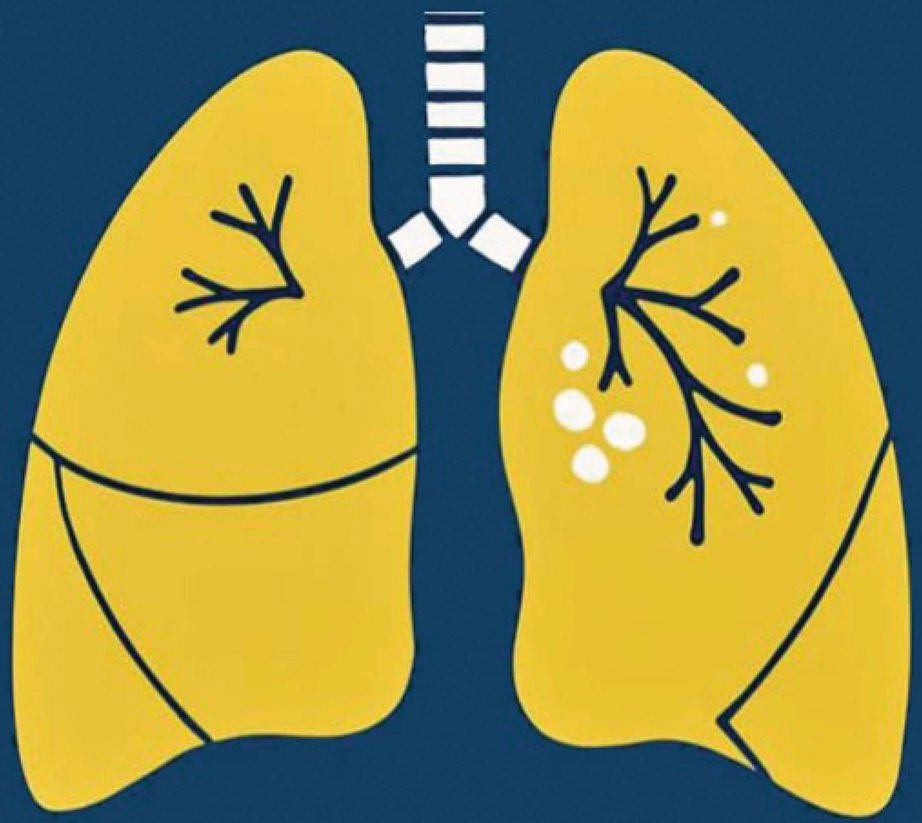
Dr. Rambod Salouti
Interventional radiologist
Iran Esfahan



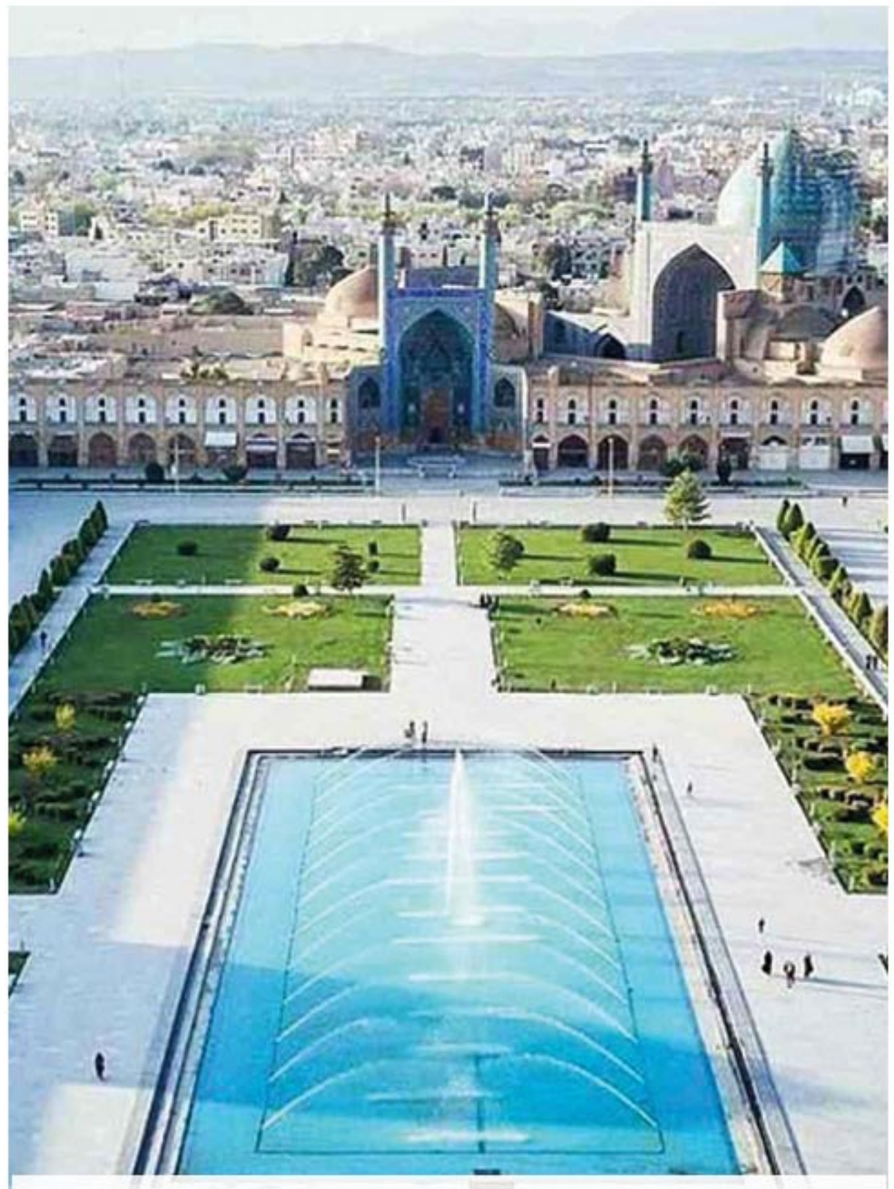
LUNG RADS

1

"Each small step you take is a powerful move towards achieving your greatest dreams and goals."

2

To Dorna,
whose presence is
the boundary
between exhaustion
and perseverance.



ISFAHAN-Nasghe Jahan Sq.

Lung-RADS (Lung Imaging Reporting and Data System), is a classification system to aid interpretation of findings in low-dose CT screening exams for lung cancer, and standardize follow-up and management decisions. The system is similar to the Fleischner criteria, but designed for the subset of patients intended for low-dose screening studies. The classification was updated in 2019 (Lung-RADS version 1.1 and 2022 (Lung-RADS v2022

Kastner J, Hossain R, Jeudy J et al. Lung-RADS Version 1.0 Versus Lung-RADS Version 1.1: Comparison of Categories Using Nodules from the National Lung Screening Trial. Radiology. 2021;300(1):199-206. doi:10.1148/radiol.2021203704 - Pubmed

American College of Radiology Committee on Lung-RADS®. Lung-RADS® v2022. American College of Radiology. 2022. Available from: link

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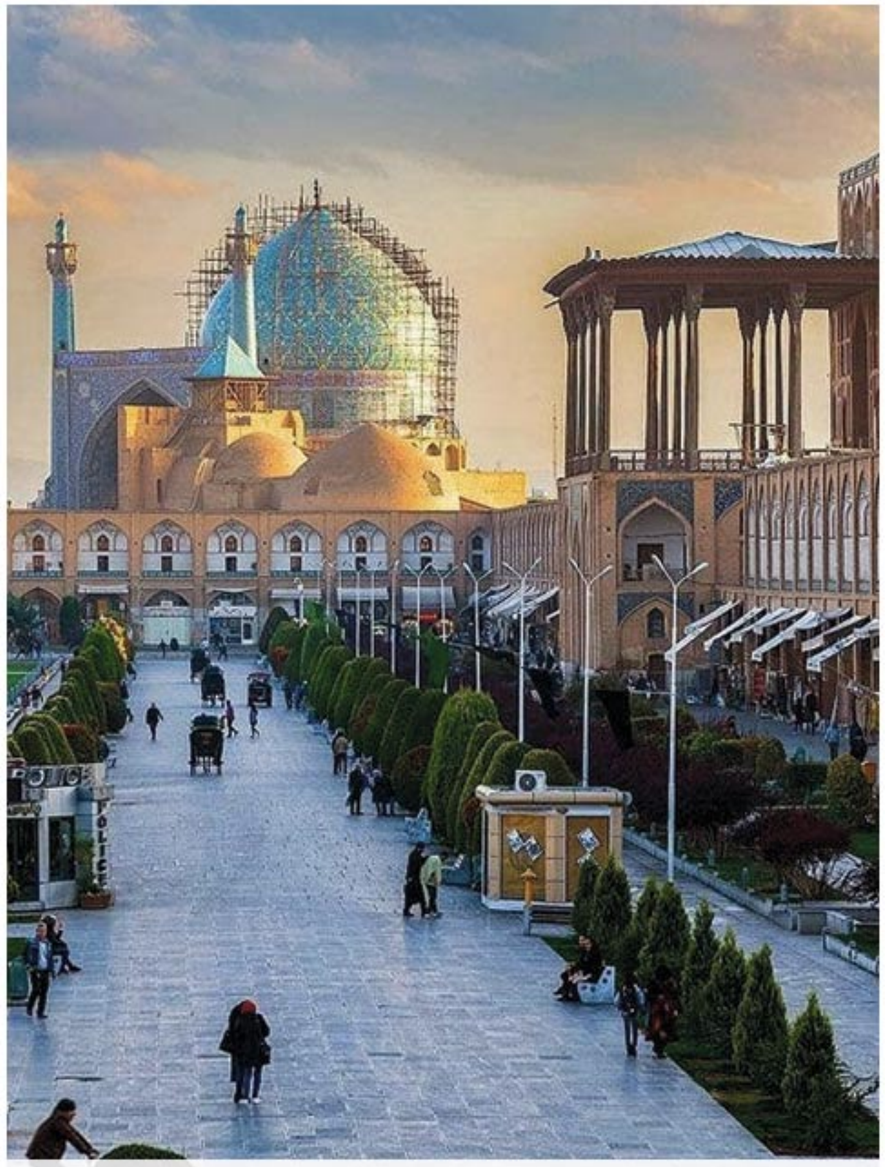

