



Seguimiento de nódulos pulmonares mediante TC

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Complejo Asistencial Universitario de León, León



MANEJO DE NÓDULOS PULMONARES DETECTADOS MEDIANTE TC ÍNDICE

OBJETIVO DOCENTE:

REVISIÓN DEL TEMA:

- Introducción
- Guías Fleischner

CONCLUSIONES

REFERENCIAS BIBLIOGRÁFICAS

OBJETIVO DOCENTE

- Diferenciar nódulos pulmonares **benignos** de posiblemente **malignos**.
- Conocer las guías de manejo de nódulos pulmonares: Guías Fleischner (**Fleischner Society**).
- Realizar correctamente el **informe radiológico** para asesorar al resto de profesionales sobre el seguimiento de nódulos pulmonares.



INTRODUCCIÓN

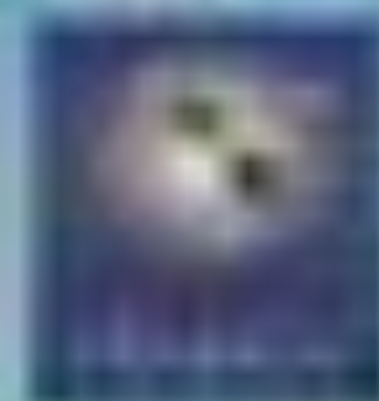
▶ NÓDULOS PULMONARES

- Lesión $< o = 3$ cm rodeada de parénquima pulmonar
- Hallazgo incidental frecuente en TC de tórax
- Papel del radiólogo:
Lesiones benignas vs. posiblemente malignas
Asesorar sobre seguimiento o técnicas de imagen invasivas
- GUÍAS DE MANEJO DE NÓDULOS PULMONARES:

FLEISCHNER
SOCIETY

FLEISCHNER GUIDELINES

A: Solid Nodules*				
Nodule Type	Size			Comments
	<6 mm (<100 mm ³)	6-8 mm (100-250 mm ³)	>8 mm (>250 mm ³)	
Single				
Low risk†	No routine follow-up	CT at 6-12 months, then consider CT at 18-24 months	Consider CT at 3 months, PET/CT, or tissue sampling	Nodules <6 mm do not require routine follow-up in low-risk patients (recommendation 1A).
High risk†	Optional CT at 12 months	CT at 6-12 months, then CT at 18-24 months	Consider CT at 3 months, PET/CT, or tissue sampling	Certain patients at high risk with suspicious nodule morphology, upper lobe location, or both may warrant 12-month follow-up (recommendation 1A).
Multiple				
Low risk†	No routine follow-up	CT at 3-6 months, then consider CT at 18-24 months	CT at 3-6 months, then consider CT at 18-24 months	Use most suspicious nodule as guide to management. Follow-up intervals may vary according to size and risk (recommendation 2A).
High risk†	Optional CT at 12 months	CT at 3-6 months, then at 18-24 months	CT at 3-6 months, then at 18-24 months	Use most suspicious nodule as guide to management. Follow-up intervals may vary according to size and risk (recommendation 2A).
B: Subsolid Nodules*				
Nodule Type	Size		Comments	
	<6 mm (<100 mm ³)	≥6 mm (>100 mm ³)		
Single				
Ground glass	No routine follow-up	CT at 6-12 months to confirm persistence, then CT every 2 years until 5 years	In certain suspicious nodules < 6 mm, consider follow-up at 2 and 4 years. If solid components or growth develops, consider resection. (Recommendations 3A and 4A).	
Part solid	No routine follow-up	CT at 3-6 months to confirm persistence. If unchanged and solid component remains <6 mm, annual CT should be performed for 5 years.	In practice, part-solid nodules cannot be defined as such until ≥6 mm, and nodules <6 mm do not usually require follow-up. Persistent part-solid nodules with solid components ≥6 mm should be considered highly suspicious (recommendations 4A-4C).	
Multiple				
	CT at 3-6 months. If stable, consider CT at 2 and 4 years.	CT at 3-6 months. Subsequent management based on the most suspicious nodule(s).	Multiple <6 mm pure ground-glass nodules are usually benign, but consider follow-up in selected patients at high risk at 2 and 4 years (recommendation 5A).	



FLEISCHNER GUIDELINES

A. Solid Nodule*			
Feature	<6 mm (< 100 cc)	6-8 mm	Comments
Single			
Low risk†	No routine follow-up	CT at 6-12 months, then annual CT at 15-24 months	Multiple <6 mm do not require routine follow-up in low-risk patients (recommendation 1A).
High risk†	Optional CT at 6-12 months	CT at 6-12 months, then consider CT at 15-24 months or tissue sampling	Certain nodules at high risk with suspicious features (spiculation, upper-lobe location, or both) may warrant 12-month follow-up (recommendation 1B).
Multiple			
Low risk†	No routine follow-up	CT at 3-6 months, then consider CT at 15-24 months	Use most suspicious nodule as guide to management. Follow-up intervals may vary according to size and risk (recommendation 1A).
High risk†	Optional CT at 12 months	CT at 3-6 months, then CT at 15-24 months	Use most suspicious nodule as guide to management. Follow-up intervals may vary according to size and risk (recommendation 1B).
Part solid			
Low risk†	No routine follow-up	CT at 6-12 months to confirm persistence, then CT at 2-4 years until 1 year	In certain cases, follow-up is not indicated. If growth develops, consider resection. (Recommendations 3B and 4B).
High risk†	No routine follow-up	CT at 3-6 months to confirm persistence. If unchanged and solid component remains <6 mm, annual CT should be performed for 3 years	In patients, part-solid nodules cannot be defined as low-risk <6 mm, and nodules <6 mm do not require follow-up. Persistent part-solid nodules with solid components <6 mm should be considered high-risk nodules (recommendation 2C).
Multiple			
Low risk†	CT at 3-6 months, if stable, consider CT at 2 and 4 years.	CT at 3-6 months. Subsequent management based on the most suspicious nodule(s).	Multiple <6 mm pure ground-glass nodules are usually benign, but annual follow-up is selected patients at high risk at 2 and 4 years (recommendation 5B).

TUMOR PRIMARIO CONOCIDO

<35 AÑOS

INMUNODEPRIMIDOS

FLEISCHNER GUIDELINES

RECOMENDACIONES GENERALES PARA EL SEGUIMIENTO DE NÓDULOS

TC de tórax con reconstrucción sagital y coronal y realizados con cortes finos ($\leq 1,5$ mm) .

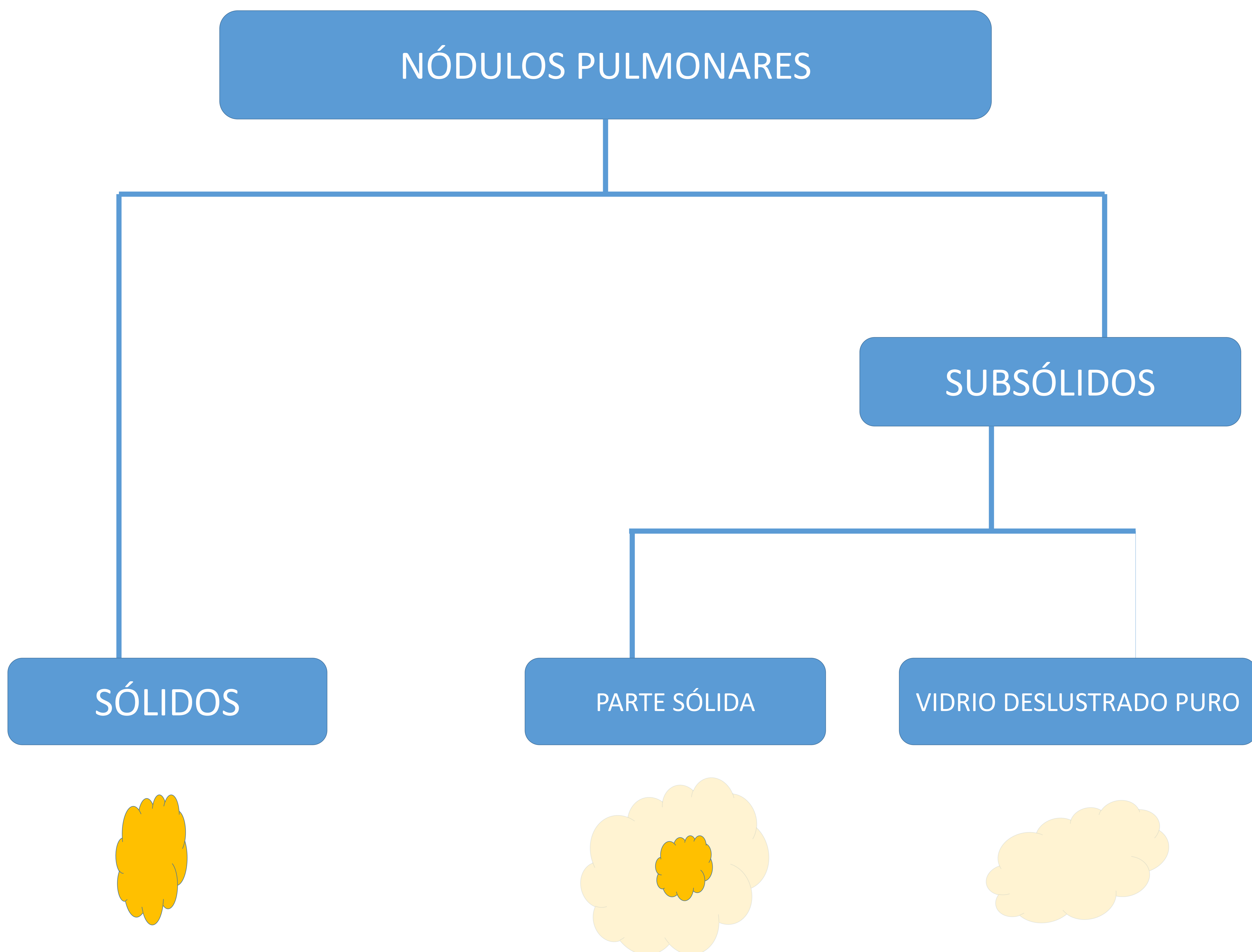
TC de seguimiento \rightarrow baja dosis de radiación.

