HOW TO PERFORM CORRECT RECIST ASSESSMENT

ESMO-EANM-ESR Joint symposium

Vienna September 29th, 2012

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Disclosures

- No disclosures

Menu du jour à 12 €

Technical Entrees

Clinical Main Course

Friend and Foe Dessert

(Tous nos prix sont entendus T.T.C et services compris)

The right technical Entrees

- The good machine
  - CT : Yes
  - MRI : Yes
  - Ultrasound : No
- The good technique
  - Slice thickness
  - Contrast enhancement
- A constant technique through the evaluations

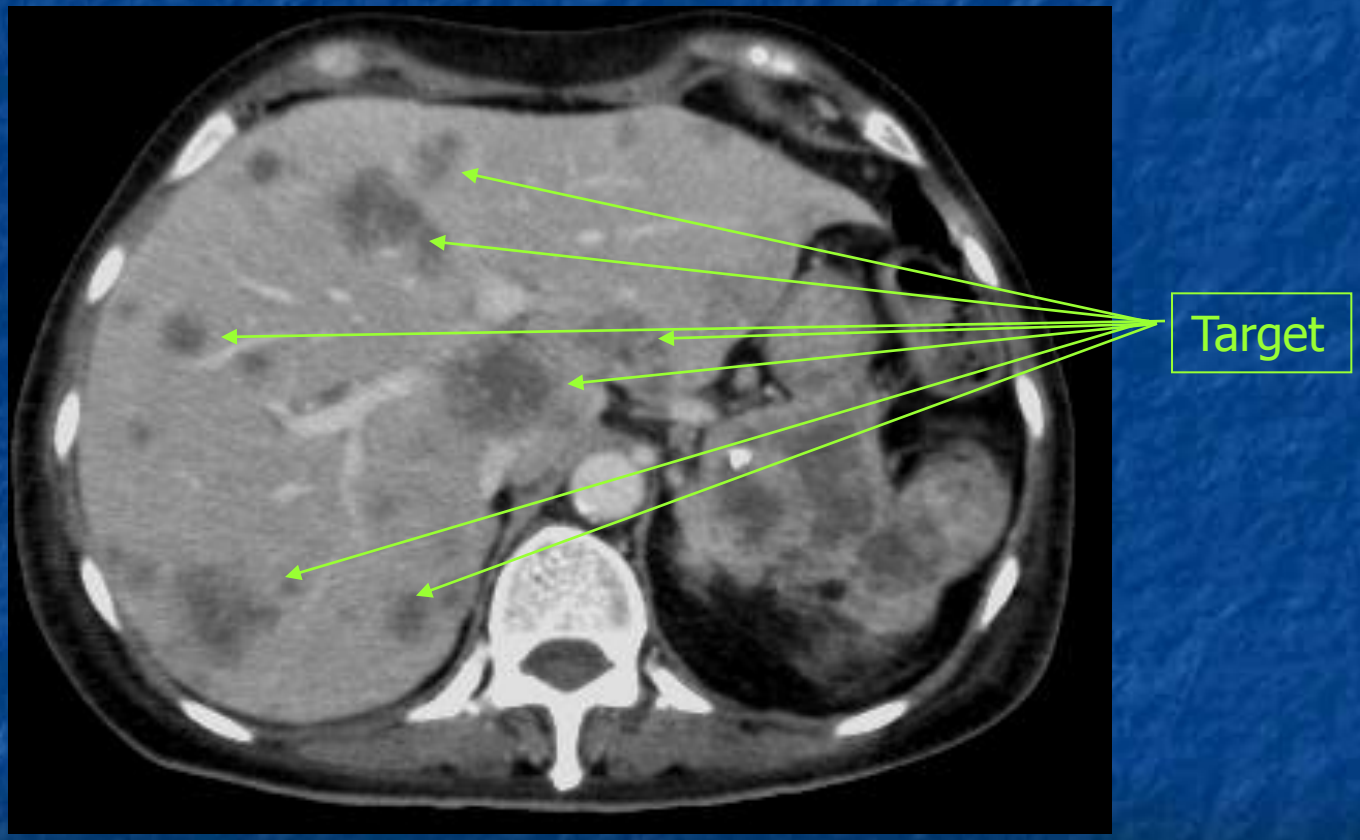

arterial
05/2012
08/2012
portal

Clinical Main Course

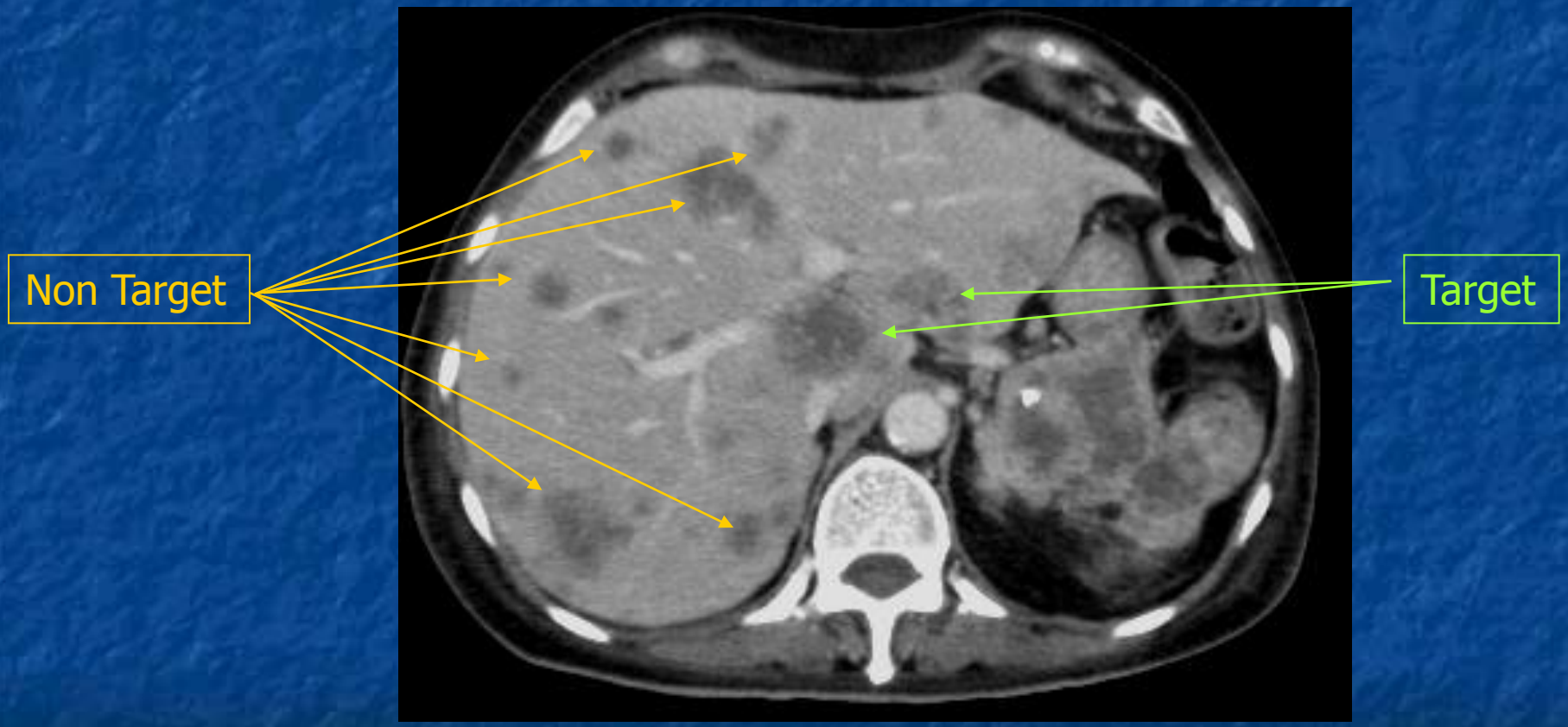
- Knowledge of RECIST rules
  - Choosing the target and non targets
  - Perform the evaluation
  - The importance of Progression

Target

A lesion that will be measured at every Time Point (Evaluation) in order to quantify the response to the treatment

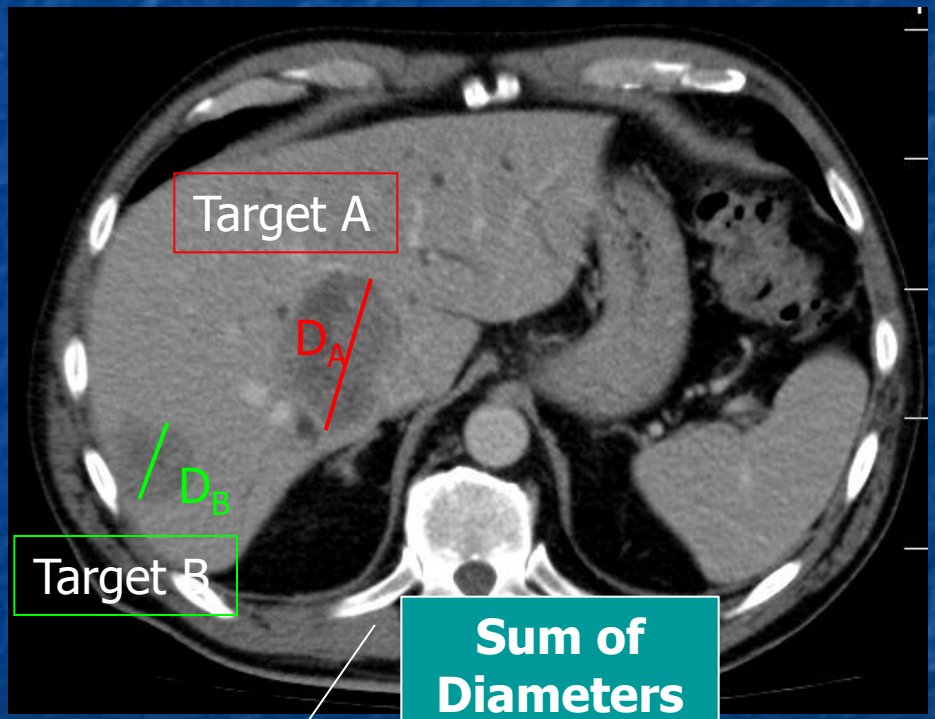


Target vs Non Target



RECIST 1.1 (1.0)

Response Evaluation Criteria In Solid Tumours



Sum of Diameters

$$D = D_A + D_B$$

- Unidimensional (largest diameter)
- Maximum of 5 (10) targets
- Maximum of 2 (5) targets by organ

