ARTA M. MONJAZEB, MD, PHD

ADVANCES IN RADIATION ONCOLOGY

RELEVANT FINANCIAL RELATIONSHIPS IN THE PAST TWELVE MONTHS BY PRESENTER OR SPOUSE/PARTNER.

GRANT/RESEARCH SUPPORT: TRANSGENE, BMS, GENENTECH, INCYTE, DYNAVAX, MERCK
CONSULTANT: INCYTE, DYNAVAX, ASTRA-ZENECA

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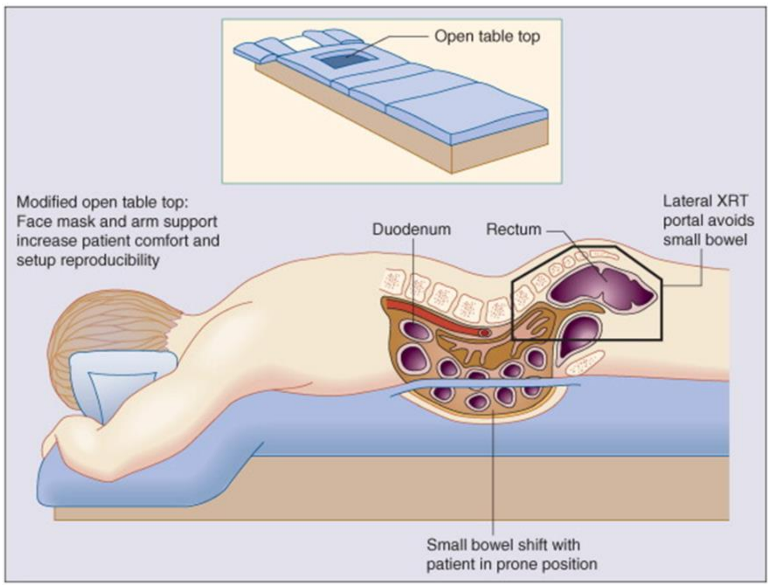
- **Advances in Treatment Delivery**
  - **IGRT**
  - IMRT
  - IMAT/VMAT
  - SBRT
  - **Particle beam therapy**
- Advances in Treatment Planning
  - Tumor Localization & Image fusion
  - Breathing adaptive radiotherapy
  - Functional treatment planning
- Advances in Radiobiology
  - Immunotherapy

IGRT for prone pelvic therapy



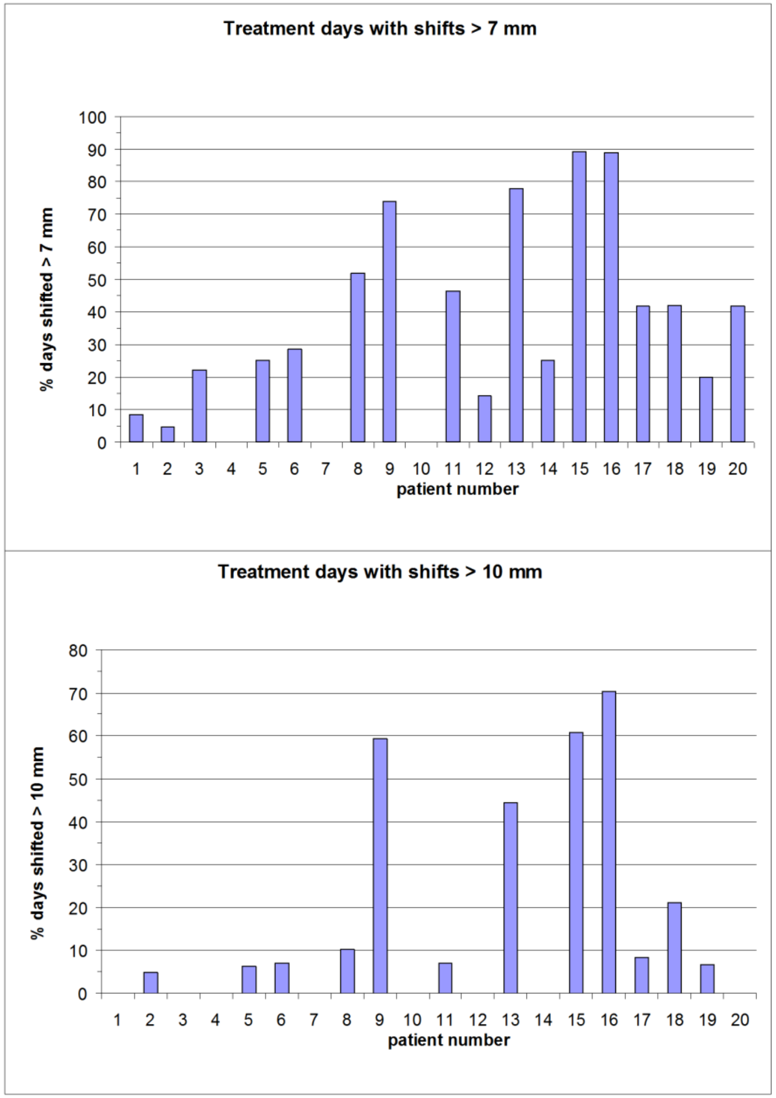
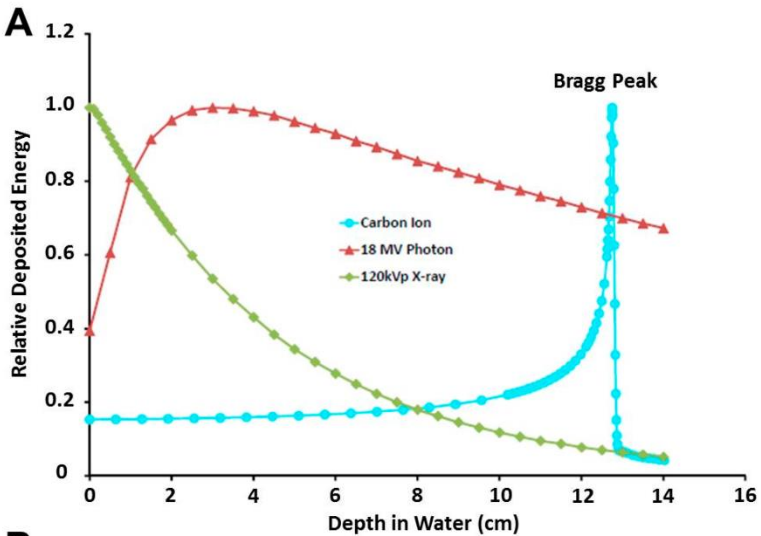
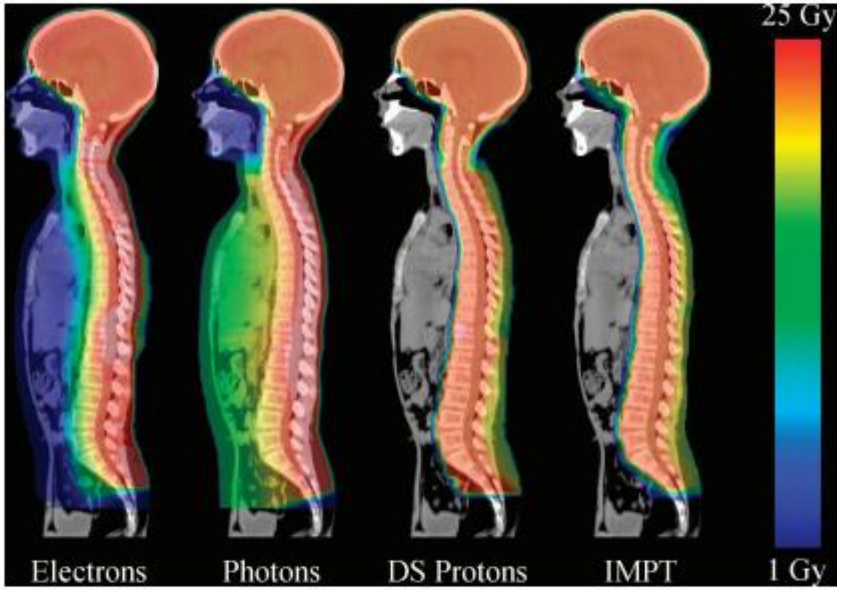
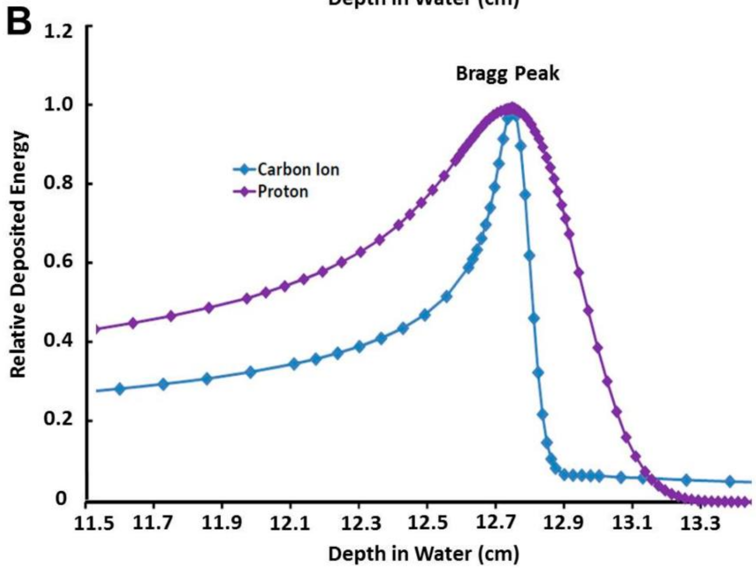


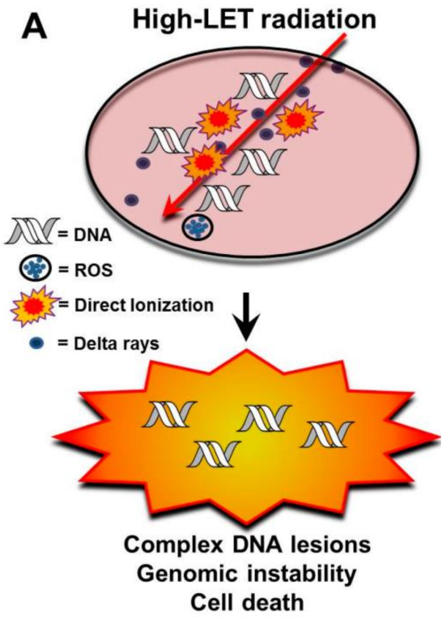
Figure 4: Proportion of days requiring IGRT-based shifts of > 7 mm, or > 10 mm, for the patient cohort.

