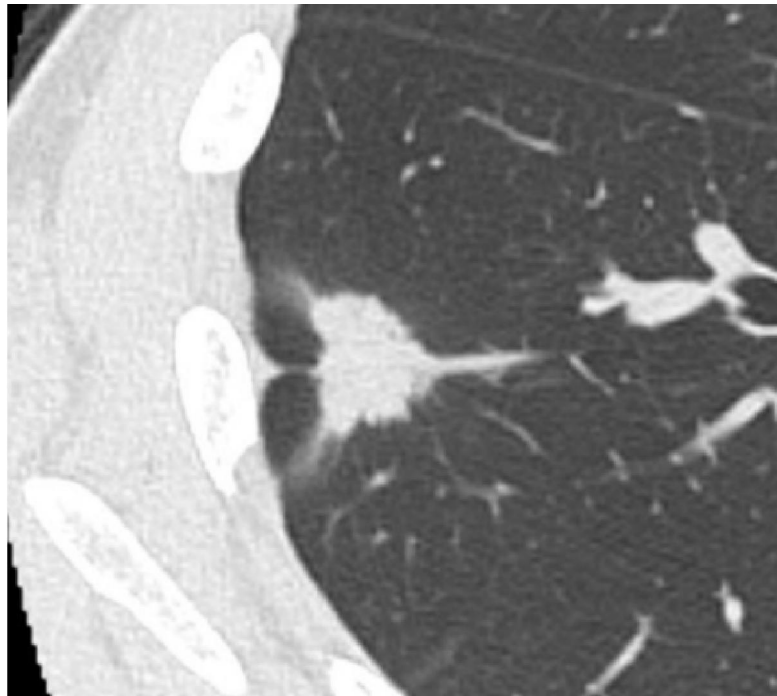


Solitary Pulmonary Nodule



Τζίλας Βασίλειος. Πνευμονολόγος

Πανεπιστημιακός Υπότροφος, Μονάδα Διαμέσων Νοσημάτων

Α' Πανεπιστημιακή Πνευμονολογική Κλινική, ΝΝΘΑ «Η Σωτηρία», ΕΚΠΑ

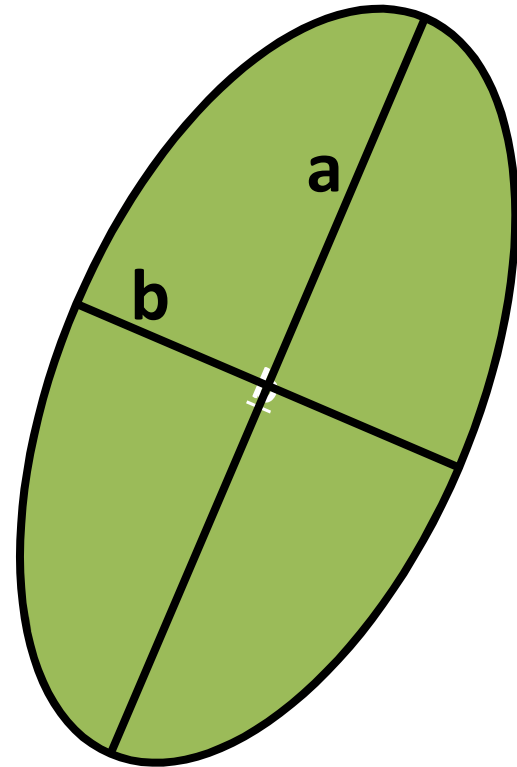
Definition

- Round or oval pulmonary parenchymal lesion, relatively well defined $\leq 3\text{cm}$
- Surrounded by pulmonary parenchyma and/or visceral pleura and is not associated with lymphadenopathy, atelectasis, or pneumonia

Lesions $> 3\text{ cm}$ are considered masses and are treated as malignancies until proven otherwise.

Measurement

- Contiguous thin sections (≤ 1.5 mm)
- Use image revealing the greatest dimension
- Use average diameter (it more accurately reflects three-dimensional tumor volume)
- Round to the nearest millimeter



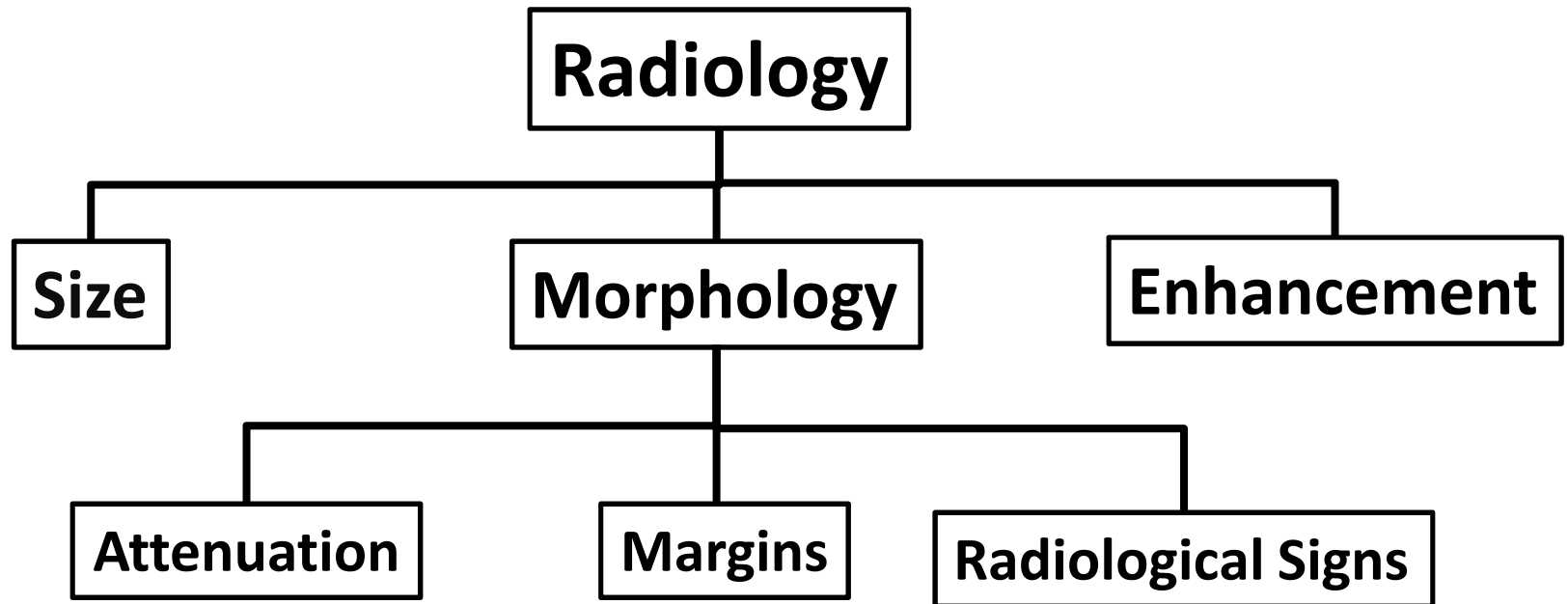
$$D = \frac{a + b}{2}$$

Solitary Pulmonary Nodule

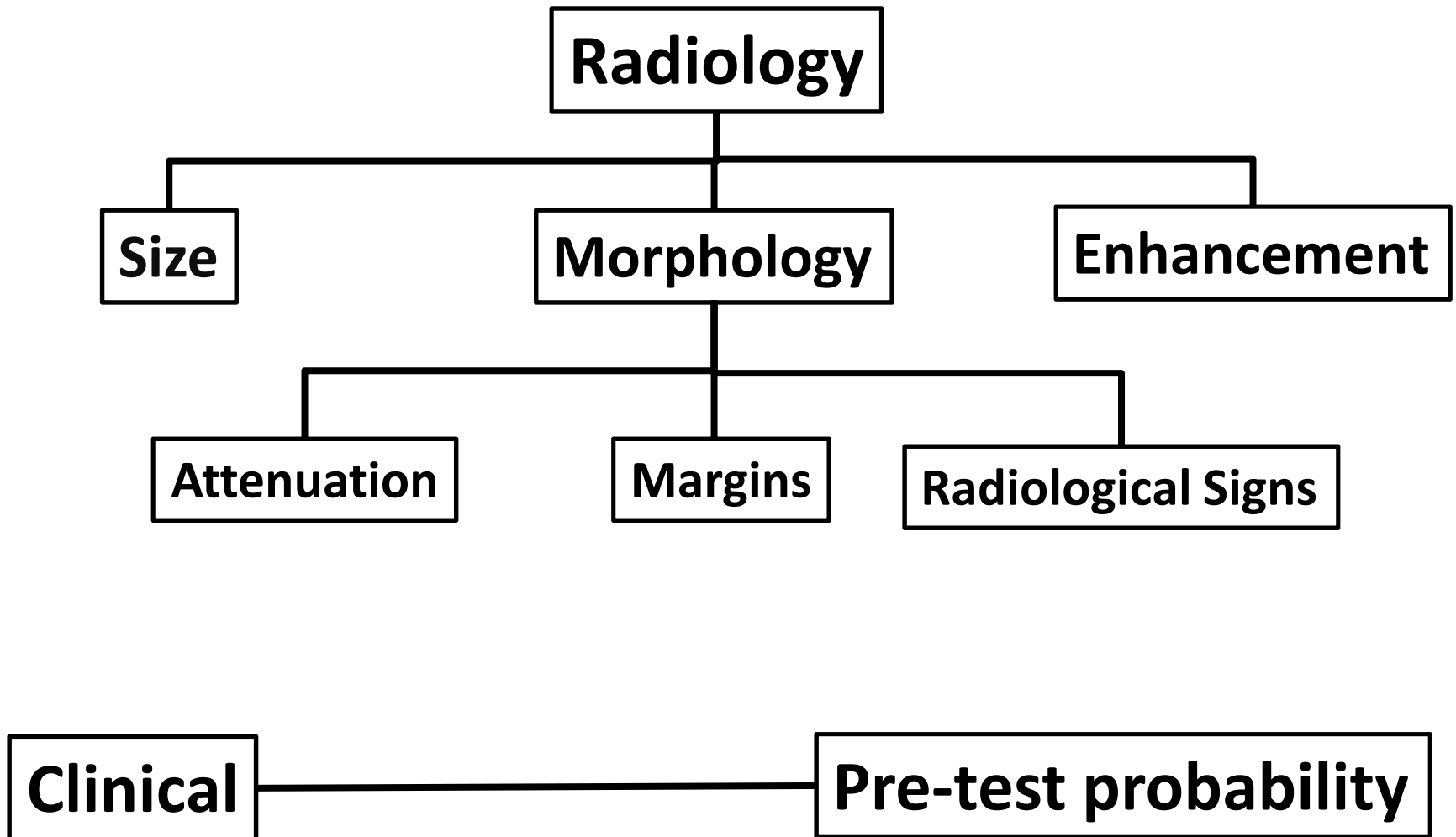
- Differential diagnosis is extremely broad
- Important not to miss malignancy
- Avoid misdiagnosis

What to look for?