ISFAHAN-Nasghe Jahan Sq.

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Lung-RADS

Category 0 (incomplete)

- prior CT studies were performed but are not available
- lungs incompletely imaged
- findings suggest inflammation or infection

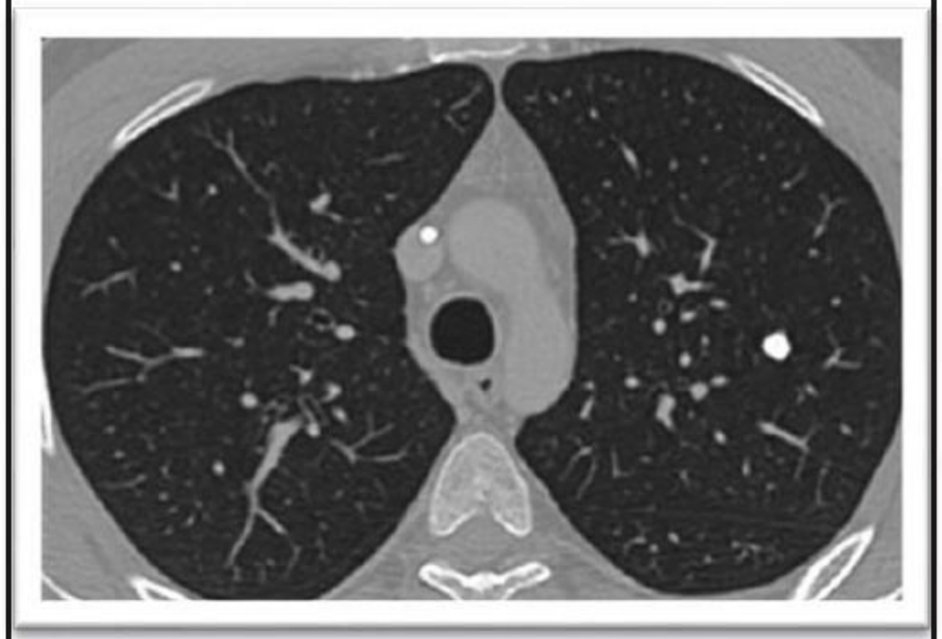
Category 1 (negative, <1% chance of malignancy)

- no lung nodules
  lung nodule(s) with specific findings
- favoring benign nodule(s)
  - o complete calcification
  - o central calcification
  - o popcorn calcification
  - o calcification in concentric rings
  - o fat-containing nodules

Lung-RADS1

complete calcification

11



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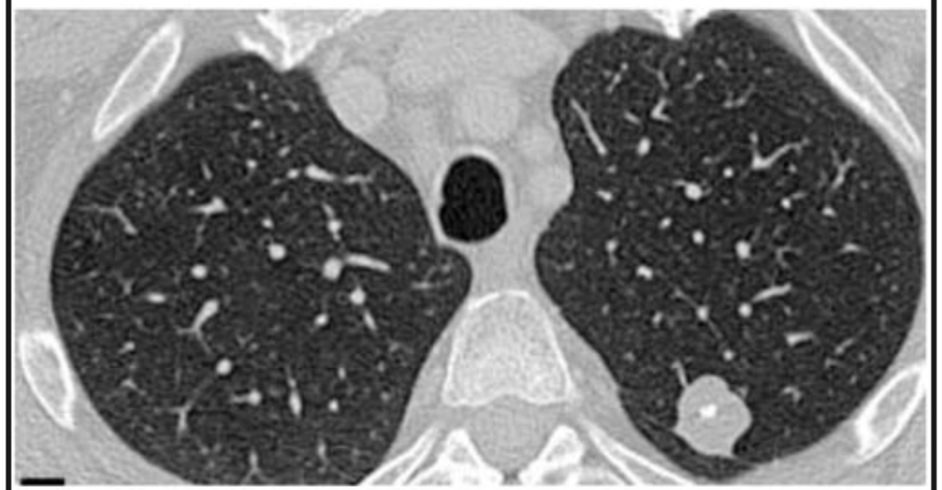
Lung-RADS1

central calcification

13



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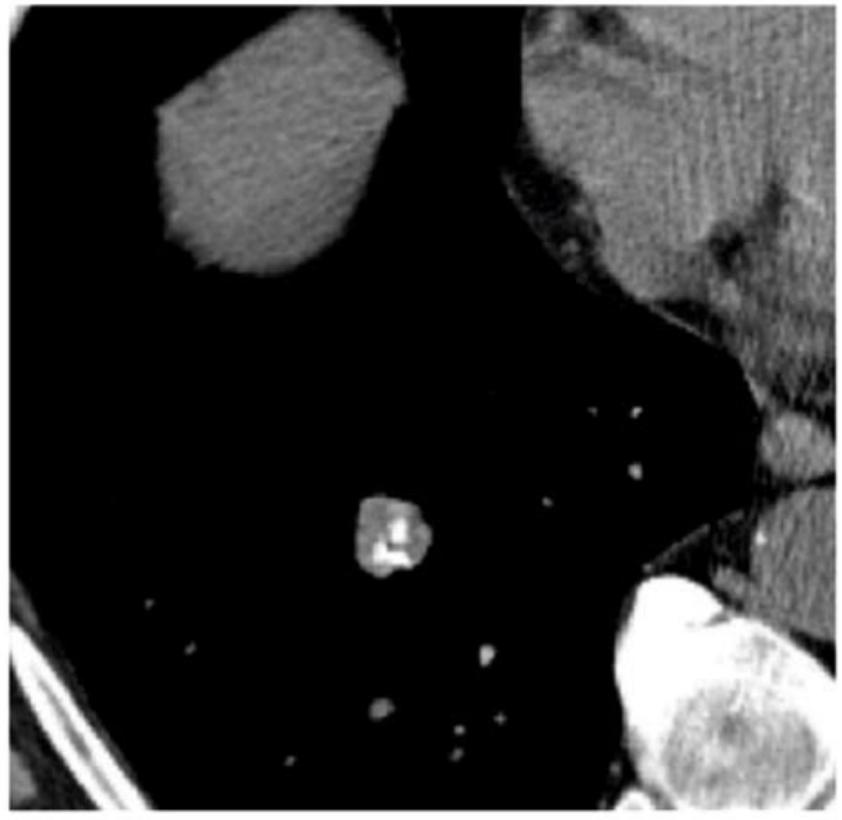
Lung-RADS1

