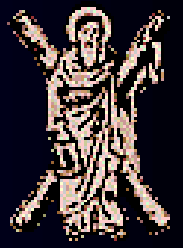
ΙΑΤΡΙΚΗ ΣΧΟΛΗ ΠΑΝΕΠΙΣΤΗΜΙΟΥ ΠΑΤΡΩΝ
ΑΠΑΡΤΙΩΣΗ
2020
ΑΣΘΕΝΗΣ ΤΕΛΙΚΟΥ ΣΤΑΔΙΟΥ- ΟΓΚΟΛΟΓΙΑ



Ακτινολογική διαγνωστική προσέγγιση ασθενούς με καρκίνο

3.11.2020

Π. Κρανιώτης

Διαγνωστικοί Χειρισμοί

1. Πρώιμη διάγνωση (screening) Ca πνεύμονα (Low dose CT)
2. Σταδιοποίηση της νόσου
3. Διαδερμική βιοψία (ιστολογική ταυτοποίηση)
4. Ανταπόκριση στην θεραπεία

1. Πρώιμη διάγνωση Ca πνεύμονα (Screening test)

- ✓ Low dose CT= Χαμηλής Δόσης Αξονική Τομογραφία Θώρακος.

- ✓ **Εφαρμόζεται σε ασθενείς «Υψηλού κινδύνου» :**

- ***Καπνιστές*** >50έτη - >30 pack/yrs

The American Association for Thoracic Surgery guidelines

Annual lung cancer screening with low-dose computed tomography screening for North Americans from age 55 to 79 years with a 30 pack-year history of smoking.

Long-term lung cancer survivors should have annual low-dose computed tomography to detect second primary lung cancer until the age of 79 years.

Low dose CT

- ✓ Ισοδύναμη δόση: 0.4-0.6 mSv

- ✓ Δόση α/α θώρακος: 0.1mSv F
  0.25mSv P

0.35 mSv

Class I <0.3 mSv
Class II >0.3 mSv

Low dose CT vs α/α θώρακα

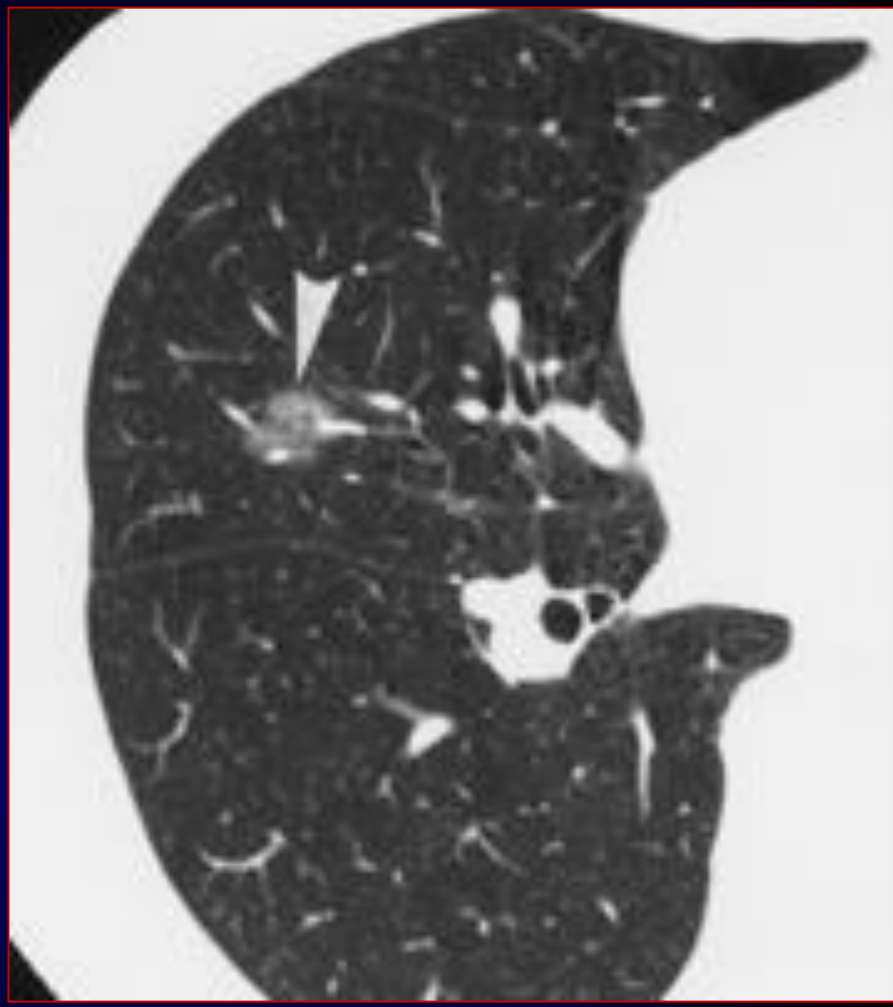
	Low dose CT	α/α θώρακα
Ευαισθησία	3	1
Ανάδειξη Ca πνεύμονα	4	1
Ανάδειξη stage I Ca πνεύμονα	6	1

Αποτελέσματα Low Dose CT

1000 ασθενείς:

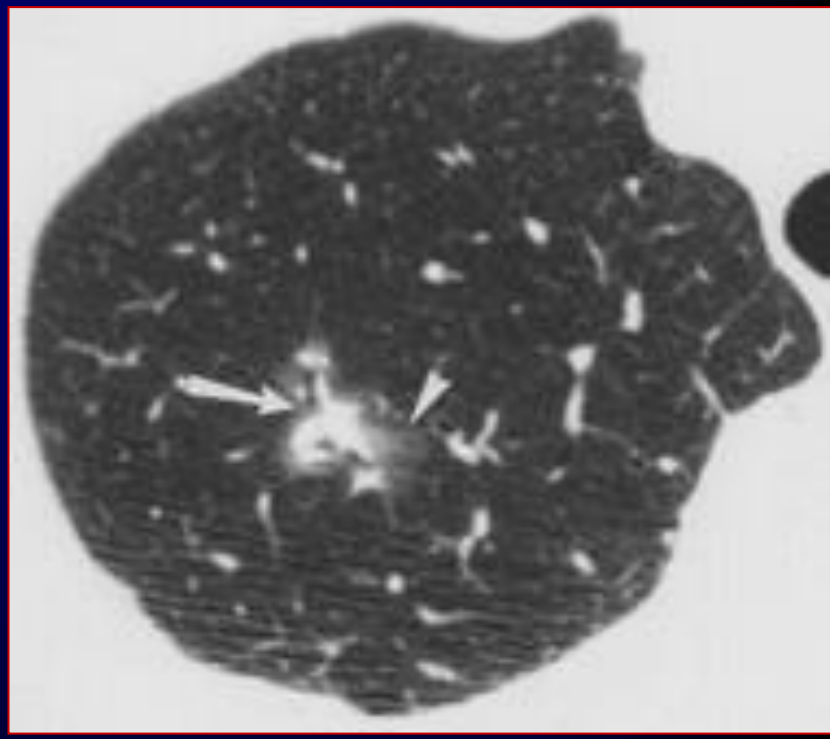
- 1.5%: Ca πνεύμονα
- 70%: stage IA→5ετής επιβίωση μετά χειρουργείο:80%

"Κρυμμένες Βλάβες"



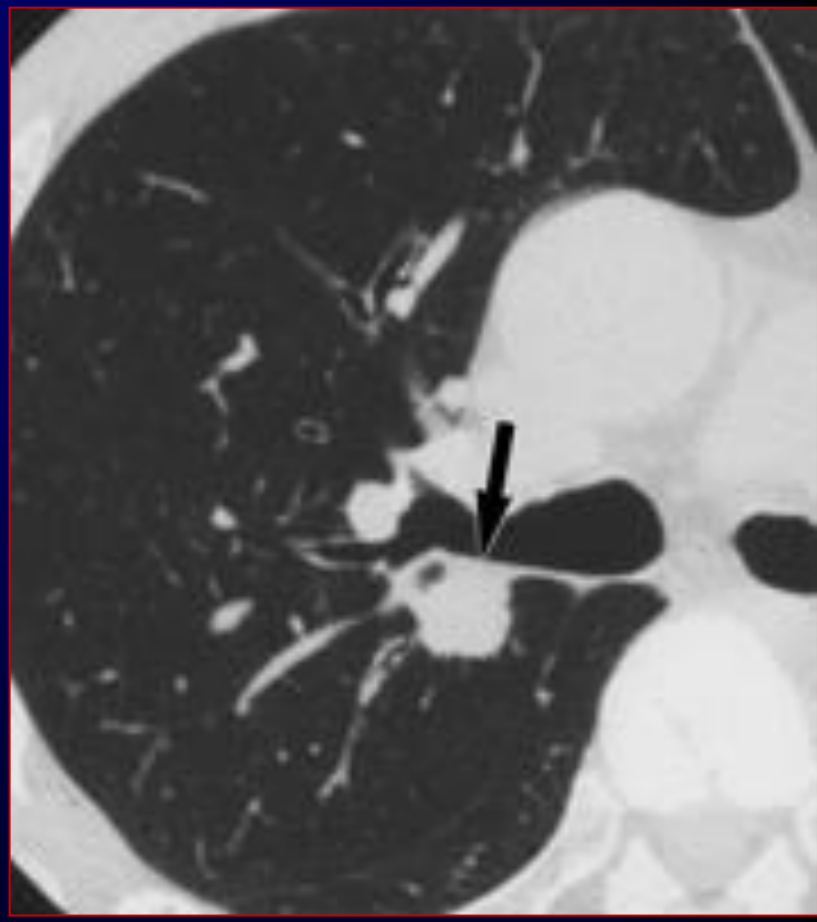
Τύπου Θολής υάλου

"Κρυμμένες Βλάβες"



Όπισθεν κλείδας

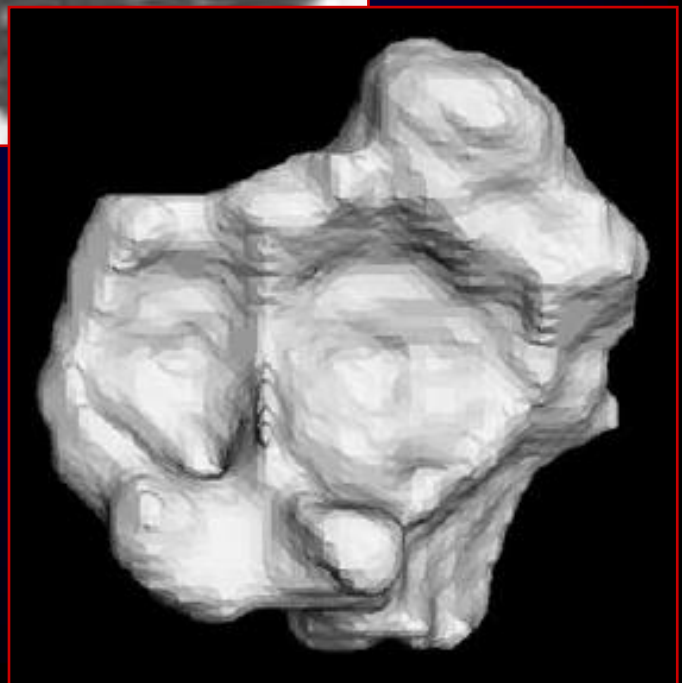
"Κρυμμένες Βλάβες"



Βλάβες που βρίσκονται κοντά στην πύλη

Χαρακτήρες οζιδίων

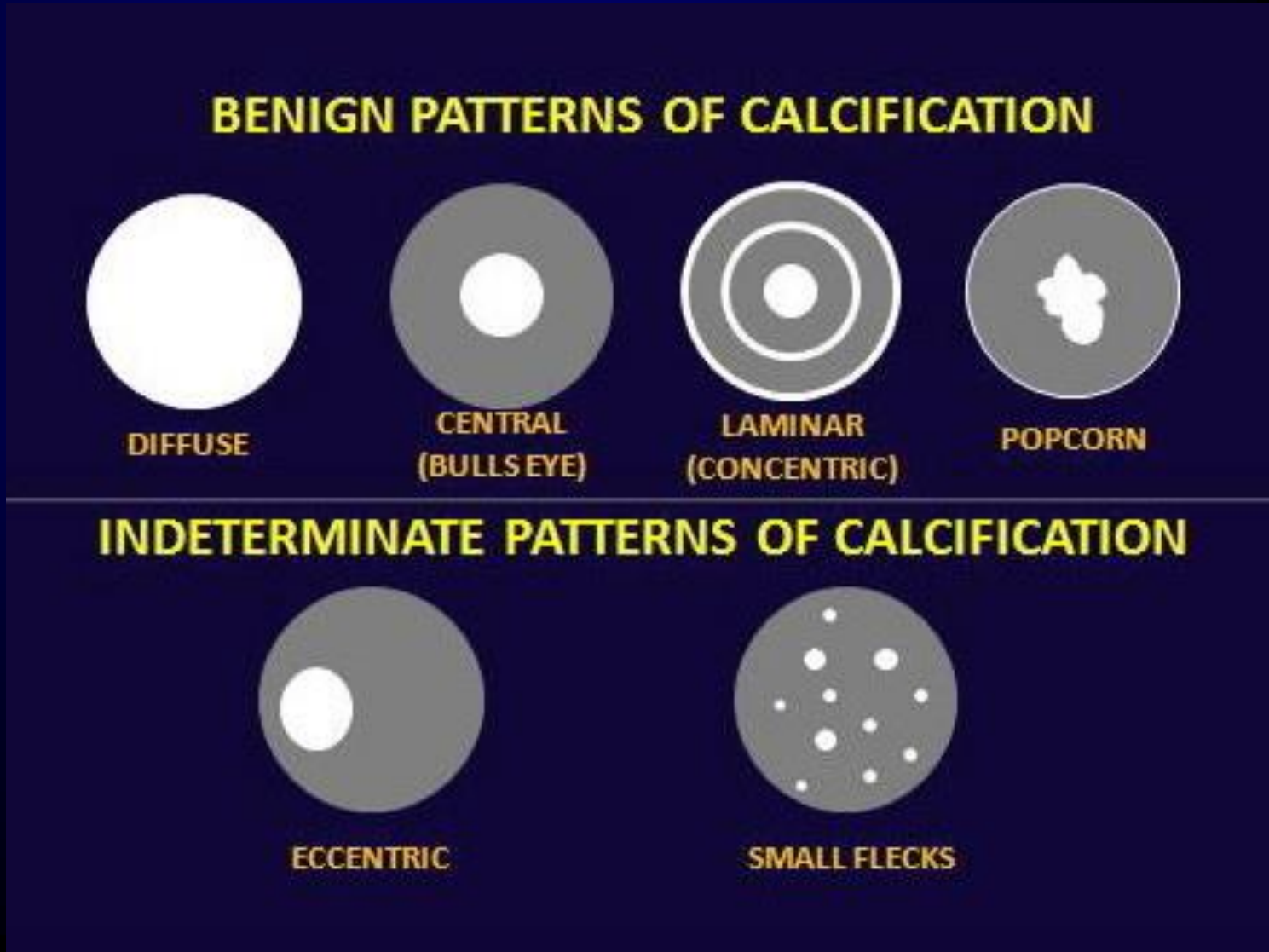
1. Μορφολογία του οζιδίου
2. Μεταβολή του μεγέθους (Volume) του όγκου
3. Αιμοδυναμικοί χαρακτήρες του όγκου