Revisar estudios previos disponibles para determinar el crecimiento o estabilidad del nódulo.



FLEISCHNER GUIDELINES

RECOMENDACIONES PARA EL SEGUIMIENTO DE NÓDULOS: PRINCIPIOS BÁSICOS





FLEISCHNER GUIDELINES

RECOMENDACIONES GENERALES PARA EL SEGUIMIENTO DE NÓDULOS

Mediciones manuales del tamaño de los nódulos pulmonares: **diámetro promedio.**

SOFTWARE: mediciones volumétricas para evaluar el crecimiento de los nódulos siempre con el mismo software.

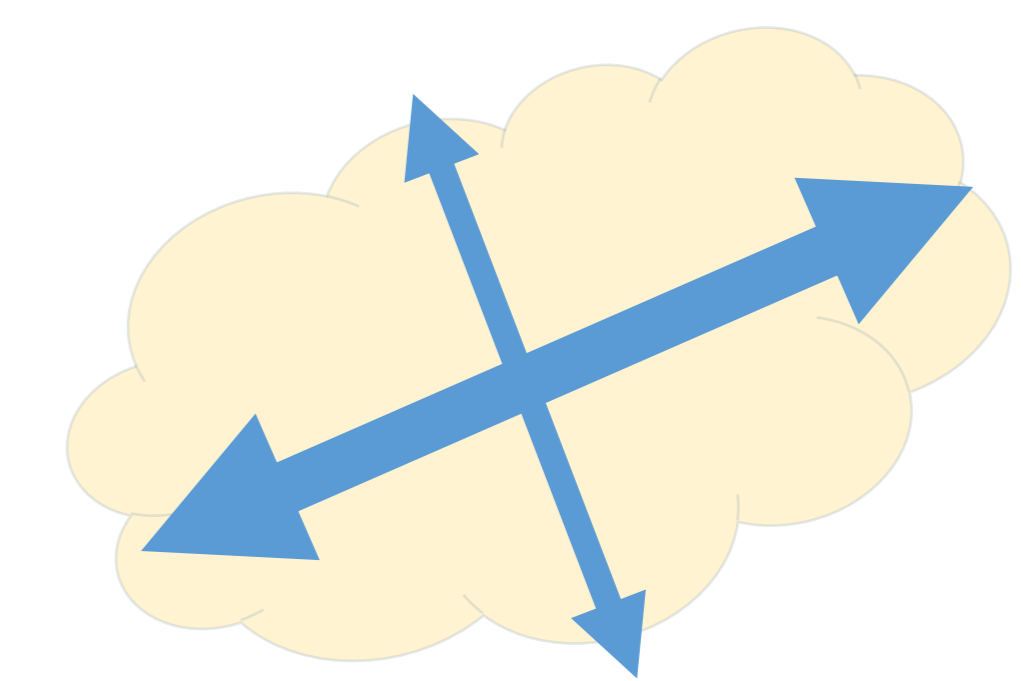
DIÁMETRO PROMEDIO $\rightarrow (A+B) : 2$



SÓLIDOS

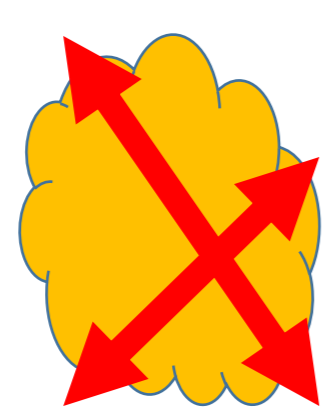
7 X 3 mm \rightarrow 5 mm

SUBSÓLIDOS VIDRIO
DESLUSTRADO PURO

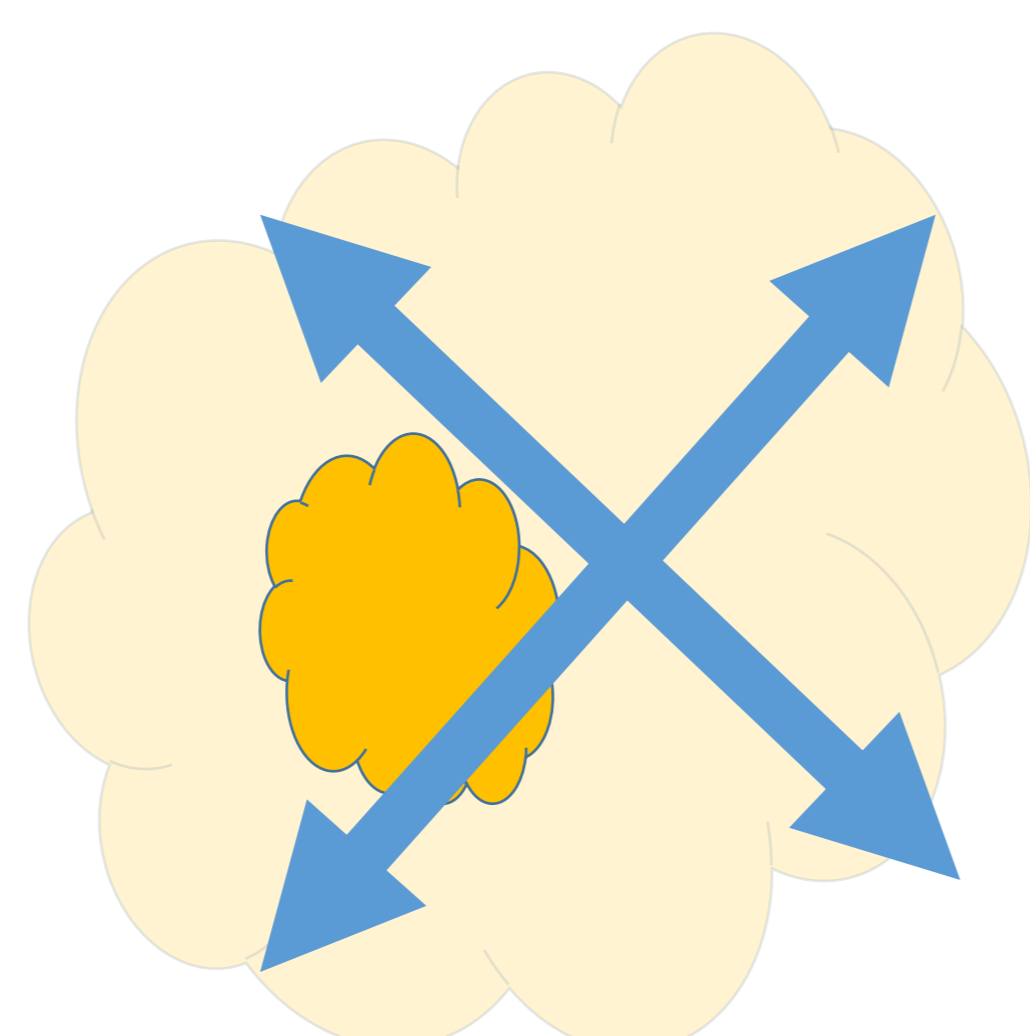


5 X 3 mm \rightarrow 4 mm

SUBSÓLIDOS CON
PARTE SÓLIDA



Parte sólida:
1 x 3 mm \rightarrow 2 mm



Parte subsólida:
7 x 5 mm \rightarrow 6 mm

FLEISCHNER GUIDELINES

MEDICIONES DE NÓDULOS PULMONARES MEDIANTE SOFTWARE



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FLEISCHNER GUIDELINES

MEDICIONES DE NÓDULOS PULMONARES MEDIANTE SOFTWARE

		de índice de cambio Referencia / Actual absoluto (%)	11/03/2021 Actual	23/08/2018 Referencia
Lesión L1 Objetivo Pulmón	RECIST 1-1 (mm)	+2,1 (+15%)	16,7	14,6
	Diámetro ortogonal (mm)	+4,2 (+33%)	15,1	10,9
	WHO (mm ²)	+93,7 (+59%)	252,6	159,0
	Volumen (ml)	+0,780 (+74%)	1,832	1,052
	Tiempo duplic. de vol. (días)	1163		
	Media de HU	+17 (+362%)	22	5
	Desviación estándar de HU	+52 (+86%)	112	60



The Radiology Assistant: Pulmonary nodules, Fleischner 2017 Guidelines.
<http://theradiologyassistant.nl/pulmonary-nodules/fleischner-2017-guidelines>
<http://radiologyassistant.nl/chest/pulmonary-nodules/fleischner-2017-guidelines>

