A Beneficência
Portuguesa
de São Paulo

Programa *Team Up* da Oncologia BP



Parceria: AstraZeneca

Avaliação por Imagem do Nódulo Pulmonar

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Médico Radiologista

BP – a Beneficência Portuguesa de São Paulo

*Material preparado por Pablo Rydz Santana

Objetivos

1. Abordagem do nódulo pulmonar
2. Características sugestivas de benignidade
3. Protocolos de seguimento
4. Métodos alternativos

Artigo Especial

Consenso brasileiro ilustrado sobre a terminologia dos descritores e padrões fundamentais da TC de tórax*

Illustrated Brazilian consensus of terms and fundamental patterns in chest CT scans

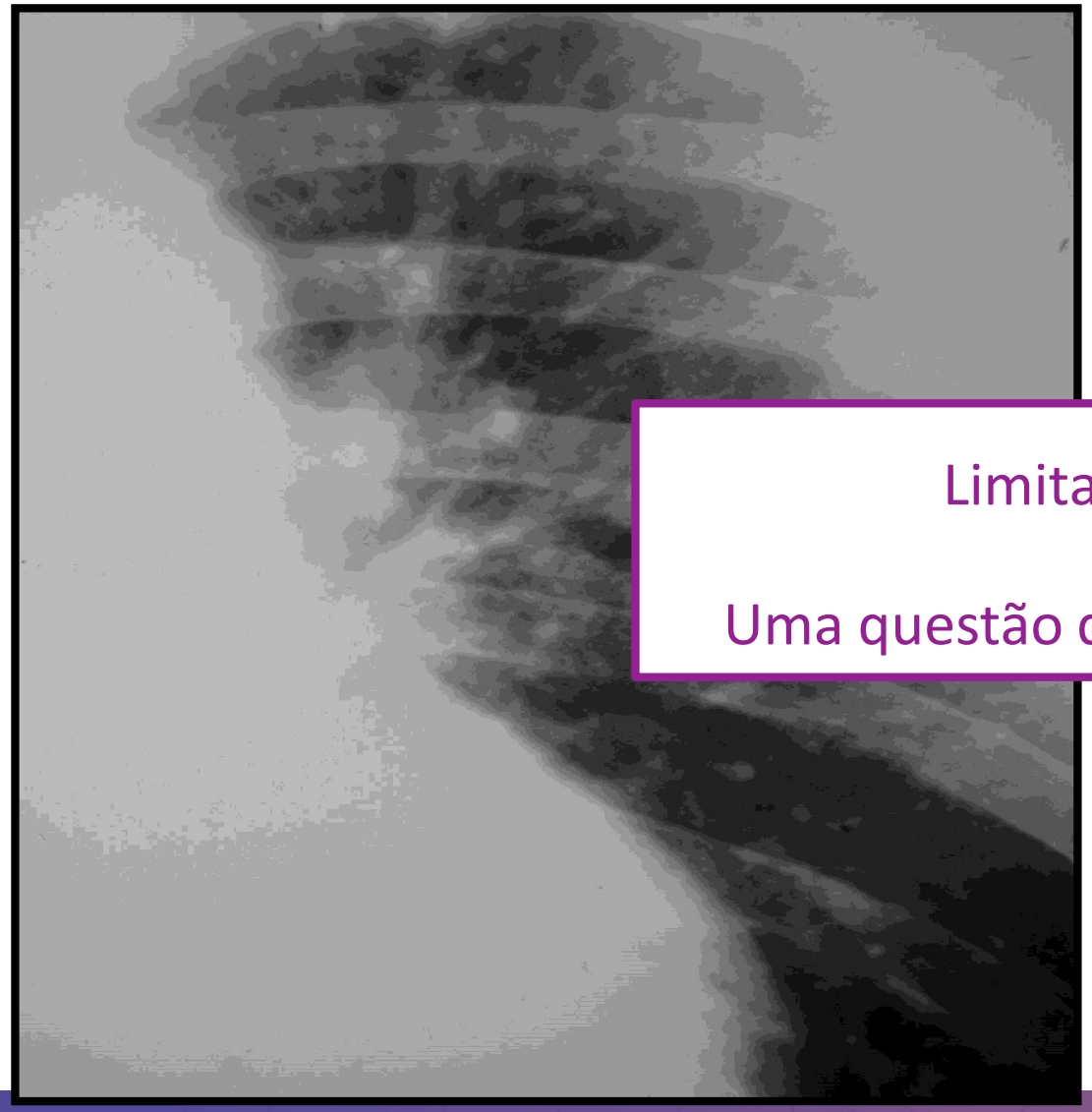
C. Isabela S. Silva, Edson Marchiori, Arthur Soares Souza Júnior, Nestor L. Müller, Comissão de Imagem da Sociedade Brasileira de Pneumologia e Tisiologia

Nódulo

Opacidade focal arredondada, ou pelo menos parcialmente delimitada, menor que 3,0 cm de diâmetro, geralmente com densidade de partes moles ou de cálcio

J Bras Pneumol. 2010;36(1):99-123

RX Convencional





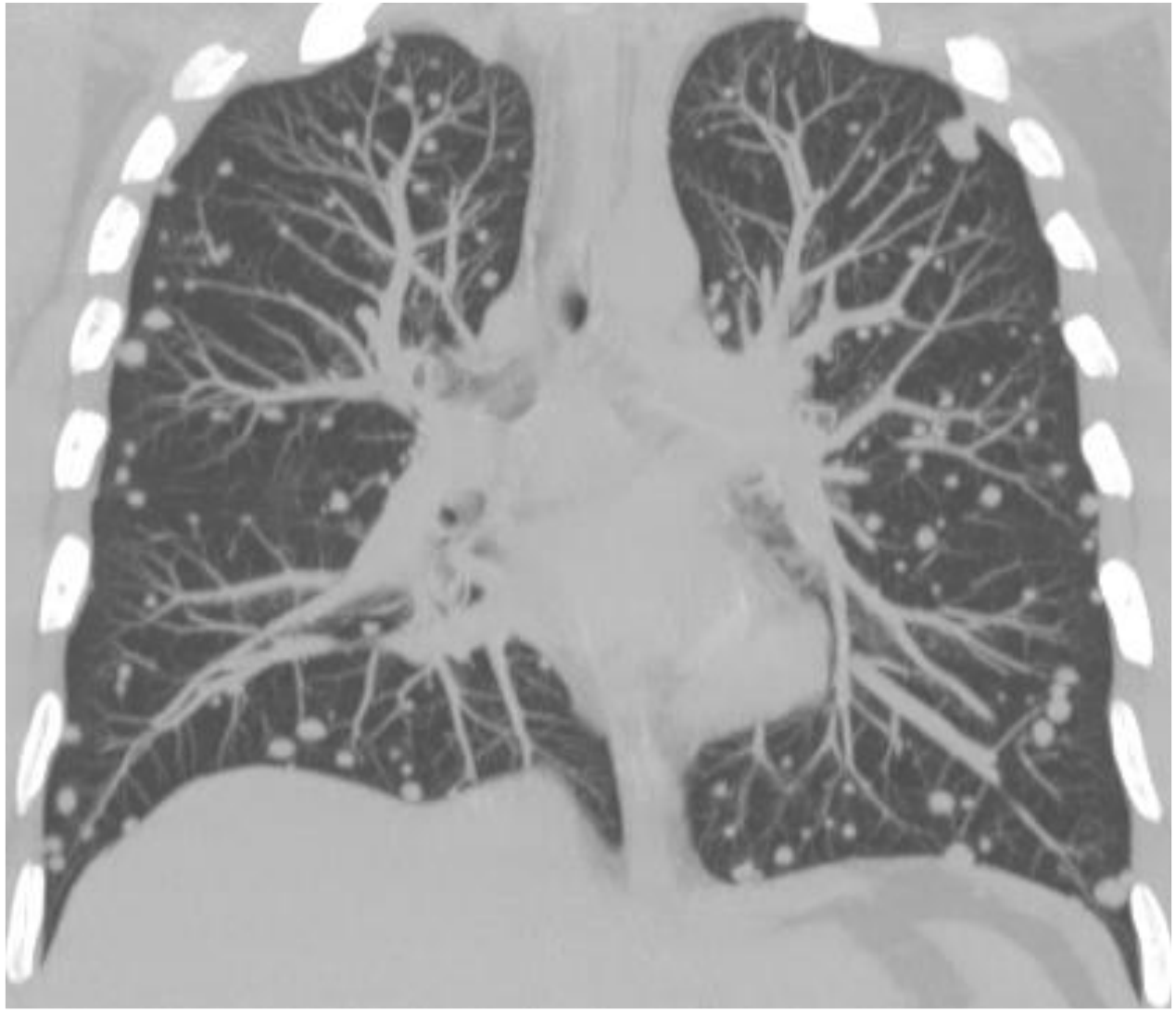
Limitação do método

Uma questão de dimensões e situação

Tomografia Computadorizada

- Detecção de nódulos
- Rastreamento por TC de baixa dose
- Projeção de intensidade máxima (MIP) na TCMD: maior sensibilidade

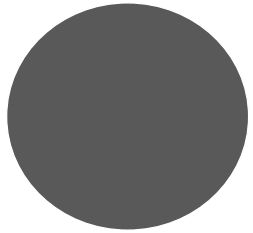
Tomografia Computadorizada (MIP)



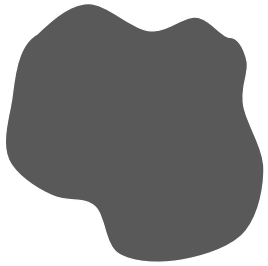
Qual é o desafio?

BENIGNOS x MALIGNOS

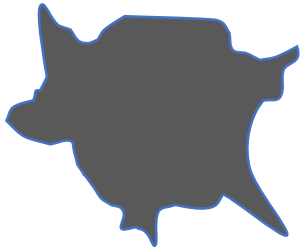
Contornos



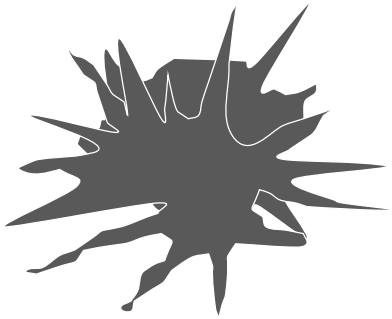
LISOS



LOBULADOS

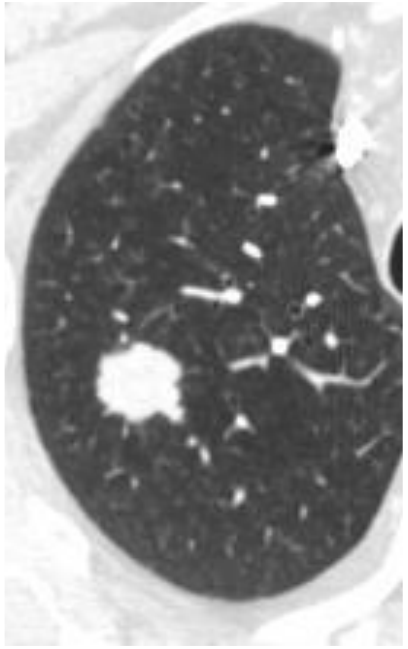


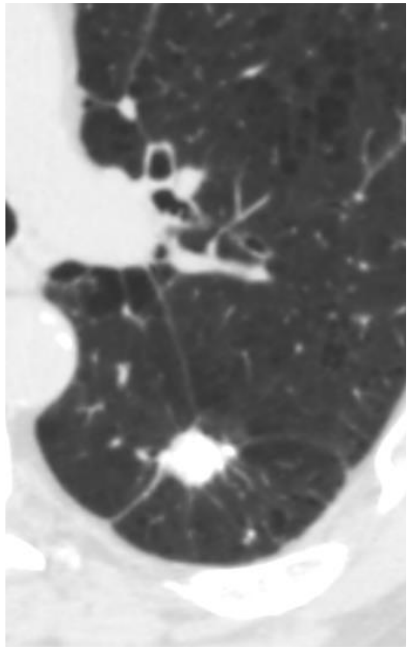
IRREGULARES

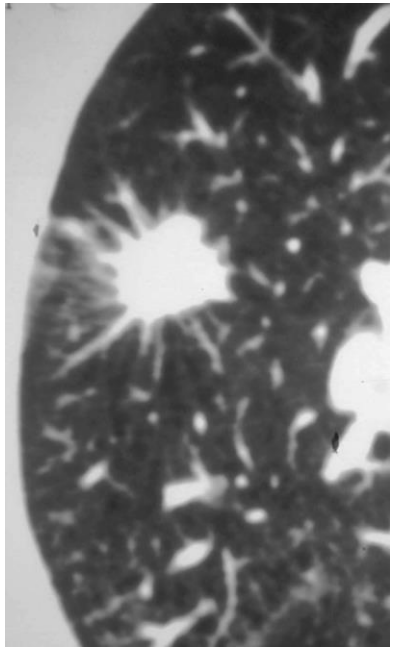


ESPICULADOS





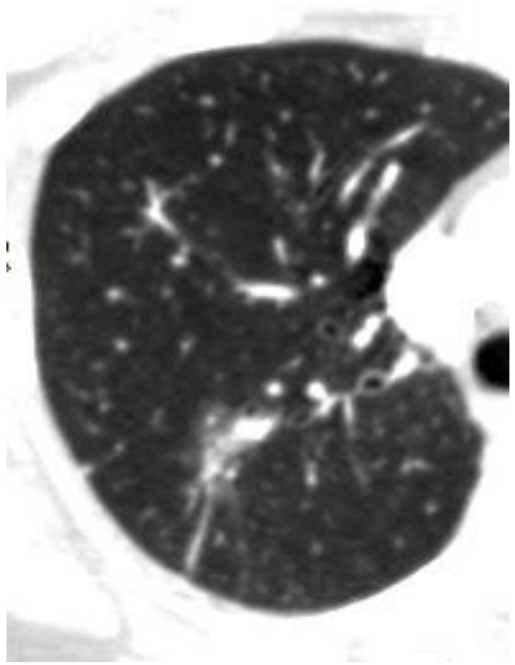


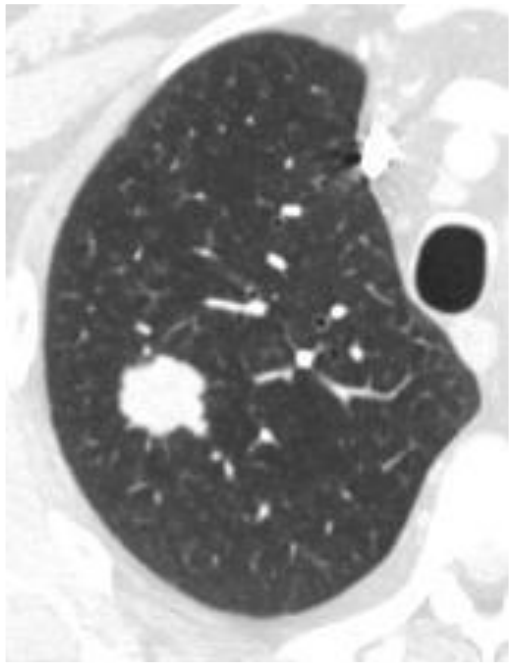


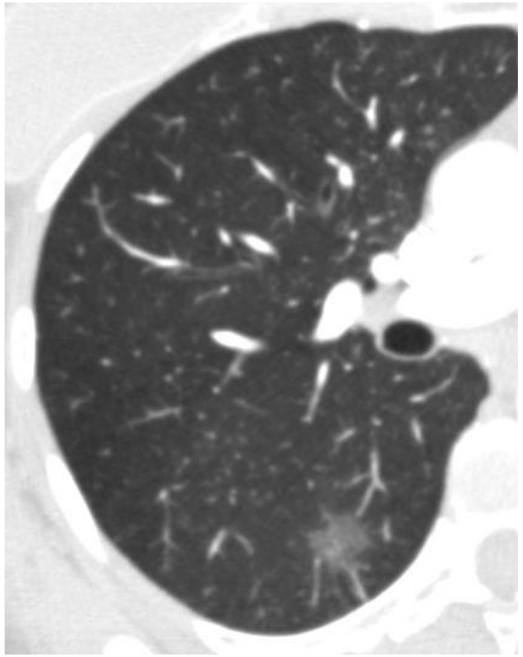
Densidade

- Sólidos
- Subsólidos: semissólidos e puramente vidro fosco (não sólidos)

