Clínica Universitária de Radiologia
ADI Associação para o Desenvolvimento da Imagiologia nos CHUC
CHUC CENTRO HOSPITALAR E UNIVERSITÁRIO DE COIMBRA

Reunião bibliográfica

António Pedro Pissarra

"Standard-, reduced-, and no- Dose Thin-section radiologic examinations: Comparison of Capability for Nodule Detection and Nodule Type Assessment in Patients Suspected of Having Pulmonary Nodules"

22 de Março de 2017

Serviço de Imagem Médica
Dir.: Prof. Doutor Filipe Caseiro Alves

Radiology

Yoshiharu Ohno, MD, PhD
Hisanobu Koyama, MD, PhD
Takeshi Yoshikawa, MD, PhD
Yuji Kishida, MD
Shinichiro Seki, MD, PhD
Daisuke Takenaka, MD
Masao Yui, MS
Mitsue Miyazaki, PhD
Kazuro Sugimura, MD

Standard-, Reduced-, and No-Dose Thin-Section Radiologic Examinations: Comparison of Capability for Nodule Detection and Nodule Type Assessment in Patients Suspected of Having Pulmonary Nodules[1]

ORIGINAL RESEARCH ■ THORACIC IMAGING

http://dx.doi.org/10.1148/radiol.2017161037

INTRODUÇÃO

TAC torácica é rotineiramente utilizada na deteção e caracterização de nódulos pulmonares

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 at 3 months, PET/CT, or tissue sampling	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 at 3 months, PET/CT, or tissue sampling	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).

B: Subsolid Nodules*

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

Tipo e tamanho de nódulo são marcadores eficazes na estratificação de risco e permitem decidir a estratégia de follow-up

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

INTRODUÇÃO

Mais recentemente tem sido utilizada RM pulmonar com UTE (ultrashort echo time) na avaliação quantitativa das alterações do parênquima em doentes com **DPOC** e **doenças do interstício associadas às doenças do tecido conjuntivo**

JOURNAL OF MAGNETIC RESONANCE IMAGING 41:1465–1474 (2015)

Original Research

Ultra-short Echo-Time Pulmonary MRI: Evaluation and Reproducibility in COPD Subjects With and Without Bronchiectasis

Weijing Ma, PhD,[1] Khadija Sheikh, BSc,[1,2] Sarah Svenningse
Damien Pike, BSc,[1,2] Fumin Guo, MSc,[1,3] Roya Etemad-Rez
Jonathan Leipsic, MD,[5] Harvey O. Coxson, PhD,[5] David G. M
and Grace Parraga, PhD[1,2,3,4*]

Contents lists available at SciVerse ScienceDirect

European Journal of Radiology

journal homepage: www.elsevier.com/locate/ejrad

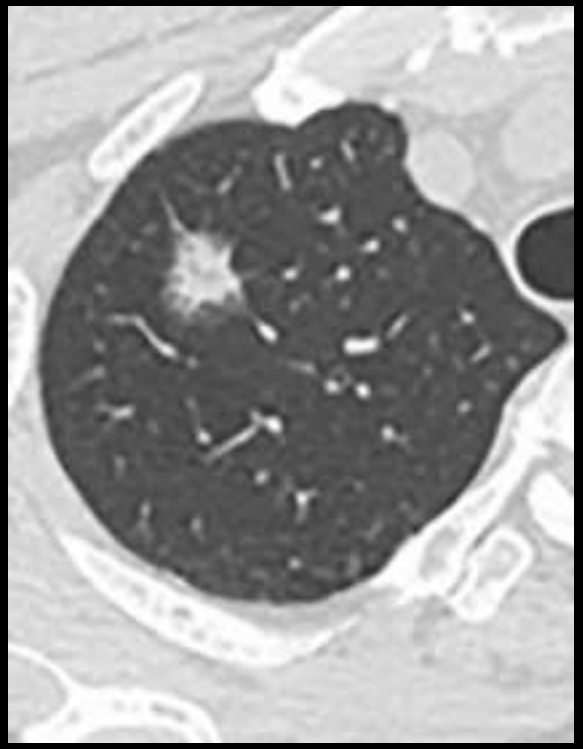
Pulmonary MR imaging with ultra-short TEs: Utility for disease severity assessment of connective tissue disease patients

Yoshiharu Ohno[a,b,*], Mizuho Nishio[b], Hisanobu Koyama[c], Daisuke Takenaka[c,d], Masaya Takahashi[e], Takeshi Yoshikawa[a,b], Sumiaki Matsumoto[a,b], Makoto Obara[f], Marc van Cauteren[f], Kazuro Sugimura[c]

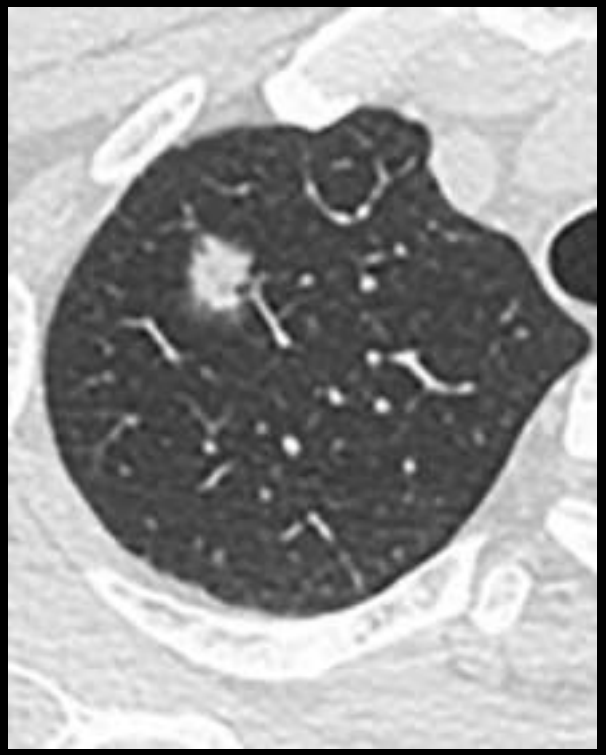
[a] Advanced Biomedical Imaging Research Center, Kobe University Graduate School of Medicine, Kobe, Hyogo, Japan
[b] Division of Functional and Diagnostic Imaging Research, Department of Radiology, Kobe University Graduate School of Medicine, Kobe, Hyogo, Japan
[c] Division of Radiology, Department of Radiology, Kobe University Graduate School of Medicine, Kobe, Hyogo, Japan
[d] Department of Radiology, Hyogo Cancer Center, Akashi, Hyogo, Japan
[e] Advanced Imaging Research Center, Department of Radiology, University of Texas Southwestern Medical Center, Houston, TX, USA
[f] Philips Electronics Japan, Tokyo, Japan