Lung nodule analysis

Αποτιτανώσεις-υπέρ καλοήθειας

- Κεντρική
- Συγκεντρική
- Ποπκορν
- Διάχυτη



Lung nodule analysis

Αιμοδυναμικοί χαρακτήρες του όγκου

- Μεταβολή της πρόσληψης >15 HU

Lung nodule analysis

Pulmonary nodules ≤4 mm have a low risk of being cancerous;

- **nodules between 4-8 mm are of intermediate risk for cancer; follow up CT scans for both categories are recommended on different schedules**

- **Pulmonary nodules >8 mm and mixed solid/ground glass nodules are suspicious for cancer;**
- **-percutaneous needle aspiration biopsy (PNAB),**

-positron emission tomography (PET),

-video assisted thoracic surgery (VATS) should be considered

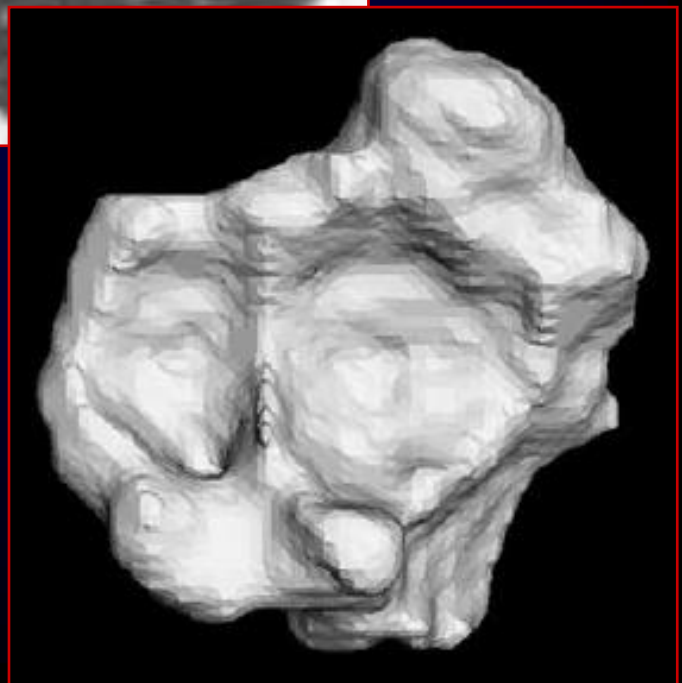
Μορφολογία του οζιδίου

- Καλοήθη =

στρογγυλλά και με ομαλά-σαφή όρια

- Κακοήθη=

λοβωτά, ακανόνιστα όρια, ακτινοειδείς προσεκβολές.

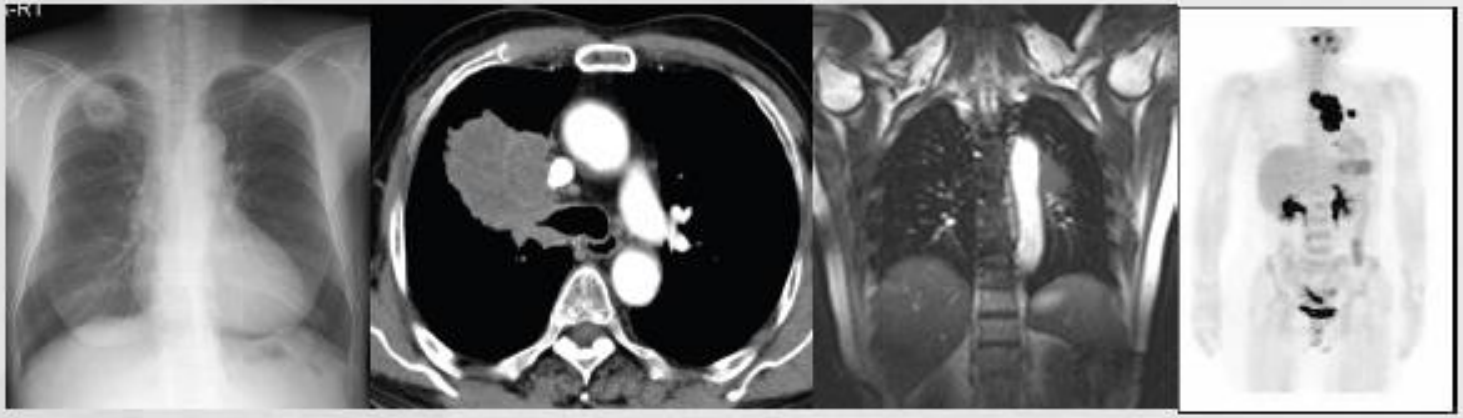


2. Σταδιοποίηση Cα πνεύμονα

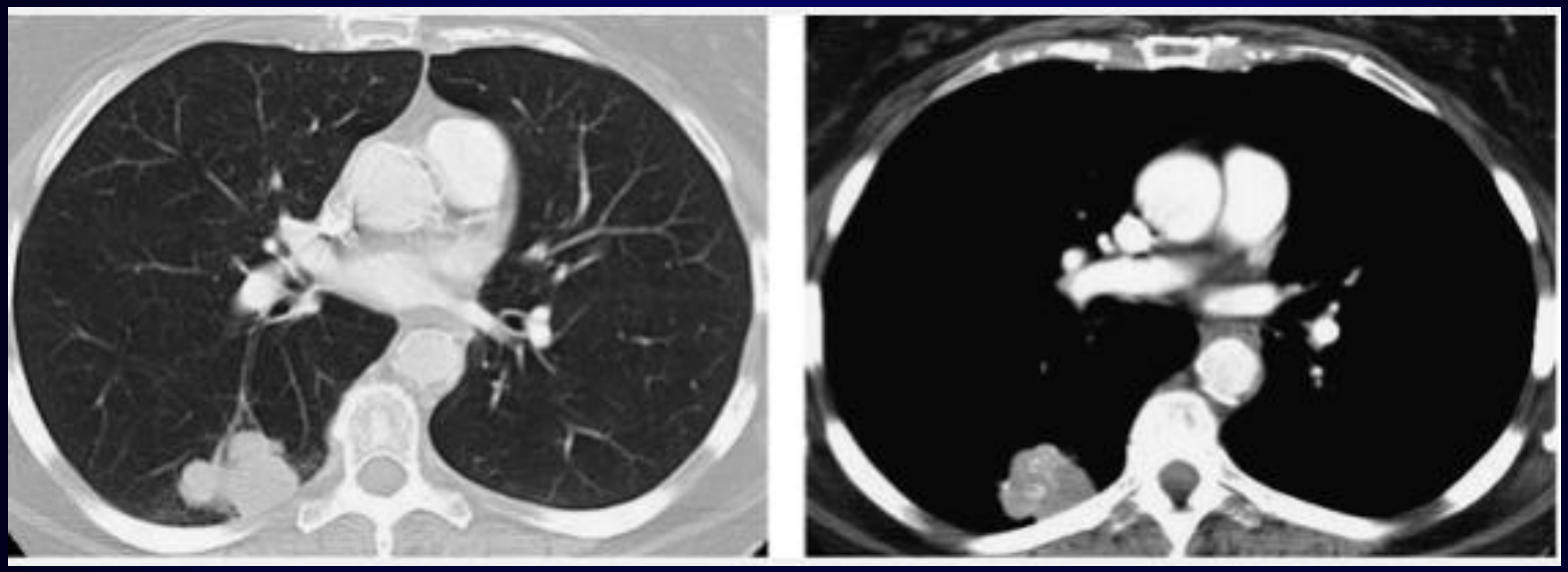
Σταδιοποίηση Ca πνεύμονα

Imaging Modalities

- Chest Radiography
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- PET-CT

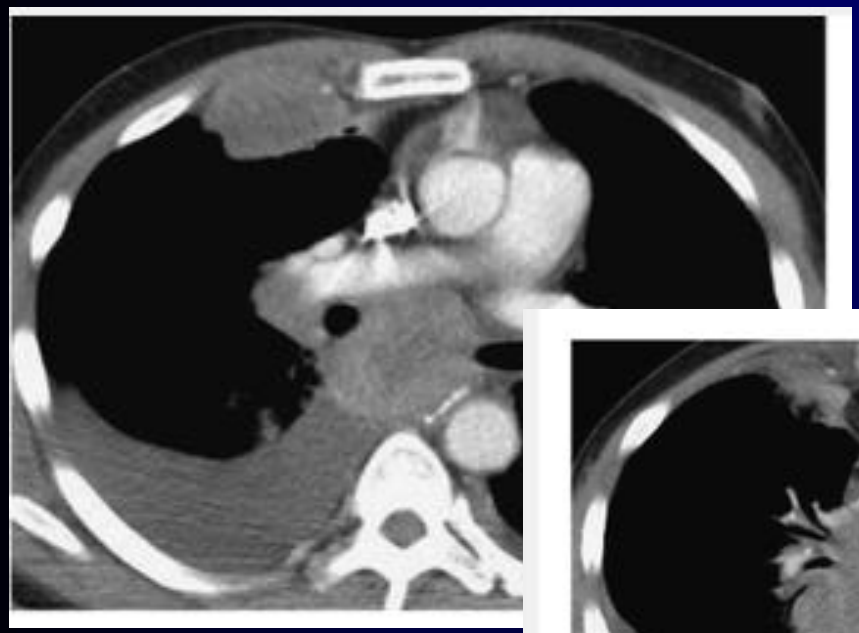


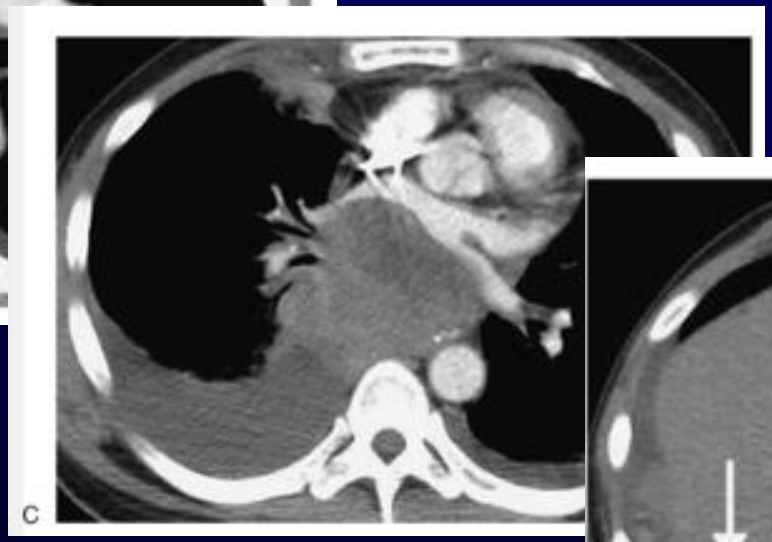
Σταδιοποίηση Ca πνεύμονα

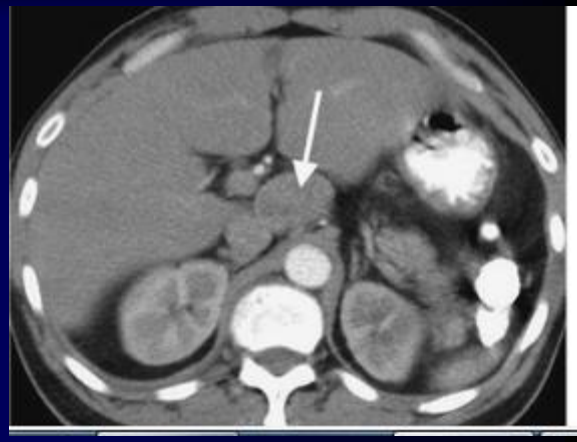


Περιορισμένο Ca

Σταδιοποίηση
Ca πνεύμονα







Εκτεταμένο μικροκυττταρικό-μόνο Chemo

Σταδιοποίηση Ca πνεύμονα με CT

- ✓ Όγκος→ T status: **Accuracy→65%**

- T1→ <3cm
- T2 → >3cm/διήθηση κύριου βρόχου >2 εκ από τρόπιδα/διήθηση υπεζωκότα/αποφρακτική πνευμονίτιδα-αταλεκτασία αλλα όχι όλου του πνευμονα.
- T3→ κάθε μεγέθους, που διηθεί τοίχωμα-διάφραγμα, υπεζωκότα, περικάρδιο/διήθηση κύριου βρόχου <2 εκ από τρόπιδα/αποφρακτική πνευμονίτιδα-αταλεκτασία αλλα όχι όλου του πνευμονα.
- T4 → **κάθε μεγέθους, που διηθεί μεσοθωράκιο, καρδιά, μεγάλα αγγεία, τραχεία, οισοφάγο, τρόπιδα, σπόνδυλο ή με δορυφόρα οζίδια**

- **AT→ υστερεί στην διήθηση μεσοθωρακίου και τοιχώματος θώρακα.**

Σταδιοποίηση Ca πνεύμονα με CT

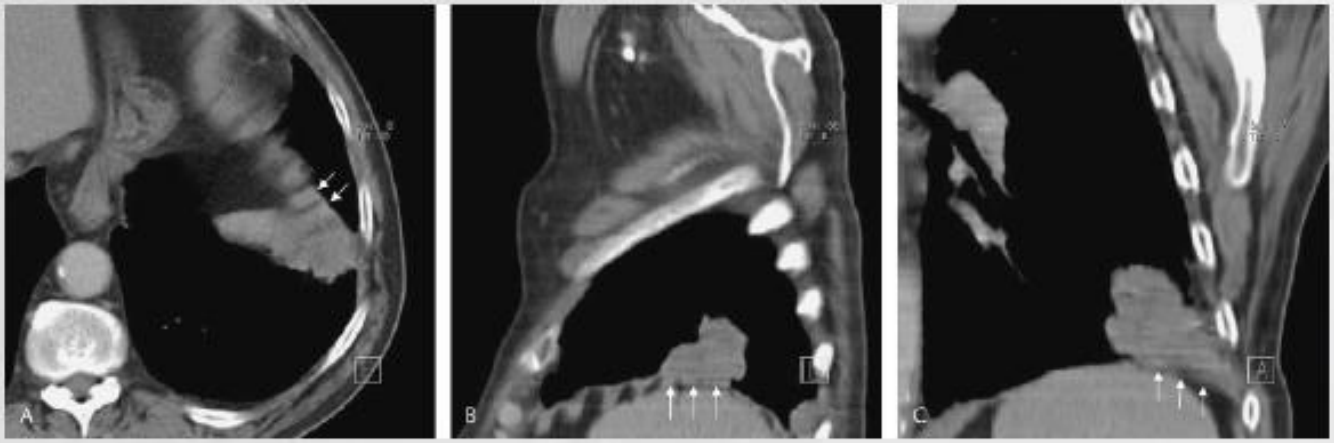
Sensitivity and specificity for diagnosing chest wall or aorta invasion using CT were 38-70% and 40-70%, respectively

Σταδιοποίηση Ca πνεύμονα με CT

- ΑΤ→ υστερεί στην διήθηση μεσοθωρακίου και τοιχώματος θώρακα.