Densidade: Risco de Malignidade







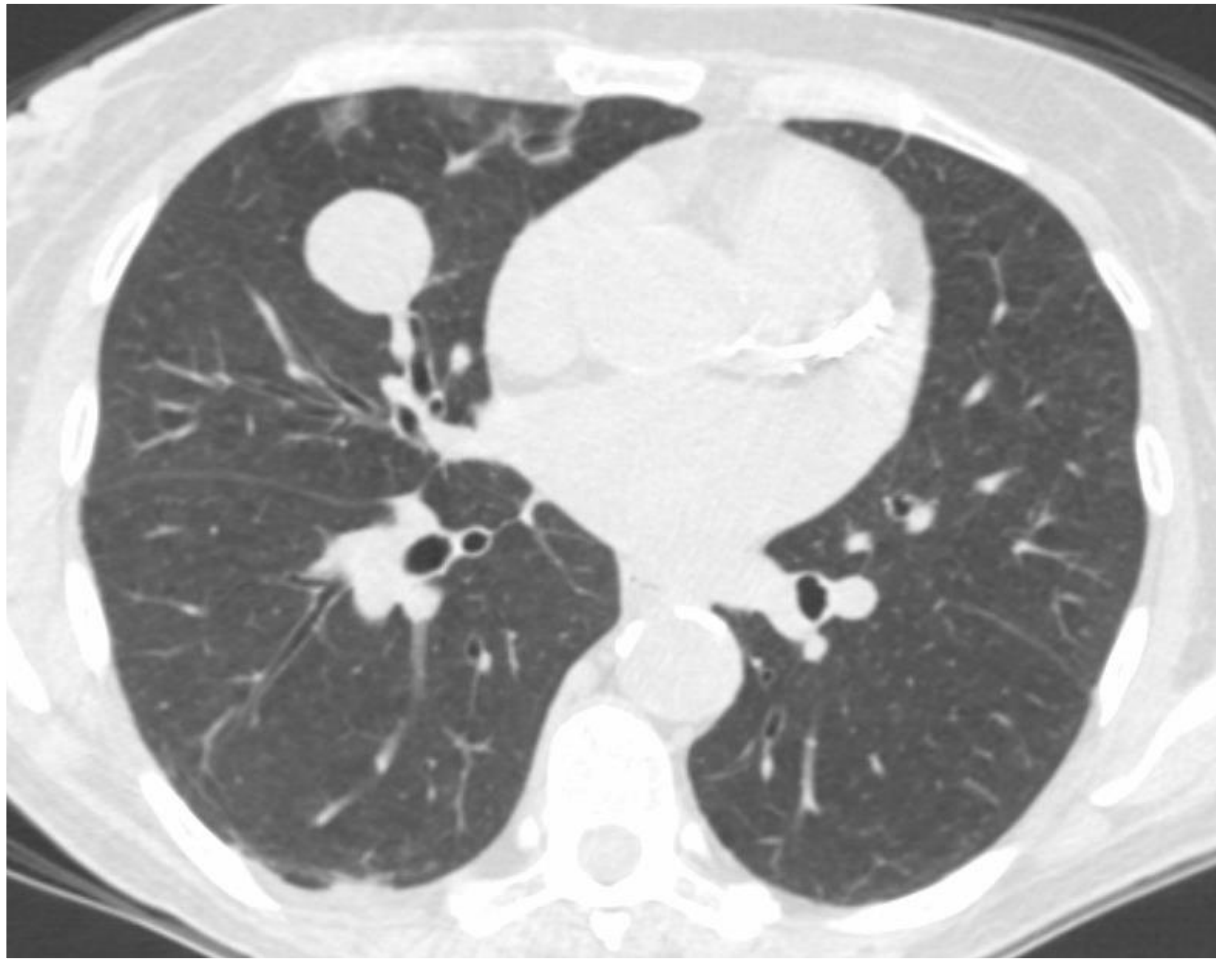
SEMI-SÓLIDO (63%) > **SÓLIDO (32%)** > **VIDRO-FOSCO (12%)**

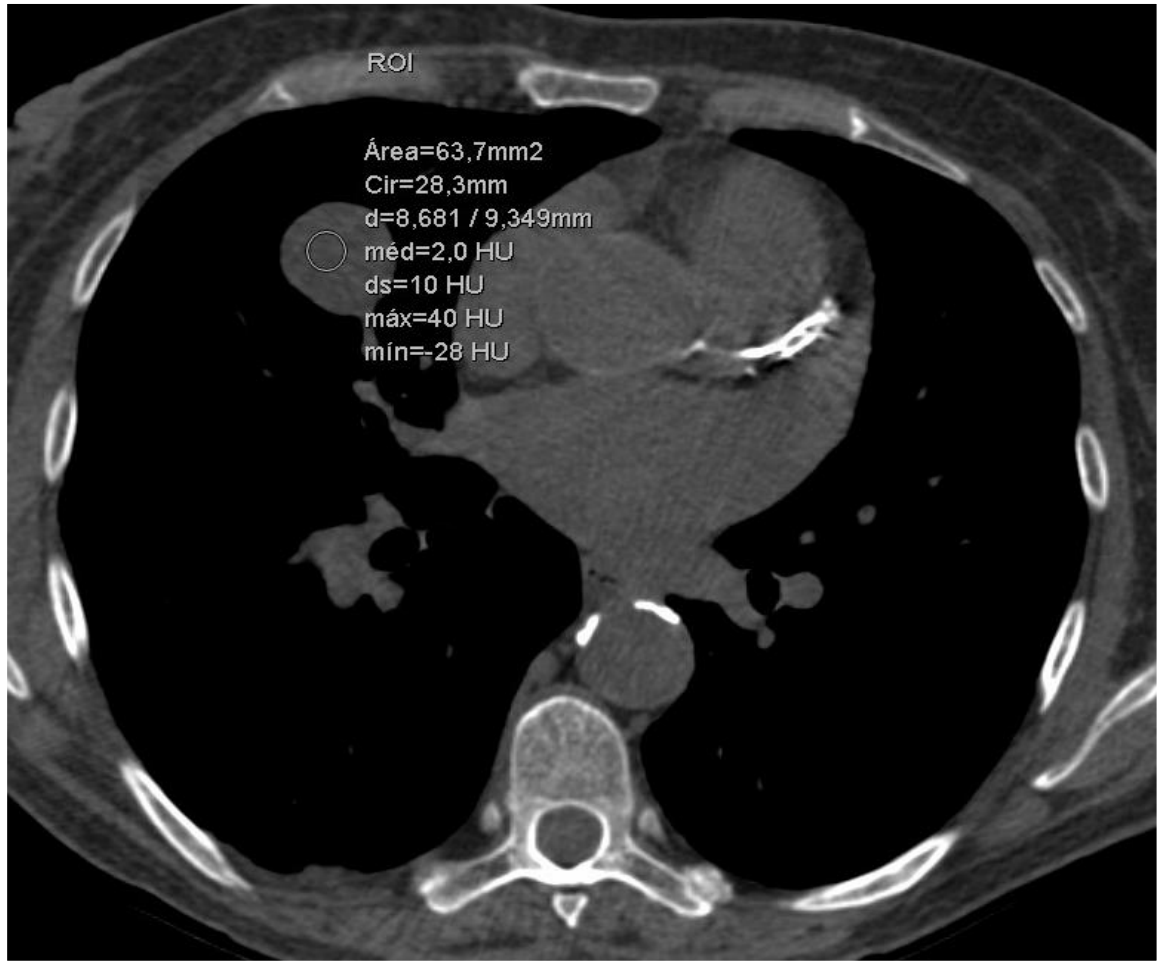
CT Screening for Lung Cancer:
Frequency and Significance of Part-Solid and Nonsolid Nodules

Henschke CI e cols

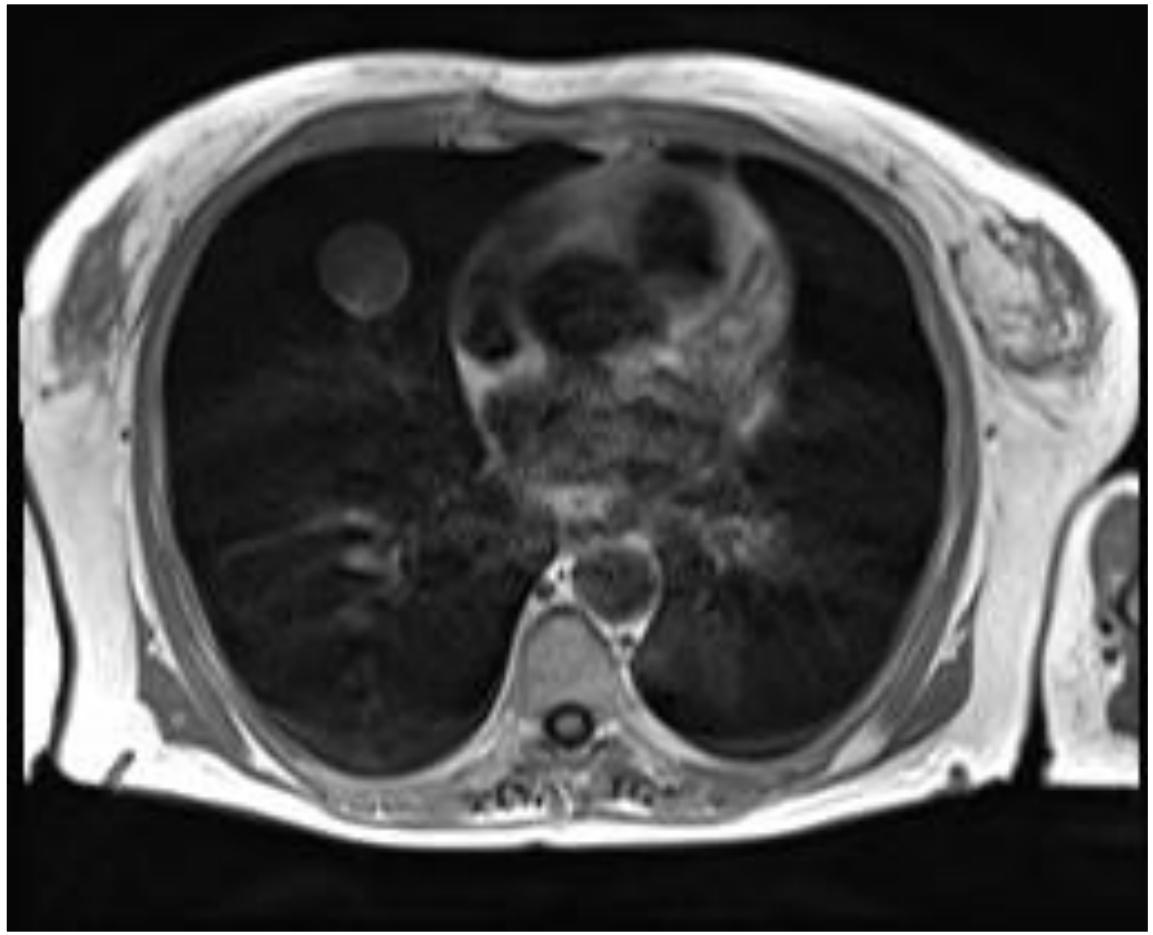
AJR 2002;178:1053–1057

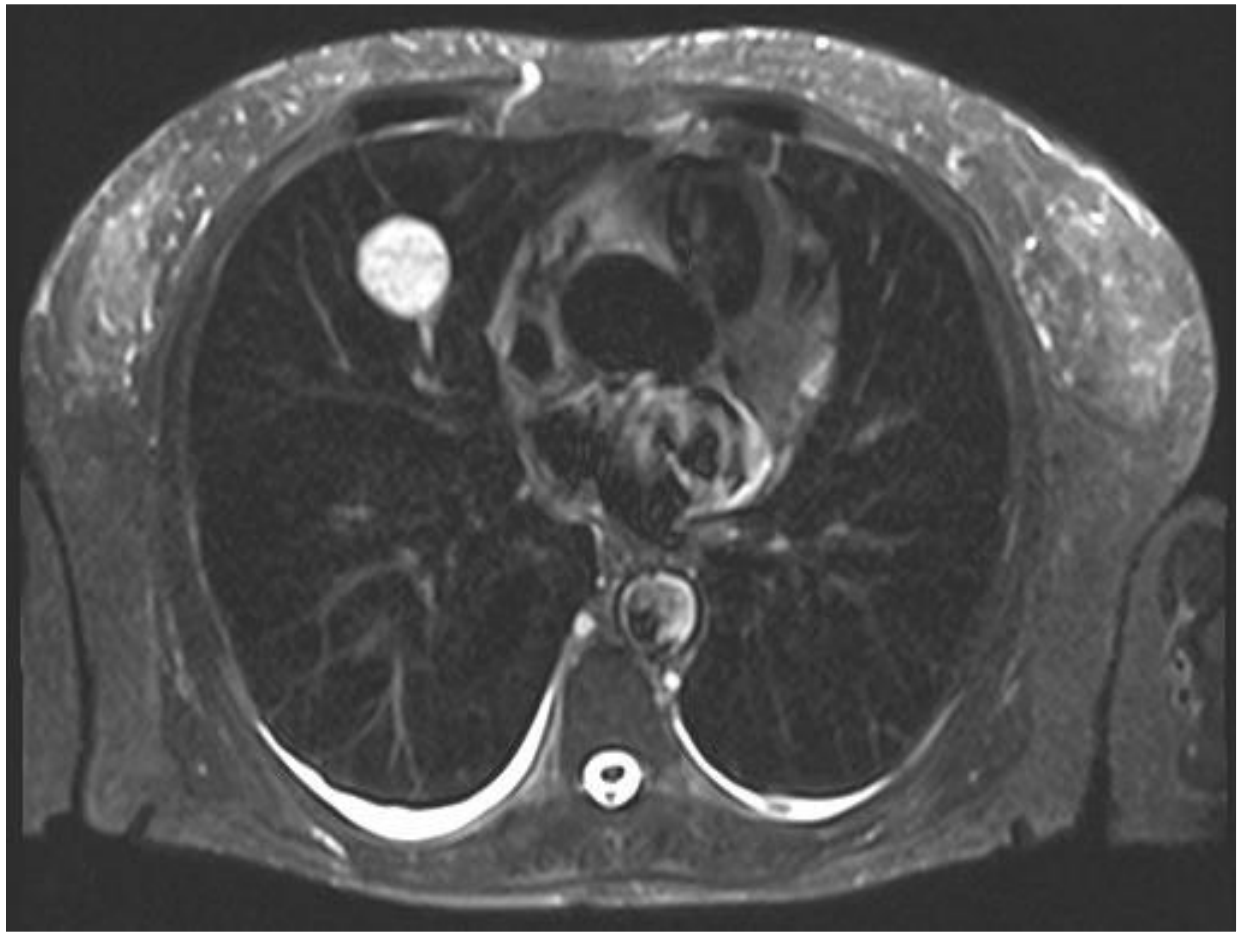
Cisto?



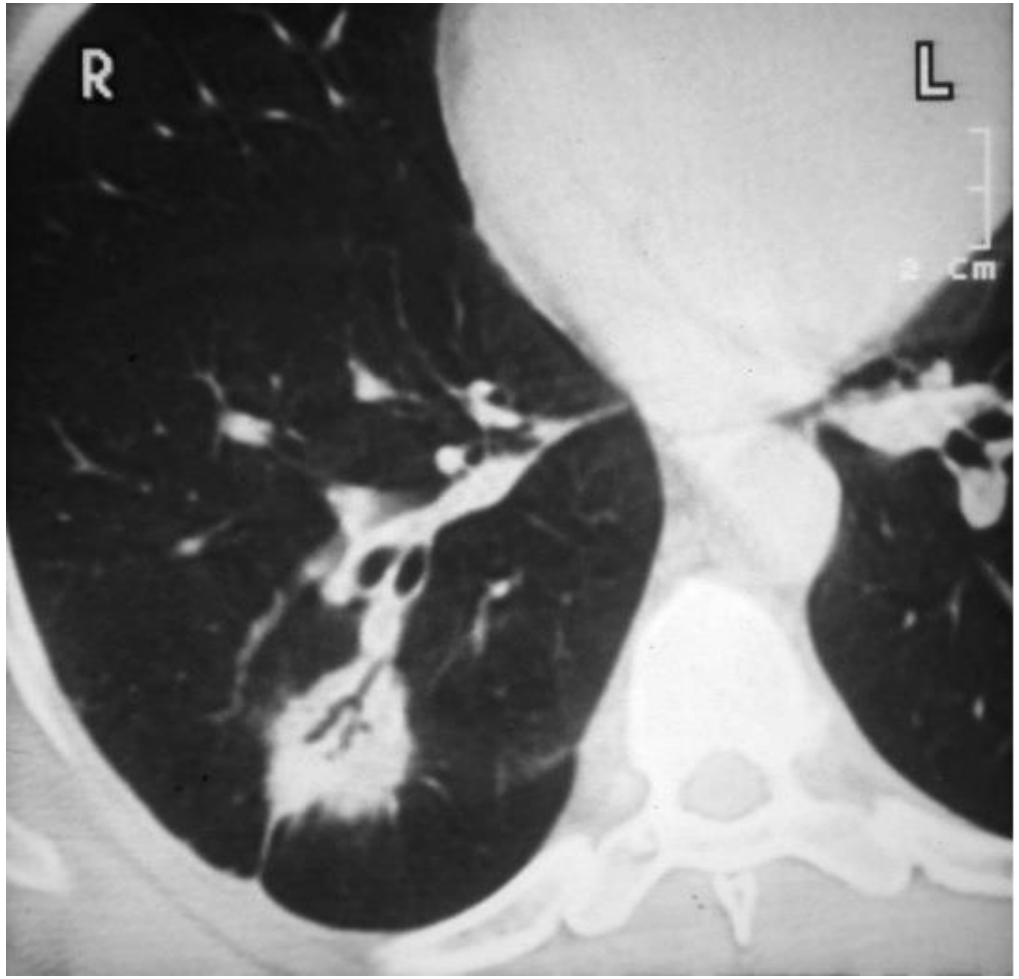

ROI
Área=63,7mm2
Cir=28,3mm
d=8,681 / 9,349mm
méd=2,0 HU
ds=10 HU
máx=40 HU
mín=-28 HU