OBJECTIVOS

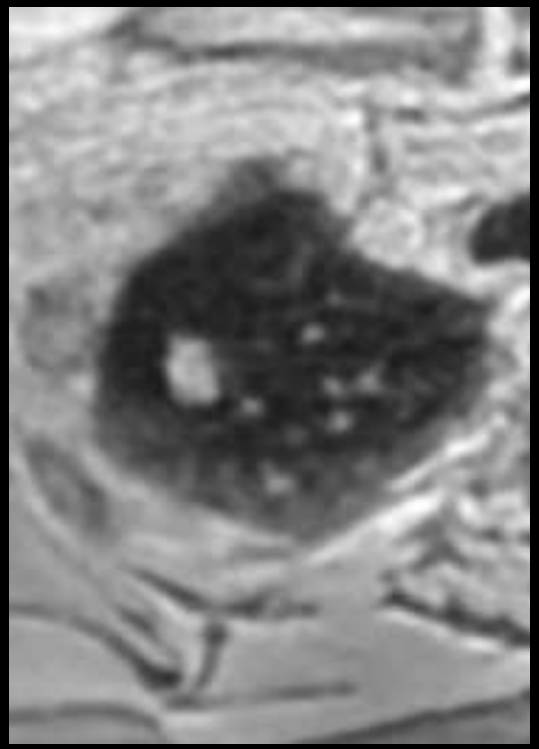
Ausência de estudos que estabeleçam uma comparação directa entre TAC torácica (dose standard e baixa dose) e RM torácica (UTE) na **deteção e caracterização** de **nódulos** pulmonares



TAC torácica (dose standard)



TAC torácica (baixa dose)



RM pulmonar (UTE)

MATERIAIS E MÉTODOS

- Estudo desenvolvido entre Dezembro de 2014 e Março de 2015

63 doentes consecutivos com suspeita da existência de doença pulmonar (radiografia torácica ou TC torácica anterior)

11 doentes excluídos

a) <18 anos
b) Grávidas
c) CI à realização de RM
d) Nódulos < 4 mm ou Ø nódulos
e) Nódulos calcificados
f) Silicose

52 doentes

29 ♂ → Idade média 66,4 anos (DP 7,3)

23 ♀ → Idade média 64,8 anos (DP 10,1)

MATERIAIS E MÉTODOS

- Todos os doentes realizaram **TC Torácica (dose standard e baixa dose)** e **RM pulmonar** no espaço de uma semana (média 2,3 dias ± 0,7)

TAC torácica (dose standard)

Aquilion ONE; Toshiba Medical Systems (320 cortes);
Corrente de tubo = **250 mA;**
Tensão, *Pitch* e rotação da gantry não modificados;
Espessura de corte **= 1 mm (cortes contíguos);**
Aquisição durante inspiração máxima;
FOV 35 cm.

https://medical.toshiba.com/products/computed-tomography/aquilion-one-family/

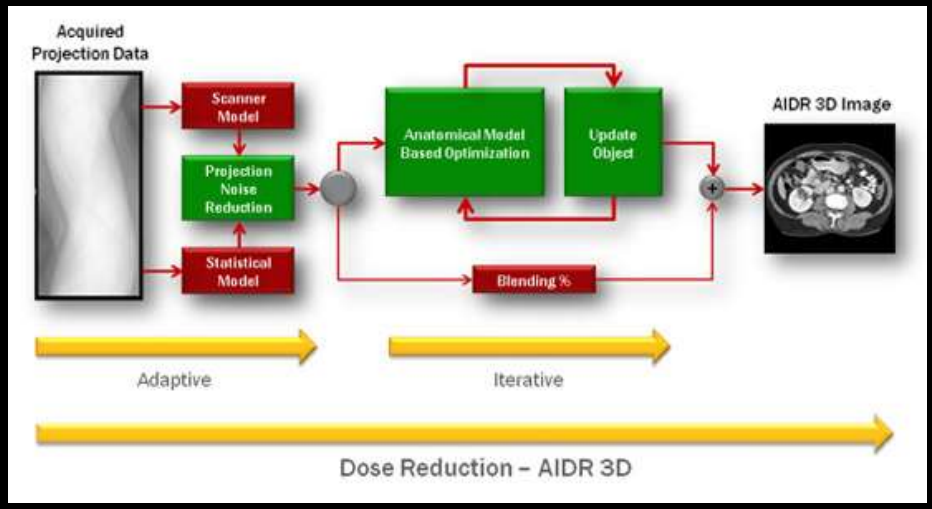
MATERIAIS E MÉTODOS

TAC torácica (dose reduzida)

Aquilion ONE; Toshiba Medical Systems (320 cortes);
Espessura de corte = 1 mm (cortes contíguos);
Tensão, Pitch e rotação da gantry não alterados;
Aquisição durante inspiração máxima;
FOV 35 cm.