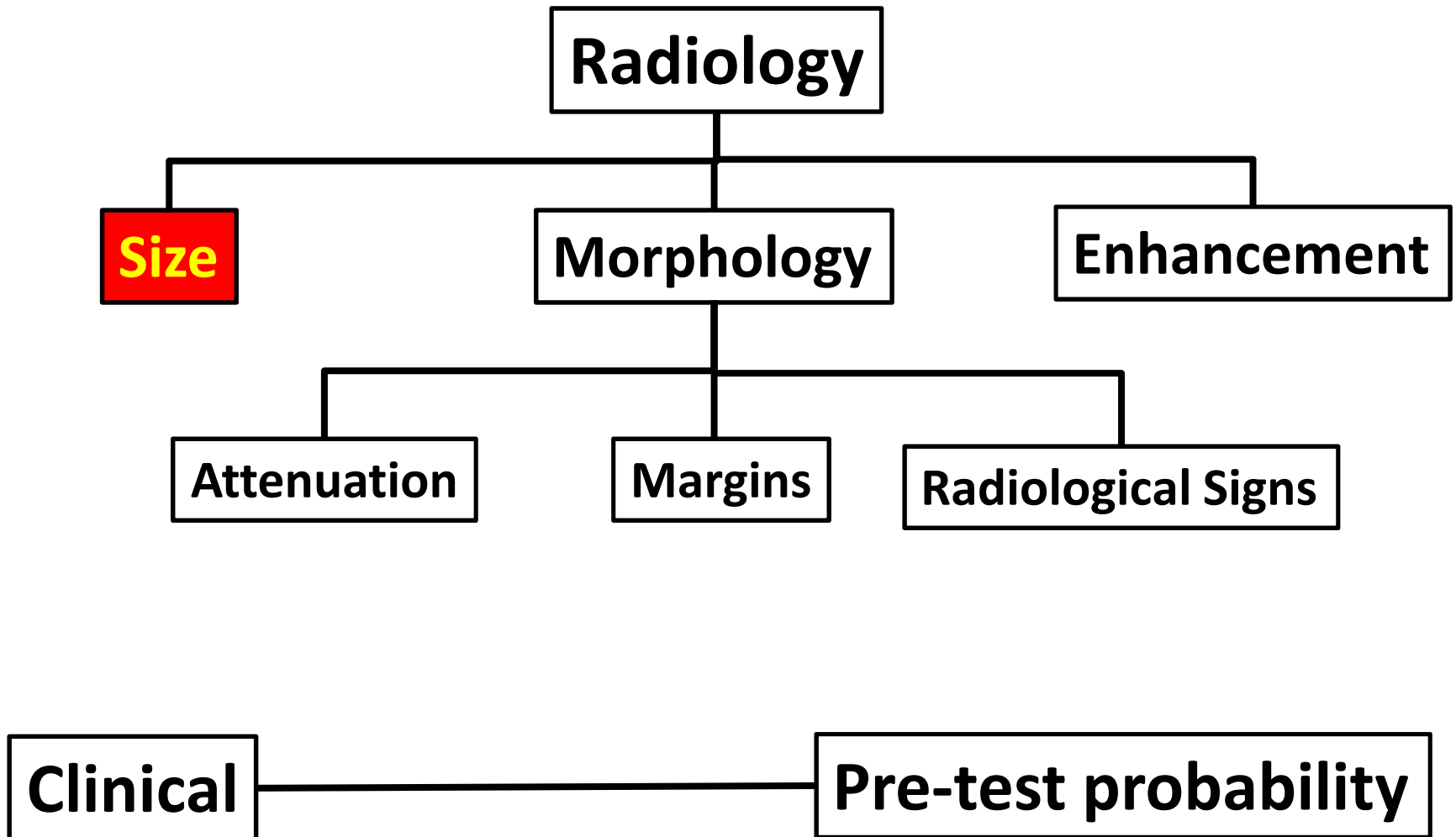
What to look for?



What to look for?



What to look for?

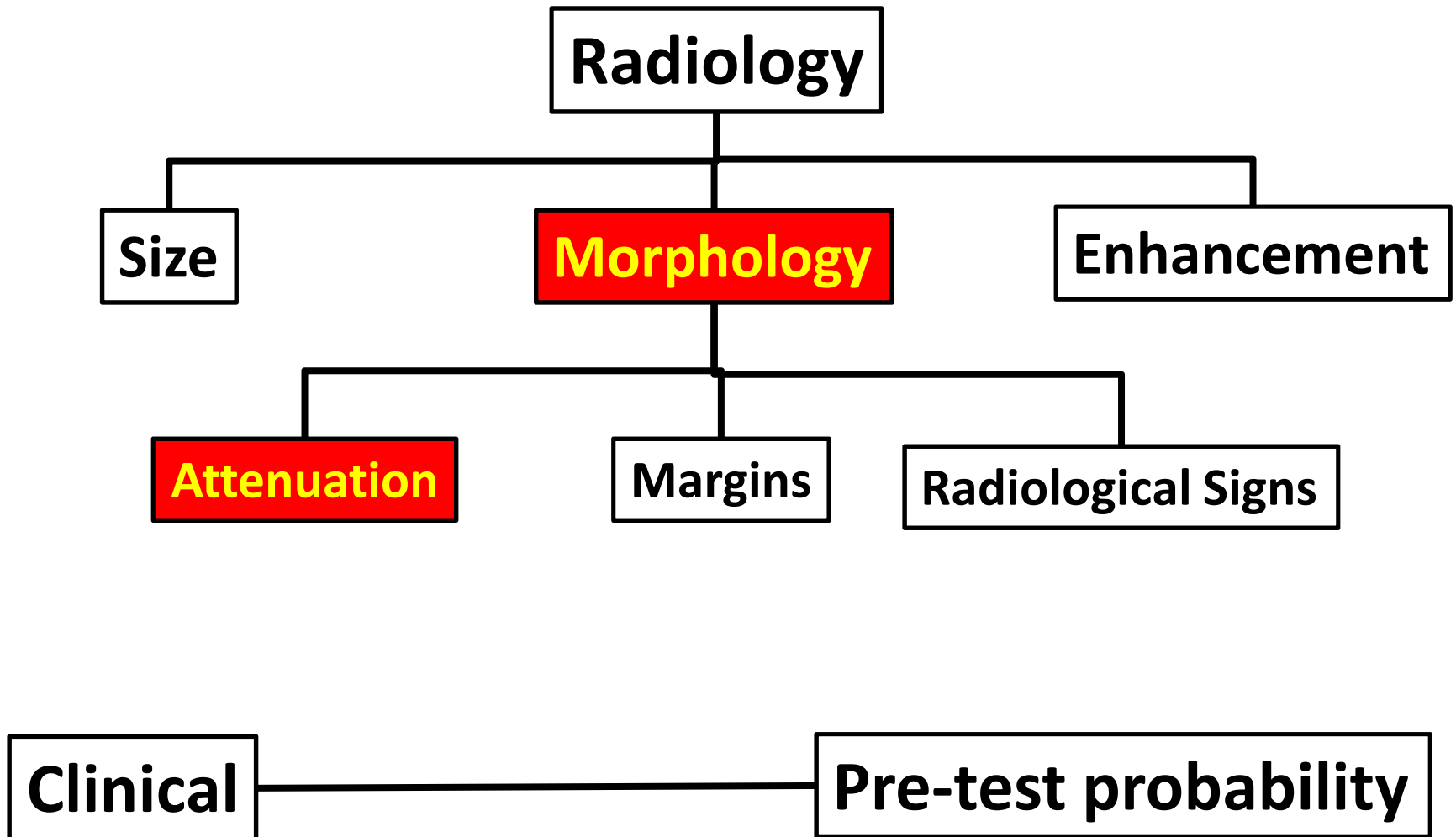


Size matters!!!