Particle beam therapy









An evidence based review of proton beam therapy: The report of ASTRO's emerging technology committee

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A B S T R A C T

Proton beam therapy (PBT) is a novel method for treating malignant disease with radiotherapy. The purpose of this work was to evaluate the state of the science of PBT and arrive at a recommendation for the use of PBT. The emerging technology committee of the American Society of Radiation Oncology (ASTRO) routinely evaluates new modalities in radiotherapy and assesses the published evidence to determine recommendations for the society as a whole. In 2007, a Proton Task Force was assembled to evaluate the state of the art of PBT. This report reflects evidence collected up to November 2009. Data was reviewed for PBT in central nervous system tumors, gastrointestinal malignancies, lung, head and neck, prostate, and pediatric tumors. Current data do not provide sufficient evidence to recommend PBT in lung cancer, head and neck cancer, GI malignancies, and pediatric non-CNS malignancies. In hepatocellular carcinoma and prostate cancer and there is evidence for the efficacy of PBT but no suggestion that it is superior to photon based approaches. In pediatric CNS malignancies PBT appears superior to photon approaches but more data is needed. In large ocular melanomas and chordomas, we believe that there is evidence for a benefit of PBT over photon approaches. PBT is an important new technology in radiotherapy. Current evidence provides a limited indication for PBT. More robust prospective clinical trials are needed to determine the appropriate clinical setting for PBT.

Radiotherapy and Oncology 103 (2012) 8–11

122 PBT trials ongoing with an expected accrual of > 42,000 patients. Only 5 of these trials randomize patients to protons vs. photons

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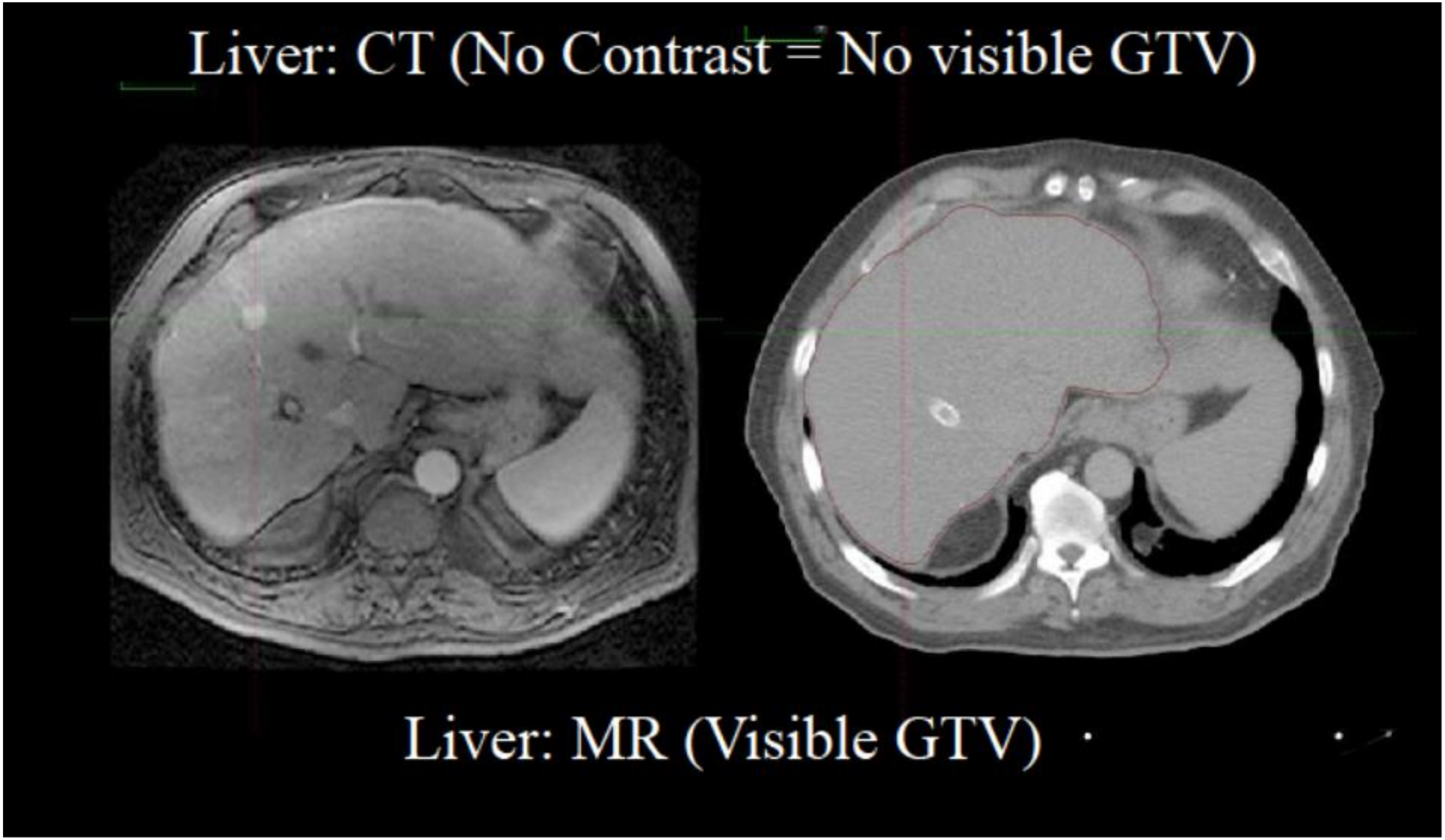
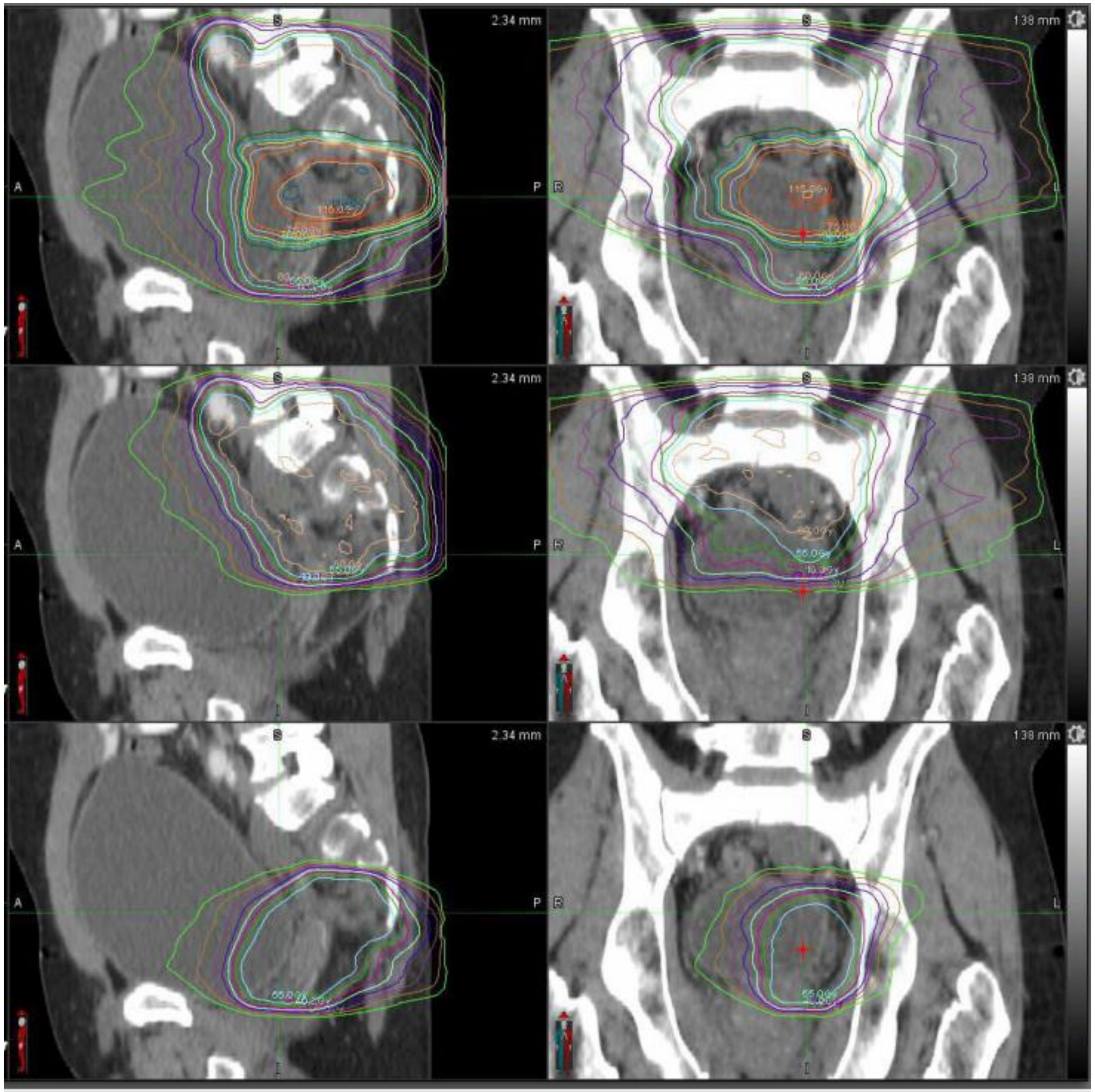
Image Fusion for Tumor Localization



