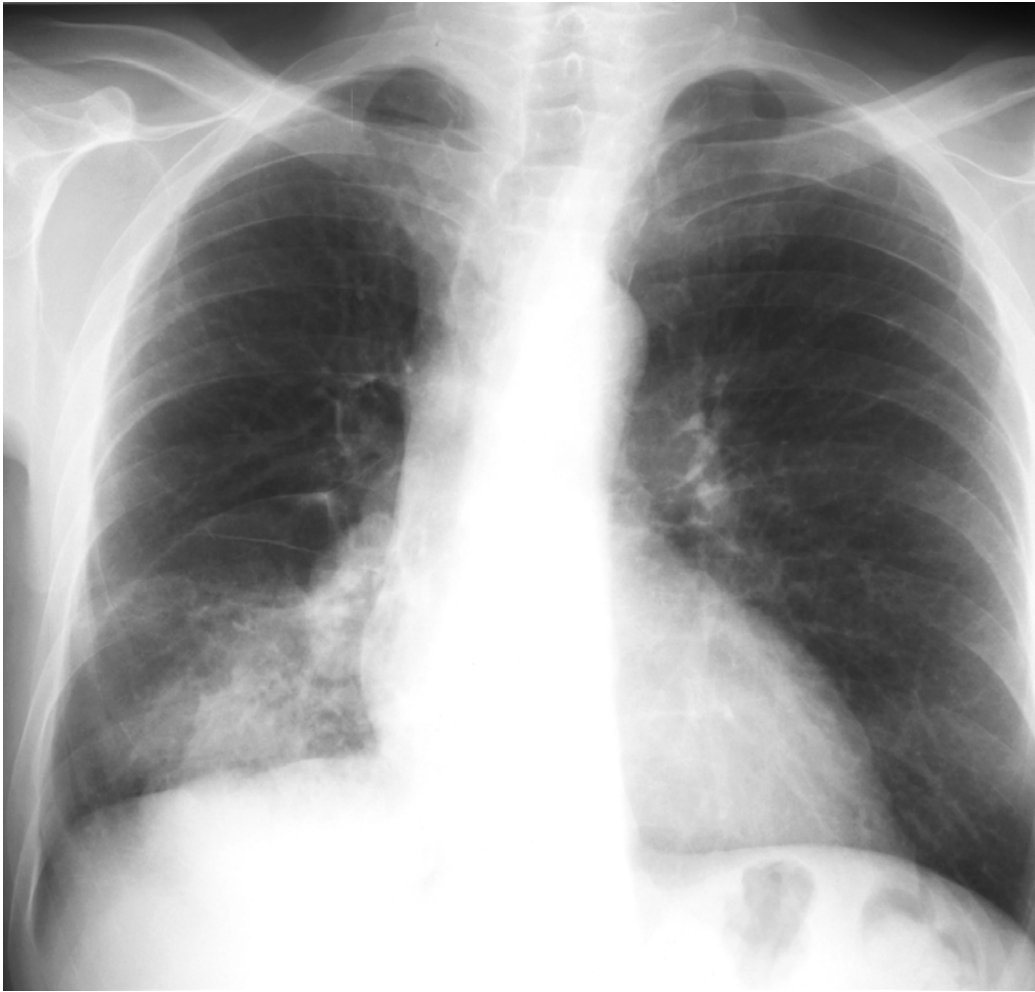


➤ croissance lépidique
➤ polymorphisme en fonction du degré d'extension

- nodule isolé périphérique (38%)
- densification isolée expansive (35%)
- nodules diffus (miliaire) et/ou infiltrats diffus (27%)

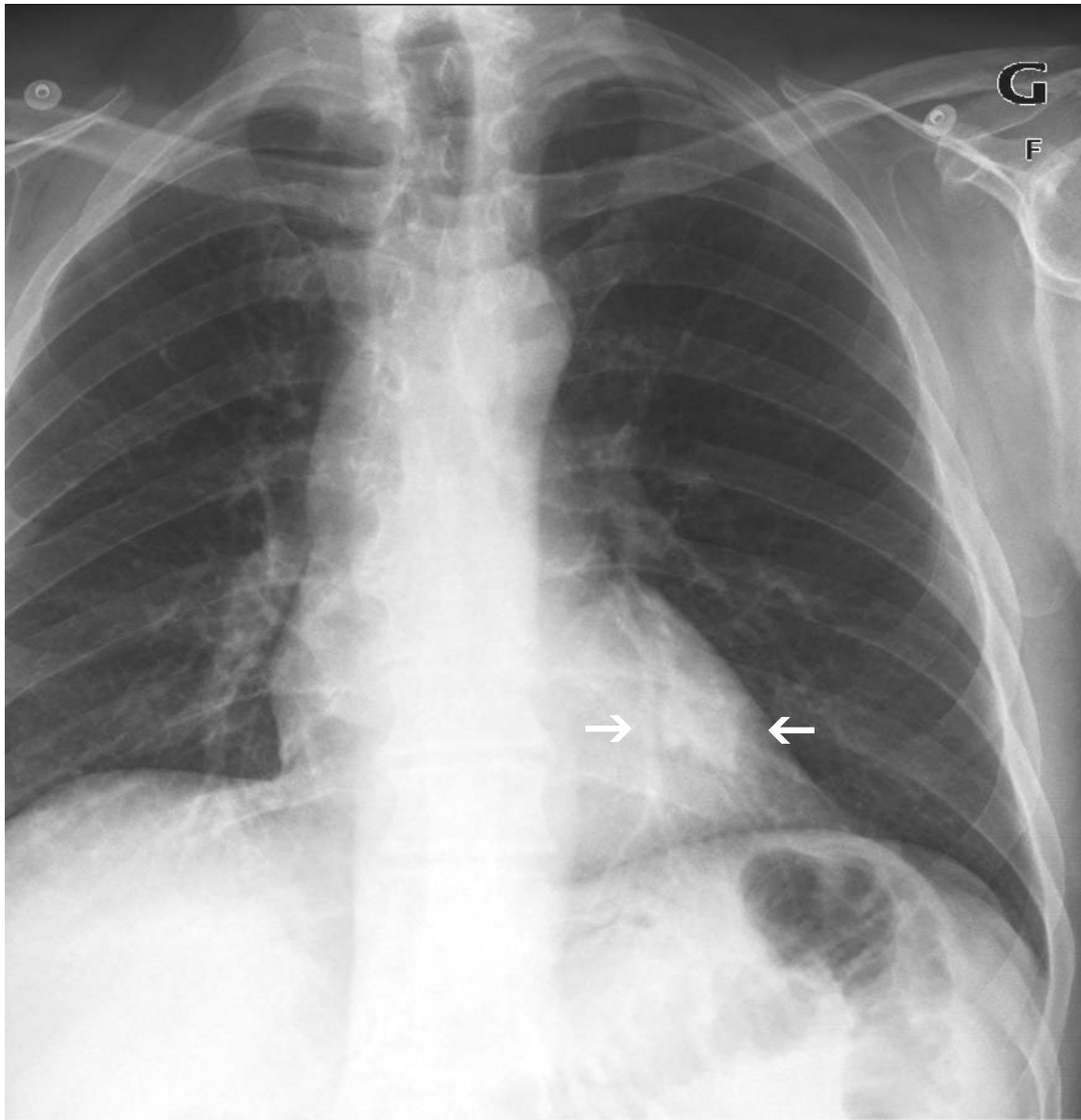
+

- "angiogram sign" (densif.) (20%)



**Adénocarcinome invasif de type
lépидique**

densification + lobulogramme aérique



Adénocarcinome invasif de type lépidique



**masse lobulée
+
bronchogramme
aérique**

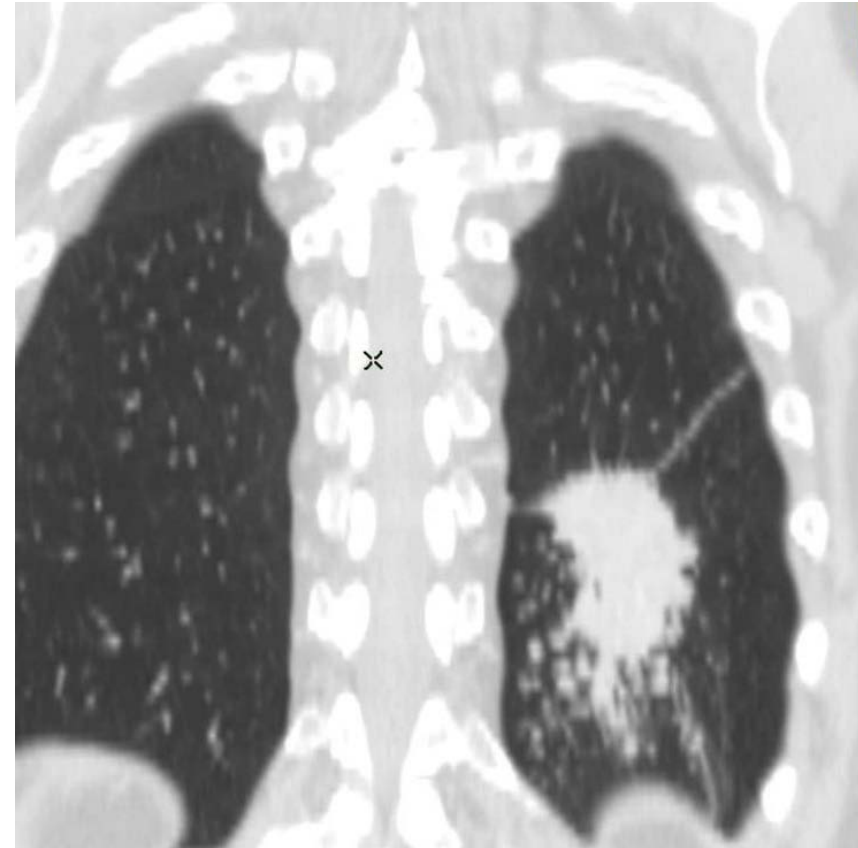
Adénocarcinome invasif de type lépidique