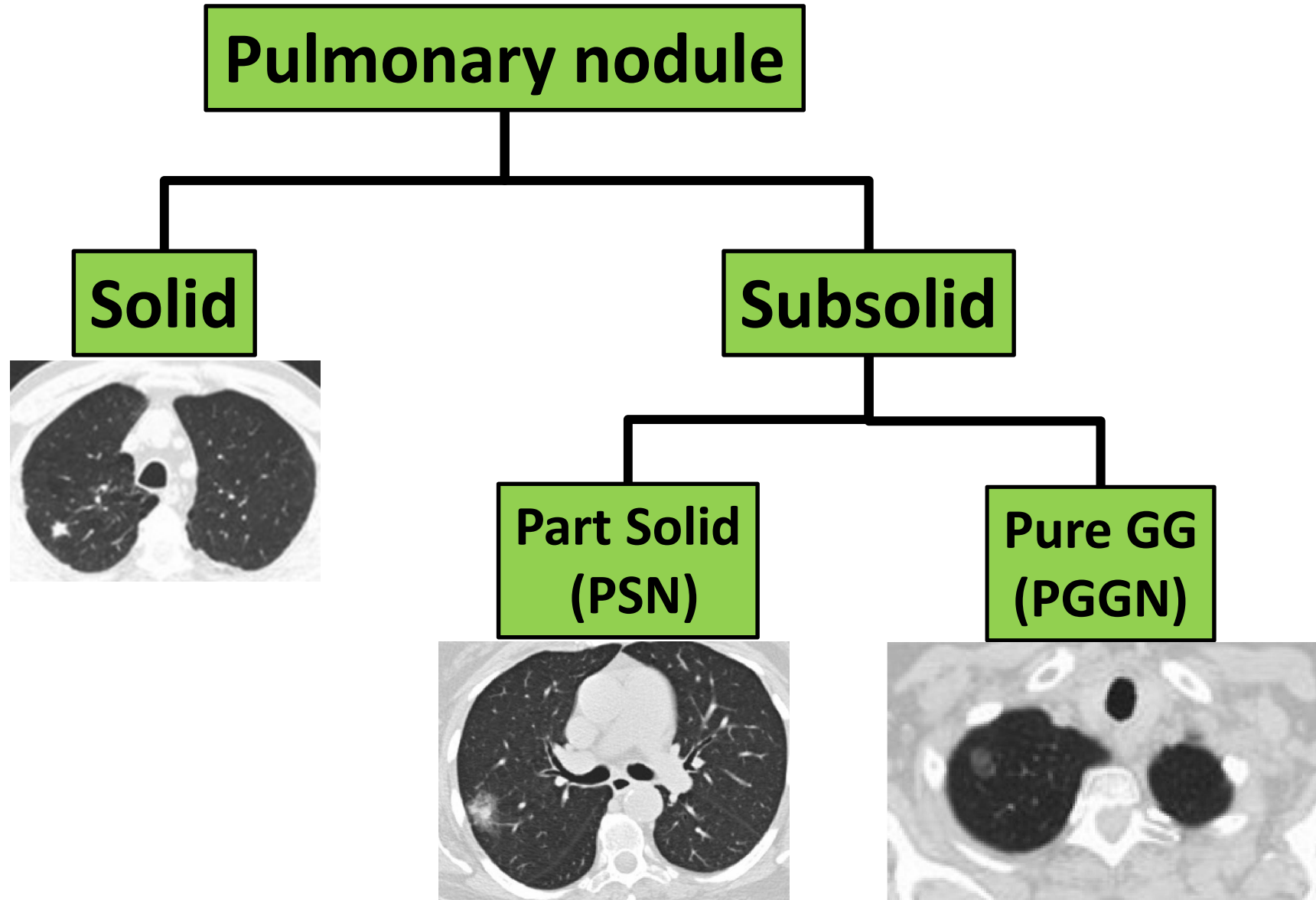
Size (mm)	(%) Malignancy	Total number
<4	0	2038
4-7	1	1034
8-20	15	268
>20	75	16

Patients with high risk for lung cancer

What to look for?



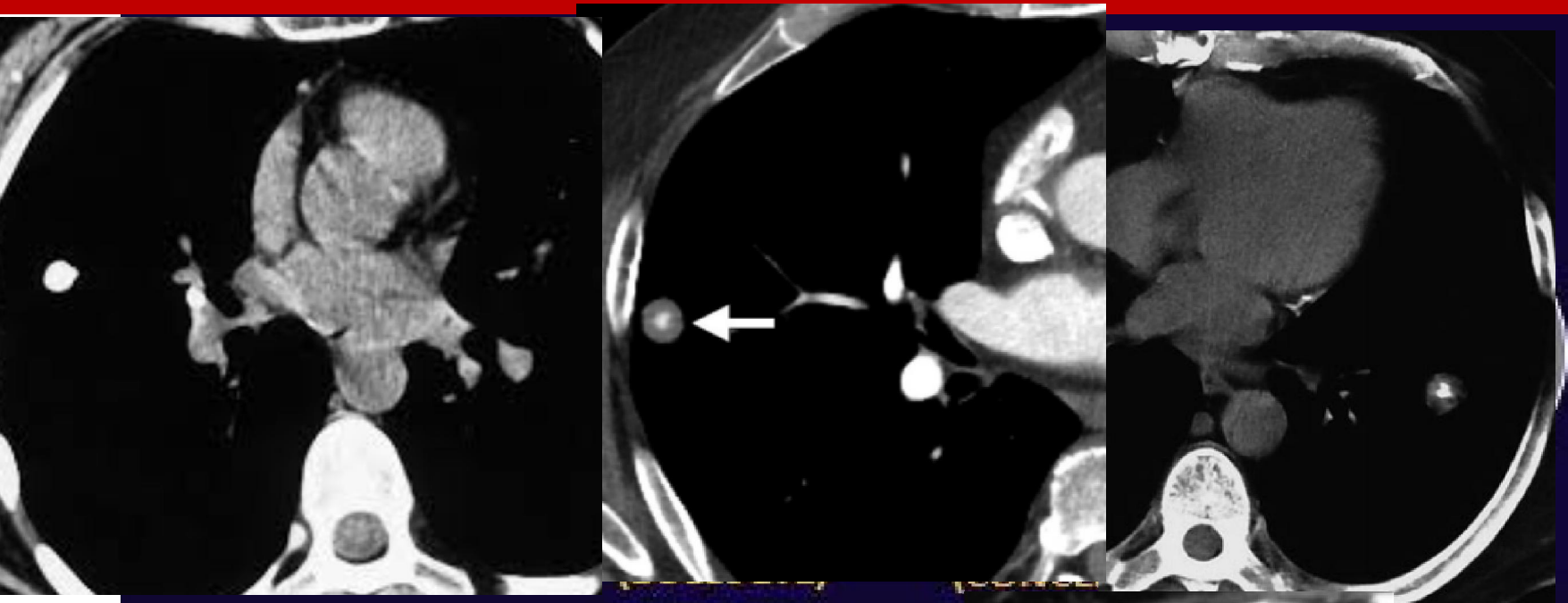
Classification of SPN according to attenuation