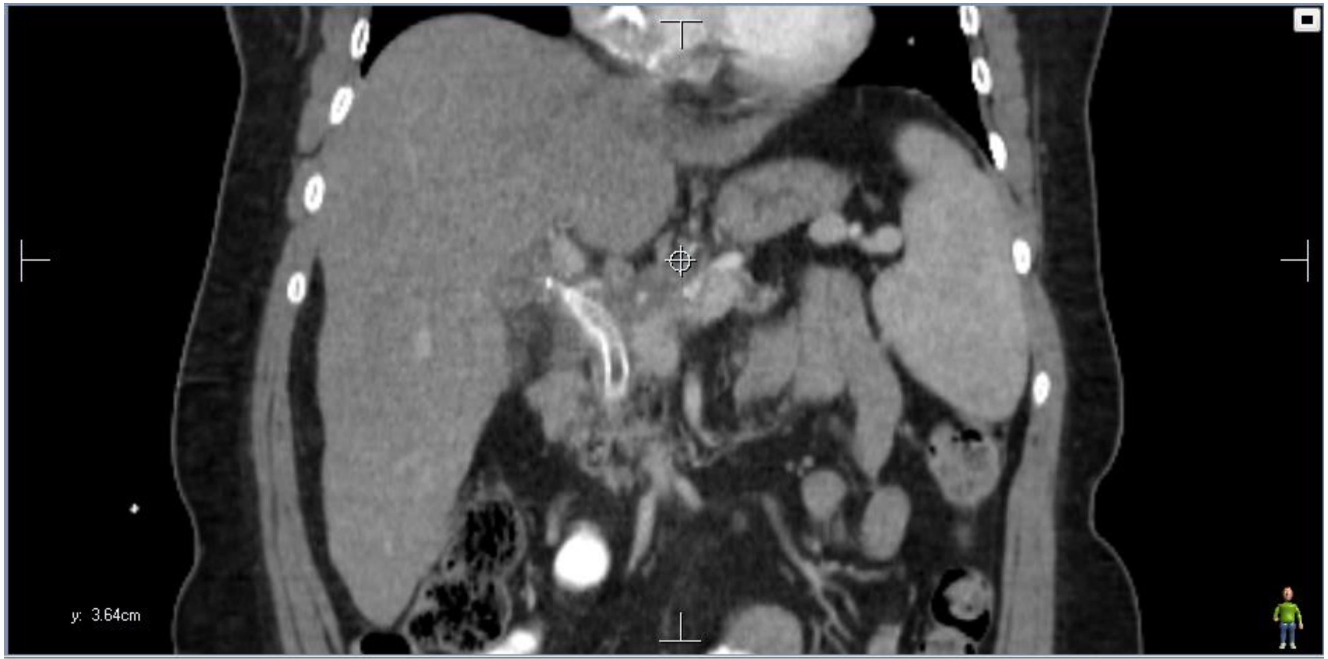
Quality Improvement Challenges: Image Co-Registration (Fusion & DIR)

