

IMAGES in RADIOTHERAPY CT, PET-CT

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IFMP Workshop

INTRODUCTION

- *Radiotherapy treatment goal*
 - *deliver as high as possible dose to the volume of interest*
 - *spar the surrounding healthy tissues as much as possible*

INTRODUCTION

- *procedure*

- *treatment simulation*
- *arrange the treatment fields*
- *treatment verification*
- *treatment evaluation*

INTRODUCTION

*the delivered dose should be the same as
the predicted one
that dose should be delivered on the certain
volume (PTV)*

Questions:

How we are sure that the delivered dose is the same as the predicted one?

How we are sure that the dose is delivered at the right place?

How we are sure that the delivered dose is the same as the predicted one?

Delivered dose accuracy depends on:

- machine functionality,
- beam calibration errors
- calculation algorithm uncertainty

How we are sure that the dose is delivered at the right place?

Delivered dose accuracy depends on:

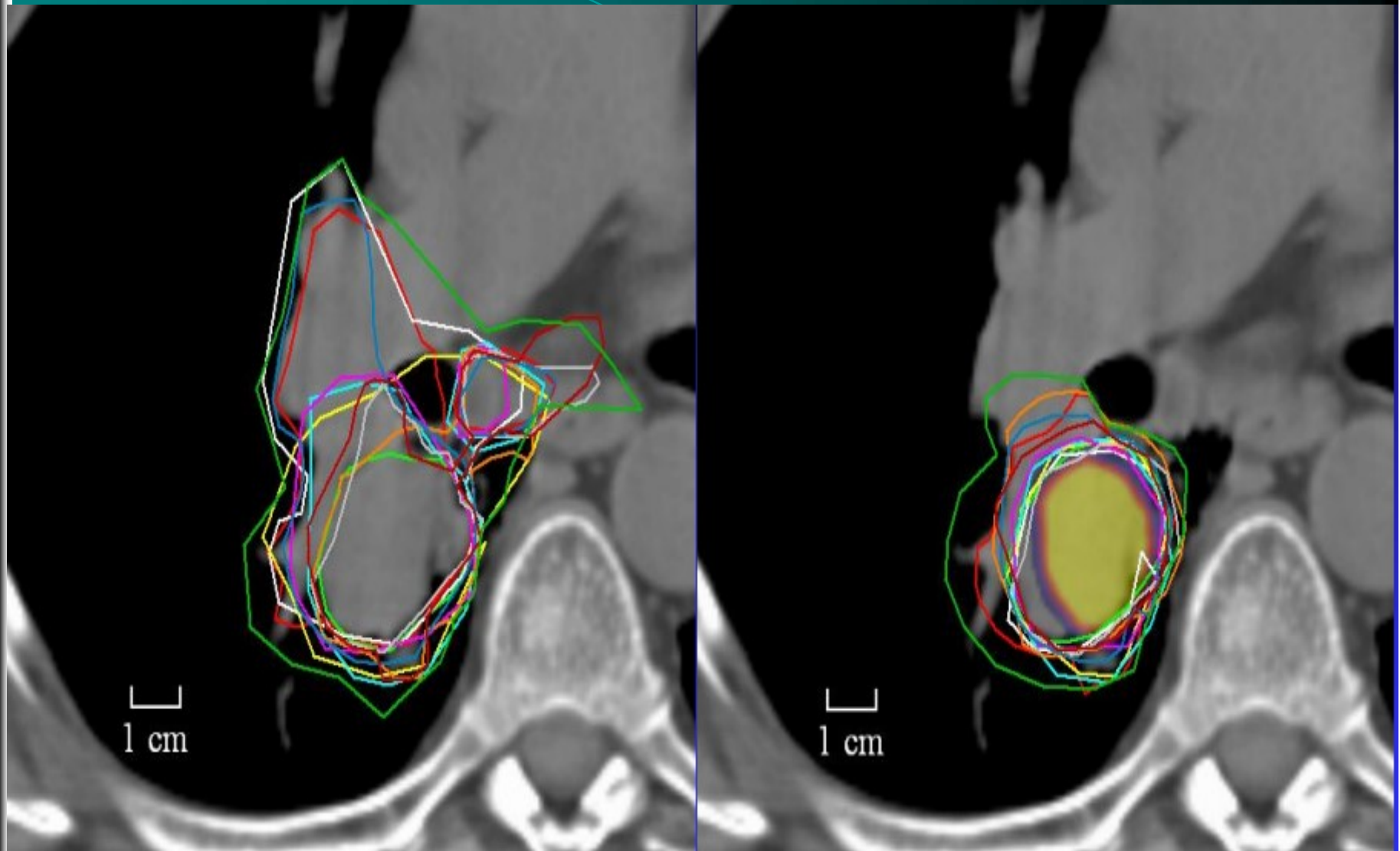
- patient position errors
- volume of interest delineation precision

How we are sure that the delineation is correct?