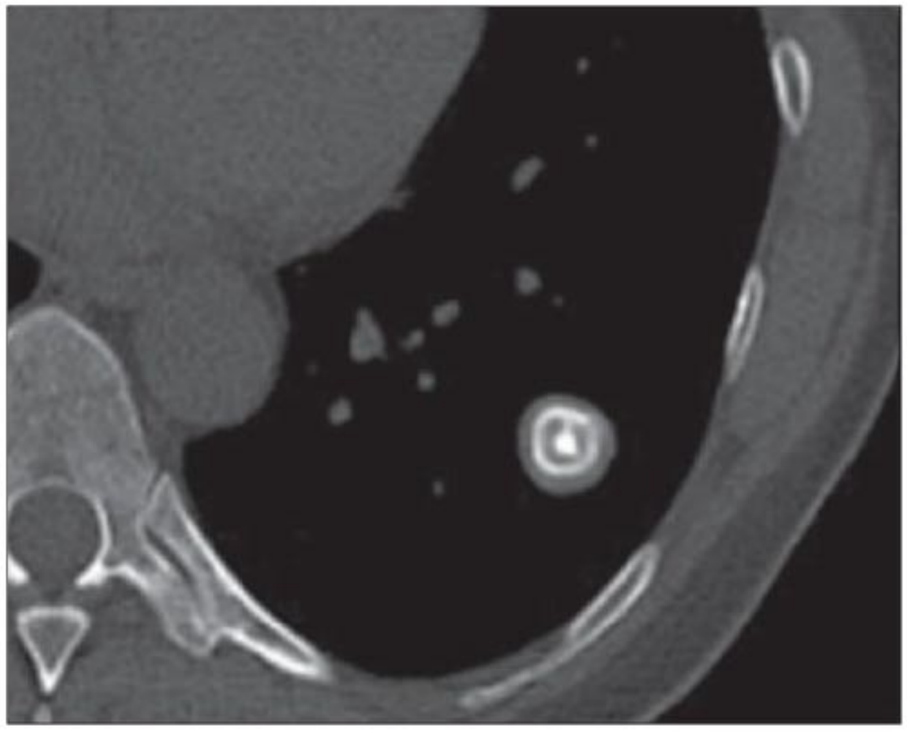
popcorn calcification



Lung-RADS1

calcification in concentric rings

17



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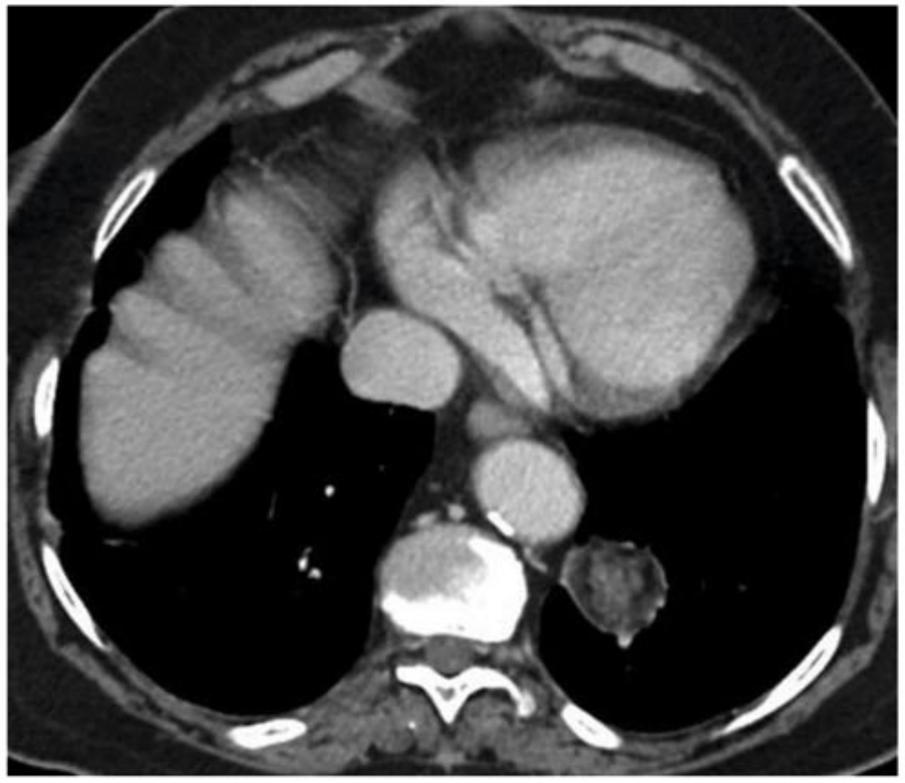
Lung-RADS1

fat-containing nodules



ISFAHAN-Khajoo Bridge

Category 2 (benign appearance or behavior, <1%

chance of malignancy)

. juxtapleural nodule <10mm mean diameter at baseline OR new and smooth, solid, oval, lenti-form,

or triangular

. solid nodule(s)

. <6 mm at baseline

. new nodule <4 mm

. part-solid nodule < 6 mm total mean diameter at baseline

. ground glass nodule(s)

. <30 mm (version 1.1 change previously 20 mm)

. ≥30 mm and unchanged or slowly growing (version 1.1 change previously 20 mm)

. subsegmental airway nodule at baseline or stable

. category 3 nodules that are stable or decreased at 6 months

 category 4B lesion that has a benign diagno-sis on work up

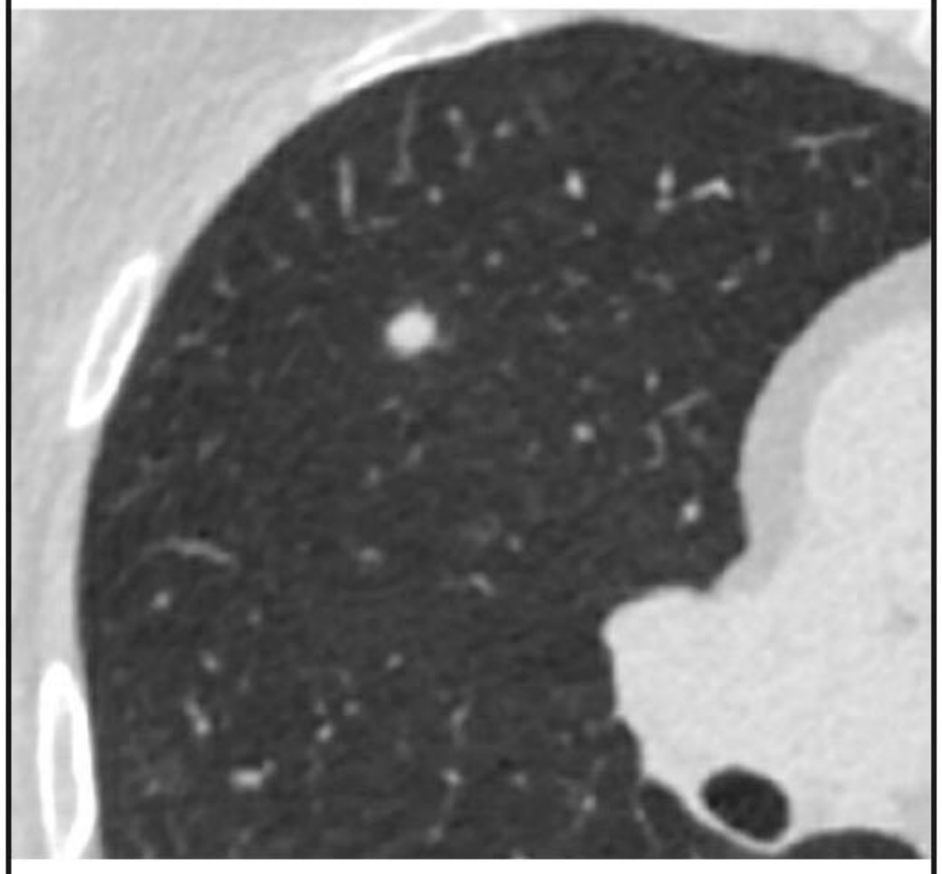
Lung-RADS 2

juxtapleural nodule <10mm mean diameter at baseline OR new and smooth, solid, oval, lentiform, or triangular

7mm well-defined nodule with attachment to the oblique fissure.