MDCT in staging lung cancer

: The role of MPR images



- No evidence of improvement of T and N staging using MDCT for lung cancer
- Role of multiplanar image reconstruction - help in assessing fissure or diaphragm invasion

Chooi et al. J Comput Assist Tomogr 2005

Σταδιοποίηση Ca πνεύμονα με CT

- ✓ Λεμφαδένες→ N status: χαμηλή ευαισθησία της ΑΤ →(57-75%)

- N1→ ομόπλευροι περιβρογχικοί και/ή πυλαίοι
- N2→ομόπλευροι μεσοθωρακικοί και ή υποτροπιδικοί
- N3→ ετερόπλευροι μεσοθωρακικοί, πυλαίοι, ομόπλευροι ή ετερόπλευροι σκαληνοί ή υπερκλείδιοι.

Σταδιοποίηση Ca πνεύμονα με CT

- ✓ Λεμφαδένες >1 εκ στον βραχύ άξονα θεωρούνται παθολογικοί.

Σταδιοποίηση Ca πνεύμονα με CT

Liver

Adrenal

Bone

Brain

Σταδιοποίηση Ca πνεύμονα με MRI

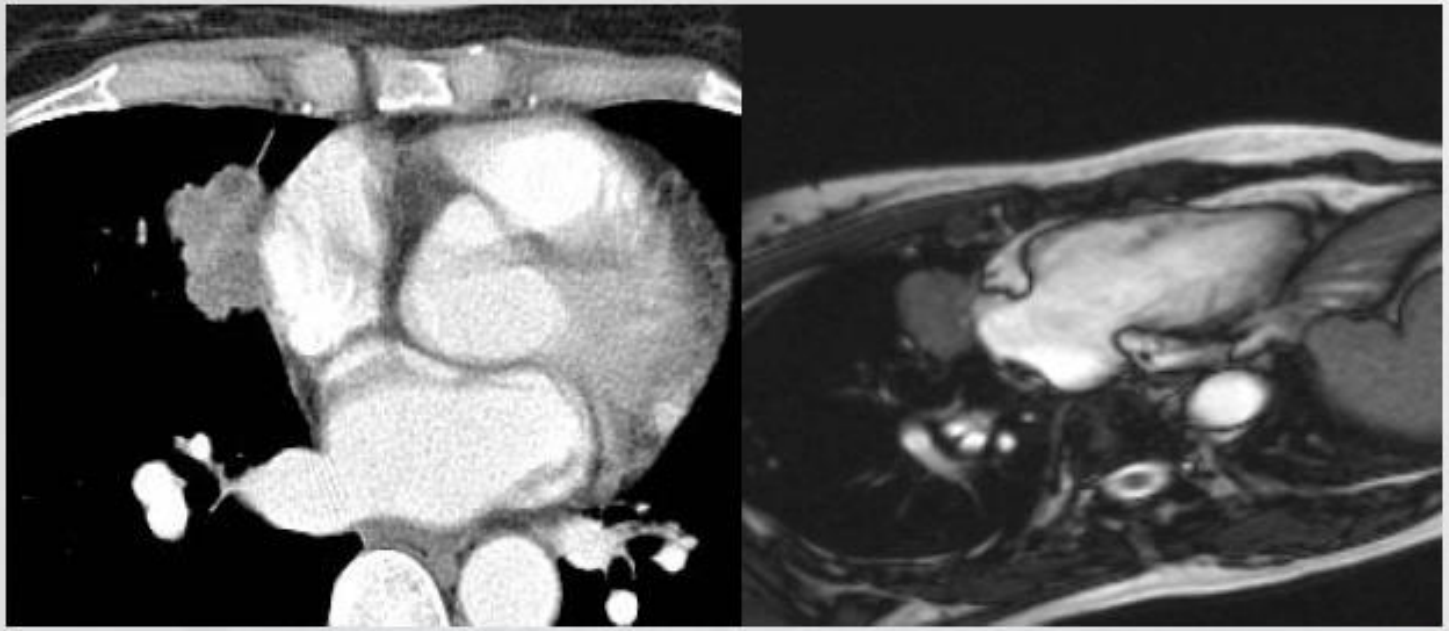
- ✓ MRI Τοπική επέκταση
- ✓ Διήθηση μεσοθωρακίου, θωρακικού τοιχώματος, διαφράγματος, σπονδυλικών σωμάτων

- ✓ MRI=CT
- ✓ Ανάδειξη λεμφαδένων

- ✓ MRI μεταστάσεις
- ✓ Ανάδειξη meta σε εγκέφαλο, ήπαρ, επινεφρίδια

Σταδιοποίηση Ca πνεύμονα με MRI

Usefulness of MRI for evaluation of cardiovascular invasion: evaluation of sliding motion between thoracic mass and adjacent structures on cine MR images



Results: the accuracy for the cine MRI images was 94.4%(51/54) for evaluating cardiovascular invasion of a thoracic mass.

Seo JS et al. JMRI 2005;22:234-241

Σταδιοποίηση Ca πνεύμονα με MRI

Evaluation of chest wall invasion by lung cancer using respiratory dynamic MRI

Table 1. Chest wall invasion, RD MRI versus pathology

	Pathological results: invasion	Pathological results: no invasion	Total
RD MRI: invasion	20	7	27
RD MRI: no invasion	0	34	34
Total	20	41	61

RD, respiratory dynamic.

Sensitivity : 20/20 (100%), Specificity : 34/41 (82.9%)

Akata S et al. J Med Imaging Radiat Oncol (2008)

Σταδιοποίηση Ca πνεύμονα με PET

The role of PET-CT in NSCLC

TABLE 5
Overall Staging at CT and Integrated PET/CT in Patients with Lung Cancer

Modality	Stage I (n = 71)	Stage II (n = 18)	Stage III (n = 17)	Total (n = 106)
CT	47 (66)	14 (78)	9 (53)	70 (66)
Integrated PET/CT	63 (89)	17 (94)	12 (71)	92 (87)

Note.—Numbers denote patients. Numbers in parentheses are percentages.

Integrated FDG PET/CT is significantly better than stand-alone CT for lung cancer staging and provides enhanced accuracy and specificity in nodal staging.

Shim SS et al. Radiology 2005; 236:1011–1019

FDG-PET/CT vs 3T MRI

Non-small cell lung cancer staging: Comparison of PET/CT versus 3T MRI

Accuracy	PET-CT	MRI	P value
T stage	82% (101/123)	86% (106/123)	P = .263
N stage	70% (105/150)	68% (102/150)	P = .880
M stage	86% (133/154)	86% (132/154)	P > .99

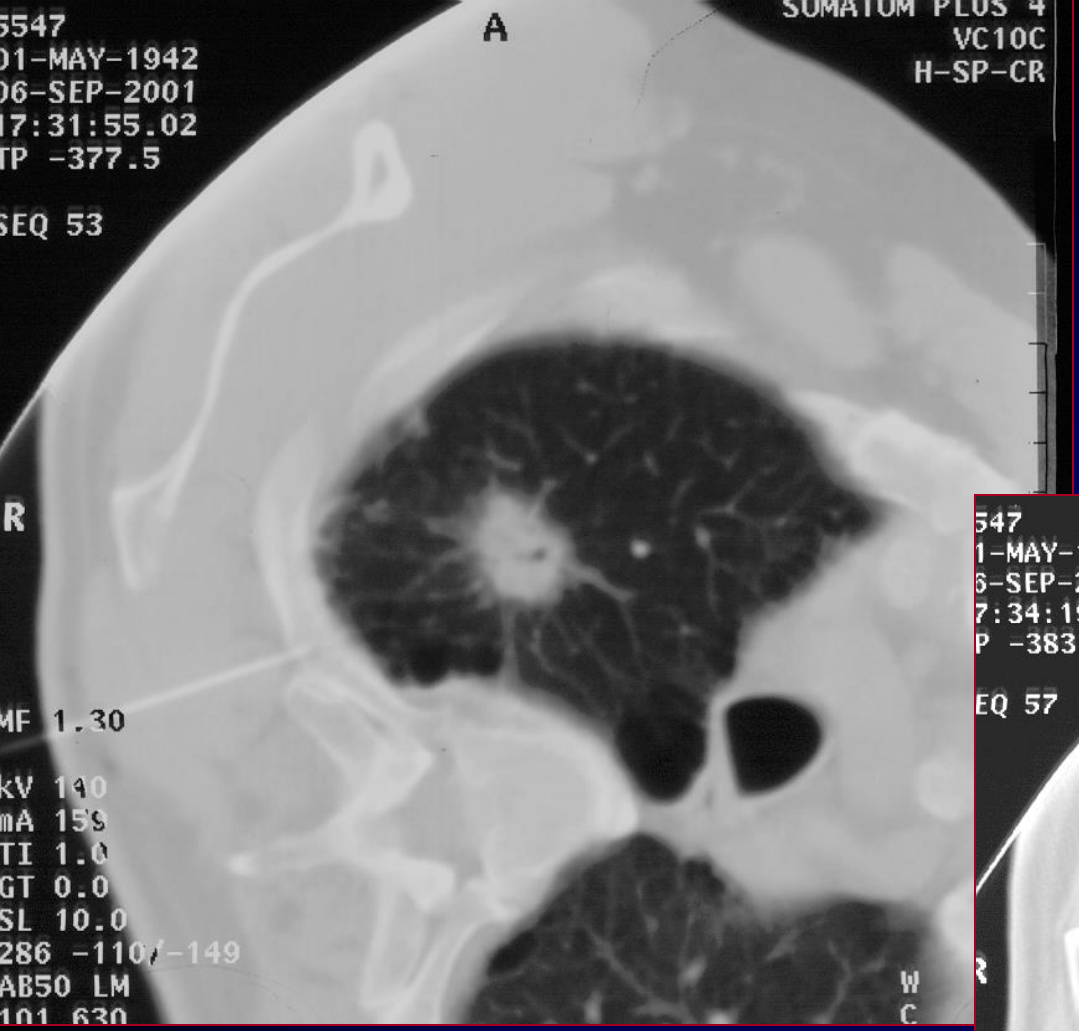
Both PET/CT and 3.0-T whole-body MR imaging appear to provide acceptable accuracy and comparable efficacy for NSCLC staging.

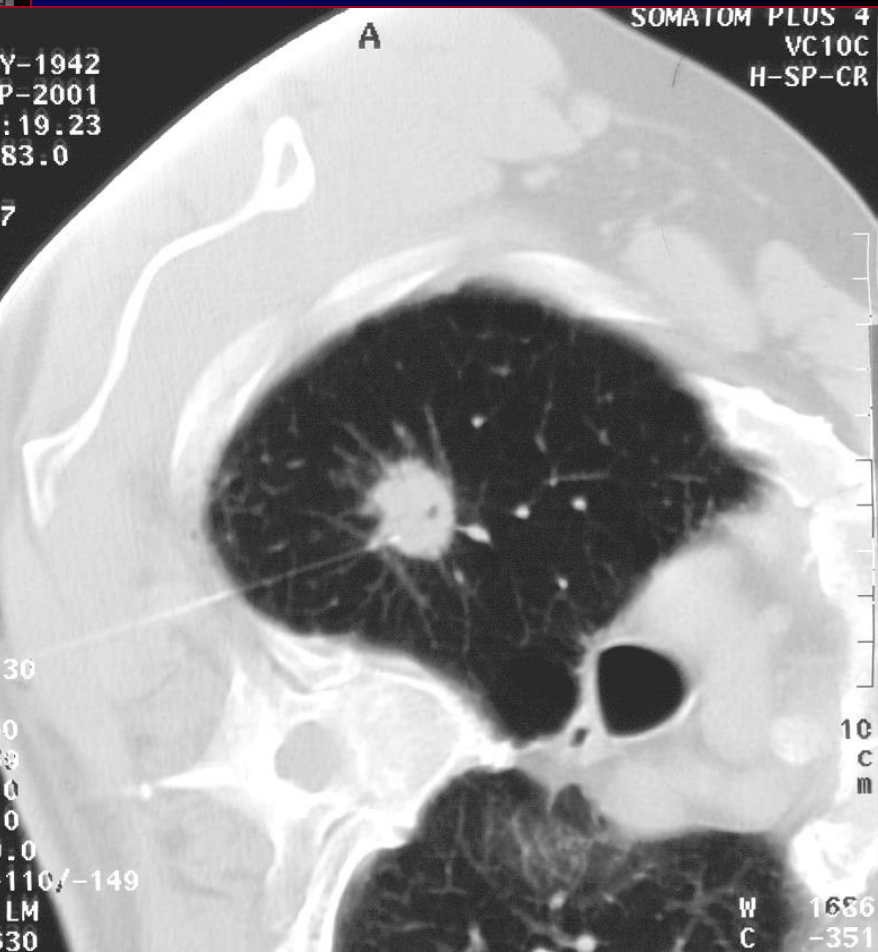
Whole-body MR imaging was more useful for detecting brain and hepatic metastases, whereas PET/CT was more useful for detecting lymph node and soft-tissue metastases.