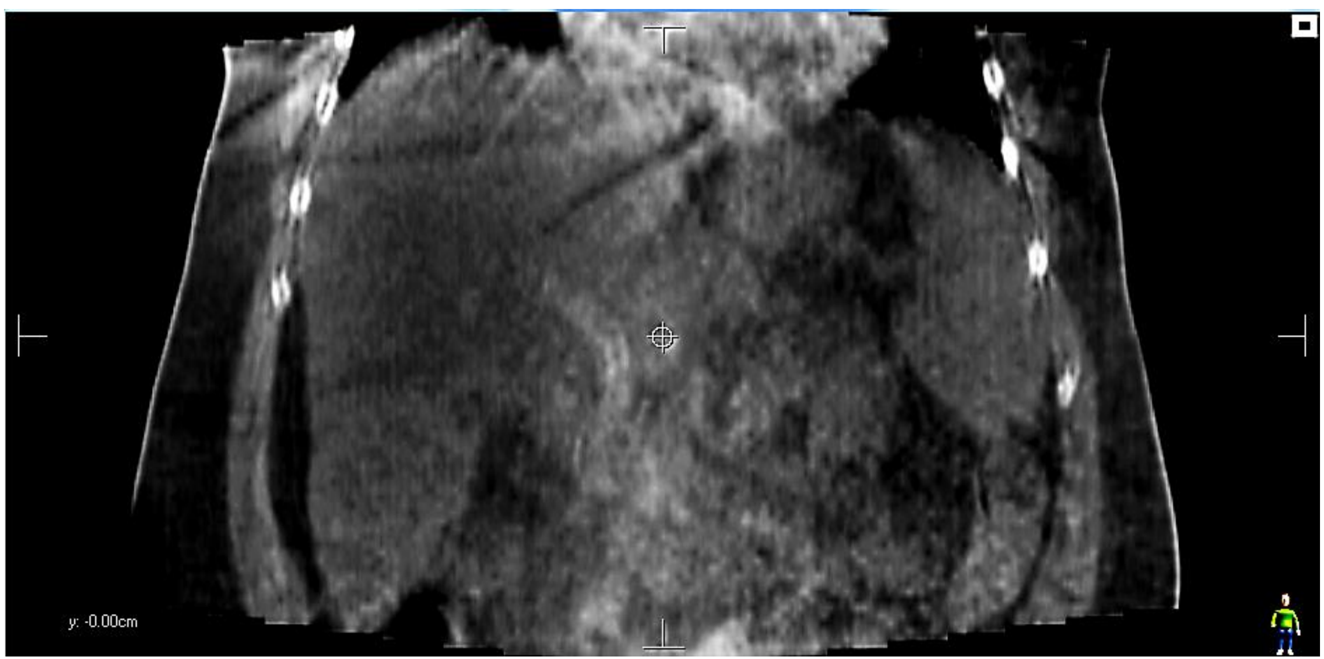
Severus Snape & Harry Potter

Image and Dose Registration

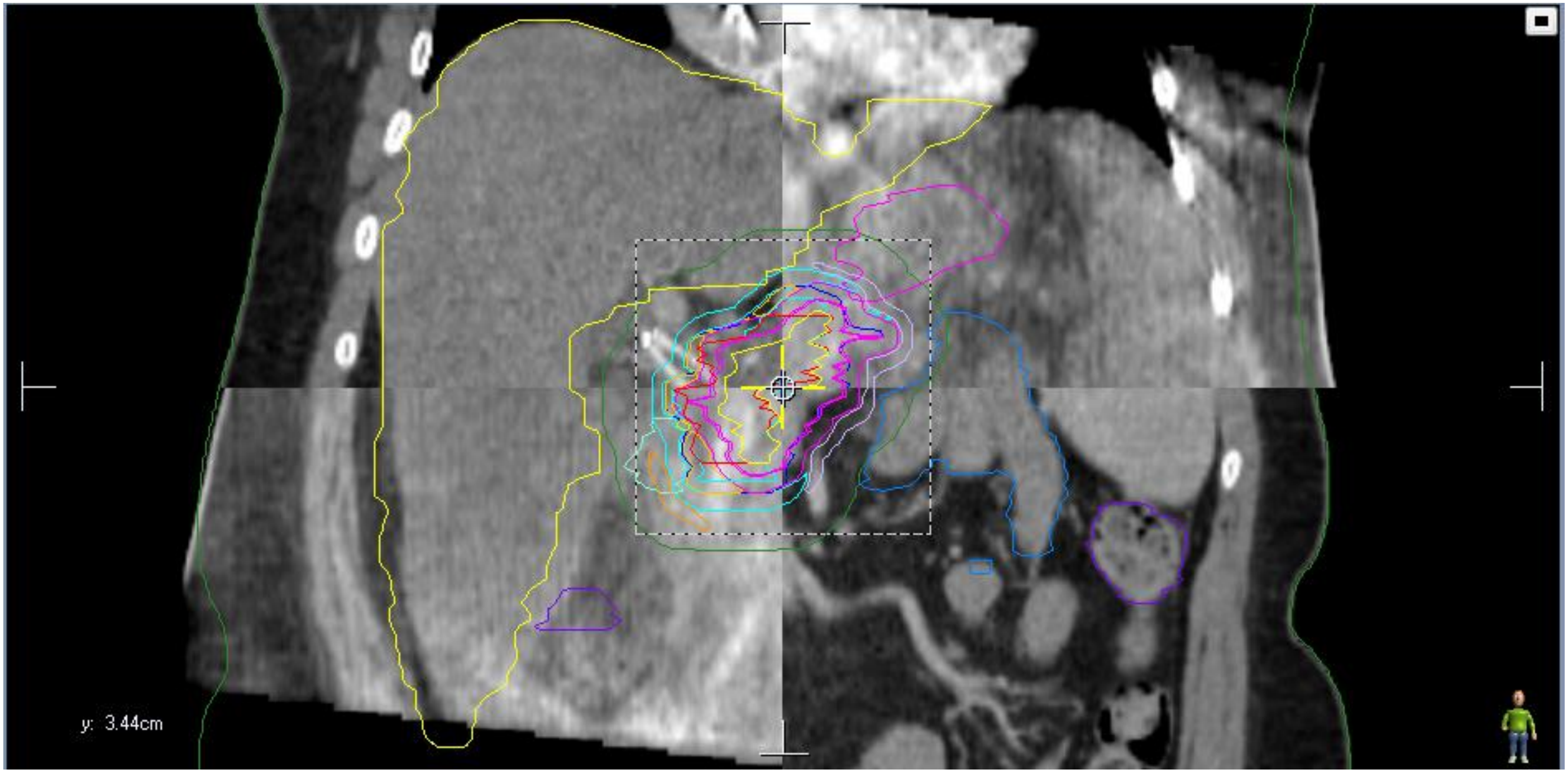


Tumor Localization for Pancreas SBRT





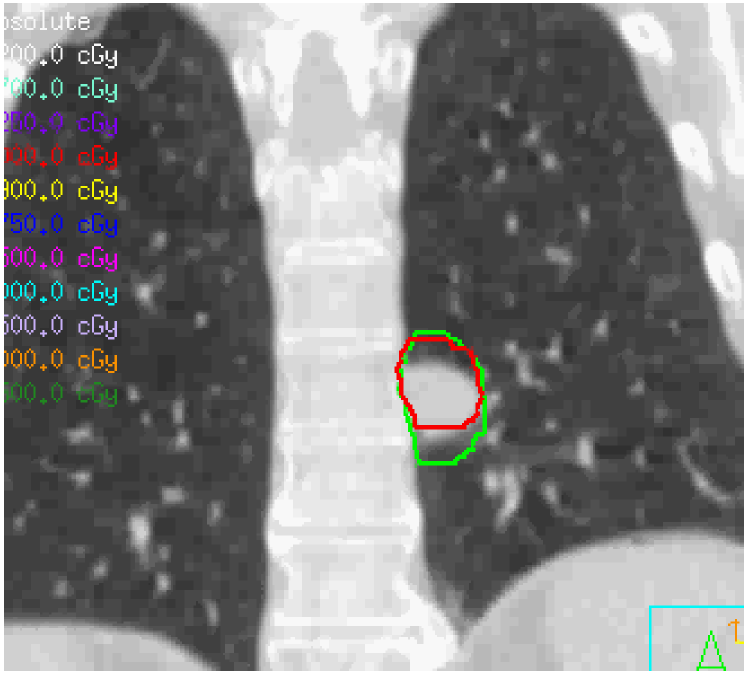
Tumor Localization for Pancreas SBRT



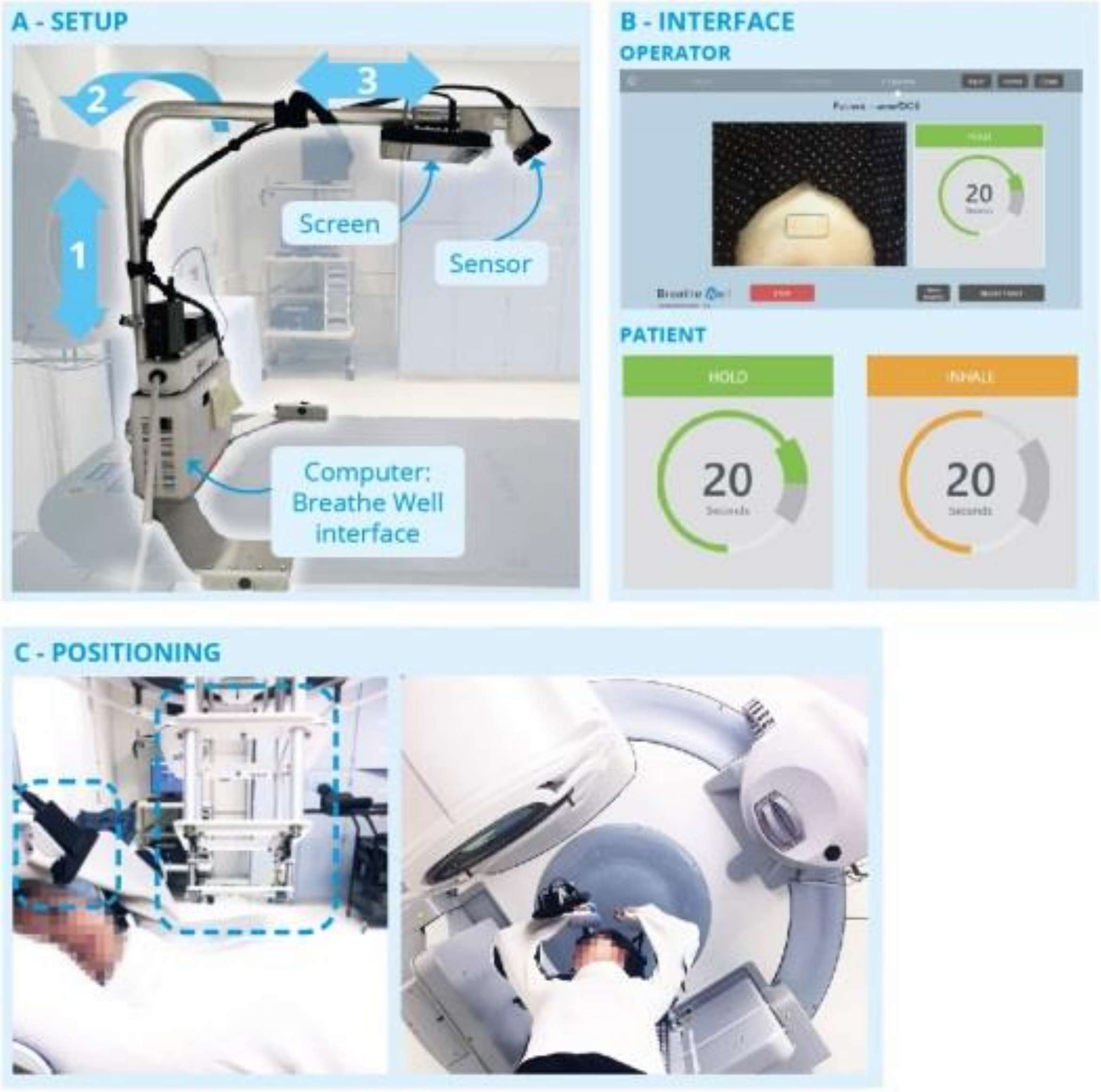
Respiratory Motion and 4D-CT

ITV Delineation with Gating

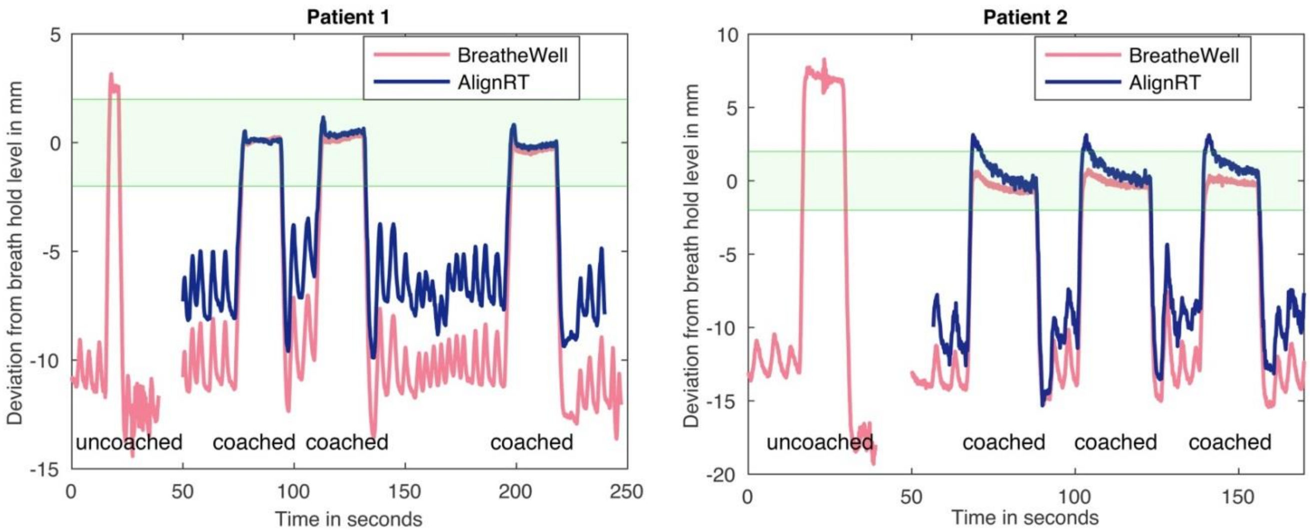
- Select a gating window based on tumor motion on 4DCT
- ITV will include tumor excursion and deformation within the selected gating window



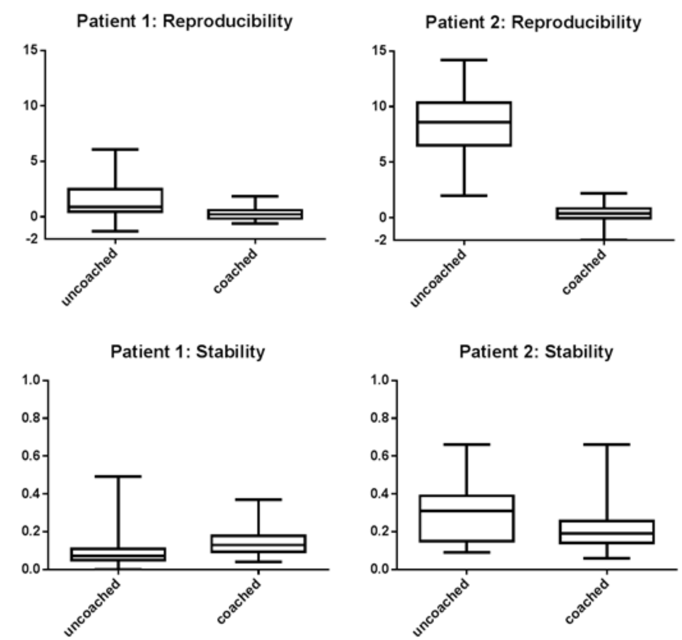
Breathe Well System Prototype



Patients' Breath Holds



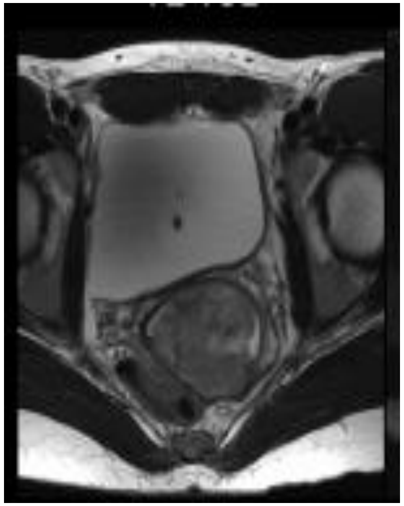
- Patients instructed to hold an uncoached breath for 10 seconds before treatment
- Reproducibility and stability for first two patients on treatment
- Reproducibility improved significantly ($p < 0.001$)
- Stability did not change significantly ($p = 0.96$)