Attenuation-Signs of benignity

- **Calcification in benign patterns**
- **Fat (-40 to -120 HU)**

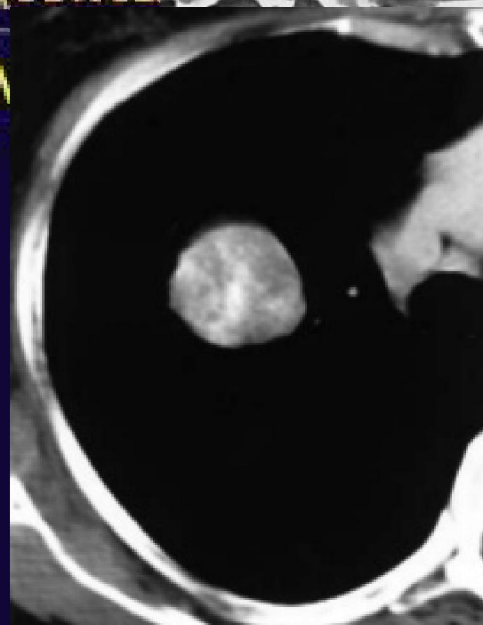
Calcification pattern in SPN



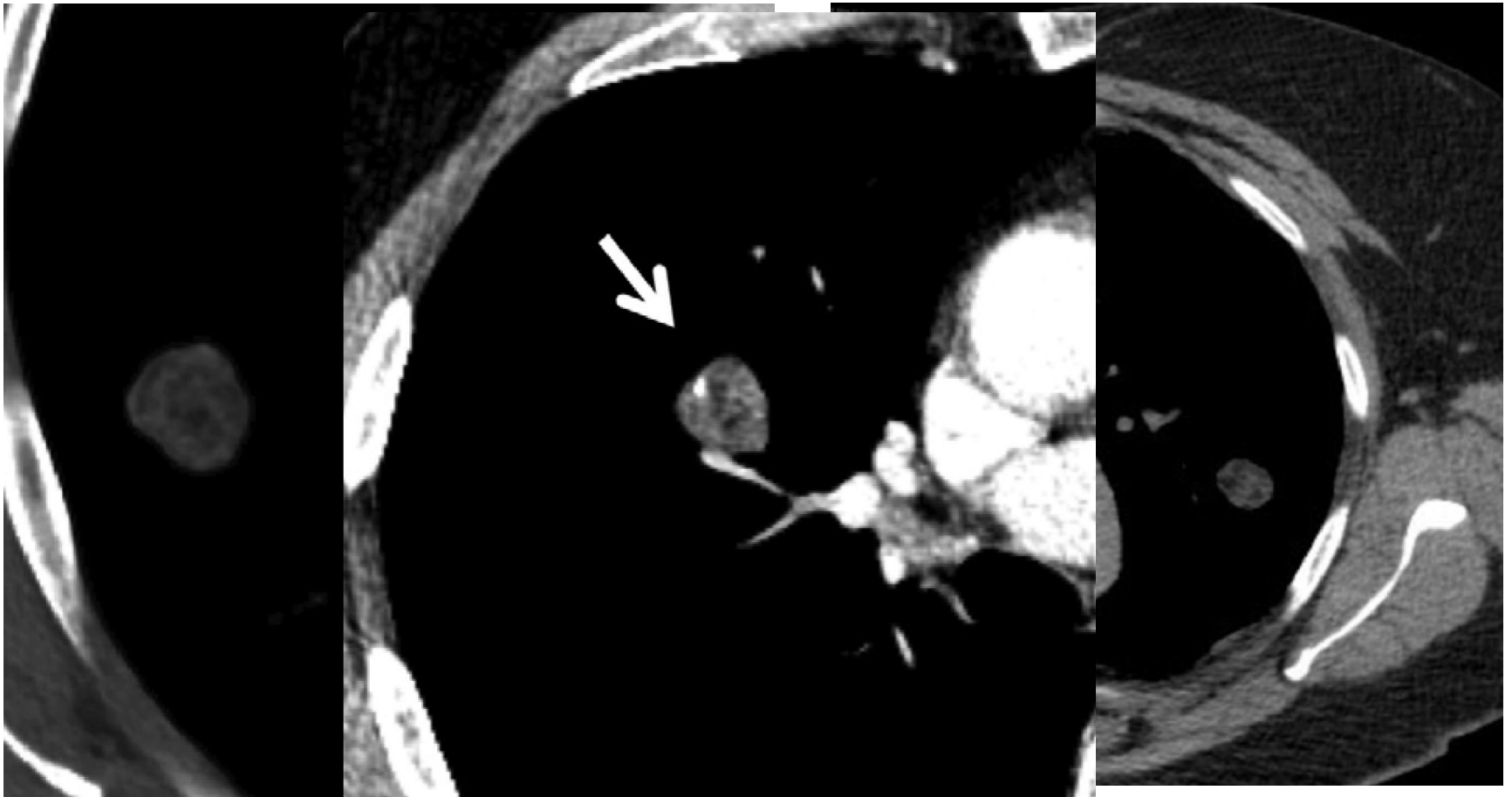
IND



ERM



ATION

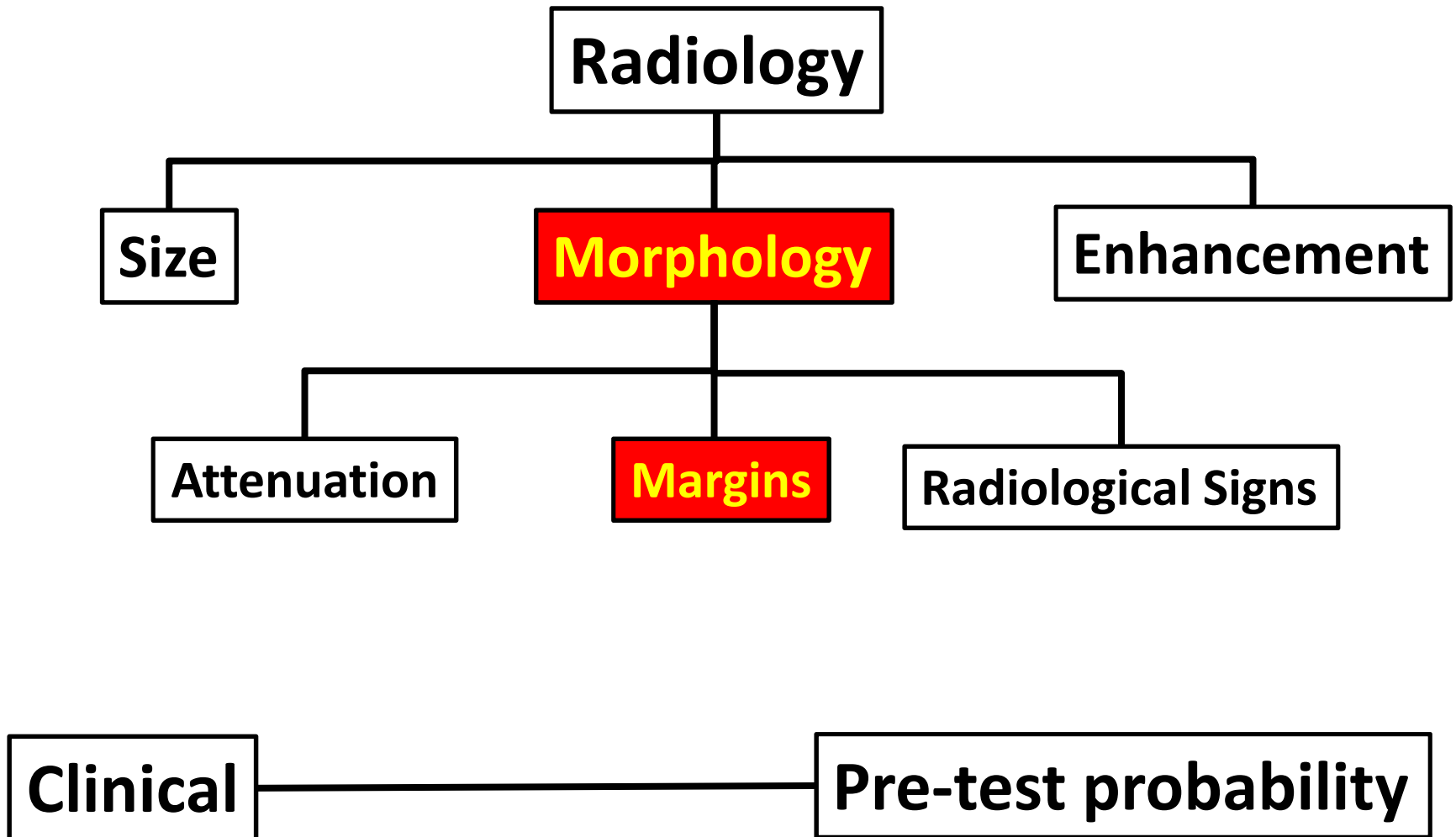


Fat density recognized within nodules
Smooth margins



Compatible with hamartoma

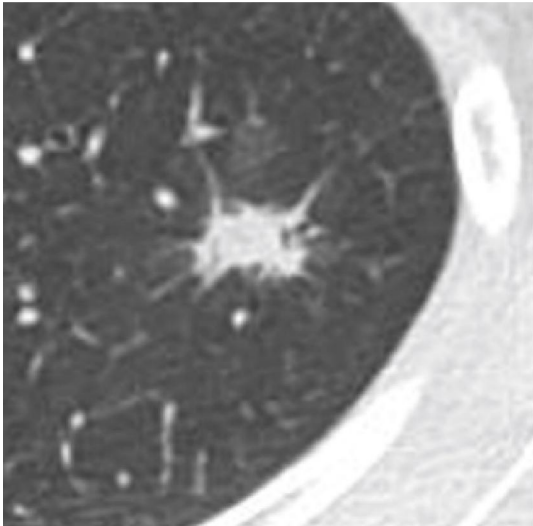
What to look for?



Margins

In favor of malignancy

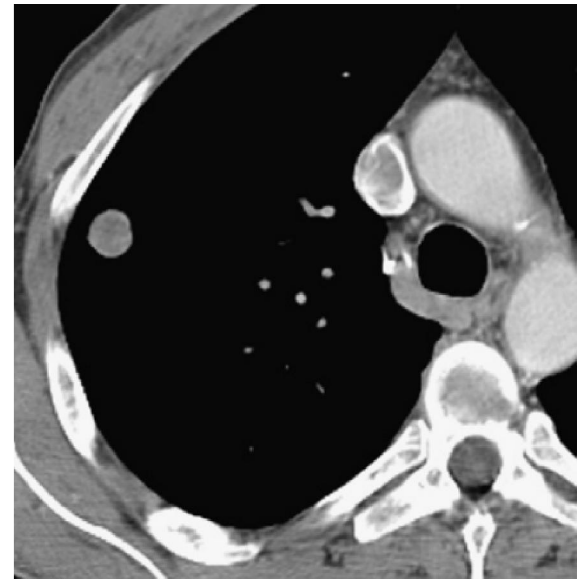
- Lobulated
- Scalloped, spiculated
- Corona radiata