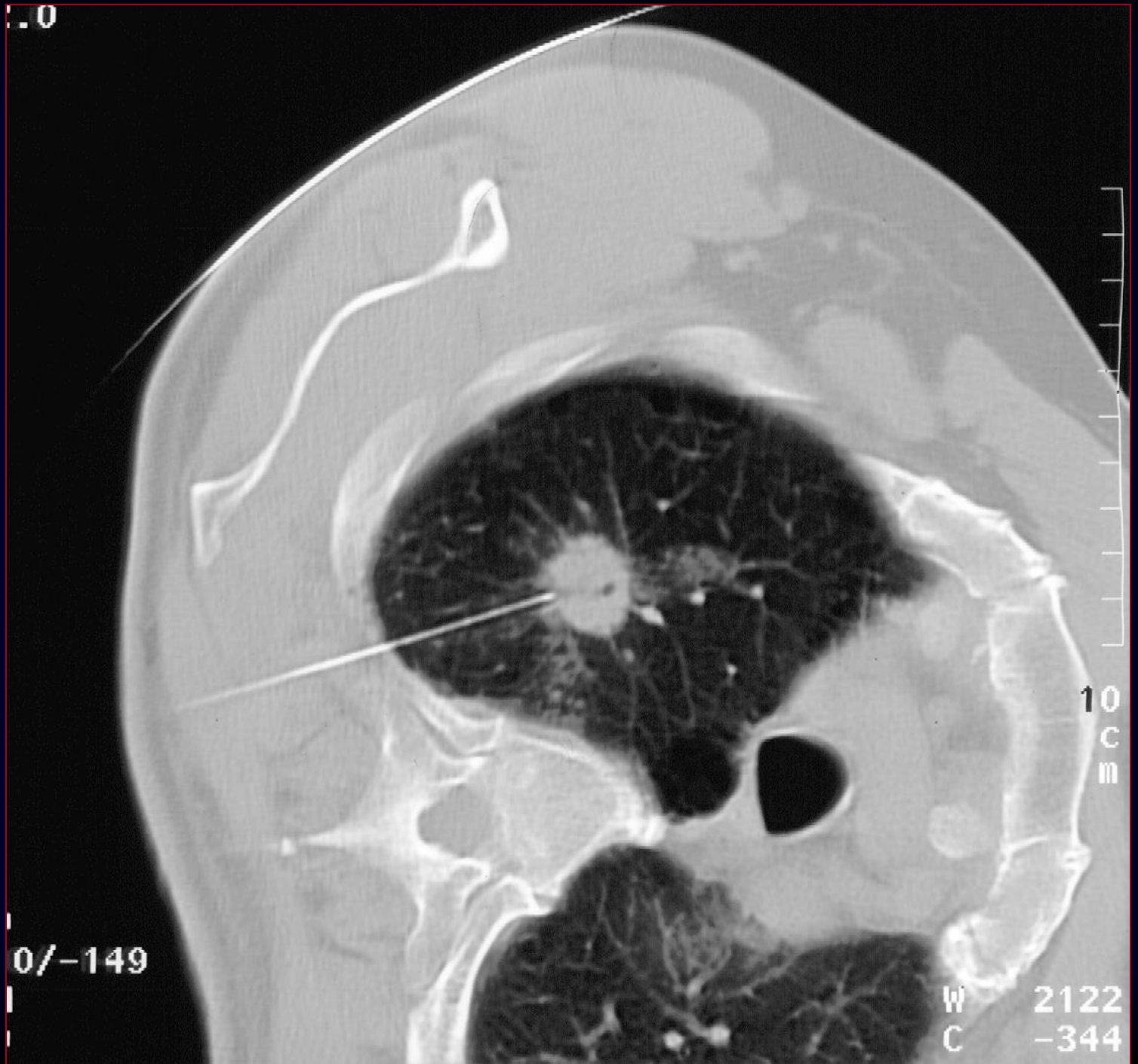
Li CA et al. Radiology 2008;248:632-642

3. Ιστολογική Ταυτοποίηση Ca Πνεύμονα με Διαδερμική Βιοψία υπό Αξονική Τομογραφία

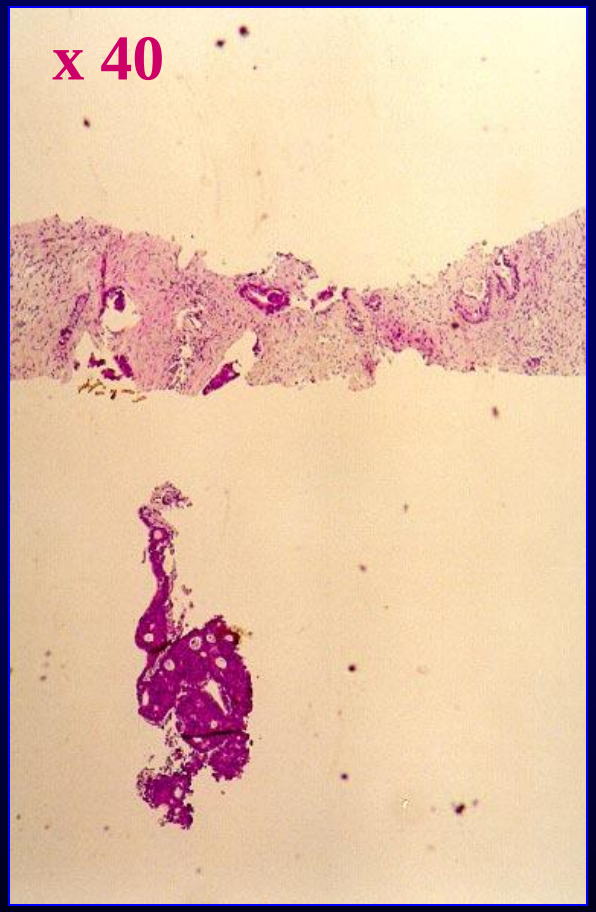
COOK
20mmT
20g
9cm

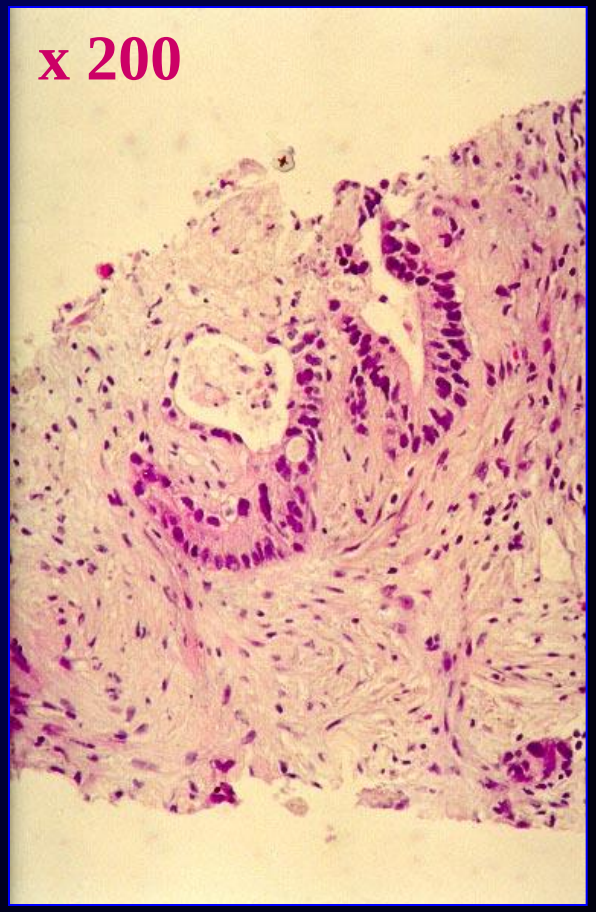

5547
01-MAY-1942
06-SEP-2001
17:31:55.02
TP -377.5
SEQ 53
A
SOMATOM PLUS 4
VC10C
H-SP-CR
R
MF 1.30
kV 140
mA 155
TI 1.0
GT 0.0
SL 10.0
286 -110/-149
AB50 LM
101 630
W
C


547
1-MAY-1942
6-SEP-2001
7:34:19.23
P -383.0
EQ 57
A
SOMATOM PLUS 4
VC10C
H-SP-CR
R
V 140
I 1.0
T 0.0
L 10.0
86 -110/-149
B50 LM
01 630
W
C
-351


.0
0/-149
10
cm
W 2122
C -344

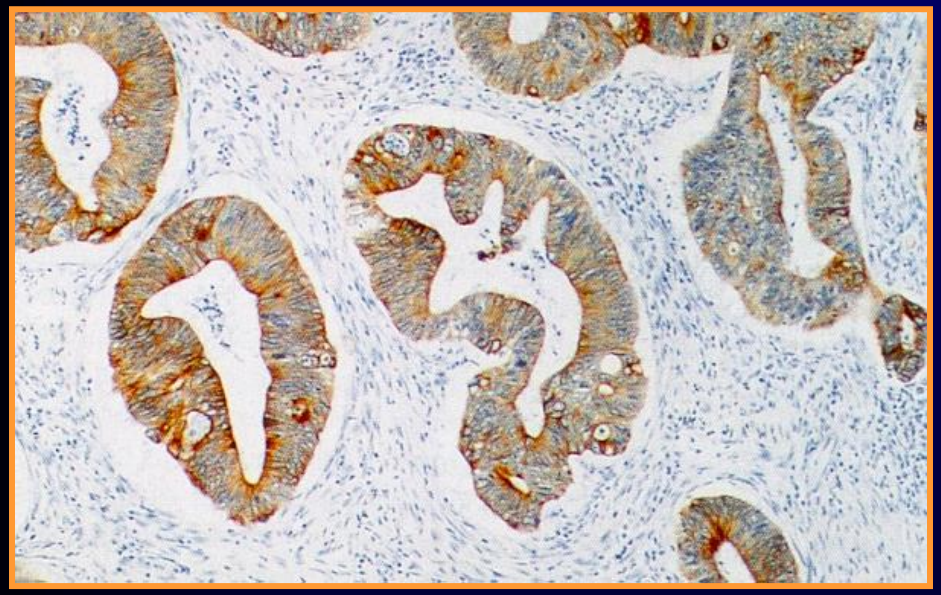
20G/9cm/10T



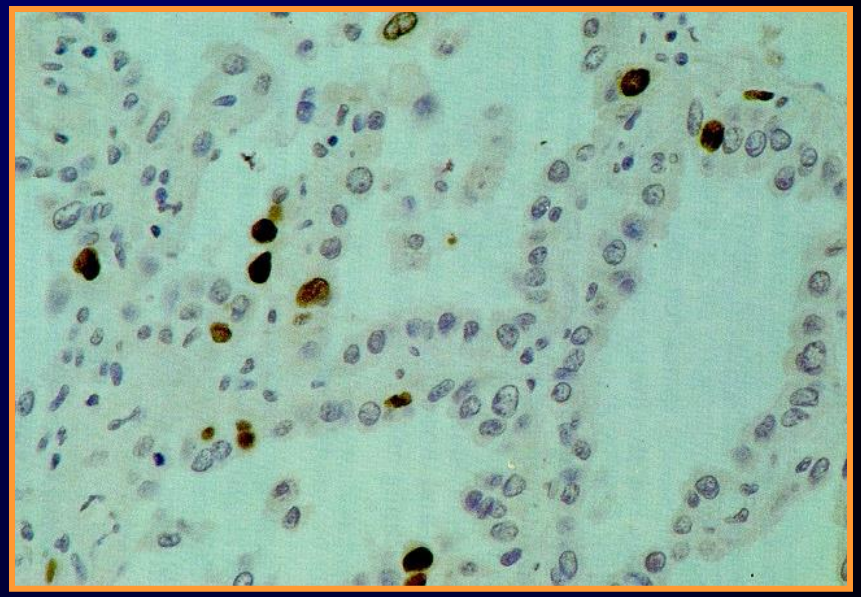


Adenocarcinoma H&E

Αδενοκαρκίνωμα: Ανοσο-ιστοχημικοί Δείκτες



Cytokeratin 19



Ki67 (cell proliferation)

Αποτελέσματα διαδερμικής βιοψίας πνεύμονα

- Ακρίβεια:>90%

- Πνευμοθώρακας:15%
- Ενδοπνευμονική αιμορραγία:3%

3. Ανταπόκριση στη θεραπεία

Response Evaluation Criteria in Solid Tumors - RESIST

Measurability of Tumor Lesion at Baseline

- **Measurable lesions:**

  Lesions that can be accurately measured in at least one dimension conventional techniques ≥ 20 mm; spiral CT scan ≥ 10 mm

  - Target lesions
  - Non-target lesions

- **Non-measurable lesions:**

  All other lesions, including the longest diameter < 20 mm using conventional techniques or < 10 mm using spiral CT scan, and the truly non-measurable lesions

Evaluation of target lesion

- Complete Response (CR)
  - disappearance of all target lesions
- Partial Response (PR)
  - at least a 30% decrease in the sum of LD of target lesions
- Progression (PD)
  - at least a 20% increase in the sum of LD of target lesions or the appearance of one or more new lesions
- Stable Disease (SD)
  - neither sufficient shrinkage to qualify for PR nor sufficient increase

How it works

3D Tumor Evaluation

The most important role for CT in Oncology is the follow-up of tumors to evaluate if the tumor is growing or shrinking and whether the therapy was effective or not. Therefore, accuracy and reproducibility are key factors in tumor assessment.

RECIST*

To evaluate tumor growth, RECIST is the established standard. The basis of RECIST is the measurement of the longest tumor diameter on an axial slice. However, the correlation between tumor size and the measured diameter is not always clear. Additionally, variations in results can occur when the measurements are done manually or are performed by different readers. *syngo* CT Oncology reduces the variations in results by automatically choosing the slice with the maximum diameter and applying a constant technique to determine the RECIST diameter.

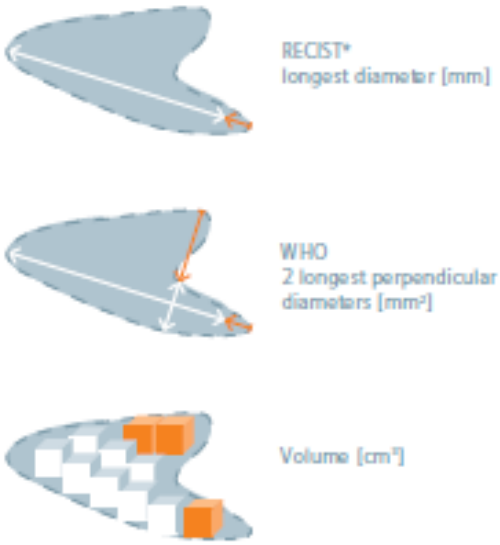
WHO

The WHO criteria suggest two measurements for better accuracy, the longest and the widest perpendicular diameters.

Volume measurement

High accuracy for measurements of tumor size and growth rate can be achieved when measuring the tumor volume. *syngo* CT Oncology automatica y measures the tumor volume by calculat g the space that is enclosed within the segmented tumor. This also leads to a h gh reproducibility of measurements, becau e inter-reader or intra-reader variations a eliminated.