FLEISCHNER GUIDELINES

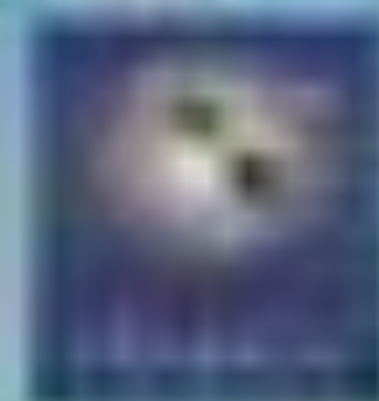
RECOMENDACIONES PARA EL SEGUIMIENTO DE NÓDULOS: PRINCIPIOS BÁSICOS

A: SOLID NODULES			
Nodule Type	Size		
	<6 mm (<100 mm ³)	6-8 mm (100-250 mm ³)	>8 mm (>250 mm ³)
Single			
Low risk [†]	No routine follow-up	CT at 6-12 months, then consider CT at 18-24 months	Consider CT at 6-12 months or tissue sampling
High risk [†]	Optional CT at 12 months	CT at 6-12 months, then CT at 18-24 months	Consider CT at 6-12 months or tissue sampling
Multiple			
Low risk [†]	No routine follow-up	CT at 3-6 months, then consider CT at 18-24 months	CT at 3-6 months, then consider CT at 18-24 months
High risk [†]	Optional CT at 12 months	CT at 3-6 months, then at 18-24 months	CT at 3-6 months, then at 18-24 months

TAMAÑO

ALTO/BAJO RIESGO DE MALIGNIDAD

NÓDULOS ÚNICOS/
NÓDULOS MÚLTIPLES



FLEISCHNER GUIDELINES

RECOMENDACIONES PARA EL SEGUIMIENTO DE NÓDULOS: PRINCIPIOS BÁSICOS

FACTORES DE RIESGO MALIGNIDAD NÓDULOS PULMONARES

- Antecedentes tabáquicos
- Exposición asbesto, radón o uranio
- Antecedentes familiares de cáncer de pulmón
- Edad avanzada
- Sexo femenino
- Raza negra/ nativos Hawaianos
- Nódulo con espiculación marginal
- Nódulo localizado en lóbulos superiores
- Nódulos múltiples (<5 nódulos incrementa el riesgo de malignidad).
- Enfisema o fibrosis pulmonar (sobre todo FPI)



FLEISCHNER GUIDELINES

RECOMENDACIONES PARA EL SEGUIMIENTO NÓDULOS

Fleischner Society 2017 Guidelines for Management of Incidentally Detected Pulmonary Nodules in Adults

A. Solid Nodules*

Nodule Type	Size			Comments
	≤5 mm (<100 mm ³)	6-8 mm (100-250 mm ³)	>8 mm (>250 mm ³)	
Single				
Low risk [†]	No routine follow-up	CT at 6-12 months, then consider CT at 18-24 months	Consider CT at 3 months, PET/CT, or tissue sampling	Nodules ≤5 mm do not require routine follow-up in low-risk patients (recommendation 1A).
High risk [†]	Optional CT at 12 months	CT at 6-12 months, then CT at 18-24 months	Consider CT at 3 months, PET/CT, or tissue sampling	Certain patients at high risk with suspicious nodule morphology, upper lobe location, or both may warrant 12-month follow-up (recommendation 1A).
Multiple				
Low risk [†]	No routine follow-up	CT at 3-6 months, then consider CT at 18-24 months	CT at 3-6 months, then consider CT at 18-24 months	Use most suspicious nodule as guide to management. Follow-up intervals may vary according to size and risk (recommendation 2A).
High risk [†]	Optional CT at 12 months	CT at 3-6 months, then at 18-24 months	CT at 3-6 months, then at 18-24 months	Use most suspicious nodule as guide to management. Follow-up intervals may vary according to size and risk (recommendation 2A).

B. Subsolid Nodules*

Nodule Type	Size		Comments
	≤5 mm (<100 mm ³)	>5 mm (>100 mm ³)	
Single			
Ground glass	No routine follow-up	CT at 6-12 months to confirm persistence, then CT every 2 years until 5 years	In certain suspicious nodules < 5 mm, consider follow-up at 2 and 4 years. If solid components or growth develops, consider resection. (Recommendations 3A and 4A)
Part solid	No routine follow-up	CT at 3-6 months to confirm persistence. If unchanged and solid component remains, ≤5 mm, annual CT should be performed for 5 years.	In practice, part-solid nodules cannot be defined as such until ≥5 mm, and nodules <5 mm do not usually require follow-up. Persistent part-solid nodules with solid components, ≥5 mm should be considered highly suspicious (recommendations 4B-4C).
Multiple	CT at 3-6 months. If stable, consider CT at 2 and 4 years.	CT at 3-6 months. Subsequent management based on the most suspicious nodule(s).	Multiple <5 mm pure ground-glass nodules are usually benign, but consider follow-up in selected patients at high risk at 2 and 4 years (recommendation 5A).



FLEISCHNER GUIDELINES

RECOMENDACIONES PARA EL SEGUIMIENTO: NÓDULOS SÓLIDOS

GRADO DE EVIDENCIA:
IA

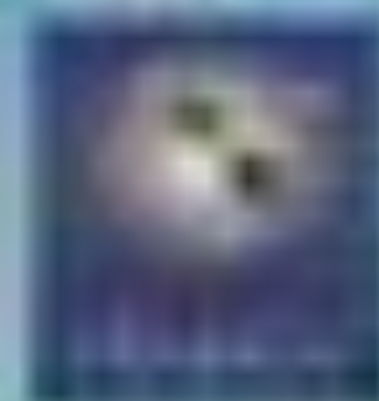
Nodule Type	<6 mm (<100 mm ³)
Single	
Low risk [†]	No routine follow-up
High risk [†]	Optional CT at 12 months
Multiple	
Low risk [†]	No routine follow-up
High risk [†]	Optional CT at 12 months



FLEISCHNER GUIDELINES

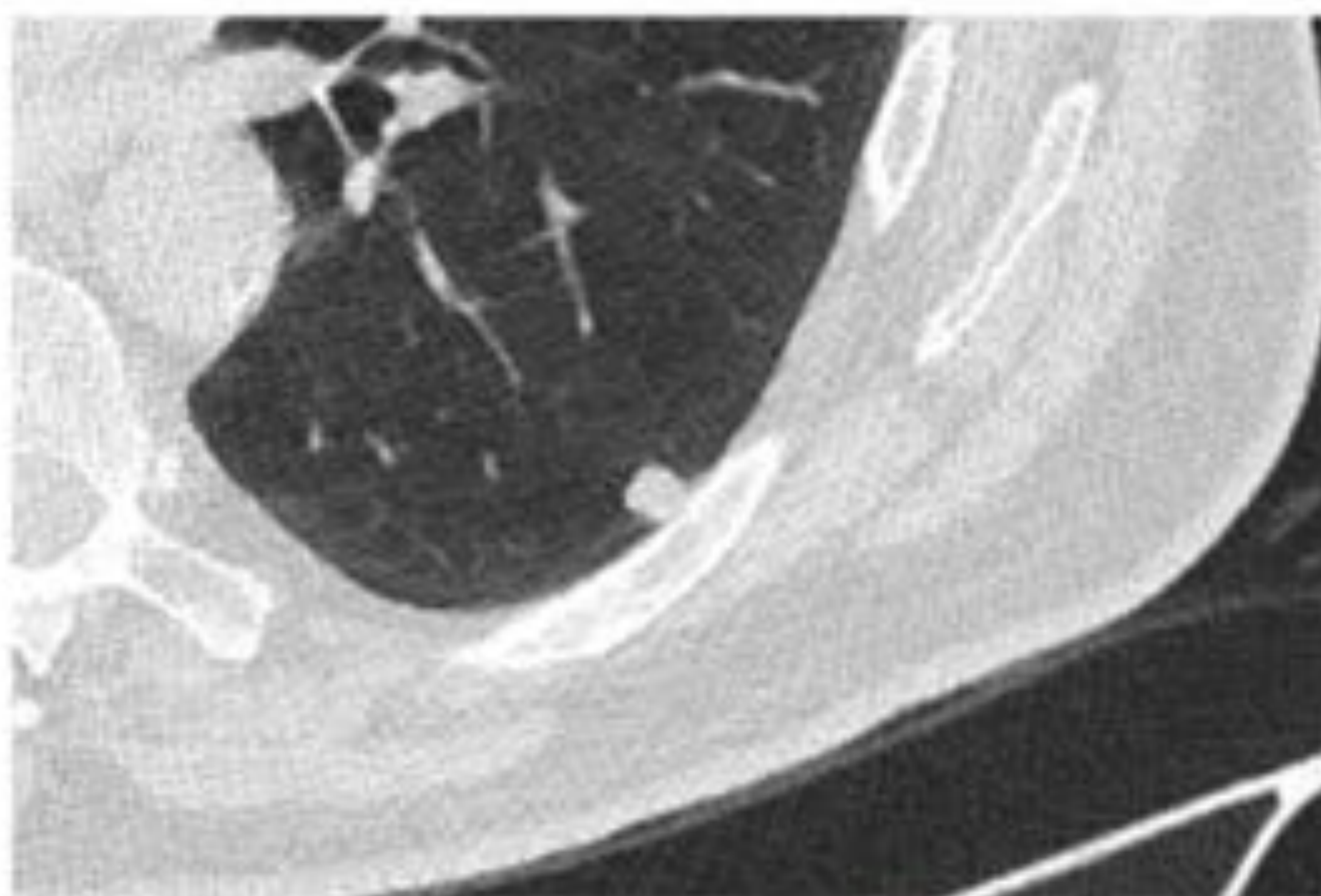
RECOMENDACIONES PARA EL SEGUIMIENTO: NÓDULOS SÓLIDOS

Nodule Type	6-8 mm (100-250 mm ³)	
Single		
Low risk [†]	CT at 6-12 months, then consider CT at 18-24 months	C
High risk [†]	CT at 6-12 months, then CT at 18-24 months	C
Multiple		
Low risk [†]	CT at 3-6 months, then consider CT at 18-24 months	C
High risk [†]	CT at 3-6 months, then at 18-24 months	C



FLEISCHNER GUIDELINES

CASO 1



VARÓN 73 AÑOS

FUMADOR 25/PAQUETES AÑO

AF: CÁNCER DE PULMÓN

ALTO RIESGO MALIGNIDAD

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NÓDULO PULMONAR DE 7 mm (diámetro promedio) en Ll.