Cisto

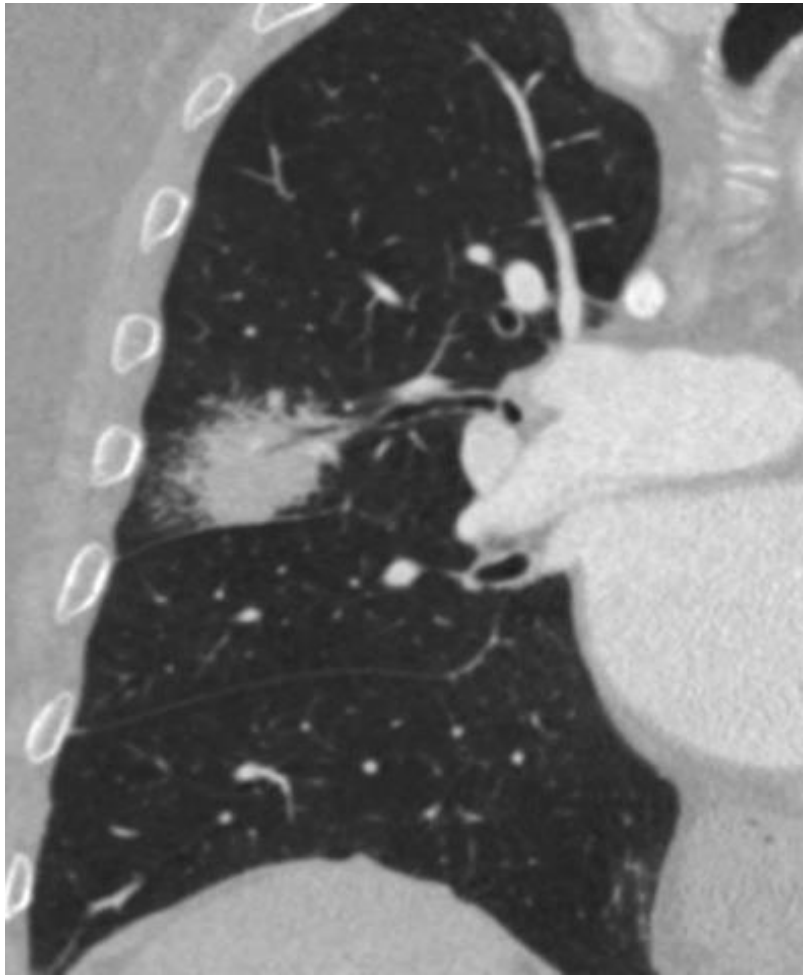




Broncograma Aéreo



ADENOCA



LINFOMA

Broncograma Aéreo



LINFOMA

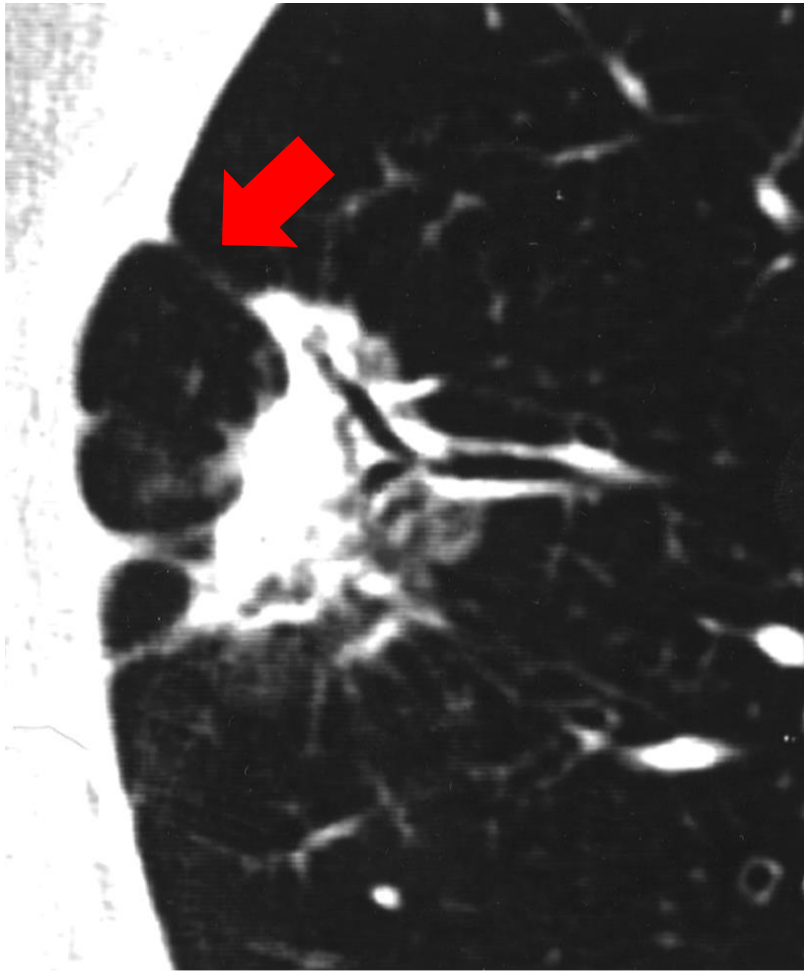


ADENOCA

Retração Pleural (*Pleural Tag)*



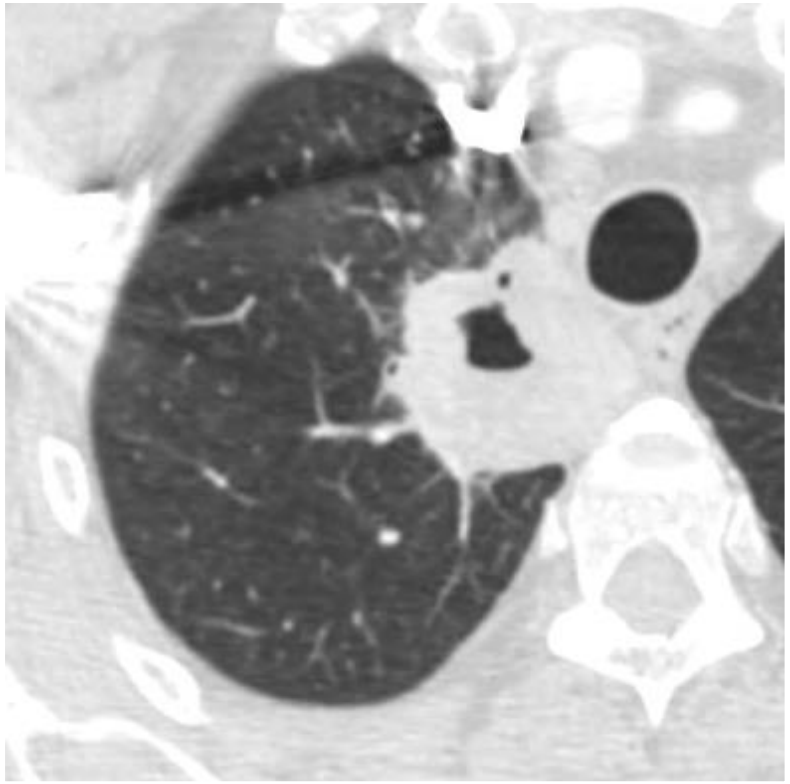
LINFOMA

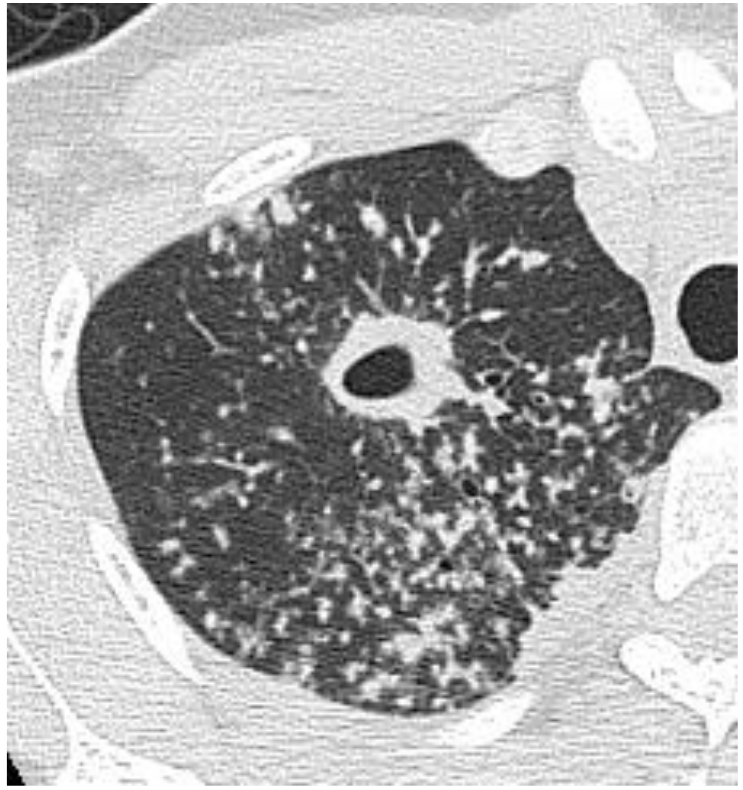


ADENOCA

Escavação: Espessura da Parede

<4 mm: 93% benigno
>16 mm: 97% maligno
5-15 mm: 50% benigno, 50% maligno
(Comprometimento do parênquima adjacente)



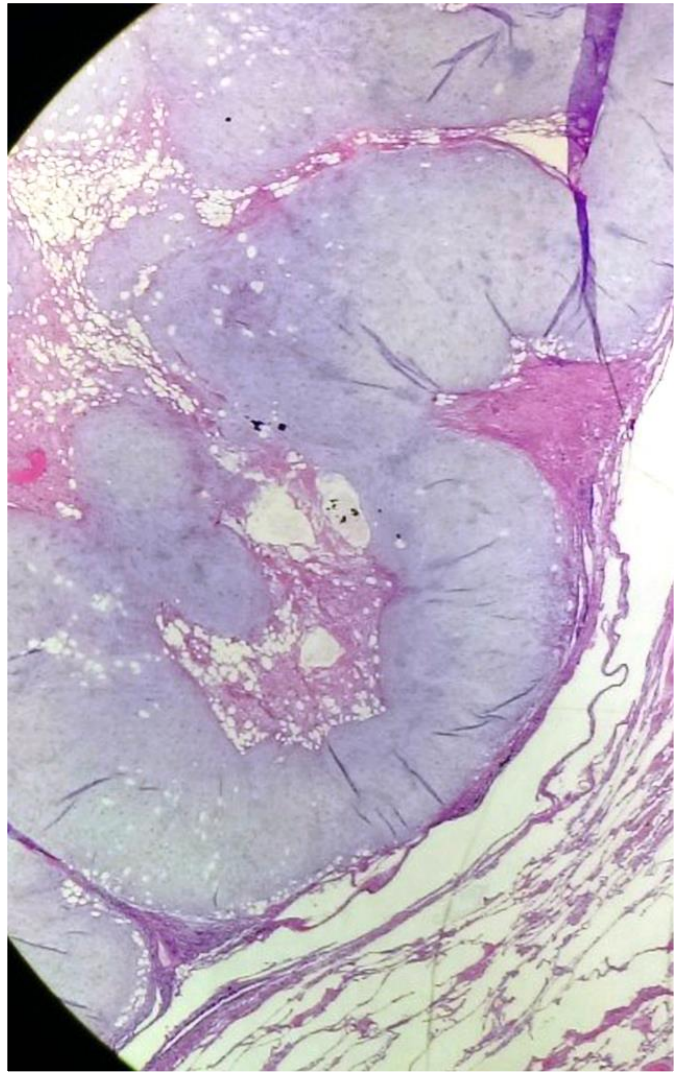


Morfologia: Sinais de Benignidade

- Gordura
- Calcificações Benignas
- Vasos de suprimento e drenagem
- Torção Feixe Broncovascular em direção ao nódulo (Sinal da “cauda do cometa”)
- Linfonodos intrapulmonares

Gordura





HAMARTOMA

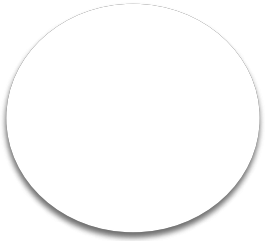
Calcificações

central, difusa, laminada, pipoca (benignas)

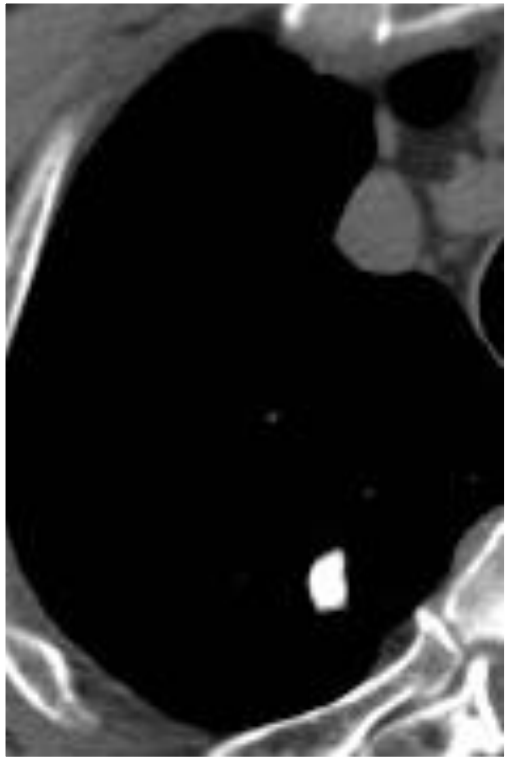
X

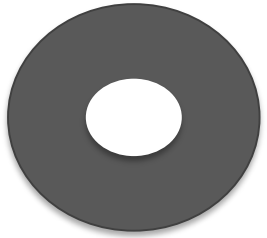
periférica, puntiforme, amorfa (suspeitas)