Evaluation criteria to assess tumor response to therapy



* RECIST – Response Evaluation Criteria in Solid Tumors; *syngo* CT Oncology considers RECIST version 1.0

ΣΥΜΠΕΡΑΣΜΑ

Ο ακτινολογικός έλεγχος έχει σημαντική θέση στο Ca του πνεύμονα και συμβάλλει:

- ✓ στην πρώιμη διάγνωση
- ✓ στην ιστολογική ταυτοποίηση
- ✓ στη σταδιοποίηση της νόσου
- ✓ Follow-up

ΙΙ

ΟΓΚΟΙ ΠΕΠΤΙΚΟΥ

Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver. It is strongly associated with cirrhosis, from both alcohol and viral aetiologies. HCC constitutes approximately 5% of all cancers partly due to the high endemic rates of hepatitis B infection [1].

HCC

Arterially-enhancing liver segment 4a mass with washout on delayed phases.

Case courtesy of Dr Natalie Yang, Radiopaedia.org. From the case <ahref="https://radiopaedia.org/cases/6870">rID: 6870

HCC

Gadoxetate disodium (also known by the tradenames **Primovist™** and **Eovist™**) is a hepatospecific paramagnetic gadolinium-based contrast agent, used exclusively in MRI liver imaging. Its chief use is in hepatic lesion characterisation, i.e. assessing focal liver lesions identified on other imaging studies.

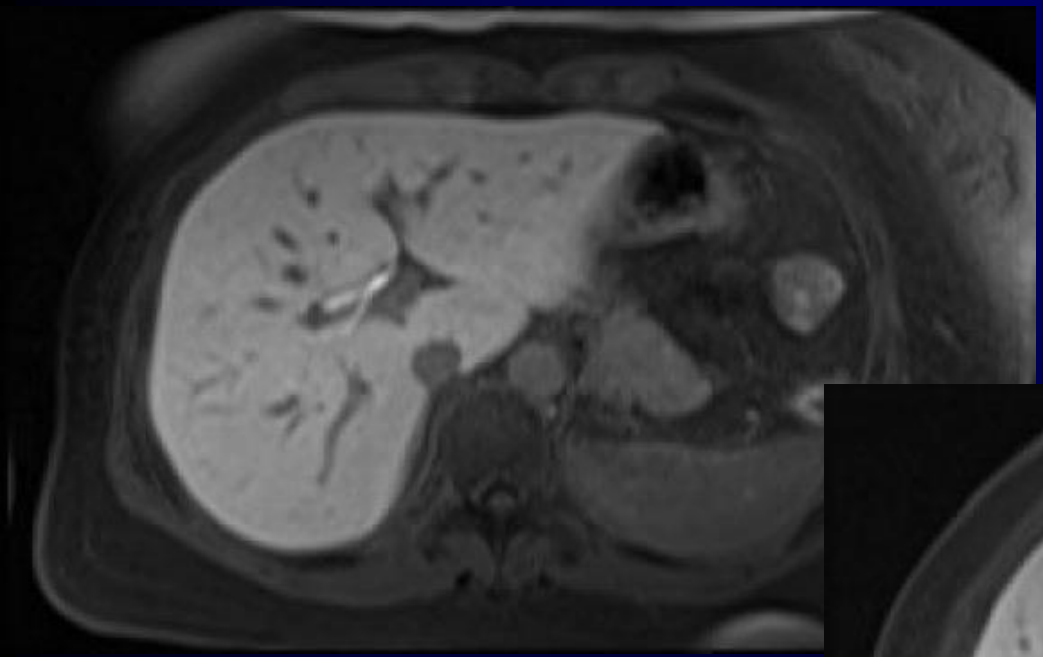
-linear, ionic molecule

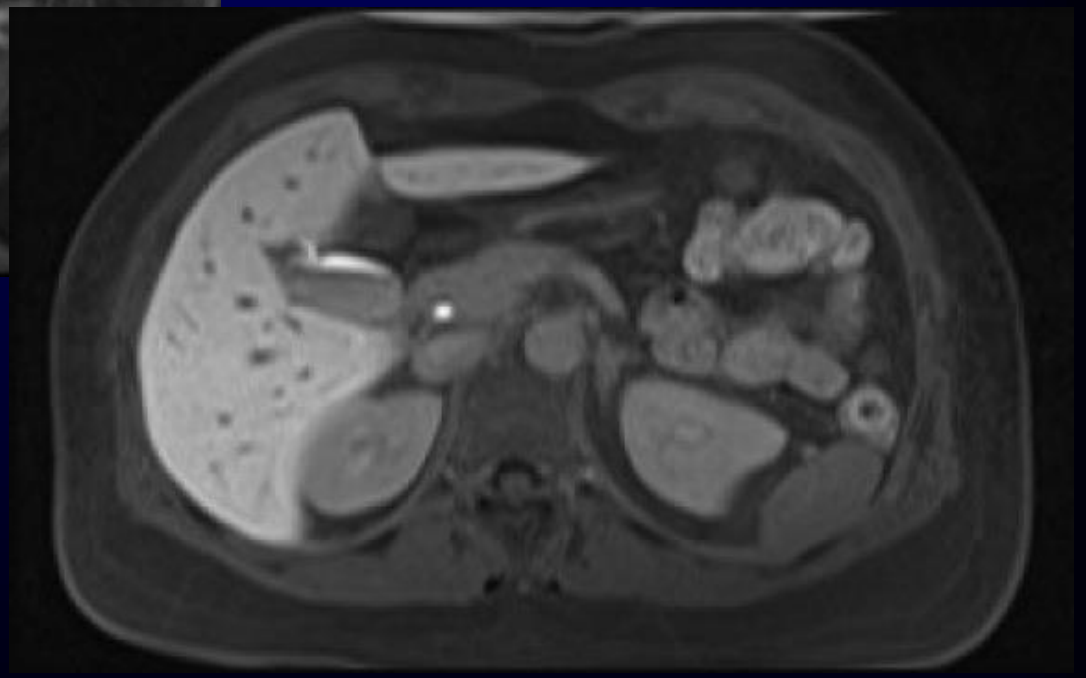
HCC

Gadobenate dimeglumine (also known as **MultiHance™**) is an extracellular intravenous contrast agent used in magnetic resonance imaging.