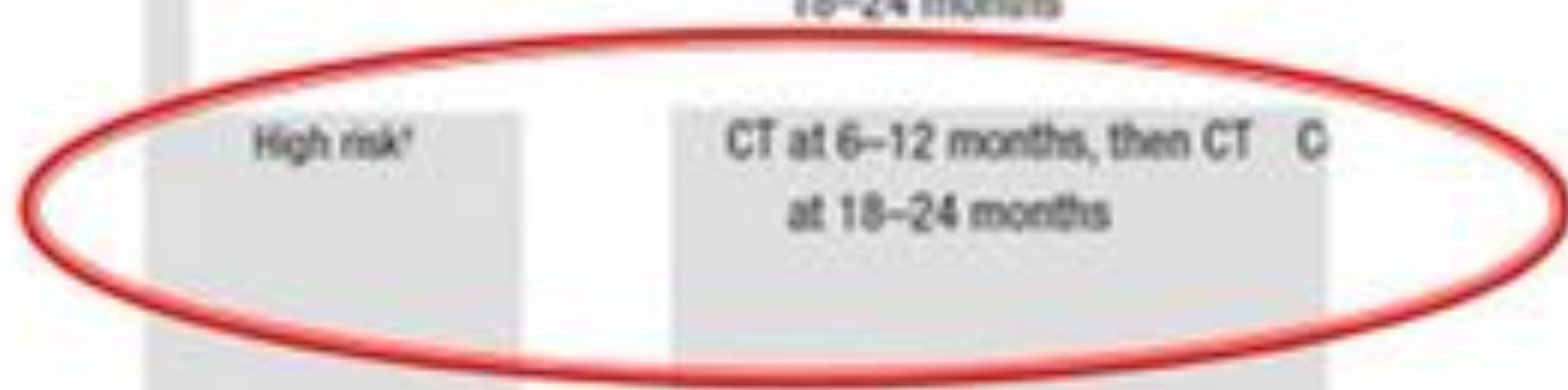
FLEISCHNER GUIDELINES

CASO 1

NÓDULO PULMONAR DE 7 mm (diámetro promedio) en LII.

ALTO RIESGO MALIGNIDAD

Nodule Type	6-8 mm (100-250 mm ³)
Single	
Low risk [†]	CT at 6-12 months, then consider CT at 18-24 months
High risk [†]	CT at 6-12 months, then CT at 18-24 months
Multiple	
Low risk [†]	CT at 3-6 months, then consider CT at 18-24 months
High risk [†]	CT at 3-6 months, then at 18-24 months



FLEISCHNER GUIDELINES

TC INICIAL

Nódulo LI
7 mm

CASO 1

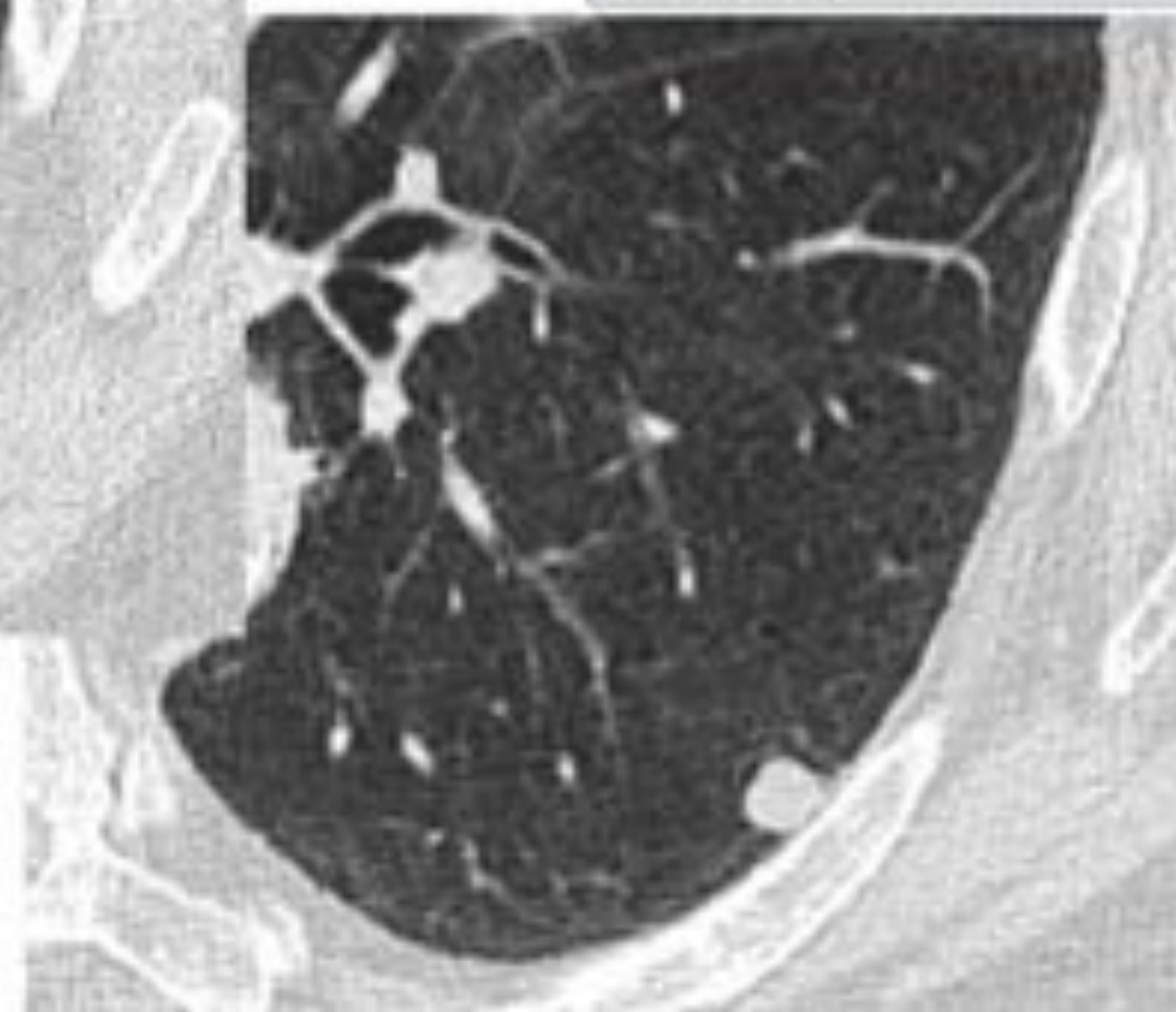
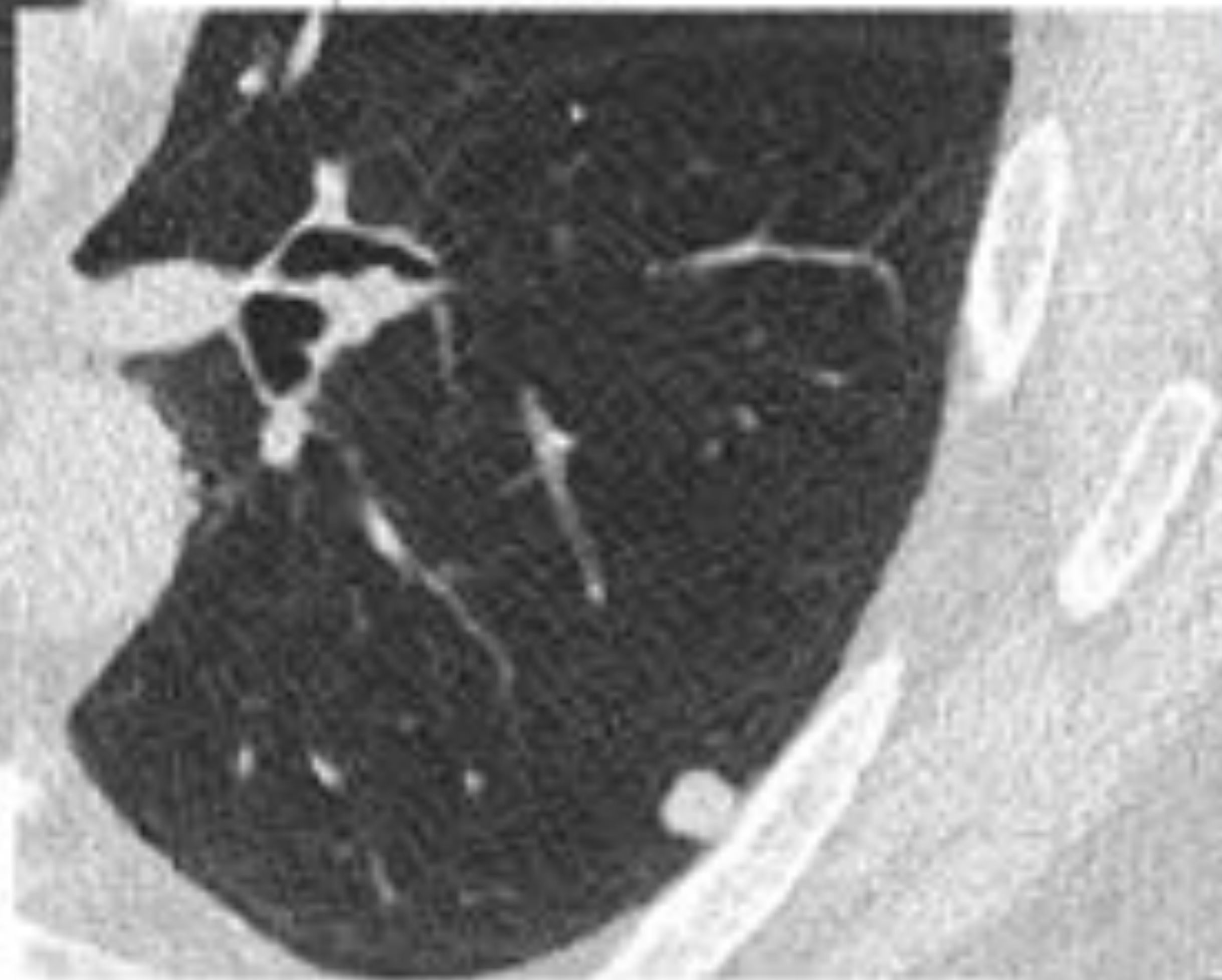
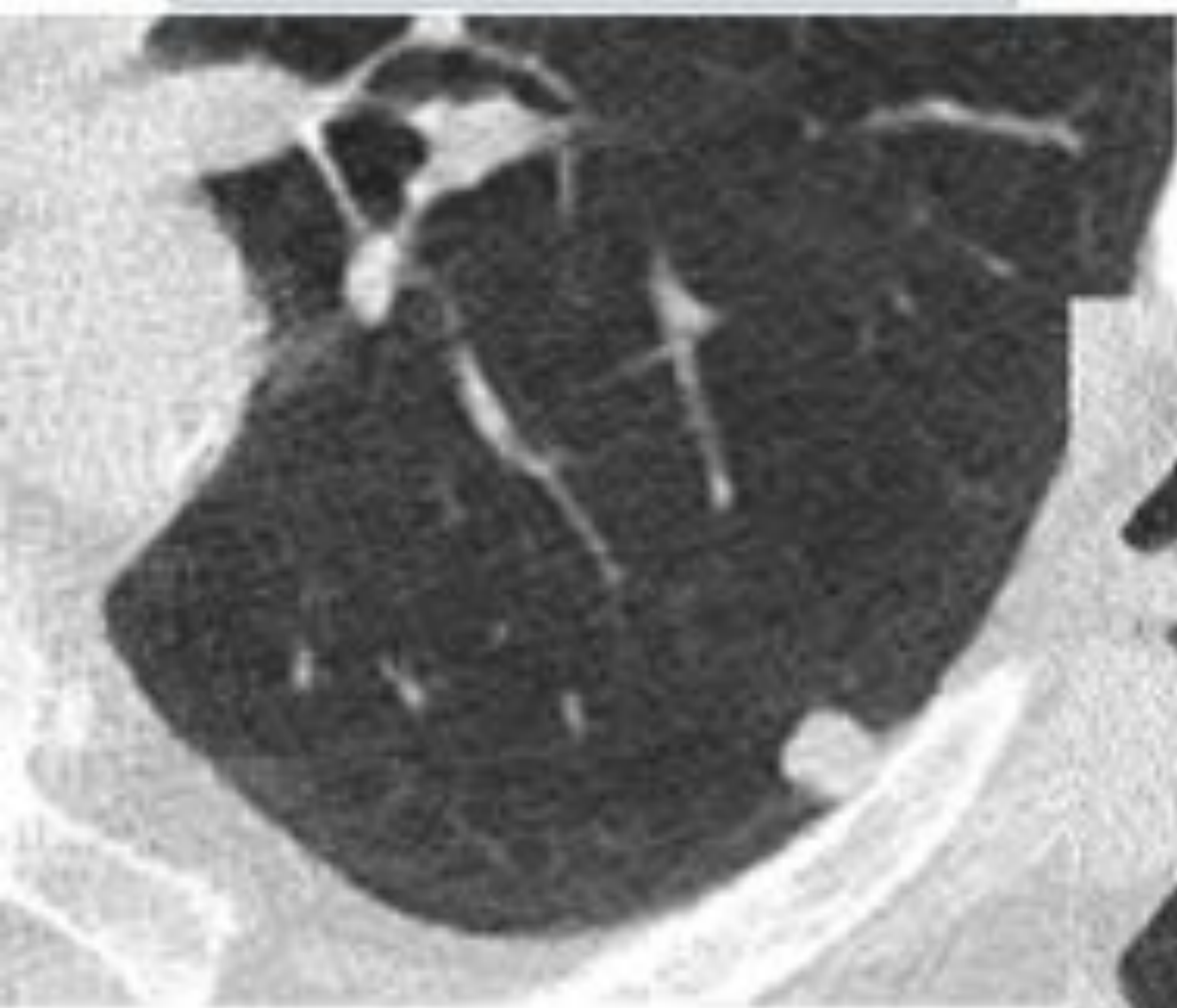
6 MESES