Calcificações Benignas

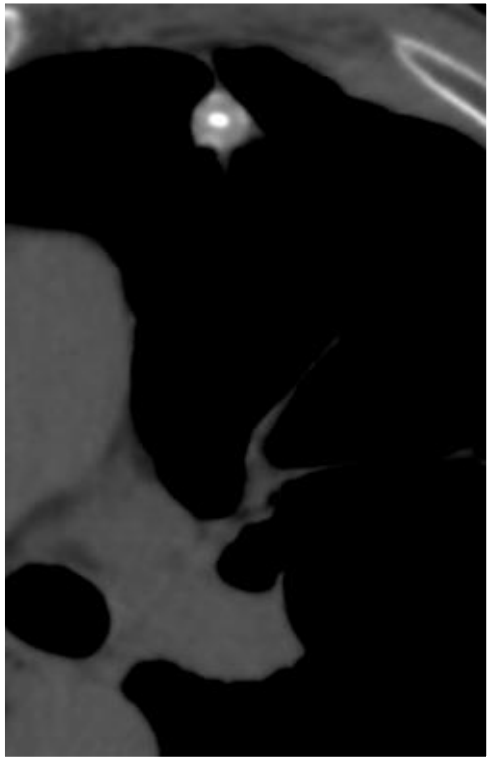


DIFUSA



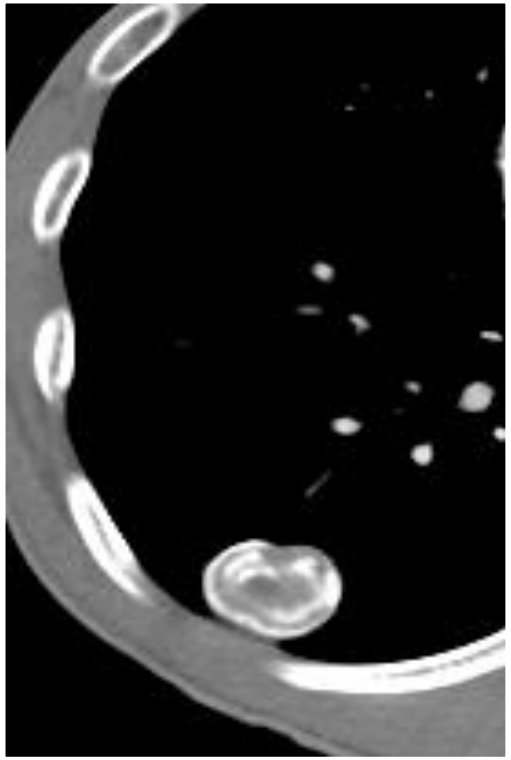


CENTRAL



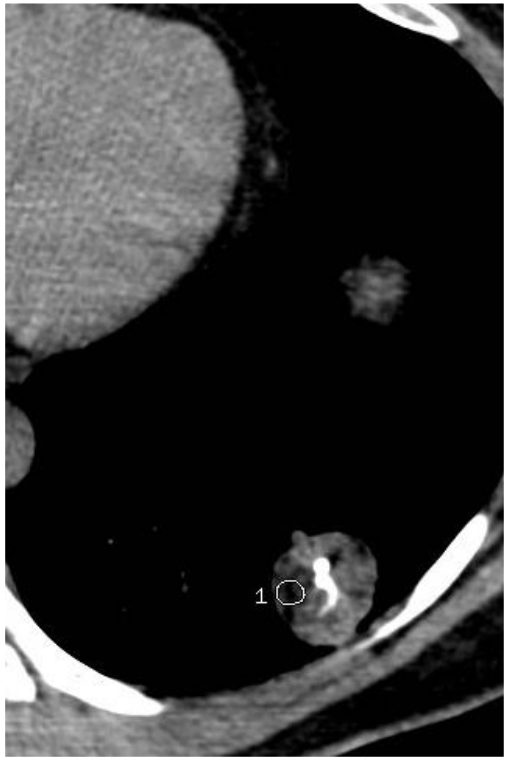


LAMINADA

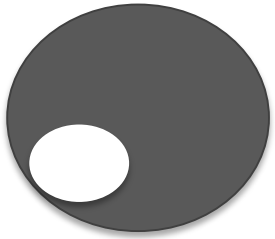




PIPOCA

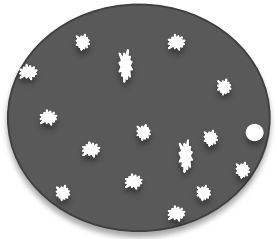


Calcificações Suspeitas

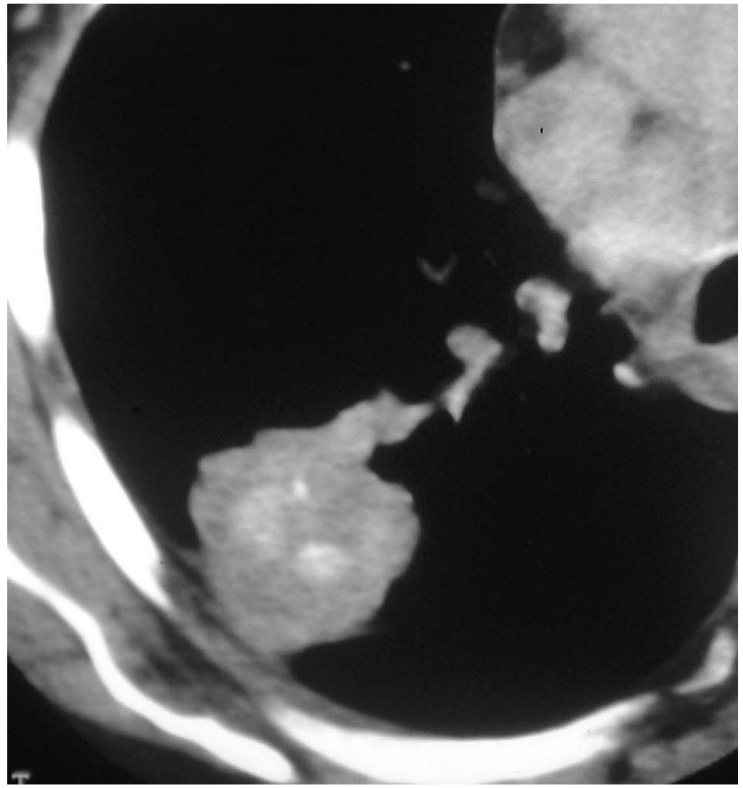


EXCÊNTRICA

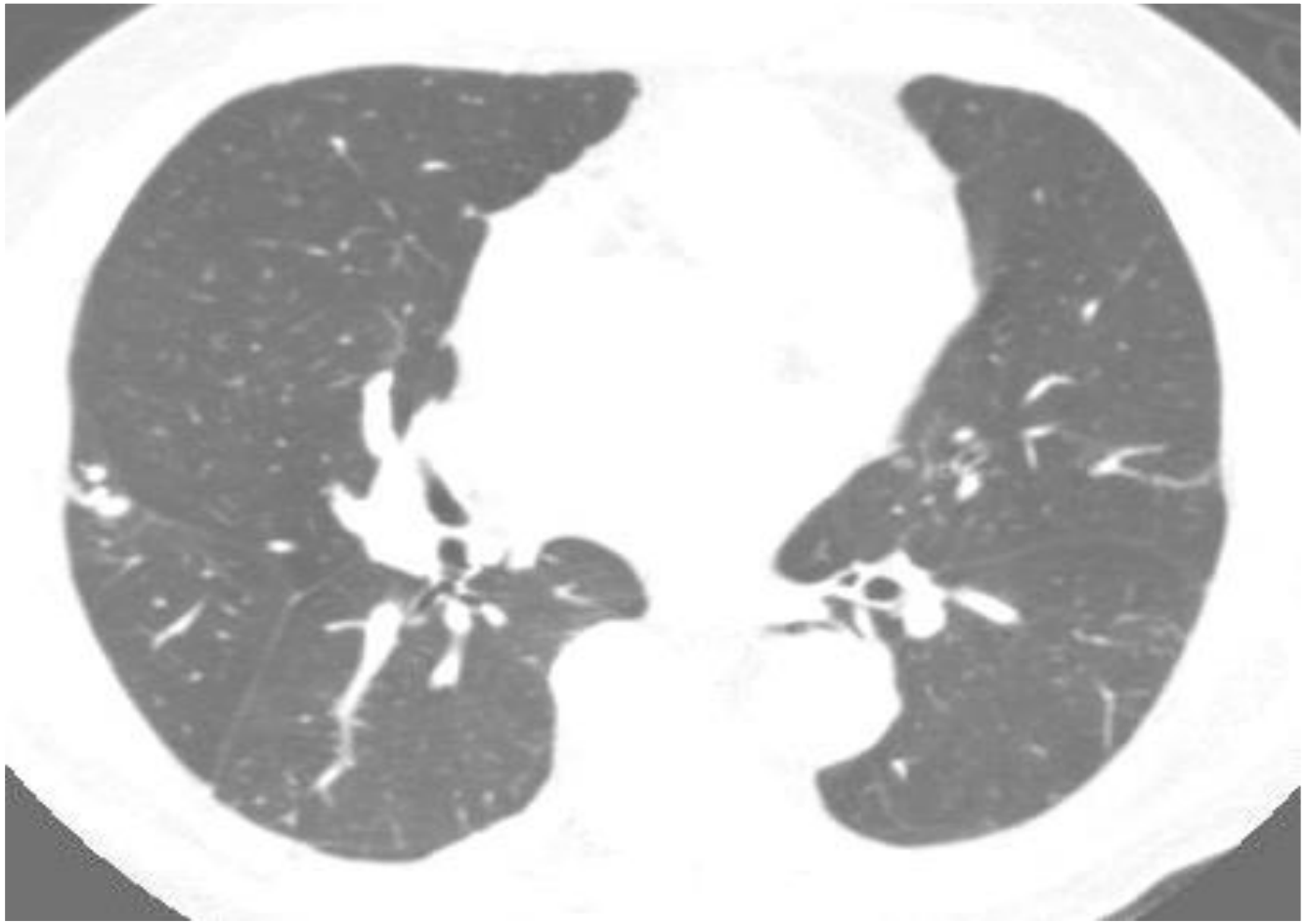




AMORFA / PUNTIFORME



Vasos de Suprimento e Drenagem



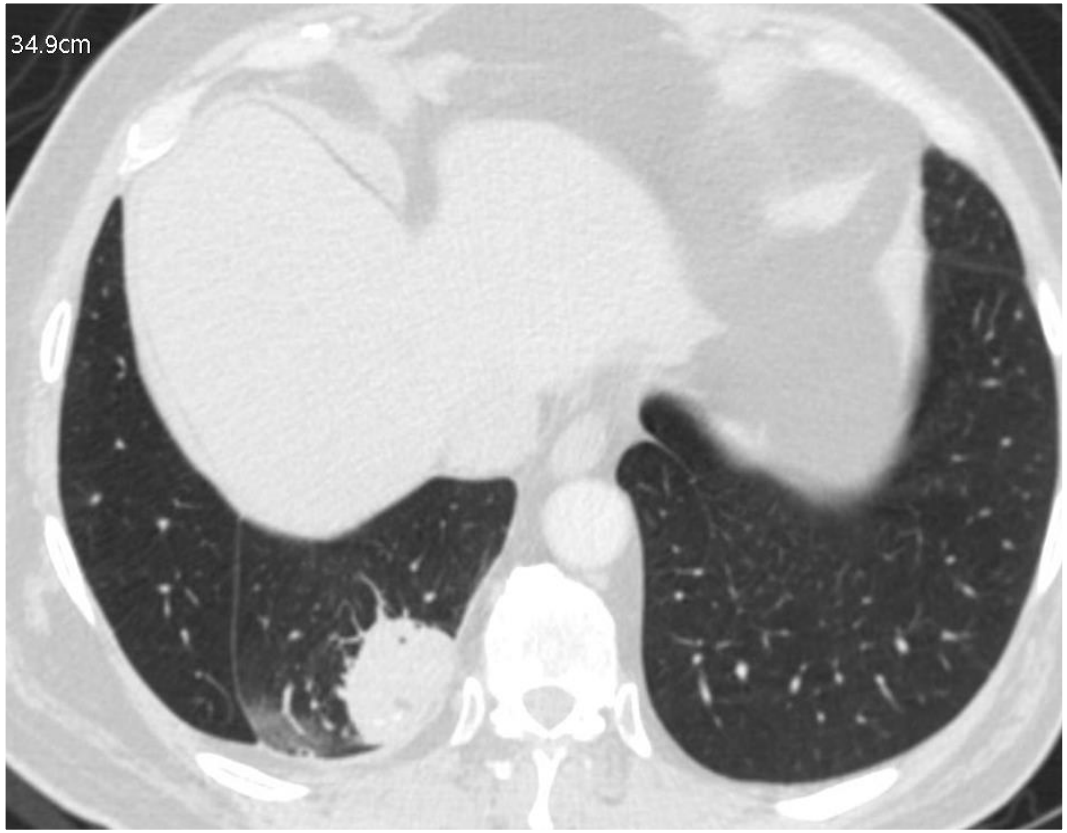
Vasos de Suprimento e Drenagem

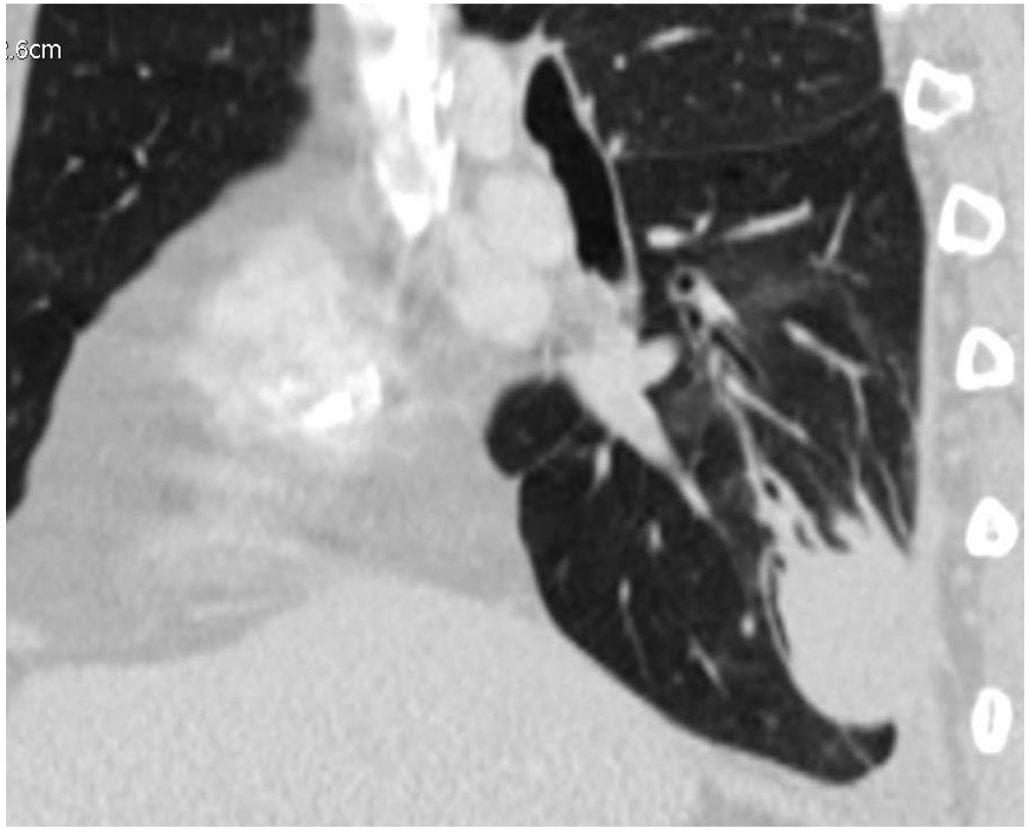




MAV

Torção Feixe Broncovascular

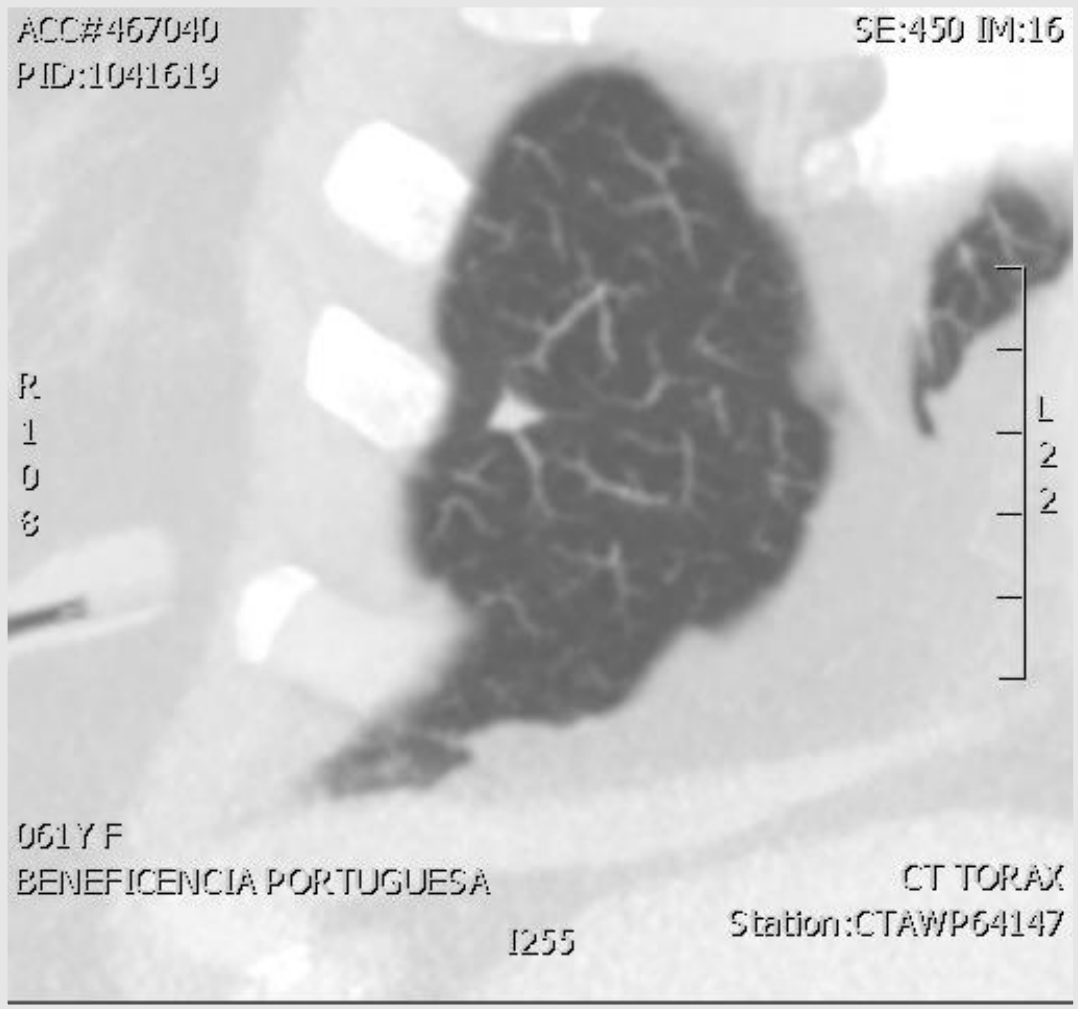


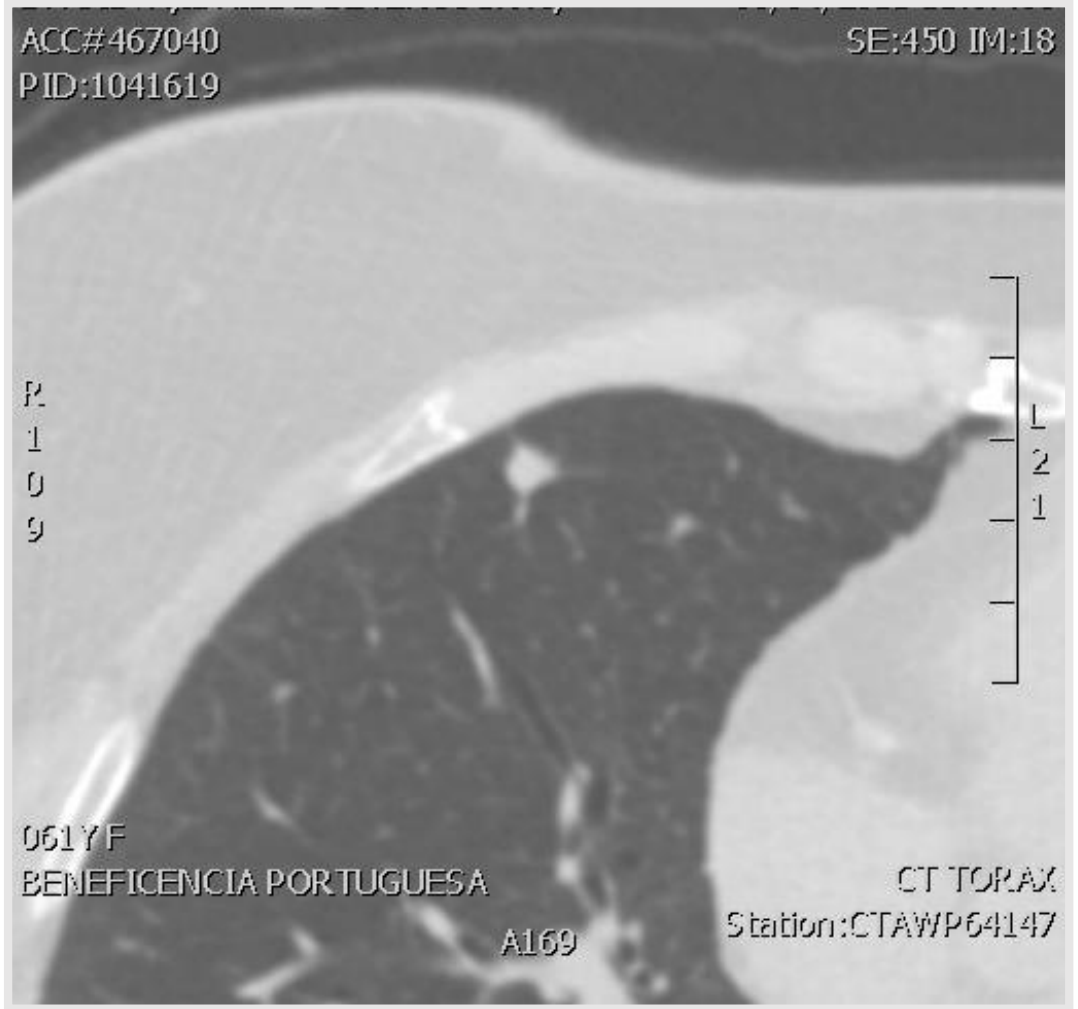


ATELECTASIA REDONDA

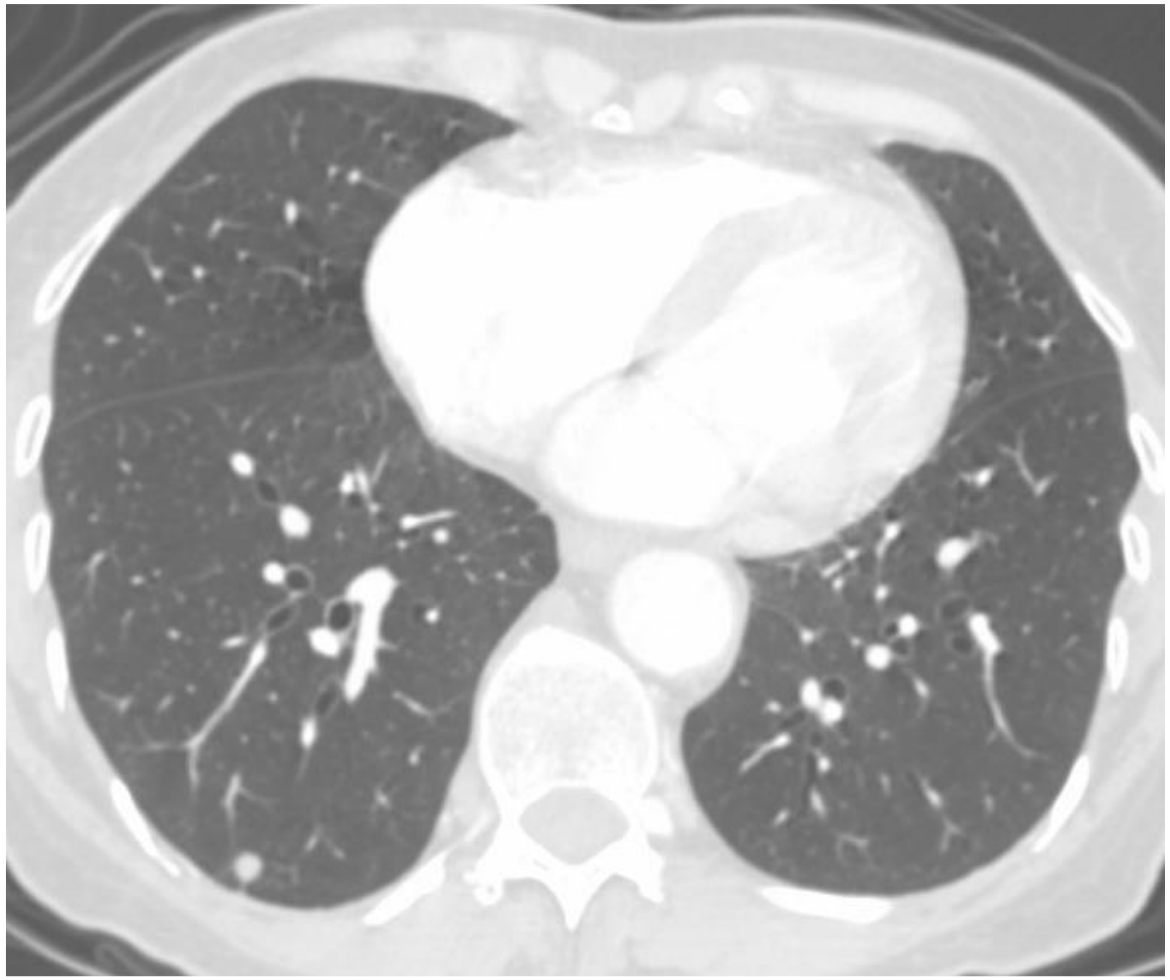
Linfonodos Intrapulmonares

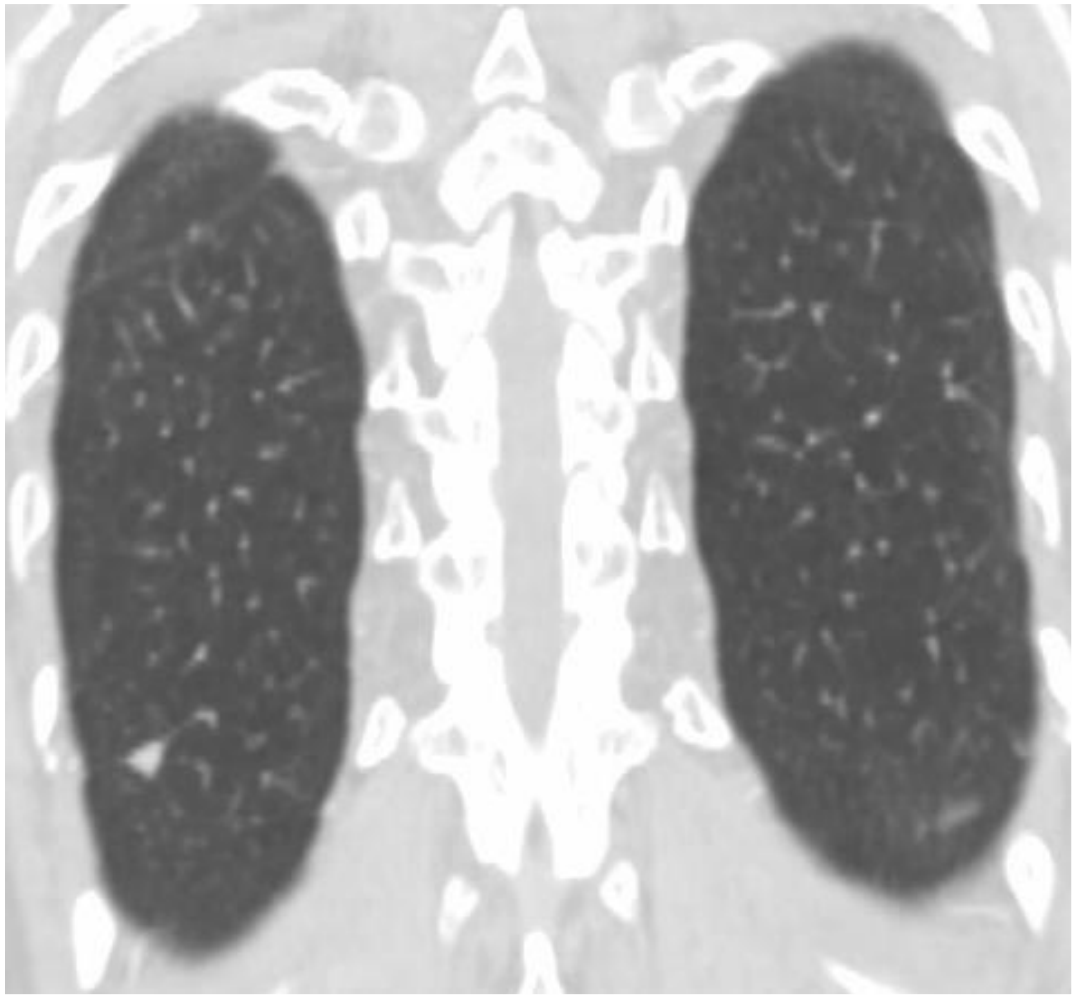
- Mais frequentes na região subpleural e abaixo da carina.
- Relação com as fissuras / margem pleural com contato amplo e plano (nódulos perifissurais).
- Nódulos homogêneos e de contornos bem definidos.
- Arredondados, ovoides ou triangulares (ameboides).
- Algumas vezes, mais de um linfonodo é identificado.


ACC#467040
PID:1041619
SE:450 IM:16
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061Y F
BENEFICENCIA PORTUGUESA
CT TORAX
I255
Station:CTAWP64147

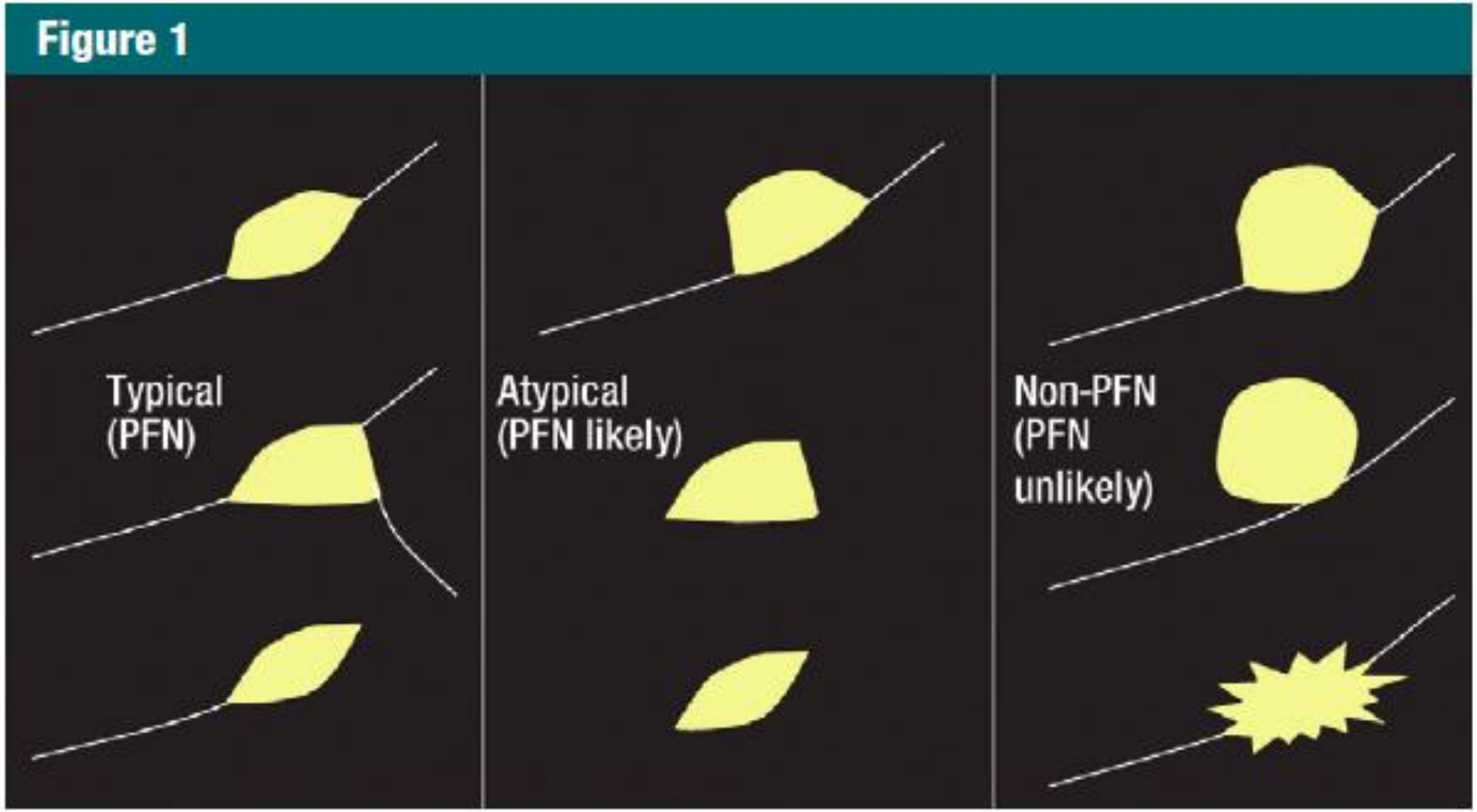

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BENEFICENCIA PORTUGUESA
CT TORAX
A169
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Linfonodos Intrapulmonares





Nódulos Perifissurais



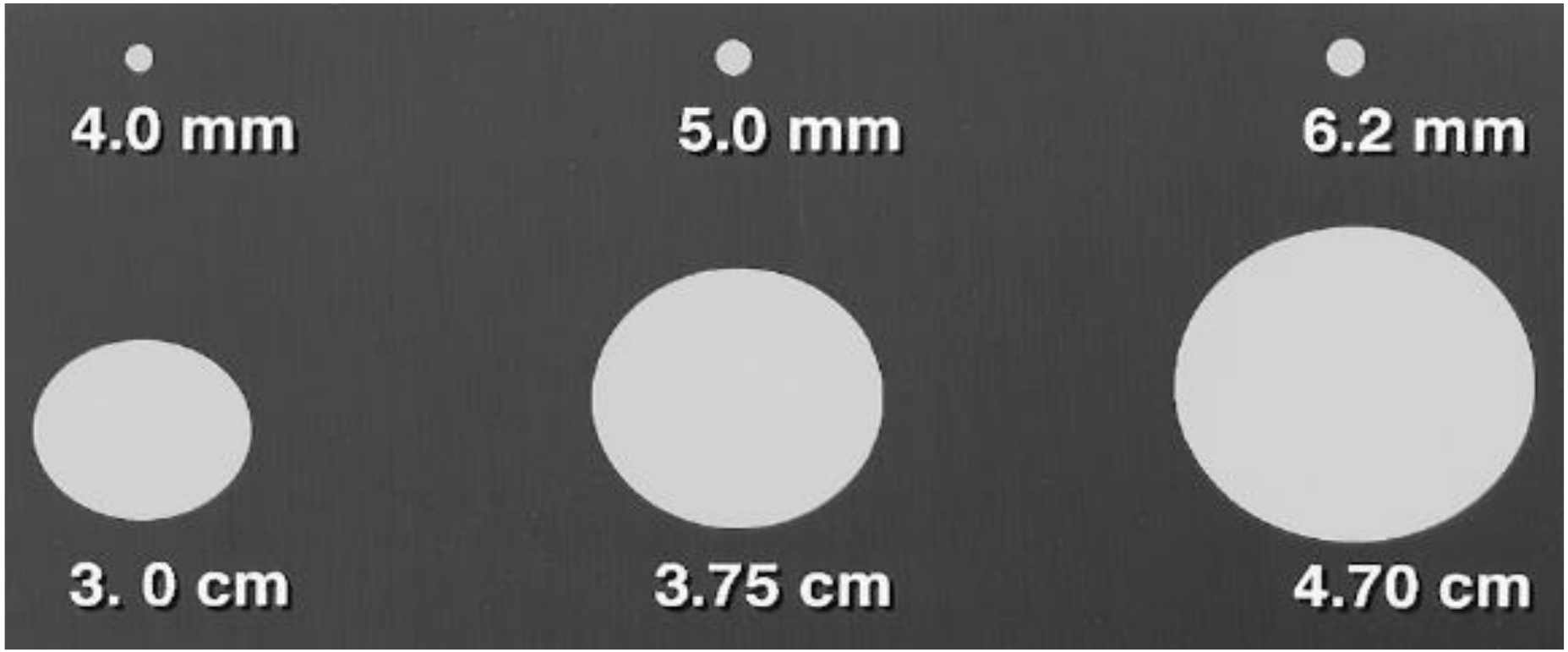
Radiology 2012; 265:611–616

Tempo de Duplicação

- Comparação com exames antigos: avaliar alteração na configuração/morfologia da lesão que sugira ***crescimento!***

- Taxa de crescimento:
  - Aumento de 25% no diâmetro corresponde à duplicação do volume.
  - Estabilidade em 2 anos indica benignidade (nódulos sólidos) e 5 anos (nódulos subsólidos).

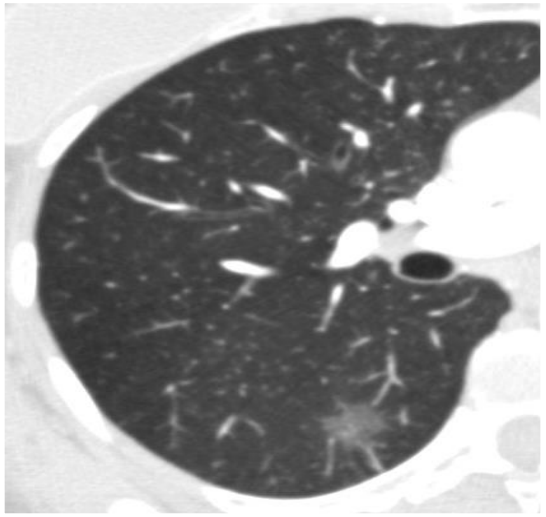
Tempo de Duplicação



RadioGraphics 2000; 20:59–66