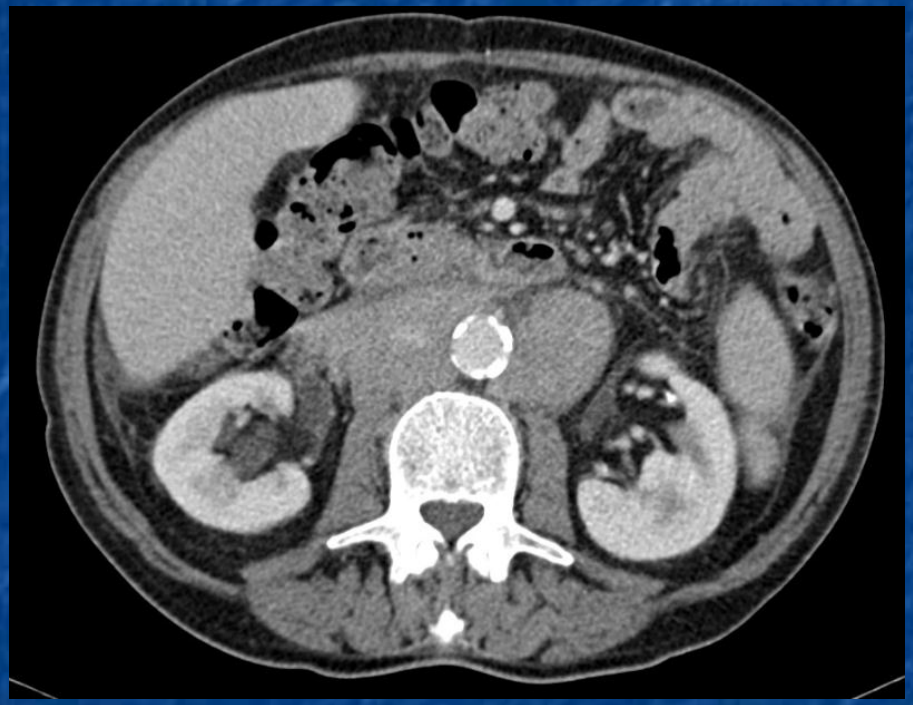
One patient, one timepoint, one "D"

Lymph Nodes

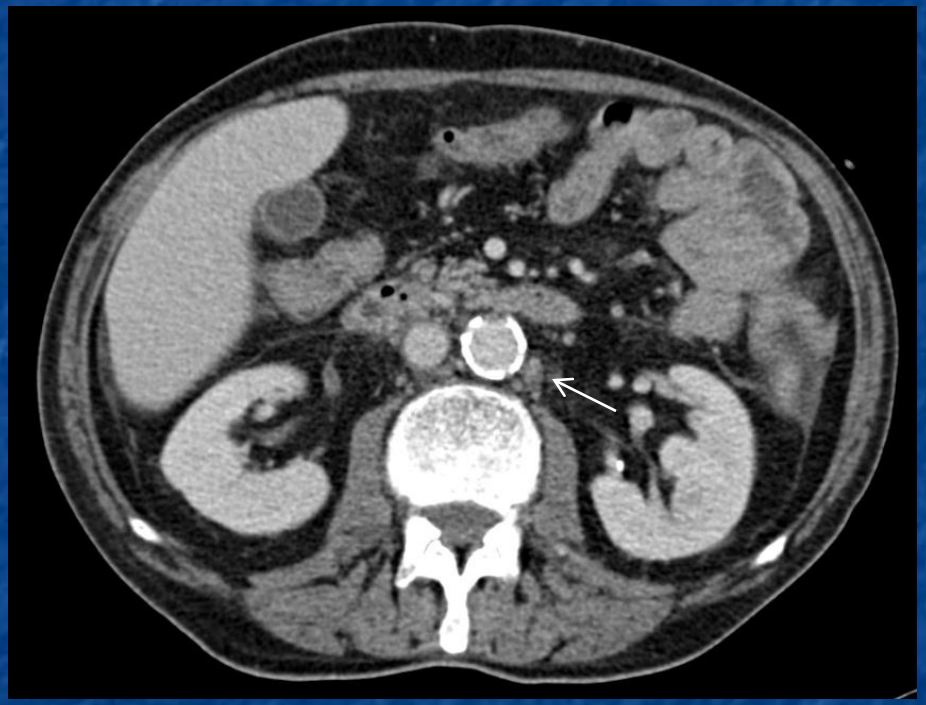
- RECIST 1.0 : nothing specific
  - long axis > 10 mm = target
- RECIST 1.1 : more complicated
  - Short axis < 10 mm = normal
  - Short axis 10≤ ≥ 14 mm = non target
  - Short axis ≥ 15 mm = target

LH Schwartz et al European Journal of Cancer, January 2009

Complete Response



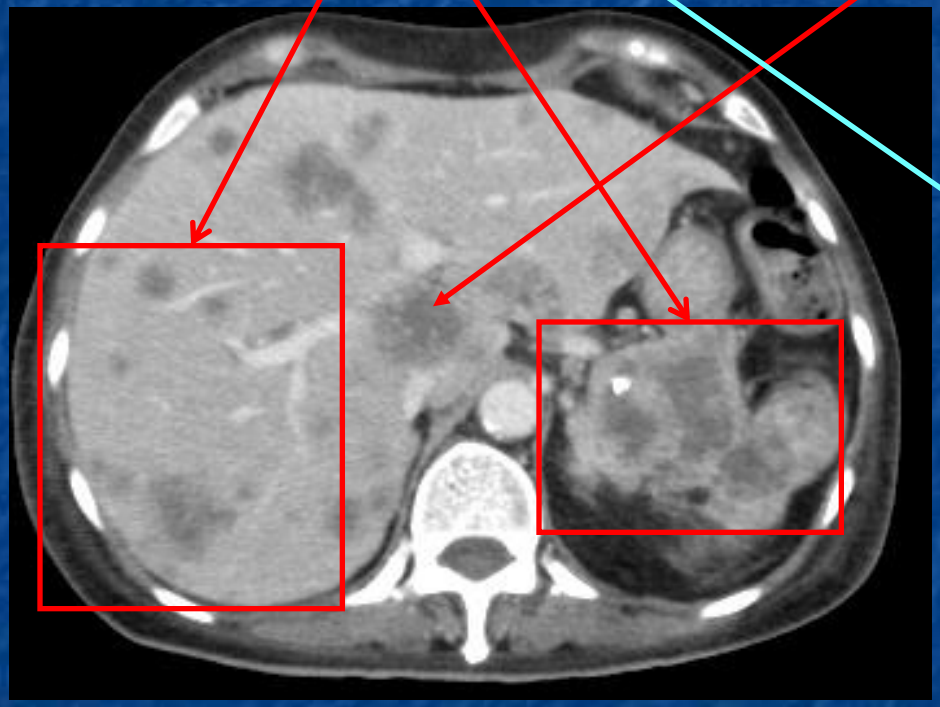
Dec 2010



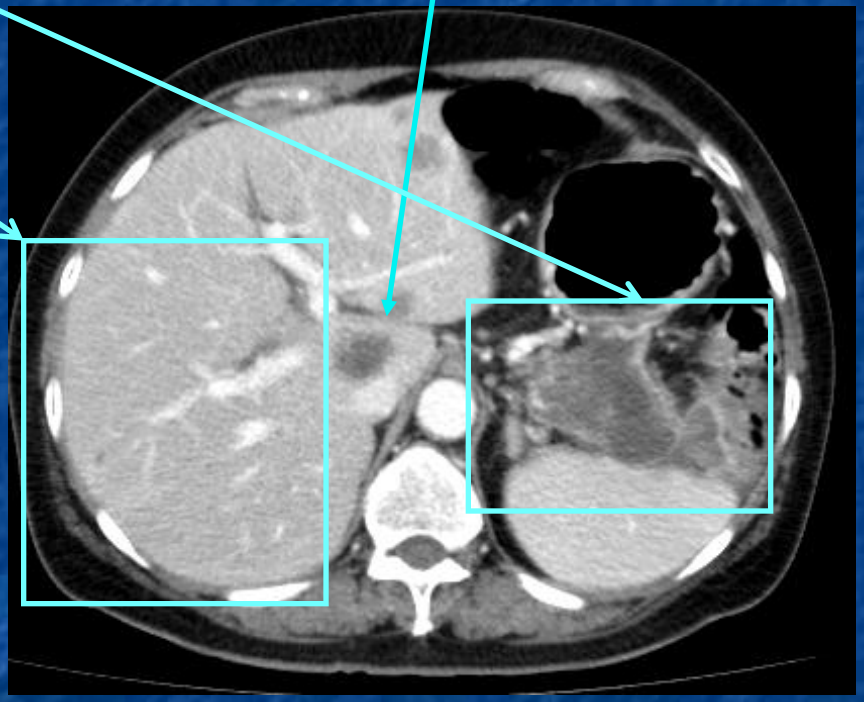
June 2011

Response of targets :
-30% of sum of Diameters (PR)
no lesion seen (CR)