Corrente de tubo = 60 mA;

Reconstrução iteractiva (Toshiba AIDR - Adaptive Iterative Dose Reduction)



http://www.toshibamedicalsystems.com/products/ct/aquilionone_function.html

RESULTADOS

"Volumetric CT dose index was obtained with ***low- and standard-dose CT and was set at 2.7 mGy and 11.3 mGy, respectively, in this study"***

Índice de dose em Tomografia Computorizada; volume ($CTDI_{vol}$) (Gy) = $CTDI_w$/ Pitch

Produto dos comprimento para séries de cortes (DLP) (mGy.cm) = $CTDI_{vol}$ x comprimento do varrimento do exame

Dose efectiva (mSv) = DLP * k (Coeficientes de ponderação baseado no DLP)

Table 3. Normalized effective dose per dose-length product (DLP) for adults (standard physique) and pediatric patients of various ages over various body regions. Conversion factor for adult head and neck and pediatric patients assume use of the head CT dose phantom (16 cm). All other conversion factors assume use of the 32-cm diameter CT body phantom[78,79]

Region of Body	*k (mSv mGy⁻¹ cm⁻¹)*				
	0 year old	*1 year old*	*5 year old*	*10 year old*	*Adult*
Head and neck	0.013	0.0085	0.0057	0.0042	0.0031
Head	0.011	0.0067	0.0040	0.0032	0.0021
Neck	0.017	0.012	0.011	0.0079	0.0059
Chest	0.039	0.026	0.018	0.013	0.014
Abdomen ≈& pelvis	0.049	0.030	0.020	0.015	0.015
Trunk	0.044	0.028	0.019	0.014	0.015

RESULTADOS

Produto dos comprimento para séries de cortes (DLP) (mGy.cm) = $CTDI_{vol}$ x comprimento do varrimento do exame

11,3x35 = 395,5 mGy.cm (dose standard)

2,7x35 = 94,5 mGy.cm (dose reduzida)

Dose efectiva (mSv) = DLP * k (0,014 em estudo torácico no adulto)

395,5x0,014 = 5,53 mSv (dose standard)

94,5x0,014 = 1,32 mSv (dose reduzida)

Tabela de Equivalências Dosimétricas

Exame	Dose (mSv)	Nº Rx Torax	Rad. Natural
Tórax	0'02	1	3 dias
Abdomen	1	50	6 meses
C. Lombar	1'3	65	7 meses
U.I.V.	2'5	125	14 meses
Trânsito E.G.D.	3	150	16 meses
Clister Opaco	7	350	3,2 anos
TC Crânio	2'3	115	1 ano
TC Tórax	8	400	3,6 anos
TC Abdomen	10	500	4,5 anos

5,53 mSv (dose standard) = 277 radiografias do tórax

1,32 mSv (dose reduzida) = 66 radiografias do tórax

MATERIAIS E MÉTODOS

RM Pulmonar

Vantage Titan 3T; Toshiba Medical Systems;
Antena de superficie “phased-array” com 16 canais;
Sincronização respiratória;
Sequência de pulso GRE (TR 4 ms; TE 110–192 µsec);
Flip angle 5º;
Isovoxel (1x1x1 mm);
Reconstrução nos planos axial e coronal.

http://www.toshiba-medical.eu/eu/product-solutions/magnetic-resonance-imaging/vantage-titan-3t/

Tempo de aquisição médio = 7 minutos (máximo de 10 min.)

MATERIAIS E MÉTODOS

TAC torácica (dose standard)
avaliada por 2 radiologistas torácicos
(13 e 25 anos de experiência)

Tamanho
Tipo de nódulo

Sólido
Parcialmente sólido
Vidro despolido

Table 1

Patient Characteristics

Characteristic	Finding
No. of each nodule type in all diameter groups	
SN	
4–6 mm	38
6–8 mm	19
8–15 mm	65
>15 mm	33
PSN	
4–6 mm	3
6–8 mm	5
8–15 mm	9
>15 mm	12
GGN	
4–6 mm	17
6–8 mm	11
8–15 mm	27
>15 mm	4
No. of nodules per patient (cases)	
1	9
2–4	21
5–10	21
>10	1

Resultados usados como referência para a comparação entre métodos

MATERIAIS E MÉTODOS

- Imagens das três modalidades foram randomizadas e analisadas por outros 2 radiologistas (21 e 22 anos de experiência em radiologia torácica, 5 anos de experiência em RM pulmonar);
- Sem acesso aos resultados obtidos nos diferentes estudos;
- Intervalo de análise de TAC/RM superior a um mês.

MATERIAIS E MÉTODOS

Comparação TC/RM: **capacidade de deteção de nódulos**

1. Ausente
2. Provavelmente ausente
3. Incerto
4. Provavelmente presente
5. Presente

Comparação TC/RM: **caracterização de nódulos**

1. Não identificado
2. Sólido
3. Sub-sólido → i. Vidro despolido; ii. Parcialmente sólido

MATERIAIS E MÉTODOS

Análise estatística: **capacidade de deteção de nódulos**

- Análise JAFROC (jackknife free-response receiver operating characteristic)
  - Método de análise de dados *multiple-reader multiple-case* utilizado para comparar a performance de diferentes modalidades em que o radiologista avalia cada doente segundo a probabilidade da existência de doença;
  - maior poder estatístico que curvas ROC;
  - obtenção da figura de mérito (0-1) para cada um dos observadores e de seguida para cada um dos métodos.

1. Ausente
2. Provavelmente ausente
3. Incerto
4. Provavelmente presente
5. Presente

MATERIAIS E MÉTODOS

Análise estatística: **caracterização de nódulos**

- Índice de k para determinar concordância inter-observador e inter-modalidade na caracterização dos nódulos identificados;

1. Não identificado
2. Sólido
3. Sub-sólido (Vidro despolido/parcialmente sólido)

- k < 0,21 pobre
- k 0,21-0,4 razoável
- k 0,41-0,6 moderada
- k 0,61-0,8 substancial
- k 0,81-1 excelente