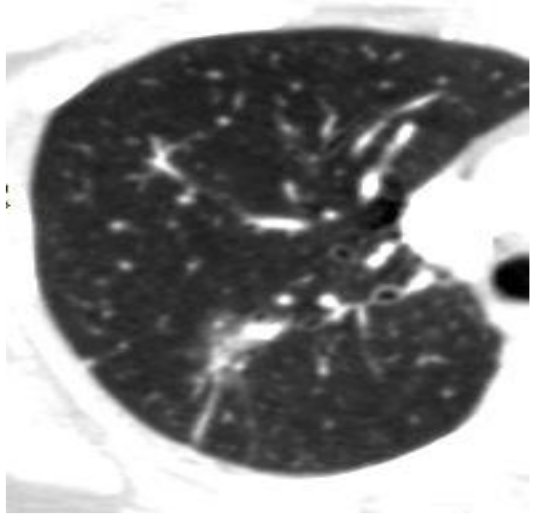
Henschke CI e cols

Tempo de Duplicação



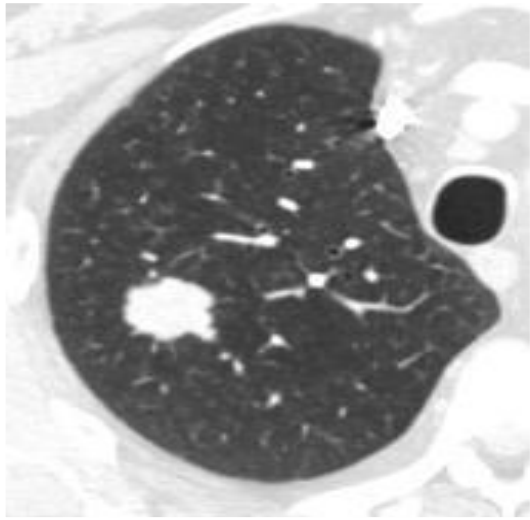
VIDRO-FOSCO (813 dias)

>



SEMI-SÓLIDO (813 dias)

>



SÓLIDO (149 dias)

Growth rate of small lung cancers detected on mass CT screening

The British Journal of Radiology, 73 (2000), 1252–1259

Recomendações da Sociedade Fleischner

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017[1]

Radiology 2017; 000:1–16

X

Lung-RADS

ACR® AMERICAN COLLEGE OF RADIOLOGY
QUALITY IS OUR IMAGE

Lung CT Screening Reporting and Data System (Lung-RADS™)

Recomendações da Sociedade Fleischner 2017

- Nódulos incidentais
- Nódulos sólidos e subsólidos combinados numa mesma diretriz simplificada
- Recomendações específicas foram incluídas para múltiplos nódulos

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017[1]

MacMahon H. e cols

Radiology 2017; 000:1–16

Recomendações da Sociedade Fleischner 2017

- Limiar mínimo do tamanho foi aumentado (6 mm).
- Seguimento sugeridos em intervalos para permitir que radiologistas, clínicos e pacientes possuam mais critérios para atender fatores de risco e preferências individuais.

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017[1]

MacMahon H. e cols

Radiology 2017; 000:1–16

Recomendações da Sociedade Fleischner 2017

A: Solid Nodules*

Nodule Type	Size <6 mm (<100 mm³)	Size 6–8 mm (100–250 mm³)	Size >8 mm (>250 mm³)	Comments
Single				
Low risk†	No routine follow-up	CT at 6–12 months, then consider CT at 18–24 months	Consider CT, PET/CT, or tissue sampling at 3 months	Nodules <6 mm do not require routine follow-up, but certain patients at high risk with suspicious nodule morphology, upper lobe location, or both may warrant 12-month follow-up (recommendation 1A).
High risk†	Optional CT at 12 months	CT at 6–12 months, then CT at 18–24 months	Consider CT, PET/CT, or tissue sampling at 3 months	Nodules <6 mm do not require routine follow-up, but 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).