Lung-RADS 2

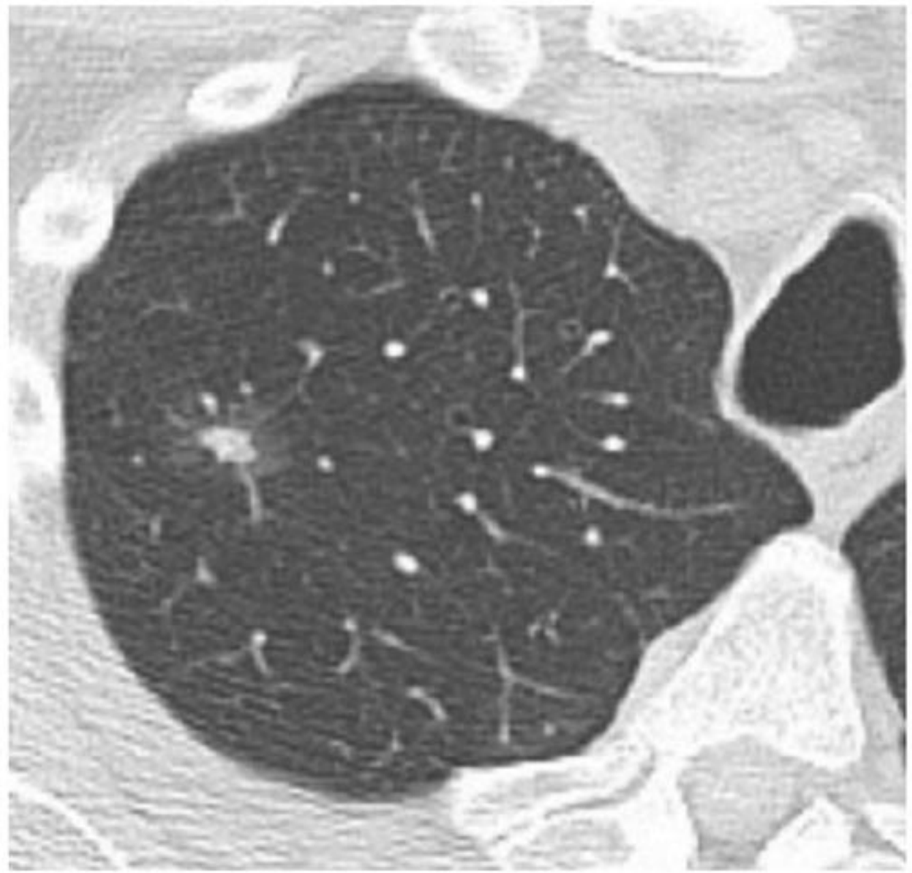
- solid nodule(s)
  - <6 mm at baseline
  - new nodule <4 mm



Lung-RADS 2

- part-solid nodule < 6 mm total mean diameter at baseline

27



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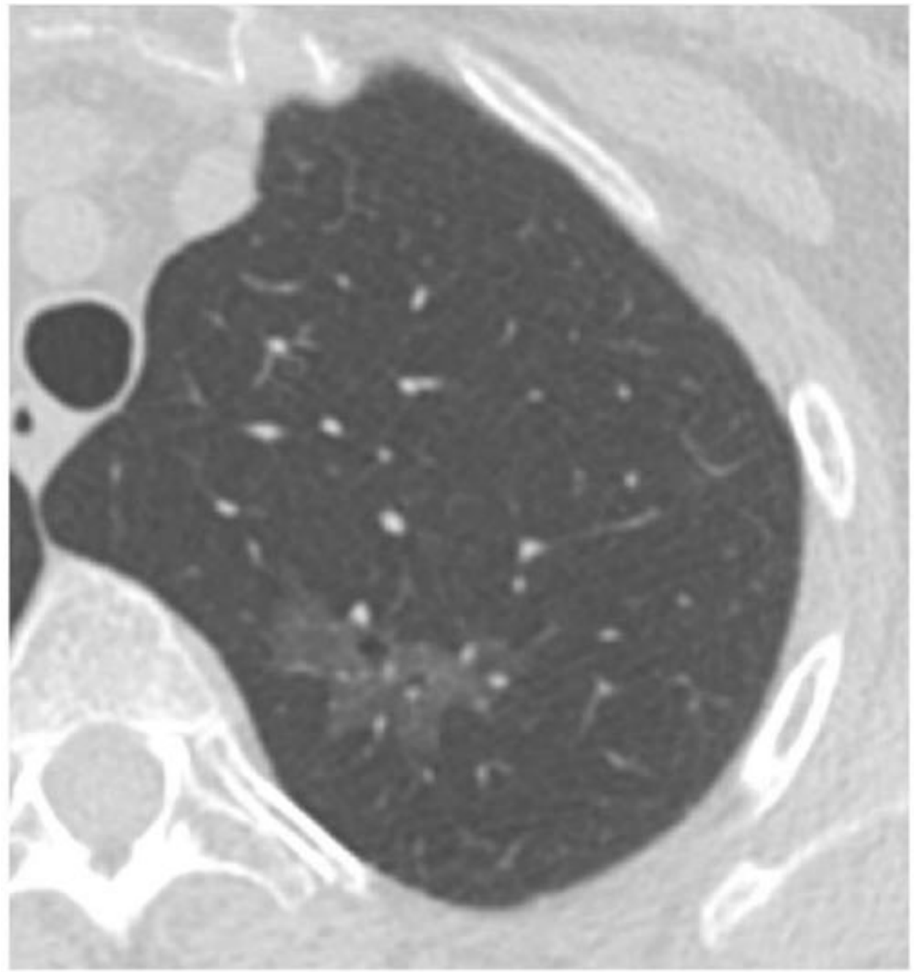
Lung-RADS 2

ground glass nodule(s)

- <30 mm (version 1.1 change previously 20 mm)

- ≥30 mm and unchanged or slowly growing (version 1.1 change previously 20 mm)