**masse lobulée
+
bronchogramme
aérique**

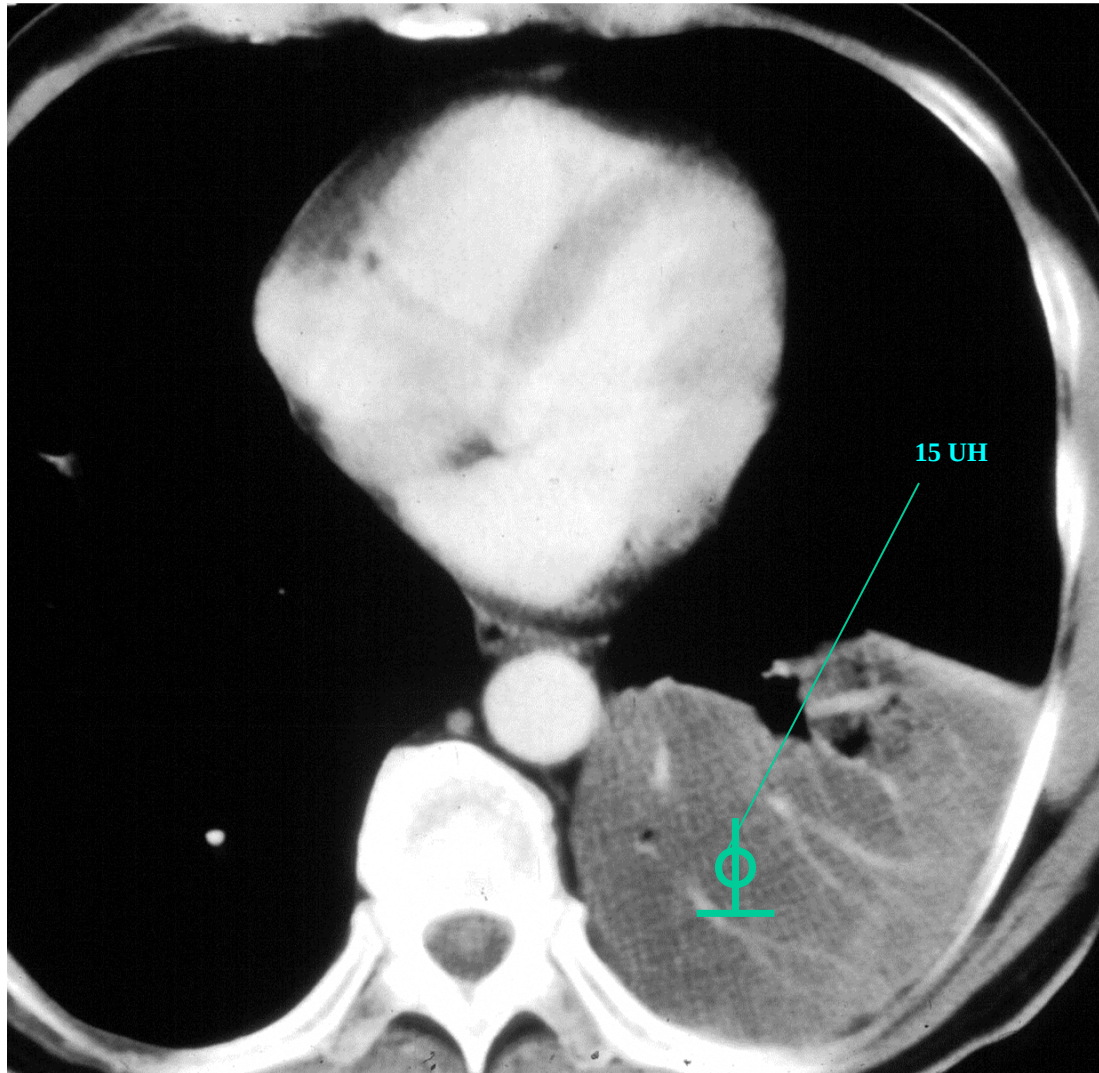


**nodules
acinaires
péritumoraux
(dissémination
bronchique)**



**Adénocarcinome invasif
de type lépidique
(dissémination : forme
miliaire)**



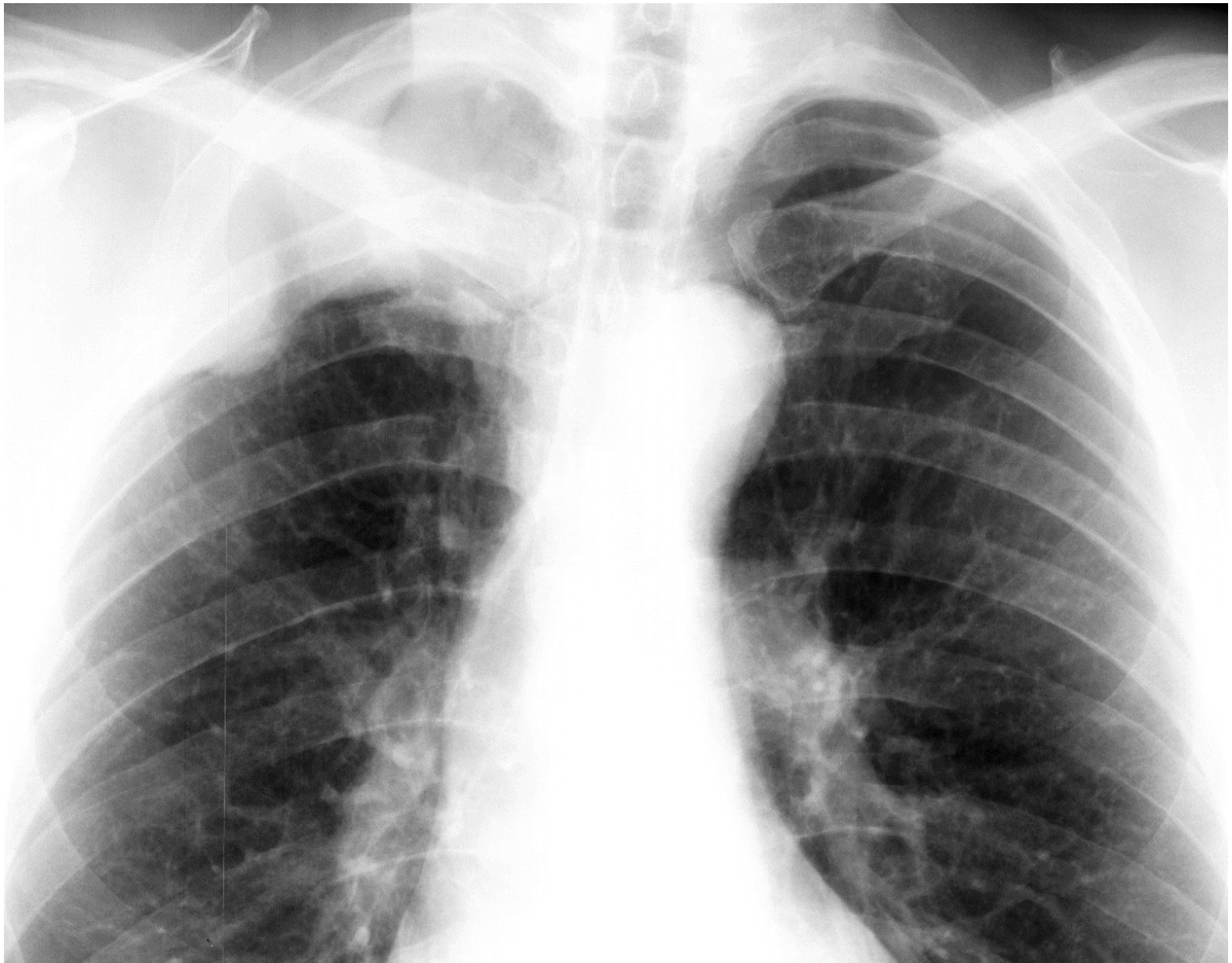


Adénocarcinome invasif de type lépidique

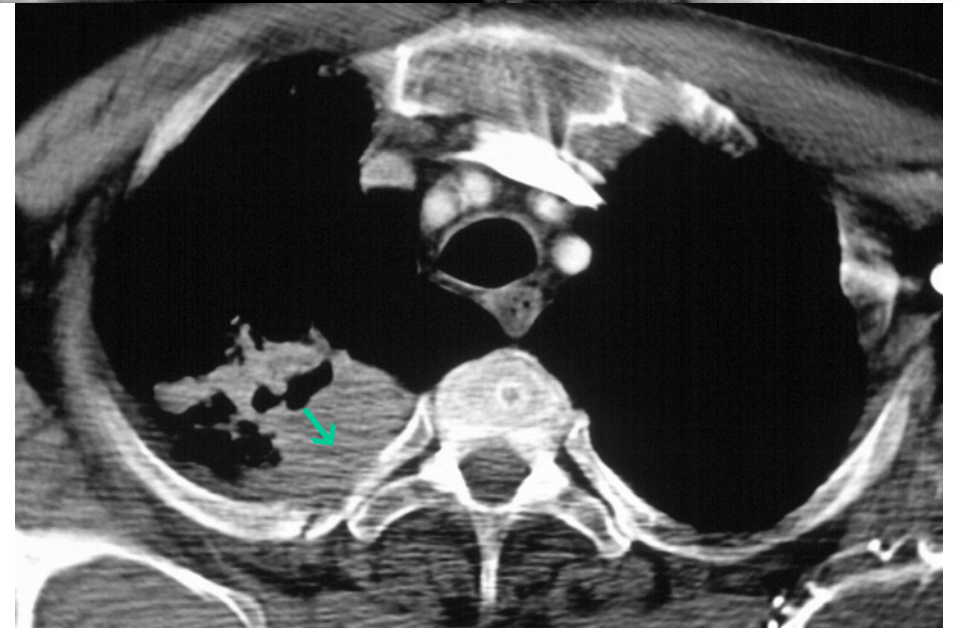
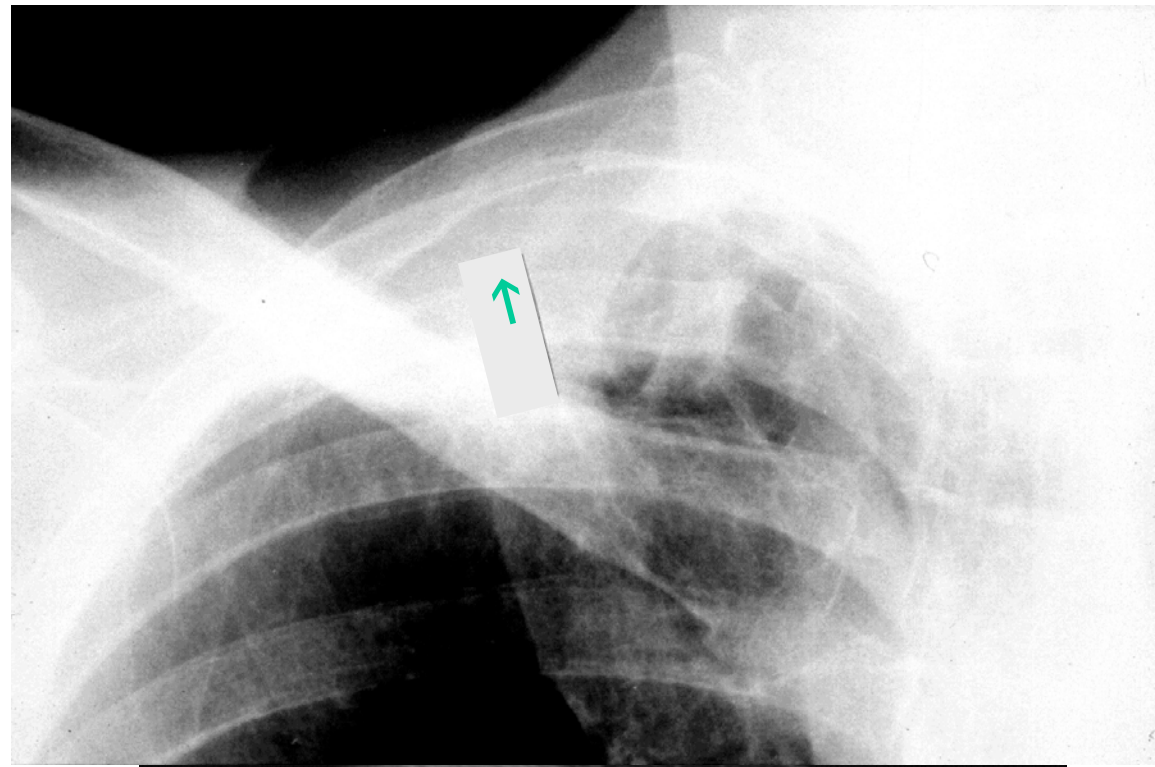
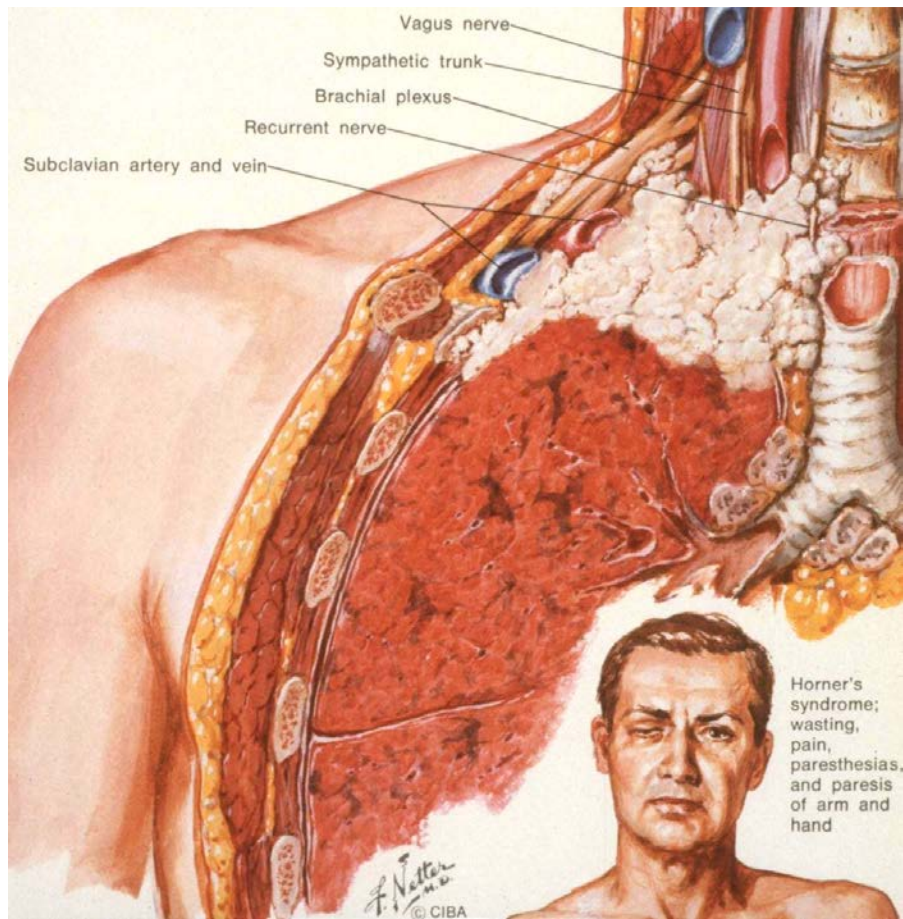
" angiogram sign "

- mucine (faible atténuation)
- vaisseaux intacts rehaussés
par
IV produit de contraste

(UH = unités HOUNSFIELD)

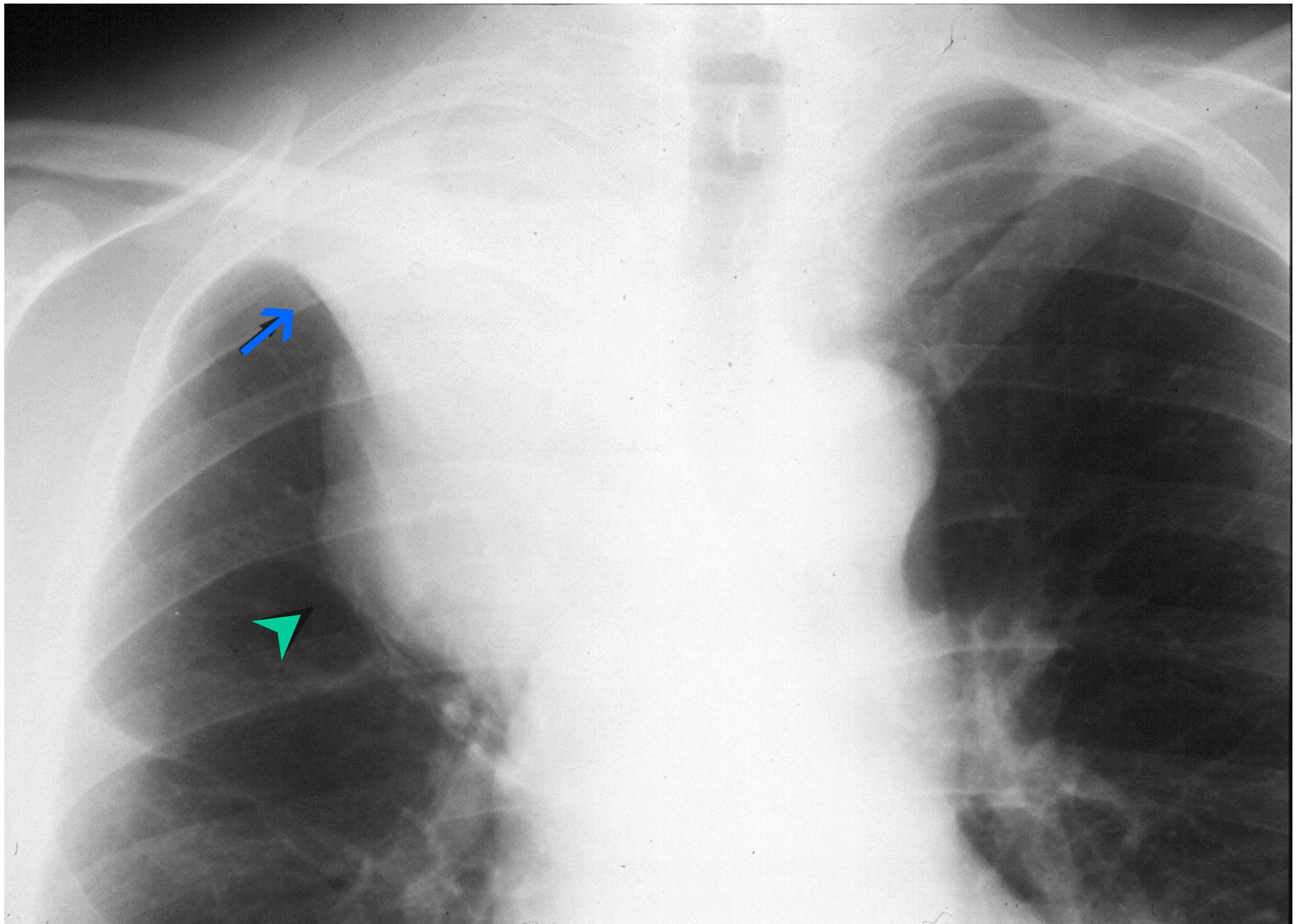


TUMEUR DE PANCOAST (< 5%)

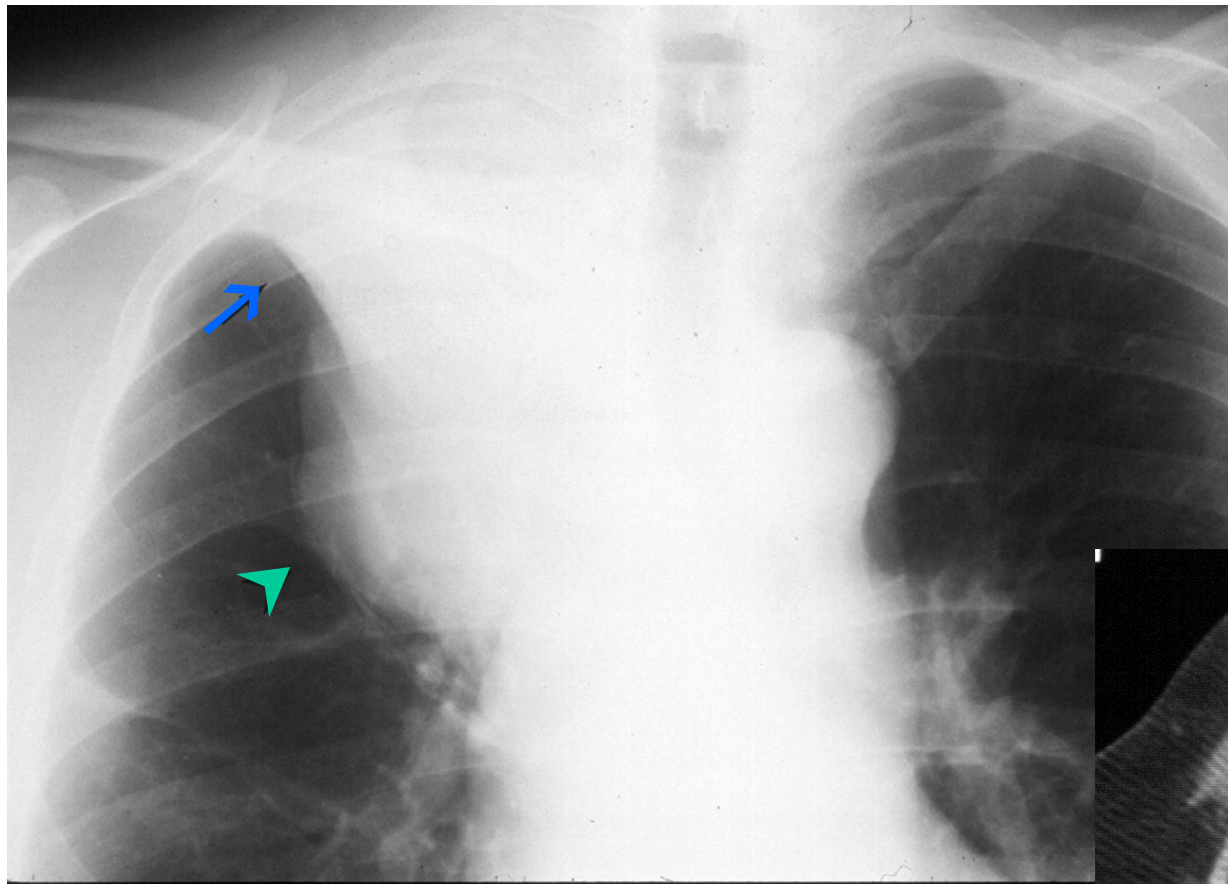


tumeur de Pancoast

- < 5 % des CB
- syndrome de Pancoast
 - douleur scapulo-humérale
 - paresthésies/paralysie brachiales
 - syndrome de Horner



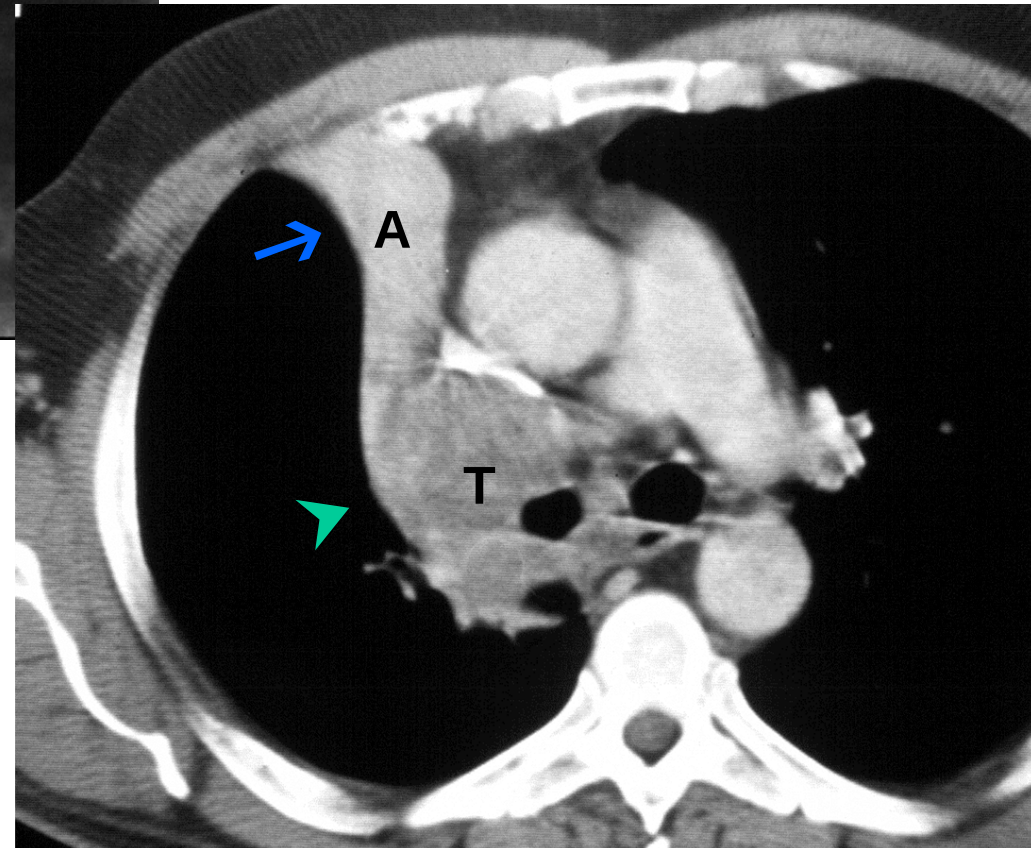
?



cancer central
atélectasie LSD

Golden S sign
(scissure en S inversé)

-  **atélectasie (A)**
-  **tumeur (T)**



CANCER BRONCHIQUE

- Les signes classiques du CB
- Le « scar carcinoma », l'adénocarcinome mucineux de type lépidique
- Le bilan d'extension
- Quelques pièges et limites
- La détection précoce du cancer B

7^{ème} édition

Supraclavicular	Scalene		Mediastinal		Subcarinal		Hilar		Peribronchial (ipsilateral)	Lymph Node (N)
	Contra-	Ipsi-	Contra-	Ipsi-	Contra-	Ipsi-	Contra-	Ipsi-		
+	+	+			+					N3
-	-	-	+ &/ +		-					N2
-	-	-	-	-	-	+ &/ +				N1
-	-	-	-	-	-	-	-	-		N0

Stage IV (Metastatic: M1a or M1b, any T, any N)

Stage IIIB

Stage IIIA

Stage IIA

Stage IIB

Stage IA

Stage IB

Stage IIA

Stage IIB

Metastatic (M):

M1a:

Local intrathoracic spread:

- Malignant pleural/pericardial effusion
- Separate tumor nodule(s) in the contralateral lung

M1b:

Disseminated (extrathoracic) disease:

Liver, bone, brain, adrenal gland, etc.

T1a	T1b	T2a	T2b	T3	T4	Primary Tumor (T)
≤2cm	>2cm but ≤3cm	>3cm but ≤5cm	>5cm but ≤7cm	>7cm	Any	a. Size
No invasion proximal to lobar bronchus		Main bronchus (≥2cm distal to the carina)		Main bronchus (<2cm distal to the carina)	—	b. Endo-bronchial location
Surrounded by lung or visceral pleura		Visceral pleura		Chest wall/diaphragm/mediastinal pleura/parietal pericardium	Mediastinum/trachea/heart/great vessels/esophagus/vertebral body/carina	c. Local Invasion
		Atelectasis/obstructive pneumonitis that extends to the hilar region but does not involve the entire lung		Atelectasis/obstructive pneumonitis of entire lung; separate tumor nodule(s) in ipsilateral primary tumor lobe	Separate tumor nodule(s) within the ipsilateral lung but different lobe as the primary mass	d. Other

T descriptors: modifications

- Greater focus on tumor size:
 - Descriptor in all T categories
 - Every cm counts
 - 3-cm cutpoint = best one
- Main bronchus involvement: same prognosis regardless of distance from carina
- Atelectasis or pneumonitis: same prognosis regardless of partial or complete
- Diaphragm involvement: T4 prognosis
- Mediastinal pleura involvement: rarely used, deleted

Descriptor	7 th edition	8 th edition
≤ 1 cm	T1a	T1a
1.1 - 2 cm	T1a	T1b
2.1 - 3 cm	T1b	T1c
3.1 - 4 cm	T2a	T2a
4.1 - 5 cm	T2a	T2b
5.1 - 7 cm	T2b	T3
> 7 cm	T3	T4
Bronchus < 2 cm from carina	T3	T2
Complete atelectasis or pneumonitis	T3	T2
Diaphragm	T3	T4
Mediastinal pleura	T3	-

Facteurs pronostic du cancer bronchique (NSCLC)

7ème édition

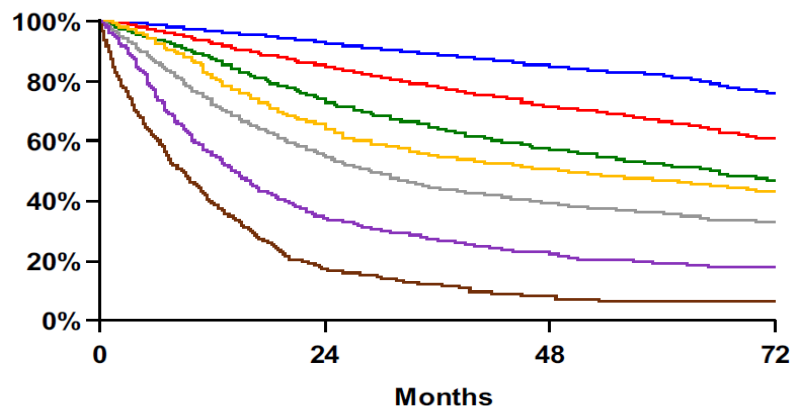
	Median Survival (mo)	Five-Year Survival Rate (%)
TNM stage		
IA	95	66
IB	75	56
IIA	44	43
IIB	29	35
IIIA	19	23
Cell type		
Bronchoalveolar carcinoma	83	61
Adenocarcinoma	45	44
Squamous cell carcinoma	44	43
Large cell carcinoma	34	41
Adenosquamous carcinoma	26	29
Sex		
Female	66	52
Male	40	41
Age (y)		
< 70	49	46
≥ 70	38	38