Response of Non Targets
No PR exists for NT
Only CR. If not → SD



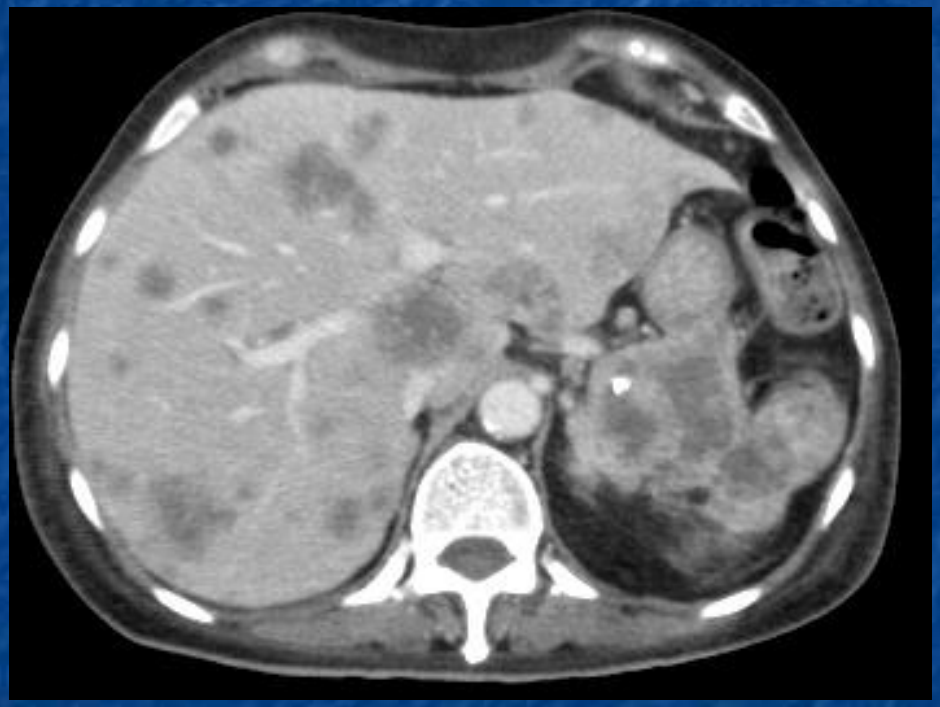
02-2007



06-2007

1. Growth of target Lesions **(more than + 20%)**
2. Unequivocal growth of Non Target Lesions
3. Unequivocal New Lesions

Progression as compared with NADIR

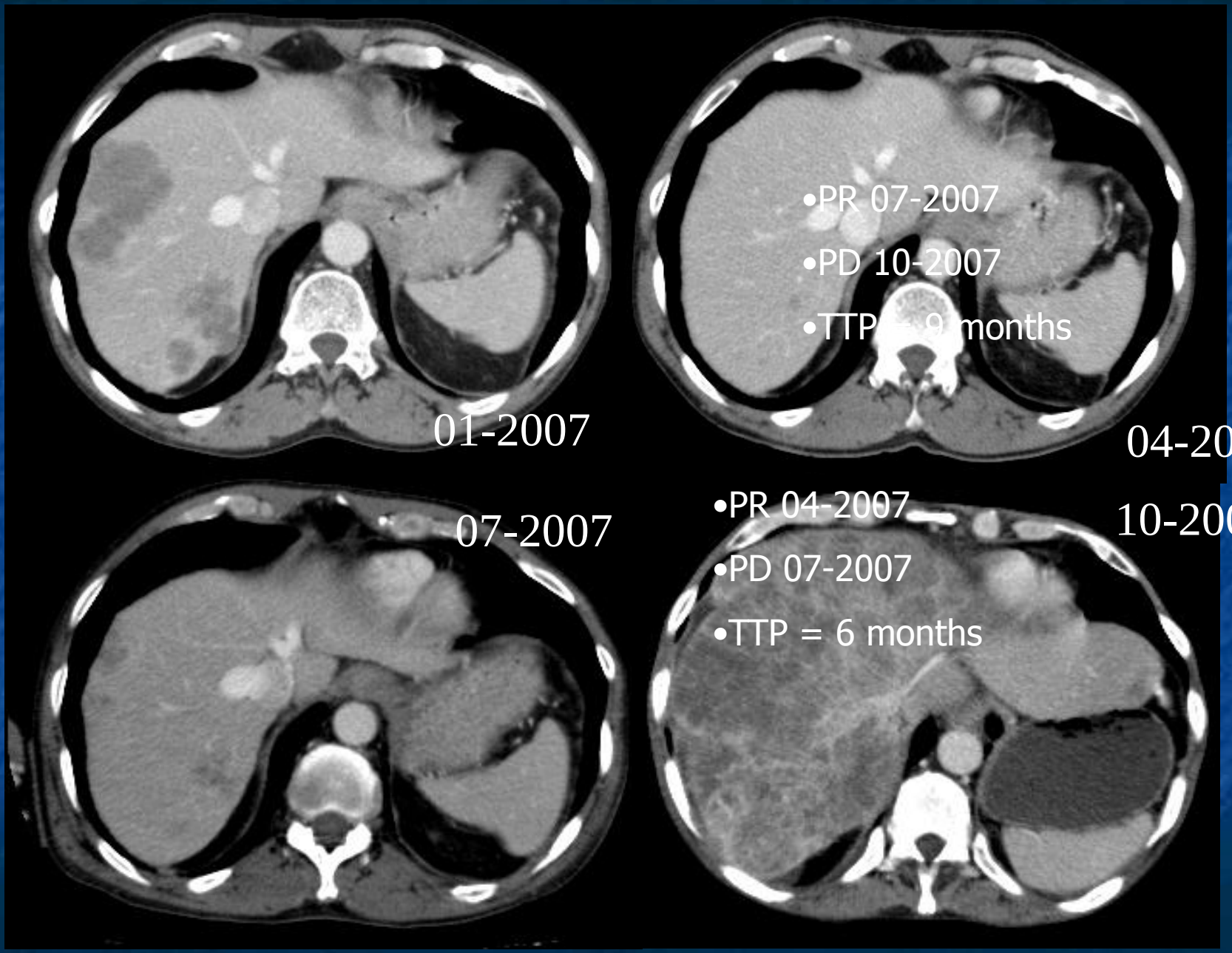


02-2007

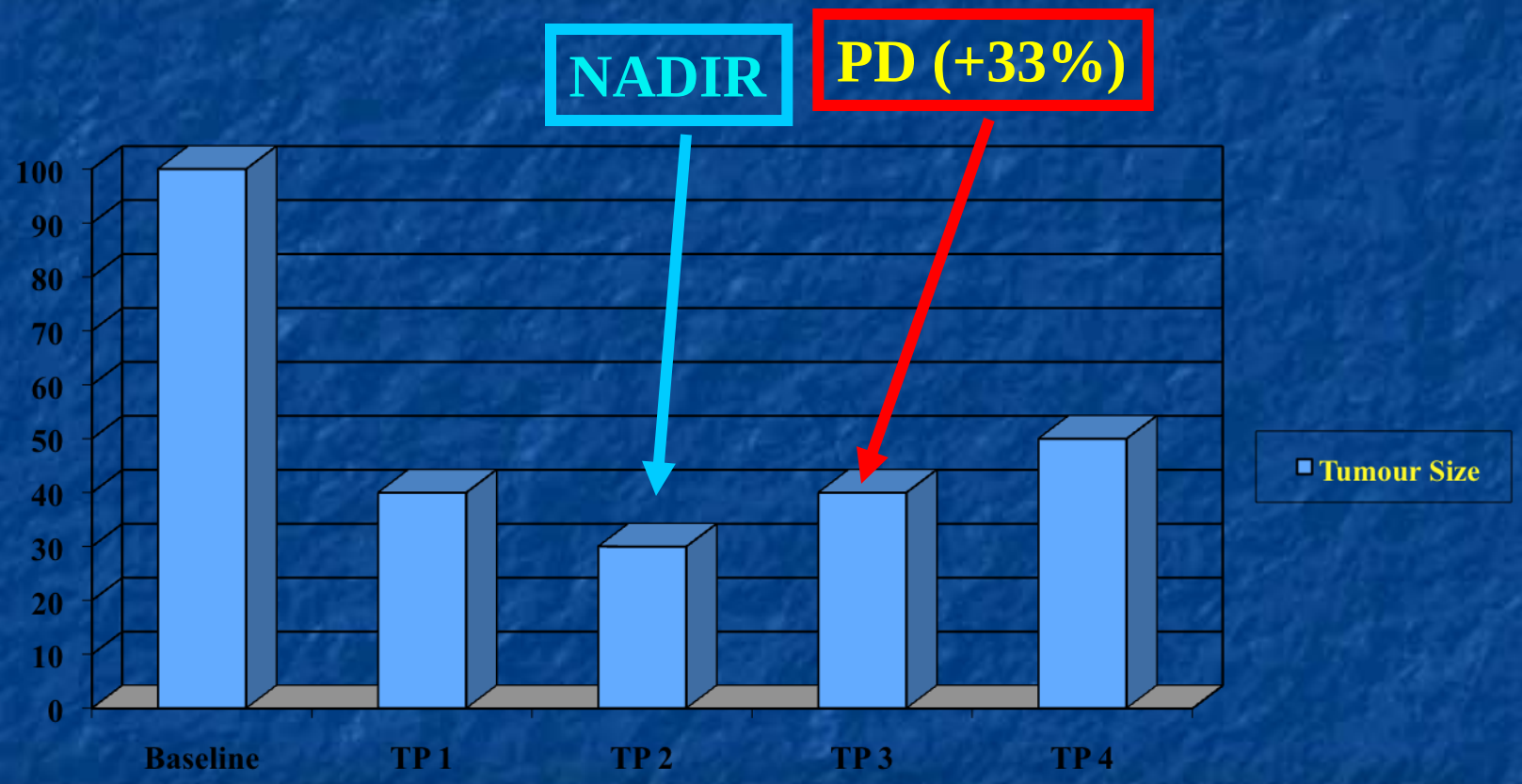
06-2007

Friend or Foe Dessert

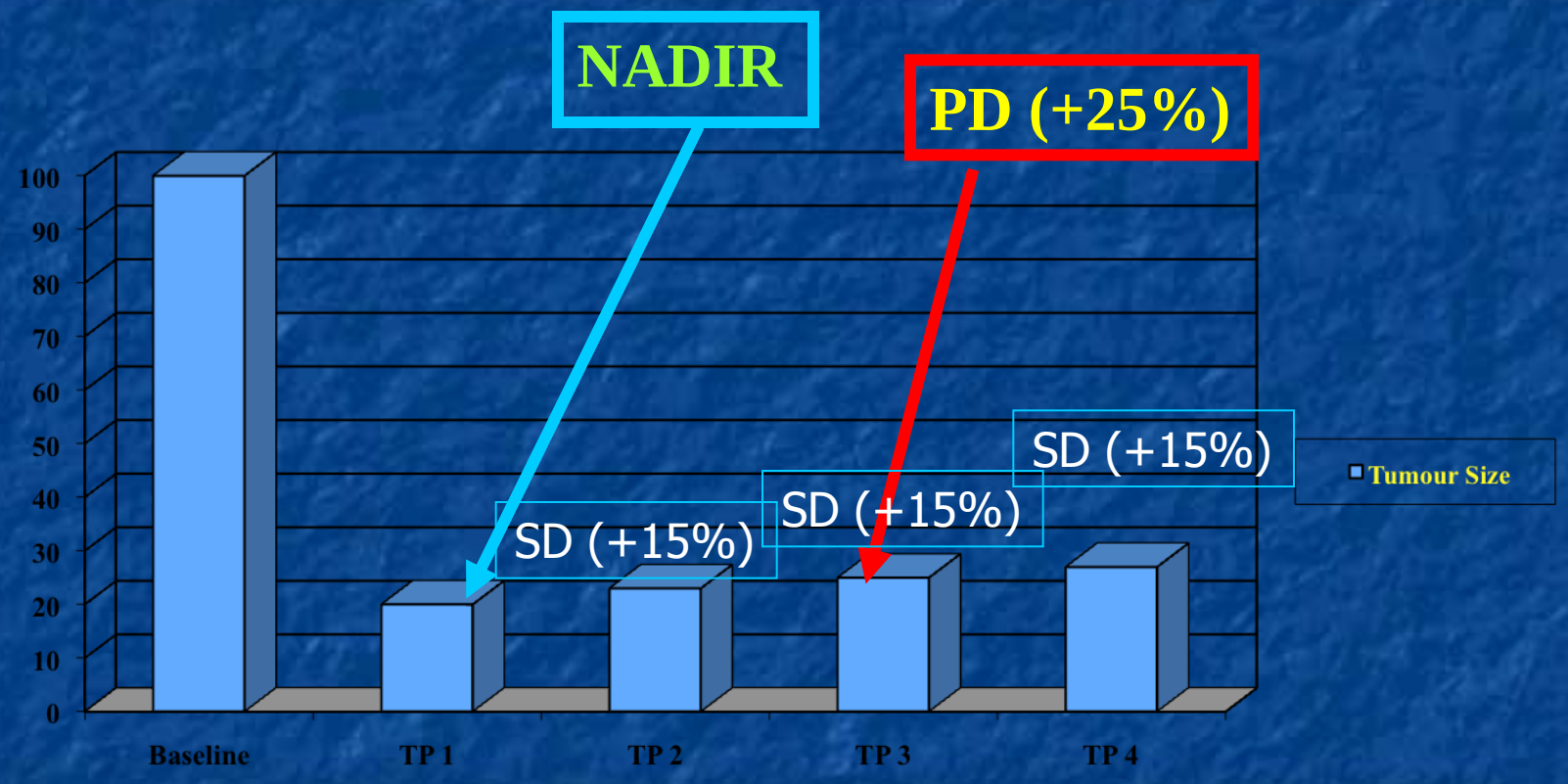
- There are ennemies…
  - The previous examination syndrome
  - The PD patient that is doing really well
  - The equivocal lesion
- Time is our friend… or our ennemy!