Adenocarcinoma

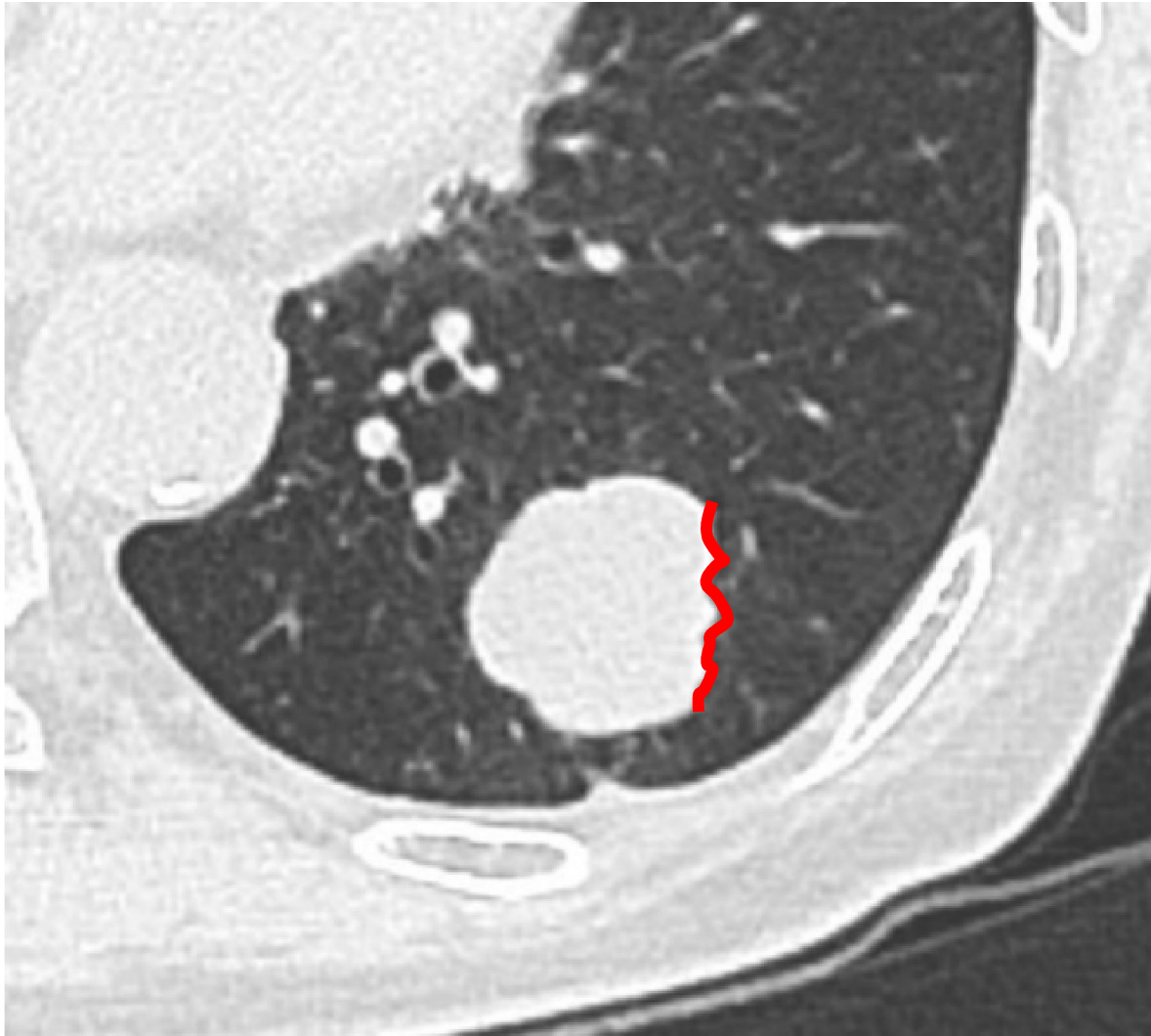
In favor of benignity

- Smooth, BUT
- 20% malignant
- 30% metastatic



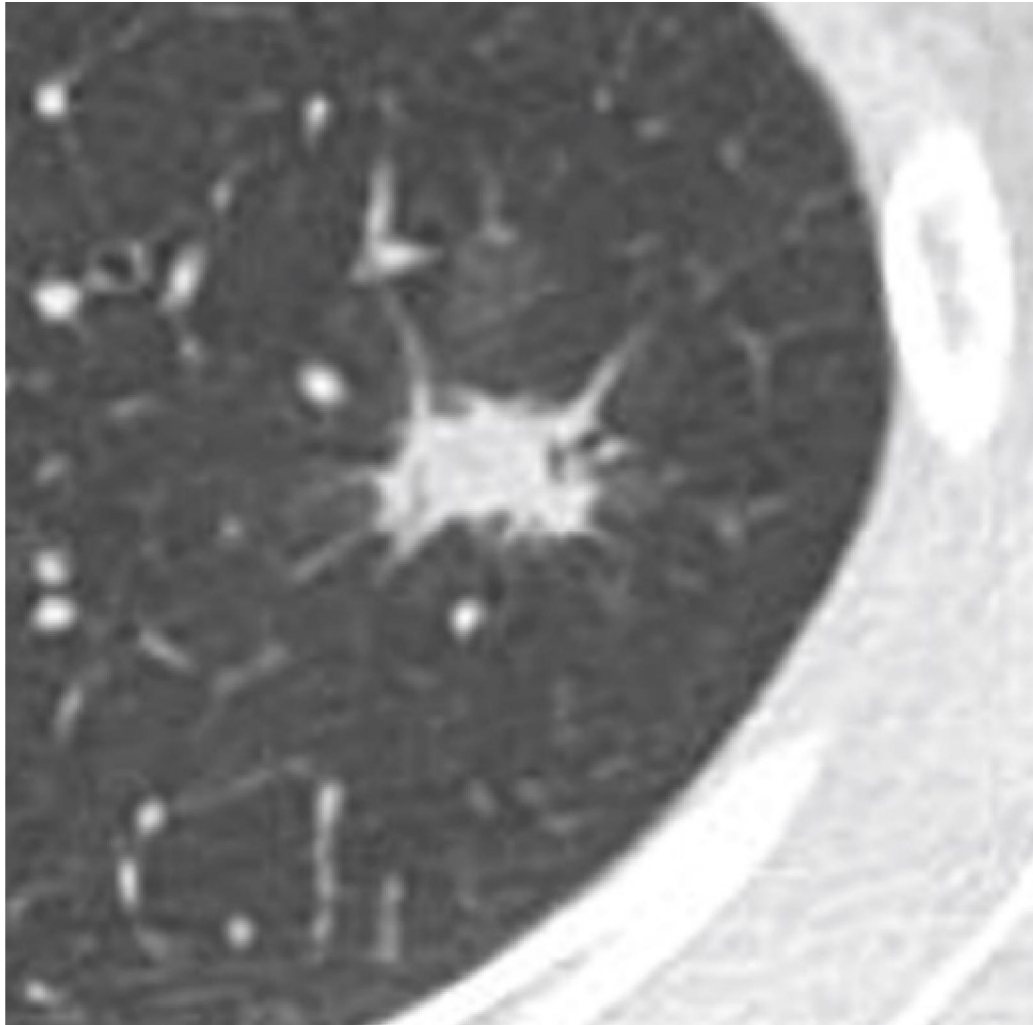
Metastatic , nasopharyngeal cancer

Lobulated margins



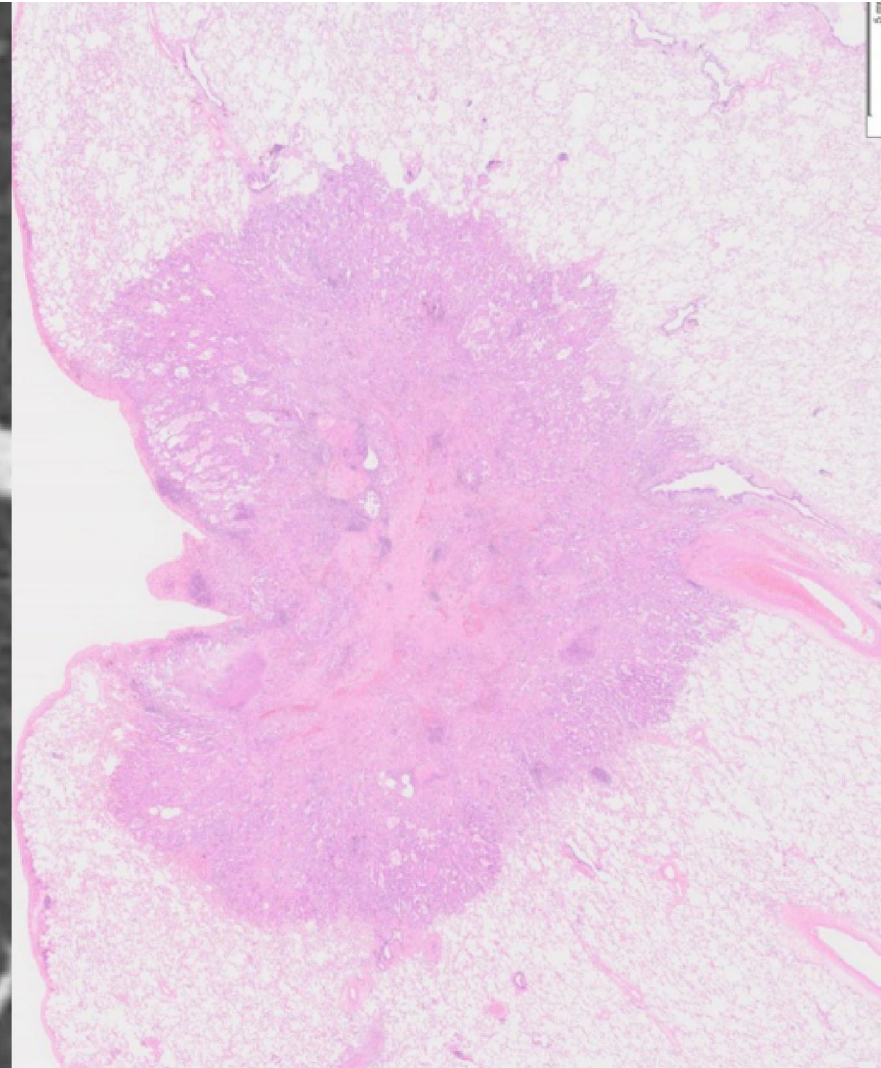
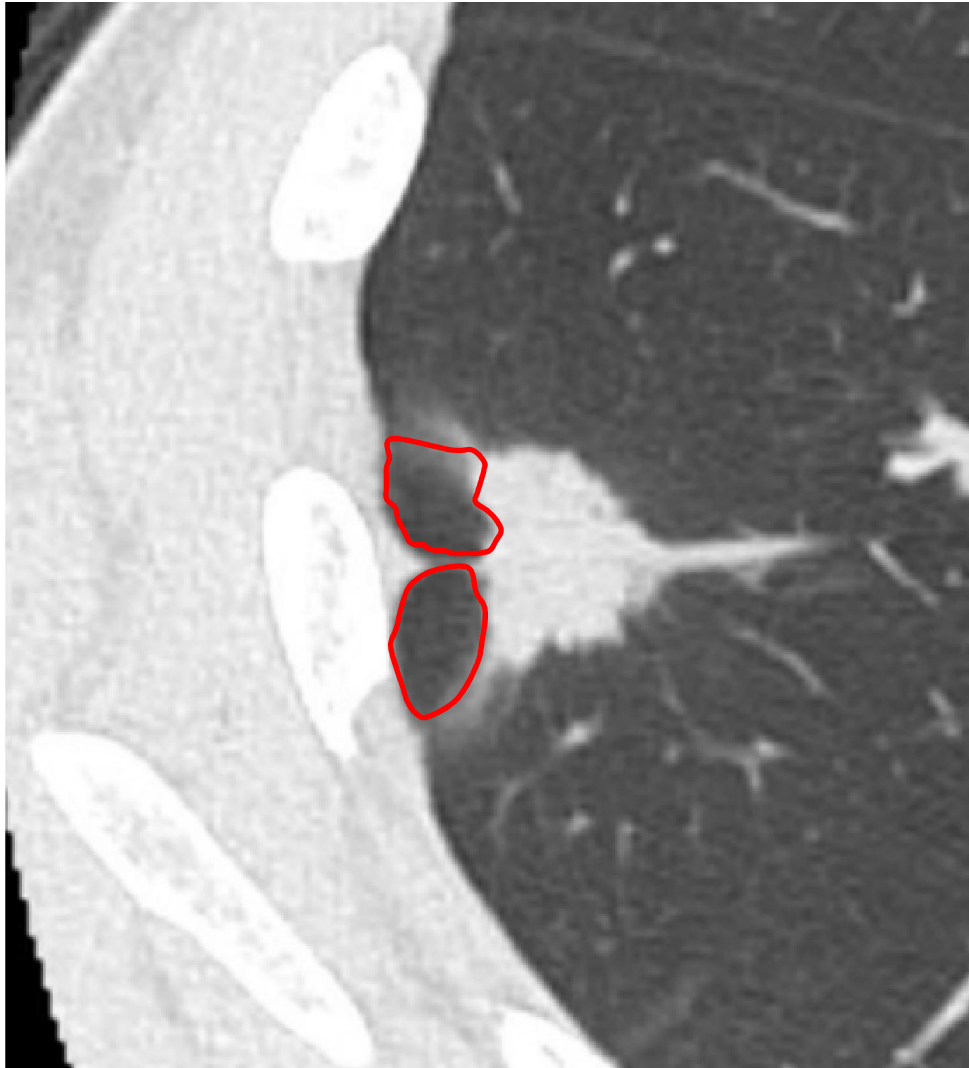
Squamous cell carcinoma