Stade IIb, IV: pas candidats à la chirurgie!- St T3: survie 28%, T4: 22%, M1a: 3%, M1b:6 mois

Kligerman SJ et al. A radiological Review of the new TNM classification for lung cancerAJR 2010; 194:562-573

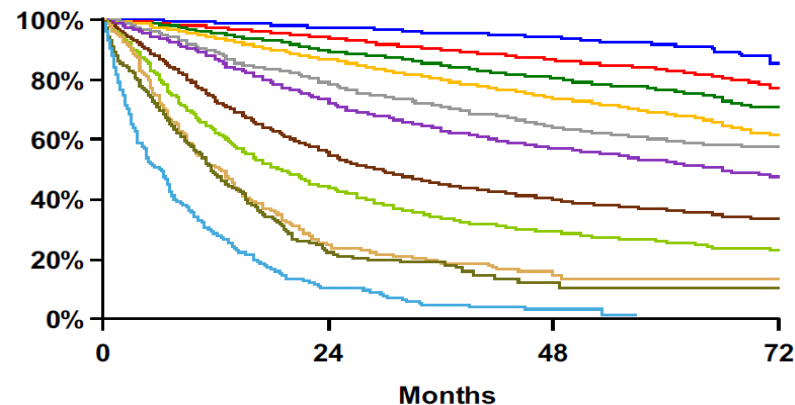
New TNM stages: better prognostic stratification

OS by clinical stage - 7th edition



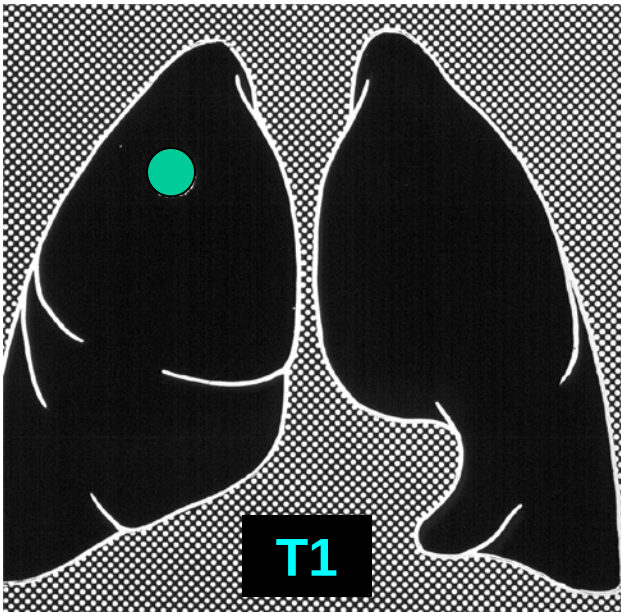
7 th Ed.	Events / N	MST	24 Month	60 Month
IA	1119 / 6303	NR	93%	82%
IB	768 / 2492	NR	85%	66%
IIA	424 / 1008	66.0	74%	52%
IIB	382 / 824	49.0	64%	47%
IIIA	2139 / 3344	29.0	55%	36%
IIIB	2101 / 2624	14.1	34%	19%
IV	664 / 882	8.8	17%	6%

OS by clinical stage - 8th edition



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%

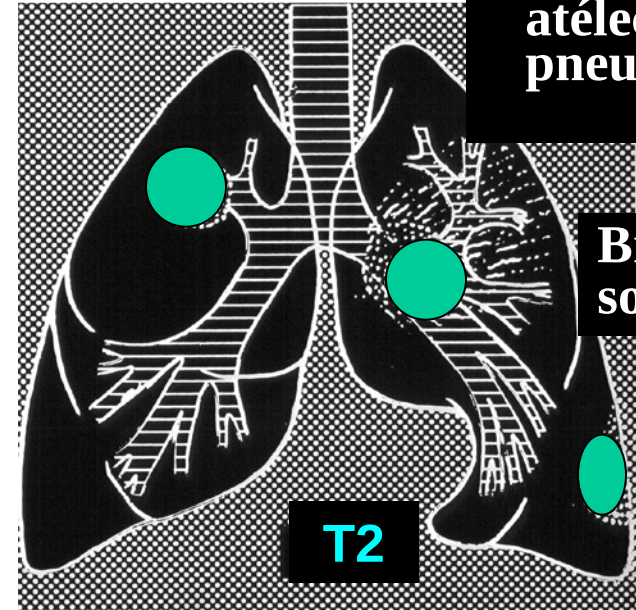
New stage does not necessarily mean change in R/



T1

T1a ≤ 1 cm T1b: 1,1-2 cm T1c 2,1- 3 cm

T



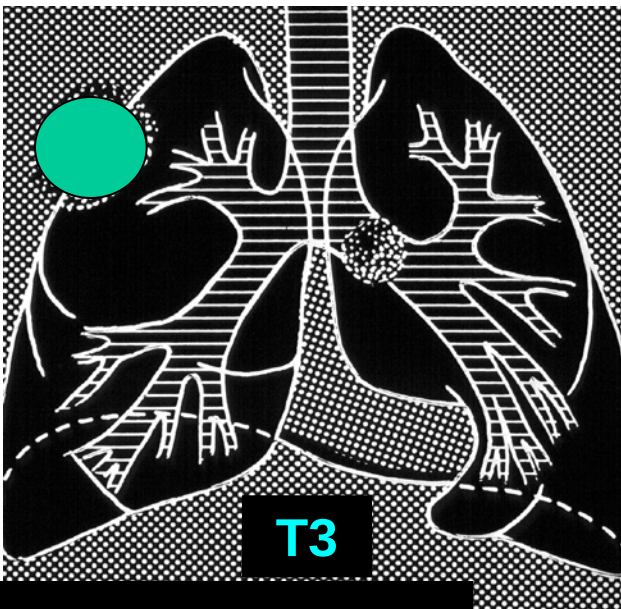
T2

atélectasie,
pneumonie

Bronche
souche

plèvre
visc.

T2a $> 3,1-4$ cm T2b $> 4,1-5$ cm



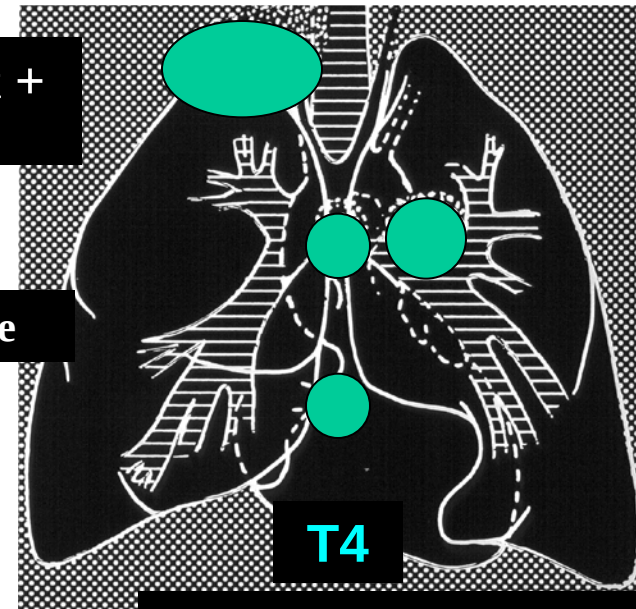
T3

paroi

T3

5,1-7 cm

Nodule T poumon même lobe



T4

Pancoast +
trachée

Diaphragme

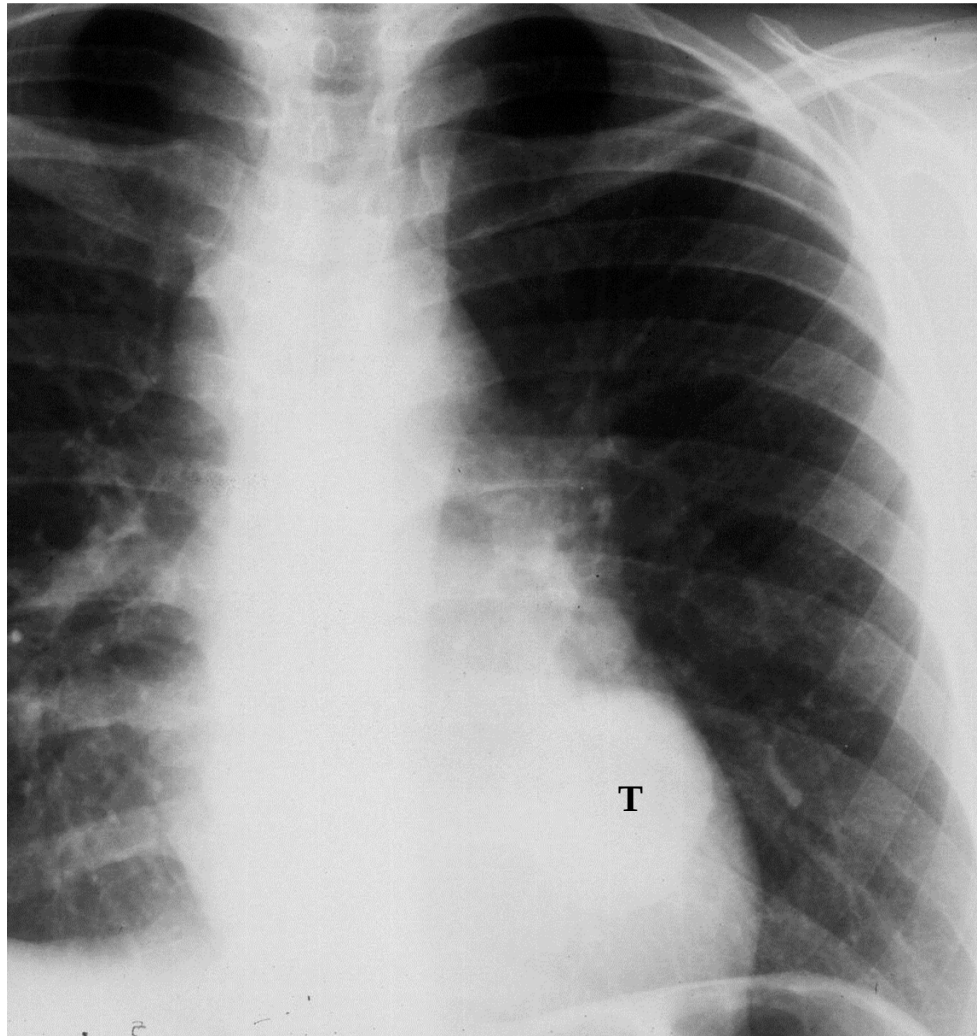
T4 > 7 cm

aorte

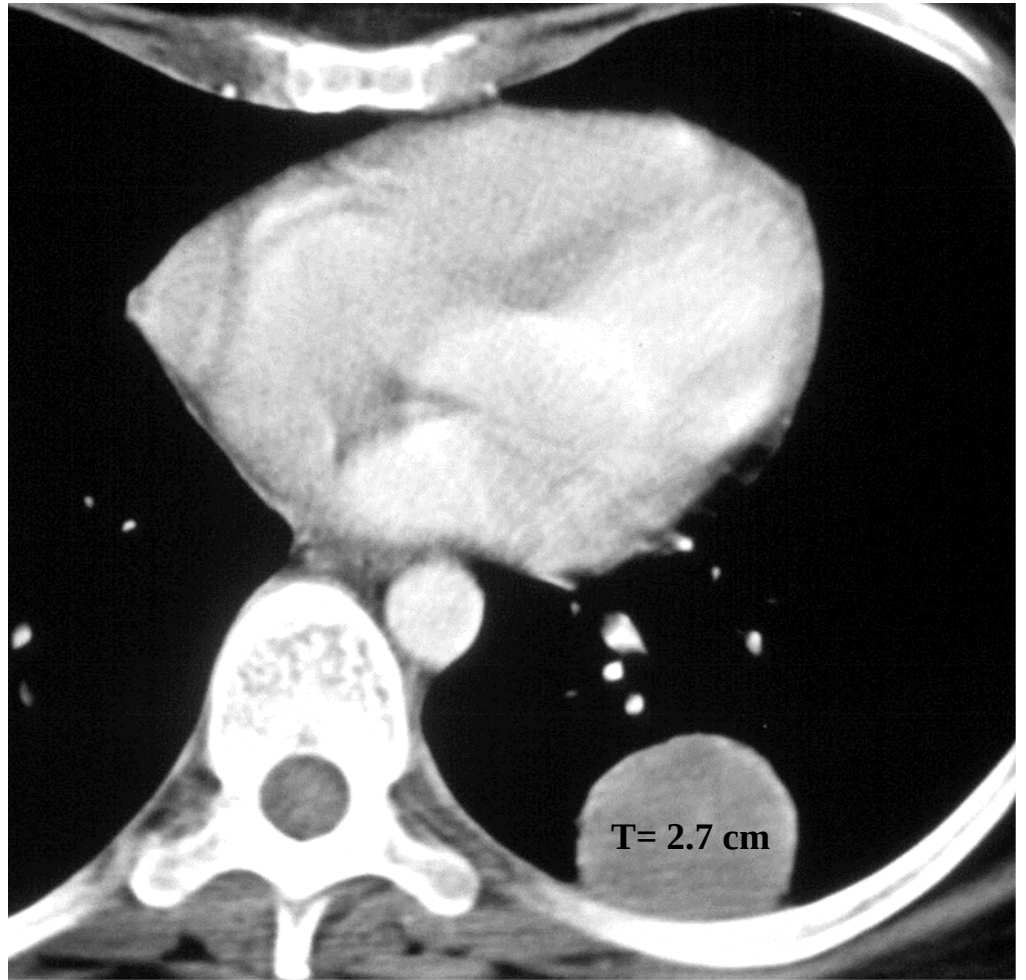
carina

vertèbre

Nodule T poumon H $\neq$ lobe

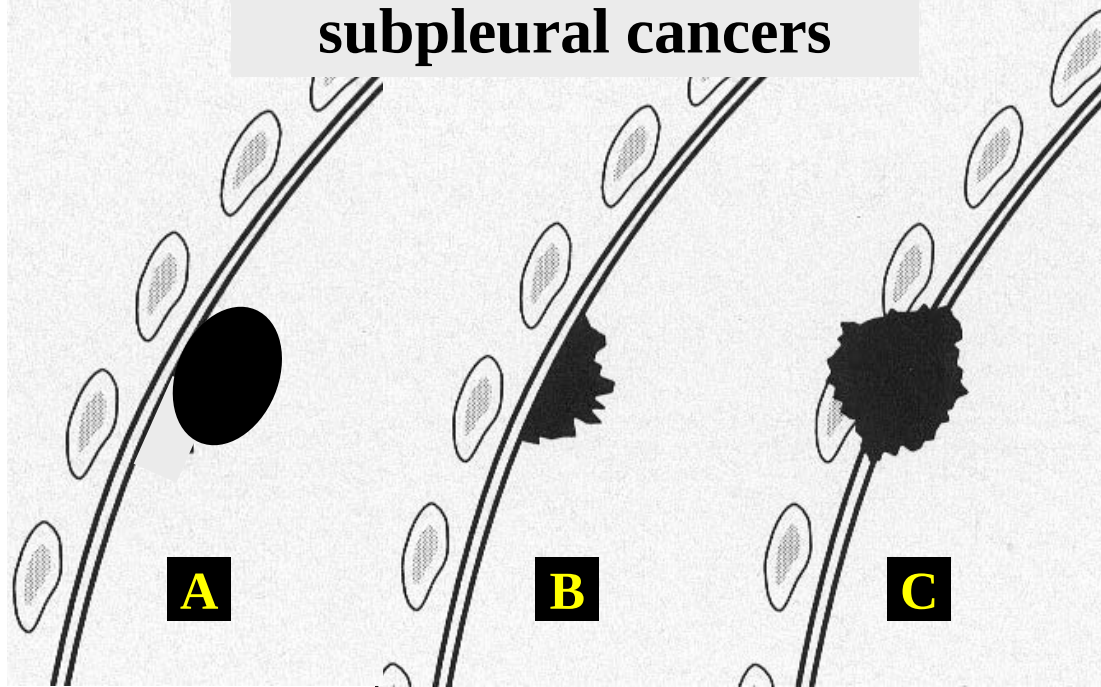


CANCER BRONCHIQUE

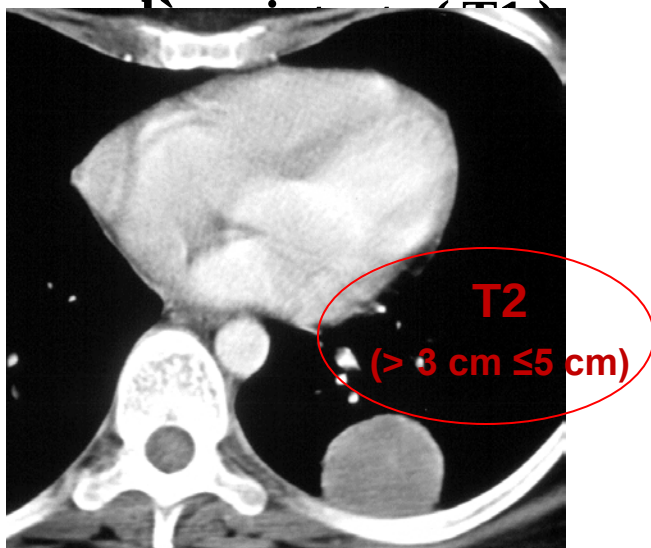


T1c - > 2 cm de diamètre, $\leq$ 3cm
(plèvre non envahie)

subpleural cancers

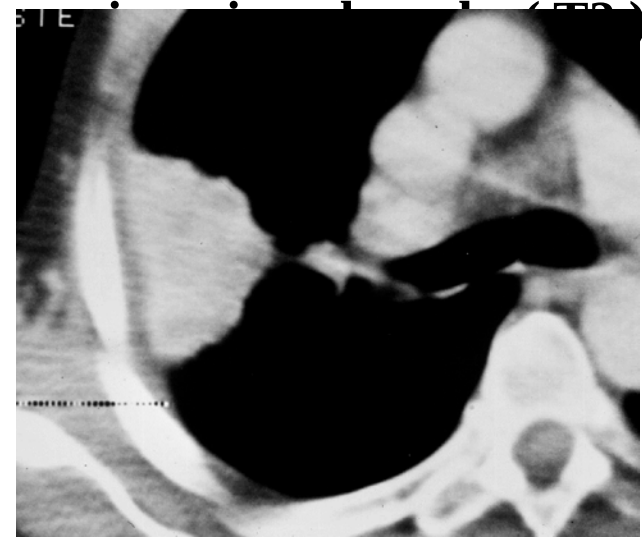


A. Cancer bronchique sous-pleural +

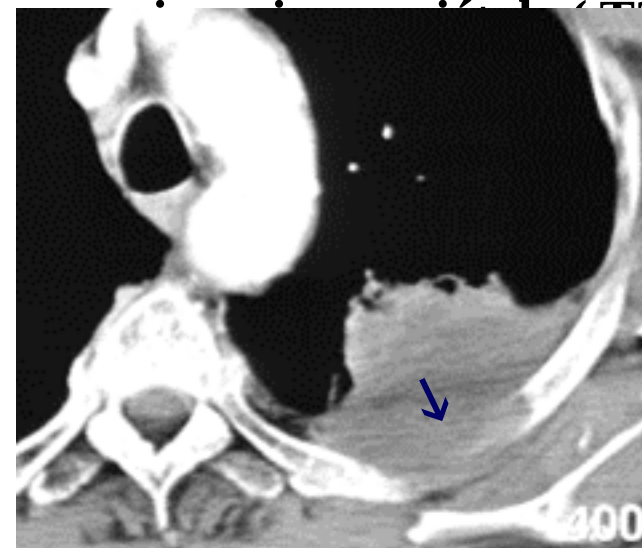


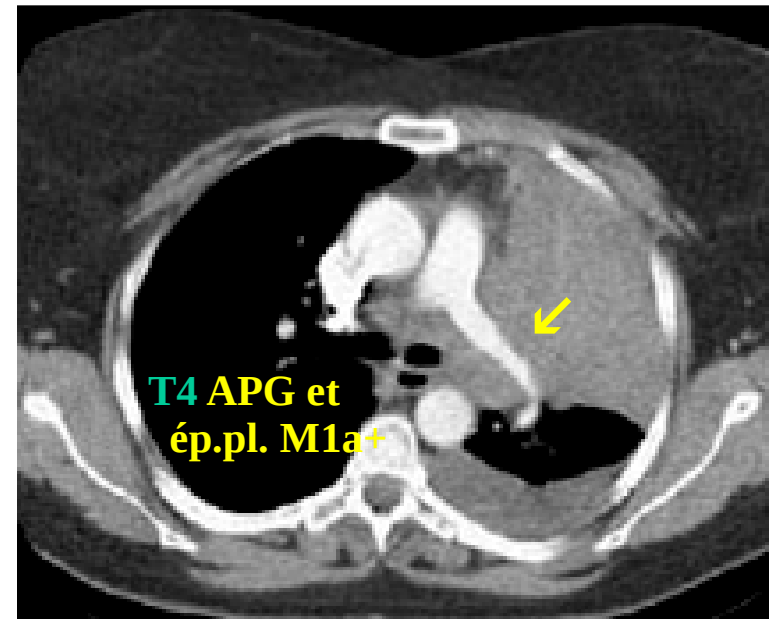
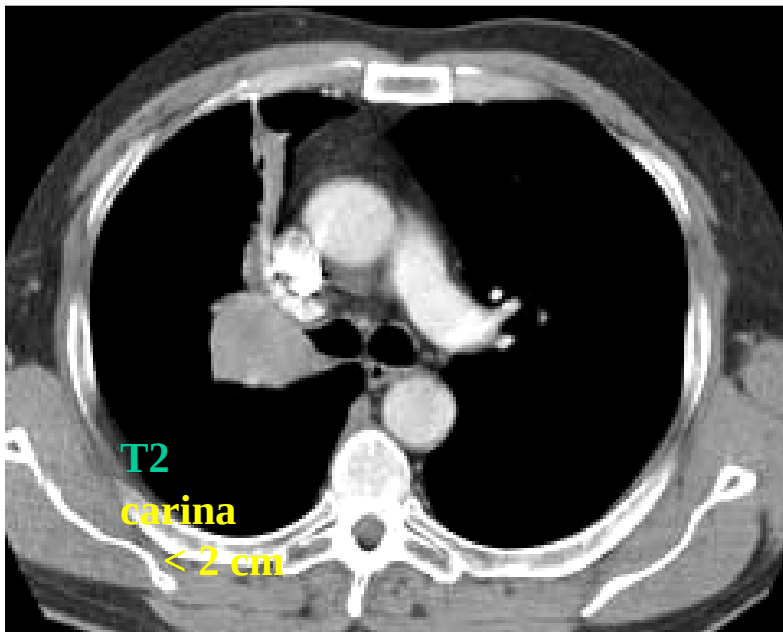
B. Cancer bronchique sous-pleural