01-2007
•PR 07-2007
•PD 10-2007
•TTP = 9 months
04-2007
07-2007
•PR 04-2007
•PD 07-2007
•TTP = 6 months
10-2007

NADIR


NADIR
PD (+33%)
100
90
80
70
60
50
40
30
20
10
0
Baseline
TP 1
TP 2
TP 3
TP 4
Tumour Size

NADIR


NADIR
PD (+25%)
100
90
80
70
60
50
40
30
20
10
0
SD (+15%)
SD (+15%)
SD (+15%)
Tumour Size
Baseline
TP 1
TP 2
TP 3
TP 4

TTP

10-2009

02-2010

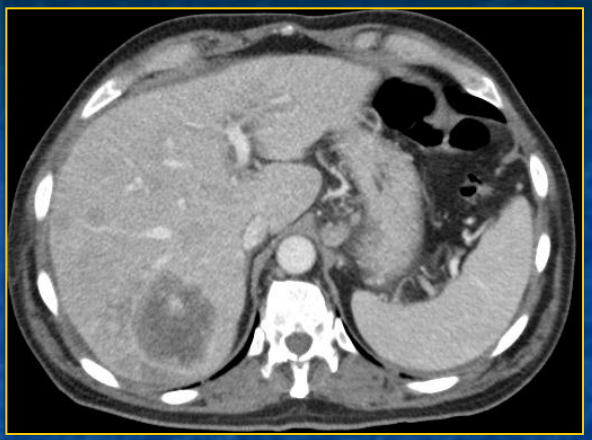
Decision should rely on unequivocal lesions. If not :

→ be conservative

→ report as "undetermined lesion" in the "Waiting List"

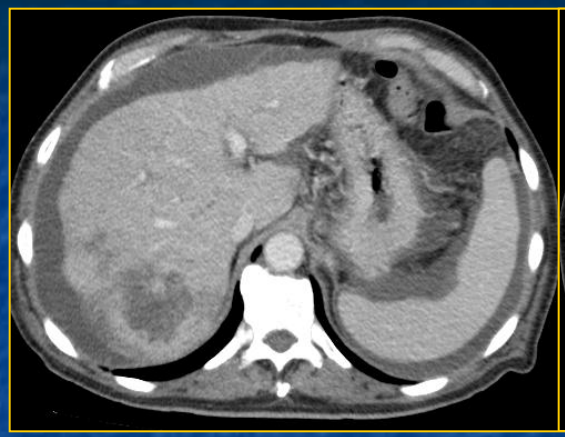
05-2010

Baseline

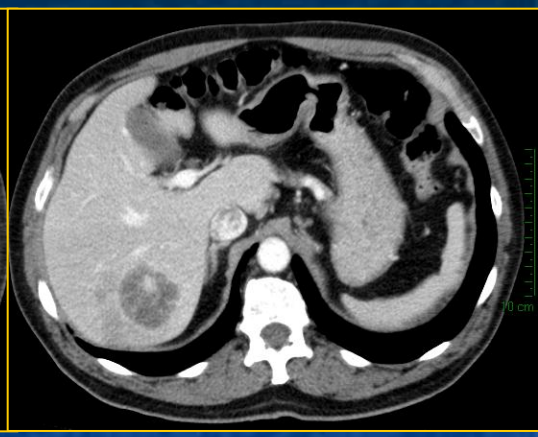


PD?

Evaluation 1



Evaluation 2



1 month

01-2007

Treatment starts
04-2007

06-2007

08-2007

3-month

Conclusion

- RECIST is a common language facilitating communication between professionals
- RECIST has limitations, and does not explore the viability of the tumours
- However, RECIST will remain as the work horse in oncologic imaging, and will remain as a complement to "functional imaging"

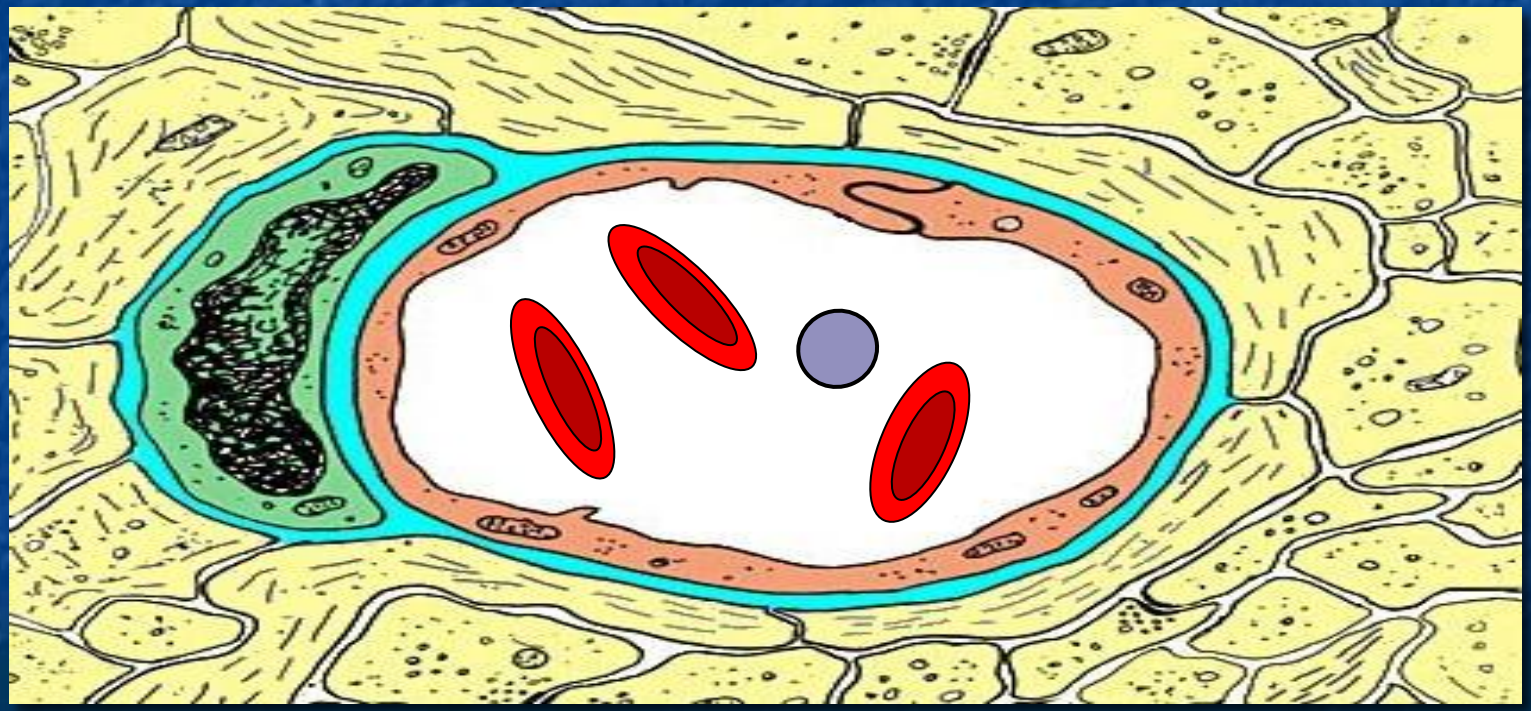
Morphology is not enough

- Perfusion (Viability) → US, CT, MRI
- Structure →Diffusion (MRI)
- Metabolism → PET