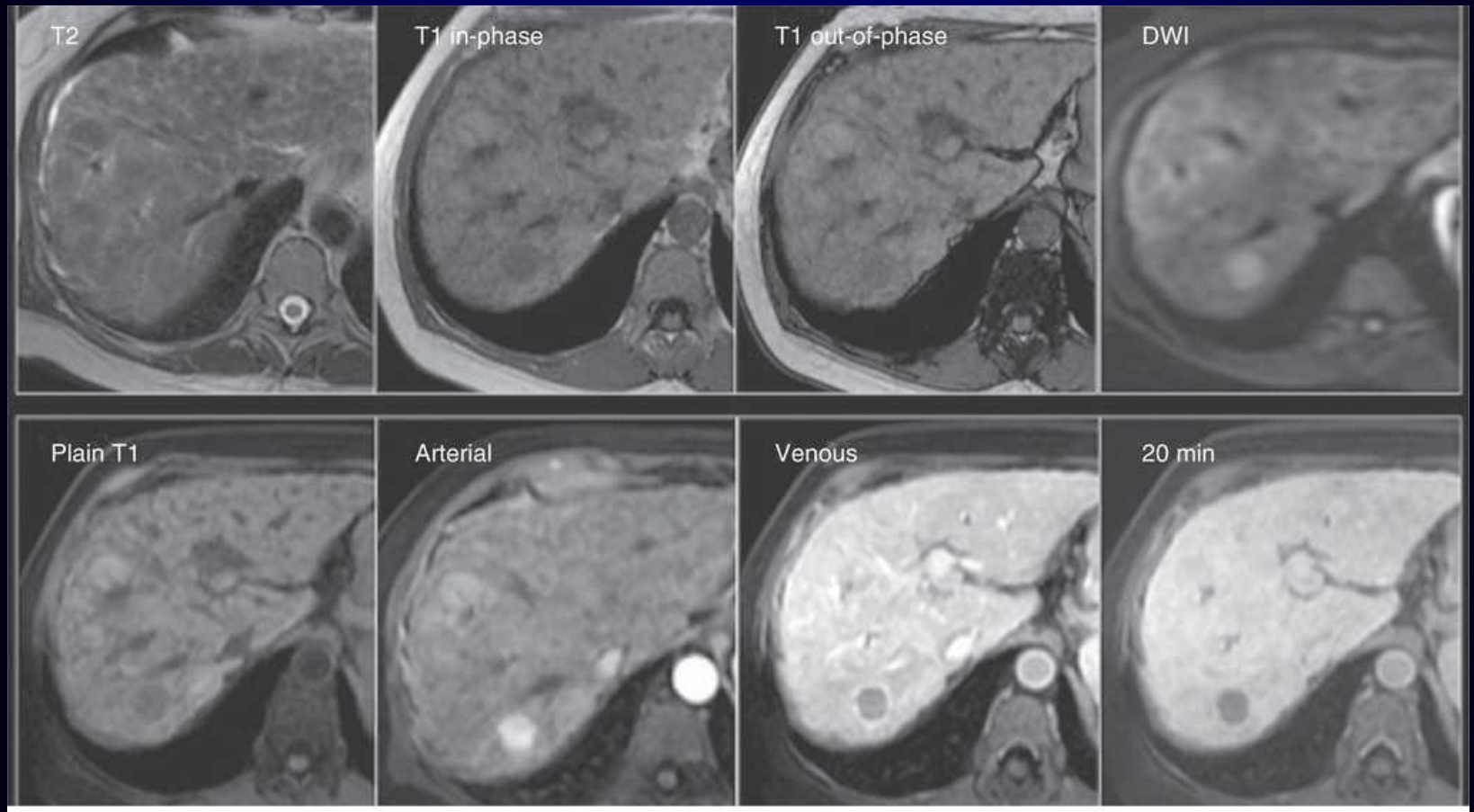
linear, ionic molecule

MRI ηπατοειδικά σκιαγραφικά



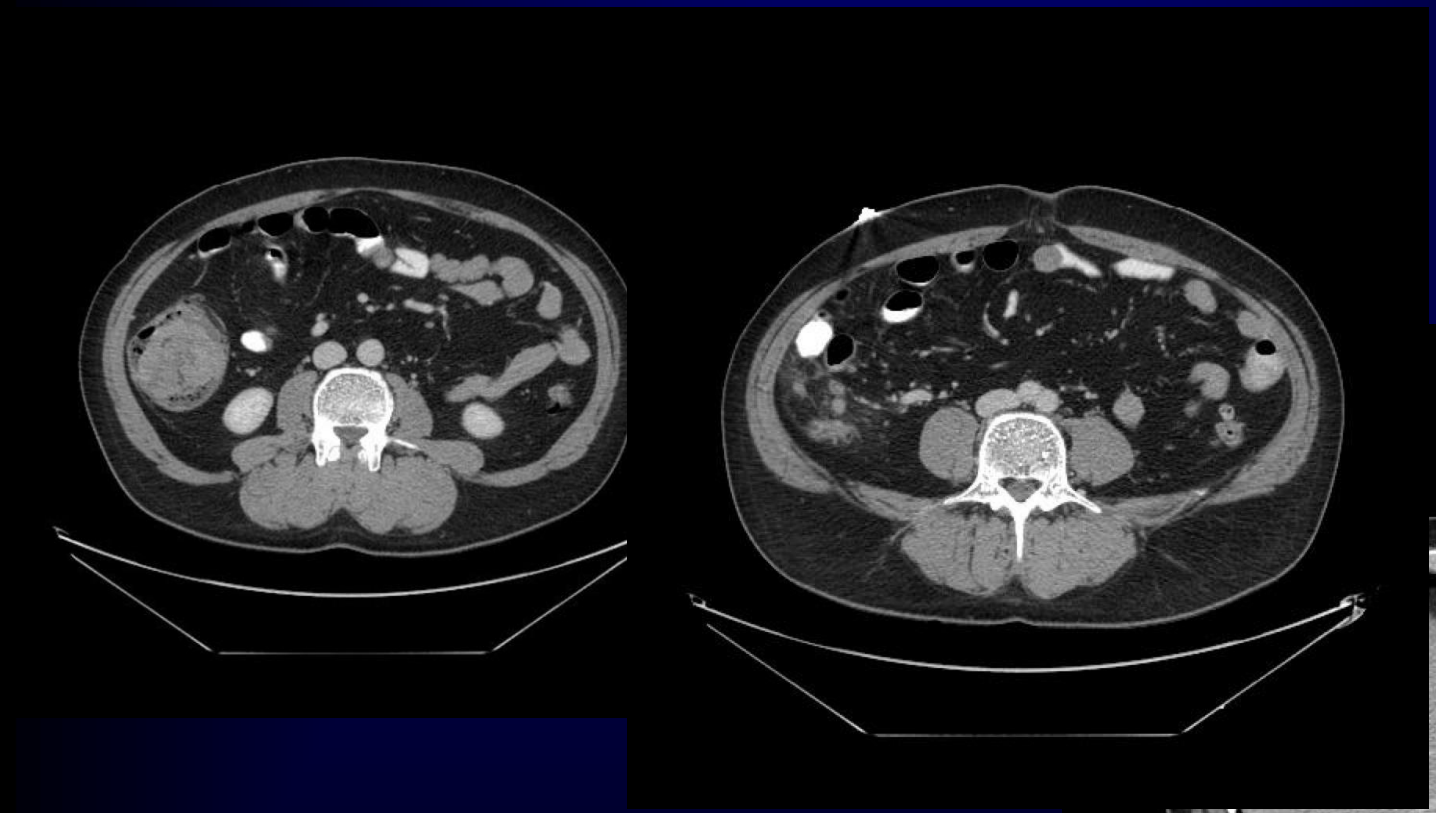


MRI ηπατοειδικά σκιαγραφικά



Rev Gastroenterol Mex. 2015;80:267–75

ΟΓΚΟΙ ΠΕΠΤΙΚΟΥ



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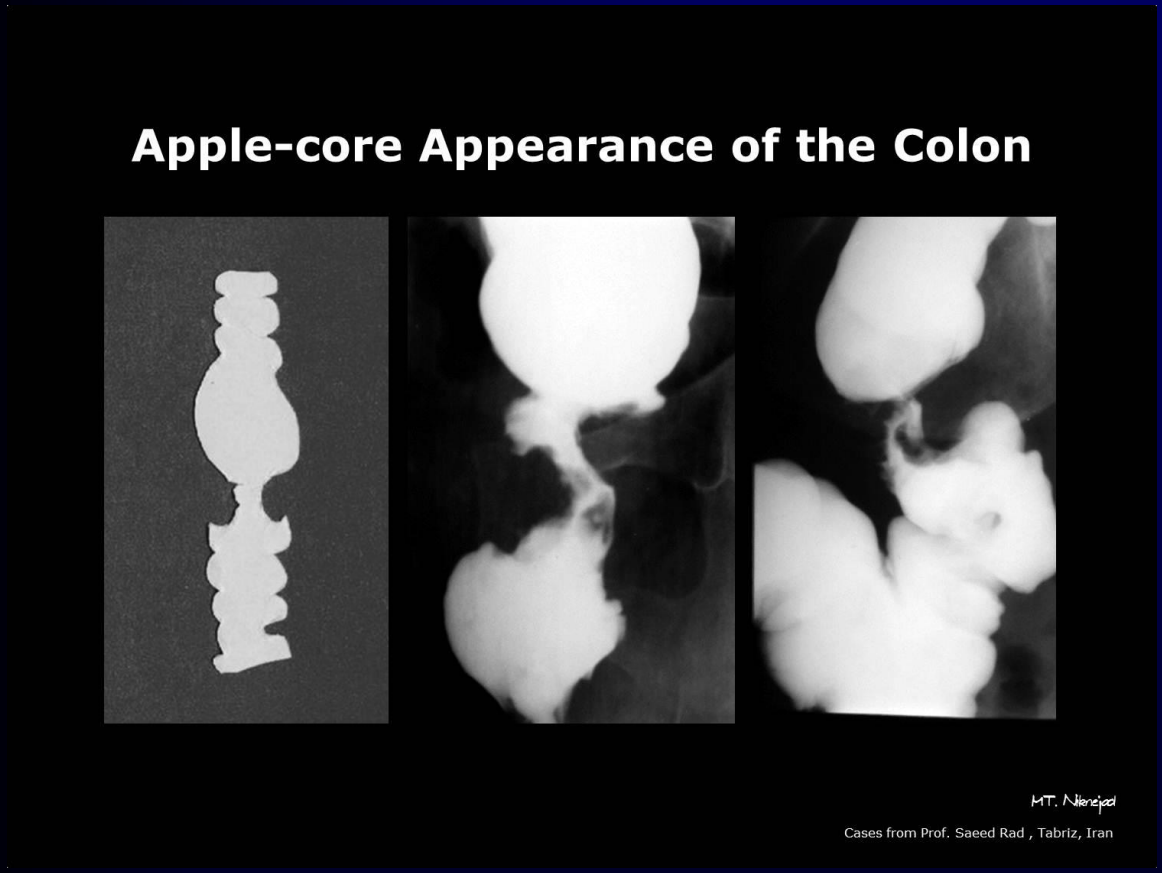

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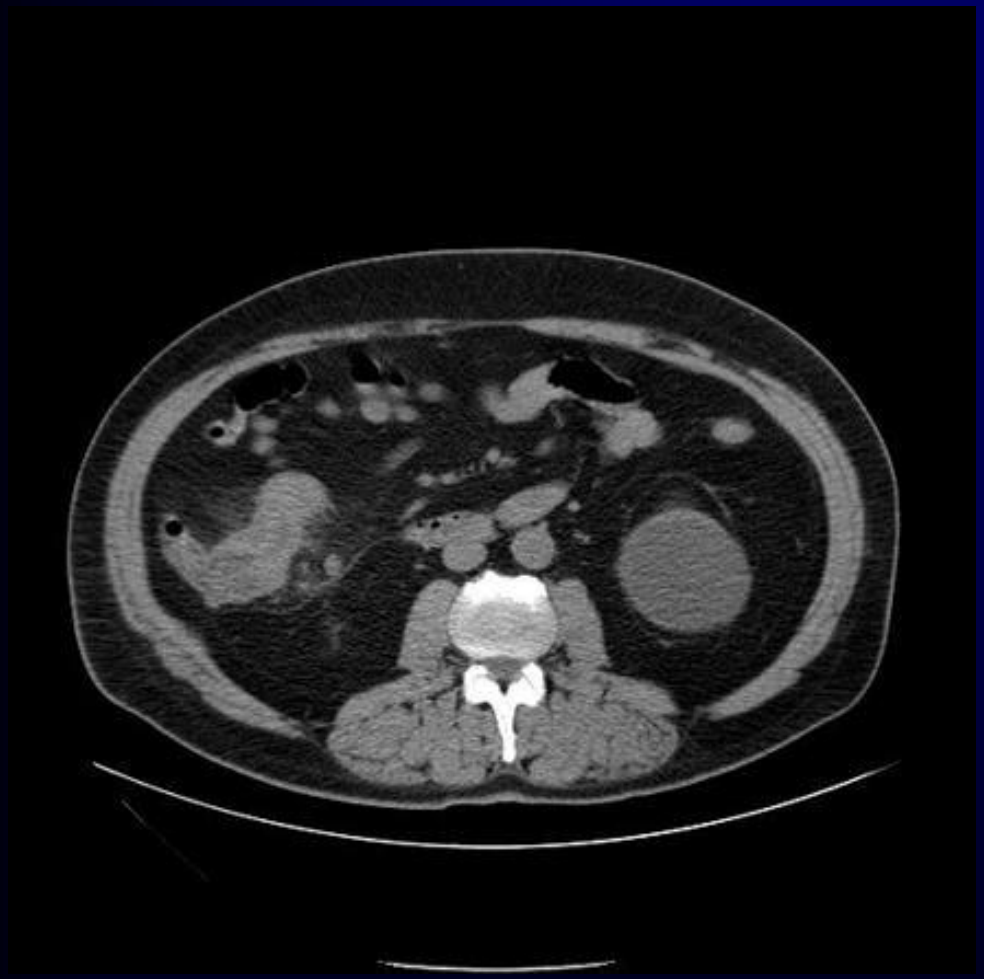
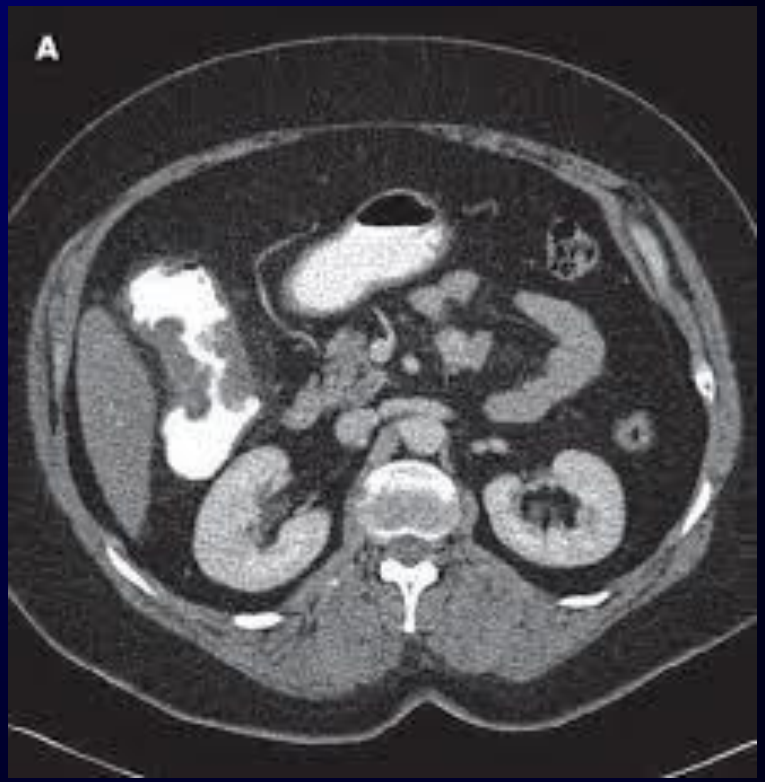
ΟΓΚΟΙ ΠΕΠΤΙΚΟΥ





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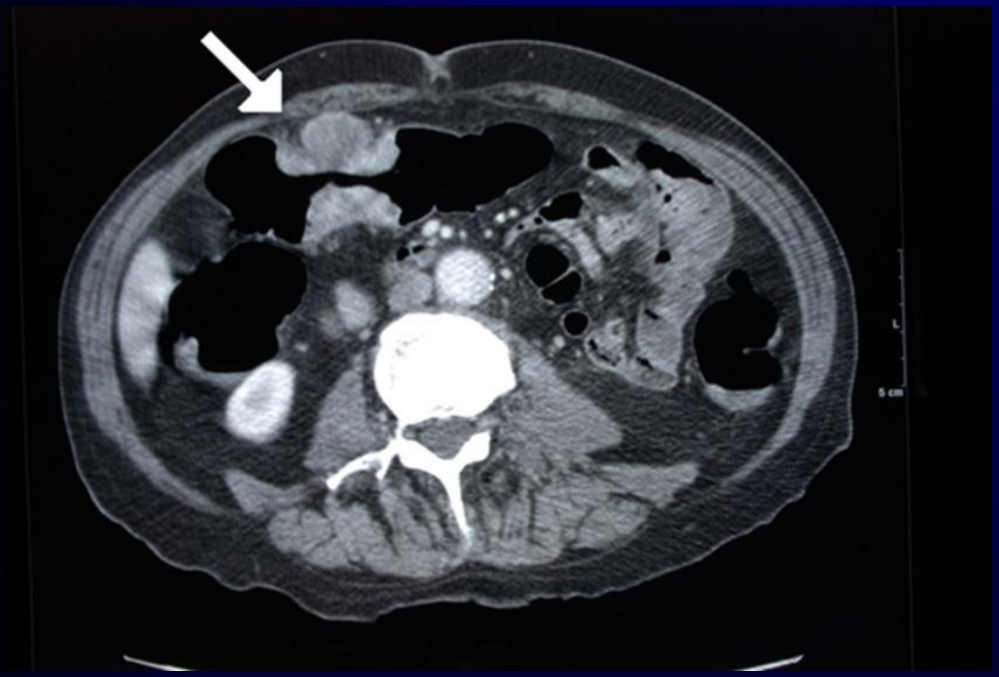
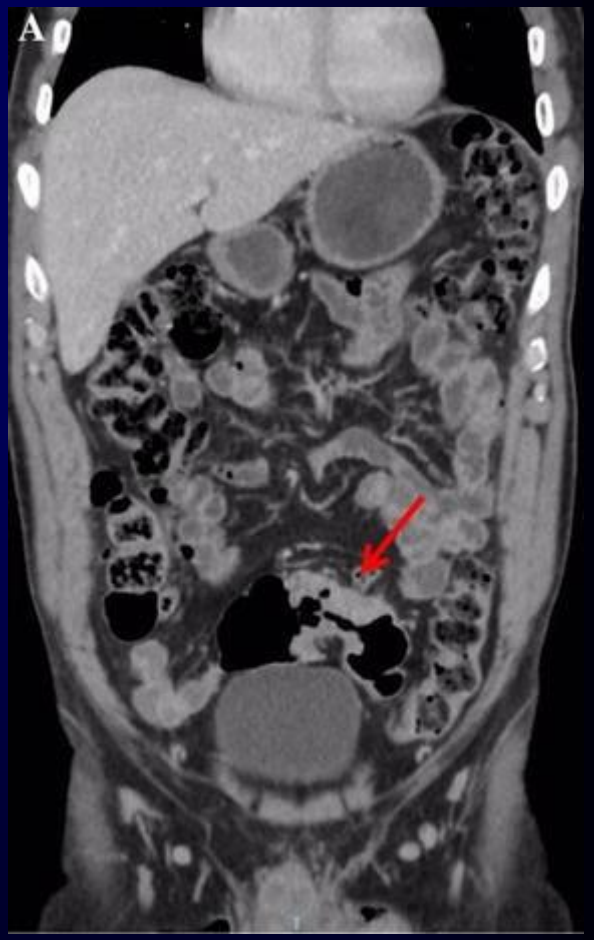




Μεταστασεις

Radiographic features

One of the main difficulties in liver imaging for metastatic disease is the high prevalence of benign liver lesions that can be misinterpreted as evidence of metastatic disease, thus dramatically changing a patients stage, and therefore treatment options. Liver haemangiomas, and to a lesser degree focal nodular hyperplasia (FNH), are the main sources of confusion [3]. Additionally, pseudolesions (e.g. transient hepatic attenuation differences (THADs), focal fatty sparing / focal fatty change) may further muddy the waters. Therefore, an understanding of the various appearances of metastatic disease is crucial.

Μεταστασεις

CT

Liver metastases are typically hypoattenuating on unenhanced CT, enhancing less than surrounding liver following contrast [1]. If there is concomitant hepatic steatosis, then the lesions may be iso- or even slightly hyperattenuating. Enhancement is typically peripheral, and although there may be central filling in, on portal venous phase, the delayed phase will show washout; helpful in distinguishing a metastasis from a haemangioma [1]. Some primaries have a tendency to produce hyper-enhancing metastases, including renal cell carcinoma, thyroid carcinoma, neuroendocrine tumours, etc (see hypervascular liver lesions).