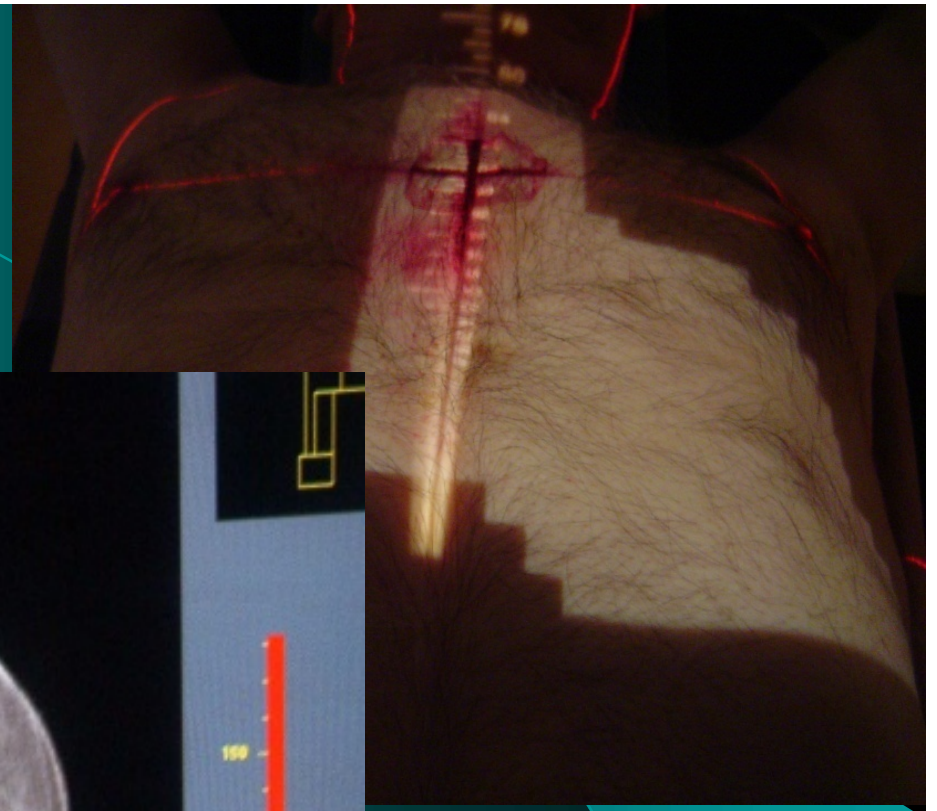
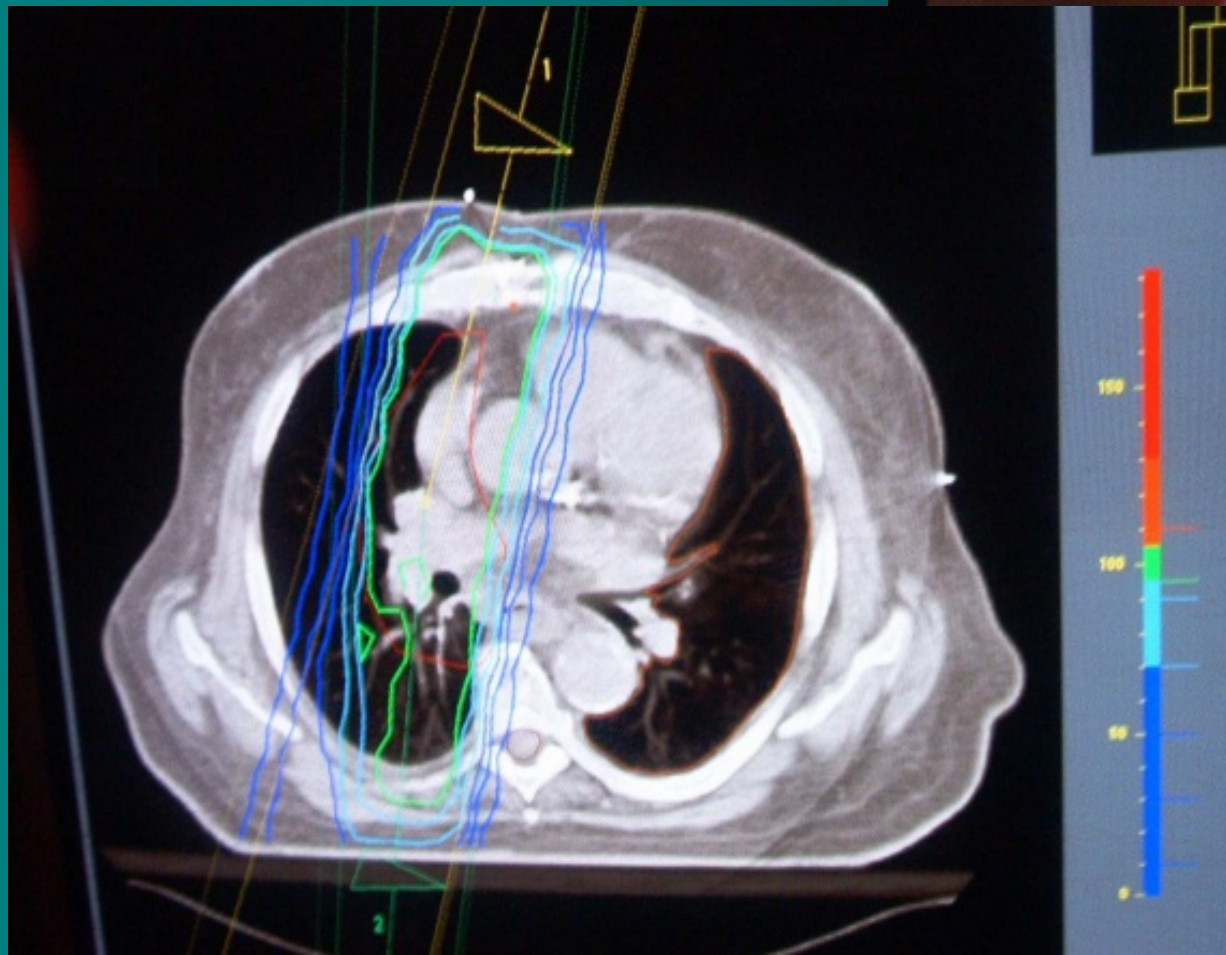
Delineation accuracy depends on:

- tumor tissue visibility
- radiation oncologist experience

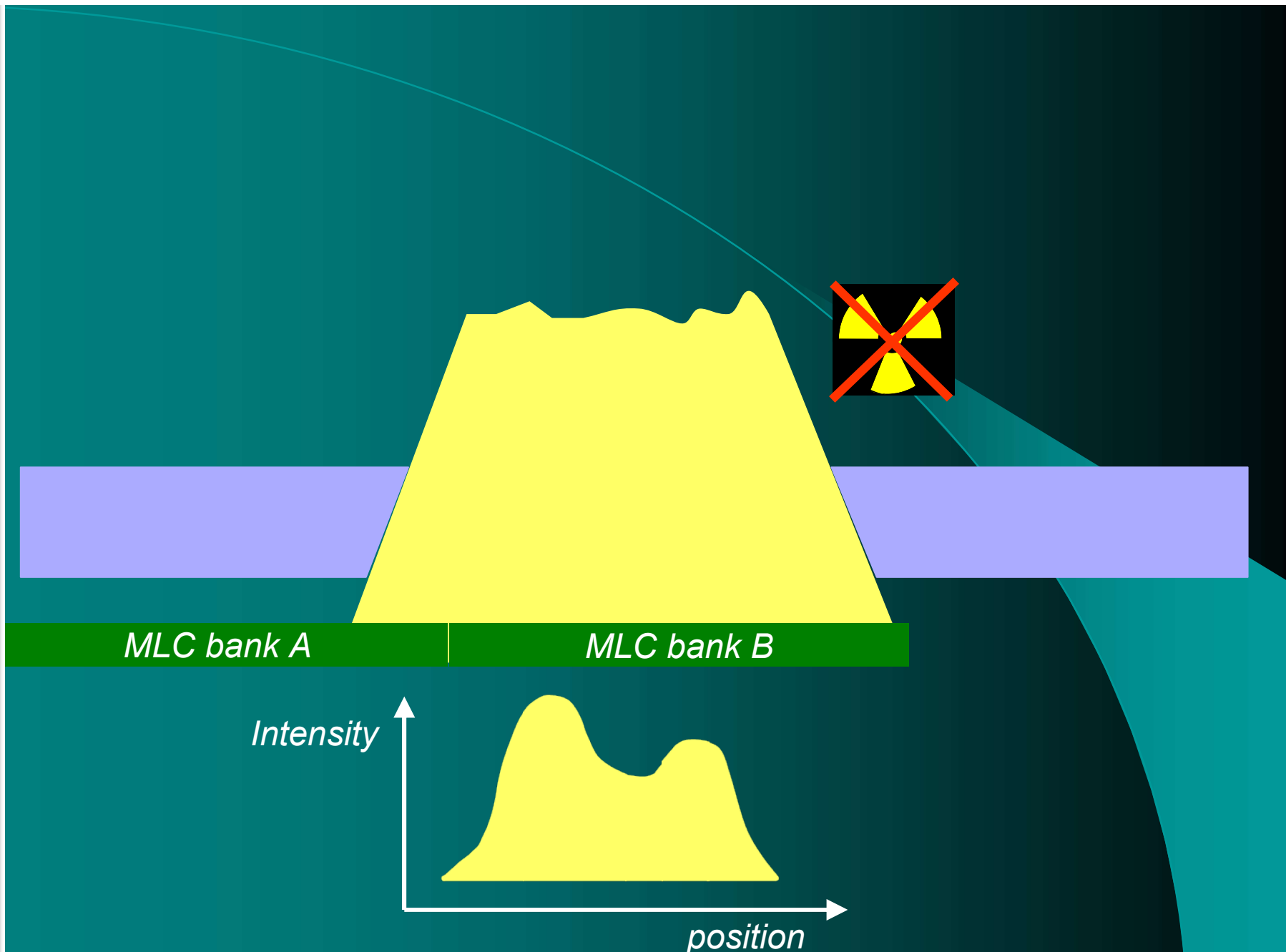
imaging



imaging





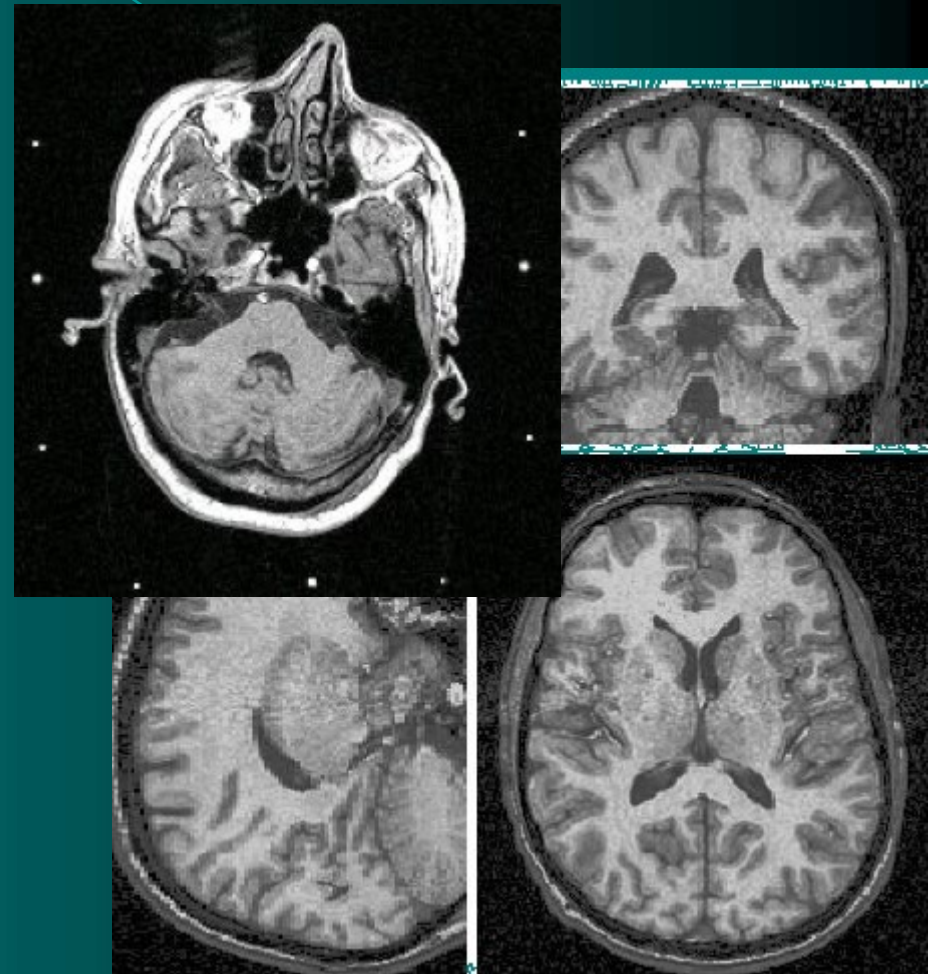
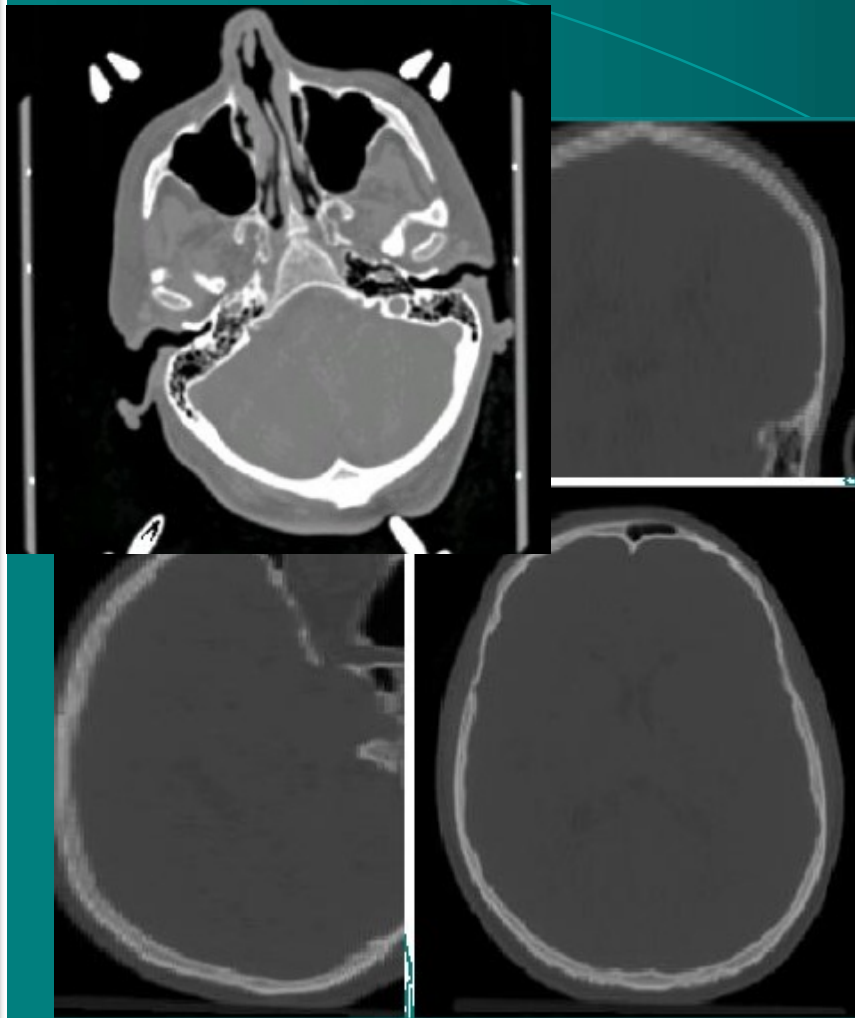


imaging

Integration of multimodality imaging data for radiotherapy treatment planning is beneficial and indispensable for perfect delineation.

- ***CT*** ***for planning***
 - ***MRI***
 - ***PET-CT***
- for registration***

Why MRI?



Why MRI?