Perfusion and Viability

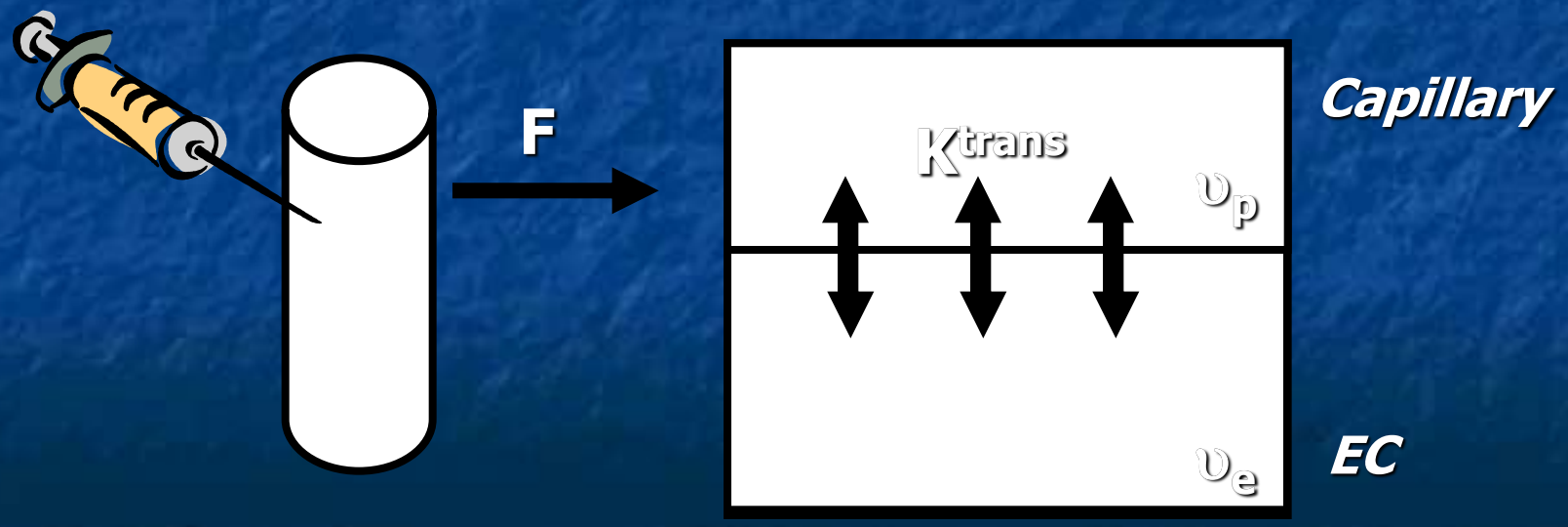
Perfusion Imaging

Perfusion → Permeability → Diffusion

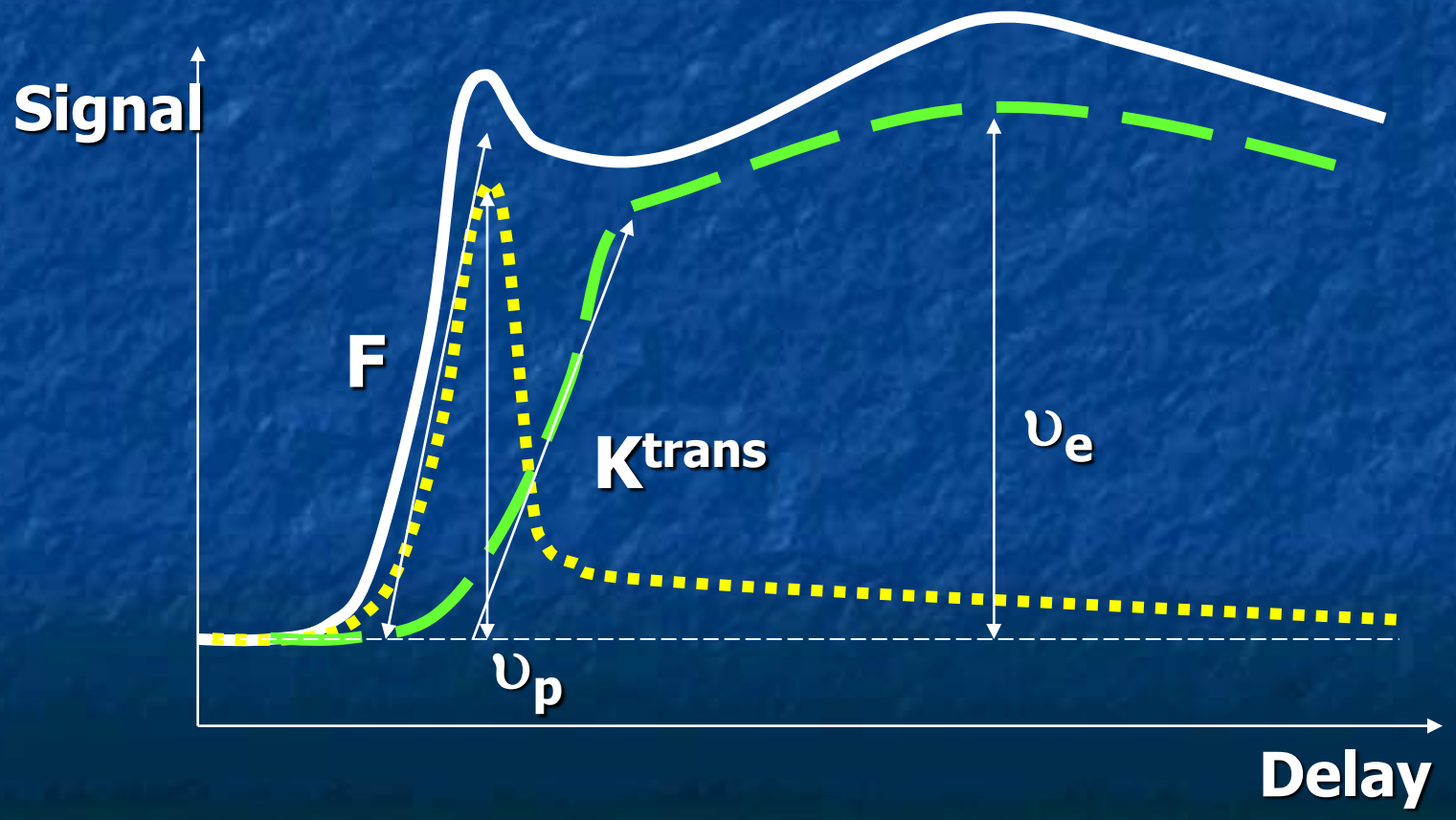


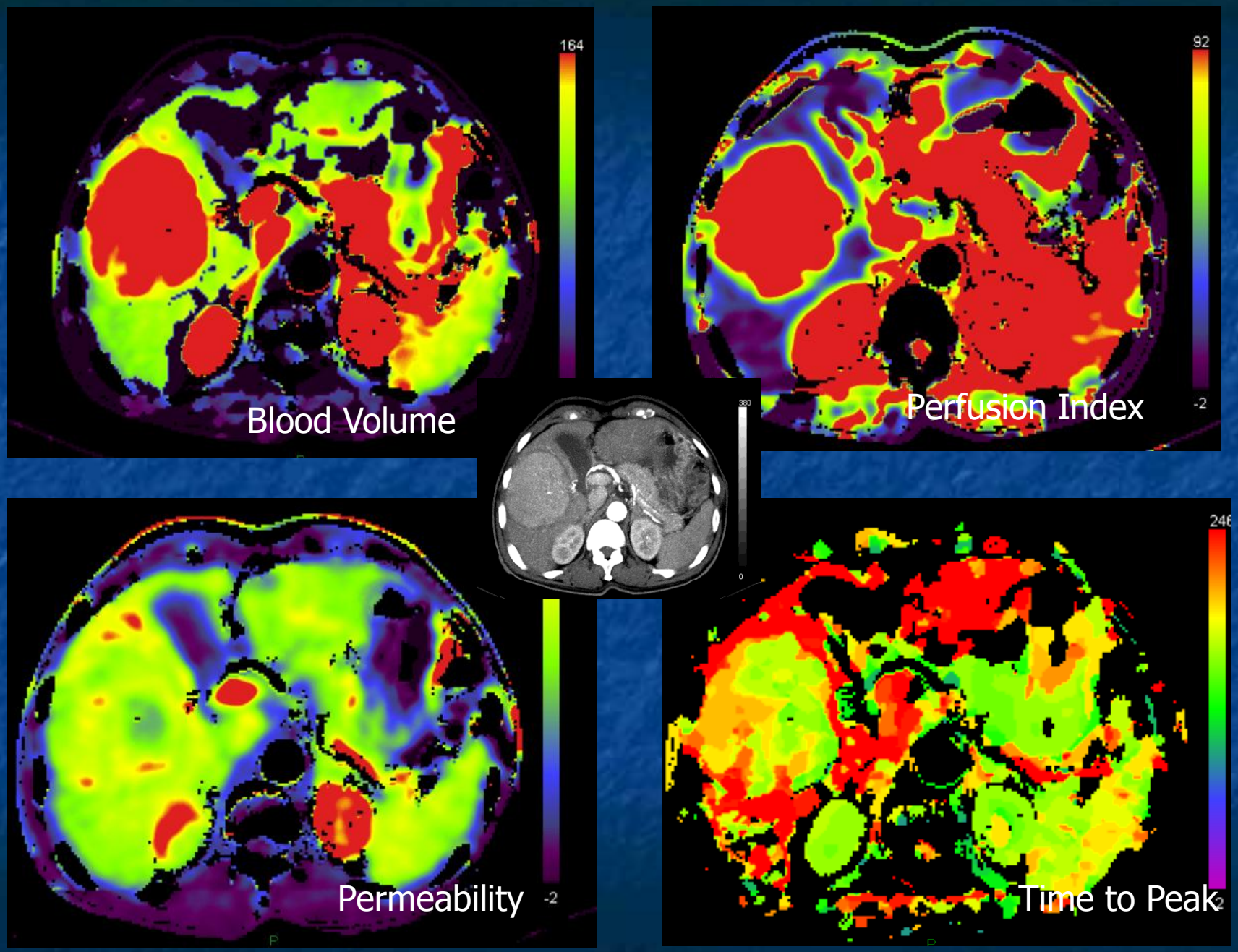
microcirculation

- Dynamic studies after injection
  - CT and MRI…
- Tracer pharmacokinetics

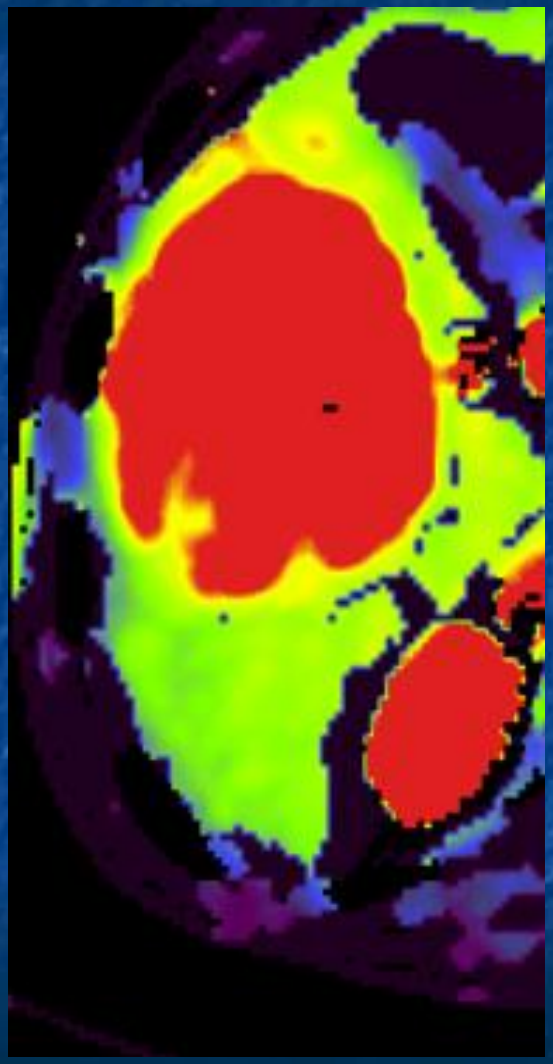


Parameters out of a slope…

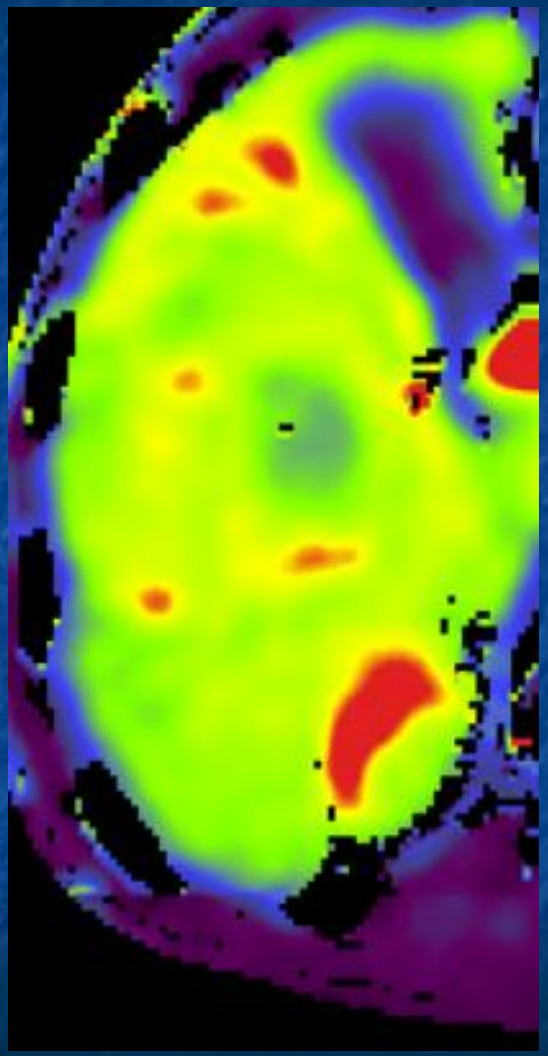



164
Blood Volume
92
-2
Perfusion Index
360
0
-2
Permeability
246
Time to Peak

Blood Volume
Treatment with Sorafenib



12-2008



01-2009

Significance of changes

- Significant changes if variation is > 30-50% *
- Absence of agreement between two software (deconvolution and Patlak analysis)**
- Variation according to the volume coverage *