RESULTADOS

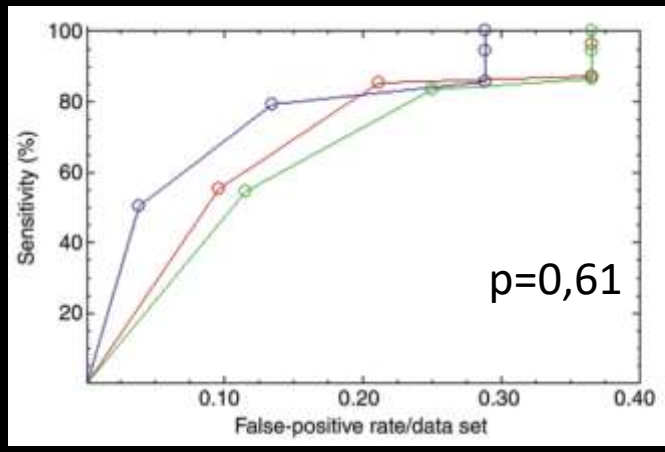
Capacidade de deteção de nódulos

Detection Rate of Each Method in All Nodule Type and Diameter Groups

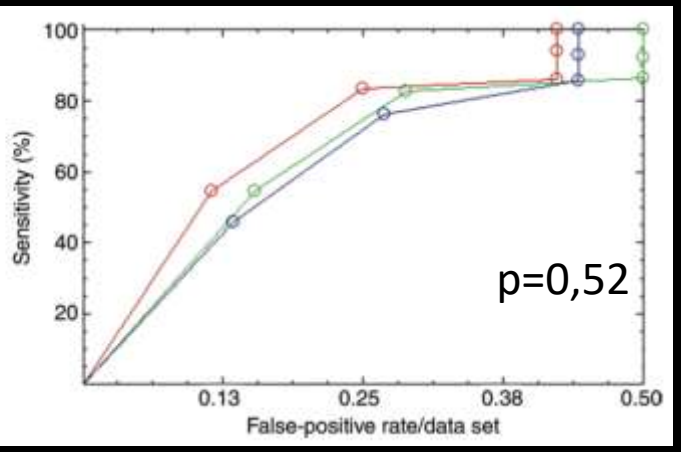
Reader, Method, and Nodule Type	Nodule Diameter			
	4–6 mm	6–8 mm	8–15 mm	>15 mm
Reader 1				
Standard-dose CT				
Total	84.5 (49/58)	100 (35/35)	100 (101/101)	100 (49/49)
GGN	58.8 (10/17)	100 (11/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	100 (38/38)	100 (19/19)	100 (65/65)	100 (33/33)
Reduced-dose CT				
Total	81.0 (47/58)	94.3 (33/35)	100 (101/101)	100 (49/49)
GGN	47.1 (8/17)	81.8 (9/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	100 (38/38)	100 (19/19)	100 (65/65)	100 (33/33)
Pulmonary MR imaging with UTE				
Total	81 (47/58)	94.3 (33/35)	100 (101/101)	100 (49/49)
GGN	51.7 (8/17)	81.8 (9/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	100 (38/38)	100 (19/19)	100 (65/65)	100 (33/33)
Reader 2				
Standard-dose CT				
Total	77.6 (45/58)	97.1 (34/35)	100 (101/101)	100 (49/49)
GGN	41.2 (7/17)	90.9 (10/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	97.4 (37/38)	100 (19/19)	100 (65/65)	100 (33/33)
Reduced-dose CT				
Total	69.0 (40/58)	97.1 (34/35)	100 (101/101)	100 (49/49)
GGN	35.3 (6/17)	90.9 (10/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	86.8 (33/38)	100 (19/19)	100 (65/65)	100 (33/33)
Pulmonary MR imaging with UTE				
Total	72.4 (42/58)	97.1 (34/35)	100 (101/101)	100 (49/49)
GGN	35.3 (6/17)	90.9 (10/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	92.1 (35/38)	100 (19/19)	100 (65/65)	100 (33/33)
Consensus reading				
Standard-dose CT				
Total	74.1 (43/58)	97.1 (34/35)	100 (101/101)	100 (49/49)
GGN	35.3 (6/17)	90.9 (10/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	94.7 (36/38)	100 (19/19)	100 (65/65)	100 (33/33)
Reduced-dose CT				
Total	74.1 (43/58)	94.3 (33/35)	100 (101/101)	100 (49/49)
GGN	35.3 (6/17)	81.8 (9/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	94.7 (36/38)	100 (19/19)	100 (65/65)	100 (33/33)
Pulmonary MR imaging with UTE				
Total	74.1 (43/58)	94.3 (33/35)	100 (101/101)	100 (49/49)
GGN	35.3 (6/17)	81.8 (9/11)	100 (27/27)	100 (4/4)
PSN	33.3 (1/3)	100 (5/5)	100 (9/9)	100 (12/12)
SN	94.7 (36/38)	100 (19/19)	100 (65/65)	100 (33/33)

RESULTADOS

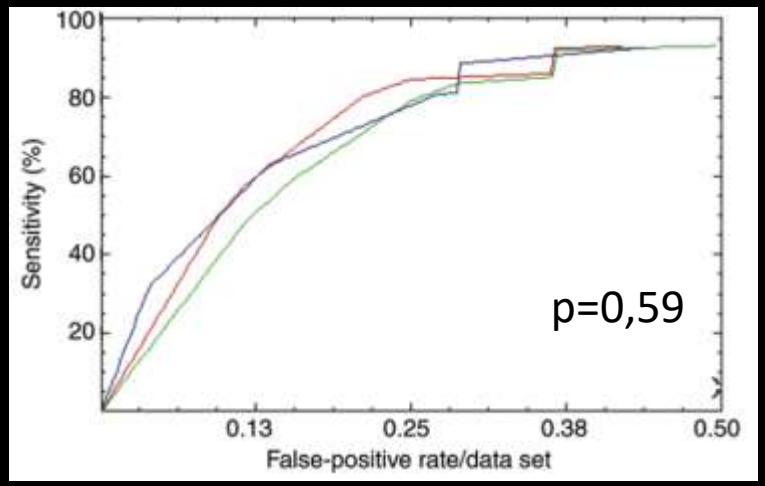
Análise JAFROC: **capacidade de deteção de nódulos**



Radiologista 1



Radiologista 2



Consenso gerado por computador

RM pulmonar

TAC (standard)

TAC (baixa dose)