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017[1]

MacMahon H. e cols

Radiology 2017; 000:1–16

Recomendações da Sociedade Fleischner 2017

B: Subsolid Nodules*

Nodule Type	Size		Comments
	<6 mm (<100 mm³)	≥6 mm (>100 mm³)	
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 component(s) 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).

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017[1]

MacMahon H. e cols

Radiology 2017; 000:1–16

Recomendações da Sociedade Fleischner 2017

Não deve ser usado:

- < 35 anos (caso a caso)
- Pacientes com diagnóstico conhecido de neoplasia (risco de metástases)
- Imunocomprometidos (risco de infecção)
- Pacientes em programas de rastreamento para CA de Pulmão

Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017[1]

MacMahon H. e cols

Radiology 2017; 000:1–16

NLST

ORIGINAL ARTICLE

Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening

The National Lung Screening Trial Research Team*

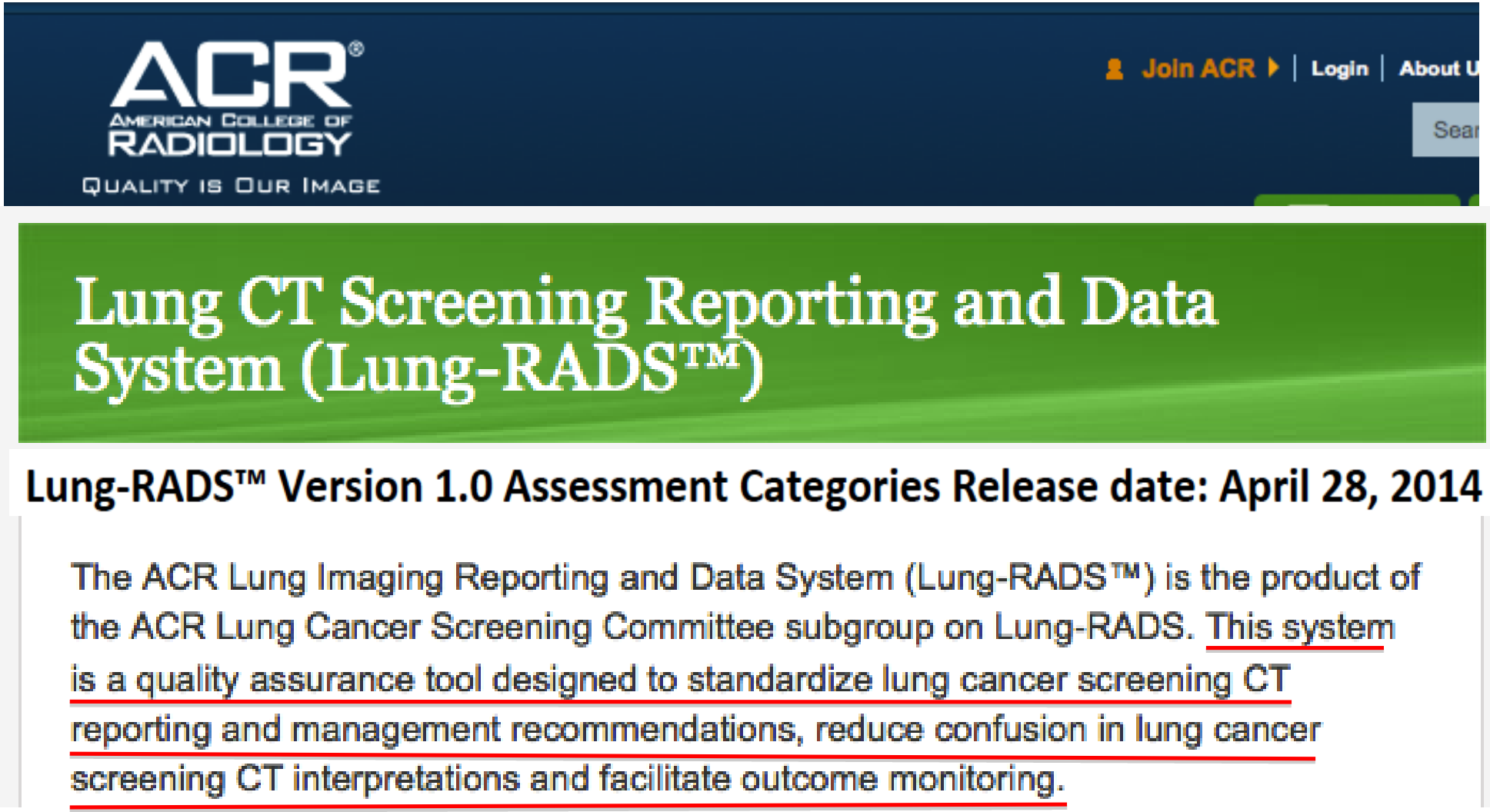
N Engl J Med 2011;365:395-409.

- **Low dose CT x CR**

  (< 2,0 mSv) x (0,2 mSv)
- **53.454 participantes; 33 US medical centers**
- **55-74 years old**
- **Smoking History > 30 packs/year**
- **↓20% mortality**



Lung-RADS


ACR
American College of Radiology
Quality is Our Image
Join ACR
Login
About U
Lung CT Screening Reporting and Data System (Lung-RADS™)
Lung-RADS™ Version 1.0 Assessment Categories Release date: April 28, 2014
The ACR Lung Imaging Reporting and Data System (Lung-RADS™) is the product of the ACR Lung Cancer Screening Committee subgroup on Lung-RADS. This system is a quality assurance tool designed to standardize lung cancer screening CT reporting and management recommendations, reduce confusion in lung cancer screening CT interpretations and facilitate outcome monitoring.

Lung-RADS X NLST

- Positive Test: 4 mm (NLST) -> 6 mm (Lung-RADS)

- Reduction of the false-positive rate:
  - Baseline screening: **26.6%** (NLST) x **12.8%** (Lung-RADS).
  - Following screening rounds: **21.8%** (NLST) x **5.3%** (Lung-RADS).

Lung-RADS

Lung-RADS™ Version 1.0 Assessment Categories Release date: April 28, 2014

Category	Category Descriptor	Category	Findings	Management	Probability of Malignancy	Estimated Population Prevalence
Incomplete	-	0	prior chest CT examination(s) being located for comparison part or all of lungs cannot be evaluated	Additional lung cancer screening CT images and/or comparison to prior chest CT examinations is needed	n/a	1%
Negative	No nodules and definitely benign nodules	1	no lung nodules nodule(s) with specific calcifications: complete, central, popcorn, concentric rings and fat containing nodules	Continue annual screening with LDCT in 12 months	< 1%	90%
Benign Appearance or Behavior	Nodules with a very low likelihood of becoming a clinically active cancer due to size or lack of growth	2	solid nodule(s): < 6 mm new < 4 mm part solid nodule(s): < 6 mm total diameter on baseline screening non solid nodule(s) (GGN): < 20 mm OR ≥ 20 mm and unchanged or slowly growing category 3 or 4 nodules unchanged for ≥ 3 months			
Probably Benign	Probably benign finding(s) - short term follow up suggested; includes nodules with a low likelihood of becoming a clinically active cancer	3	solid nodule(s): ≥ 6 to < 8 mm at baseline OR new 4 mm to < 6 mm part solid nodule(s) ≥ 6 mm total diameter with solid component < 6 mm OR new < 6 mm total diameter non solid nodule(s) (GGN) ≥ 20 mm on baseline CT or new	6 month LDCT	1-2%	5%
Suspicious	Findings for which additional diagnostic testing and/or tissue sampling is recommended	4A	solid nodule(s): ≥ 8 to < 15 mm at baseline OR growing < 8 mm OR new 6 to < 8 mm part solid nodule(s: ≥ 6 mm with solid component ≥ 6 mm to < 8 mm OR with a new or growing < 4 mm solid component endobronchial nodule	3 month LDCT; PET/CT may be used when there is a ≥ 8 mm solid component	5-15%	2%
		4B	solid nodule(s) ≥ 15 mm OR new or growing, and ≥ 8 mm part solid nodule(s) with: a solid component ≥ 8 mm OR a new or growing ≥ 4 mm solid component	chest CT with or without contrast, PET/CT and/or tissue sampling depending on the *probability of malignancy and comorbidities. PET/CT may be used when there is a ≥ 8 mm solid component.	> 15%	2%
		4X	Category 3 or 4 nodules with additional features or imaging findings that increases the suspicion of malignancy			
Other	Clinically Significant or Potentially Clinically Significant Findings (non lung cancer)	S	modifier - may add on to category 0-4 coding	As appropriate to the specific finding	n/a	10%
Prior Lung Cancer	Modifier for patients with a prior diagnosis of lung cancer who return to screening	C	modifier - may add on to category 0-4 coding	-	-	-

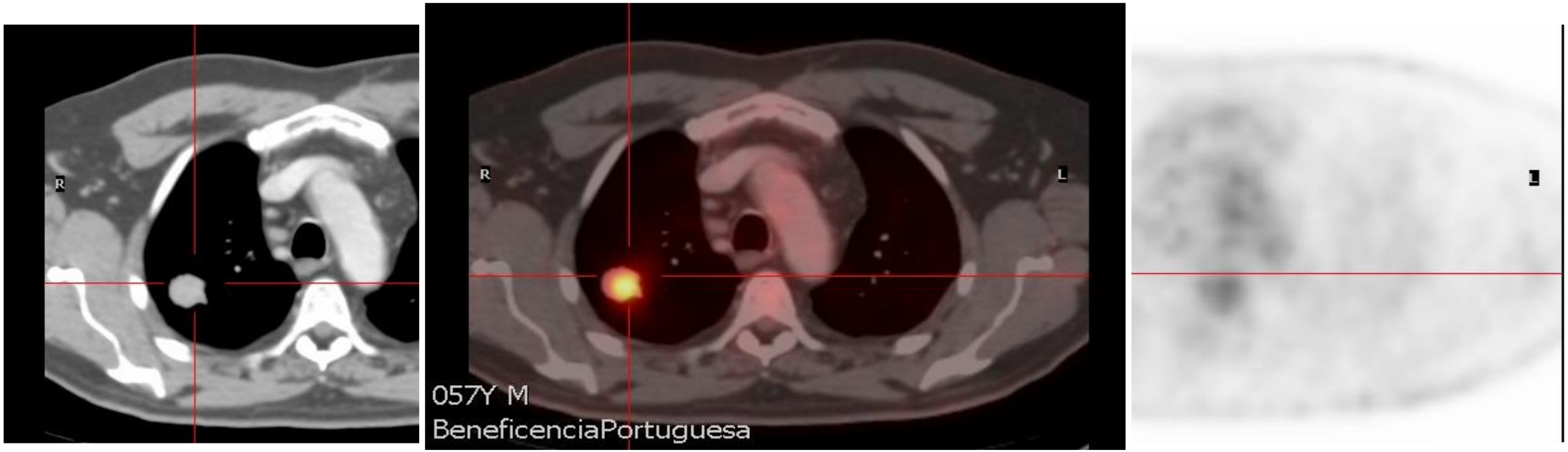
Parceria: AstraZeneca

Lung-RADS – Notas Importantes:

- **Exame negativo**: não significa que o indivíduo não tem câncer
- **Tamanho**: nódulos devem ser medidos na janela de pulmão e relatados com o diâmetro médio
- **Crescimento**: aumento de tamanho > 1,5 mm

PET/CT

- > 0,7 cm, indeterminados após TC
- Sens. (97%), Esp. (85%), Acur. (93%)
- Alto VPN: 5% de chance de CA, se PET/CT normal

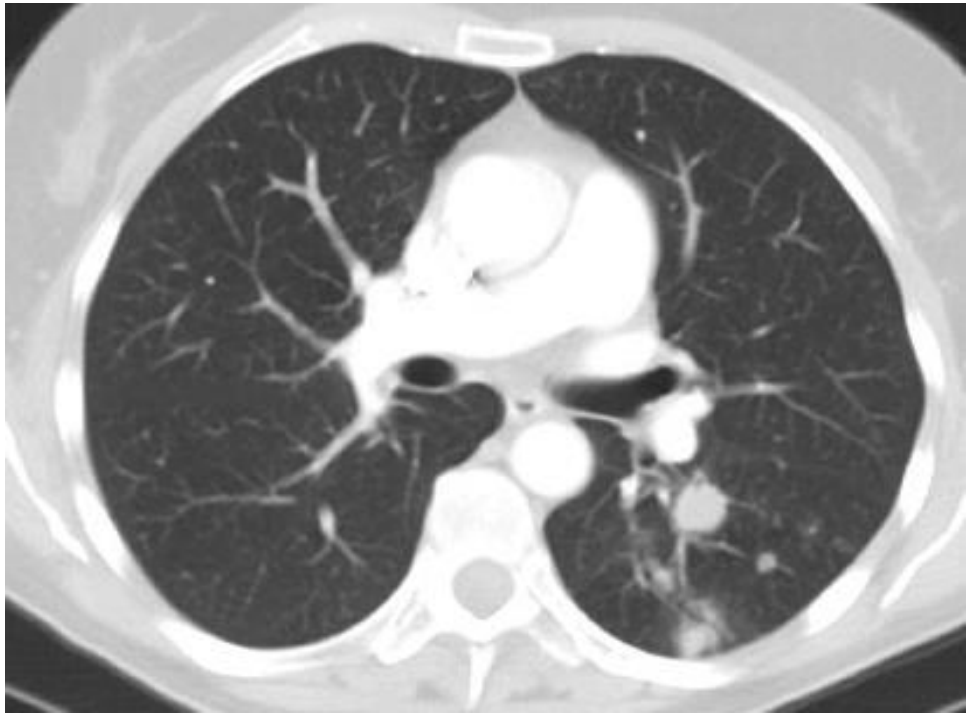


Kim SK et al. J Nucl Med 2007;48:214–220
Hashimoto Y et al. J Nucl Med 2006;47:426–431