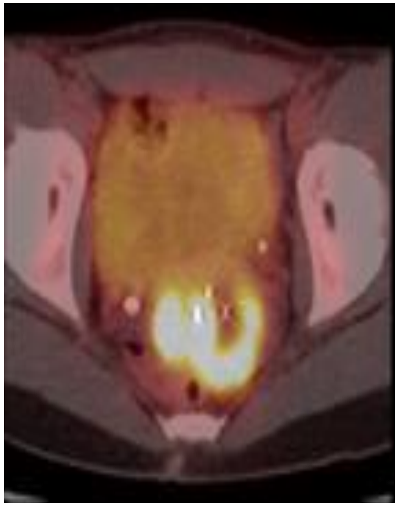


Anatomic vs. Biological imaging

ANATOMICAL		BIOLOGICAL


CT


MRI


PET/CT

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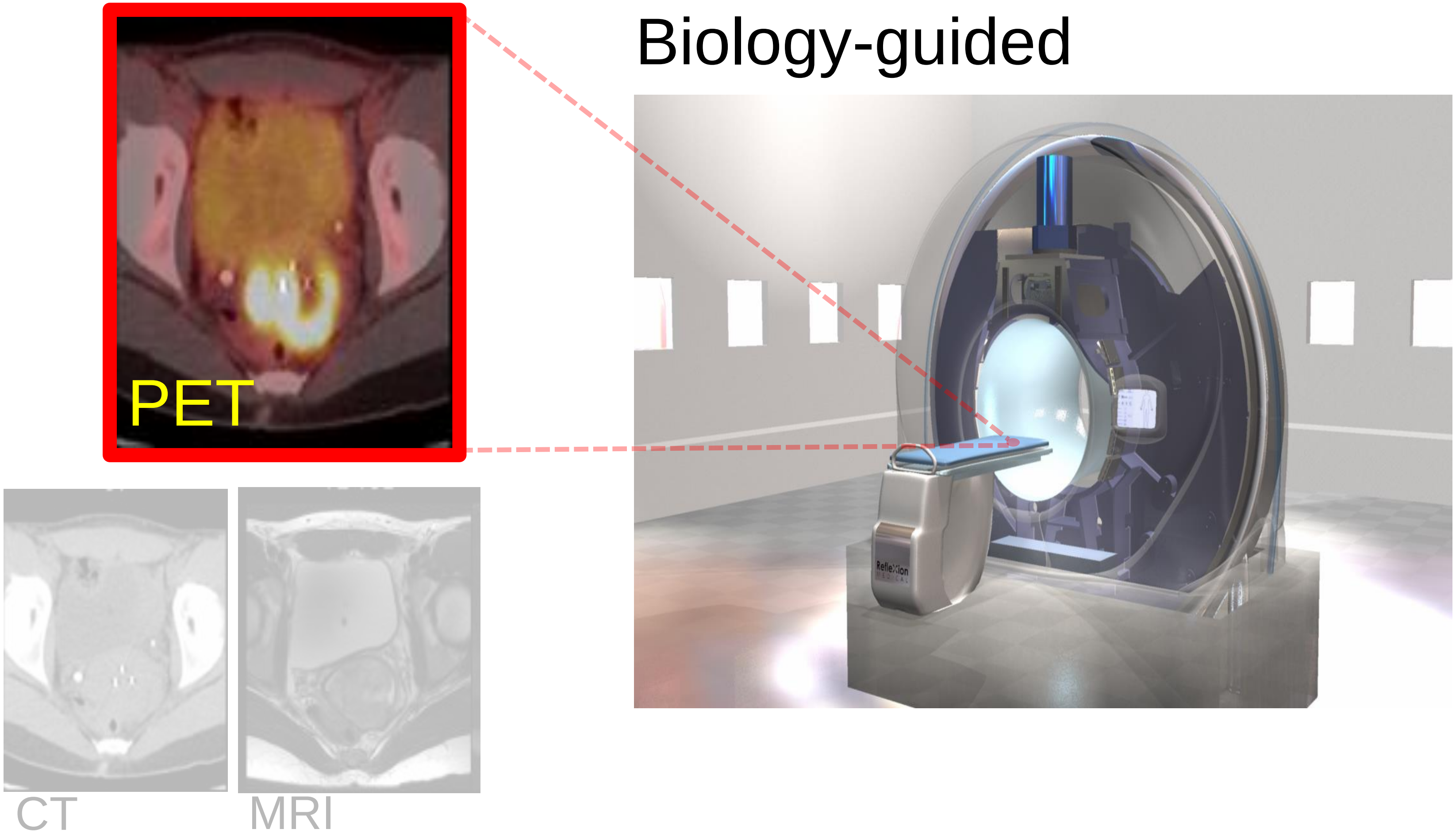
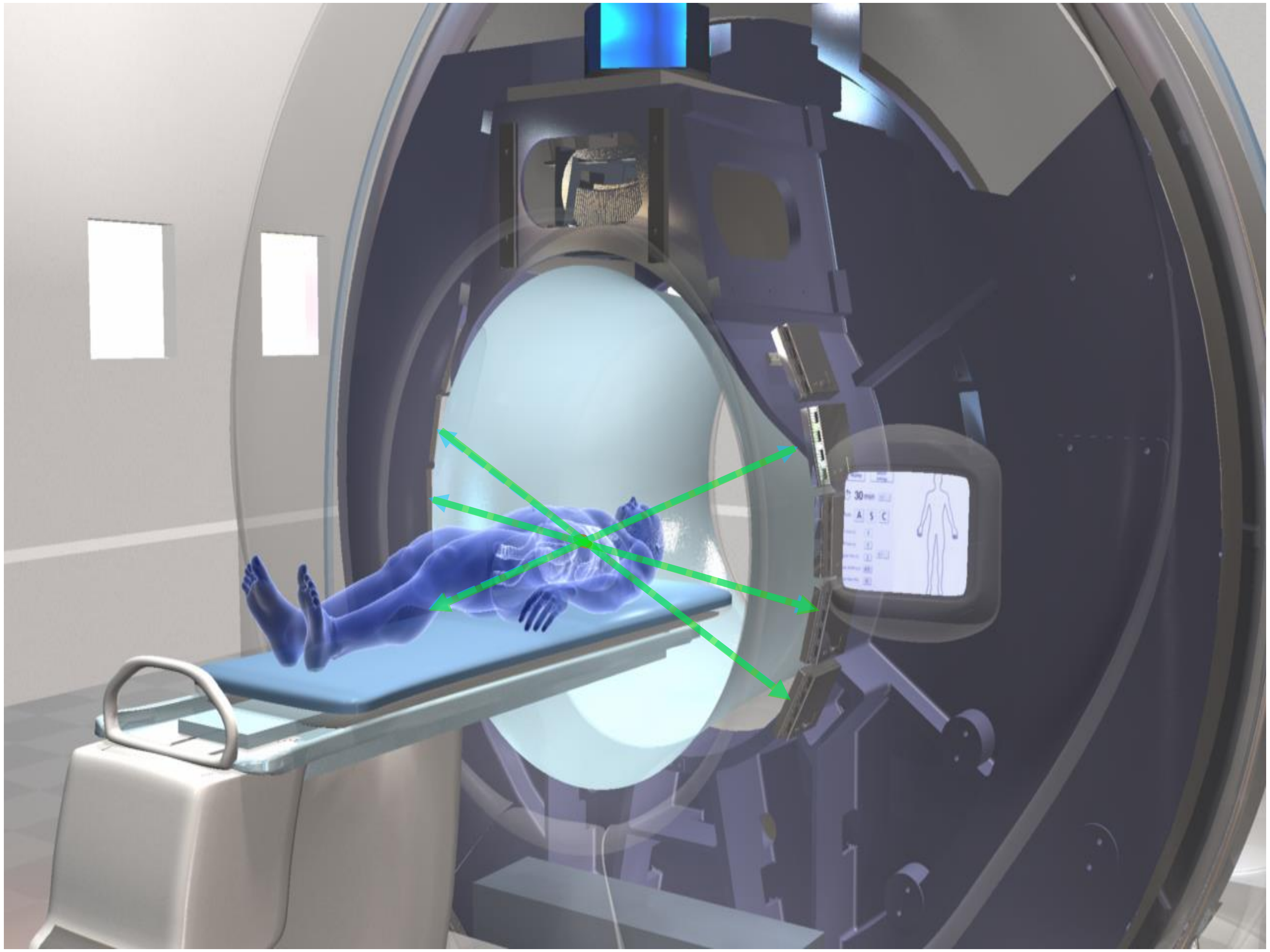
Biology-guided



Can guiding RT from “biological” signals improve or enable new applications?