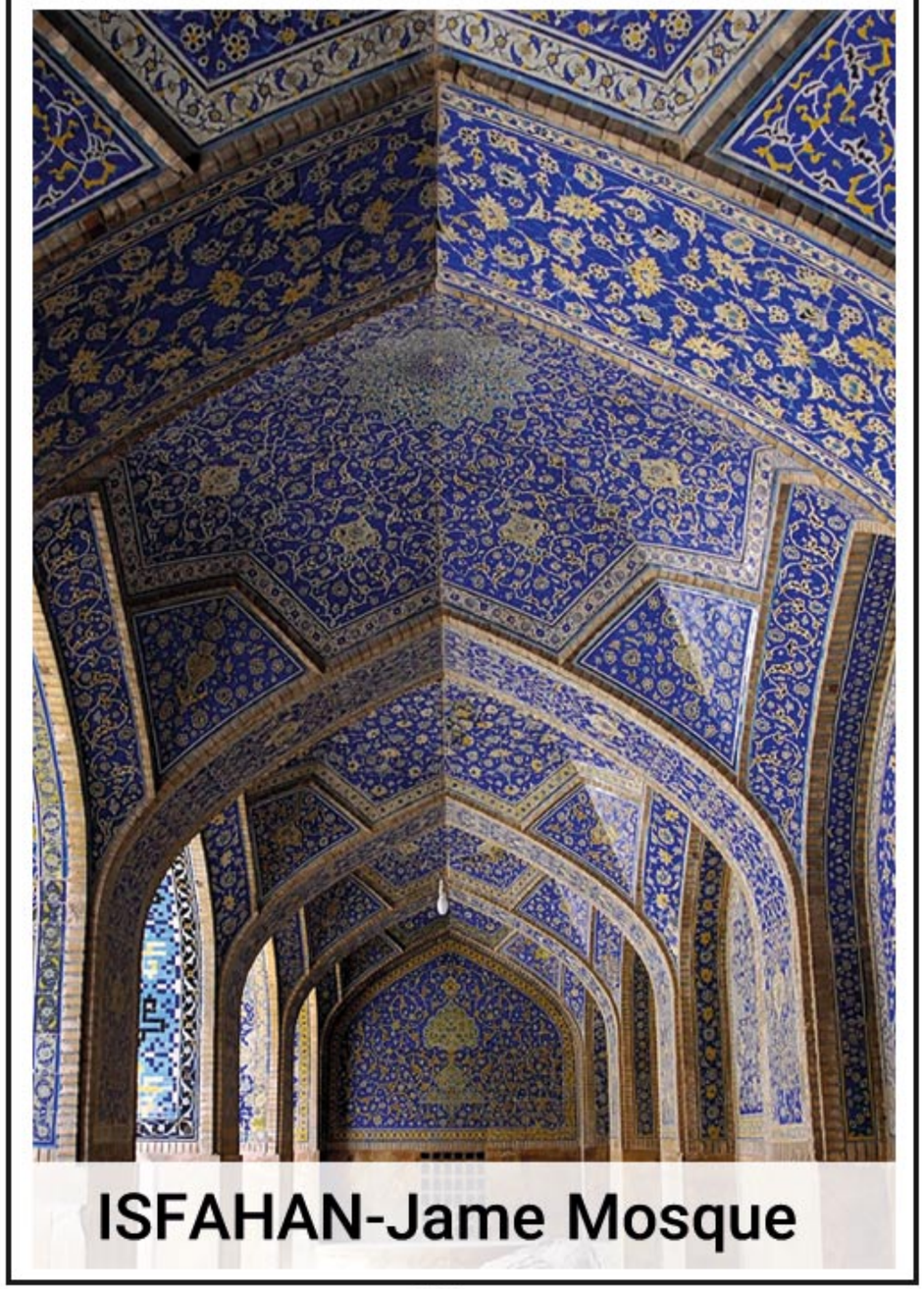
Lung-RADS 2

subsegmental airway nodule

at baseline or stable

31

32



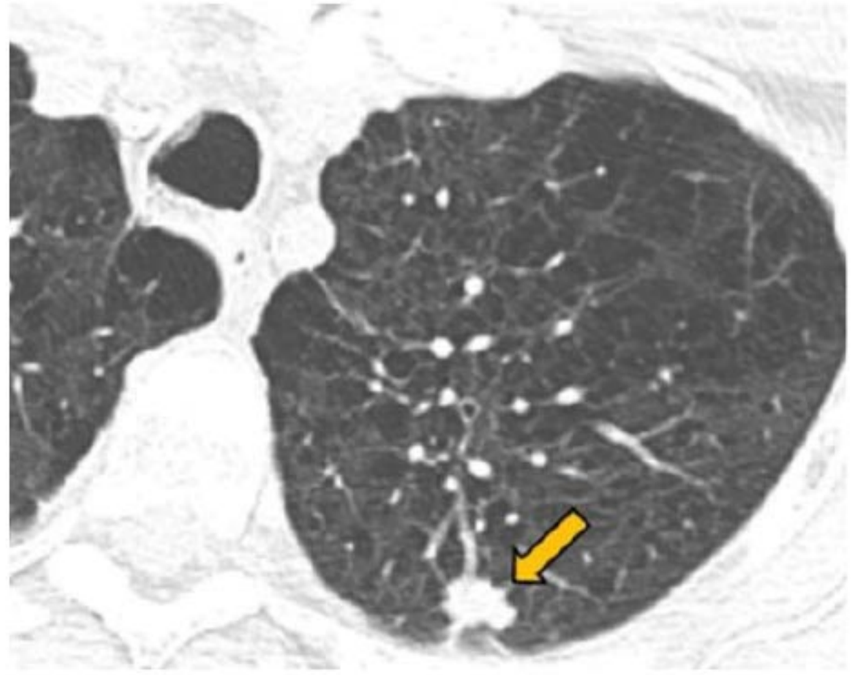
ISFAHAN-Jame Mosque

Category 3 (probably benign, 1-2% chance of malignancy)

. solid nodule(s)
o between 6 and 8 mm at baseline
o new nodule between 4 mm and 6 mm
. subsolid nodule(s)
o ≥6 mm total diameter with solid component <6 mm
o new <6 mm total diameter
. ground glass nodule(s)
o ≥30 mm on baseline CT or new (version 1.1 change previously 20 mm)
. atypical thick-walled lung cyst with enlarging cystic component (mean diameter)
. category 4A lesion, stable or decreased in size at 3-month follow-up (excluding airway nodules)

Lung-RADS 3

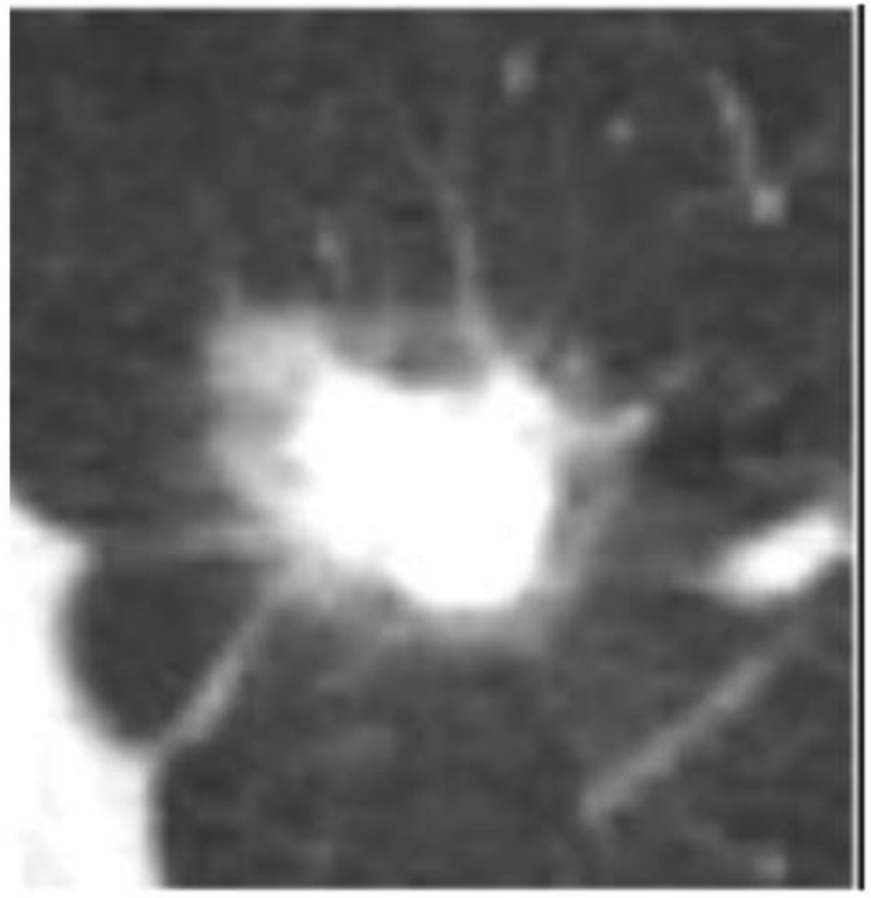
- solid nodule(s)
  - between 6 and 8 mm at baseline
  - new nodule between 4 mm and 6 mm



Lung-RADS 3

subsolid nodule(s)

- ≥6 mm total diameter with solid component <6 mm
- new <6 mm total diameter

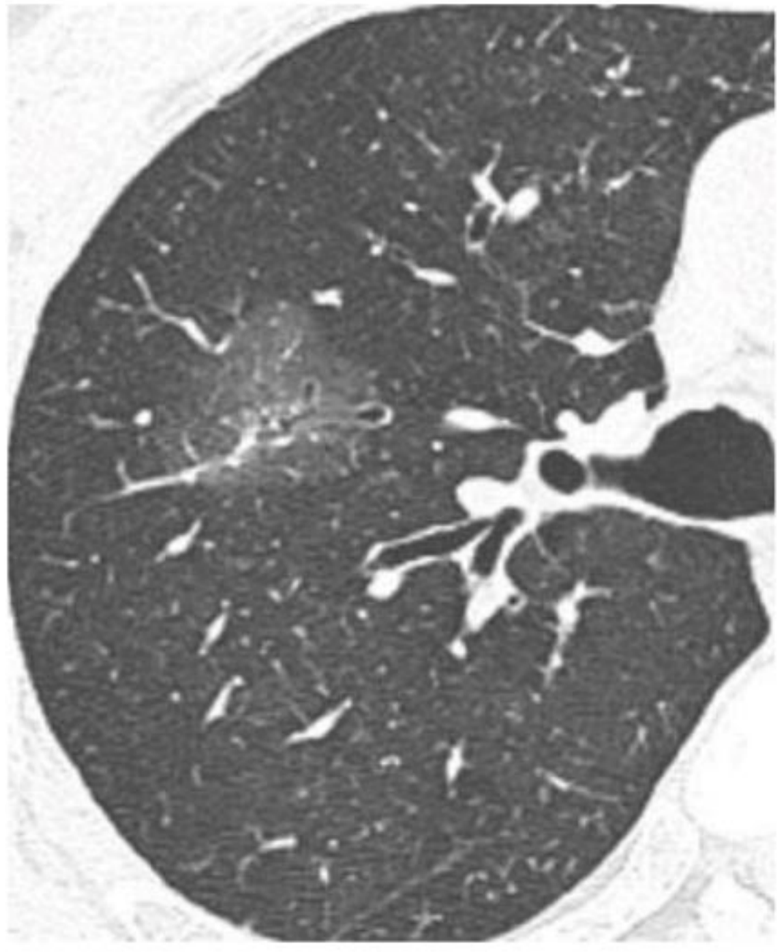


Lung-RADS 3

ground glass nodule(s)