Nódulo LI
7 mm

**ESTABILIDAD
NO REQUIERE
SEGUIMIENTO**

18 MESES

Nódulo LI
7 mm



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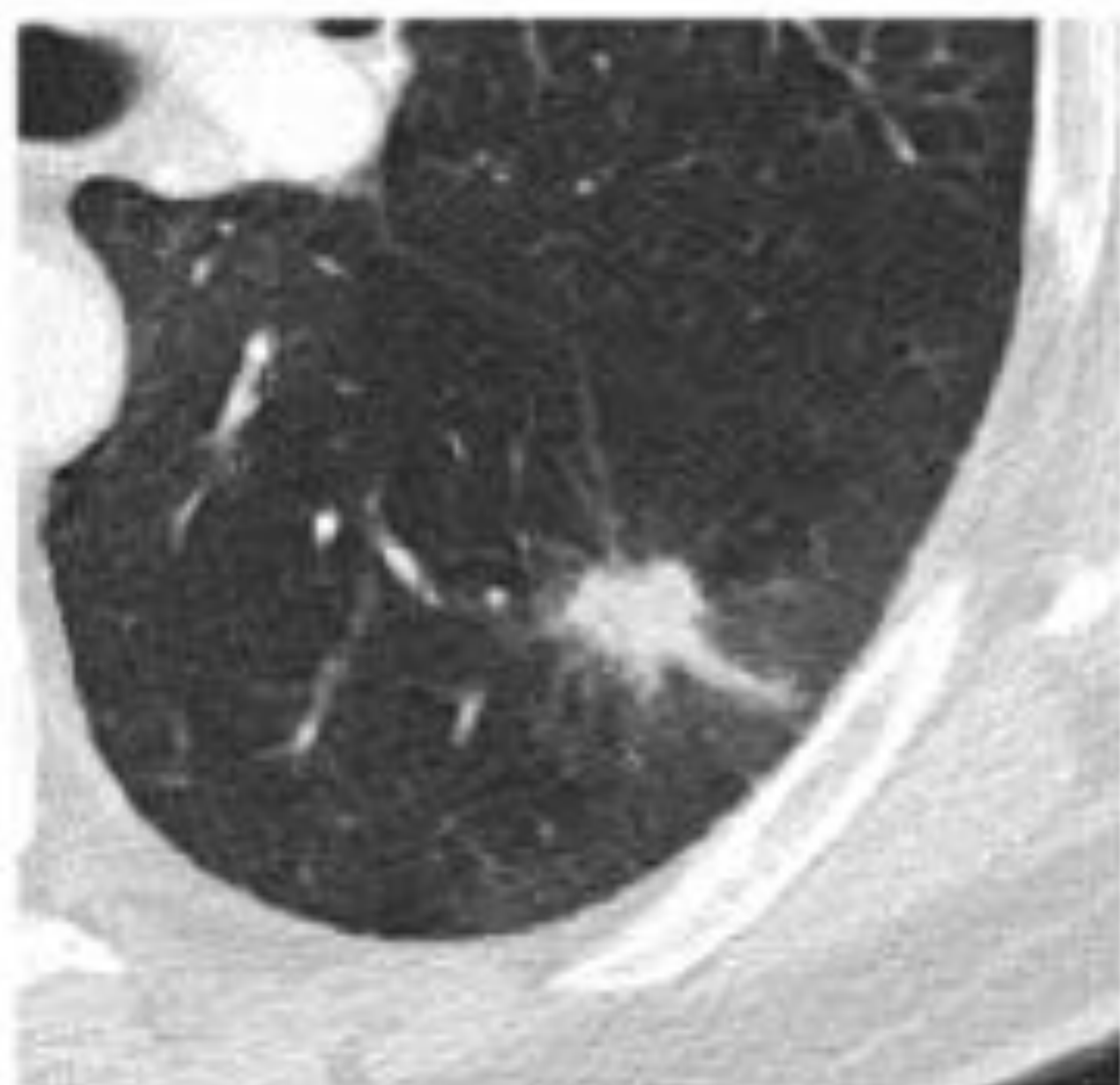
FLEISCHNER GUIDELINES

RECOMENDACIONES PARA EL SEGUIMIENTO: NÓDULOS SÓLIDOS

Nodule Type		>8 mm (>250 mm ³)
Single		
Low risk [†]	REDACTED	Consider CT at 3 months, PET/CT, or tissue sampling
High risk [†]		Consider CT at 3 months, PET/CT, or tissue sampling
Multiple		
Low risk [†]		CT at 3-6 months, then consider CT at 18-24 months
High risk [†]	CT at 3-6 months, then at 18-24 months	

FLEISCHNER GUIDELINES

CASO 2



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Varón 72 años

Fumador

Enfisema

ALTO RIESGO
MALIGNIDAD



NÓDULO PULMONAR **ESPICULADO** DE 10,5 mm
(diámetro promedio) en LII.