Spiculated, irregular margins

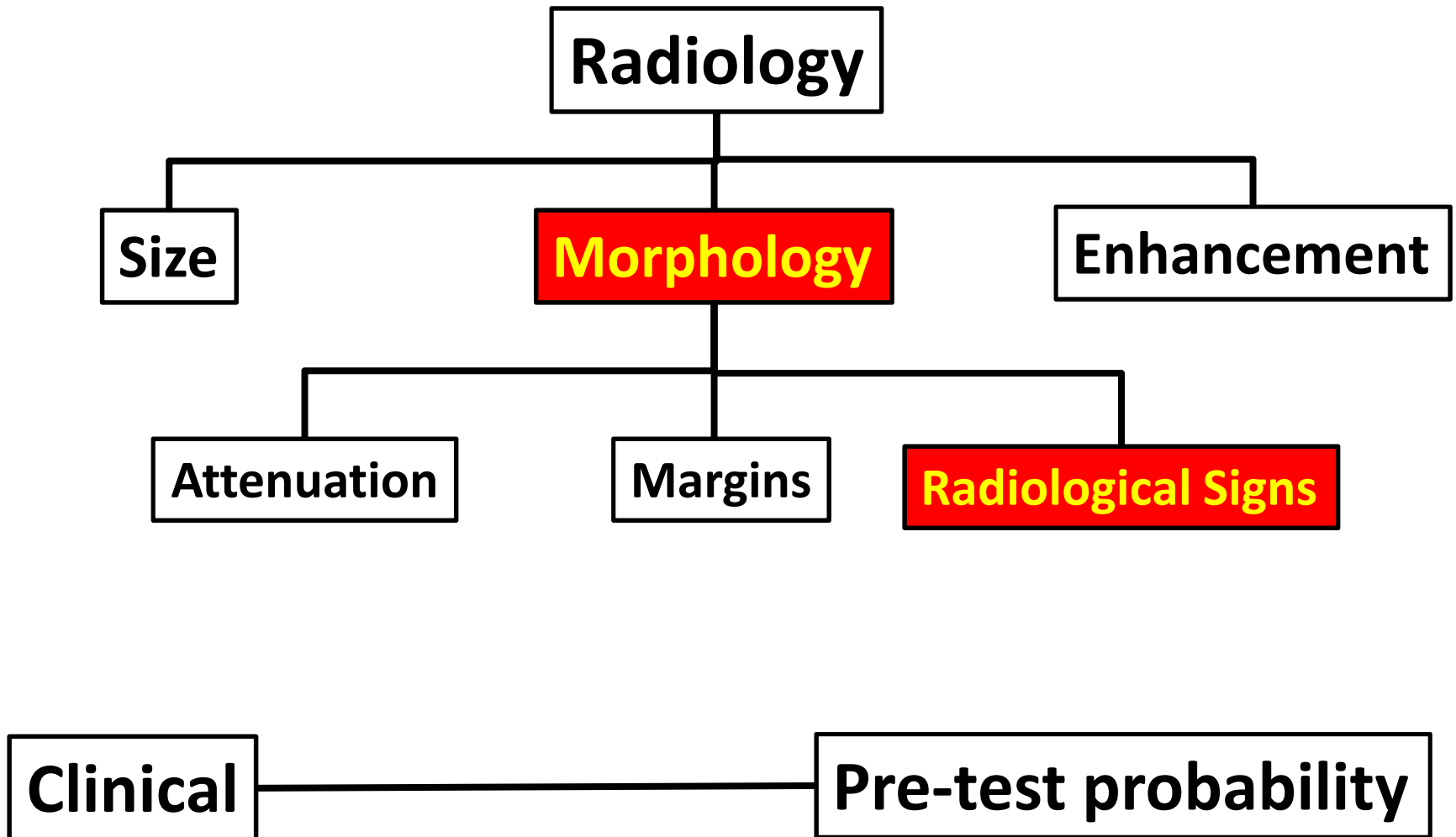


Adenocarcinoma

Pit-fall sign



What to look for?