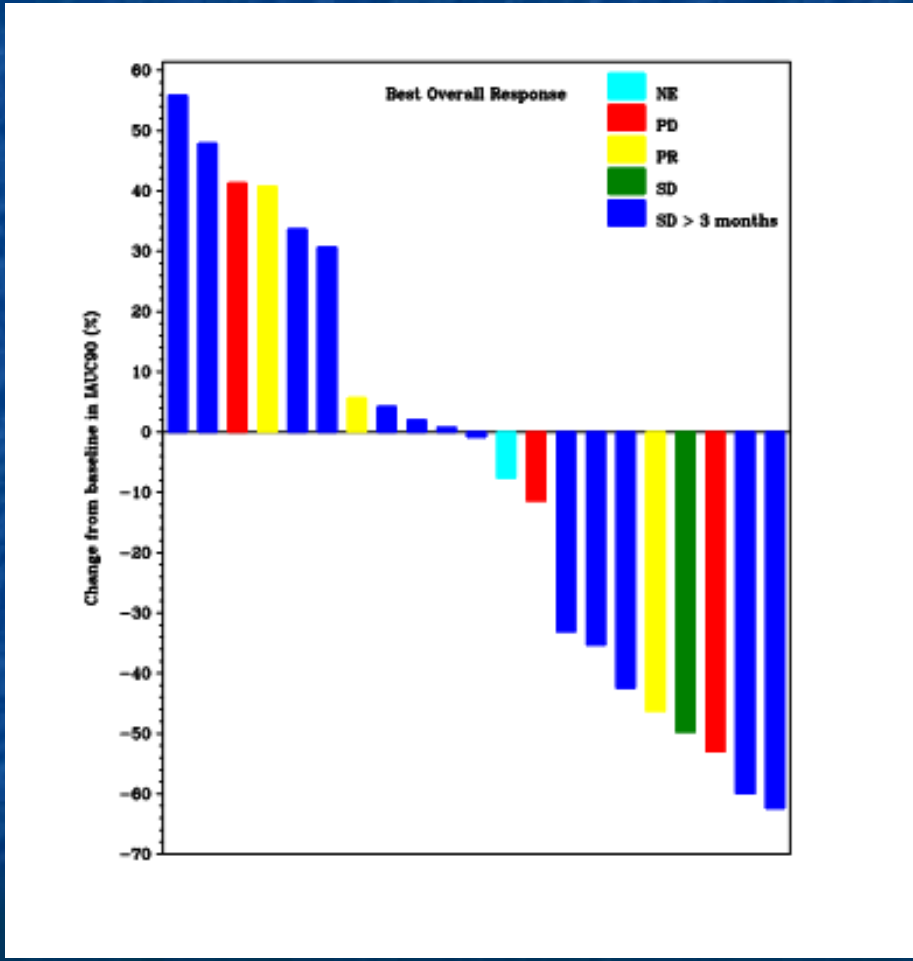
*** Marcus et al, Crit Rev Oncol Hematol 2008**
**** Goh et al, Radiology 2007**
**** Ng et al, Radiology 2006**

Area Under the Curve (AUC) as a predictor of response/survival

- Survival in patients with unresectable liver tumours, treated with regional chemotherapy *
  - AUC > 34 mM/s
    - median survival 35.1 months
  - AUC < 34 mM/s
    - median survival 19.1 months

*** Jarnagin et al Ann Oncol 2009**

Controversial results

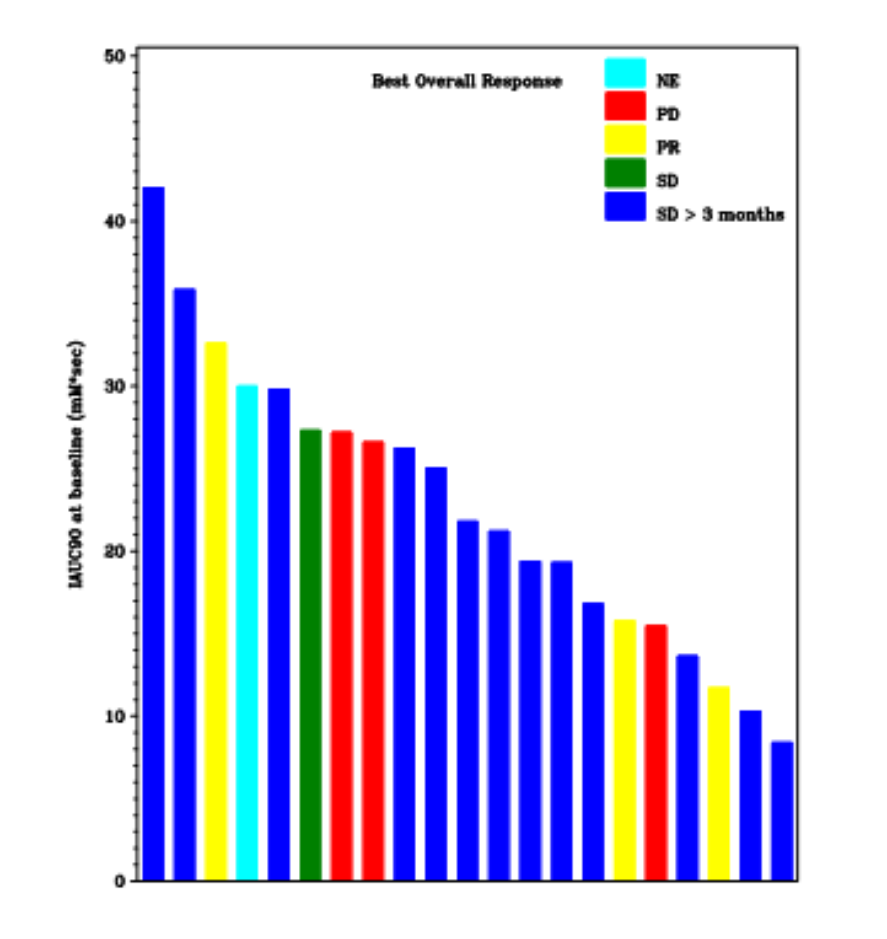


% of change in blood volume

patients

Controversial results

Pre treatment tumor blood volume

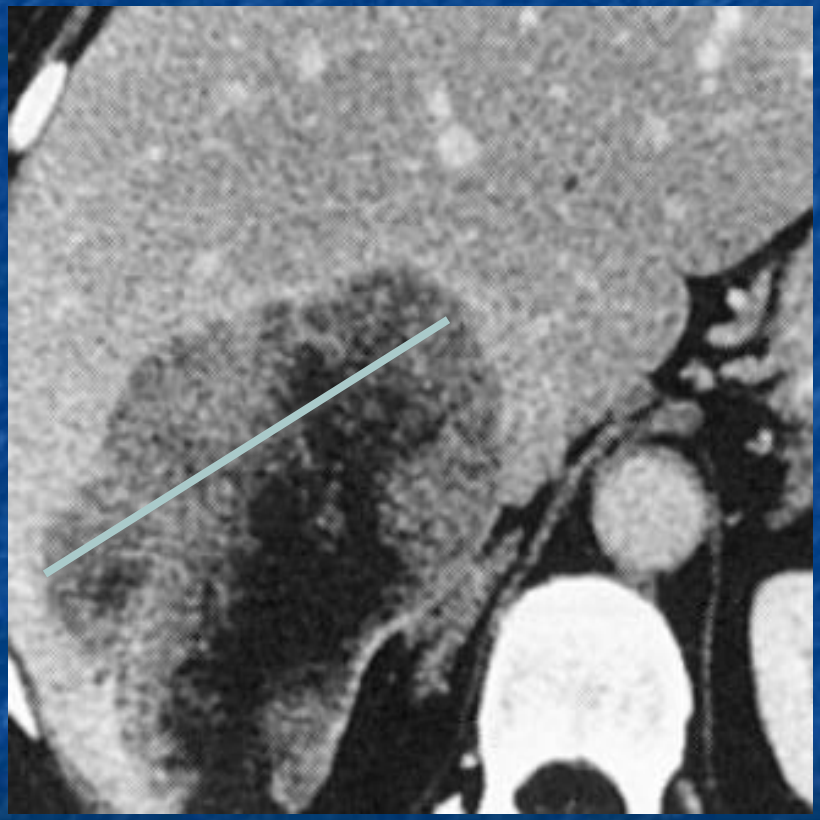


patients

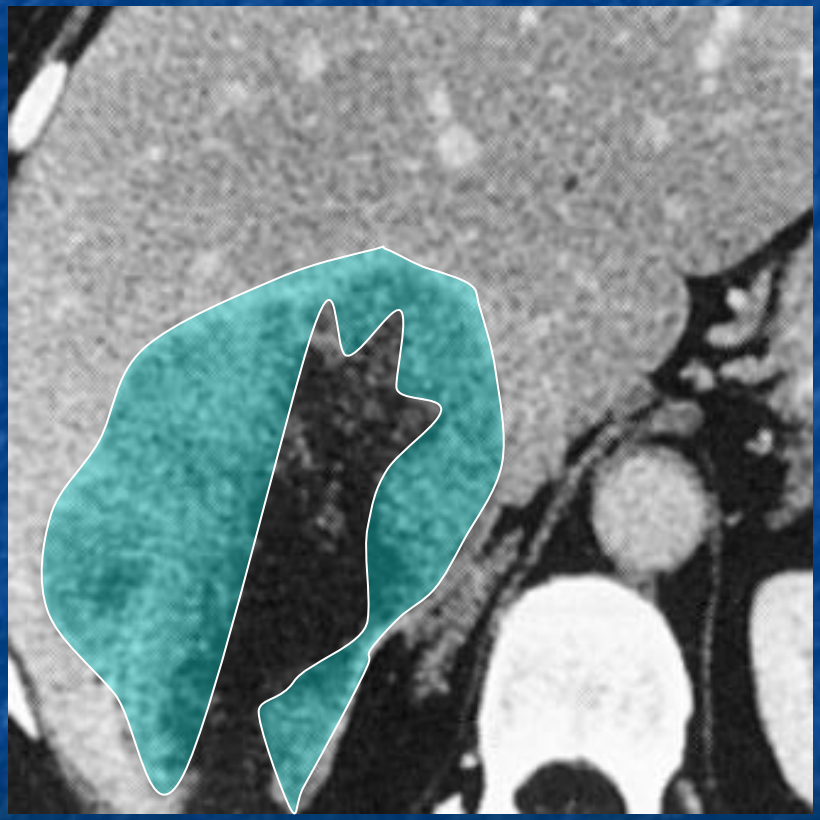
Viability can be evaluated semi-quantitatively