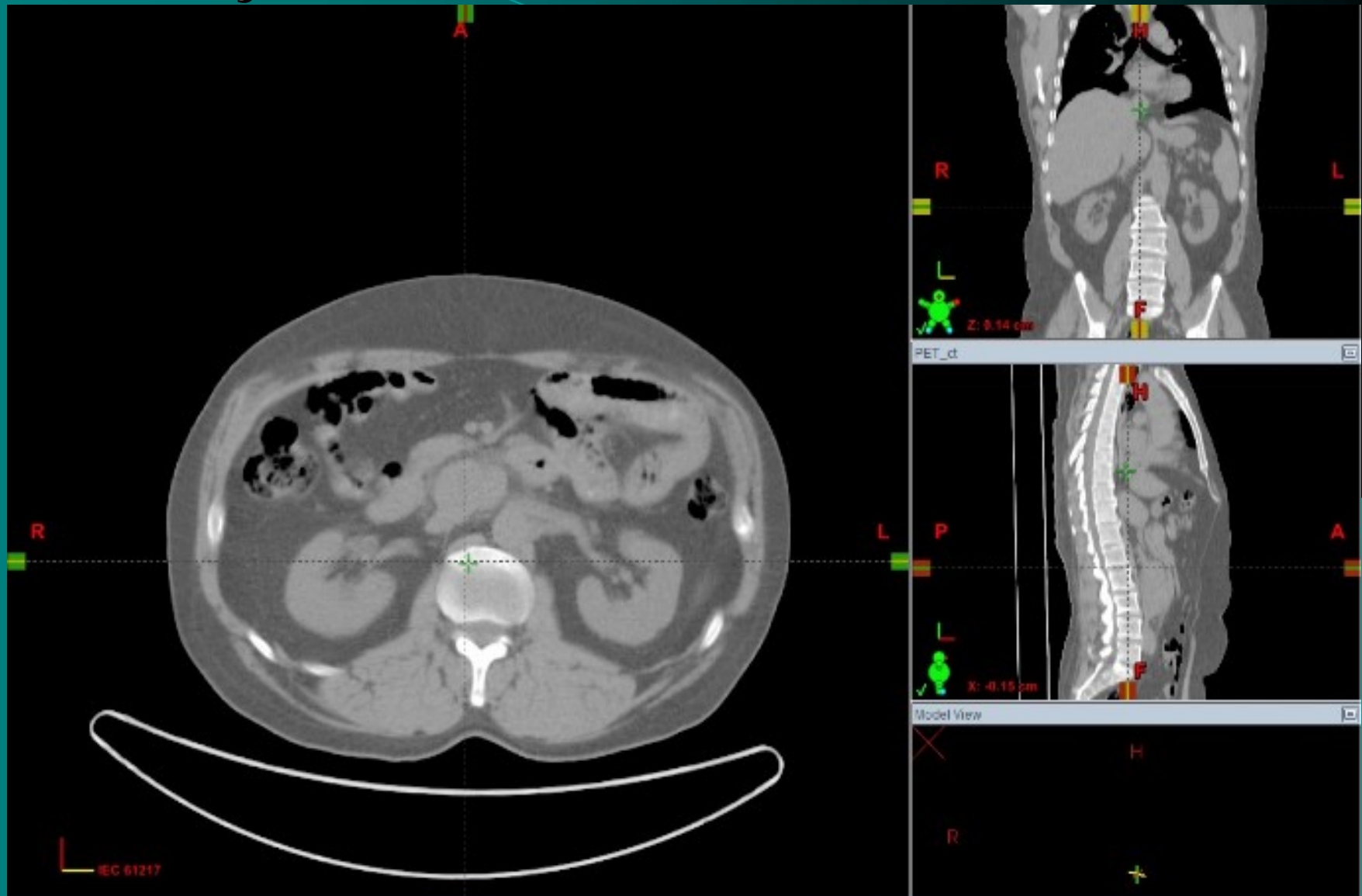


16-Oct-20

Workshop on PET Developments and Applications, OHRID 2015

Slide 15

Why PET/CT?



Why PET/CT?