RESULTADOS

Análise JAFROC: **capacidade de deteção de nódulos**

Table 2

Assessment of Nodule Detection Capability of Three Methods

Reader and Method	FOM	Sensitivity (%)	False-Positive Rate	Specificity (%)
Reader 1				
Standard-dose CT	0.87	96.3 (234/243)	0.37 per data set	99.6 per data set
Reduced-dose CT	0.86	94.7 (230/243)	0.37 per data set	99.6 per data set
Pulmonary MR imaging with UTE	0.91	94.7 (230/243)	0.29 per data set	99.7 per data set
Reader 2				
Standard-dose CT	0.85	94.2 (229/243)	0.42 per data set	99.6 per data set
Reduced-dose CT	0.81	92.2 (224/243)	0.50 per data set	99.5 per data set
Pulmonary MR imaging with UTE	0.81	93.0 (226/243)	0.44 per data set	99.6 per data set
Consensus assessment				
Standard-dose CT	0.86	93.4 (227/243)	0.42 per data set	99.6 per data set
Reduced-dose CT	0.84	93.0 (226/243)	0.50 per data set	99.5 per data set
Pulmonary MR imaging with UTE	0.86	93.0 (226/243)	0.44 per data set	99.6 per data set

Ausência de diferença estatisticamente significativa entre os três métodos

RESULTADOS

Índice de k: **caracterização de nódulos**

Table 4

Interobserver Agreement for Classification as Missed Nodule, SSN, or SN with Each Method

Method and Reader	Visual Classification: SSN	SN	Missed Nodule	κ Value	*P* Value
Standard-dose CT	...	...	...	0.95 (0.97, 1.00)	<.001
Reader 1	79	155	9	...	...
Reader 2	75	154	14	...	...
Reduced-dose CT	...	...	...	0.94 (0.97, 0.99)	<.001
Reader 1	75	155	13	...	...
Reader 2	74	150	19	...	...
Pulmonary MR imaging with UTE	...	...	...	0.95 (0.97, 1.00)	<.001
Reader 1	75	155	13	...	...
Reader 2	74	152	17	...	...

Note.—Unless otherwise indicated, data are number of nodules. Data in parentheses are 95% CI.

Table 5

Intermethod Agreement for Classification as Missed Nodule, SSN, or SN Based on Consensus Assessment

Method	Visual Classification: SSN	SN	Missed Nodule	κ Value	*P* Value
Standard-dose CT vs reduced-dose CT	...	...	...	0.98 (0.95, 1.00)	<.001
Standard-dose CT	74	153	16	...	...
Reduced-dose CT	73	153	17	...	...
Standard-dose CT vs pulmonary MR imaging with UTE	...	...	...	0.98 (0.95, 1.00)	<.001
Standard-dose CT	74	153	16	...	...
Pulmonary MR imaging with UTE	73	153	17	...	...
Reduced-dose CT vs pulmonary MR imaging with UTE	...	...	...	0.99 (0.98, 1.00)	<.001
Reduced-dose CT	73	153	17	...	...
Pulmonary MR imaging with UTE	73	153	17	...	...

Note.—Unless otherwise indicated, data are number of nodules. Data in parentheses are 95% CI.

k < 0,21 pobre
k 0,21-0,4 razoável
k 0,41-0,6 moderada
k 0,61-0,8 substancial
k 0,81-1 excelente

RESULTADOS

Índice de k: **caracterização de nódulos**

Table 6

Interobserver Agreement for Classification as Missed Nodule, GGN, PSN, or SN with Each Method

Method and Reader	Visual Classification: GGN	PSN	SN	Missed Nodule	κ Value	*P* Value
Standard-dose CT	...	...	...	...	0.95 (0.97, 1.00)	<.001
Reader 1	52	27	155	9	...	...
Reader 2	48	27	154	14	...	...
Reduced-dose CT	...	...	...	...	0.94 (0.90, 0.98)	<.001
Reader 1	48	27	155	13	...	...
Reader 2	47	27	150	19	...	...
Pulmonary MR imaging with UTE	...	...	...	...	0.95 (0.97, 1.00)	<.001
Reader 1	48	27	155	13	...	...
Reader 2	47	27	152	17	...	...

Note.—Unless otherwise indicated, data are number of nodules. Data in parentheses are 95% CI.

Table 7

Intermethod Agreement for Classification as Missed Nodule, GGN, PSN, or SN Based on Consensus Assessment

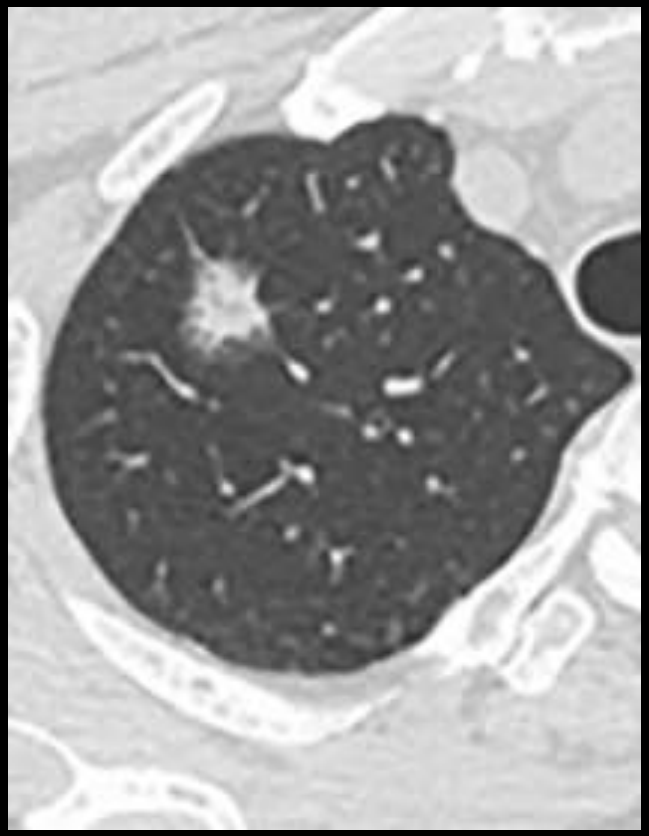
Method	Visual Classification: GGN	PSN	SN	Missed Nodule	κ Value	*P* Value
Standard-dose CT vs reduced-dose CT	...	...	...	...	0.98 (0.95, 1.00)	<.001
Standard-dose CT	47	27	153	16	...	...
Reduced-dose CT	46	27	153	17	...	...
Standard-dose CT vs pulmonary MR imaging with UTE	...	...	...	...	0.98 (0.95, 1.00)	<.001
Standard-dose CT	47	27	153	16	...	...
Pulmonary MR imaging with UTE	46	27	153	17	...	...
Reduced-dose CT vs pulmonary MR imaging with UTE	...	...	...	...	0.99 (0.98, 1.00)	<.001
Reduced-dose CT	46	27	153	17	...	...
Pulmonary MR imaging with UTE	46	27	153	17	...	...