Reflexion - A novel radiation therapy system that responds to individual PET emissions in real-time to guide the treatment beam

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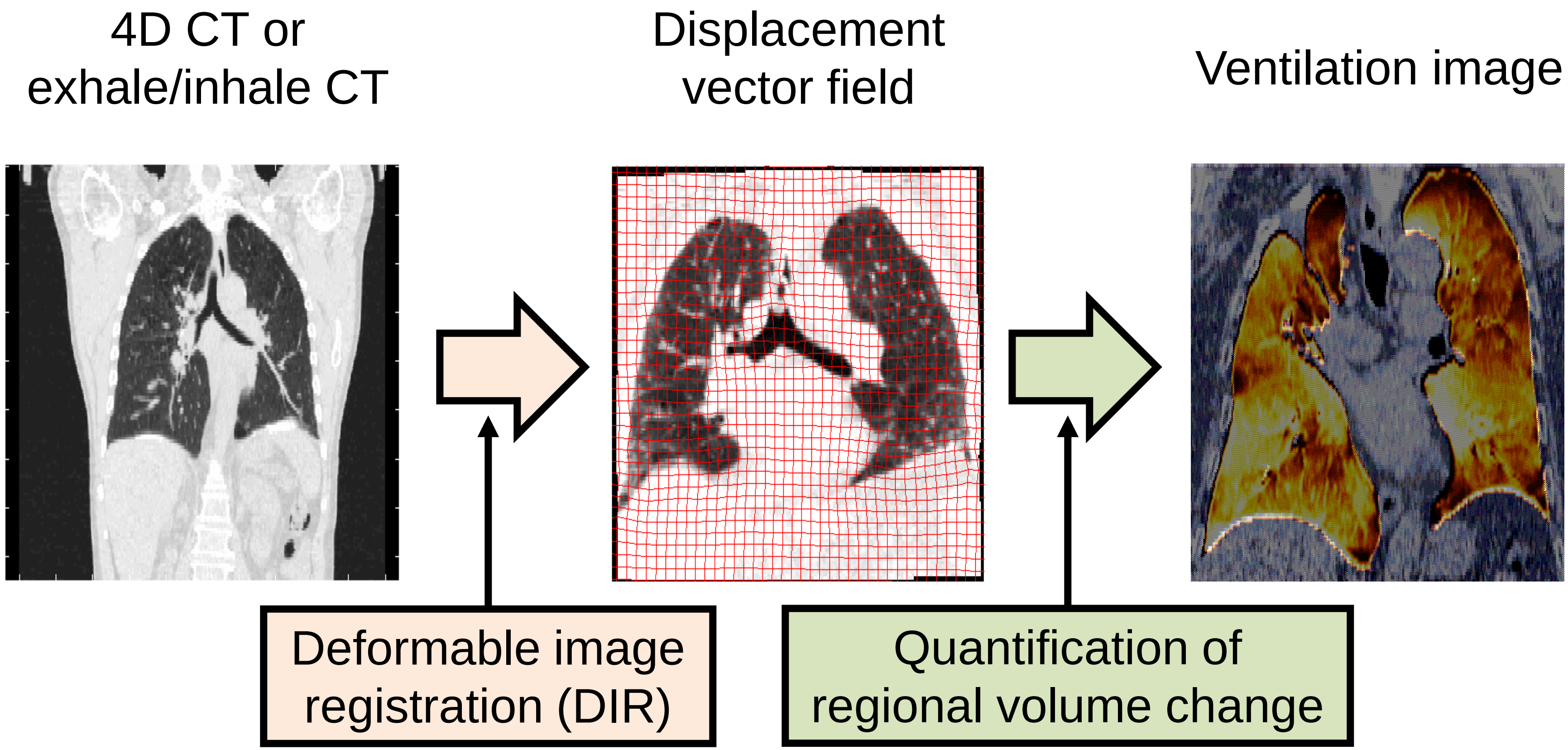
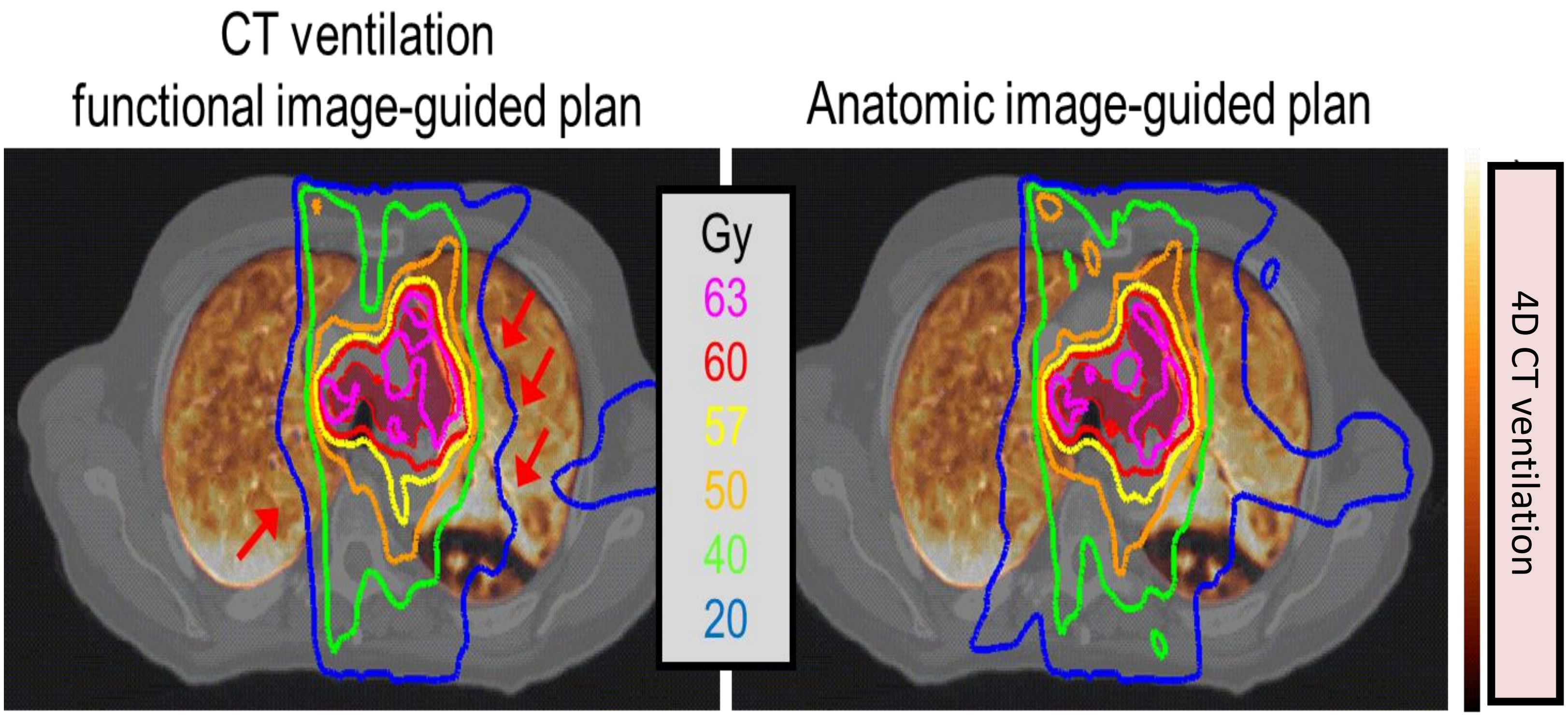
CT Ventilation Imaging



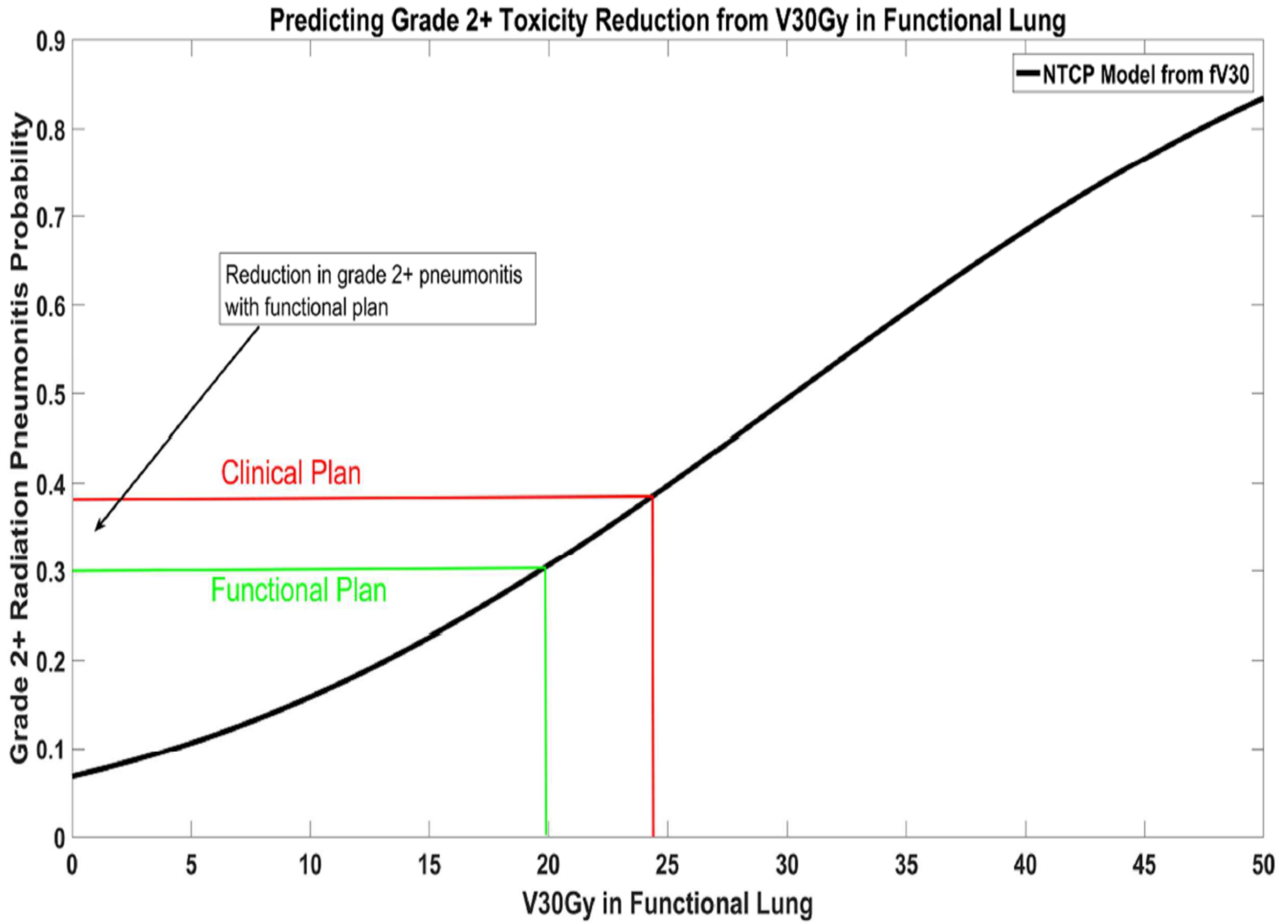
- Higher resolution, lower cost, or
  shorter scan time than other modalities