+

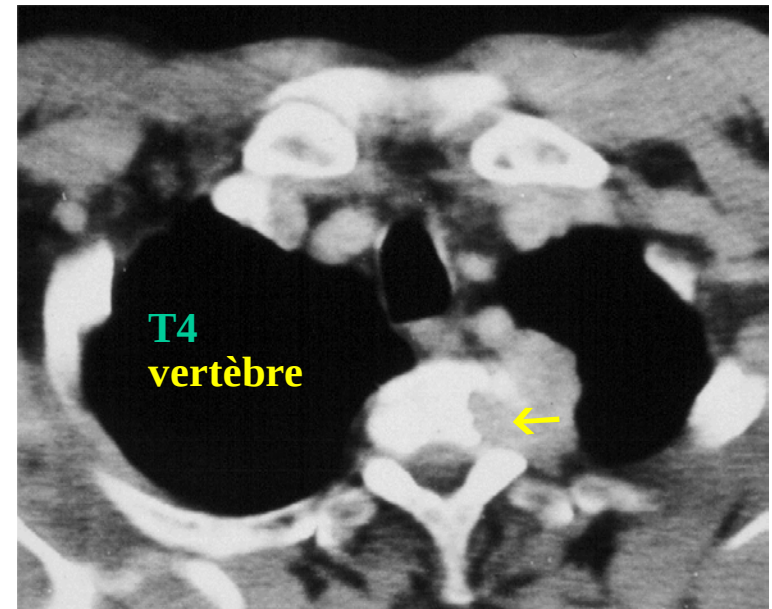
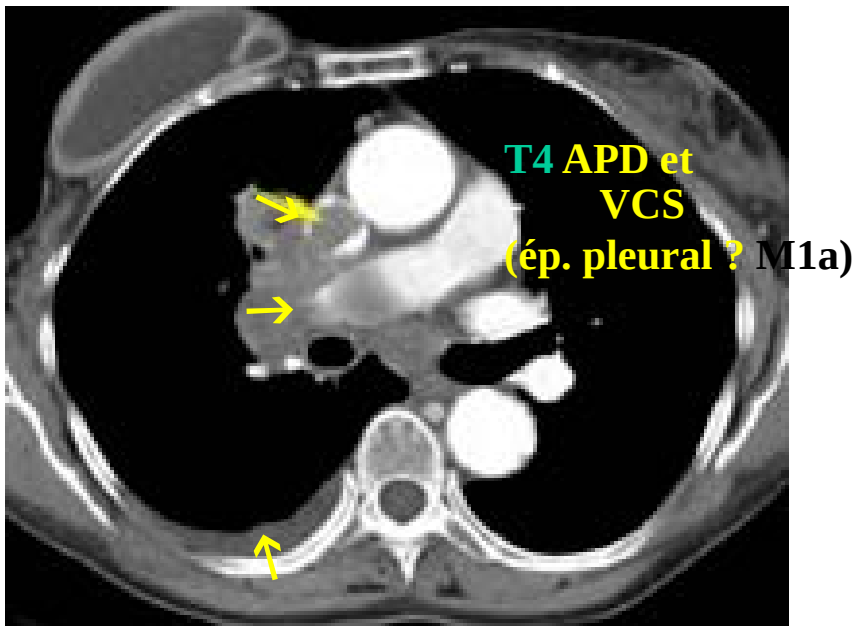


C. Cancer bronchique sous-pleural +





exemples de tumeurs (T)



stations ganglionnaires hilaires et médiastinales

Table 2

IASLC Anatomic Definitions for Lymph Node Stations

Location of Involved Lymph Nodes, Anatomic Definitions	Upper Border	Lower Border	Other Borders
Station Number 1			
Low cervical, supraclavicular, sternal notch: 1R = right-sided, 1L = left-sided	Lower margin of the cricoid cartilage	Clavicles bilaterally; in the midline, upper border of the manubrium	Border between 1R and 1L = midline trachea
Station Number 2			
Upper paratracheal: 2R = right-sided	Apex of the right lung and the pleural space; in the midline, upper border of the manubrium	Intersection of the caudal margin of the innominate vein and the trachea	Includes nodes extending to the left lateral border of the trachea
2L = left-sided	Apex of the right lung and the pleural space; in the midline, upper border of the manubrium	Superior border of the aortic arch	...
Station Number 3			
Prevascular and retrotracheal: 3a = prevascular	Apex of the chest	Carina	Anterior border = posterior aspect of the sternum
3p = retrotracheal	Apex of the chest	Carina	Right posterior border = anterior border of the superior vena cava, left posterior border = left carotid artery
Station Number 4			
Lower paratracheal: 4R = right paratracheal and pretracheal nodes	Intersection of the caudal margin of the innominate vein and the trachea	Lower border of the azygos vein	Includes nodes extending to the left lateral border of the trachea
4L = nodes to the left of the left lateral border of the trachea, medial to the ligamentum arteriosum	Upper margin of the aortic arch	Upper rim of the left main pulmonary artery	...
Station Number 5			
Subaortic (aortopulmonary window): Subaortic lymph nodes lateral to the ligamentum arteriosum	Lower border of the aortic arch	Upper rim of the left main pulmonary artery	...

Supraclavicular zone

- 1 Low cervical, supraclavicular, and sternal notch nodes

SUPERIOR MEDIASTINAL NODES

Upper zone

- 2R Upper Paratracheal (right)
- 2L Upper Paratracheal (left)
- 3a Prevascular
- 3p Retrotracheal
- 4R Lower Paratracheal (right)
- 4L Lower Paratracheal (left)

AORTIC NODES

AP zone

- 5 Subaortic
- 6 Para-aortic (ascending aorta or phrenic)

INFERIOR MEDIASTINAL NODES

Subcarinal zone

- 7 Subcarinal

Lower zone

- 8 Paraesophageal (below carina)
- 9 Pulmonary ligament

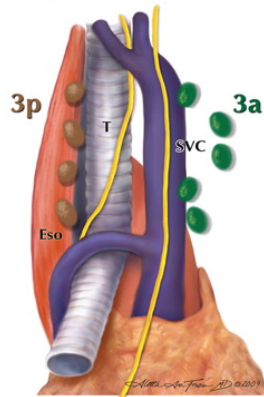
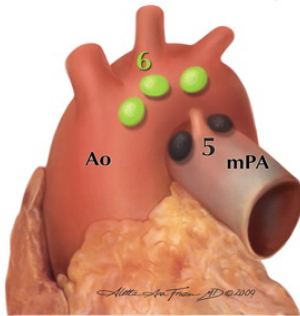
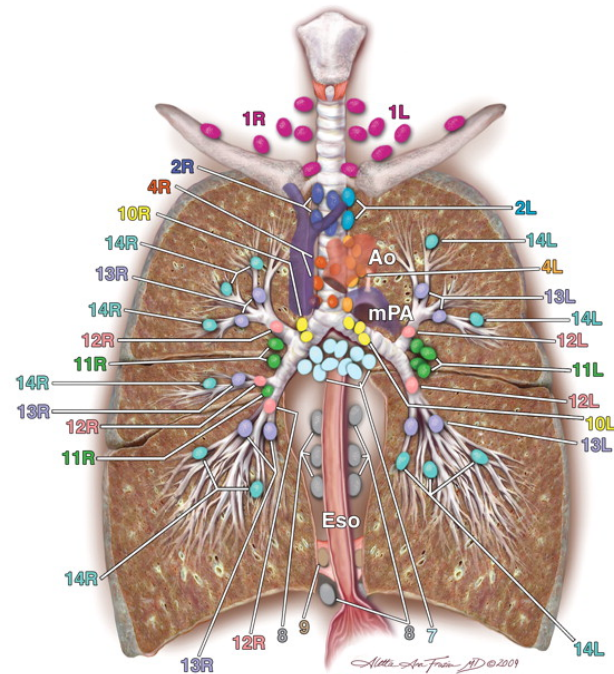
N1 NODES

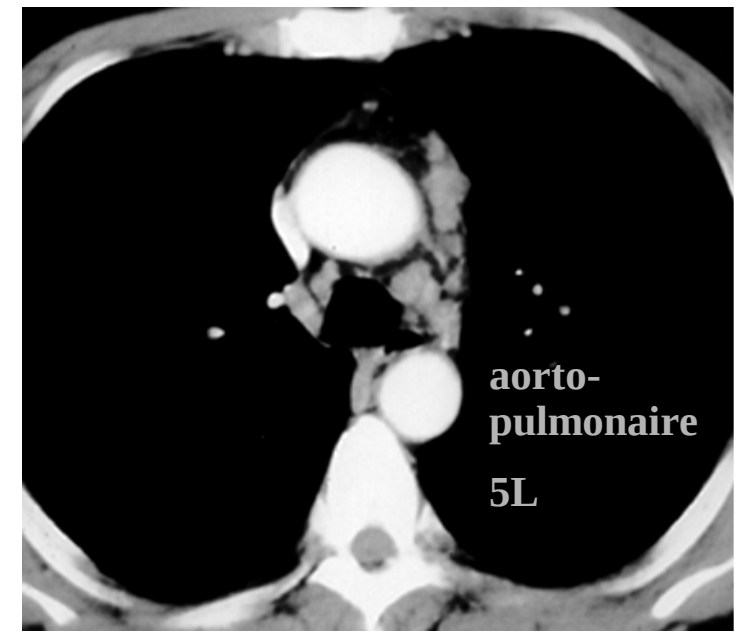
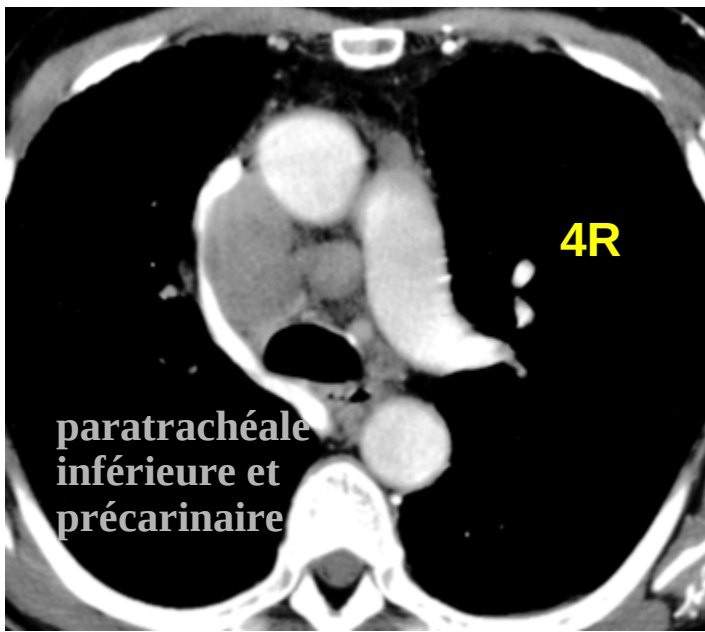
Hilar/Interlobar zone

- 10 Hilar
- 11 Interlobar

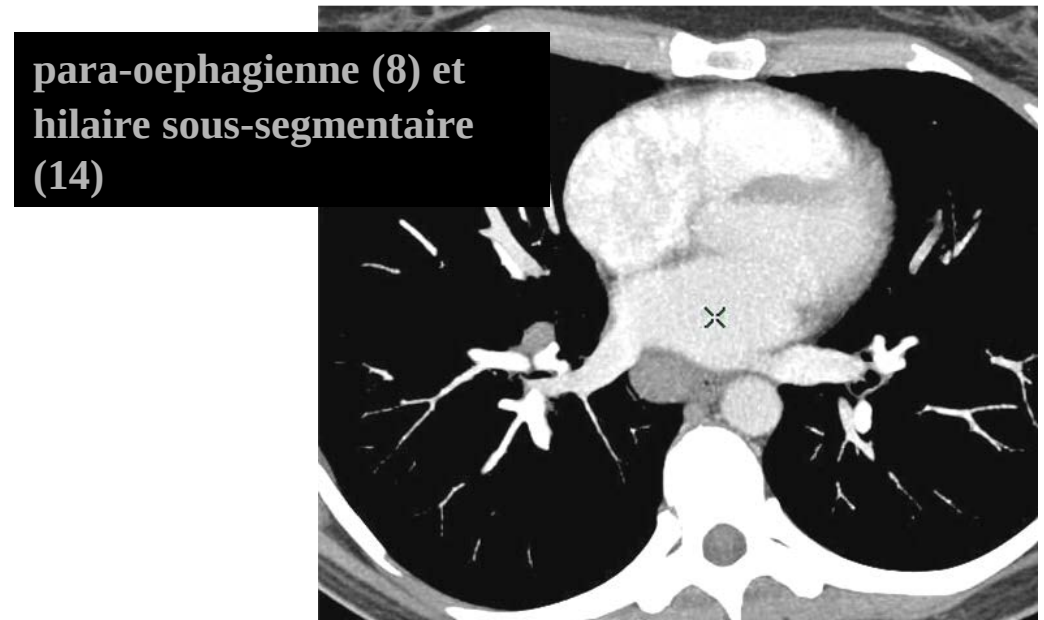
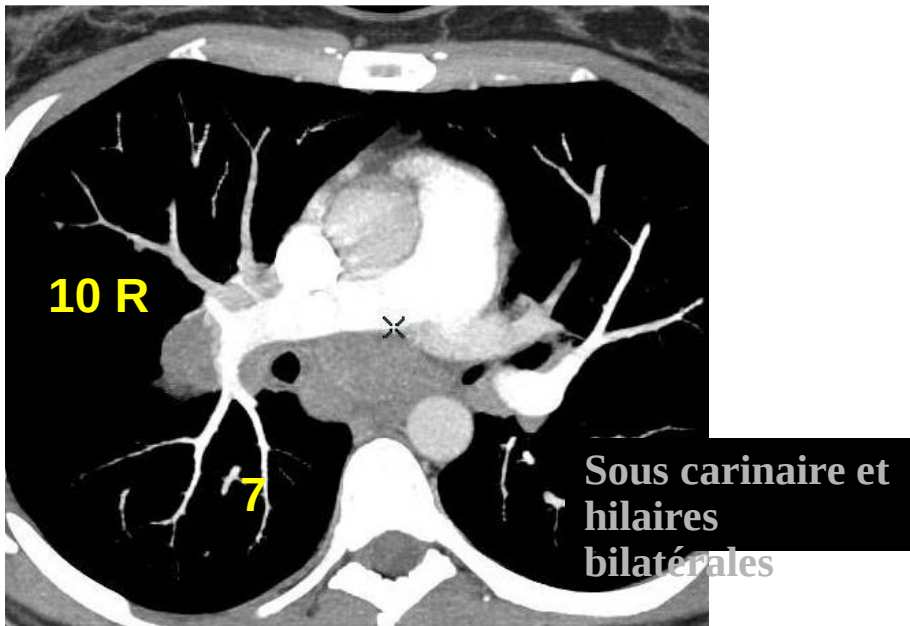
Peripheral zone

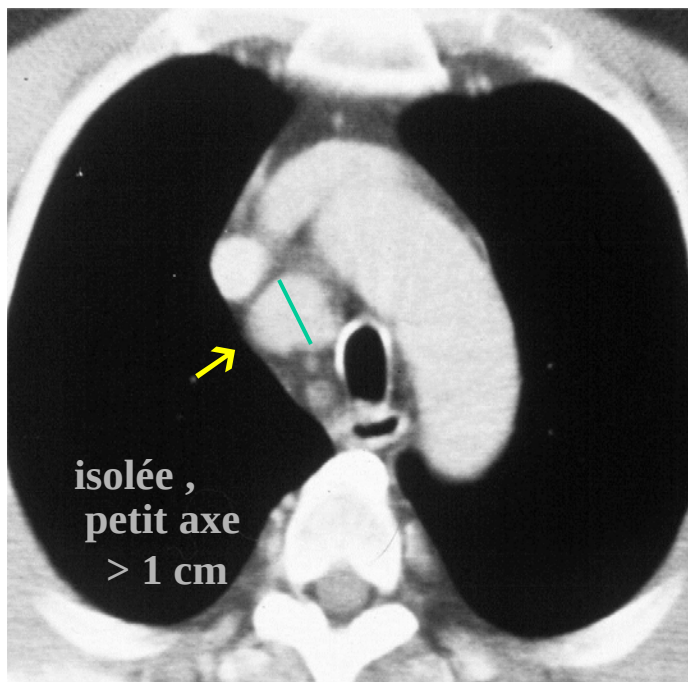
- 12 Lobar
- 13 Segmental
- 14 Subsegmental