Μεταστασεις

Μεταστασεις-DWI

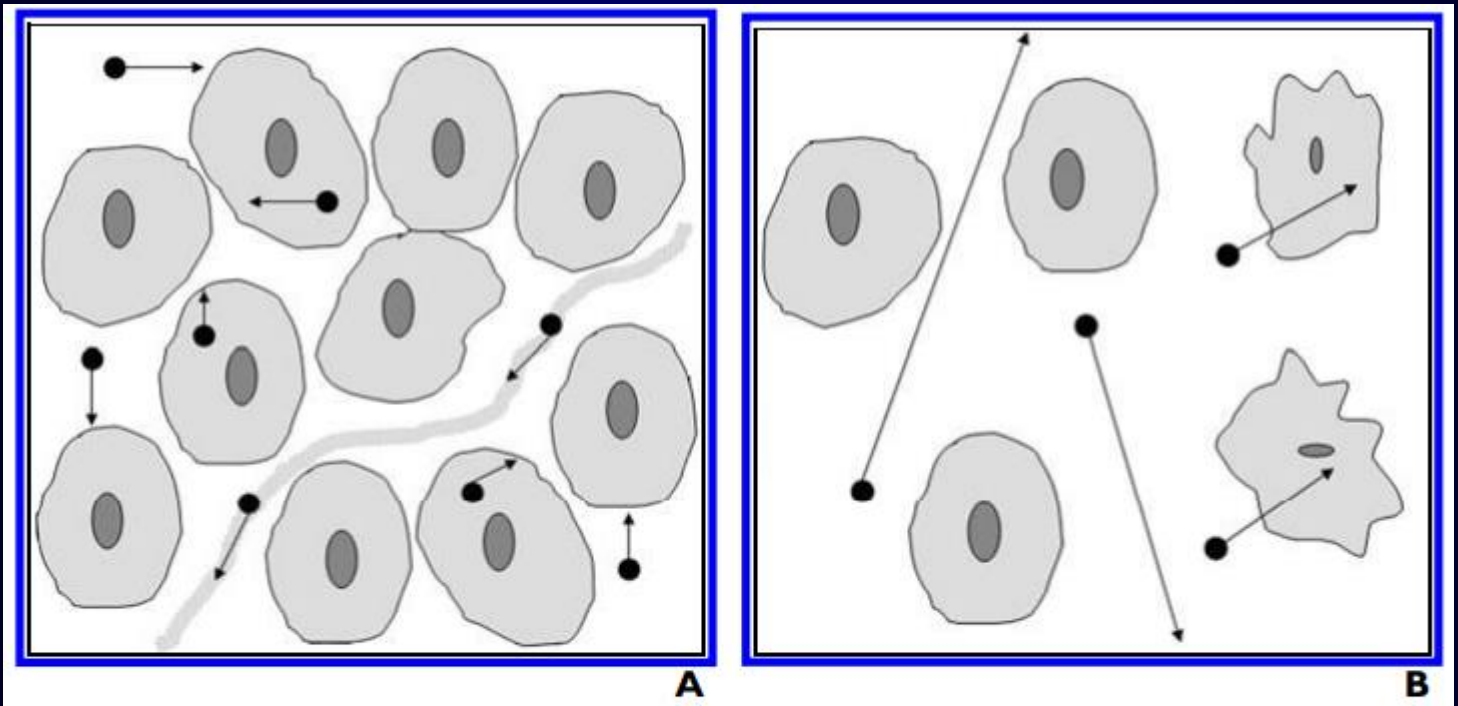
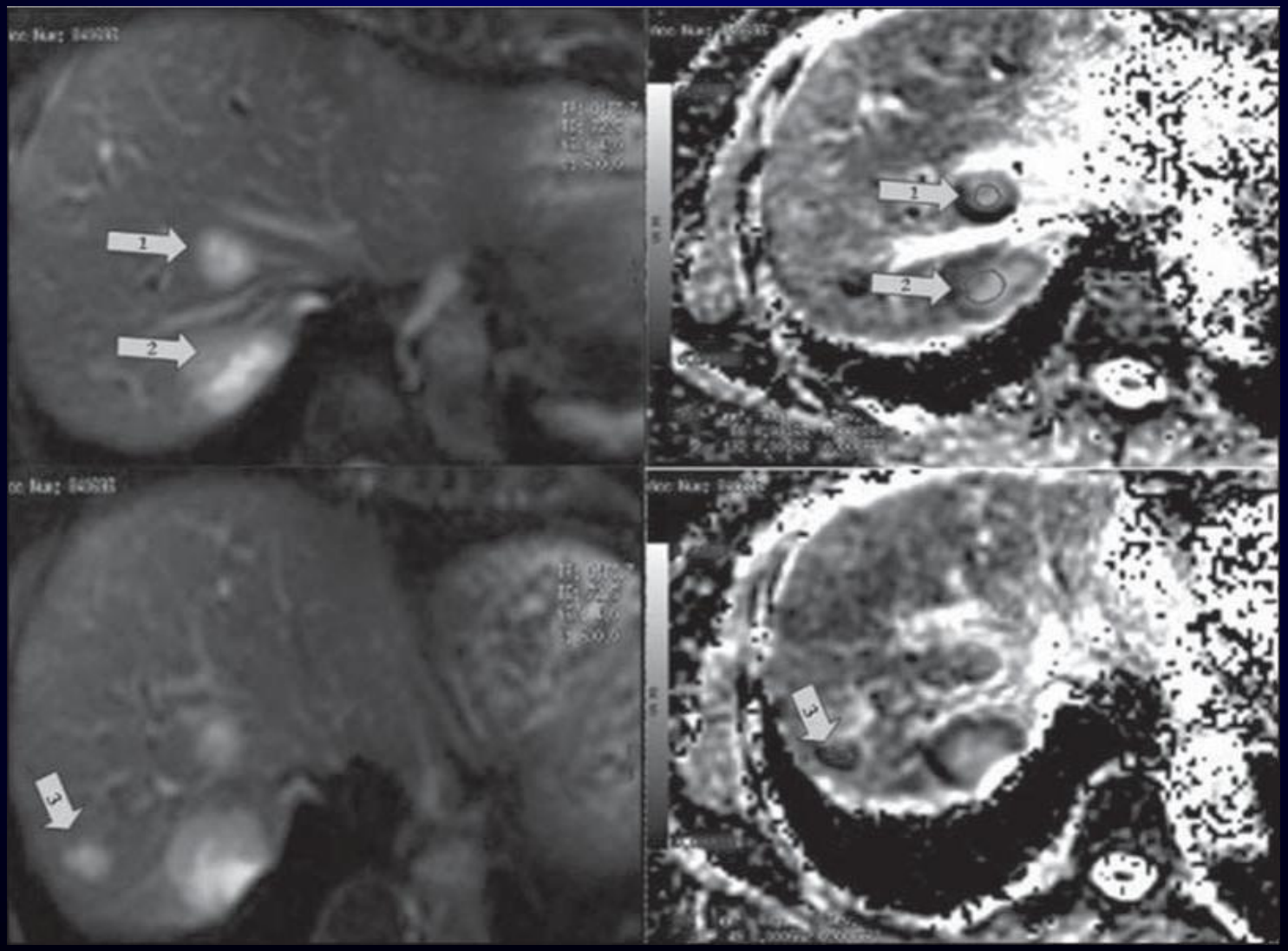


Fig. 1—Diffusion of water molecules.
A, Restricted diffusion: cellularity and intact cell membranes. Drawing represents 1 voxel of tissue evaluated by diffusion-weighted imaging (DWI) containing cells and blood vessel. Note water molecules (*black circles with arrows*) within extracellular space, intracellular space, and intravascular space, all of which contribute to measured MR signal. In this highly cellular environment, water diffusion is restricted because of reduced extracellular space and by cell membranes, which act as barrier to water movement.
B, Free diffusion: low cellularity and defective cell membranes. In less cellular environment, relative increase in extracellular space allows freer water diffusion than more cellular environment would. Defective cell membranes also allow movement of water molecules between extracellular and intracellular spaces.

Μεταστασεις-DWI



Υπεραγγειούμενες Μεταστασεις

MRI-CT

-Melanoma
-Renal cell carcinoma
-Islet cell carcinoma(Neuroendocrine tumors of Pancreas
-Choriocarcinoma
-Thyroid carcinoma

Ca ορθου

Rectal cancers, although sharing many of the features of generic colorectal carcinoma (CRC), has different preoperative imaging assessment, with MRI rectum as the mainstay for local staging, and distinct surgical techniques (i.e. total mesorectal excision).

Ca orθou

Radiographic features

Although CT can make the diagnosis in more advanced cases, due to better soft-tissue contrast, MRI has become the fundamental imaging modality for evaluation and staging.

Endorectal ultrasound also has a role in the staging, particularly for assessment and differentiation between T1 and T2 disease, but is not commonly performed by a radiologist.

MRI may be performed for:

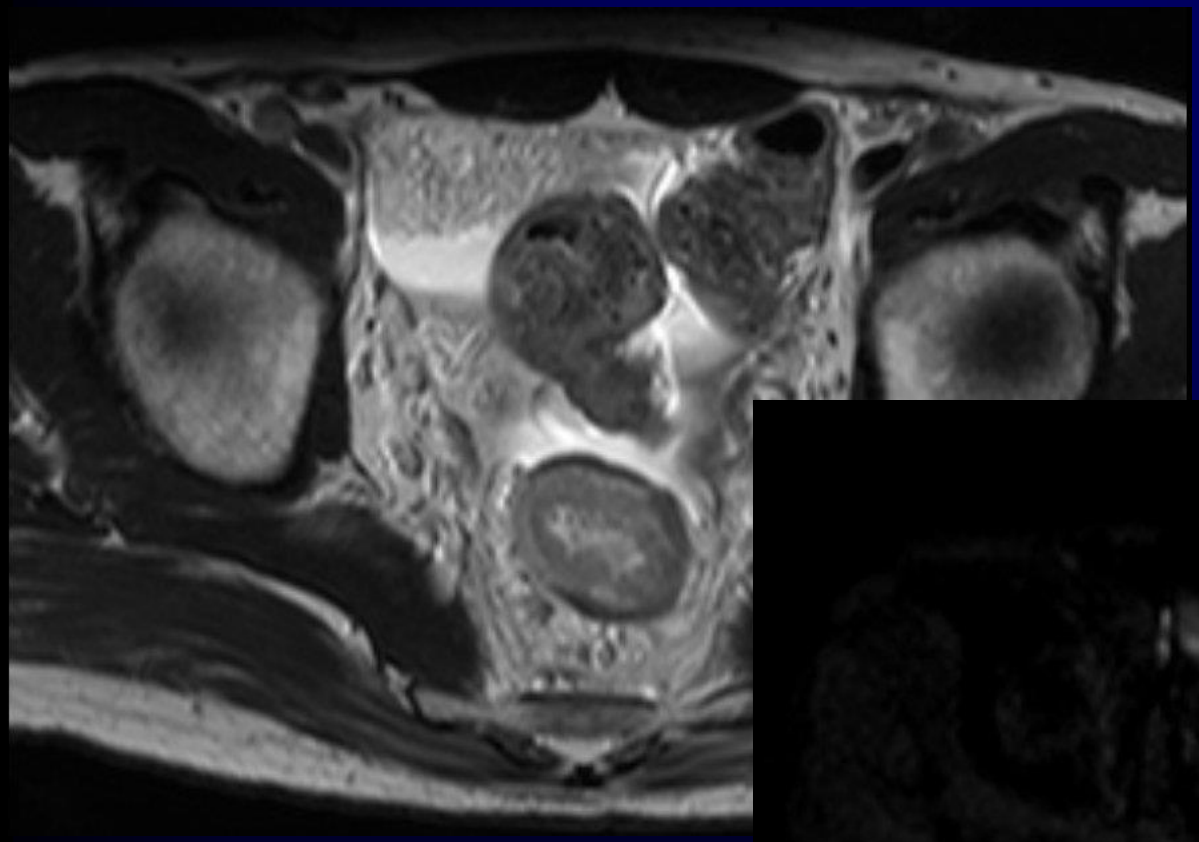
diagnosis and/or locoregional staging

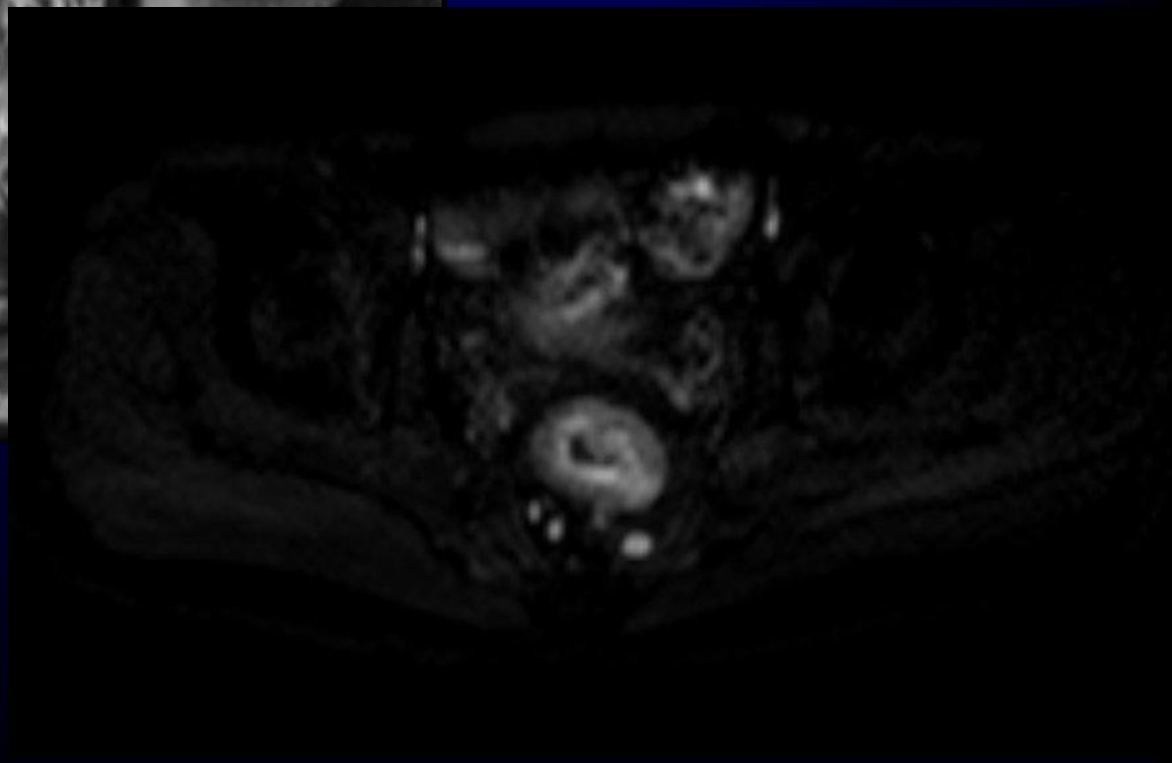
- helps evaluate which patients may benefit from neoadjuvant therapy (usually stage II and III) and for evaluating poor prognostic factors
- helps surgical planning

assessment of the effectiveness/response of neoadjuvant therapy

monitoring for recurrence post-therapy

Ca ορθου T3 σταδιο





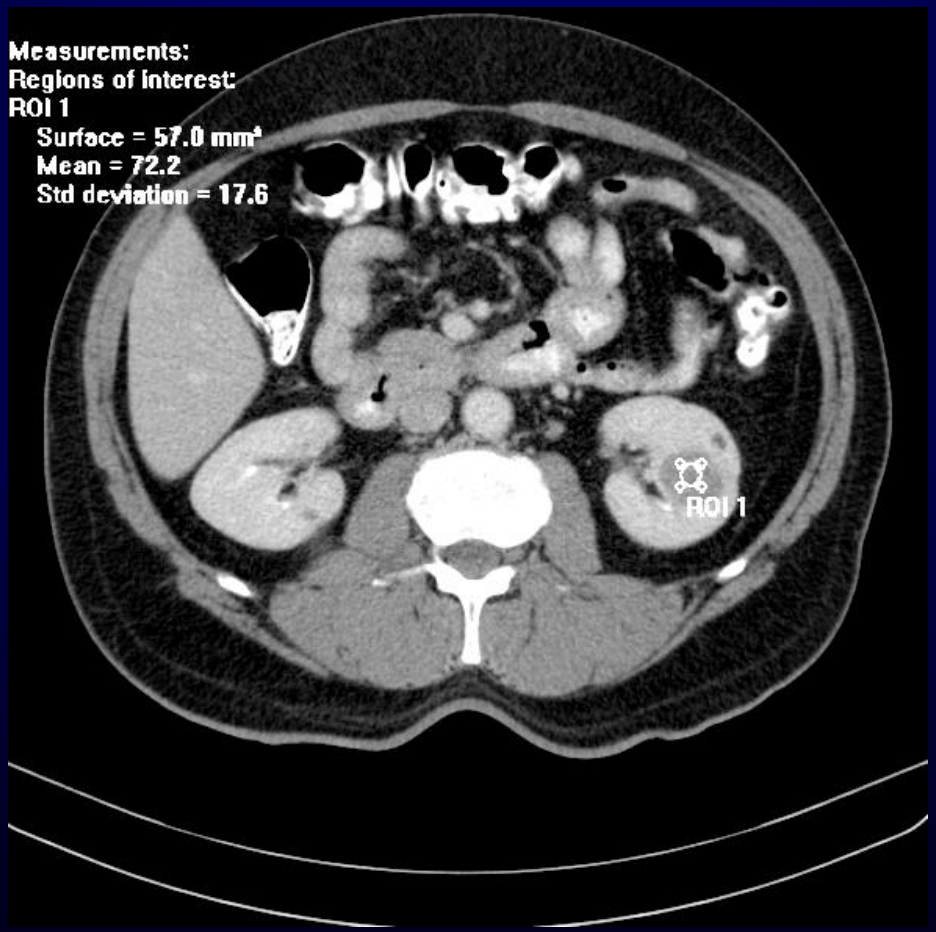
RCC-hypernephroma-Grawitz

clear cell renal carcinoma (conventional): 70-80%
- arises from proximal convoluted tubules
- large uniform cells with clear cytoplasm (thus the name and T2 appearance (see below)
- highly vascular
- subtype: clear cell multilocular renal cell carcinoma