- ≥30 mm on baseline CT or new

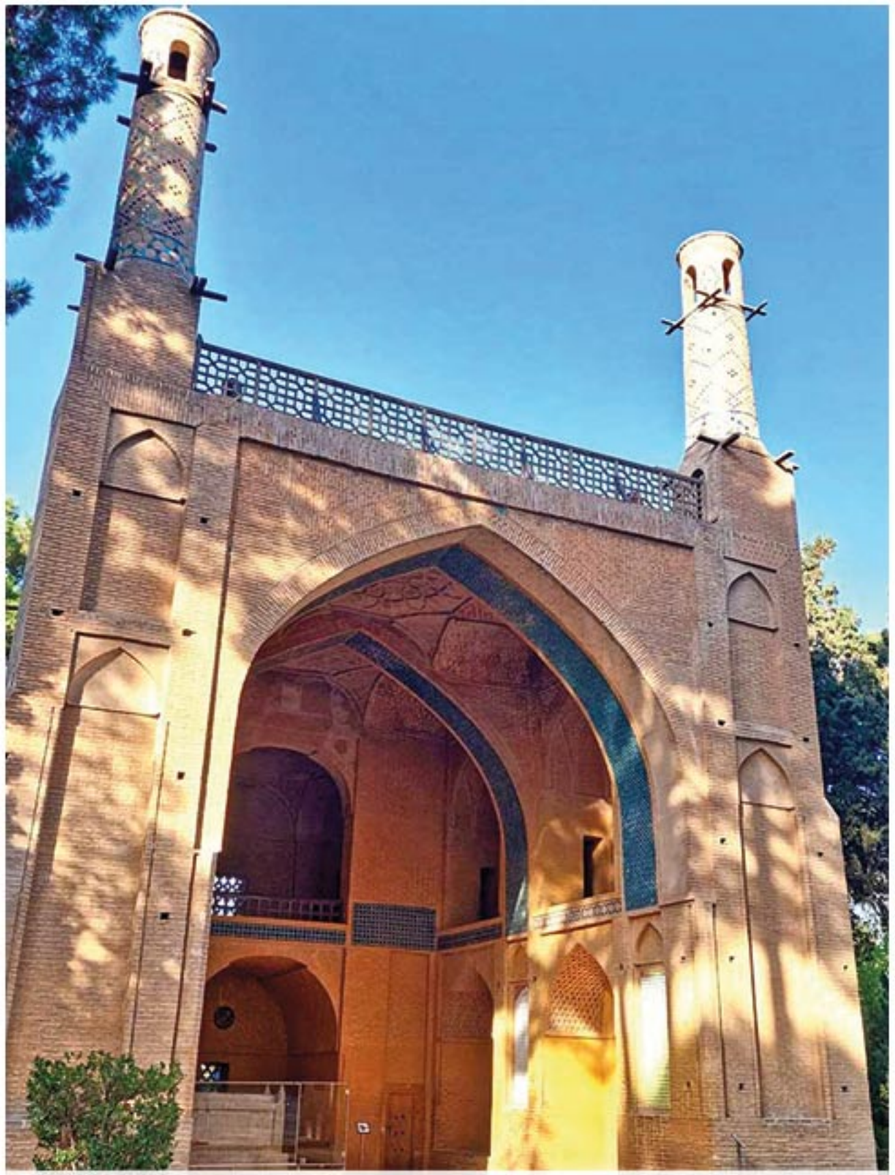
(version 1.1 change previously 20 mm)



Lung-RADS 3

atypical thick-walled lung cyst with

enlarging cystic component (mean diameter)



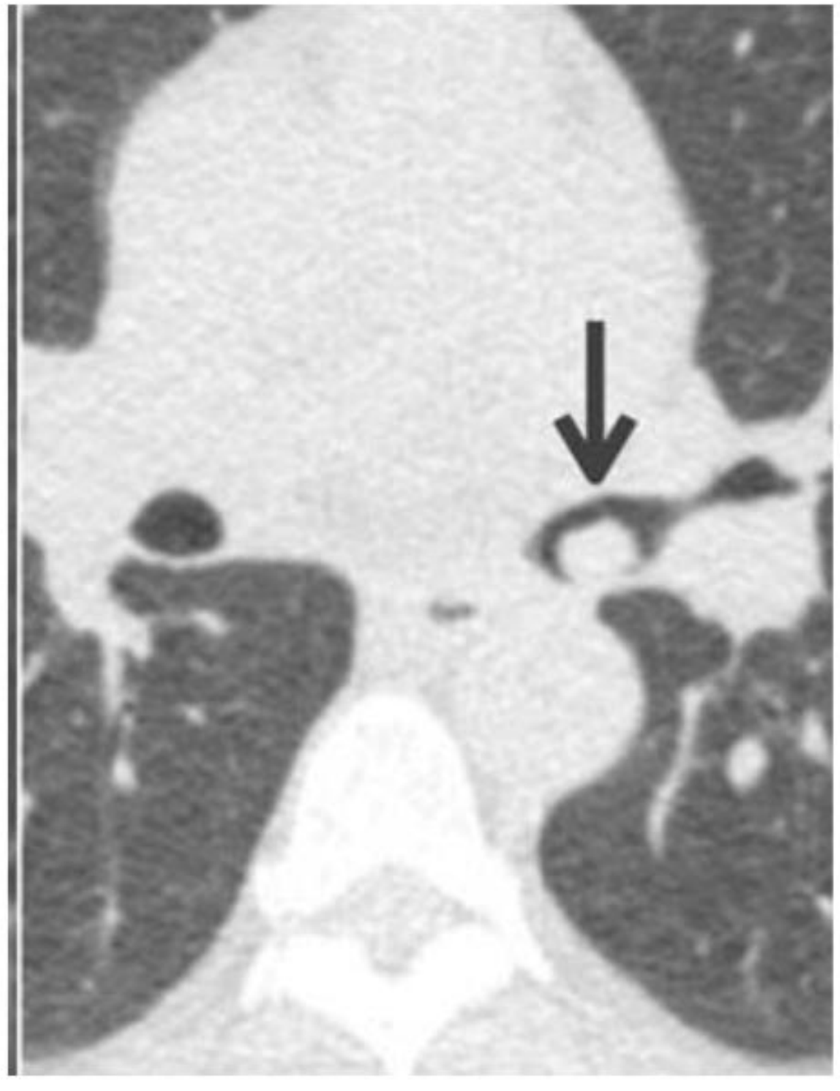
ISFAHAN-Monar Jonban

Category 4B (very suspicious, >15% chance of malignancy)

. stable or growing airway nodule, segmental or more proximal
. solid nodule(s)
o ≥15 mm at baseline
o new or growing, and ≥8 mm
. part-solid nodule(s)
o solid component ≥8 mm
o new or growing ≥4 mm solid component
. atypical pulmonary cyst: thick-walled cyst with increasing wall thickness/nodularity OR growing
multilocular cyst (mean diameter) OR
multilocular cyst with increased loculation or new/increased opacity (nodular, ground glass, or
consolidation)
. solid or part solid nodule growing slowly over multiple screening exam

Lung-RADS 4B

- stable or growing airway nodule, segmental or more proximal

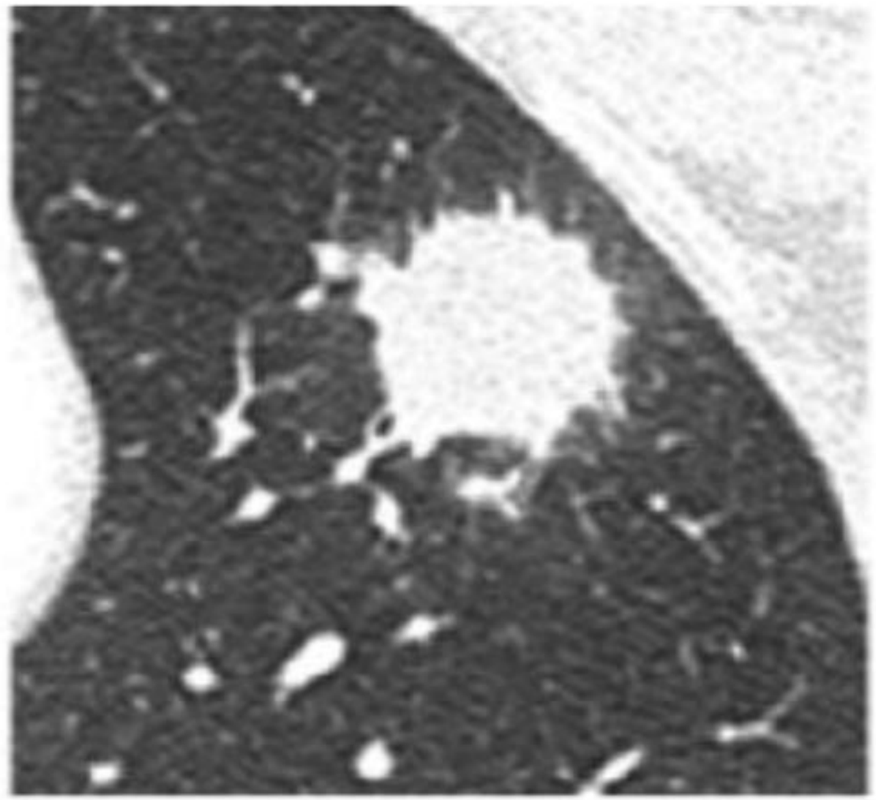


Lung-RADS 4B

solid nodule(s)