Note.—Unless otherwise indicated, data are number of nodules. Data in parentheses are 95% CI.

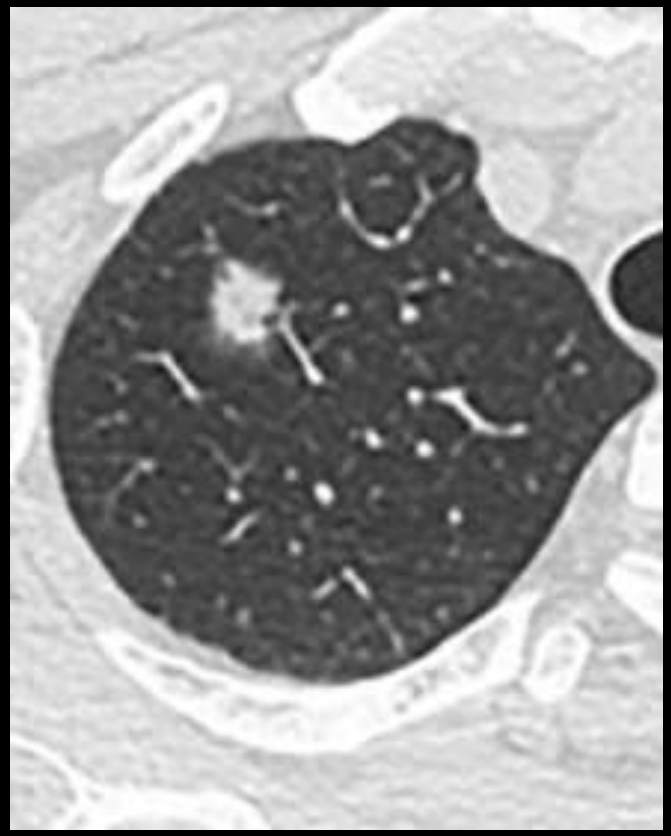
k < 0,21 pobre
k 0,21-0,4 razoável
k 0,41-0,6 moderada
k 0,61-0,8 substancial
k 0,81-1 excelente

RESULTADOS

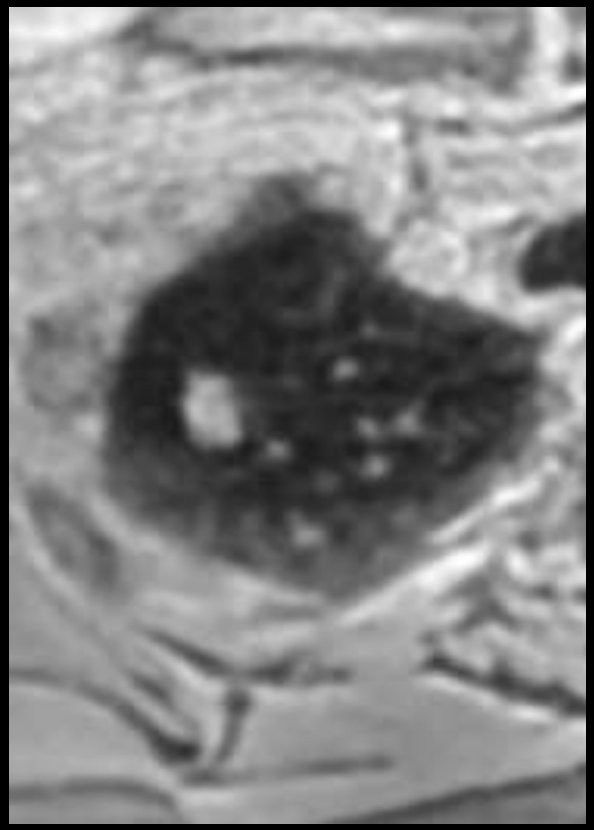
Nódulo sólido



TAC torácica (dose standard)



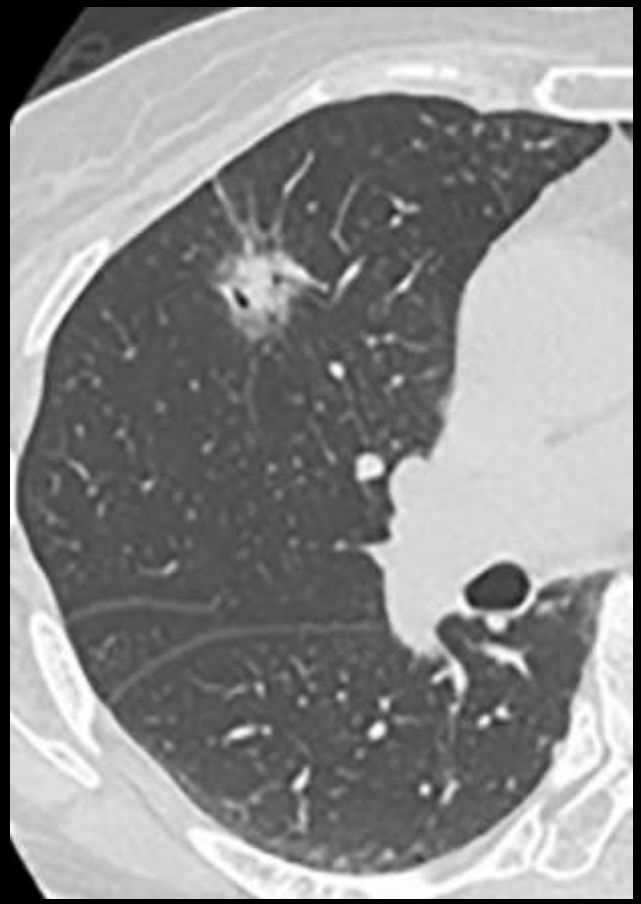
TAC torácica (baixa dose)