Air Bronchogram



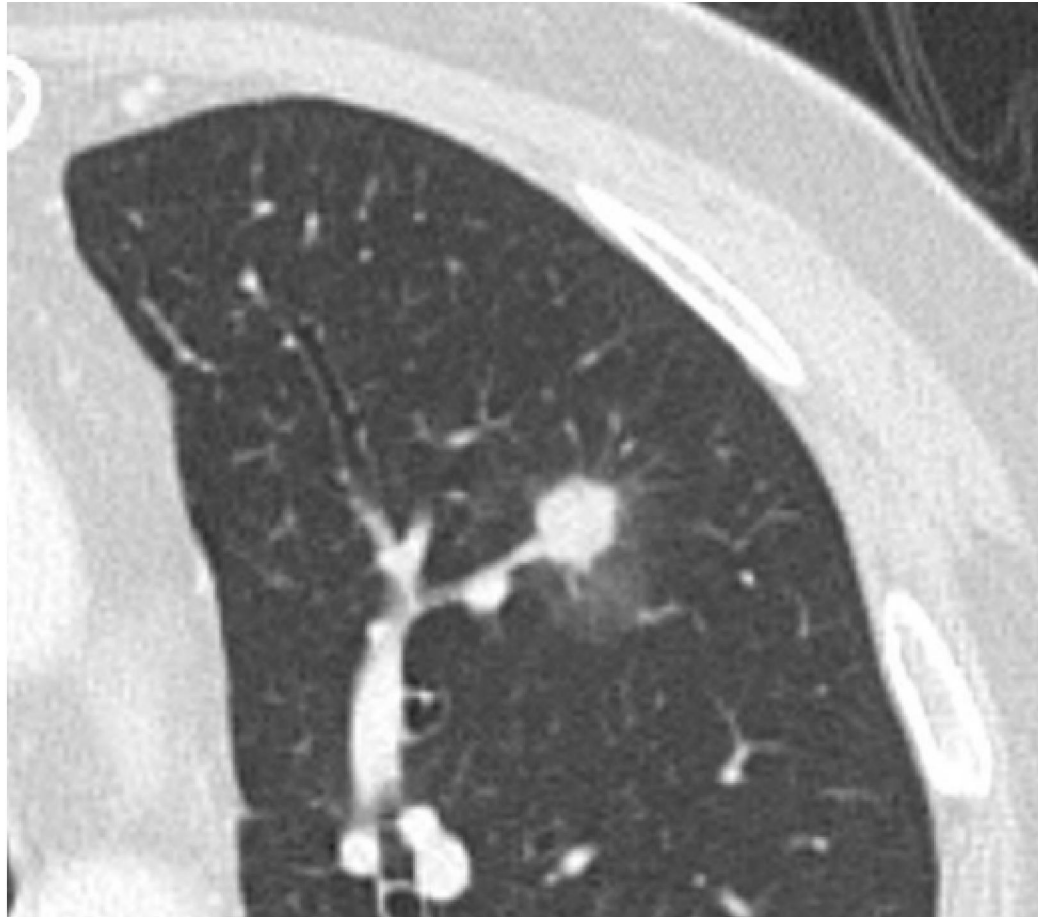
Adenocarcinoma



Adenocarcinoma

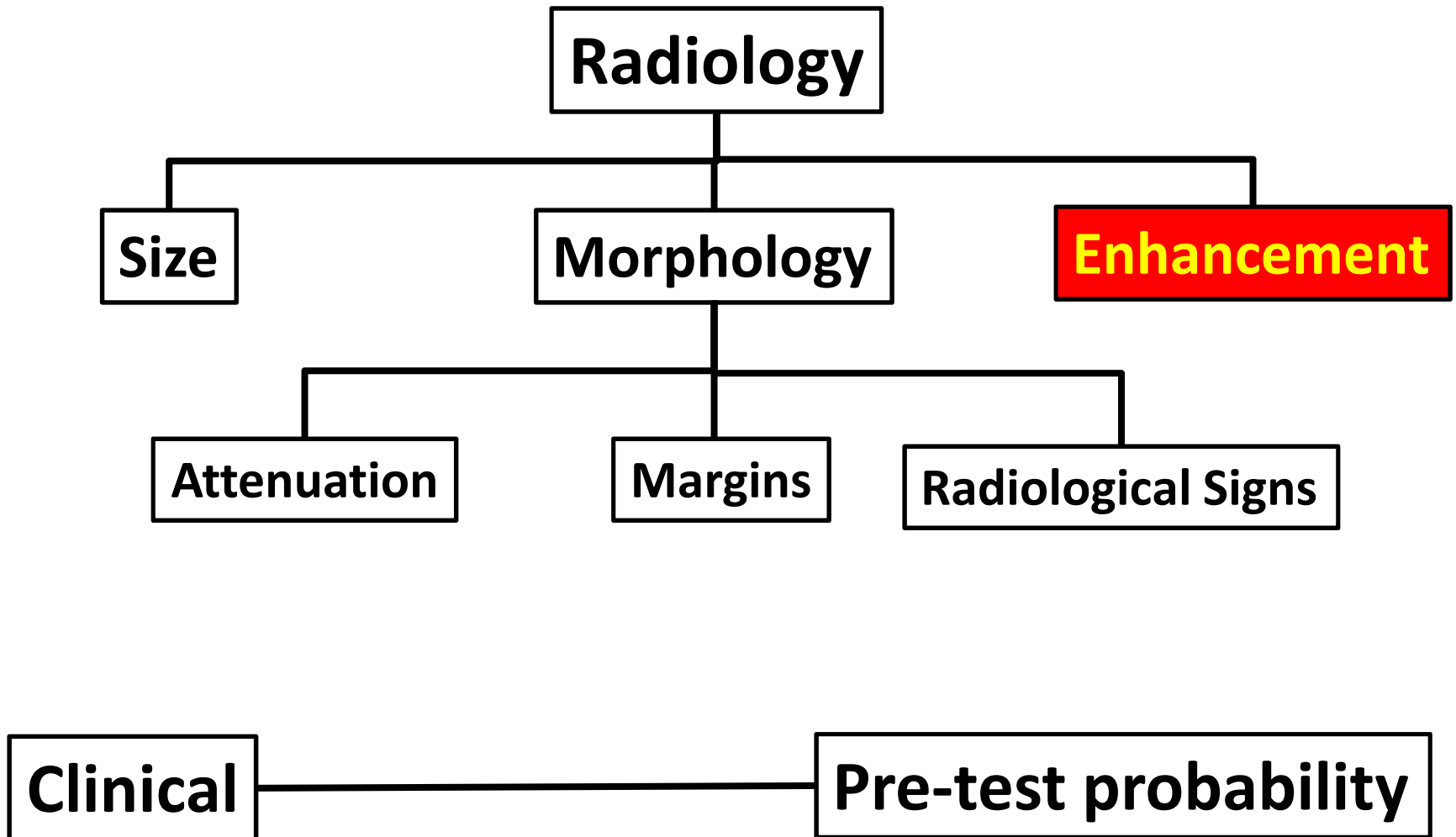
The presence of air bronchograms and/or bubble-like lucencies should not mislead away from the possibility of malignancy

Halo sign



Adenocarcinoma

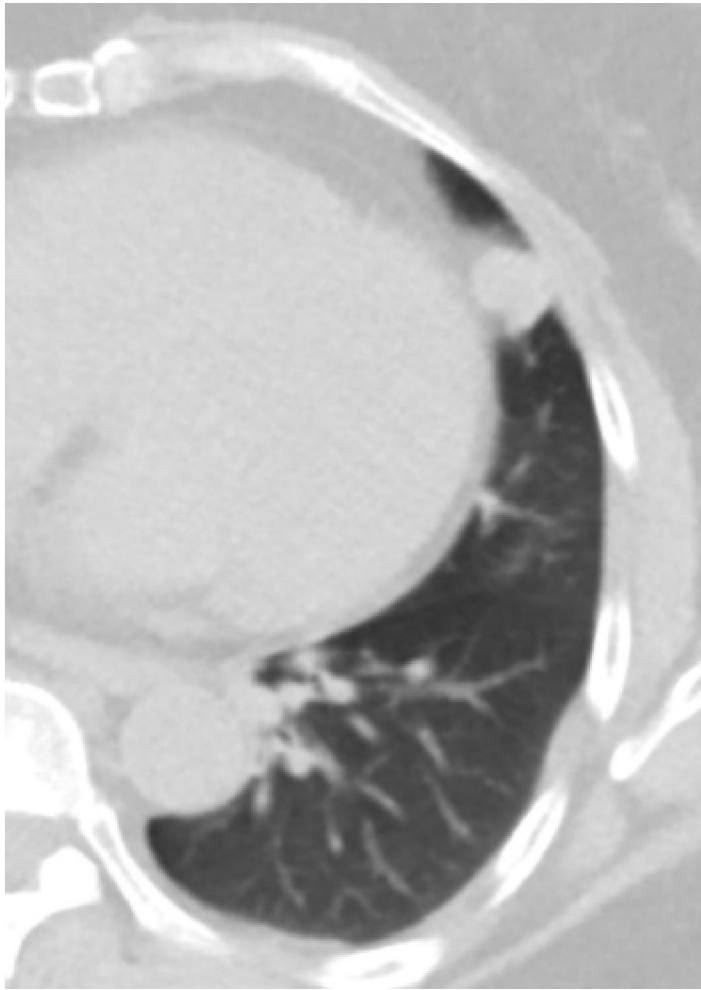
What to look for?



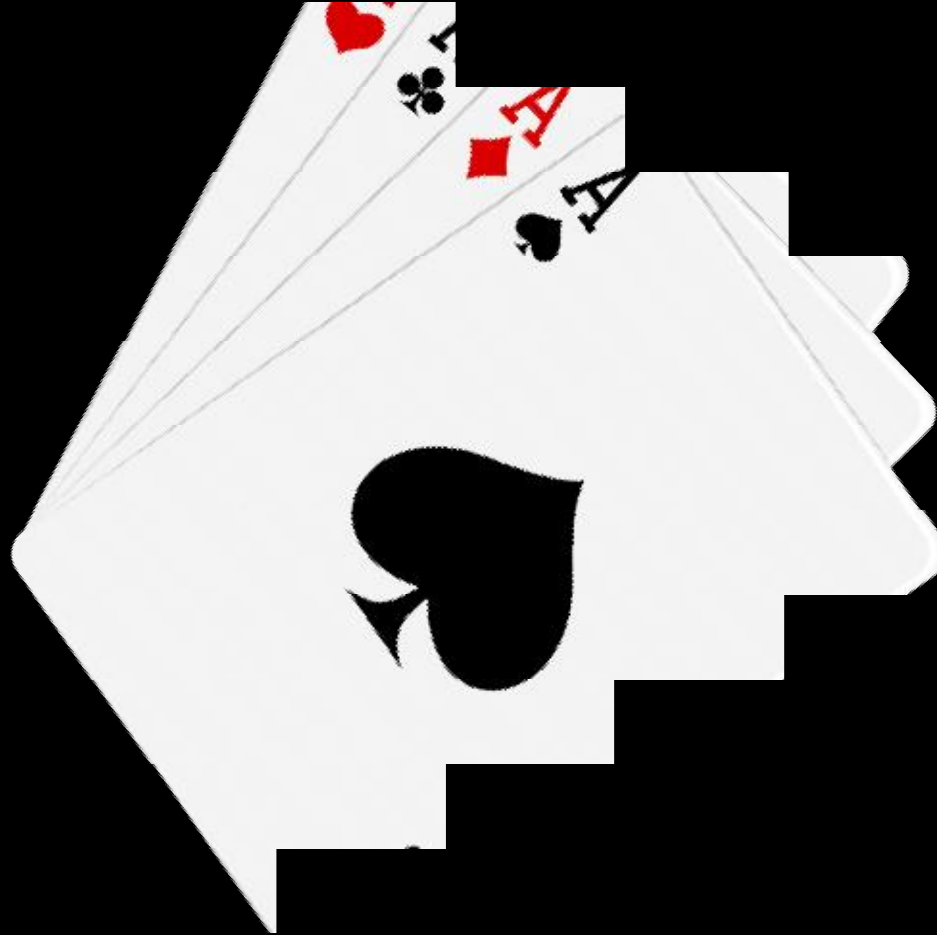
Contrast enhancement

- **Contrast enhancement <15 HU:**
- **Very high predictive value for benignity (99%)**
- **Diagnosis of Pulmonary Arteriovenous Malformations**