- Enhancement of the tumour after injection
  - Size
    - Unidimensional (mRECIST) or surface (EASL/AASLD) measurement
    - Automatic 3D volumetry (WIP)
  - Enhancement
    - Choi's criteria for GIST

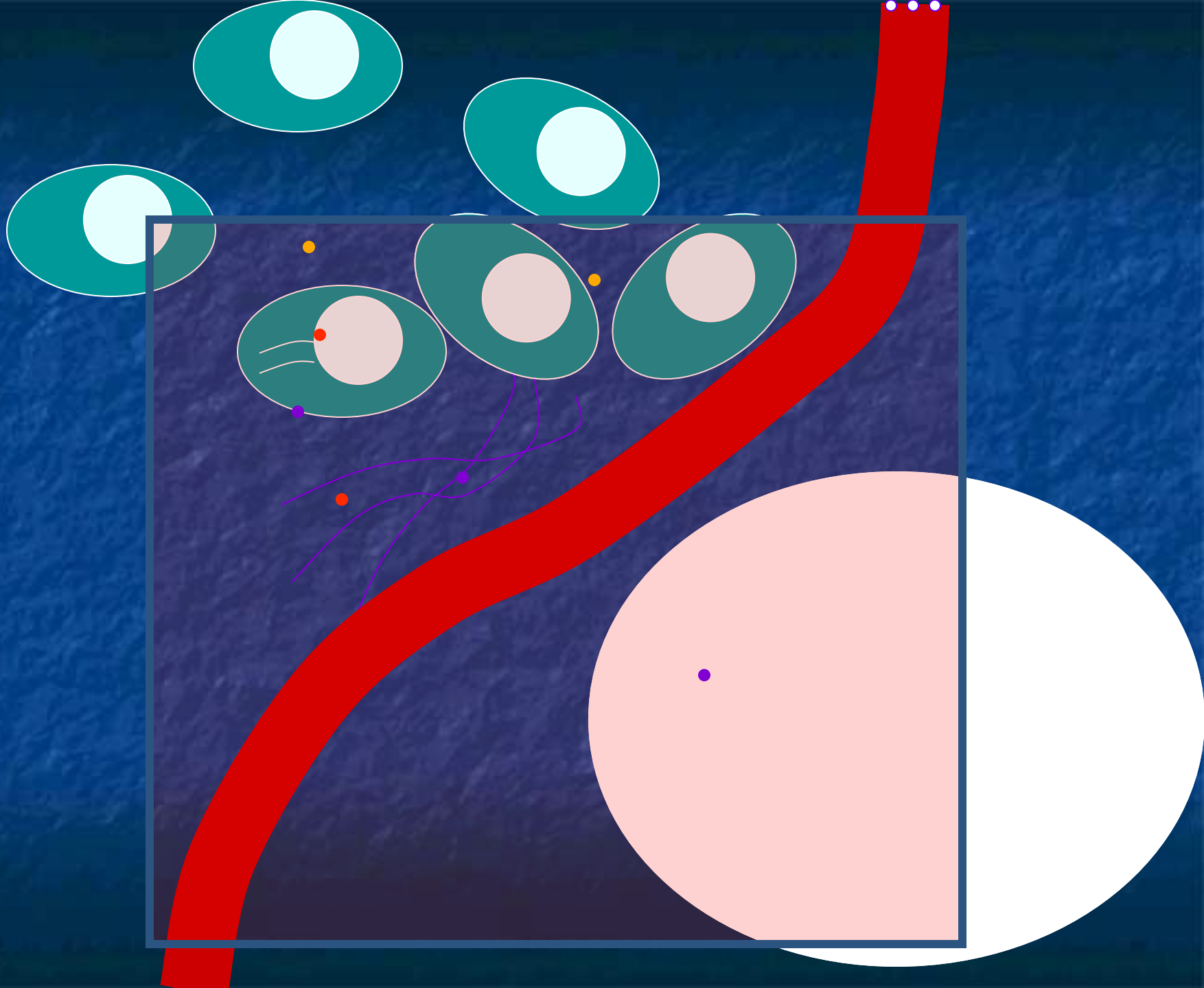
mRECIST (HCC)



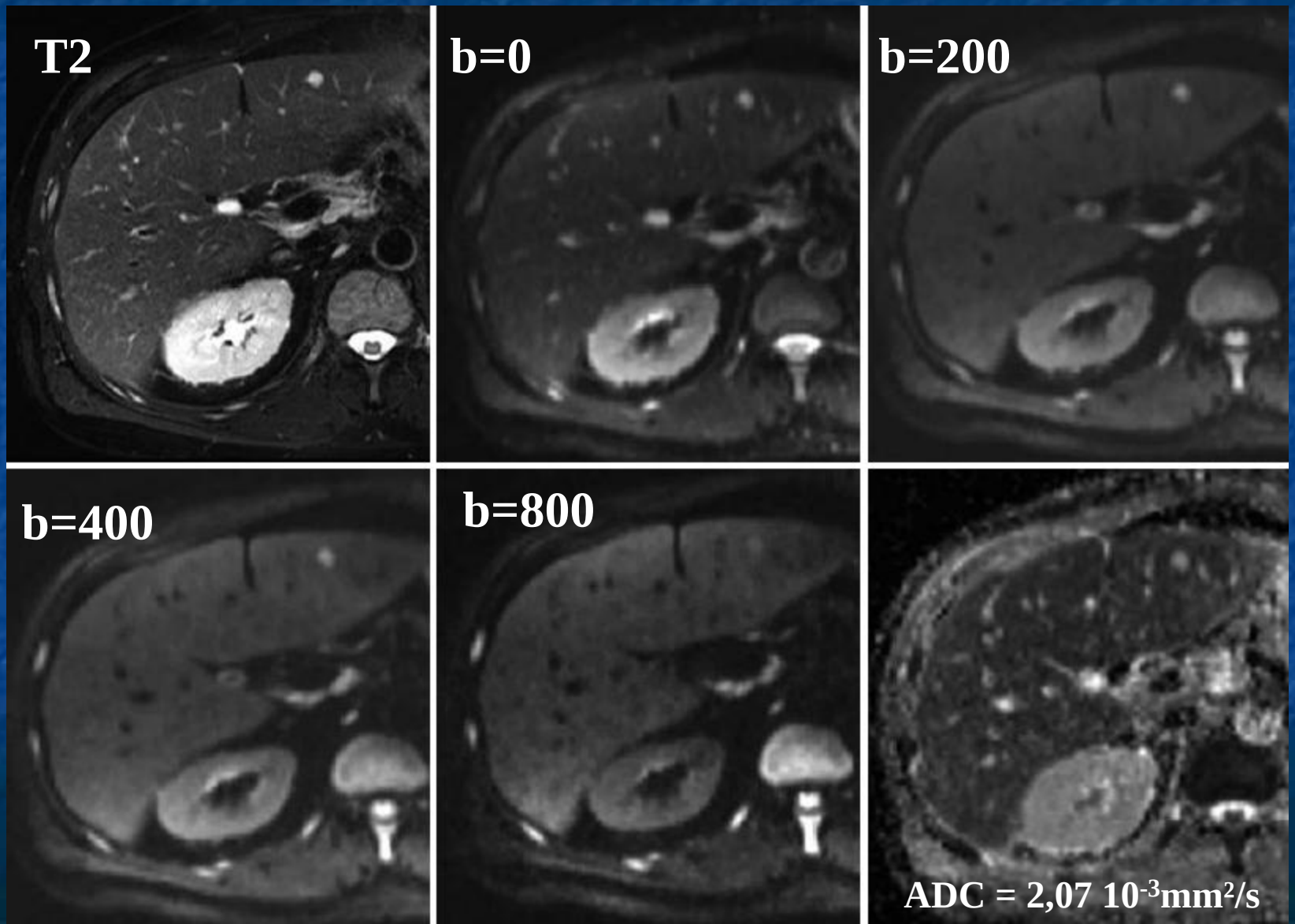
EASL and similar (HCC)



Diffusion Weighted Imaging

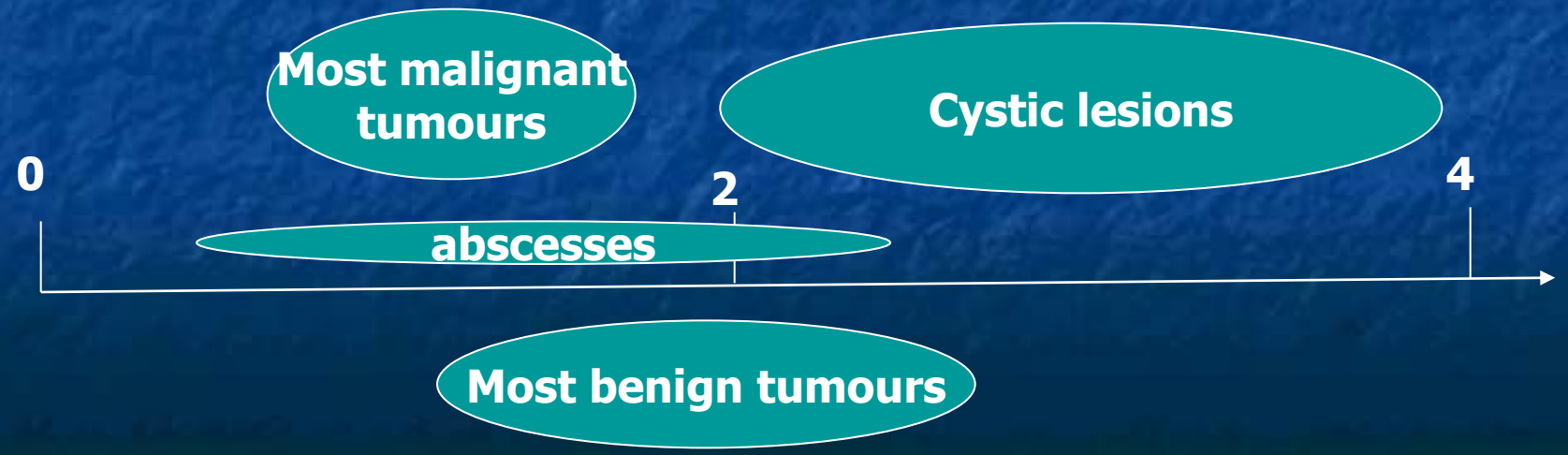


Biliary Cyst



The ADC map

- The role of the ADC map is to provide quantification. The ADC value of a lesion id expressed in mm^2/s (while « b » is expressed in mm^2/s)