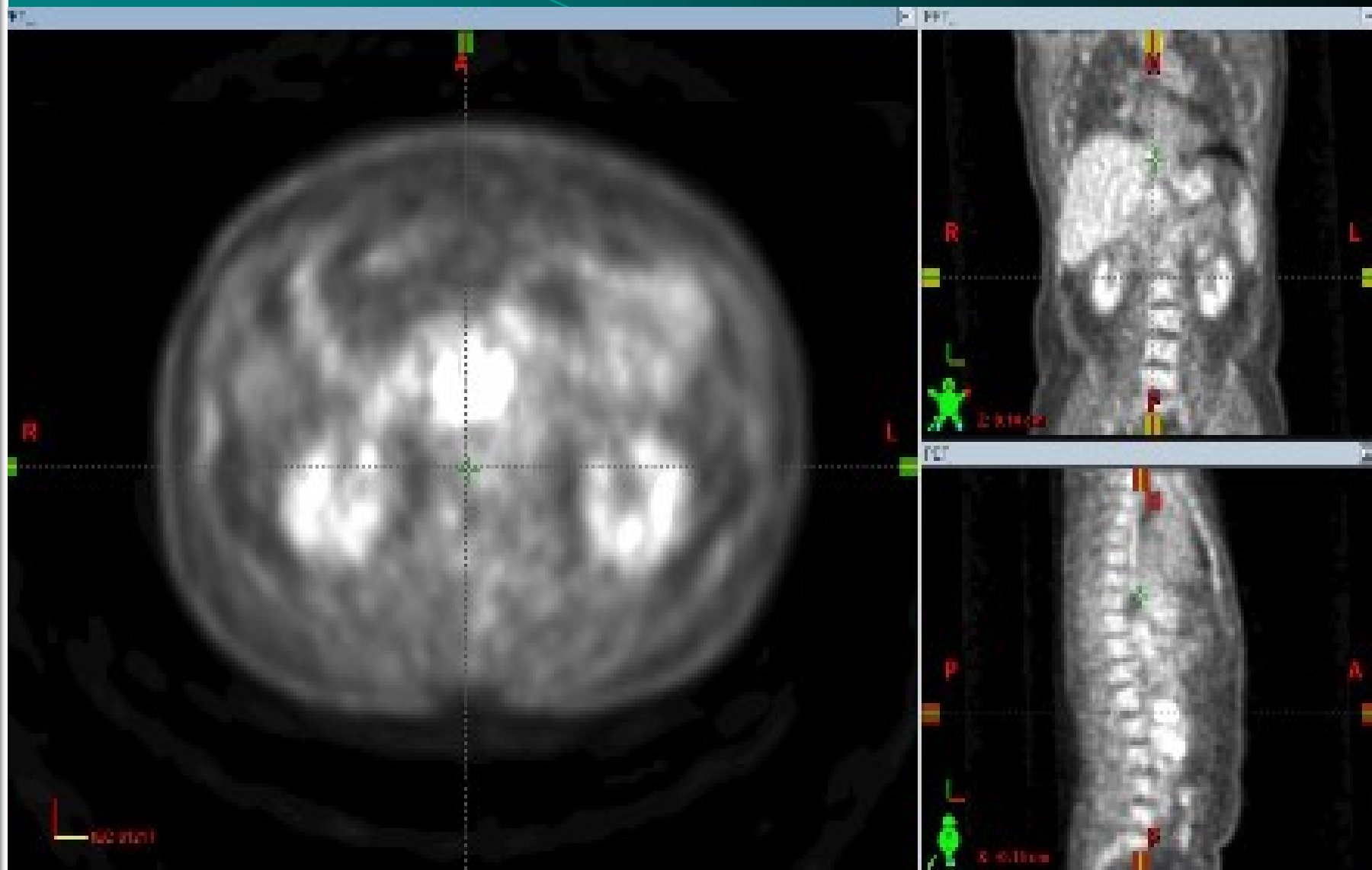
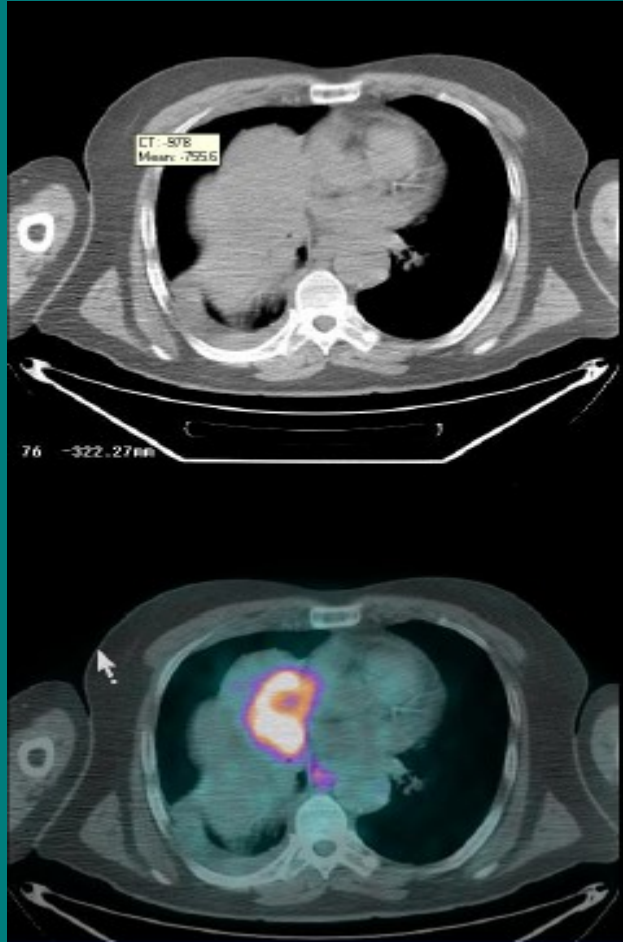


Figure 1 displays PET/CT images of a patient with a thoracic vertebral fracture. The main image is an axial PET/CT scan showing a fracture in the T12 vertebra. The inset shows a sagittal PET/CT scan of the thoracic spine, highlighting the fracture site. The PET images show increased uptake at the fracture site, indicating a fracture callus.

Why PET/CT?