CT Ventilation Image-guided RT for Lung Functional Avoidance



Yamamoto *et al*. (*Radiother Oncol* 2016)

Lung functional avoidance RT may reduce toxicity



Faught/Yamamoto *et al*. (*IJROBP* In Press)

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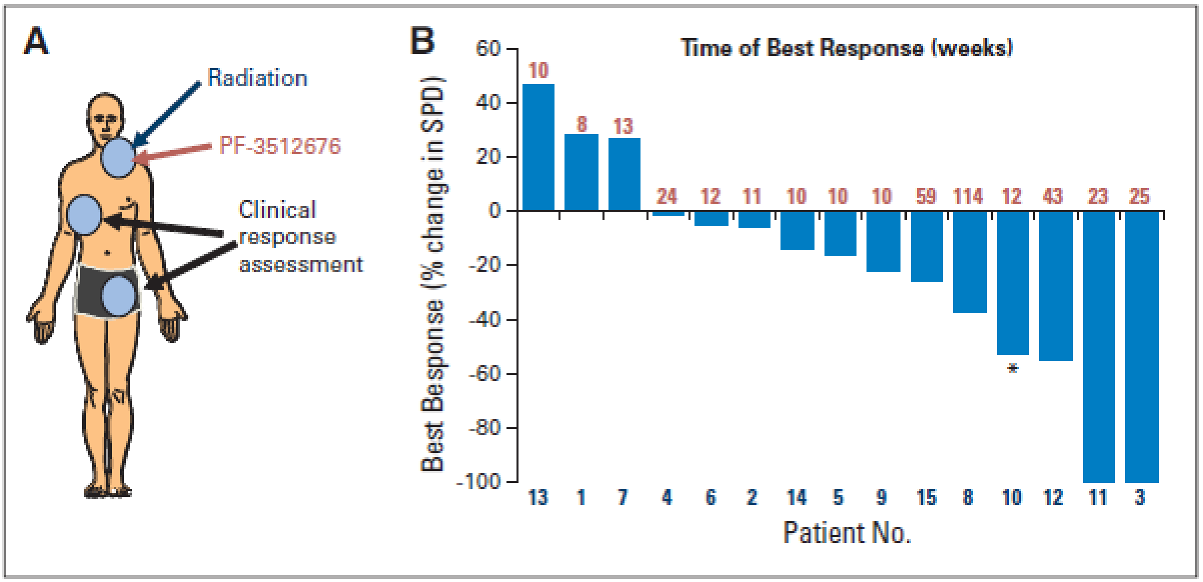
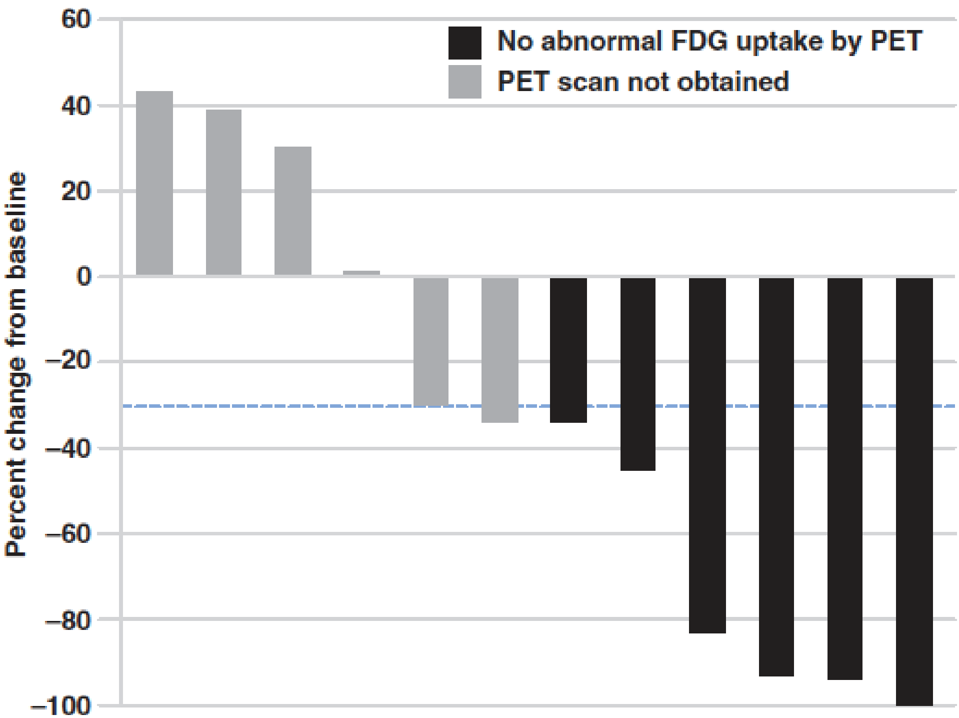
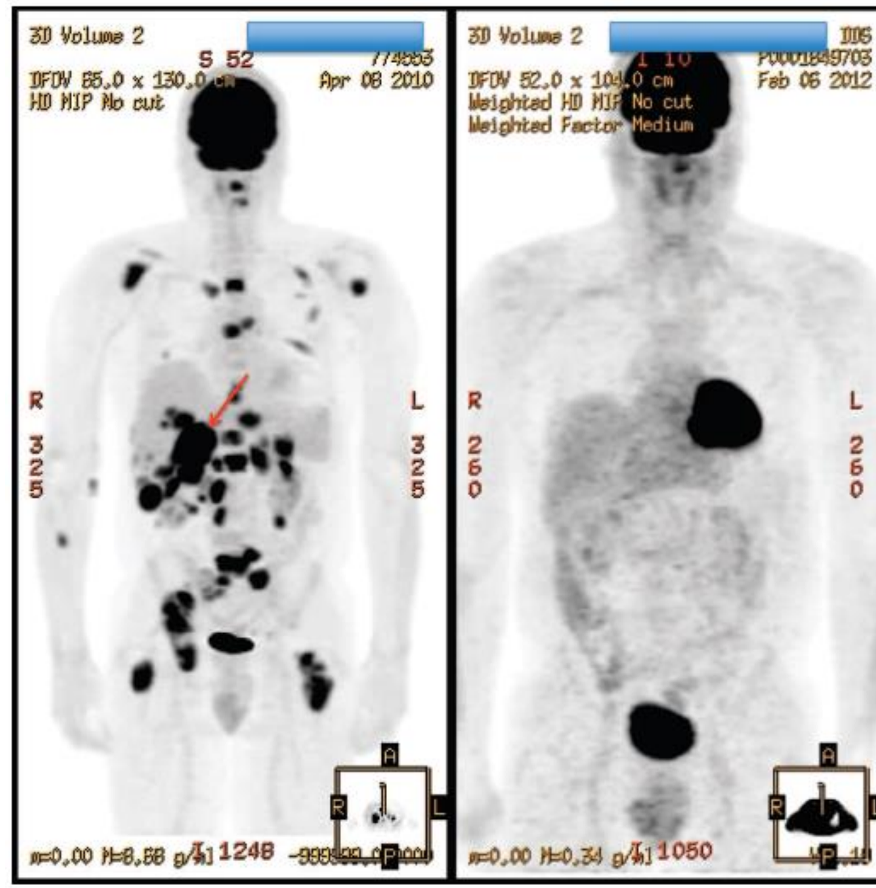
In Situ Vaccination With a TLR9 Agonist Induces Systemic Lymphoma Regression: A Phase I/II Study

Joshua D. Brody, Weiyun Z. Ai, Debra K. Czerwinski, James A. Torchia, Mia Levy, Ranjana H. Advani, Youn H. Kim, Richard T. Hoppe, Susan J. Knox, Lewis K. Shin, Irene Wapnir, Robert J. Tibshirani, and Ronald Levy