PAVM



Prior imaging studies



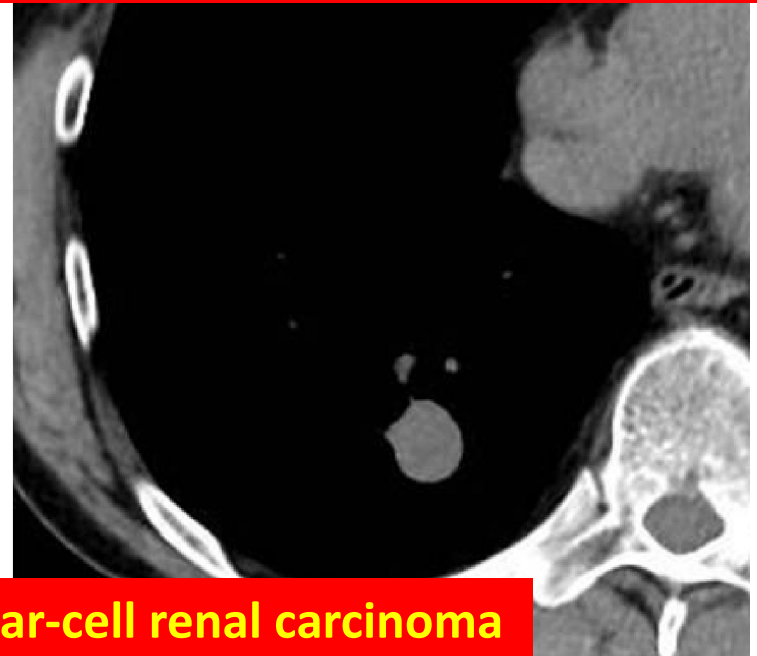
PET/CT scan-False negatives

- **Size <0,8-1cm**
- **Type of tumor**

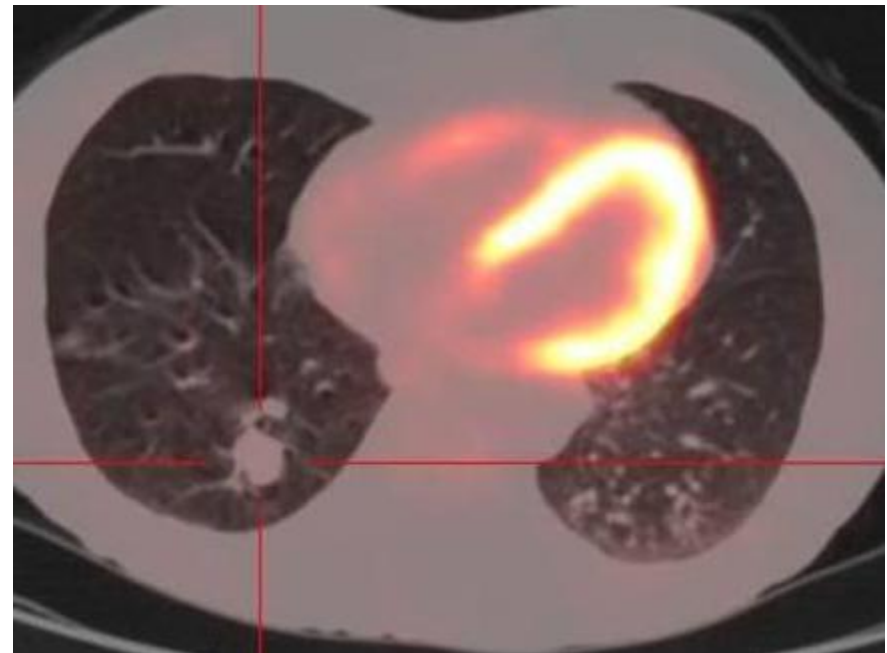
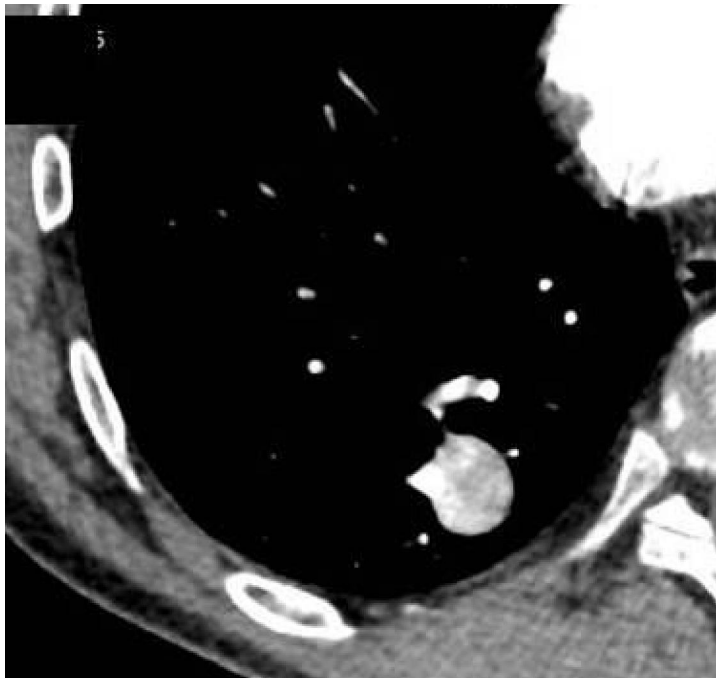
Examples of potentially negative FDG-PET malignancies

- **Adenocarcinoma**
- **Carcinoid tumors**
- **Low grade lymphomas**
- **Renal cell carcinomas**
- **Hepatomas**
- **Mucinous tumors of the GIT**

61 year old male, right nephrectomy in 2006 due to kidney neoplasia

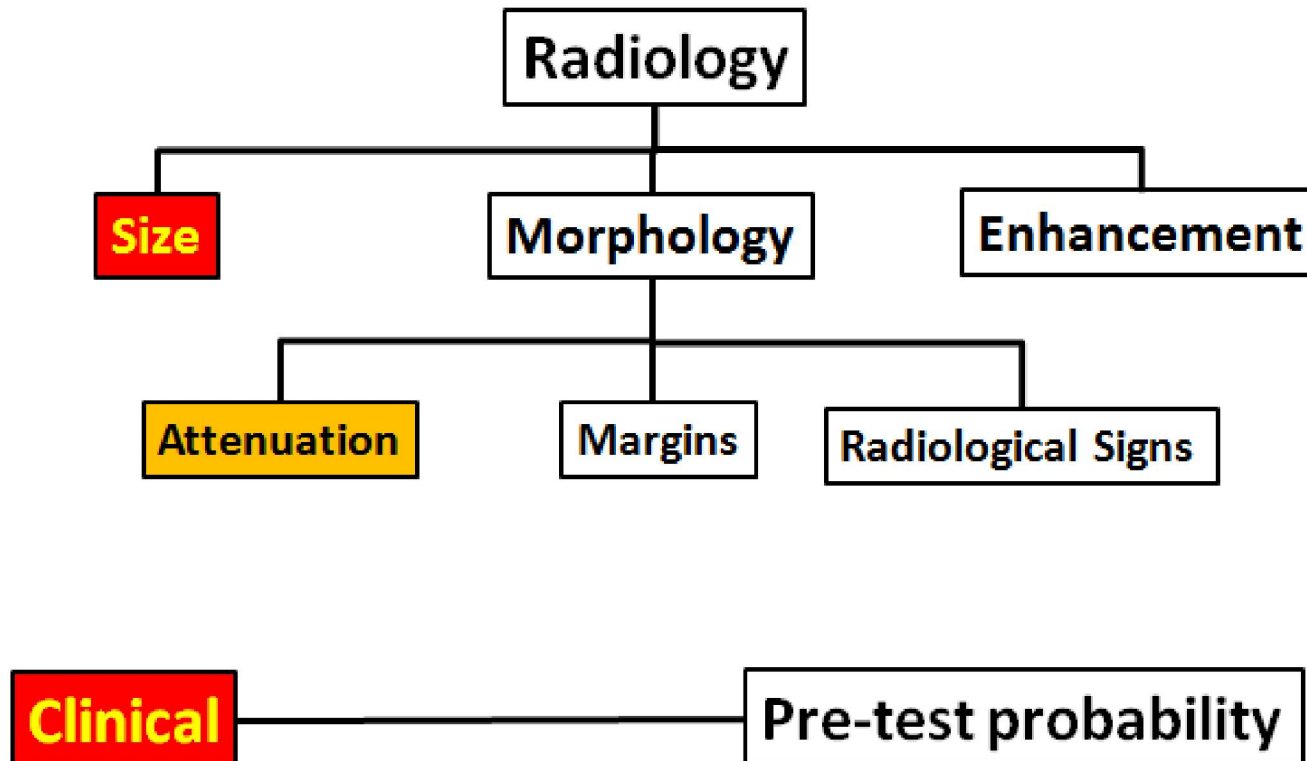


Metastasis from clear-cell renal carcinoma



Especially difficult to evaluate nodules <1cm

- PET is unreliable
- It is difficult to assess accurately morphology



Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017¹

These guidelines DO NOT apply to patients:

- **Younger than 35 years,**
- **Immunocompromised**
- **With known cancer**
- **Subjected to lung cancer screening**

When to follow up?

Minimum threshold size for recommending follow-up: estimated cancer risk $\geq 1\%$

Solid nodules

Size (mm)	<6	6-8	>8
Low Risk	No routine follow up	CT at 6–12 months <u>Consider</u> CT at 18–24 months	Consider CT at 3 months, PET/CT, or tissue sampling
High Risk	Optional in 12 months	CT at 6–12 months <u>Obtain</u> CT at 18–24 months	

Solid nodules <6mm

- **Risk of cancer in nodules <6 mm less than 1%, even in patients at high risk**
- **Suspicious morphology and/or upper lobe location can increase cancer risk into the 1%–5% range**
- **Earlier follow-up is not recommended as such small nodules, if malignant, rarely advance in stage over 12 months**

Subsolid nodule

Size (mm)	≤6	>6
Ground Glass	No routine follow-up	CT at 6–12 months (confirm persistence), then CT every 2 years until 5 years
Part Solid	N/A	CT at 3–6 months (confirm persistence) If unchanged and solid component remains ≤6 mm, annual CT for 5 years.

Risk Factors for Malignancy



Brock model

- Larger nodule size
- Spiculation
- Part-solid nodule type
- Older age
- Female sex
- Family history of lung cancer
- Emphysema
- Upper lobe nodule location
- Lower nodule count

Fibrosis!!!

67 year old man with progressive shortness of breath

At presentation



Upper lobe predominant centrilobular emphysema

Irregular reticular pattern

Traction bronchiectasis

Honeycomb changes

CPFE

At presentation



After 1 year



Enlarging lobulated nodule in the left upper lobe

Take home messages

- **SPN evaluation is multidimensional**
- **Begin by estimating pretest probability for malignancy**
- **Important radiological parameters**
 - ✓ **Size**
 - ✓ **Morphology**
 - ✓ **Enhancement**
 - ✓ **Location**
- **Science and Art: follow up vs invasive diagnosis**