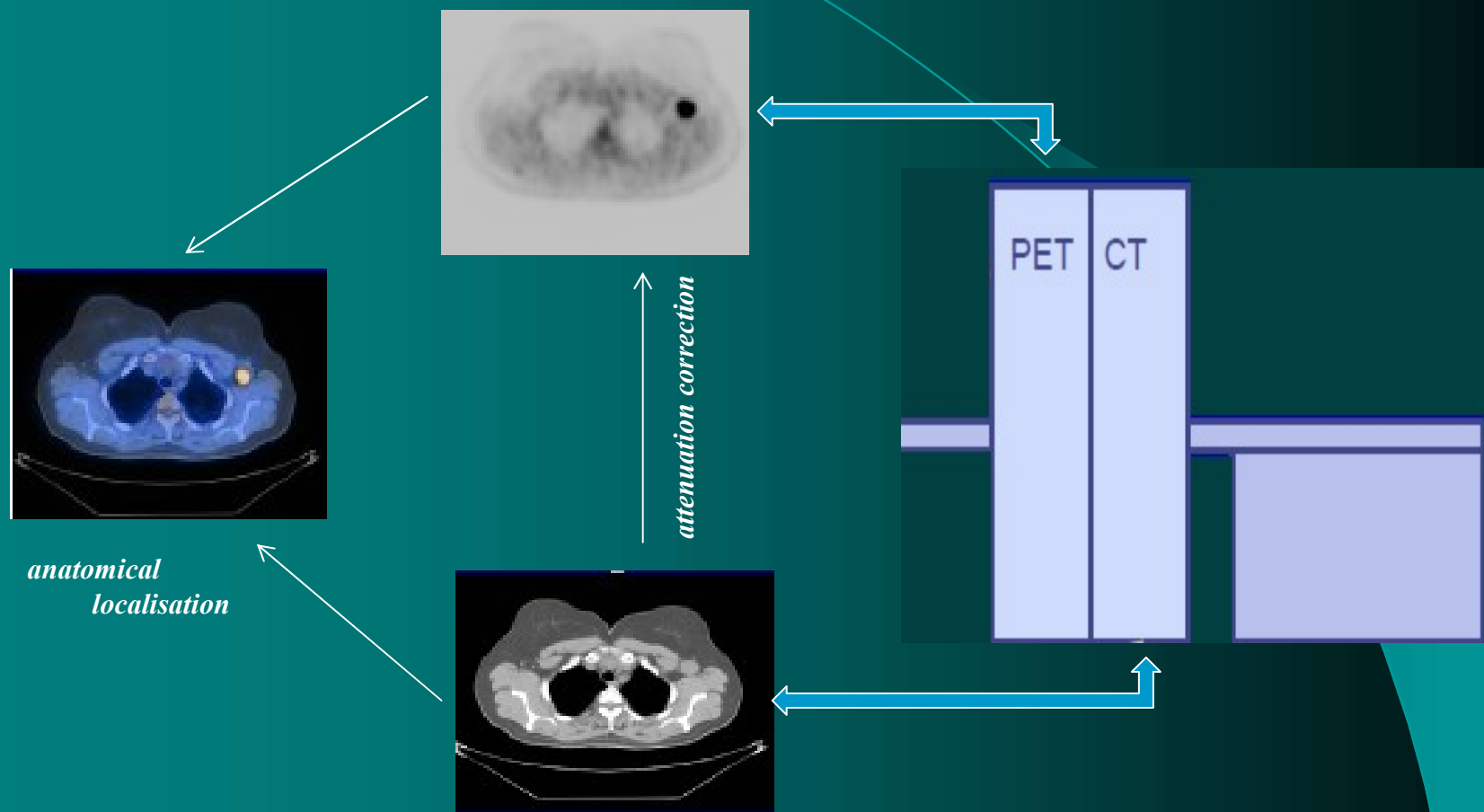


66 years male patient

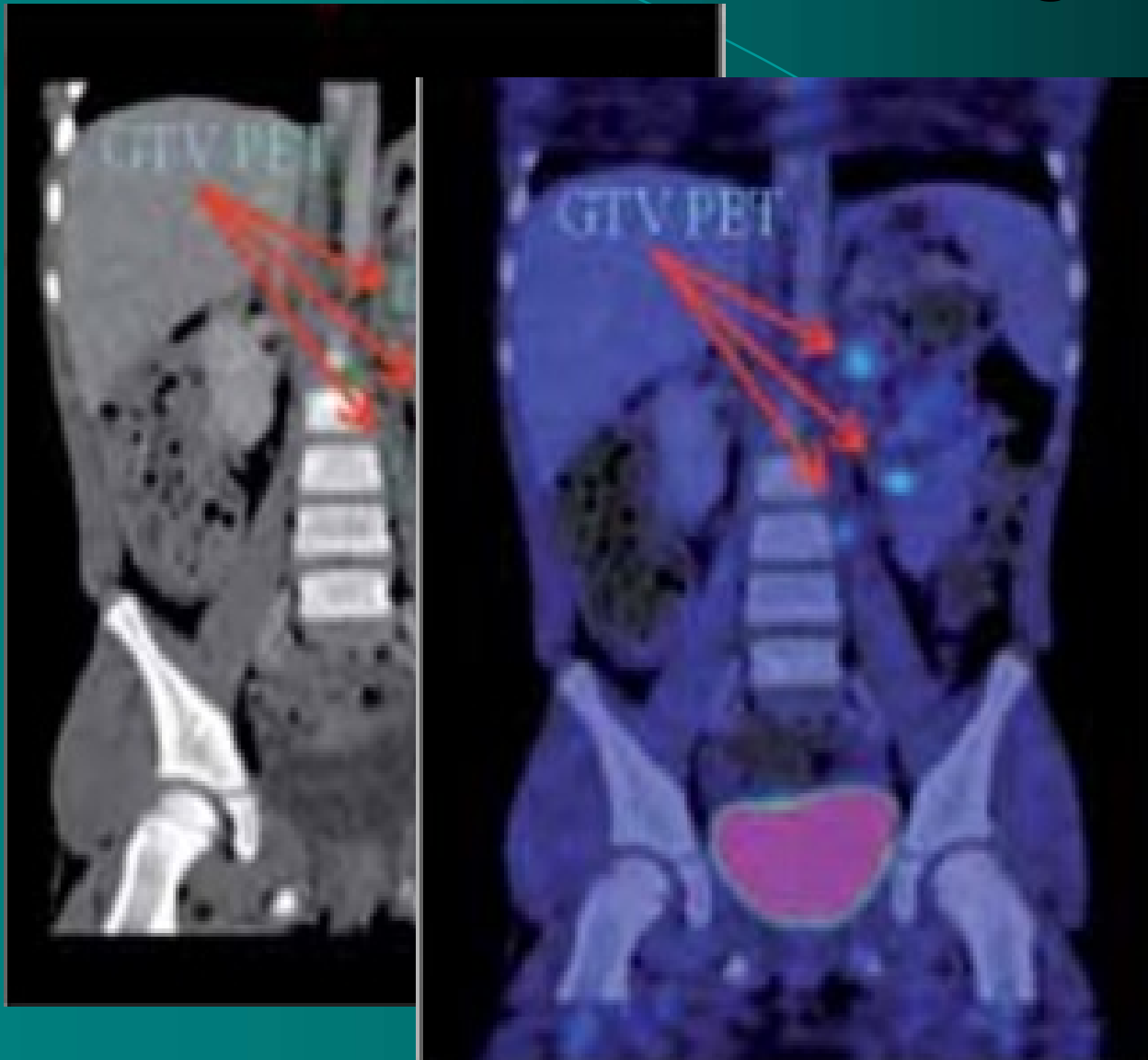
- *Primary: lung Ca with atelectasis*
- *Right hilar mass*