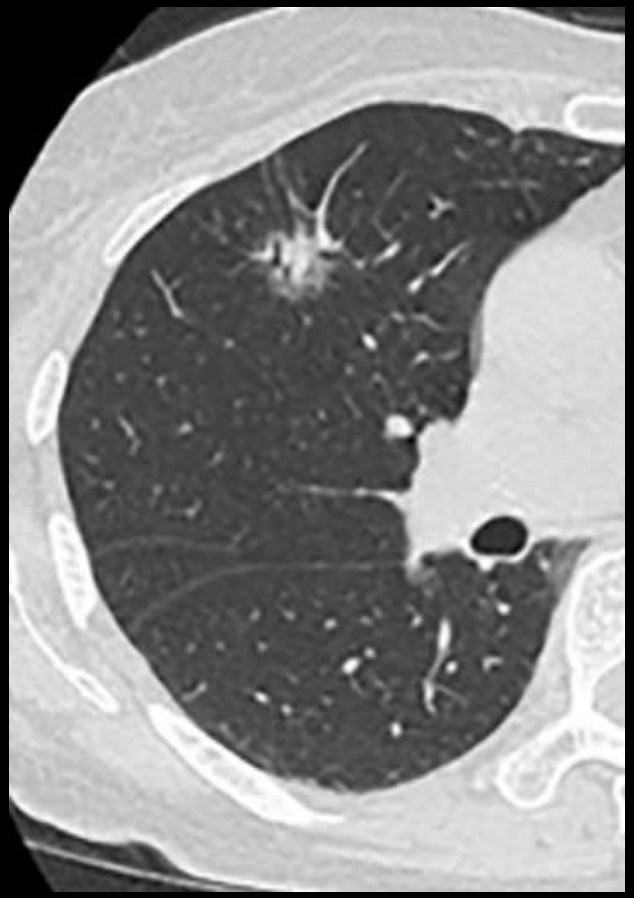
RM pulmonar

RESULTADOS

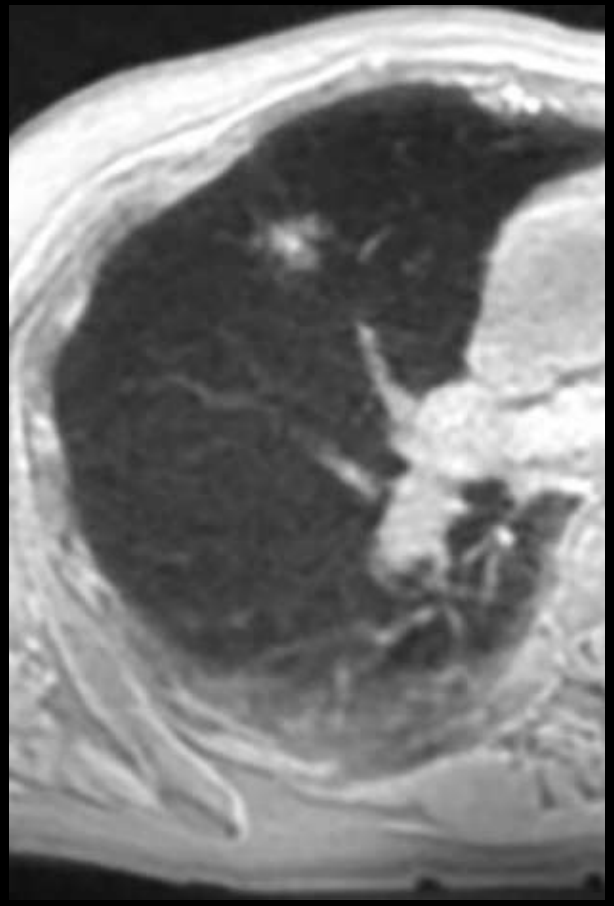
Nódulo parcialmente sólido



TAC torácica (dose standard)



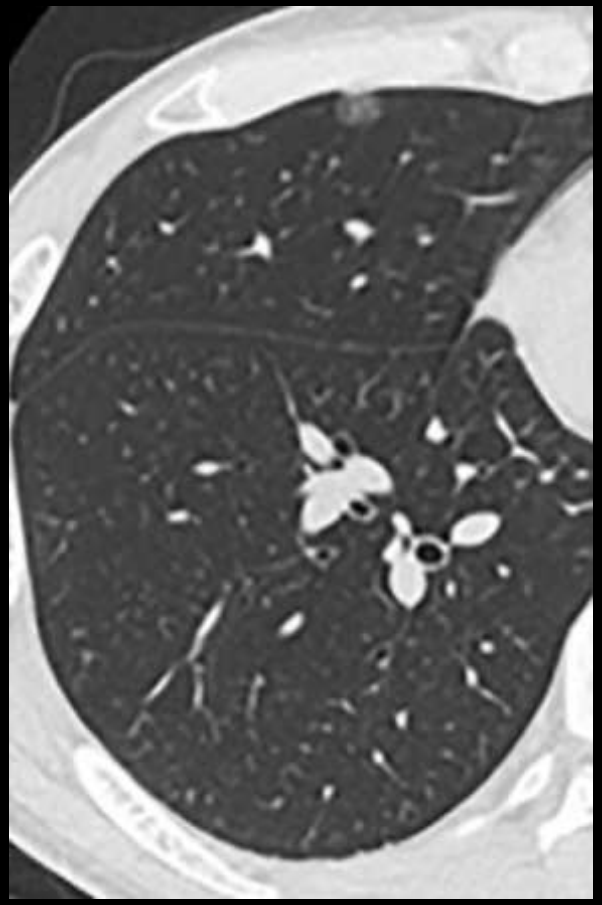
TAC torácica (baixa dose)