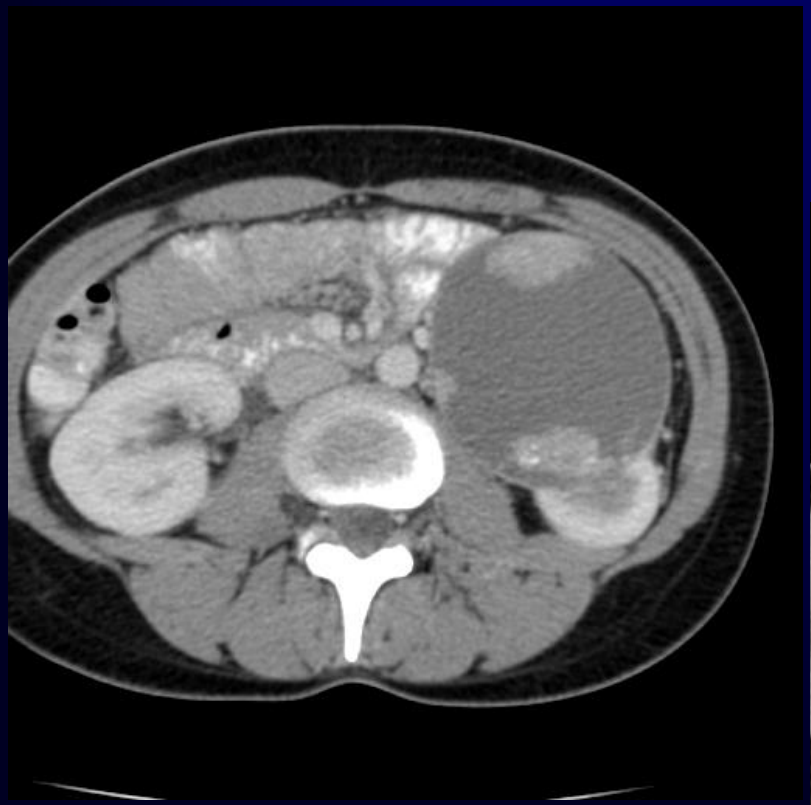
papillary renal cell carcinoma: 13-20%
- arises from distal convoluted tubules
- can be multifocal and bilateral
- most common form in dialysis-associated RCC
  - type I: sporadic, generally good prognosis [4]
  - type II: inherited, bilateral and multifocal

Clear cell carcinoma

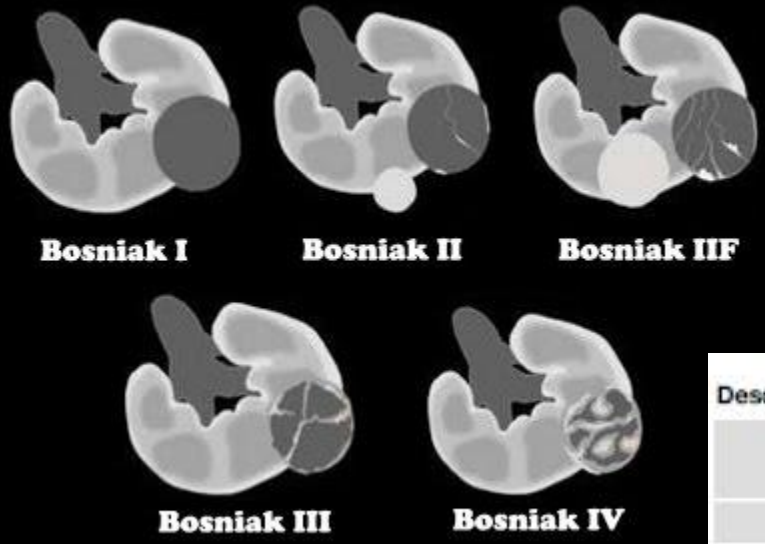
Papillary cell carcinoma



Papillary cell carcinoma



Papillary cell carcinoma

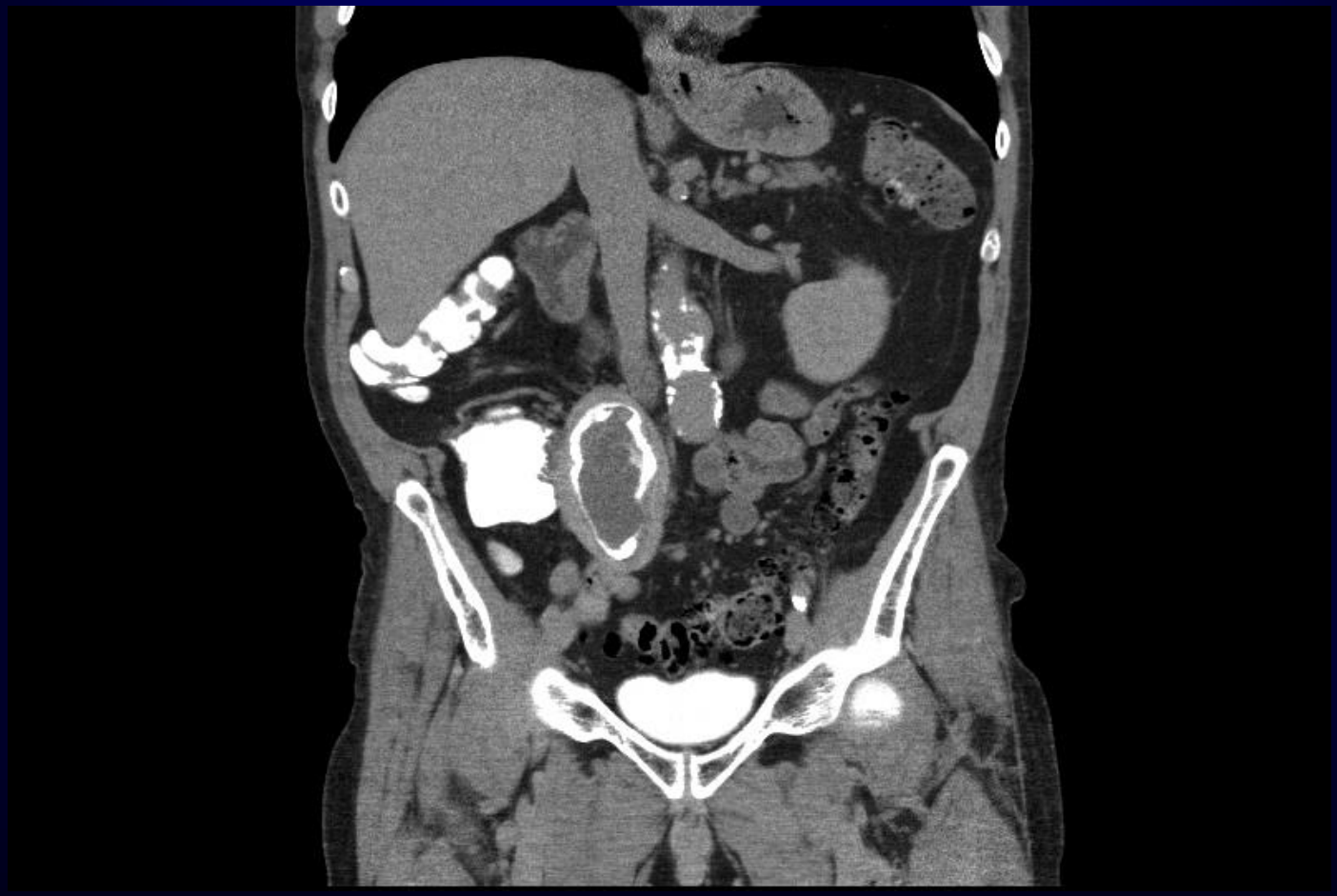


Description	Features	Workup	%malignant	
1	Simple cyst	Anechoic, imperceptable wall, round	Nil	~0
2	Minimally complex	single thin septation, thin Ca++	Nil	~0
2F	Minimally complex - needing followup	thin septation, thick Ca++, hyperdense on CT*	US or CT followup	5%
3	Indeterminate	thick or multiple septations, mural nodule, hyperdense on CT*	partial nephrectomy**	50%
4	Clearly malignant	solid mass with cystic spaces	surgery (partial / total nephrectomy)**	~100%

- * for a hyperdense cyst on CT to be 2F needs to meet the following criteria:
  - <3cm diameter
  - at least 1/4 of its wall needs to be seen (therefore needs to be exophytic)
  - no enhancement
- ** increasingly RF ablation is an alternative in the elderly / poor surgical risk.

Transient cell carcinoma

Transient cell carcinoma



Transient cell carcinoma

Transient cell carcinoma

Εντός εκκολπωματος της ουροδοχου κυστης

Cannonball metastases refer to multiple large, well-circumscribed, round pulmonary metastases that appear not unsurprisingly like cannonballs. The French terms "**envolée de ballons**" and "**lâcher de ballons**", which translate to "balloons release", are also used to describe this same appearance.

Metastases with such an appearance are classically secondary to [1,2]:

renal cell carcinoma

choriocarcinoma

Or less common primary tumours:

prostate carcinoma [2]

endometrial carcinoma [2]

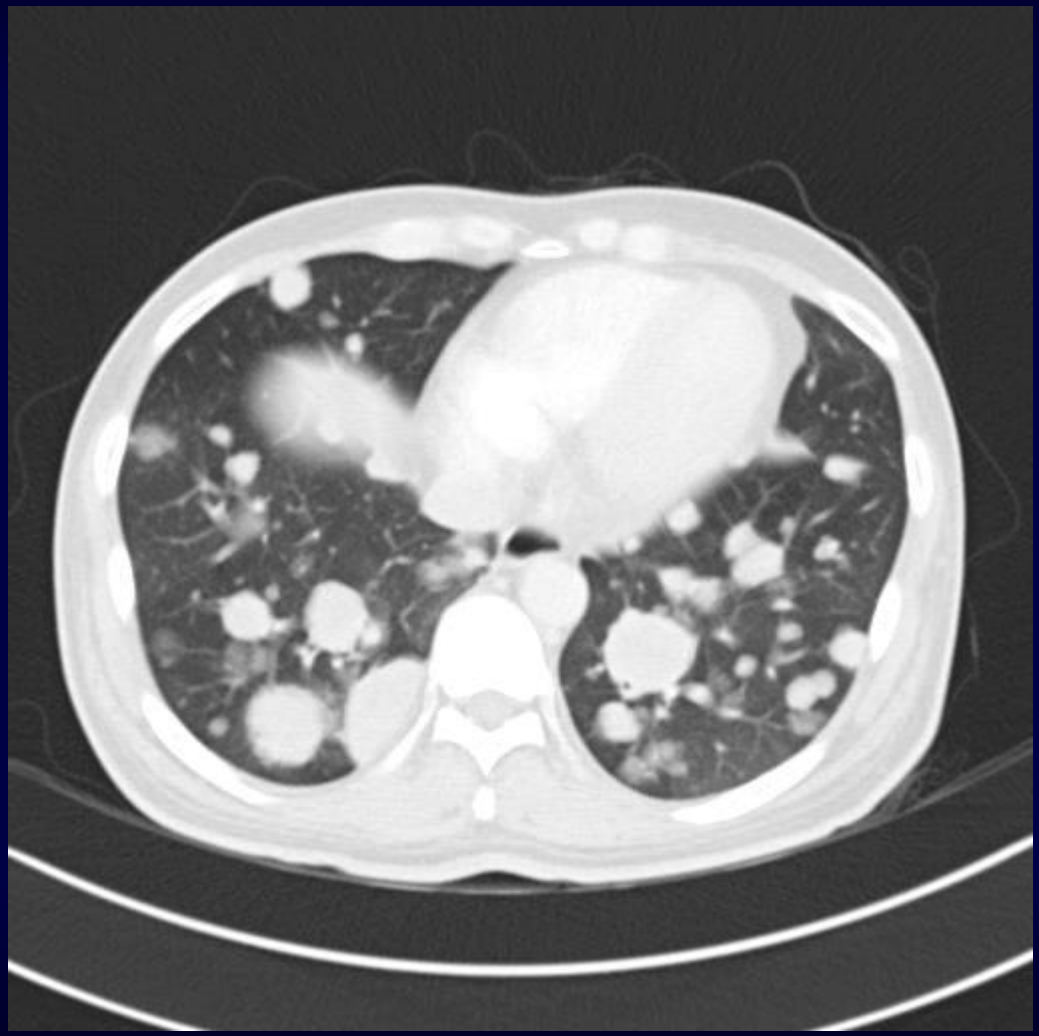
synovial sarcoma [3]

adrenal carcinoma [4]

Cannonball mets-RCC

Random pattern

Cannonball mets-RCC



Random pattern

Σας Ευχαριστώ
για την
Προσοχή σας