FLEISCHNER GUIDELINES

CASO 2

NÓDULO PULMONAR DE 10,5mm (diámetro promedio) en LI.

ALTO RIESGO MALIGNIDAD

Nodule Type	>8 mm (>250 mm ³)
Single	
Low risk [†]	Consider CT at 3 months, PET/CT, or tissue sampling
High risk [†]	Consider CT at 3 months, PET/CT, or tissue sampling
Multiple	
Low risk [†]	CT at 3-6 months, then consider CT at 18-24 months
High risk [†]	CT at 3-6 months, then at 18-24 months

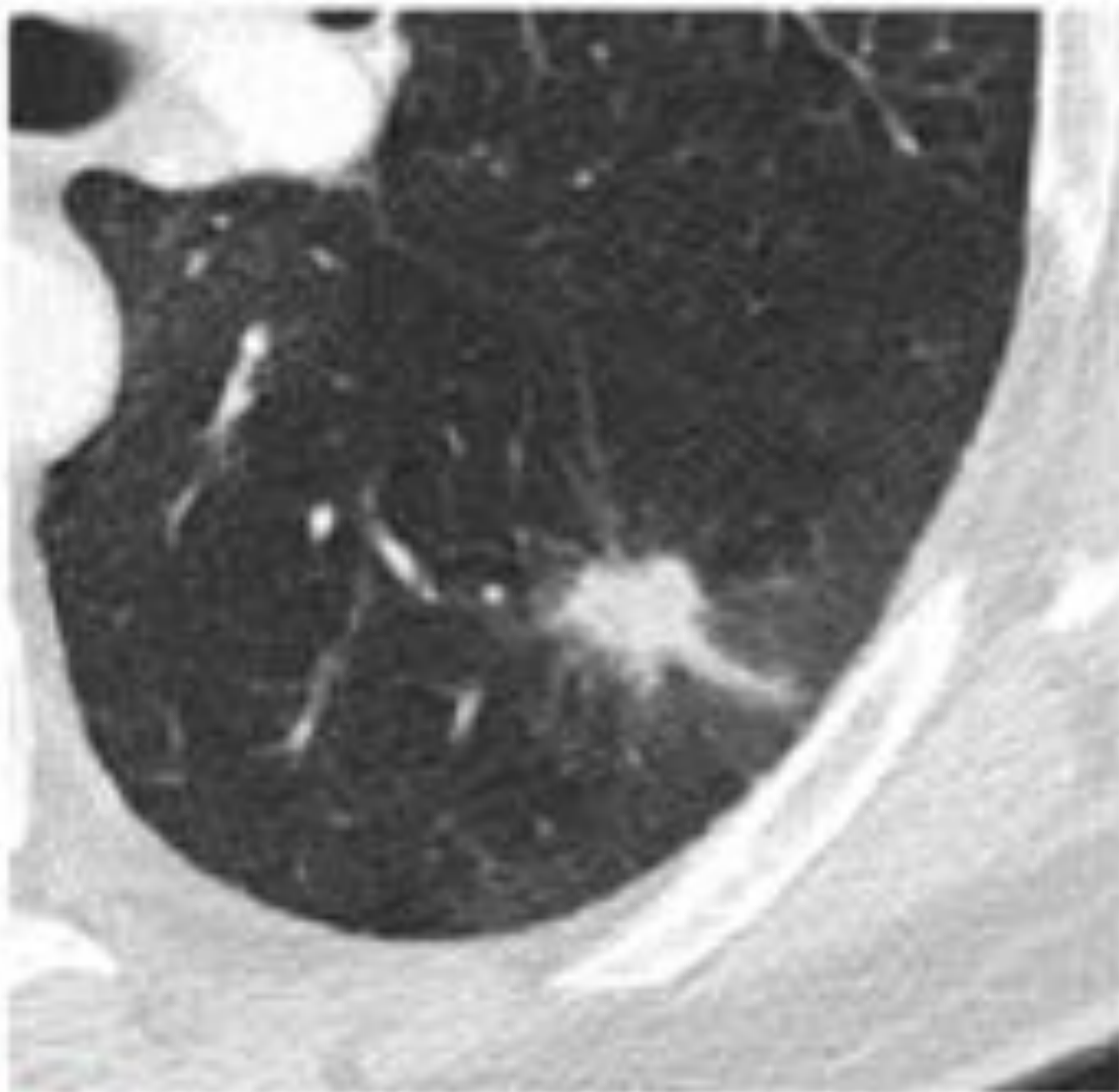


FLEISCHNER GUIDELINES

CASO 2

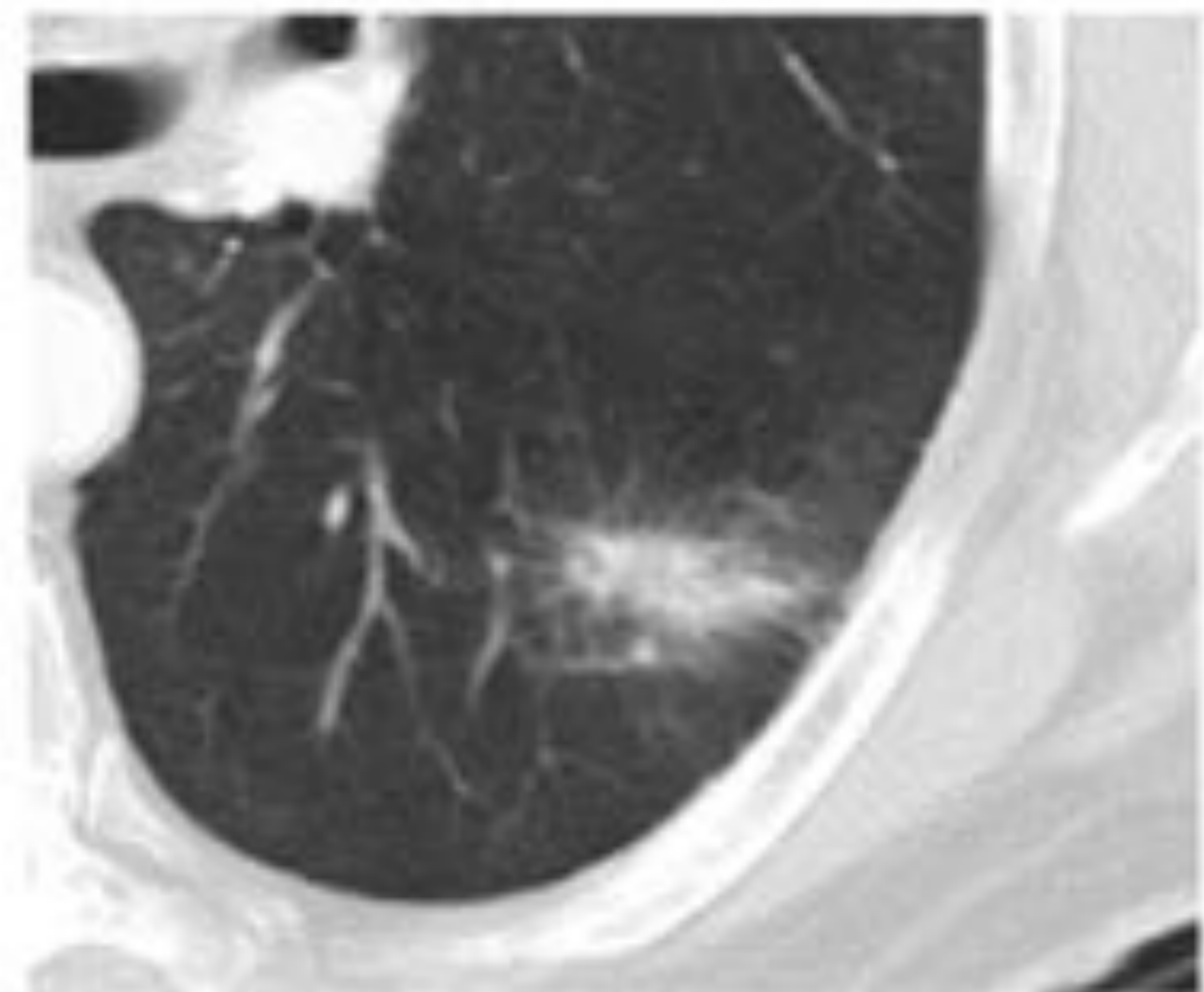
TC INICIAL

Nódulo LI
10,5 mm



3 MESES

Nódulo LI
20,2 mm



CRECIMIENTO

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FLEISCHNER GUIDELINES

RECOMENDACIONES DE SEGUIMIENTO: NÓDULOS SUBSÓLIDOS

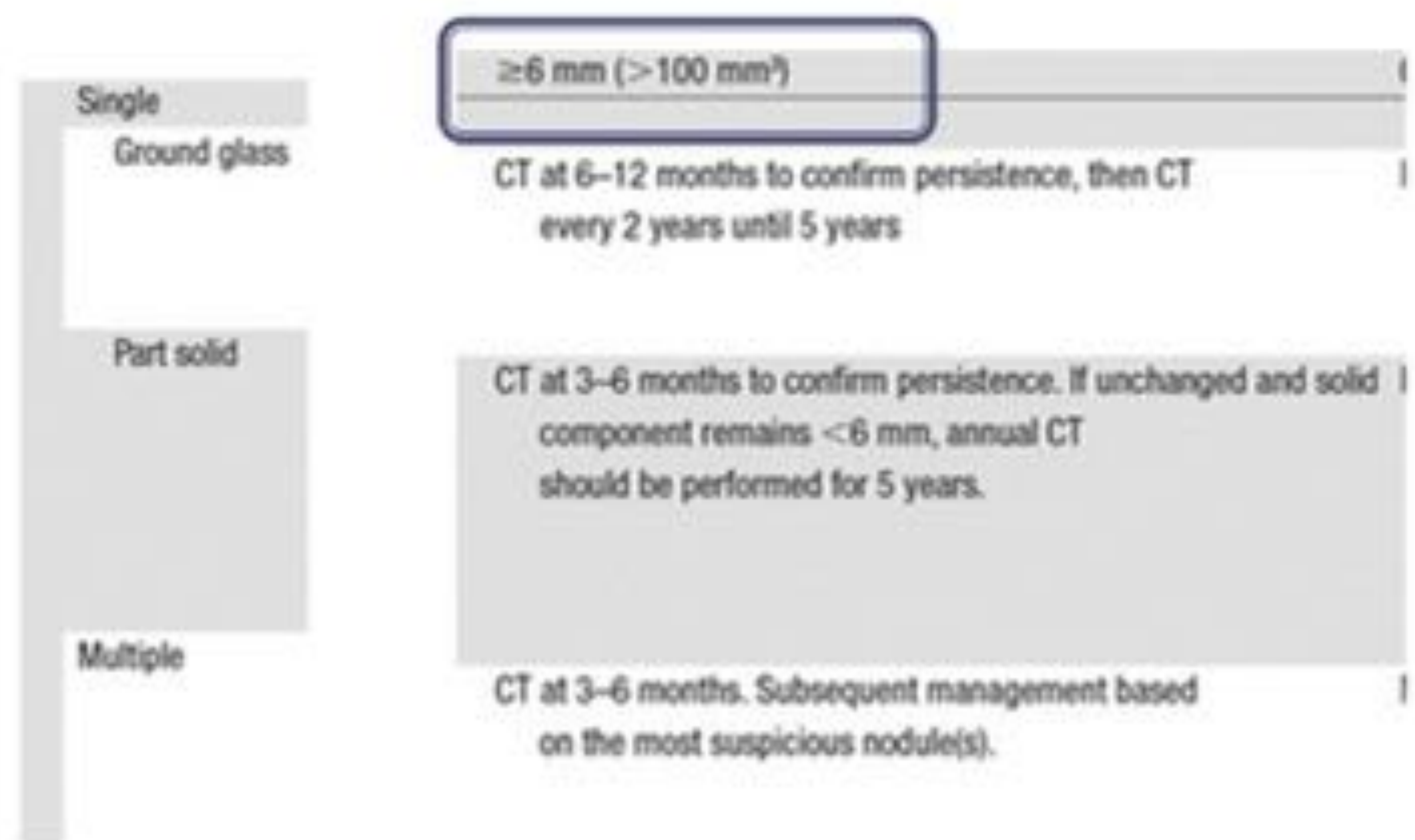
**GRADO DE EVIDENCIA:
IB**

Nodule Type	<6 mm (<100 mm ³)
Single	
Ground glass	No routine follow-up
Part solid	No routine follow-up