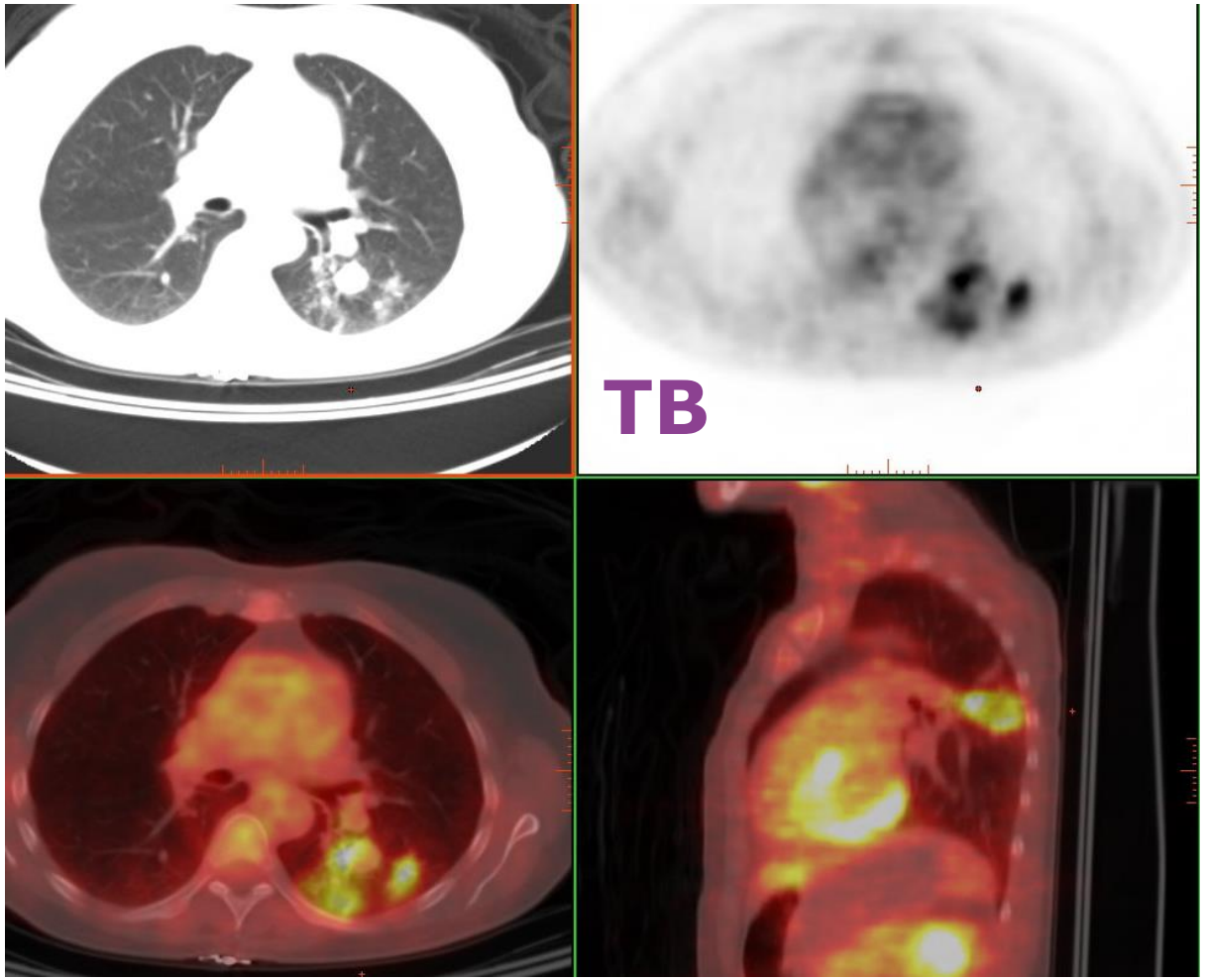
PET/CT: Falsos Positivos

- Infecções
- Processos inflamatórios

Mulher, 57 anos, CA de ovário



Dr. Gustavo Meirelles

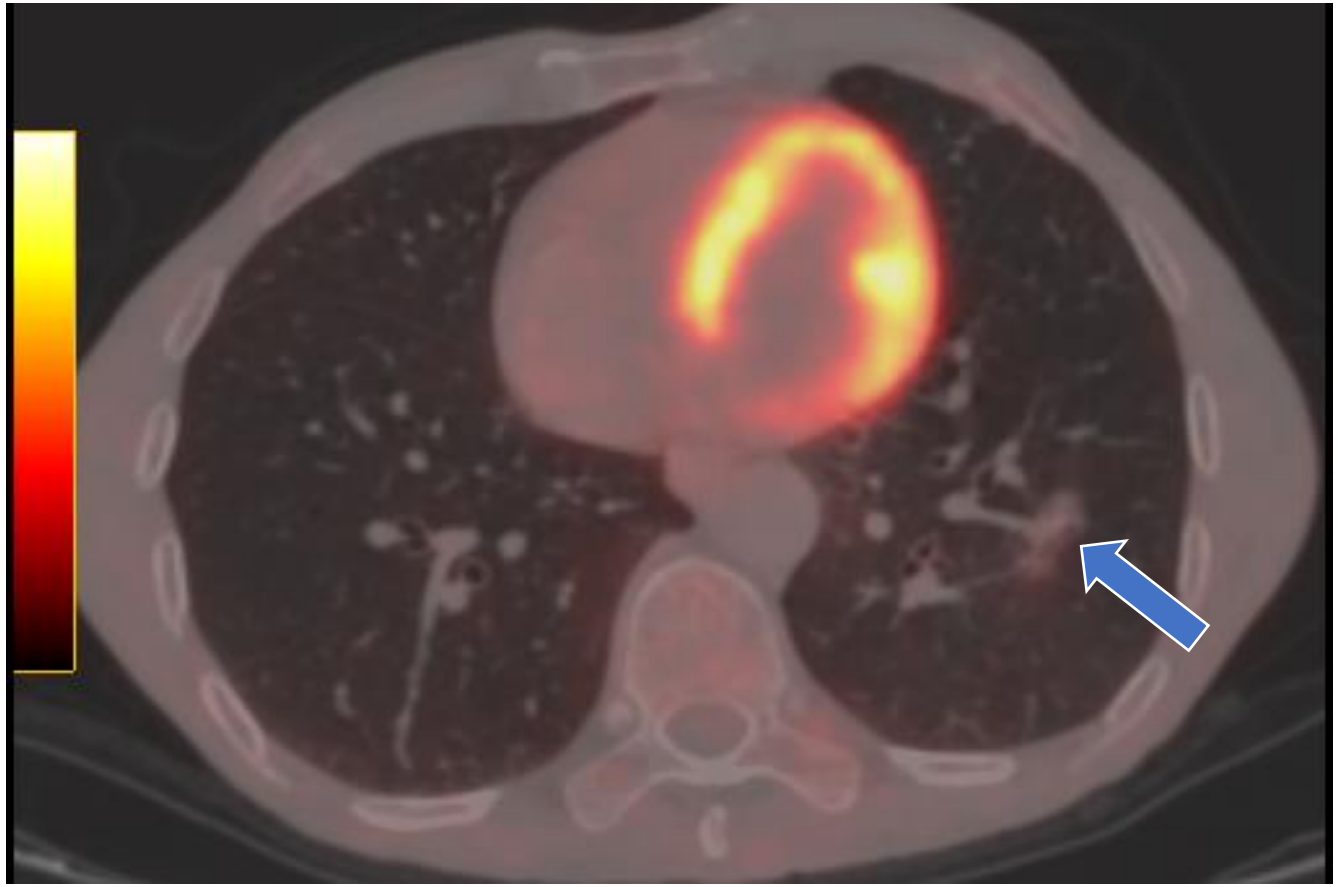


Shim SS et al. AJR 2006;186:639–648
Asad S et al. AJR 2004;182:983–989

PET/CT: Falsos Negativos

- Carcinoide
- Adenoca *in situ*/lepídico

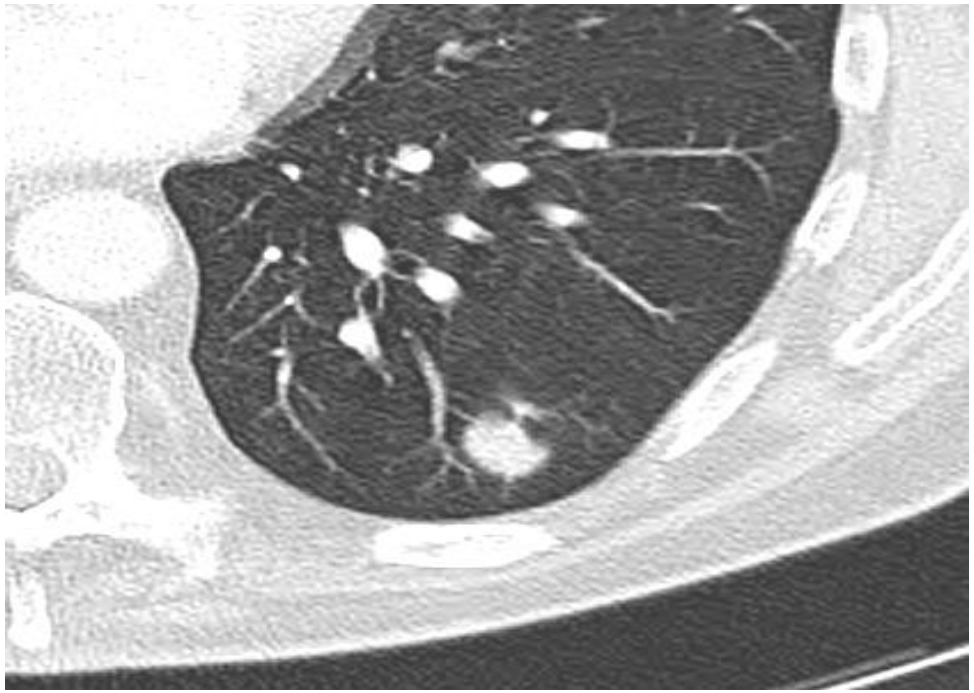
AIS

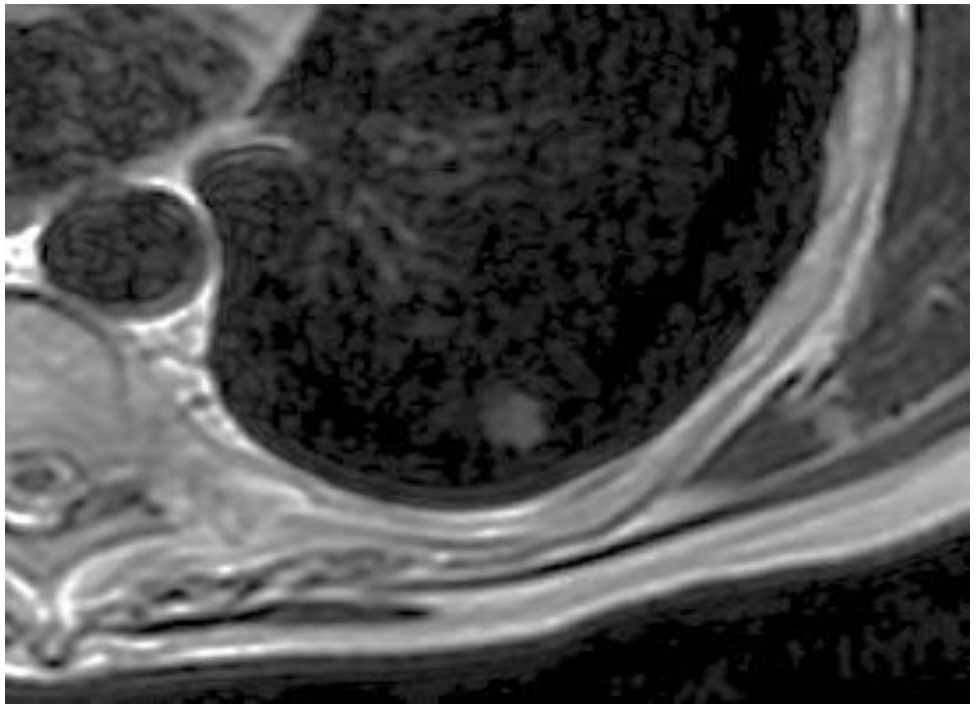


Shim SS et al. AJR 2006;186:639–648
Asad S et al. AJR 2004;182:983–989

Ressonância Magnética

- No atual momento, não há diferença estatística entre a TC e a RM na detecção de nódulos malignos.

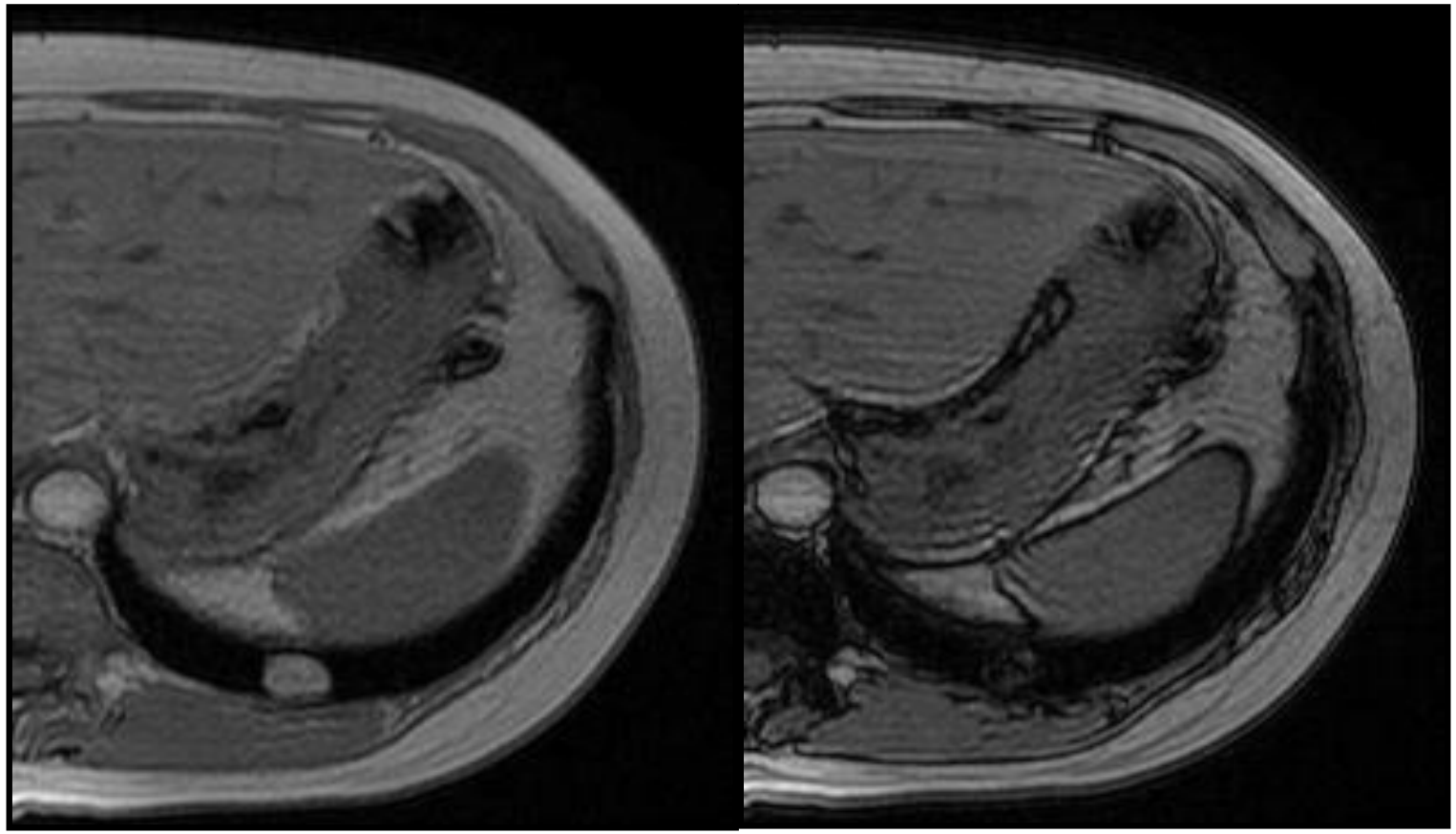




Dr. Bruno Hochhegger

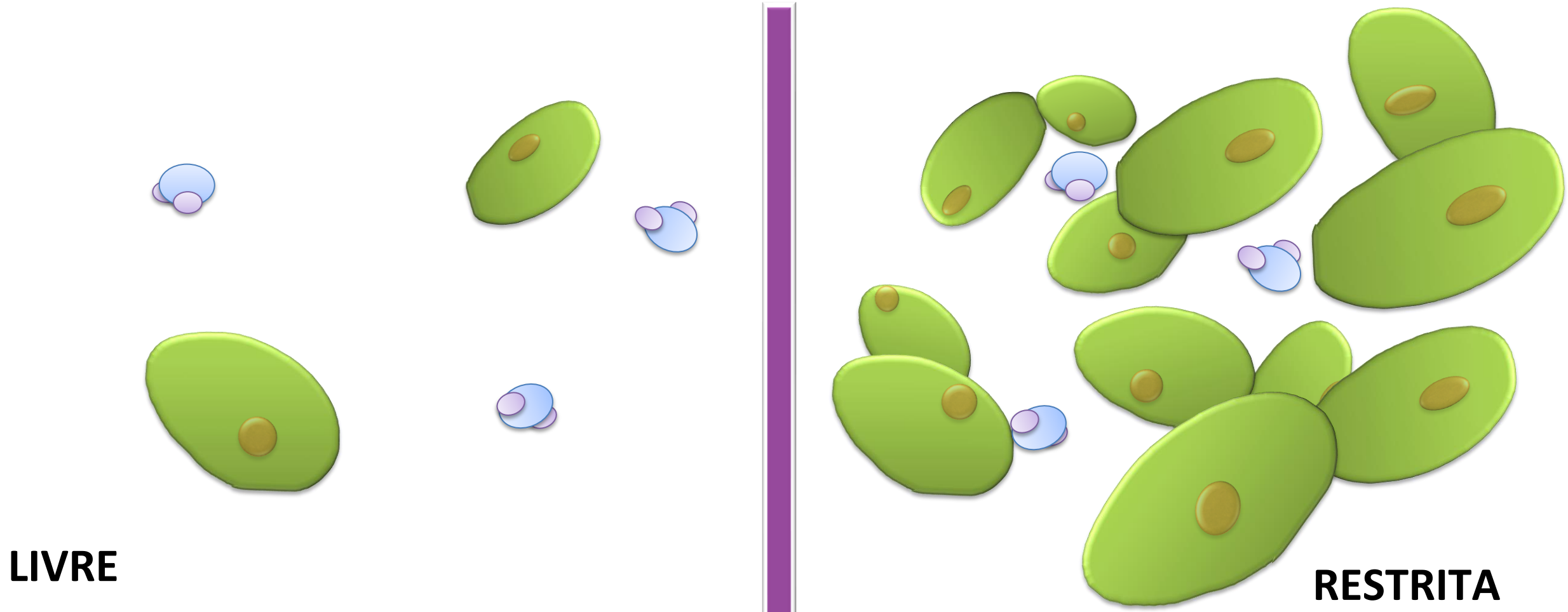
Ressonância Magnética

- Gordura?