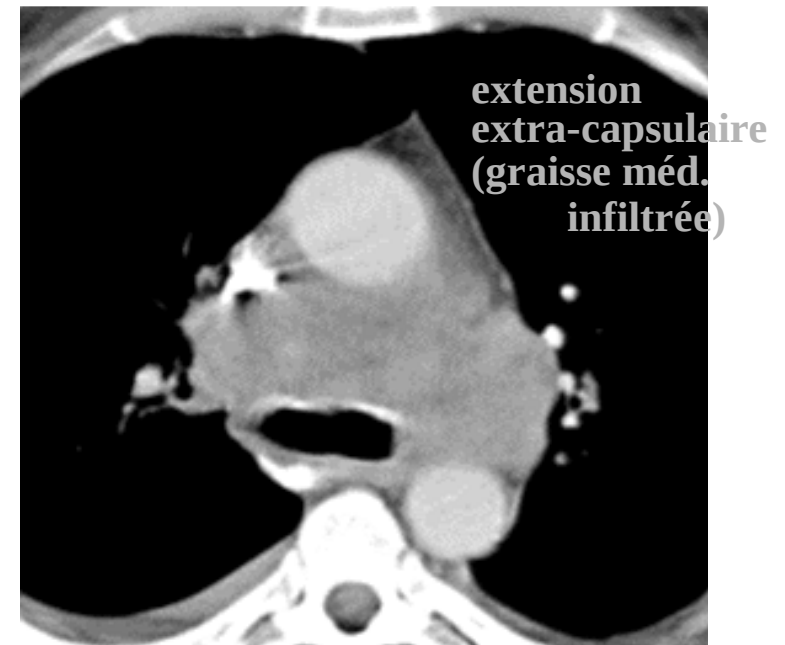
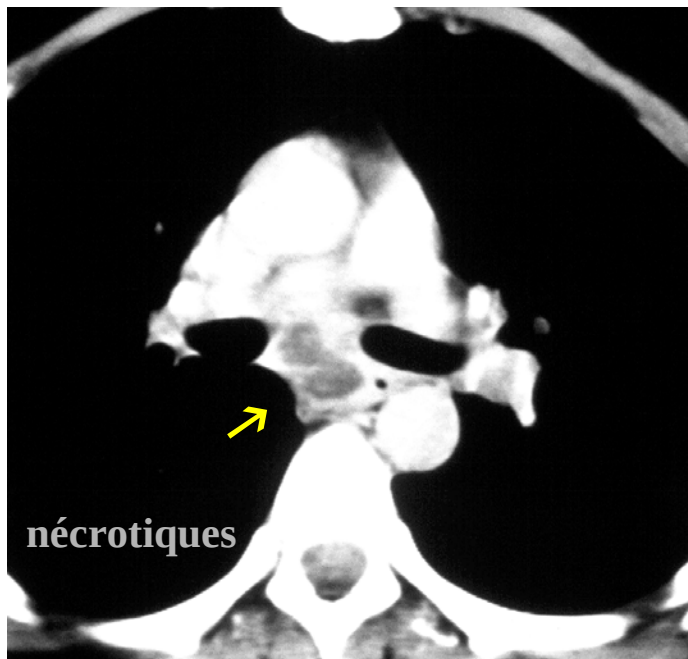


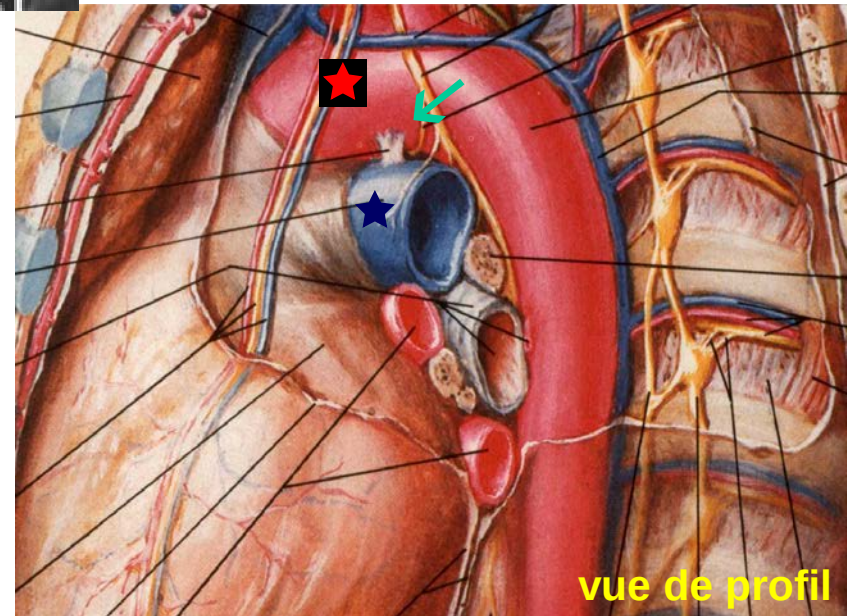
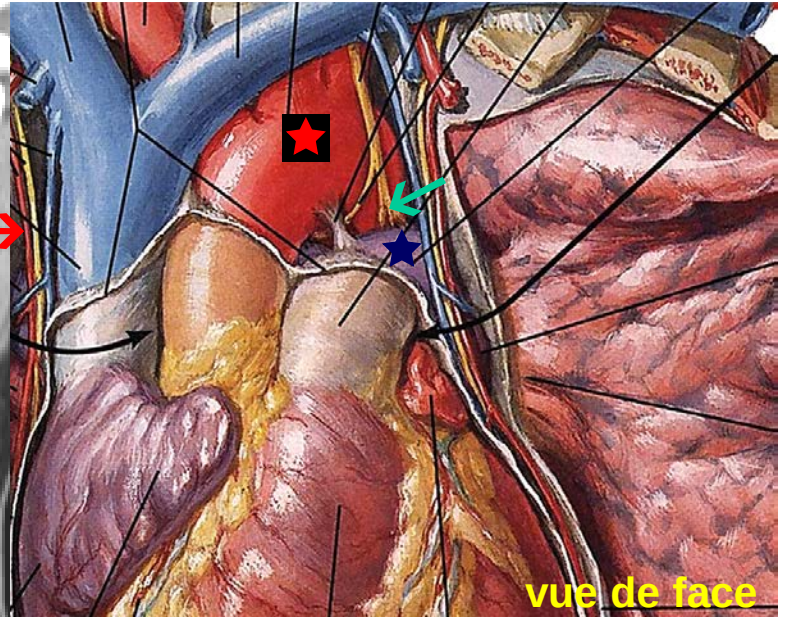
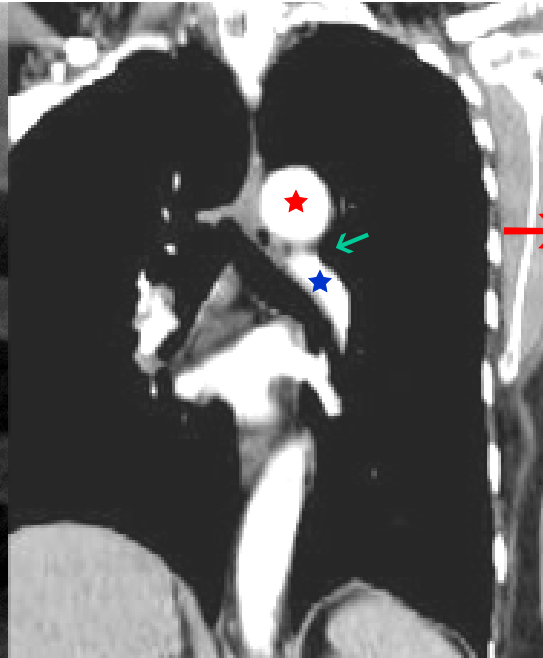
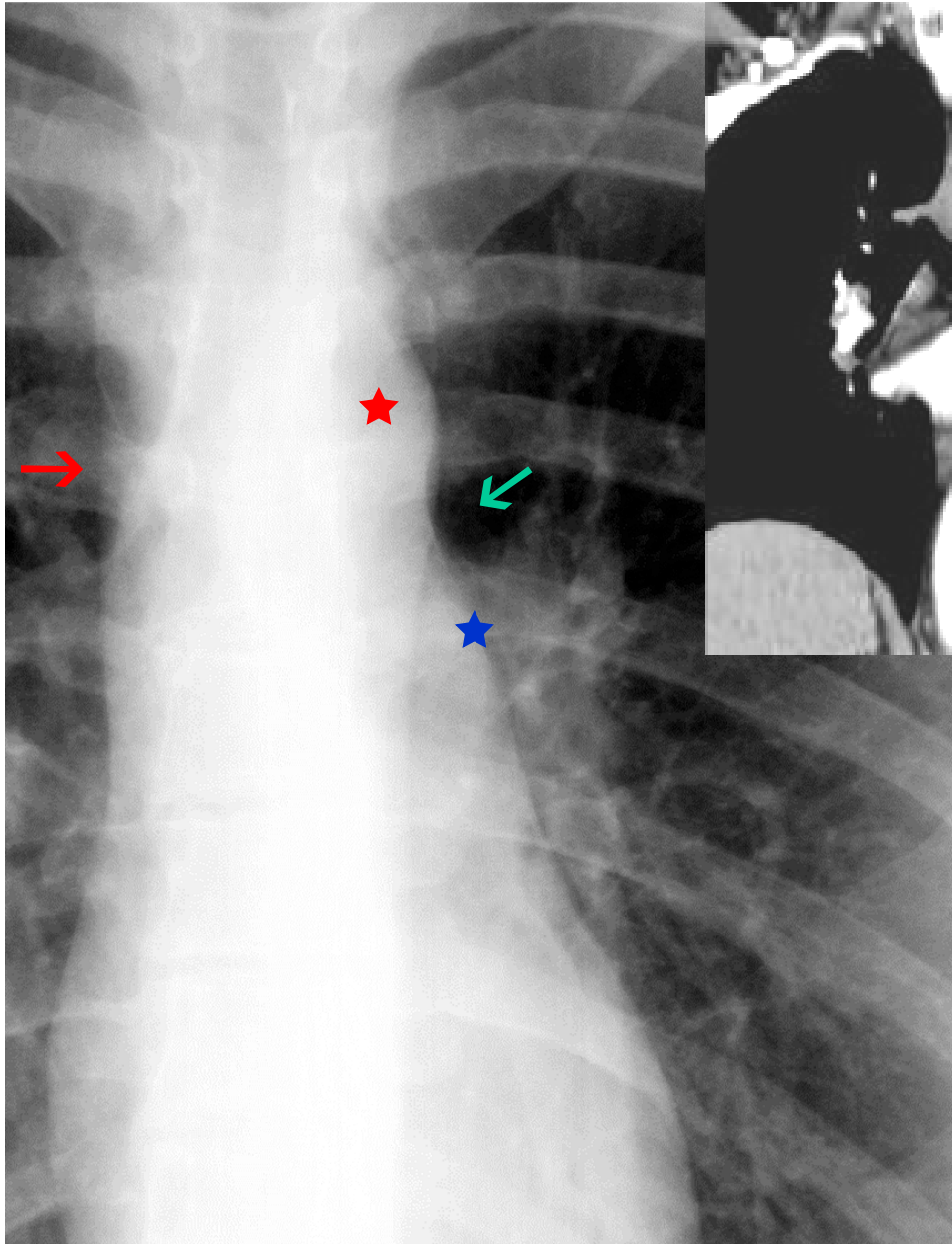
exemples d'adénomégalias dans différentes stations ganglionnaires





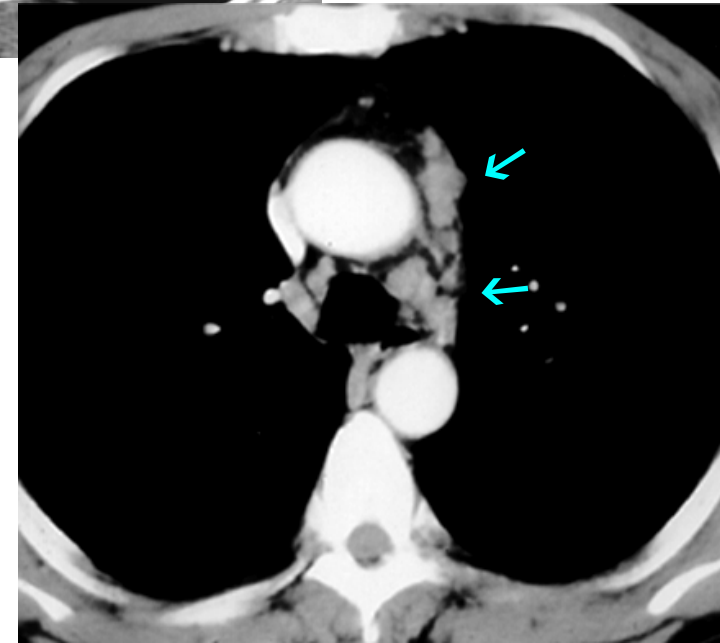
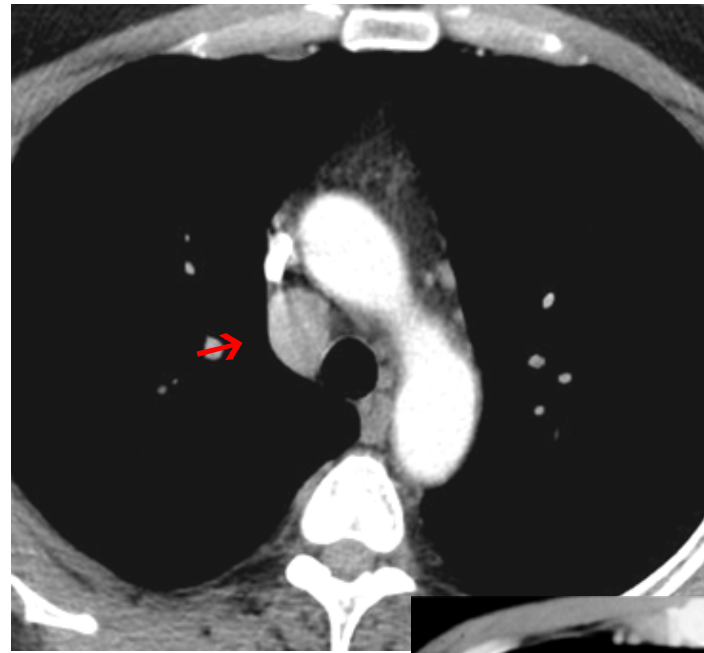
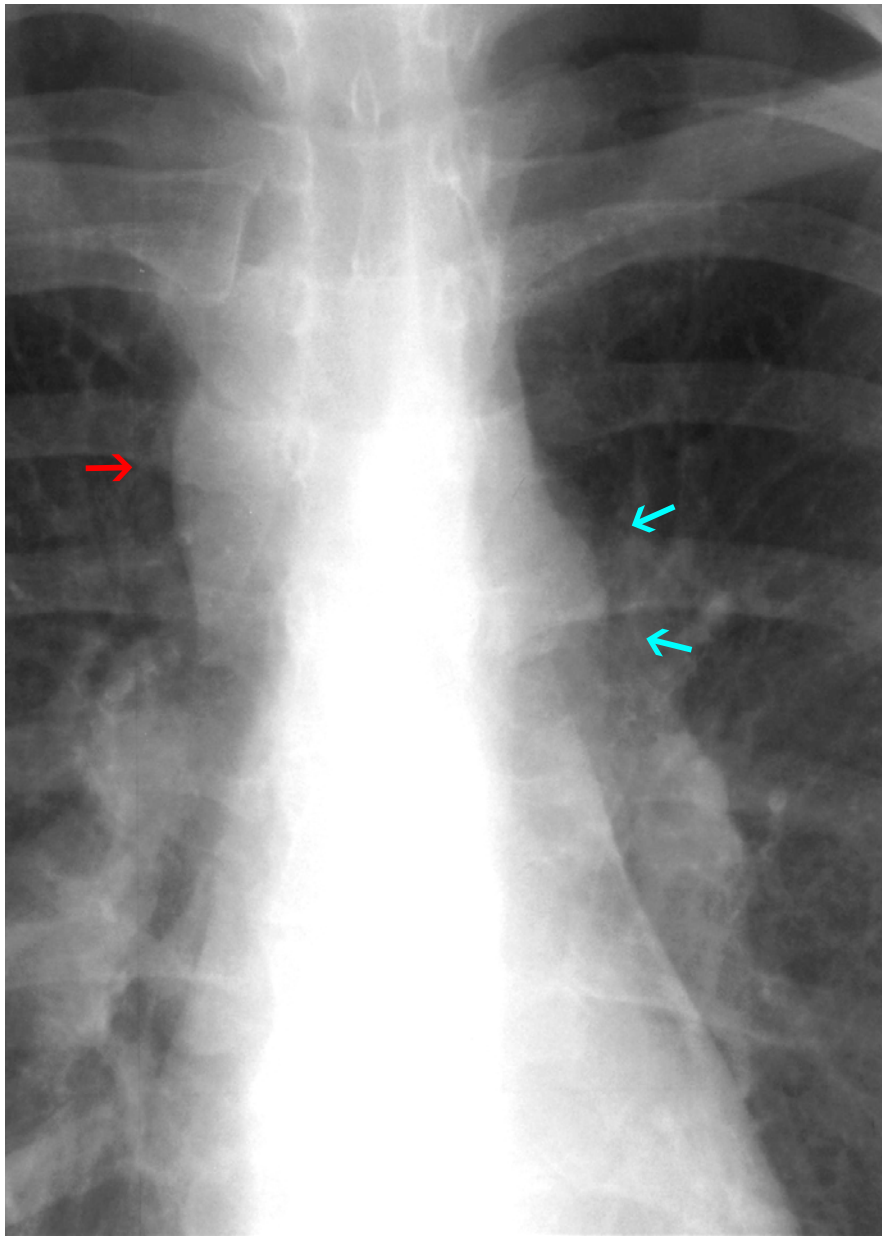
types d'adénopathies métastatiques





fenêtre aorto-pulmonaire
 non région paratrachéale droite normale

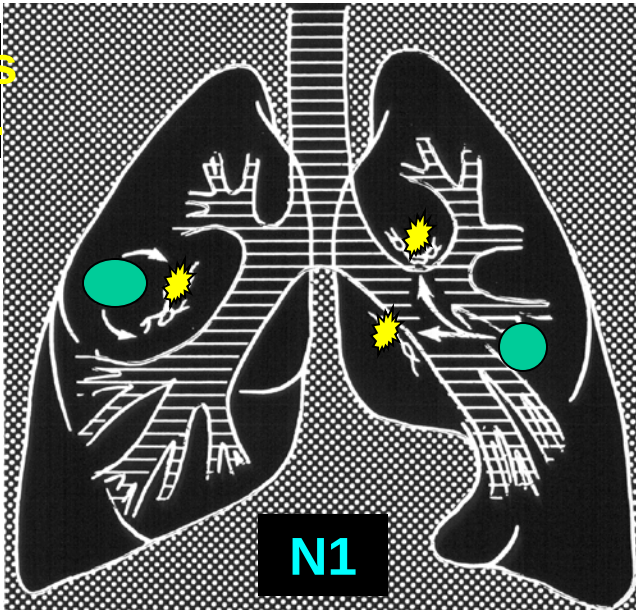
jamais convexes vers le poumon
 sur le cliché de face !!!



fenêtre A-P
 région paratrach.
 DR. } convexes

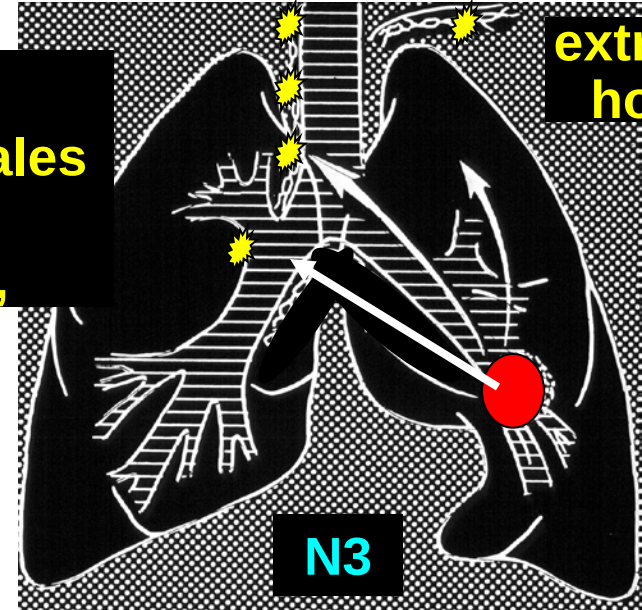
adénopathies - de la fenêtre A-P

hilaires
homol.



hilaires,
médiastinales
,
extra-thor.,
control.