- ≥15 mm at baseline
- new or growing, and ≥8 mm

47



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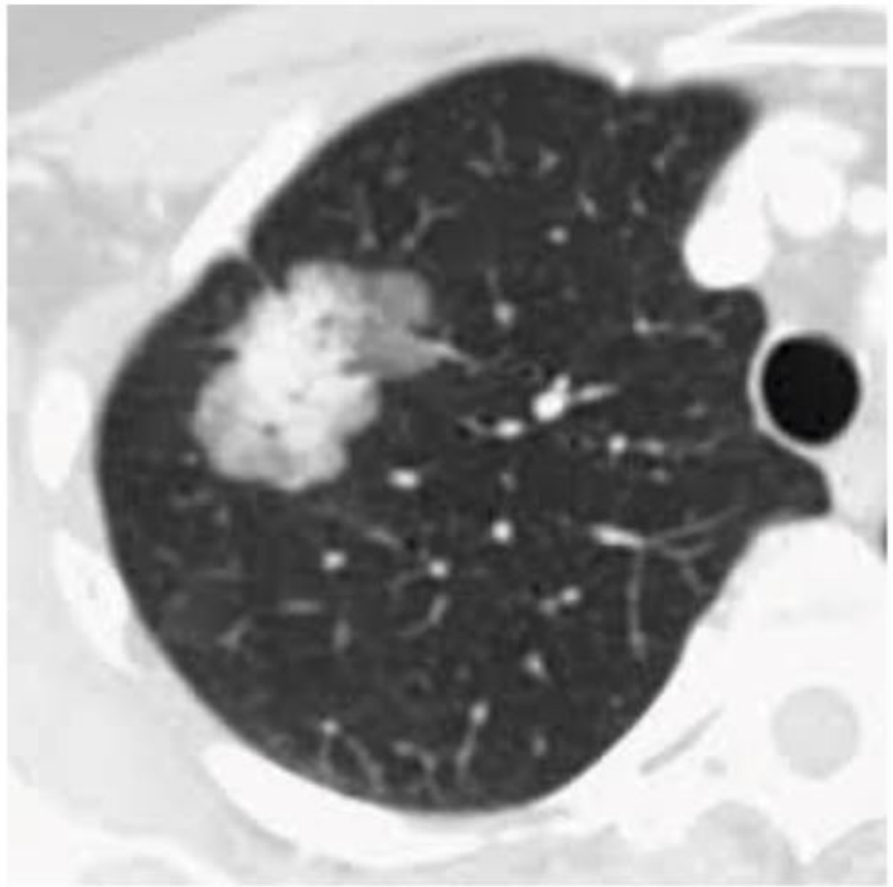
Lung-RADS 4B

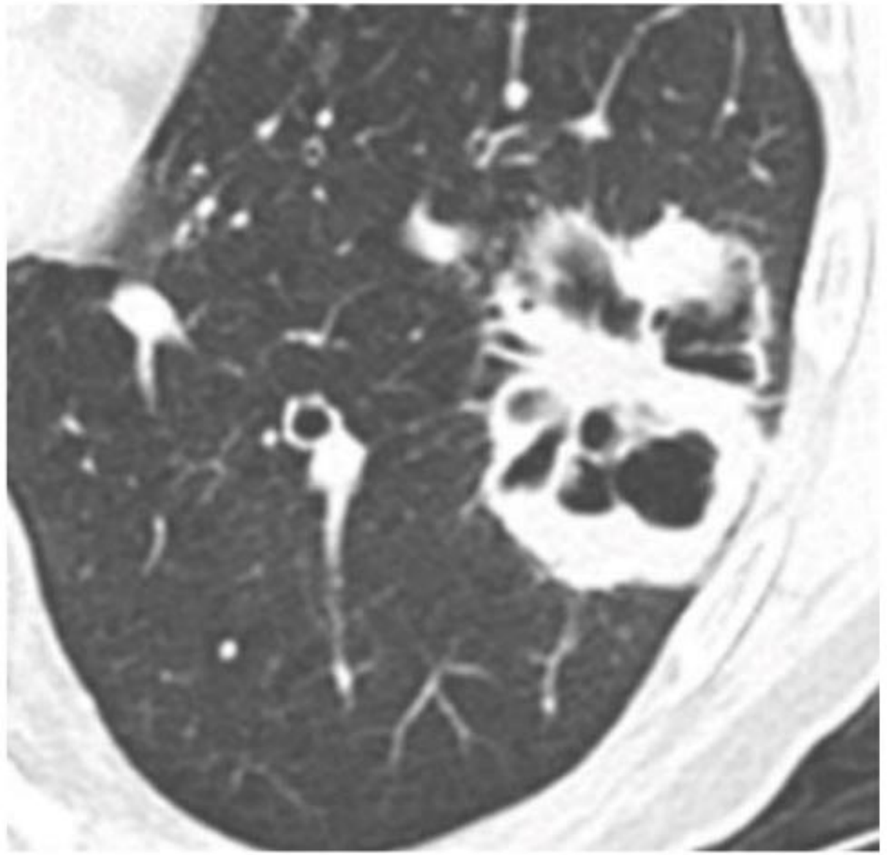
part-solid nodule(s)

- solid component ≥8 mm
- new or growing ≥4 mm solid component

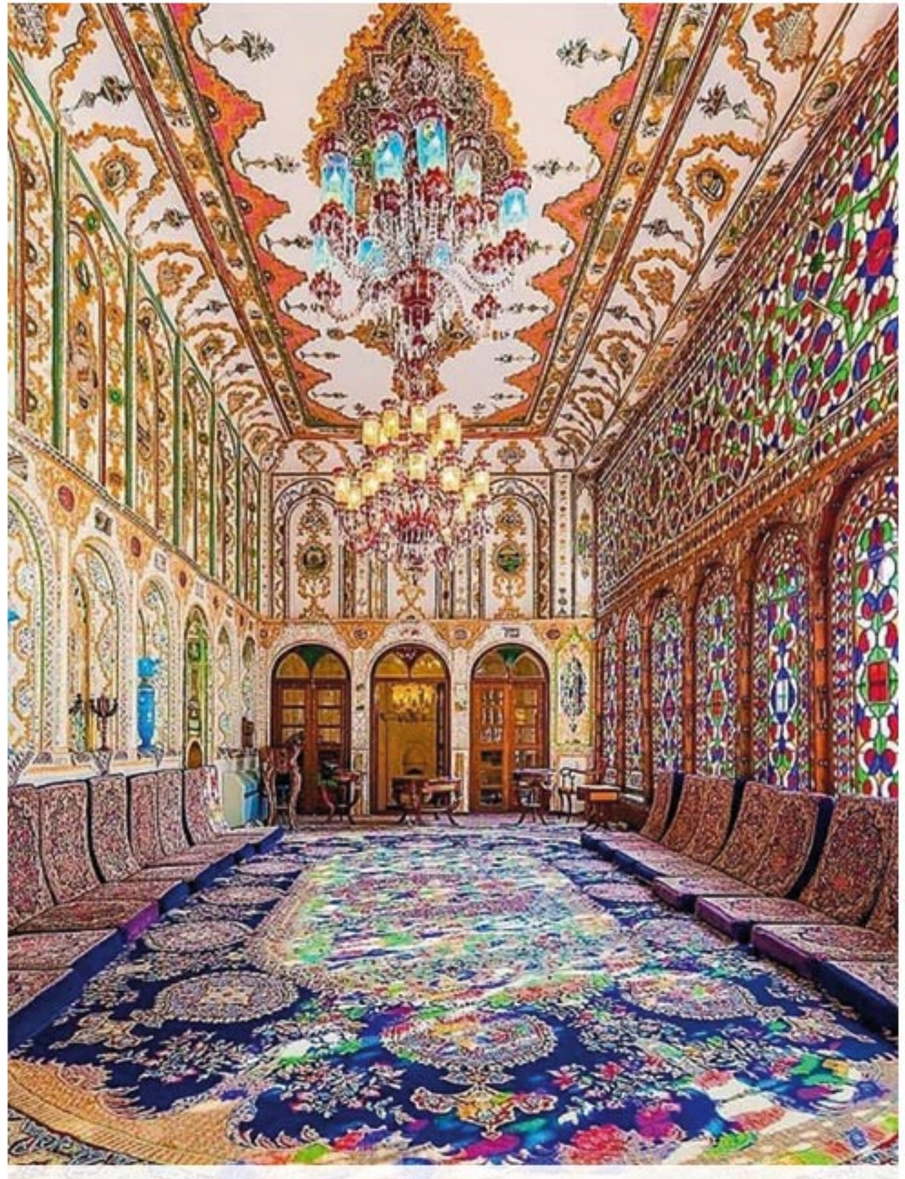


Lung-RADS 4B

atypical pulmonary cyst: thick-walled cyst with increasing wall thickness/nodularity OR growing
multilocular cyst (mean diameter) OR multilocular cyst with increased loculation or new/increased opacity
(nodular, ground glass, or consolidation)