12/2007

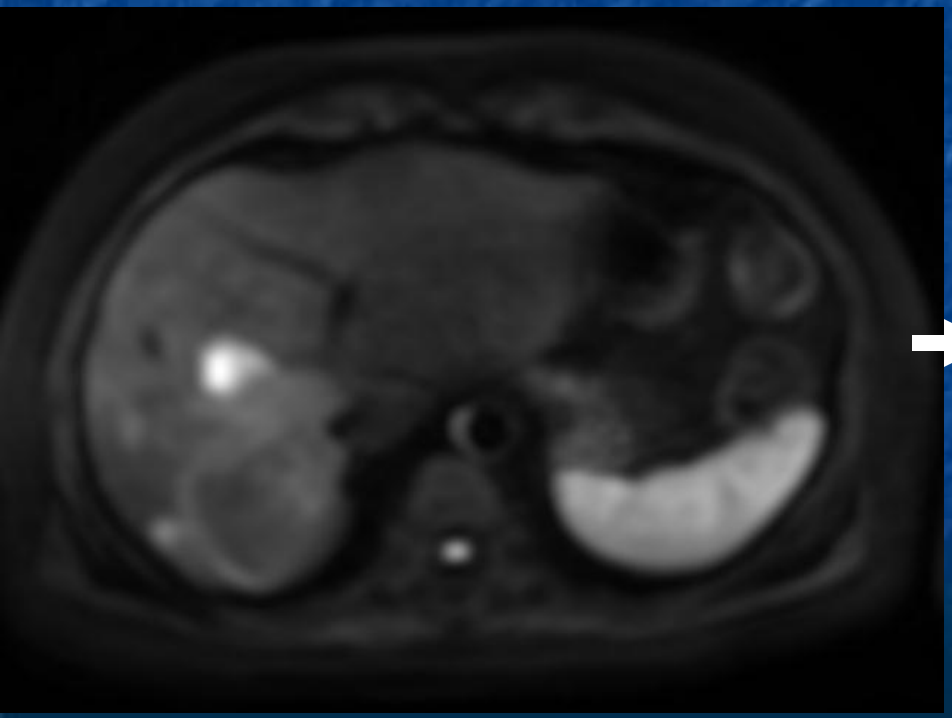

12/2008


12/2008


12/2008

PET-Fake!

- Inversion of image pixels



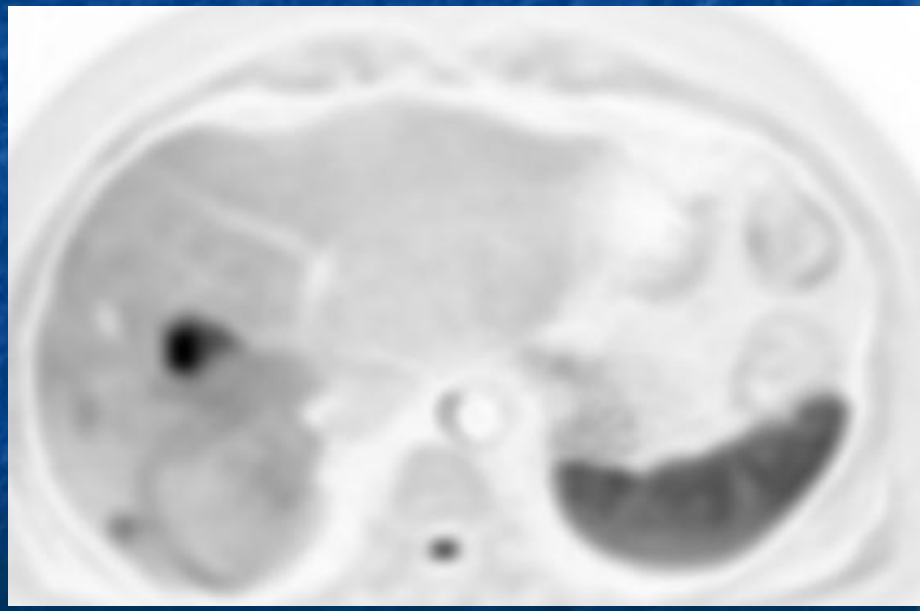
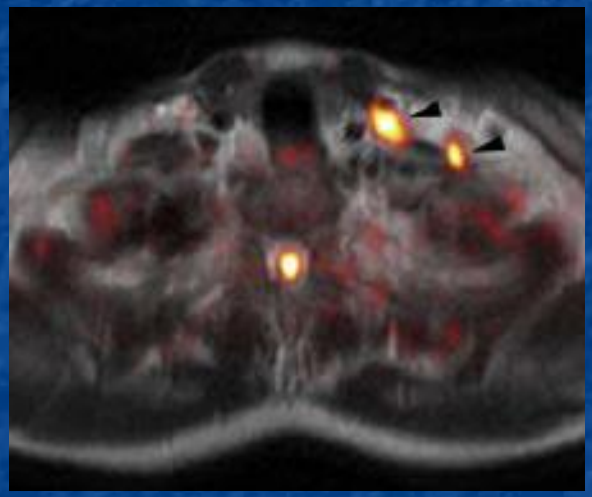
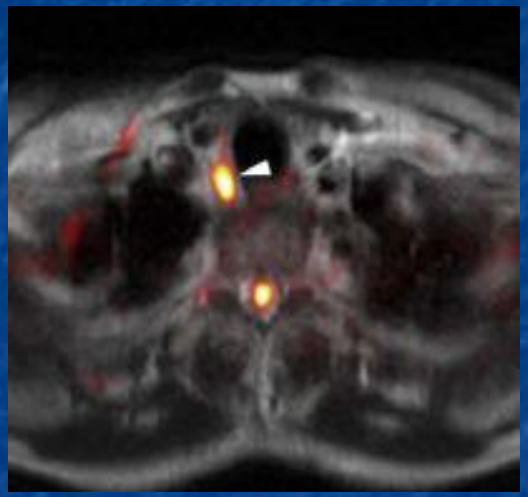
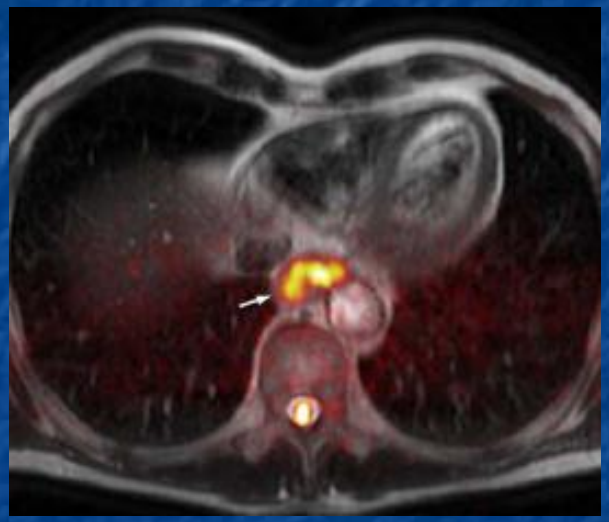


Image Fusion







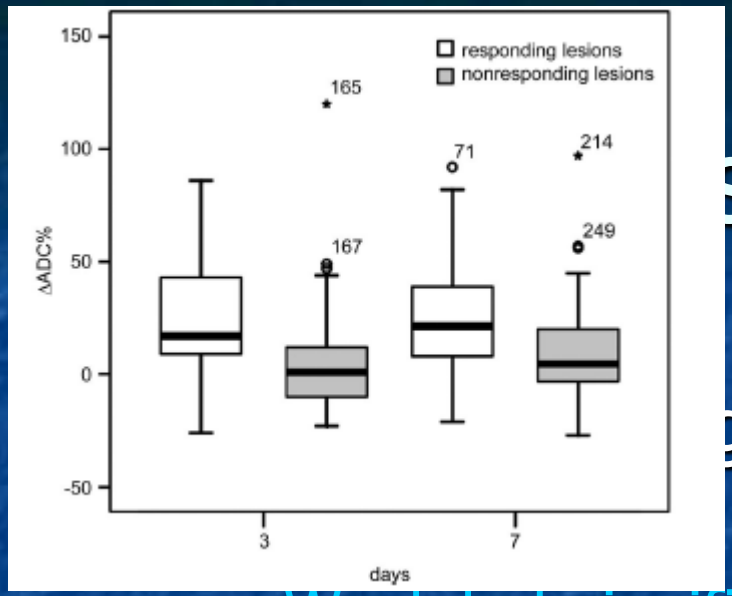
Eur Radiol
DOI 10.1007/s00330-008-1291-4

MAGNETIC RESONANCE

Aine Sakurada
Taro Takahara
Thomas C. Kwee
Tomohiro Yamashita
Seiji Nasu
Tomohiko Horie
Marc Van Cauteren
Yutaka Imai

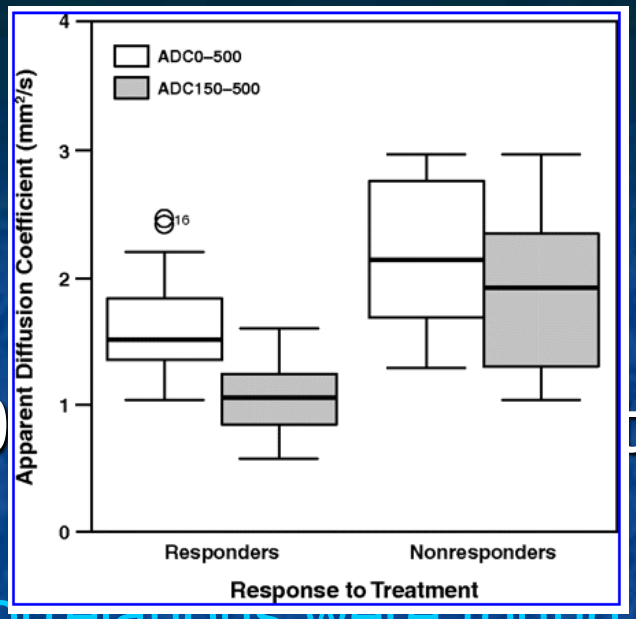
Diagnostic performance of diffusion-weighted magnetic resonance imaging in esophageal cancer

Se (LN) 78%
Sp (LN) 56%



sion

gy 200 th



- « Weak but significant correlations were found between final tumor size reduction and both pretreatment ADCs (…) and early ADC changes »
- « We conclude that an early increase in the mean ADC and a low pretherapy mean ADC in hepatic metastasis from gastric or colorectal carcinomas can help predict good response to chemotherapy »

Koh et al. AJR 2007

Rectal Cancer

- Comparison of tumour volume with DWI before and after chemoradiotherapy is an excellent predictor of the absence of residual tumour*
- Combination of PET and DWI is a powerful predictor of response (Se 100%, Sp 94%) **

*** Curvo-Semedo, Radiology, 2011**
**** Lambrechts, Acta Oncol 2010**

Role of Functional imaging today

- Animal studies
- Phase I
- Phase II
- Phase III
- Phase IV
- Routine

Functional Imaging today

- Definitely not a standard
- Clearly still WIP
- Unlikely to replace morphology.
- Likely to be a complementary tool.