N

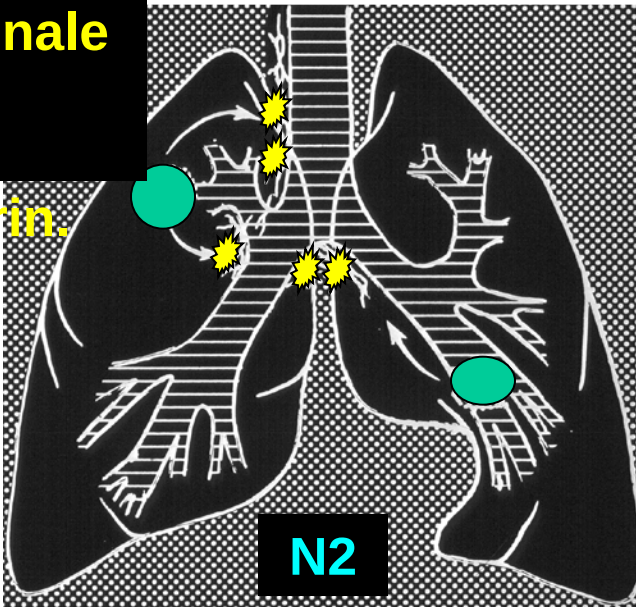


extra-thor
homol.

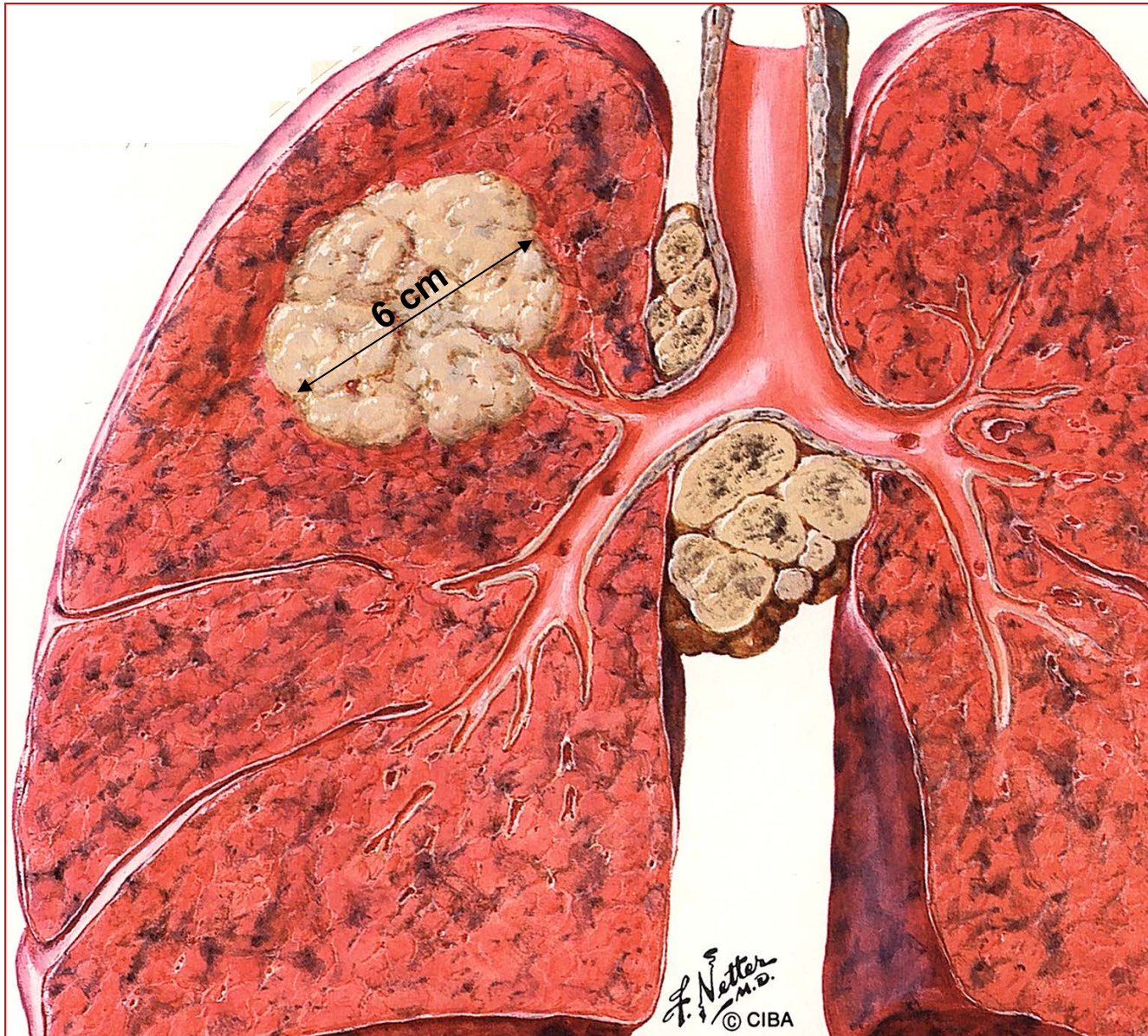
métastases ganglionnaires

•médiastinale
s
homol.

•sous-carin.



N3	- LSD	3.6 %
	- LID	3.7 %
	- LSG	11 %
	- LIG	25 %

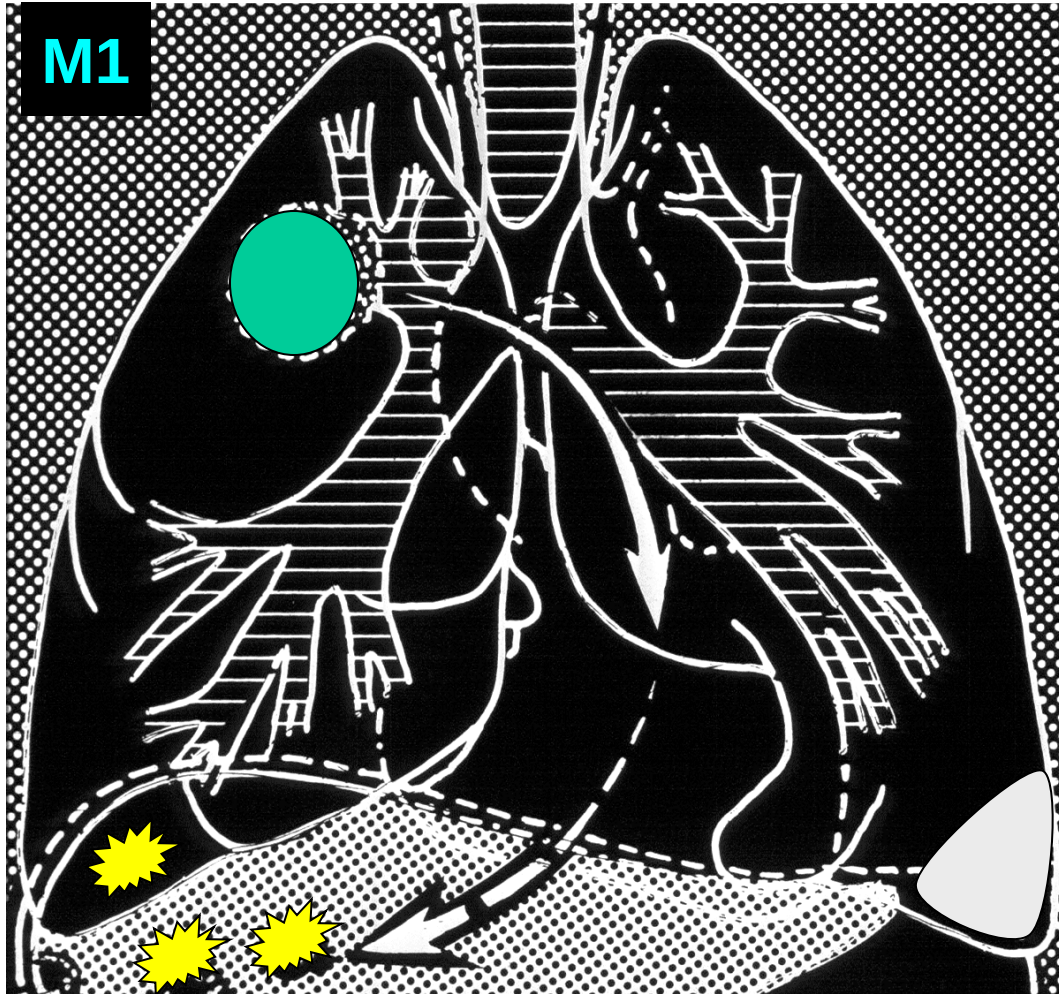


T ? 3

**Tumeur > 5 cm
et ≤ 7 cm**

N ? 2

- sous-carinaire (7)
- para-trachéal inf.
dr.(4R)



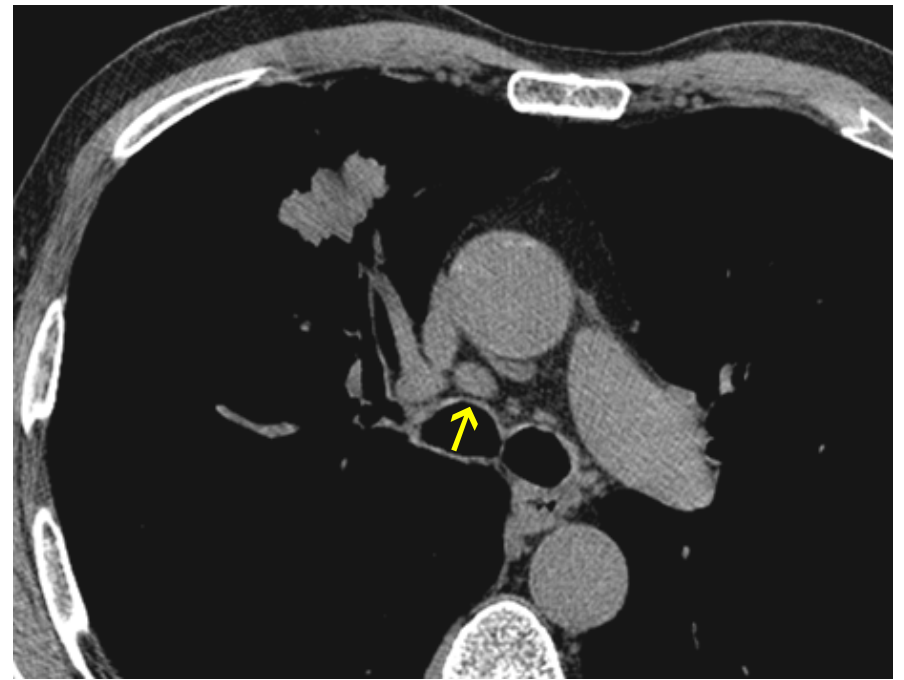
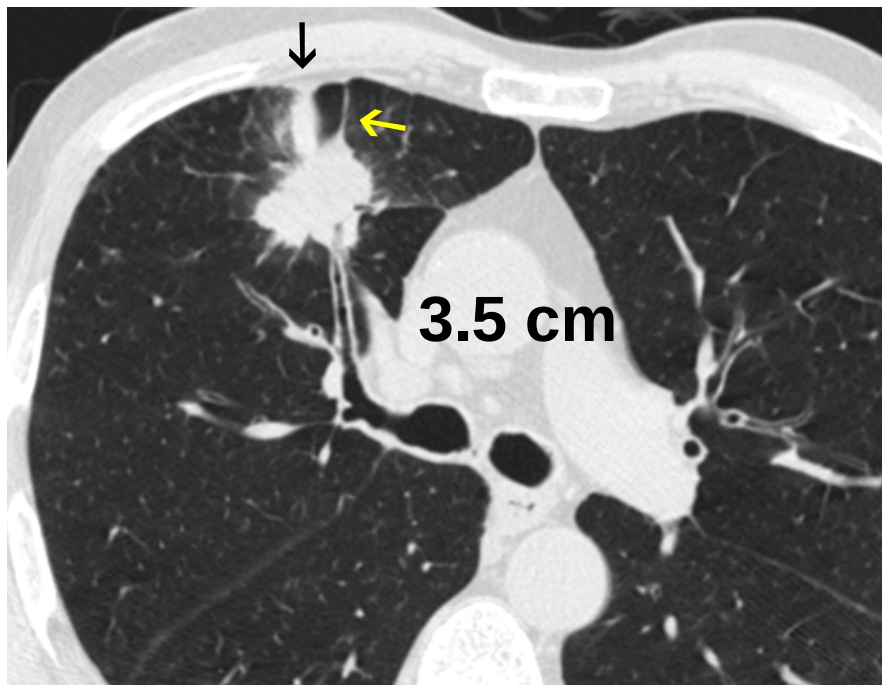
M1

M1

métastases à distance

prévalence : 30 %

- **M1a: intrathoracique**
- **Plèvre, péricarde, nodule poumon controlatéral**
- **M1b: extra-thoracique (n=1)**
- **M1c: multiple lésions (n>1)**
- **foie : 12 %**
- **cerveau : 10 %**
- **squelette : 10 %**
- **surrénales : 8 %**



T? N? M0

T2 a (>3,1 cm- 4cm, invasion pleurale)

N0

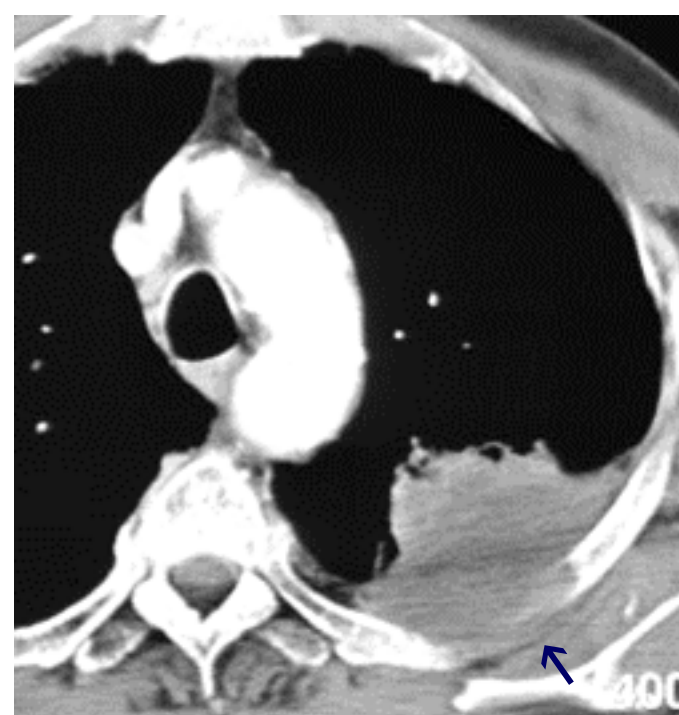
M0

➡ stade IB

New TNM stages

	N0	N1	N2	N3	M1a Any N	M1b Any N	M1c Any N
T1a	IA1	IIB	IIIA	IIIB	IVA	IVA	IVB
T1b	IA2	IIB	IIIA	IIIB	IVA	IVA	IVB
T1c	IA3	IIB	IIIA	IIIB	IVA	IVA	IVB
T2a	IB	IIB	IIIA	IIIB	IVA	IVA	IVB
T2b	IIA	IIB	IIIA	IIIB	IVA	IVA	IVB
T3	IIB	IIIA	IIIB	IIIC	IVA	IVA	IVB
T4	IIIA	IIIA	IIIB	IIIC	IVA	IVA	IVB

New TNM stages: IA1-3, IIIC, IVA, IVB

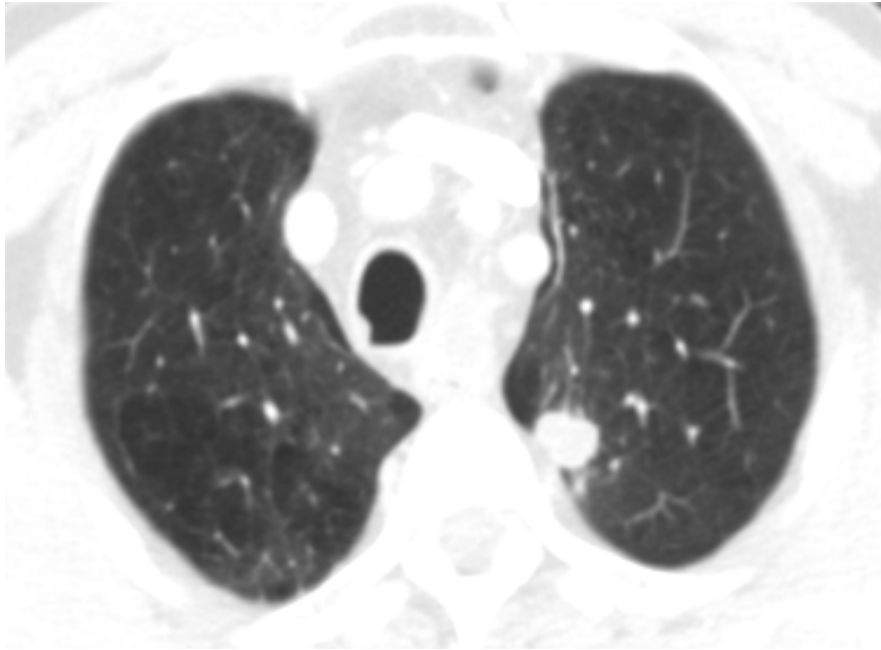


T3 (côte) N0 M1c (foie; N>1)

➔ stade IV

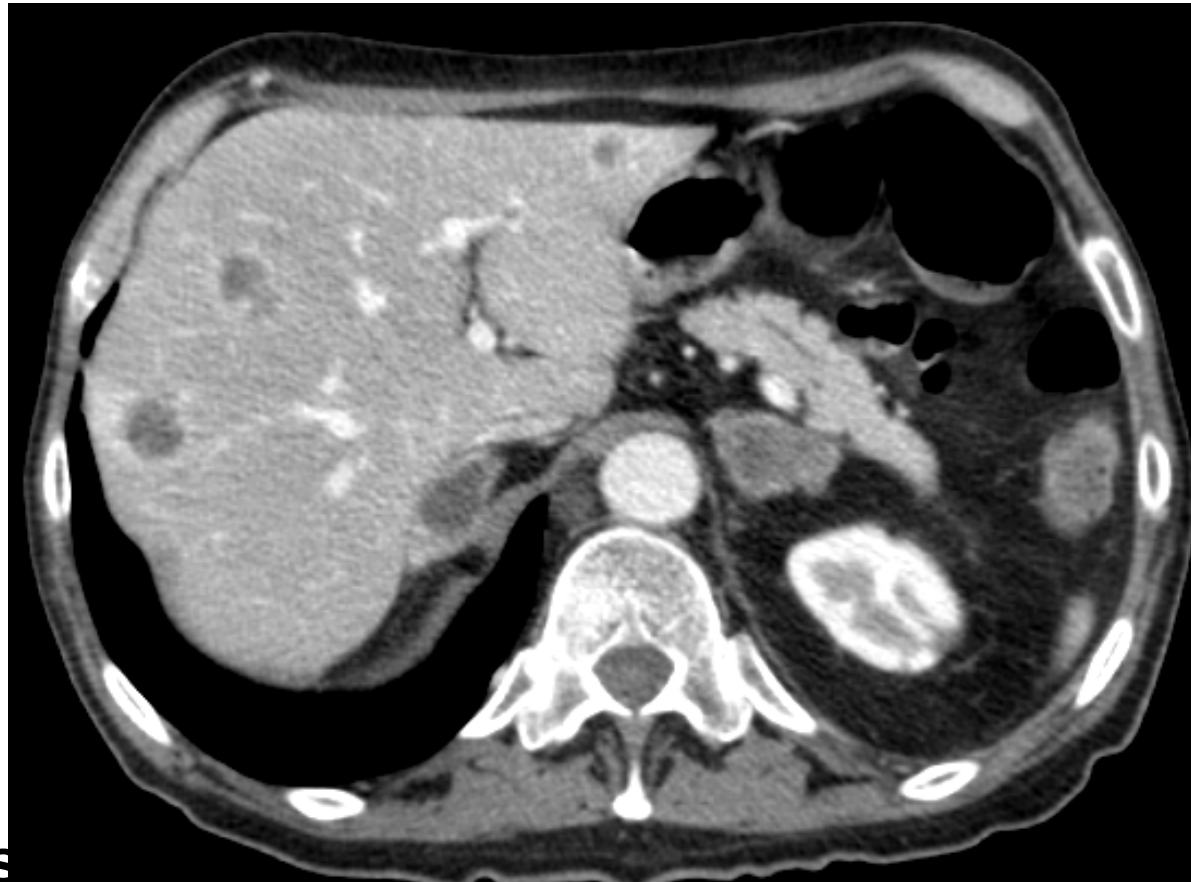
+ CT abdomen sup. !!!