Multiple	CT at 3-6 months. If stable, consider CT at 2 and 4 years.



FLEISCHNER GUIDELINES

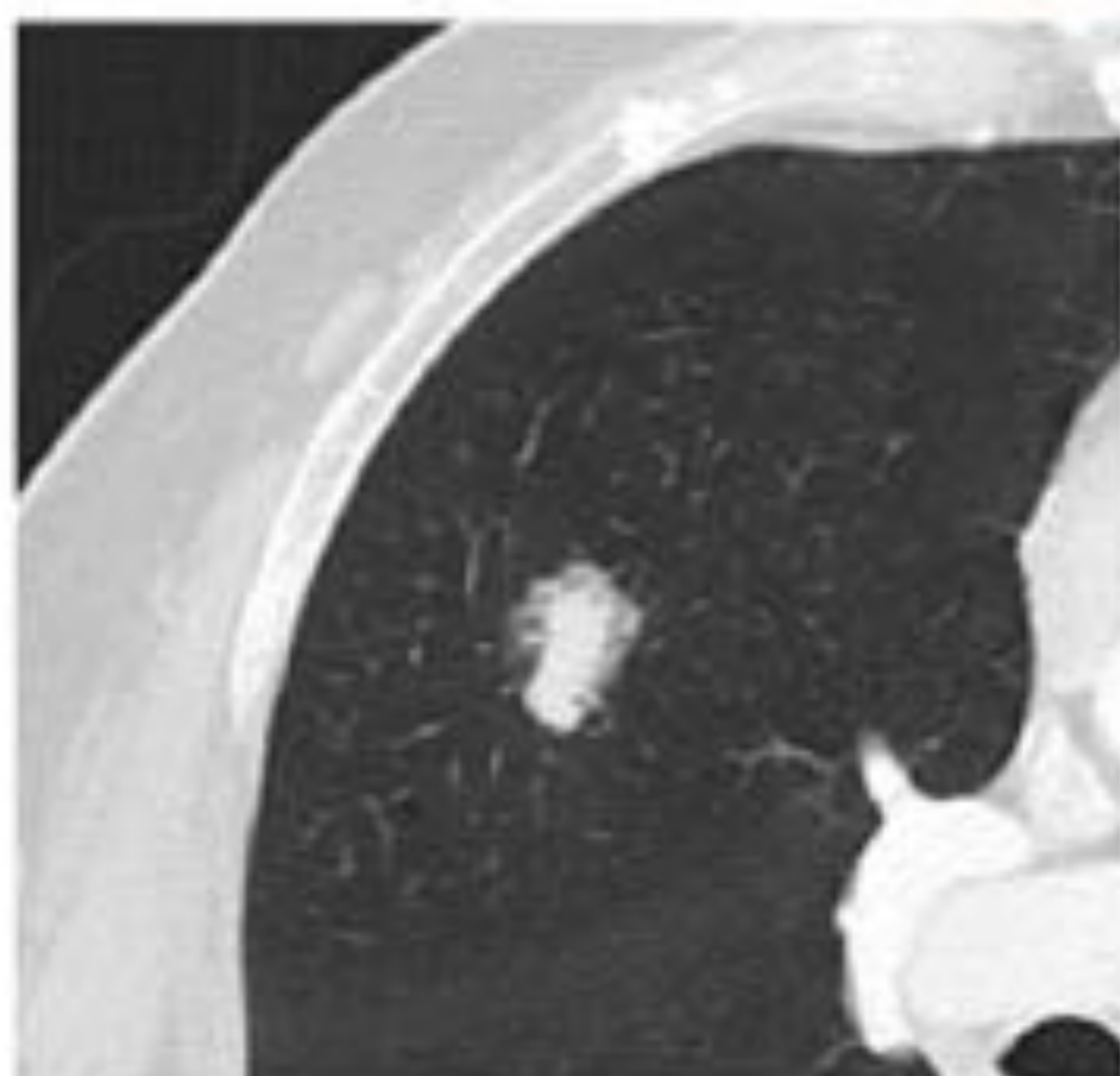
RECOMENDACIONES DE SEGUIMIENTO: NÓDULOS SUBSÓLIDOS





FLEISCHNER GUIDELINES

CASO 3



Varón **65 años**

No fumador

Artritis reumatoide

**BAJO RIESGO DE
MALIGNIDAD**

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de León (CAULE)



**NÓDULO PULMONAR SUBSÓLIDO DE 20 mm
(diámetro promedio) en LM.**

FLEISCHNER GUIDELINES

CASO 3

NÓDULO PULMONAR SUBSÓLIDO DE 20mm (diámetro promedio) en LII.

BAJO RIESGO MALIGNIDAD

	≥ 6 mm (> 100 mm ³)
Single Ground glass	CT at 6–12 months to confirm persistence, then CT every 2 years until 5 years
Part solid	CT at 3–6 months to confirm persistence. If unchanged and solid component remains < 6 mm, annual CT should be performed for 5 years.
Multiple	CT at 3–6 months. Subsequent management based on the most suspicious nodule(s).