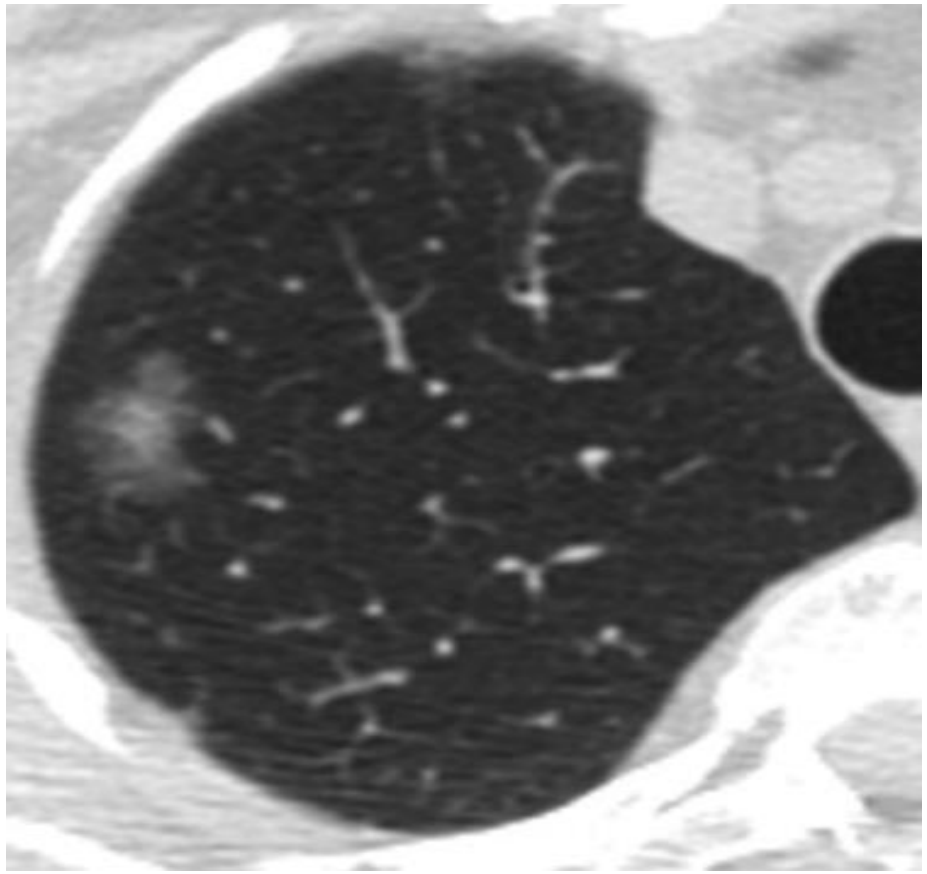
Hochhegger B, et al AJR 2012

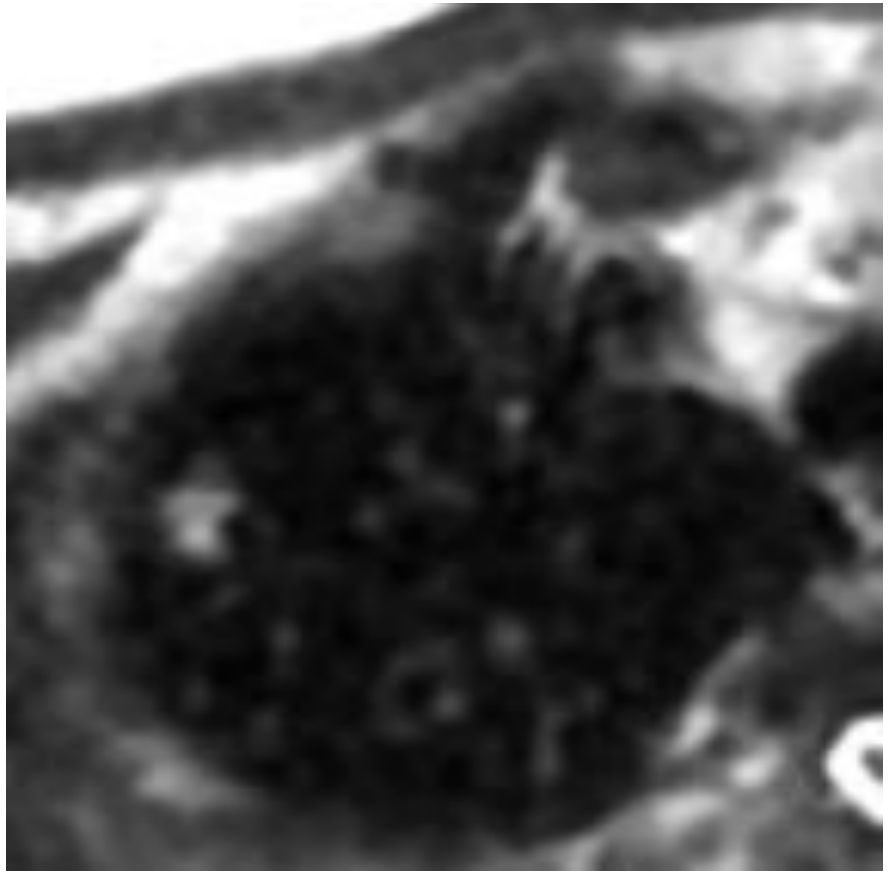
Ressonância Magnética – Difusão



Ressonância Magnética – Difusão

- Nódulo semissólido



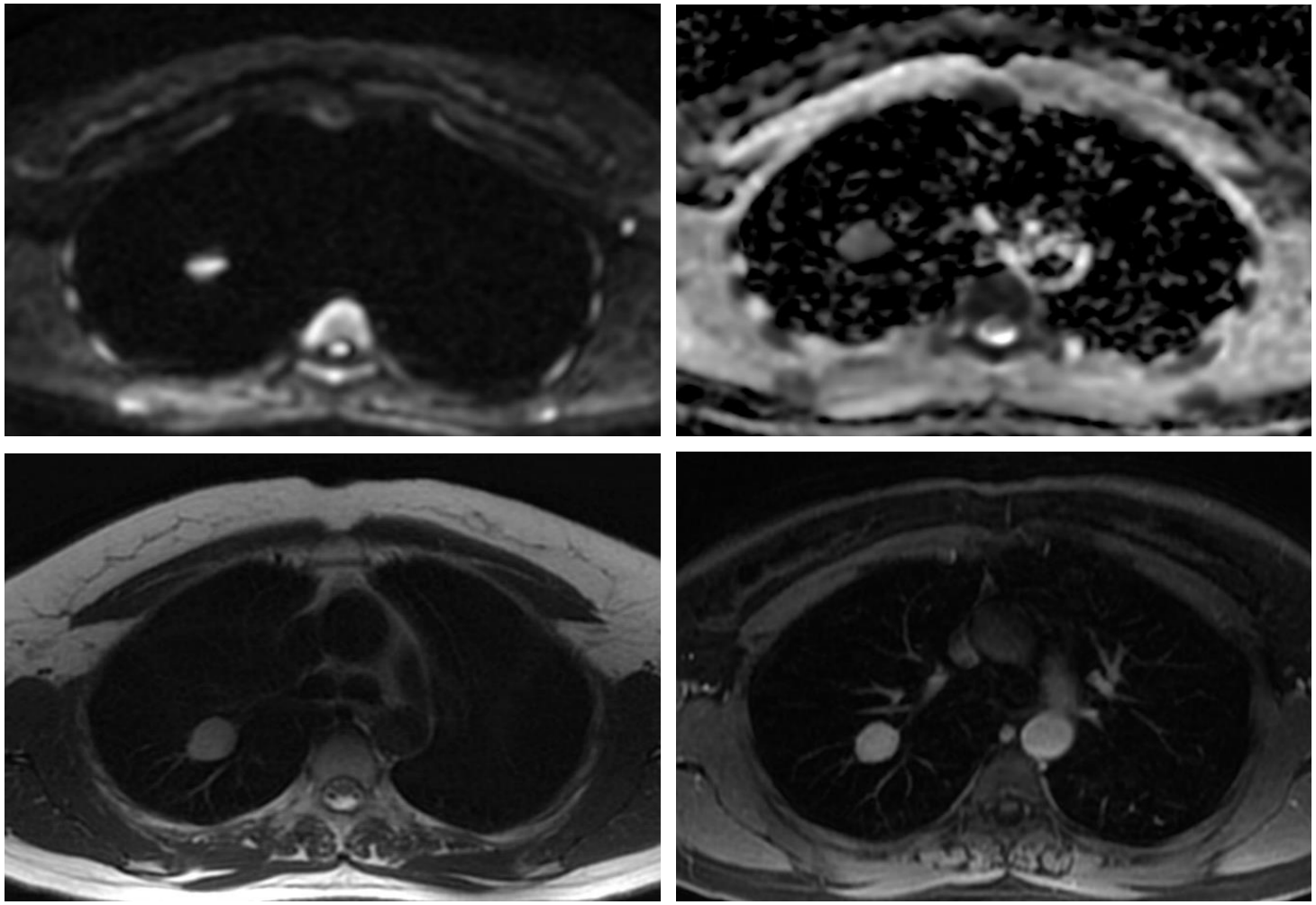


ADENOCARCINOMA *IN SITU*

Dr. Arthur Soares de Souza Jr.

Ressonância Magnética – Difusão

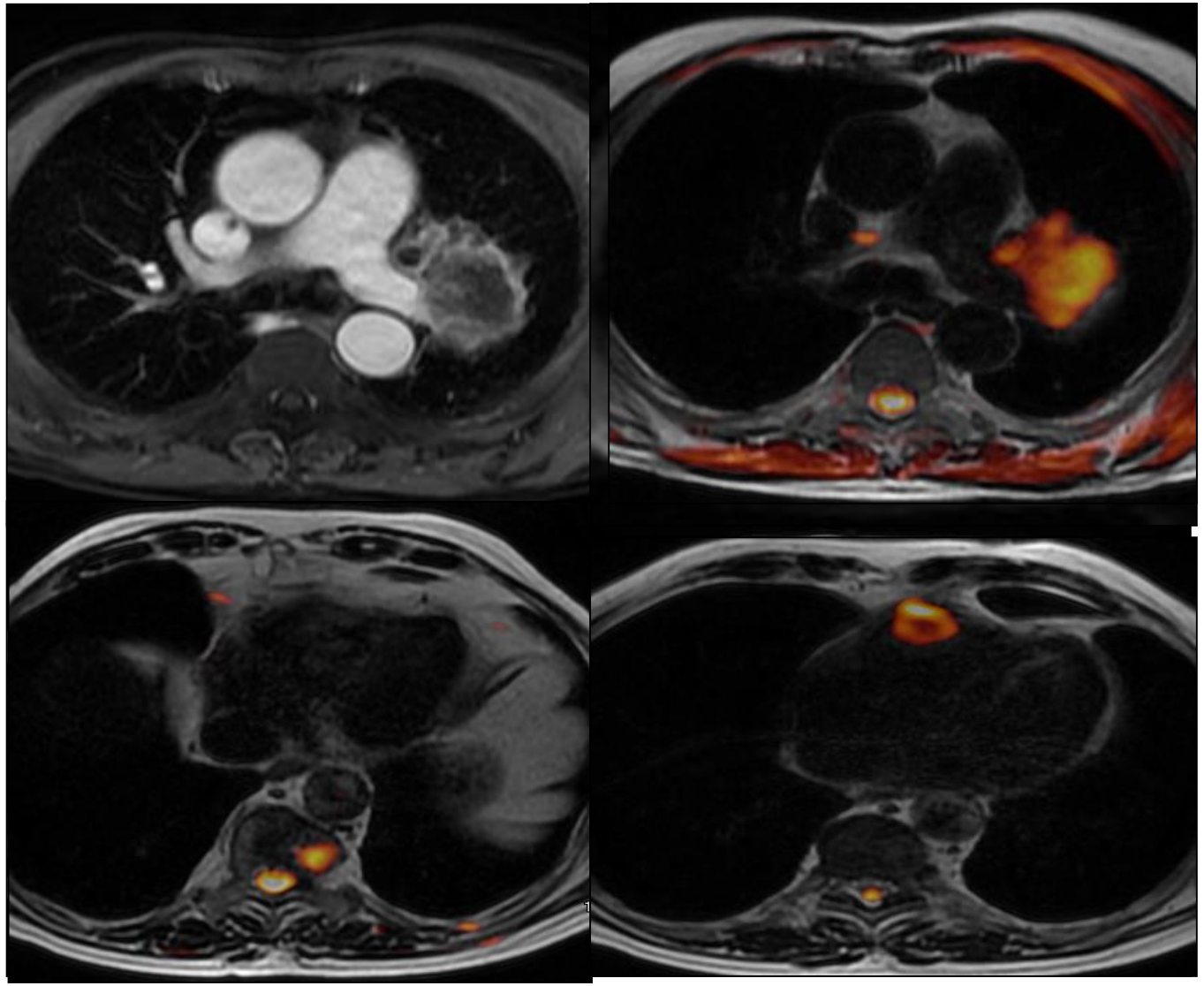
F, 43 anos



TU CARCINOIDE

Ressonância Magnética – Difusão

M, 68 anos



CEC PULMÃO

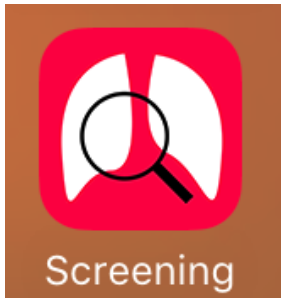
Conclusões

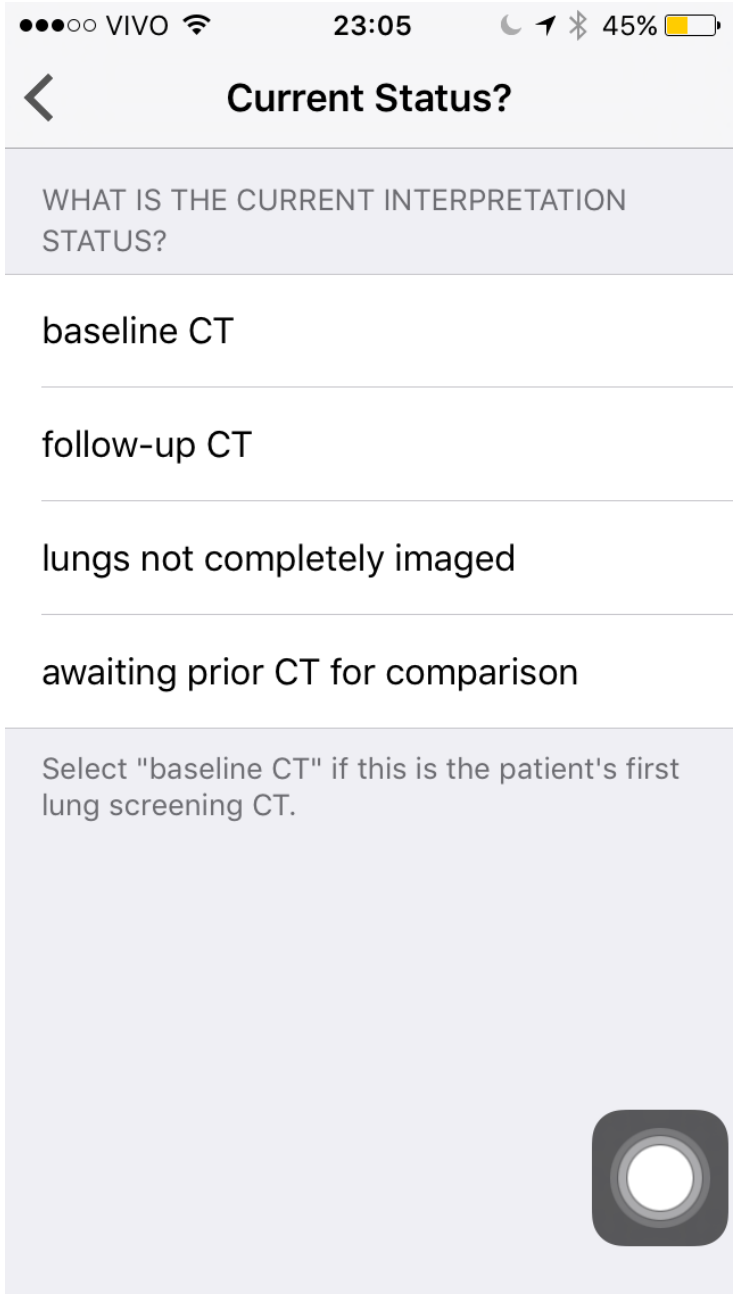
- Estratificação dos pacientes quanto ao risco de malignidade é essencial para o manejo do NPS
- Obtenção de exames prévios para comparação
- Fleischner x Lung-RADS
- Seguimento dos NVF/Semissólidos difere dos nódulos sólidos
- Manejo estratégico envolve PET/CT
- Perspectiva da RM

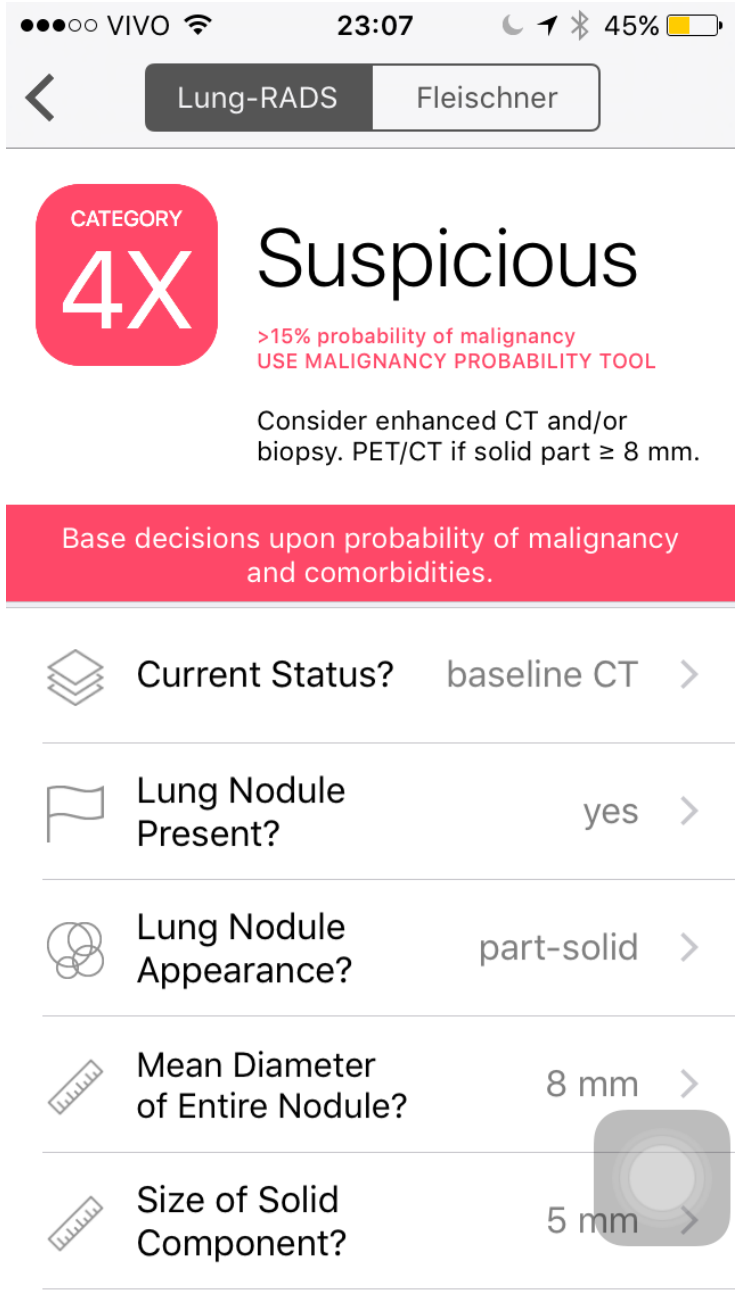
Conclusões

- CADA PACIENTE É UM PACIENTE!
  (cada Instituição é uma Instituição)
- Para cálculos de probabilidades veja:
  - http:/www.chestx-ray.com/SPN/SPNProb.html
- VIGILÂNCIA: Bom senso!

Dica


Screening


VIVO 23:05 45%
Current Status?
WHAT IS THE CURRENT INTERPRETATION STATUS?
baseline CT
follow-up CT
lungs not completely imaged
awaiting prior CT for comparison
Select "baseline CT" if this is the patient's first lung screening CT.


VIVO 23:07 45%
Lung-RADS
Fleischner
CATEGORY
4X
Suspicious
>15% probability of malignancy
USE MALIGNANCY PROBABILITY TOOL
Consider enhanced CT and/or biopsy. PET/CT if solid part ≥ 8 mm.
Base decisions upon probability of malignancy and comorbidities.
Current Status? baseline CT
Lung Nodule Present? yes
Lung Nodule Appearance? part-solid
Mean Diameter of Entire Nodule? 8 mm
Size of Solid Component? 5 mm

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A Beneficência
Portuguesa
de São Paulo

Parceria:

AstraZeneca