SCLC

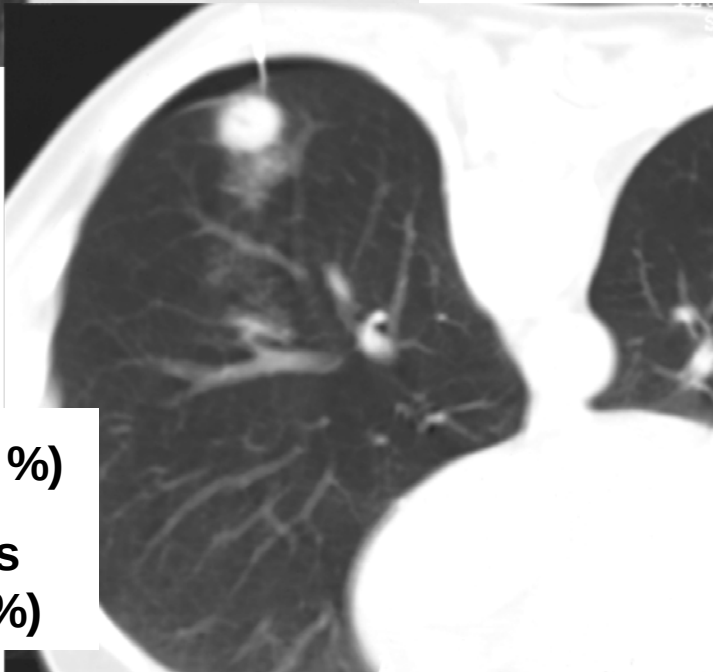
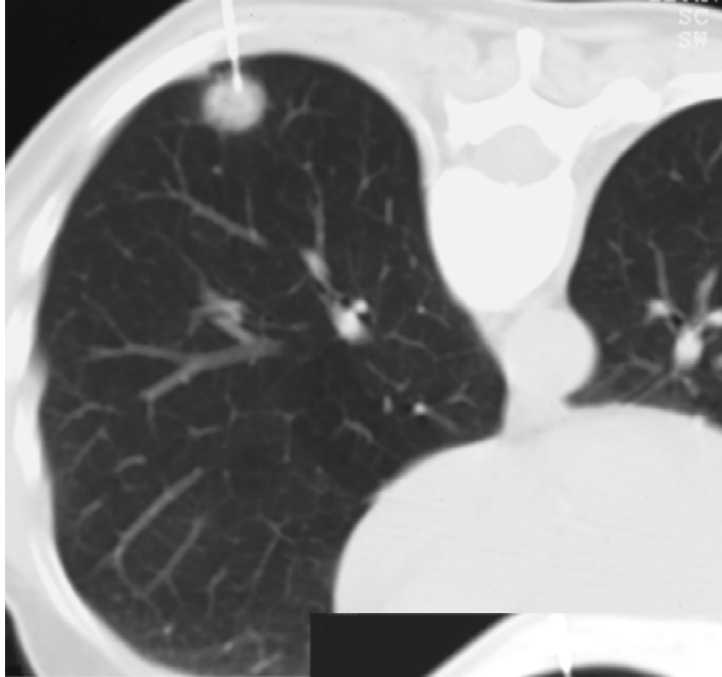
> anaplasique à petites cellules



T1 N0 M1c (foie + surrénales)

➔ stade IV ➔ stade EXTENSIF

PONCTION-BIOPSIE TRANSTHORACIQUE



- PNO (10-20 %)
- hémoptysies (1-10 %)

PBTTH



NSCLC

SCLC



- chirurgie

radio/chimioth.
(chirurgie)

....

→ **stade IIIA** (pas tjrs)

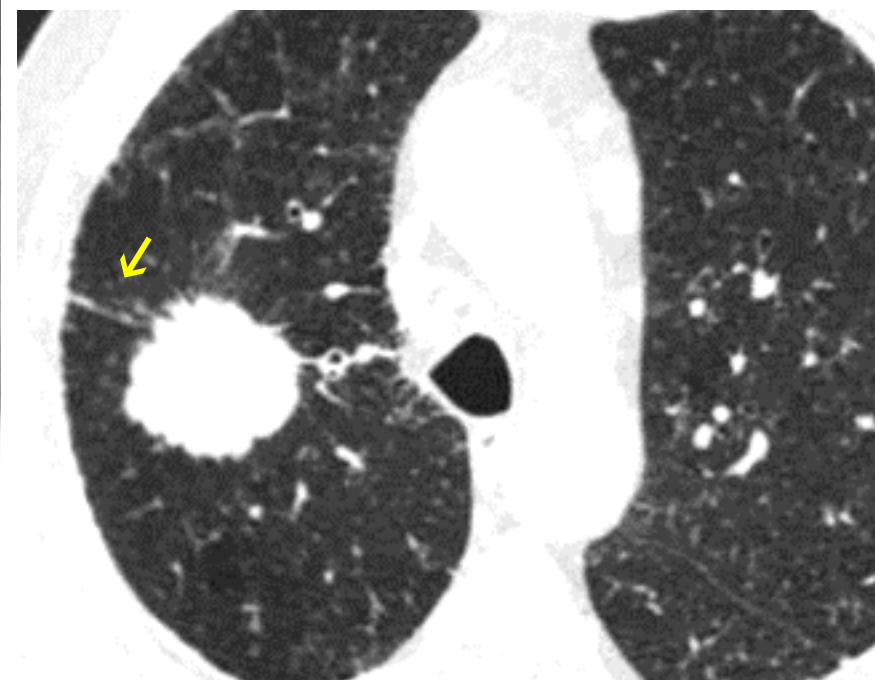
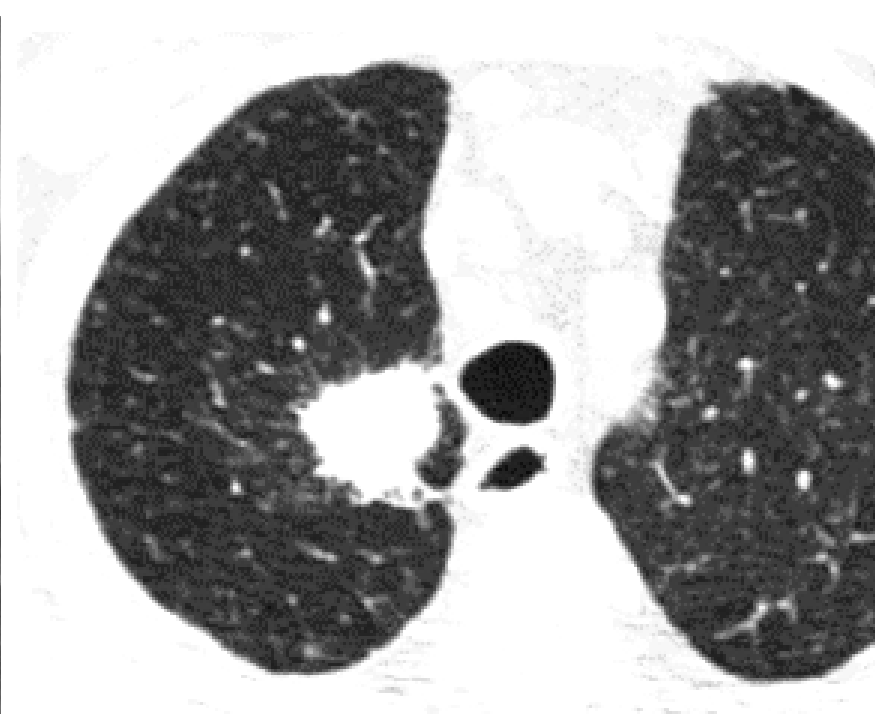
- radio/chimioth.

stade IIIB

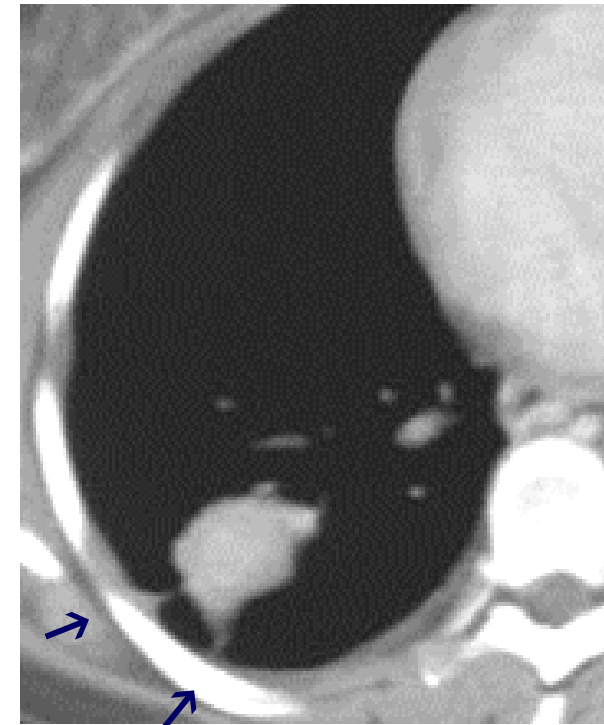
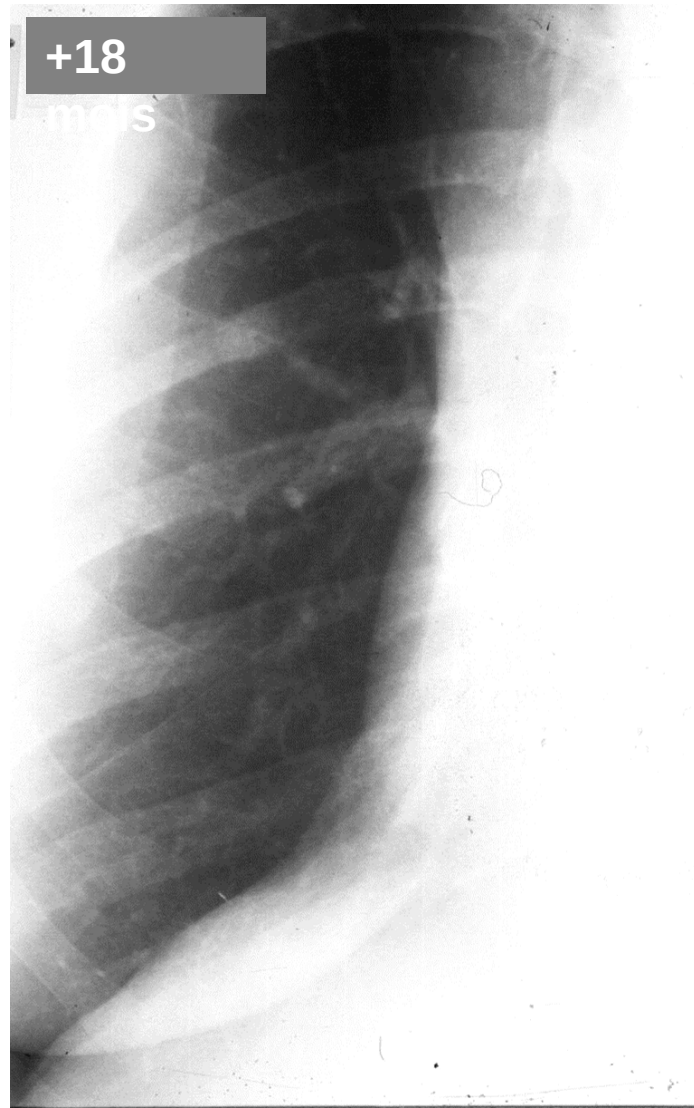
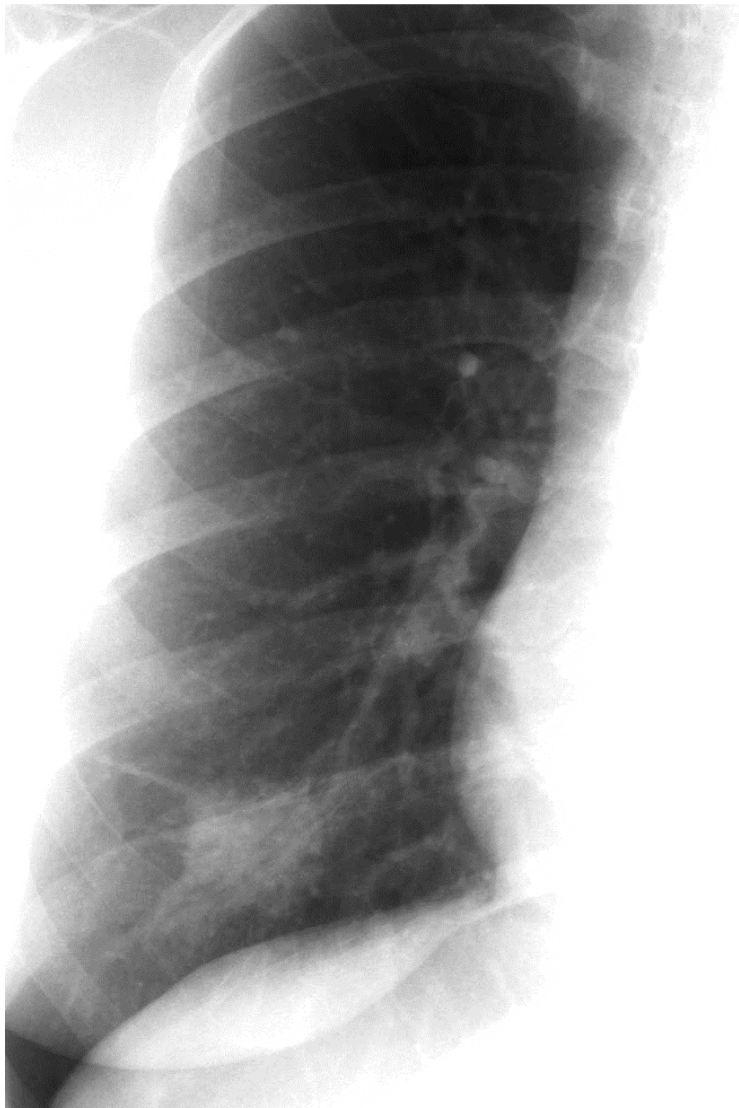
stade IV

CANCER BRONCHIQUE

- Les signes classiques du CB
- Le « scar carcinoma », l'adénocarcinome mucineux de type lépidique
- Le bilan d'extension
- Quelques pièges et limites
- La détection précoce du cancer B



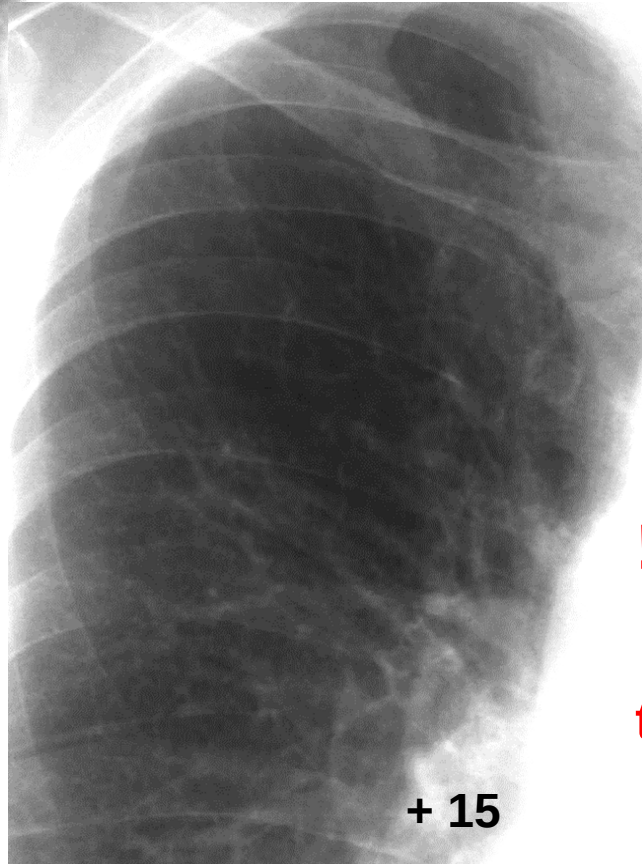
CANCERS BR. SYNCHRONES (0.5 - 2 %)
→ "pleural tag"



CANCER BRONCHIQUE METACHRONE
(17-20%)

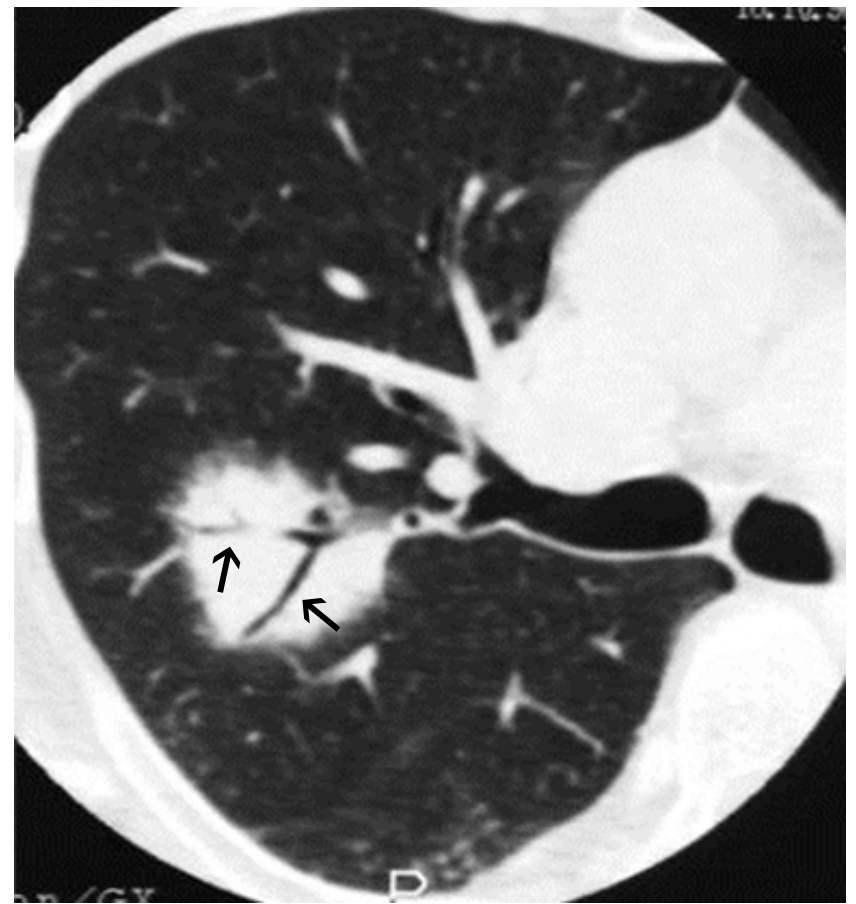


Δ ?