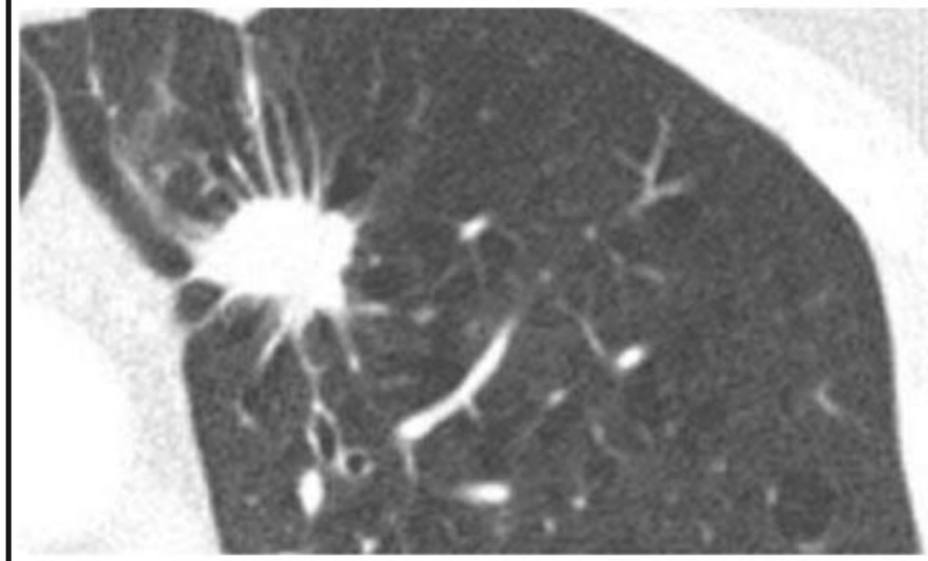
ISFAHAN-Aali Qapu Palace



ISFAHAN-Molabashi House

Category 4x (very suspicious, >15% chance of malignancy)

category 3 or 4 nodules with additional features or imaging findings that increase the suspicion of
malignancy
 includes:
o spiculation
o ground glass nodule(s) that double in size in 1 year
o enlarged regional lymph nodes
 for new large nodules that develop on an annual repeat screening CT, a 1 month LDCT may be
recommended to address potentially infectious or inflammatory conditions. (version 1.1 addition)



Modified categories

- [X]S (e.g. "3S") if there is a clinically significant or potentially significant non-lung cancer finding
- (version 1.1 removal): [X]C (e.g. "3C") for a patient with a prior diagnosis of lung cancer who returns to screening

ISFAHAN-Nasghe Jahan Sq.

Changes 2022

Up to 9% of lung cancers present as an atypical pulmonary cyst and these are classified as 3, 4A or 4B

lesions depending on the most concerning feature. Features of concern are wall-thickening, nodularity,

multilocularity and associated opacity as well as an interval increase in any of these features. A cavitating

solid nodule is a different entity and is classified according to mean diameter.

Juxtapleural replaces perifissural as a descriptor for typical intraparenchymal lymph nodes which can

occur along any pleural surface.

Endobronchial nodules have been renamed 'airway nodules' and concerning features are location in a

segmental or more proximal bronchus and stability or growth on follow-up.

Nodule growth now relies on mean diameter and applies to a 12 month follow-up interval.

Ground-glass nodules that grow no more than 1.5mm over 12 months are category 2. A higher growth

rate or a new solid component triggers reclassification.

The timing of the next follow-up low-dose CT scan is now based on the grade of the findings.

Potentially benign infectious/ inflammatory findings can be allocated to category 0. These findings include

more than 6 new nodules, rapid appearance of an 8mm or larger nodule and segmental or lobar

consolidation. These need to be reclassified according to the most suspicious feature on the next followup CT scan after 1-3 months. Other potentially benign infectious/inflammatory findings such as new treein-bud nodules and a new ground-glass nodule less than 3cm diameter do not require short term followup and can be classified using existing size criteria based on the most suspicious nodule1. Multiple

endobronchial segmental abnormalities without a proximal obstructing lesion can be assigned to either

category 4

Recommended follow-up

Category 0:

- comparison with prior studies before assignment of Lung-RADS classification

Category 1:

- continue annual screening with LDCT

Category 2:

- continue annual screening with LDCT

Category 3:

- 6-month follow-up with LDCT

Category 4A:

- 3-month follow-up with LDCT
- PET-CT may be used if there is a ≥8 mm solid component

Category 4B and 4X:

- chest CT with or without contrast, as appropriate
- PET-CT and/or tissue sampling depending on the probability of malignancy and comorbidities (PET-CT if solid component ≥8 mm)
- for new large nodules that develop on an annual repeat screening CT, a 1 month LDCT may be recommended to address potentially infectious or inflammatory conditions. (version 1.1 addition)

ISFAHAN-Zayande Roud

Practical points

nodule measurement should be in lung windows

- to calculate nodule mean diameter, measure both the long and short axis to one decimal point,

and report mean nodule diameter to one decimal point. [previously recommended rounding to

nearest whole number version 1.0.]

- only a single measurement is necessary for round nodules

- "growth" is an increase in size of ≥1.5 mm

- assignment of a Lung-RADS status is based on the most suspicious nodule

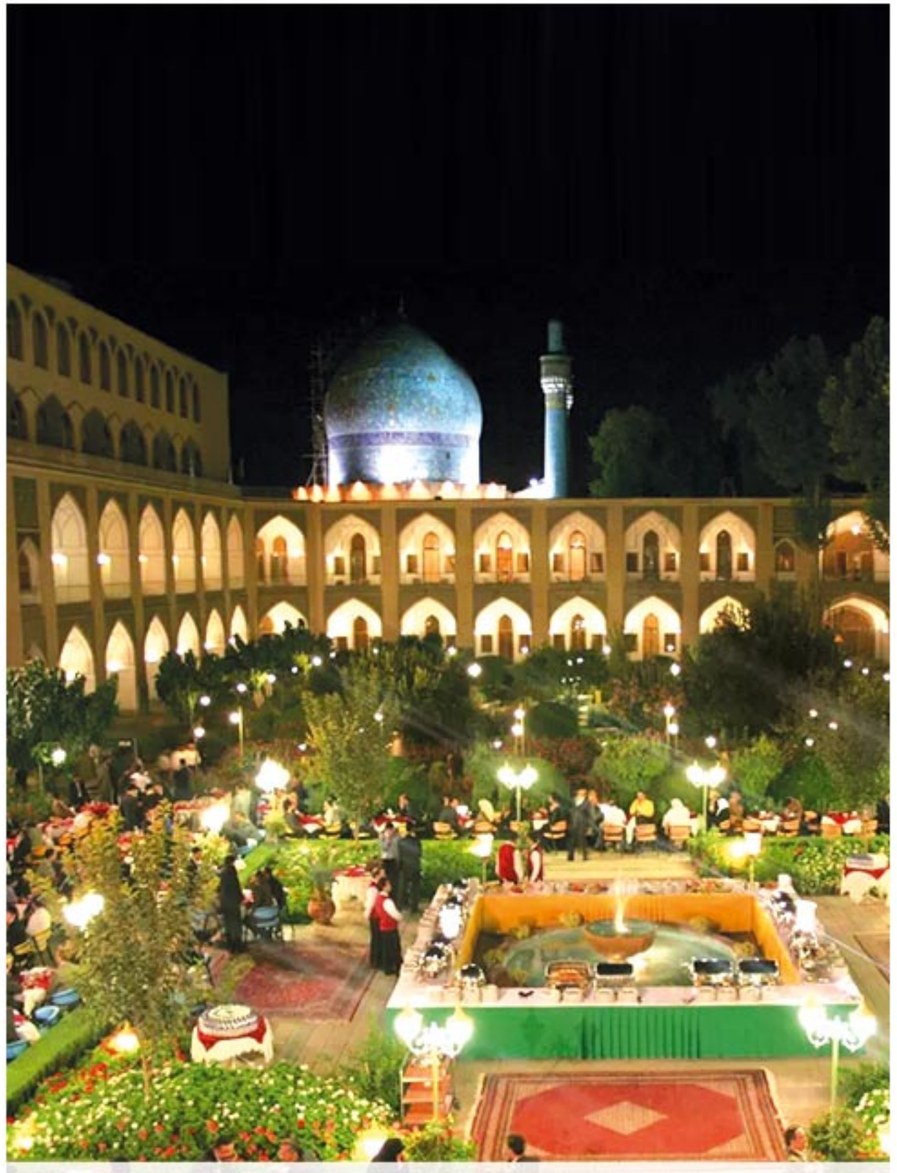
- category 4B management is based on multiple factors including overall patient status and patient

preference

- solid nodules with smooth margins, an oval, lentiform or triangular shape, and maximum diameter

less than 10 mm (perifissural nodules) should be classified as category 2. (version 1.1 addition)

- for category x, the Lung-RADS is rendered as "Lung-RADS category x" or "Lung-RADS x"



ISFAHAN-Abbasi Hotel