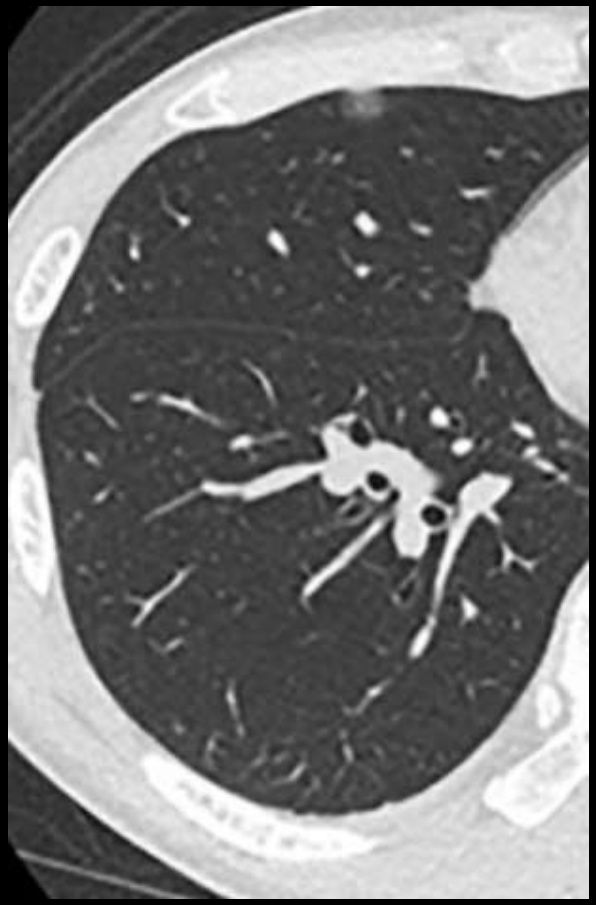
RM pulmonar

RESULTADOS

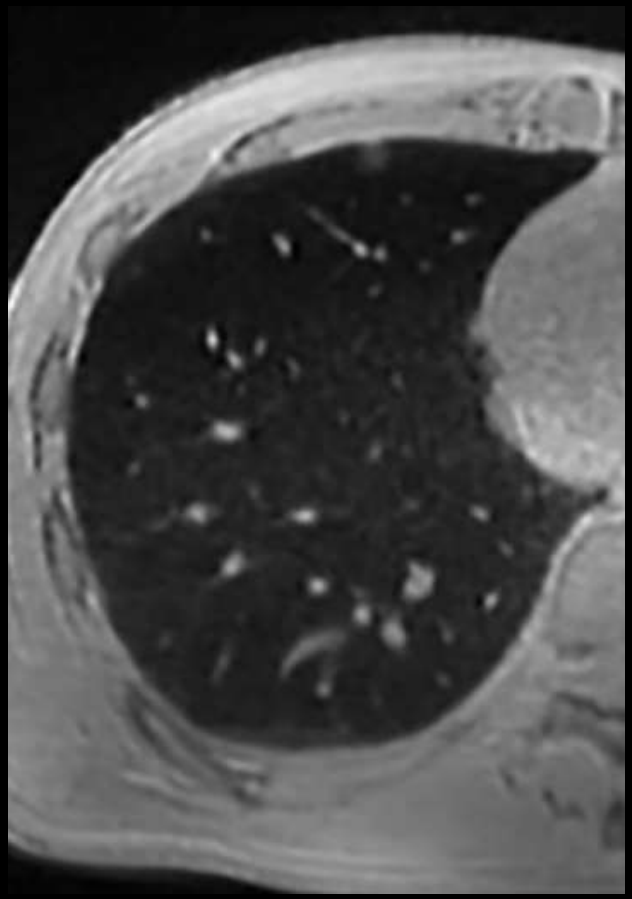
Nódulo em vidro despolido



TAC torácica (dose standard)



TAC torácica (baixa dose)



RM pulmonar

DISCUSSÃO

- Radiologistas (separadamente ou após consenso) não encontraram diferenças significativas na **<u>deteção</u>** de nódulos entre os três métodos (S, E e FOM semelhantes);

- Baixa taxa de falsos negativos: maioria dos nódulos não identificados correspondiam a nódulos com 4-6 mm, de todos os tipos;

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[a]	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, 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[b]	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	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[a]	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[b]	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: <6 mm (<100 mm³)	Size: ≥6 mm (>100 mm³)	Comments
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).

DISCUSSÃO

- Verificou-se concordância entre os diferentes métodos (TAC de dose standard, baixa dose e RM pulmonar) na avaliação do tipo de nódulos (k>0,94);

1. Não identificado
2. Sólido
3. Sub-sólido

1. Não identificado
2. Sólido
3. Vidro despolido
4. Parcialmente sólido

LIMITAÇÕES

- Doentes saudáveis não incluídos: redução progressiva do limiar de doença por parte do radiologista até encontrar achado anormal;
- Número e tamanho dos vários tipos de nódulos era diferente;
- Não foram avaliadas todas as características dos nódulos (forma, contornos, localização, indentação pleural, calcificação etc.), impossibilitando avaliar a real capacidade da RM pulmonar na caracterização de nódulos pulmonares
- Avaliação da presença de nódulos com base escalas de cincos pontos, quando na prática clínica é uma avaliação binária (S/N)

Avaliação em estudos futuros

CONCLUSÃO

- RM pulmonar com UTE é potencialmente tão eficaz na deteção e classificação dos nódulos como a TAC torácica (dose standard e baixa dose)

- Por não usar radiação ionizante poderá ter papel na prática clínica futura, nomeadamente para despiste da presença de lesões nodulares em doentes de risco, follow-up de lesões nodulares e avalição de tratamentos conservadores.

Clínica Universitária de Radiologia
ADI Associação para o Desenvolvimento da Imagiologia nos CHUC
CHUC CENTRO HOSPITALAR E UNIVERSITÁRIO DE COIMBRA

Reunião bibliográfica

António Pedro Pissarra

"Standard-, reduced-, and no- Dose Thin-section radiologic examinations: Comparison of Capability for Nodule Detection and Nodule Type Assessment in Patients Suspected of Having Pulmonary Nodules"

22 de Março de 2017

Serviço de Imagem Médica
Dir.: Prof. Doutor Filipe Caseiro Alves