+ 15

jours



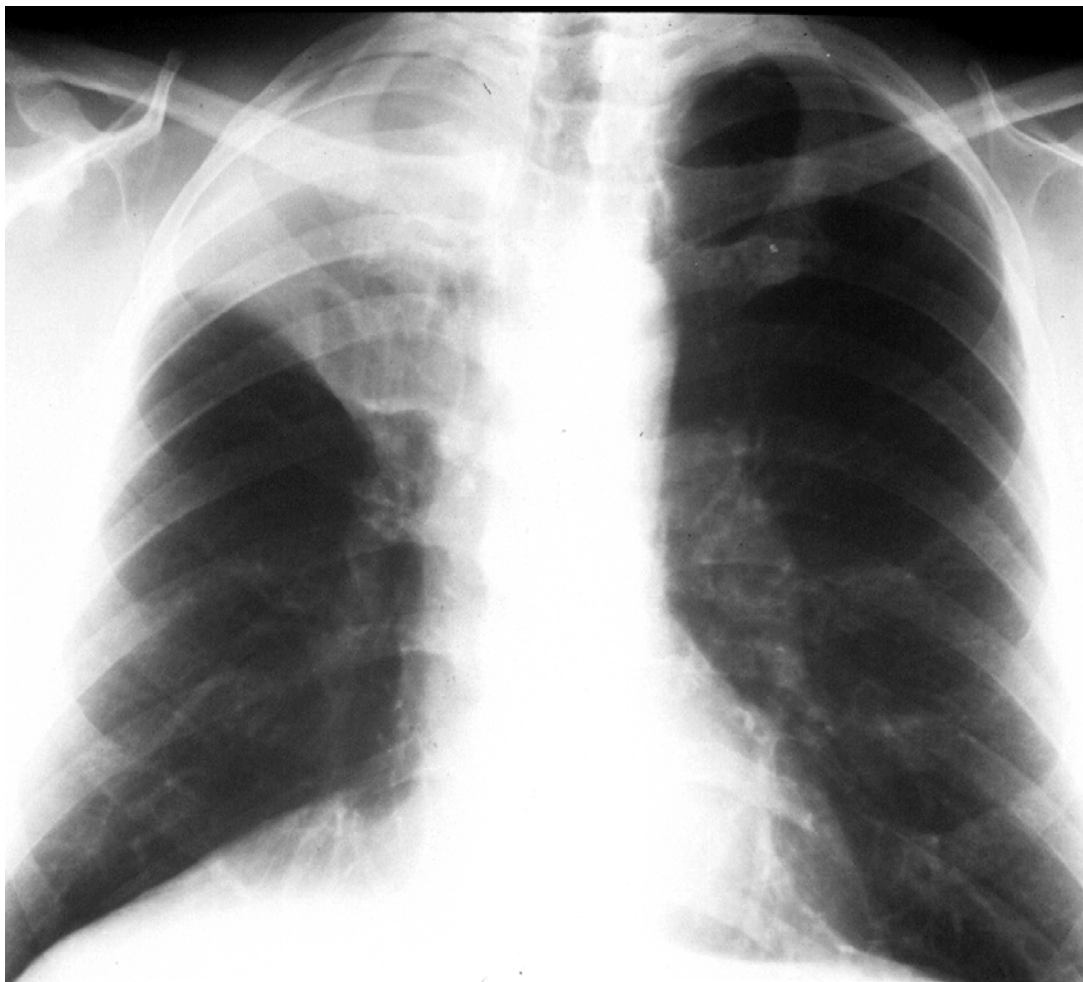
corrélation radio-clinique
!!!



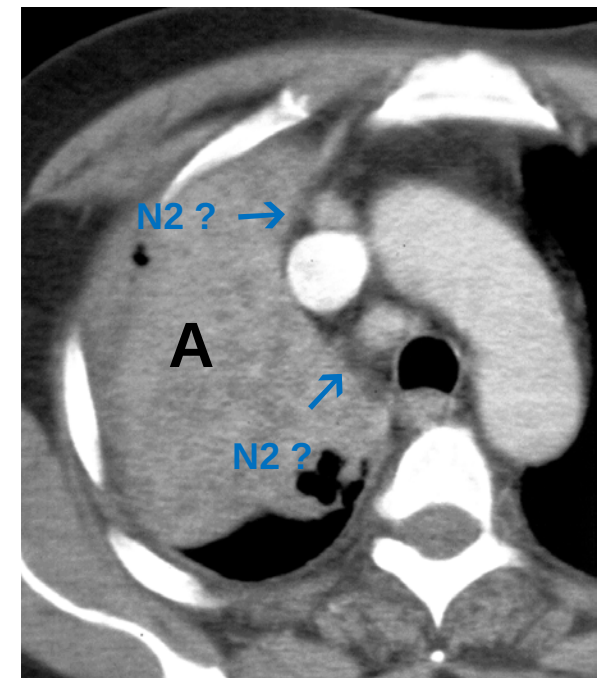
toux, expectorations,
température



PNEUMONIE RONDE



petit axe
11 / 12 mm



ggl.
inflammatoires



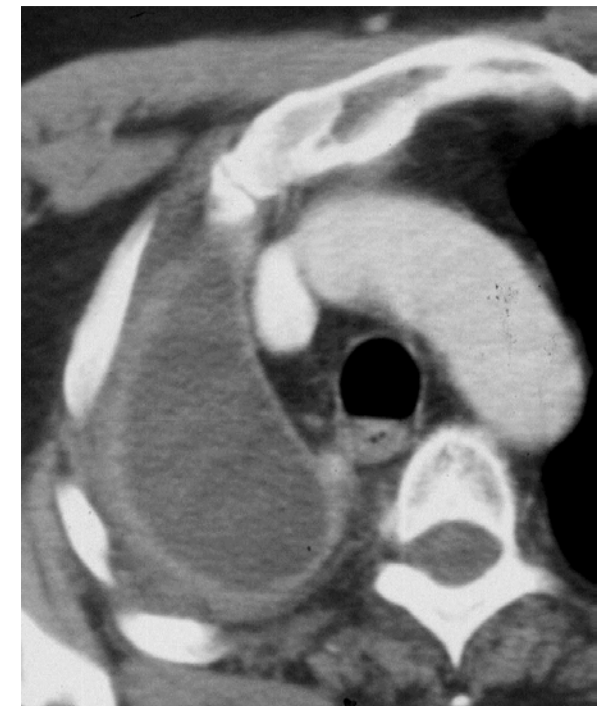
N0

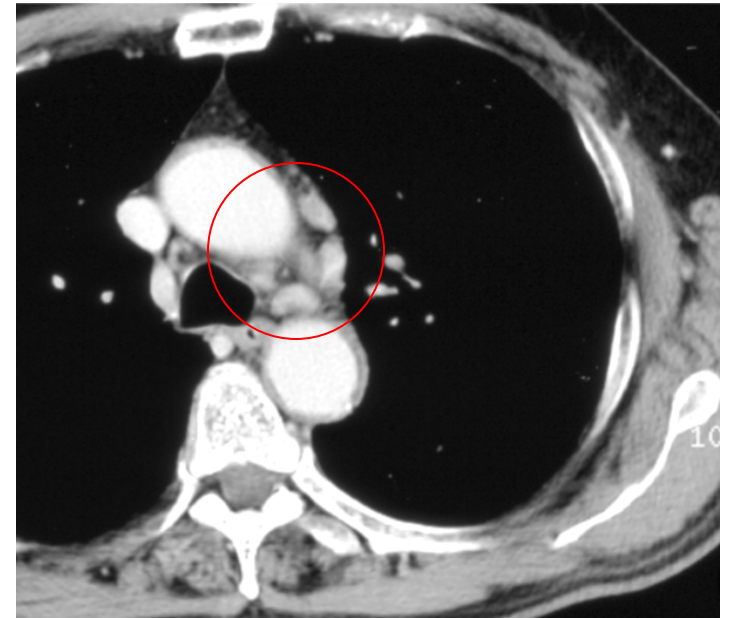
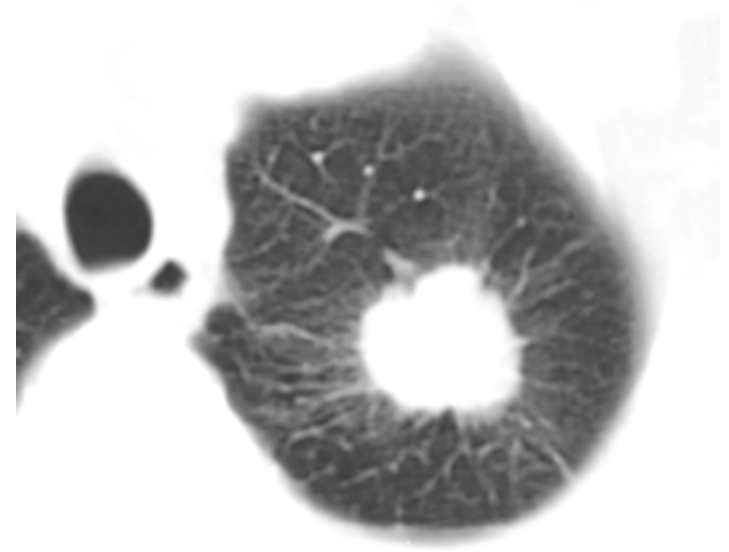
CB central + atélectasie lobaire (A)

c T2a N2 ? M0 ➔ stade IIIA ?

p T2a N0 M0 ➔ stade IB

post-pneumonectomie
-curage ganglionnaire
- espace liquidien





CB : masse, contour lobulé et spiculé

c T2a N0? M0 → stade IB ?

p T2a N2 M0 → stade IIIA

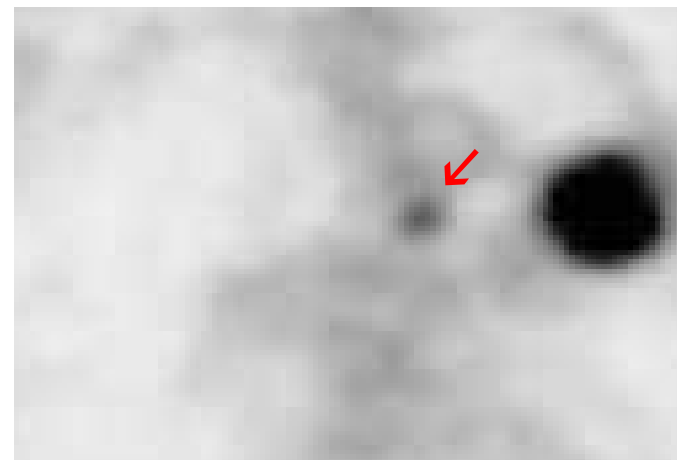
33% des petits ganglions sont positifs (micrométastases

ggl.)



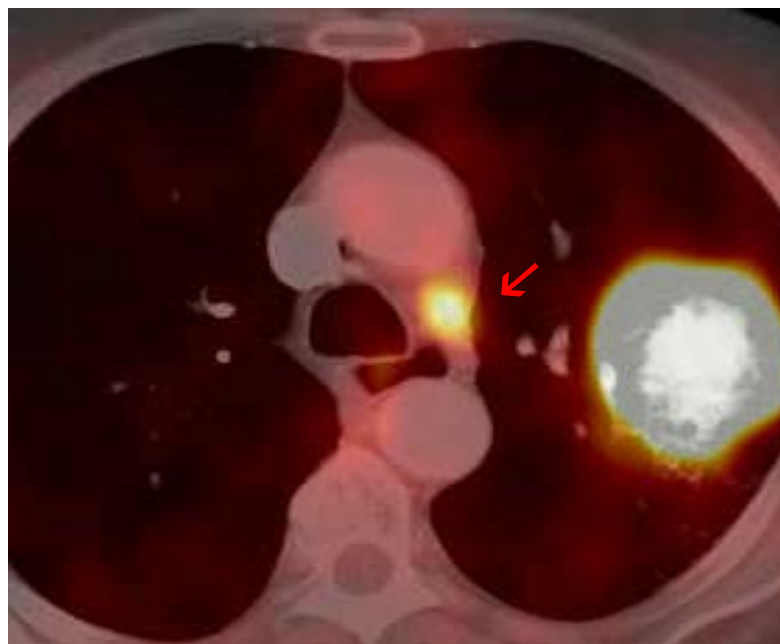
T2

N ?



N2

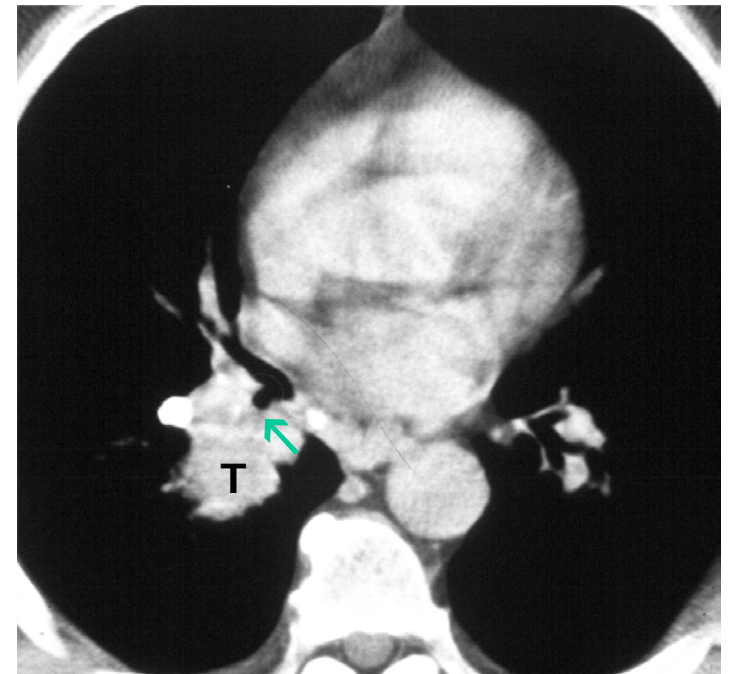
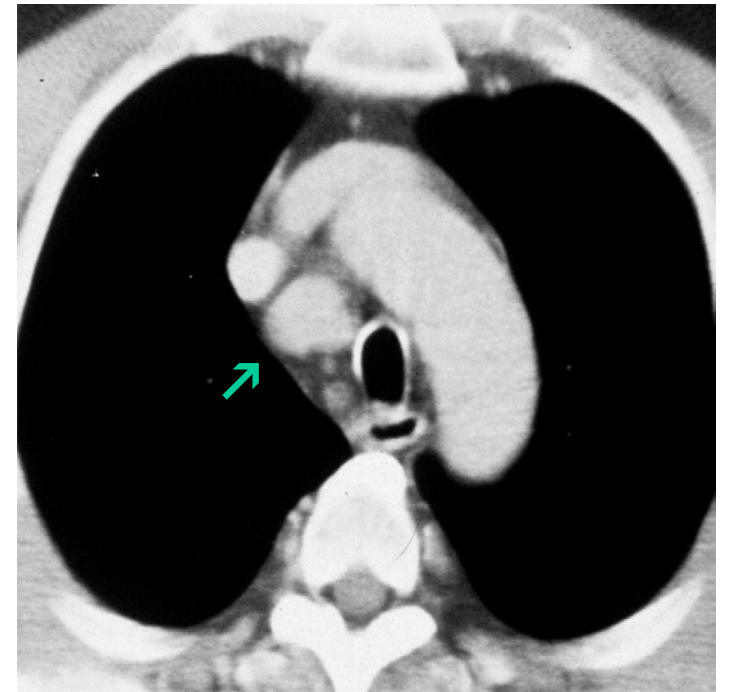
PET-¹⁸FDG
(fluoro-déoxy-glucose)



FUSION
PET / TDM



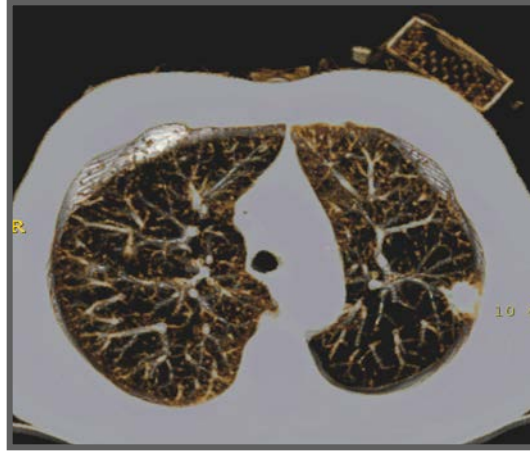
T2a N2 M0 → stade
IIIA



CANCER BRONCHIQUE

- Les signes classiques du CB
- Le « scar carcinoma », l'adénocarcinome mucineux de type lépidique
- Le bilan d'extension
- Quelques pièges et limites
- Le traitement par radiofréquence
- La détection précoce du cancer B

CT à faible dose est un outil sensible pour détecter le cancer bronchique de façon précoce



1000 volontaires, >60 ans, ≥ 10 années-paquet

CT de base, CT répété annuellement

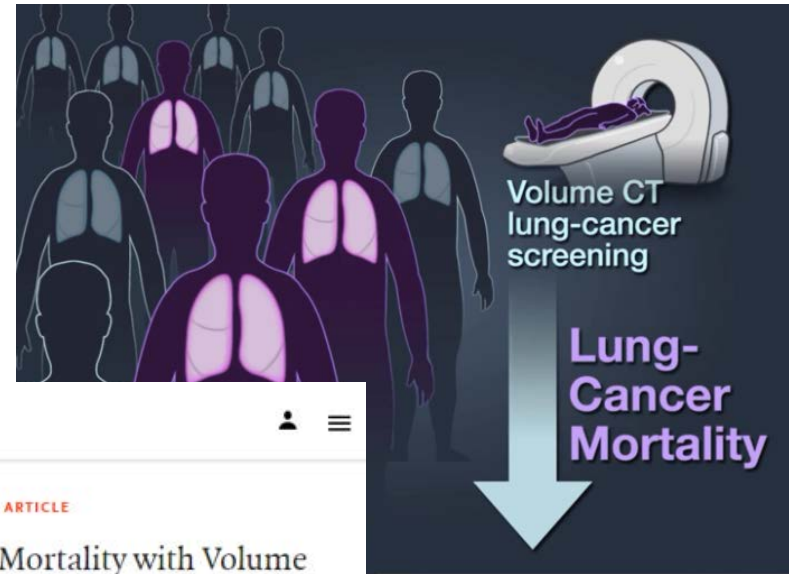
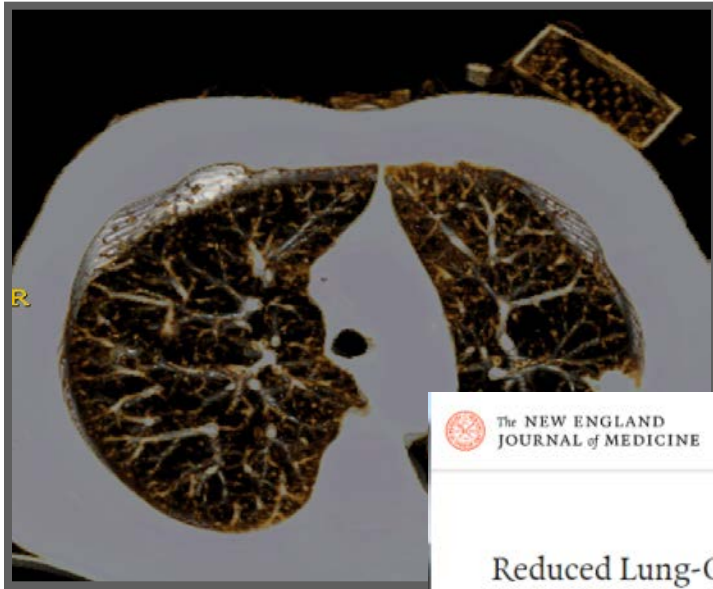
140 kVp, 40 mA, collimation: 10 mm

2.7 % cancers du poumon-85% stade I-26/27 étaient résecables

Henschke CI et al. Early lung cancer action project: overall design and findings from baseline screening. The Lancet 1999 354: 99-105

Etude NSLT

- 53454 personnes étudiées
- 24 % tests + pour CT, 6,9% pour la Rx
- 96,4% FP pour CT, 94,5% pour la Rx
- Incidence: 645/100000 pers/an pour le CT (1060), 572/100000 pers/an pour la Rx (941)
- 247 décès/100000 pers/an pour le CT, 309 décès/100000 pers/an pour la Rx
- Réduction de 20% la mortalité liée au cancer pulmonaire



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Reduced Lung-Cancer Mortality with Volume CT Screening in a Randomized Trial

Harry J. de Koning, M.D., Ph.D., Carlijn M. van der Aalst, Ph.D., Pim A. de Jong, M.D., Ph.D., Ernst T. Scholten, M.D., Ph.D., *et al.*

February 6, 2020
 N Engl J Med 2020; 382:503-513
 DOI: 10.1056/NEJMoa1911793

NELSON
 (N=13,195 men)

CURRENT OR FORMER SMOKERS

- ✓ Smoked >15 cigarettes/day for >25 years
- ✓ Smoked >10 cigarettes/day for >30 years
- ✓ Former smokers who had quit smoking ≤10 years prior