Integrated PET/CT Imaging System

BENEFITS of COMBINED TECHNIQUE



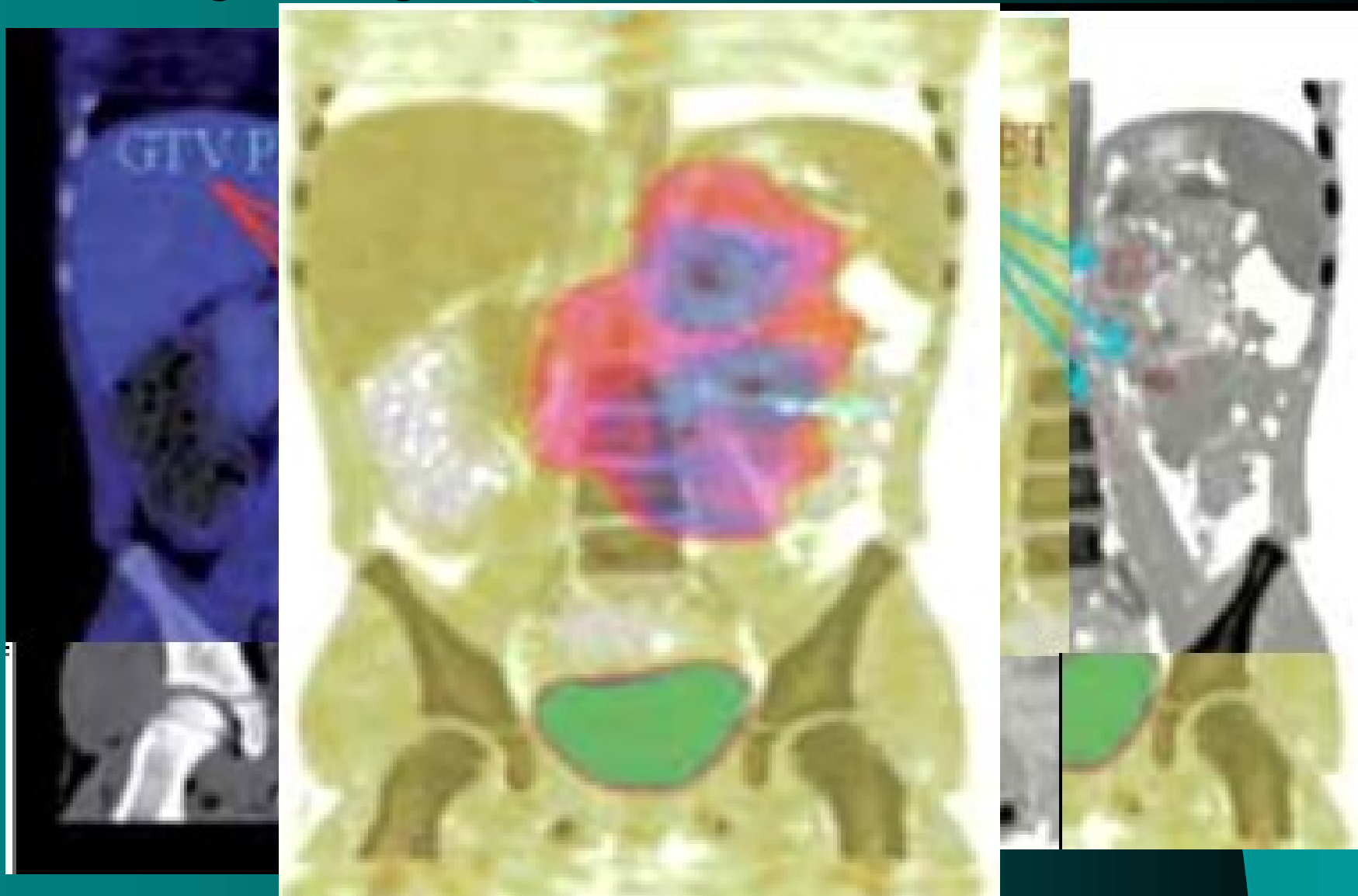
Pre - treatment imaging



- *lung on CT*
- *lung on PET*

images registration

- *CT - PET*



Imaging for treatment verification

- *geometry verification*
 - *Patient position during the treatment which affect intra-fraction dose distribution*
 -

Imagin

- *LUNG*
- *kV.*
- *CB*

Plan Tree Image Gallery



Reference:
setupCBC...

Transversal - CT_1 - CBCT_1 - 3/12/2014 13:35

3D/3D Match



Head Post Supine
Z: 5.80 cm

Couch Position (IEC 61217 Scale) and Shift

	TARGET	ACTUAL	SHIFT		TARGET	ACTUAL	SHIFT	
Couch Vrt	-8.5	-8.9	+0.4	<input checked="" type="checkbox"/> Include	Couch Lat	+4.3	+4.2	+0.1 <input checked="" type="checkbox"/> Include
Couch Lng	131.9	131.8	+0.1	<input checked="" type="checkbox"/> Include	Couch Rtn	359.9	359.9	0.0 <input type="checkbox"/> Include

Reset Shift

Save Match

Apply Shift

Imaging for treatment evaluation

- *CBCT verification plan*



Conclusion:

PET scan is revolution on tumor tissue recognizing

PET- CT scan is even more

The imaging of biologic inhomogeneities within sub volumes of the tumor may offer the possibility to adapt doses to local differences in radiosensitivity.

Conclusion:

All set-up and patient positioning tools currently used in the radiation oncology department on simulators and linear accelerators should be equally conscientiously used in the PET suite when images are acquired for treatment planning.

All quality controls required in the radiation therapy process, particularly those for geometrical alignment between all parts of the radiotherapy chain, must also include the PET scanner.