FLEISCHNER GUIDELINES

CASO 3

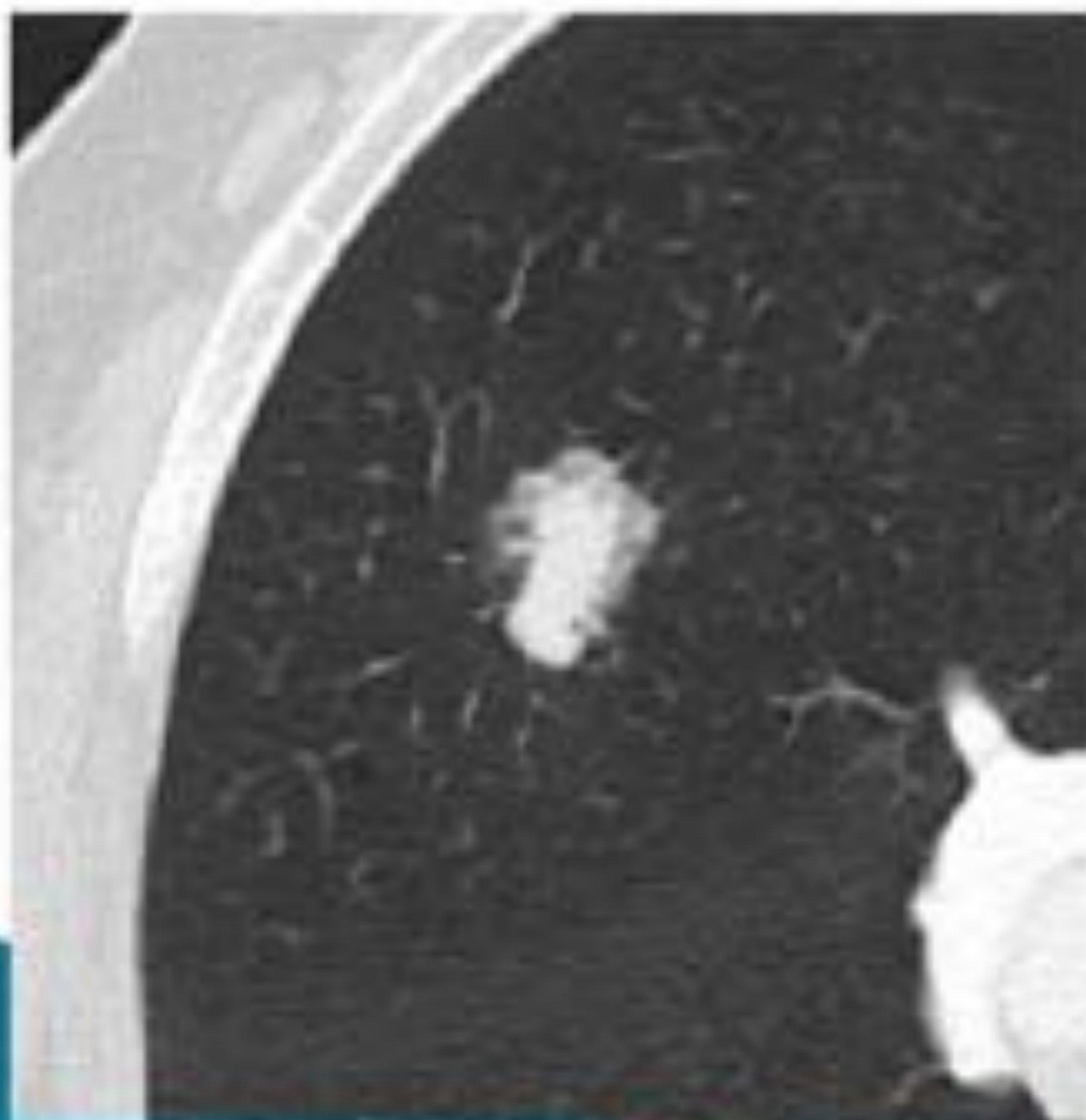
TC INICIAL

Nódulo LM
20 mm

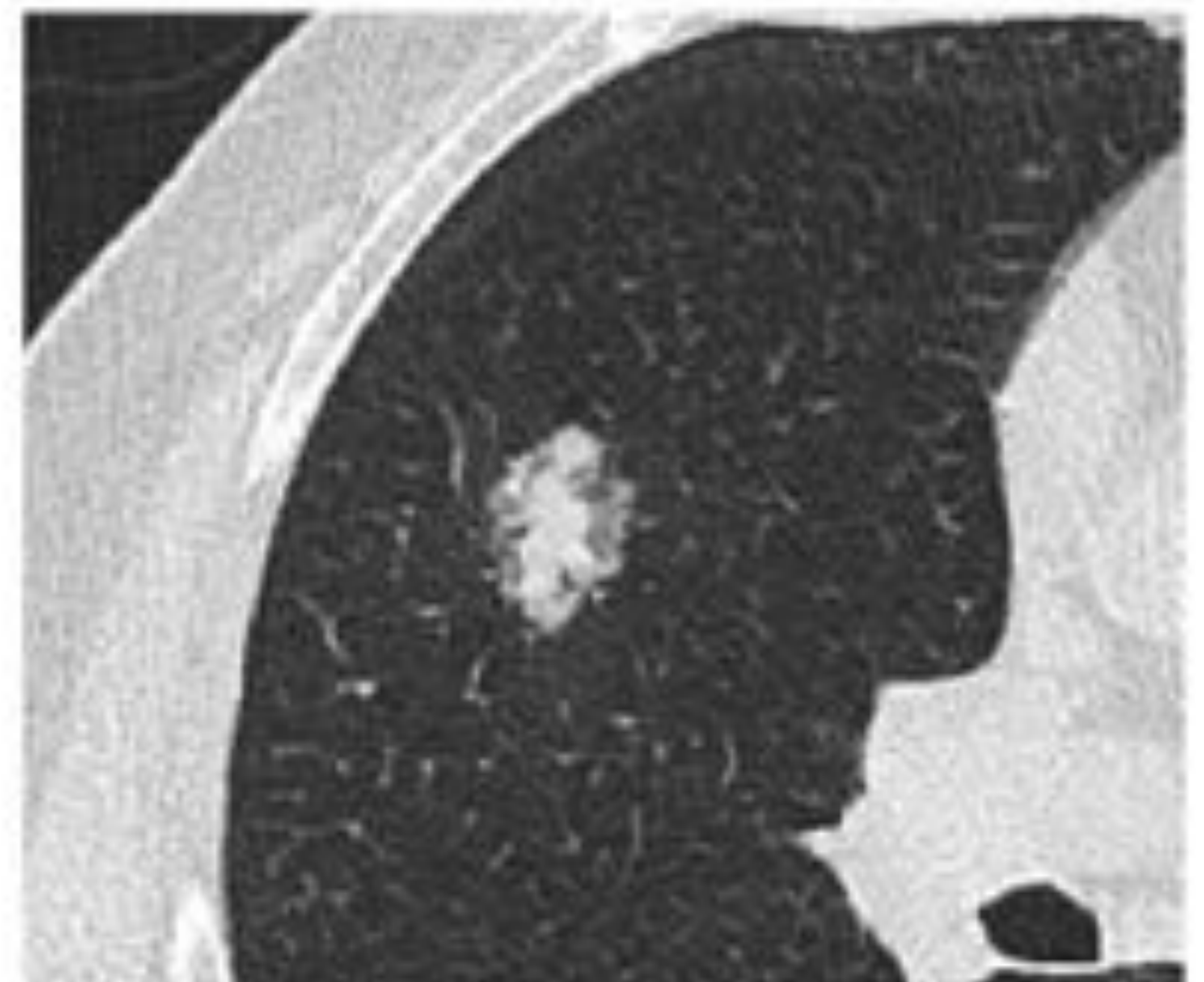
CRECIMIENTO

3 MESES

Nódulo LM
25 mm



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FLEISCHNER GUIDELINES

CONSIDERACIONES ADICIONALES: NÓDULOS PERICISURALES

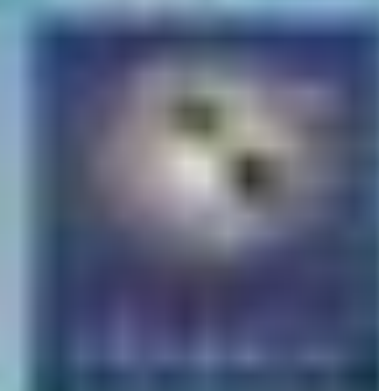
- TÍPICOS :Morfología poligonal o triangular. <15 mm pleura.

NO SE RECOMIENDA EL SEGUIMIENTO (incluso si tiene diámetros mayores a 6 mm)

FLEISCHNER GUIDELINES

CONSIDERACIONES ADICIONALES:
NÓDULOS DETECTADOS EN TC NO TORÁCICOS





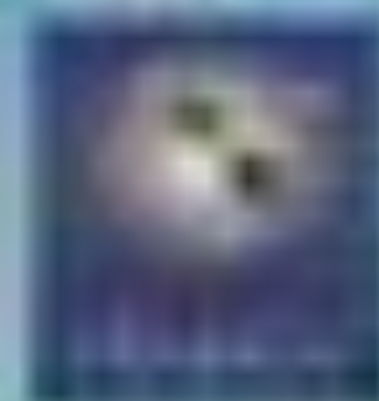
CONCLUSIONES

- Nódulos pulmonares hallazgo frecuente en TC de tórax.
- Radiólogos → decisiones y recomendaciones basadas en guías de manejo de nódulos pulmonares.
- Fleishner Society → Guía manejo de nódulos pulmonares.
- Criterios benignidad/malignidad nódulos pulmonares.



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- ▶ **Academical medical centre. Fleischner Society 2017 [internet]. Radiology Assistant. [Consultado 6. Dic 2020]. Disponible en:**
<https://radiologyassistant.nl/chest/plumonary-nodules/fleischner-2017-guideline>