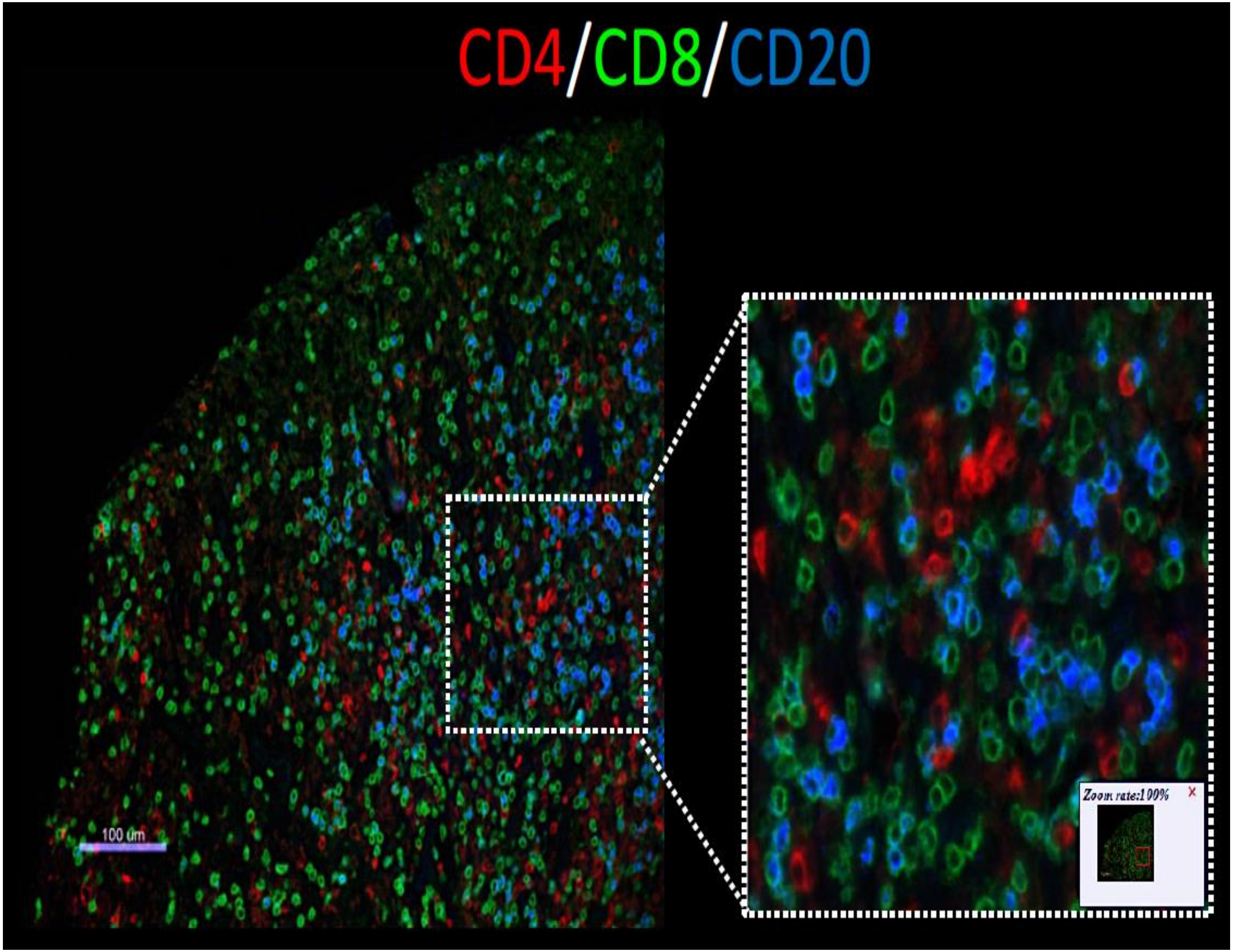
RT + HD systemic IL-2





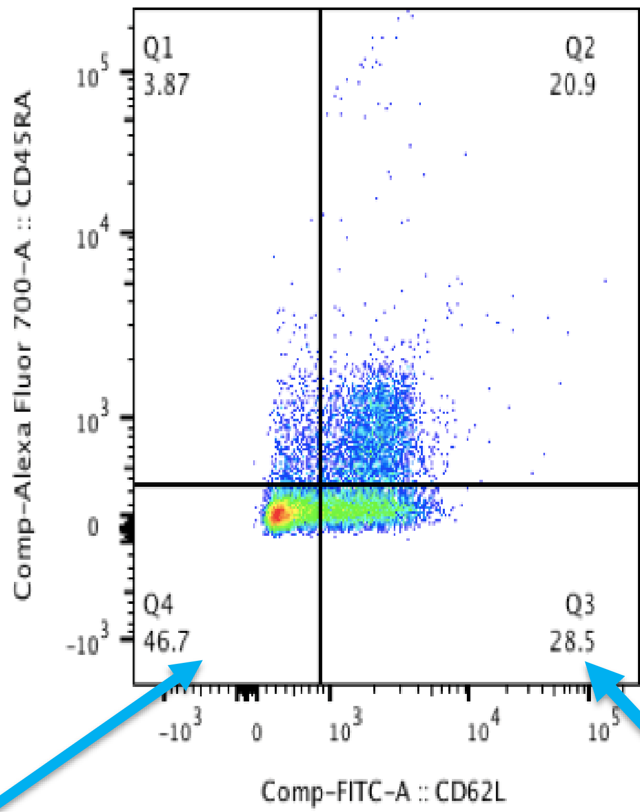
ORR: 66%
Historical response rate: 10-15%

www.ScienceTranslationalMedicine.org 6 June 2012 Vol 4 Issue 137 137ra74

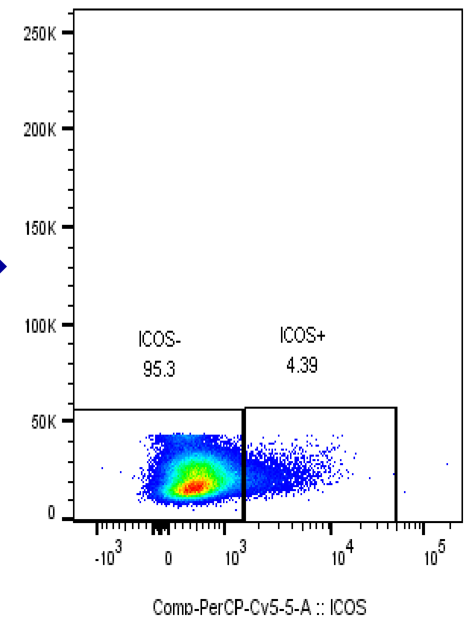

CD4/CD8/CD20
100 um
Zoom rate:100%

FACS Analysis for Memory T cell populations

CD4+ Memory Cell Subsets



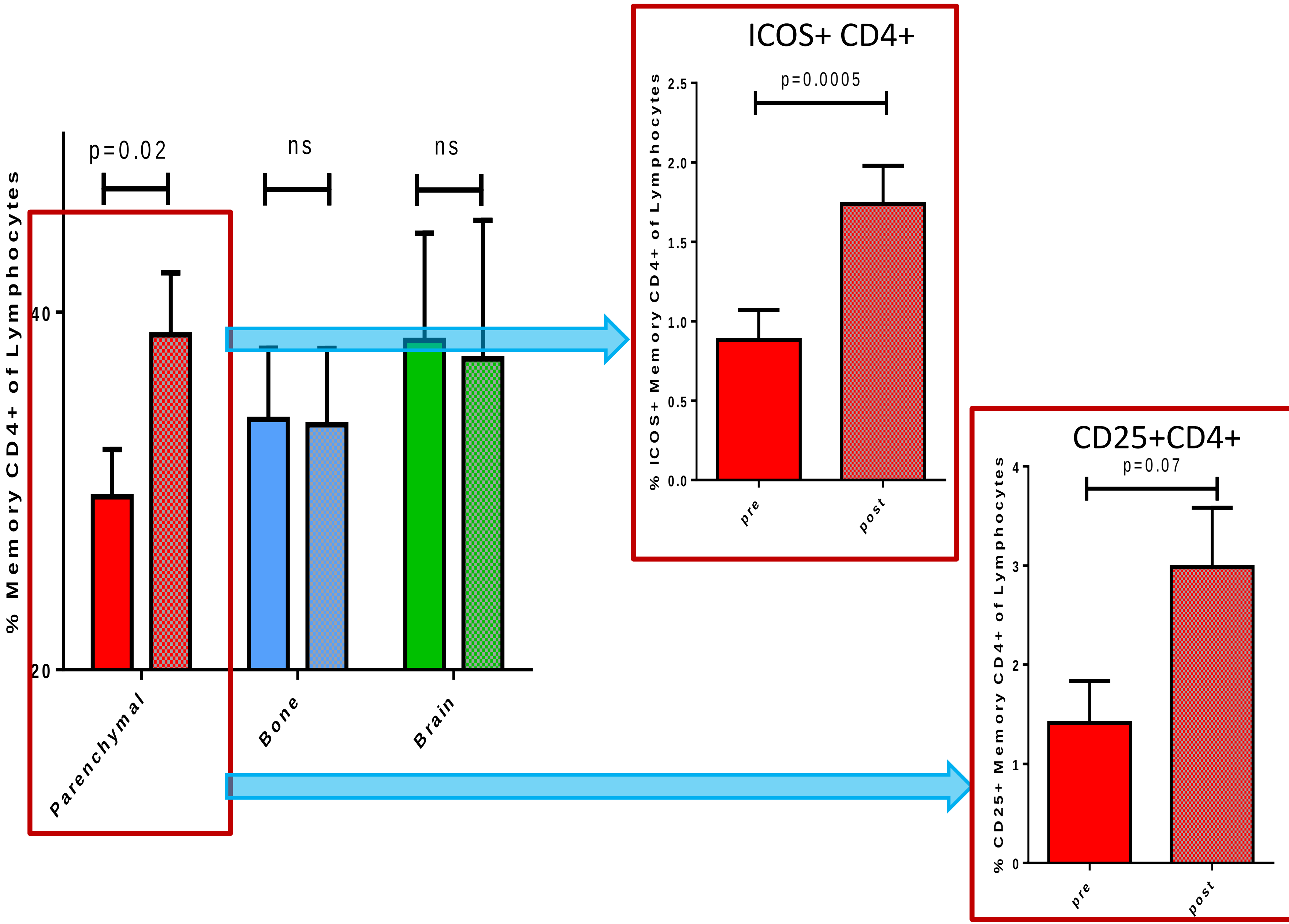
ICOS+ CD4+ Cells

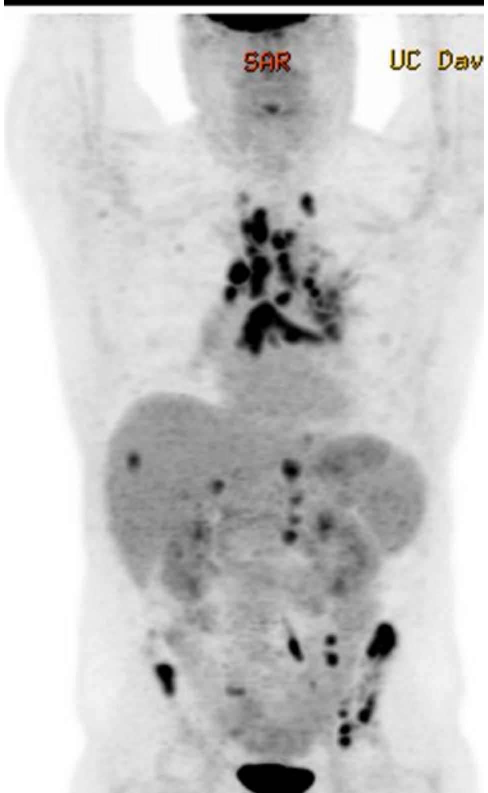


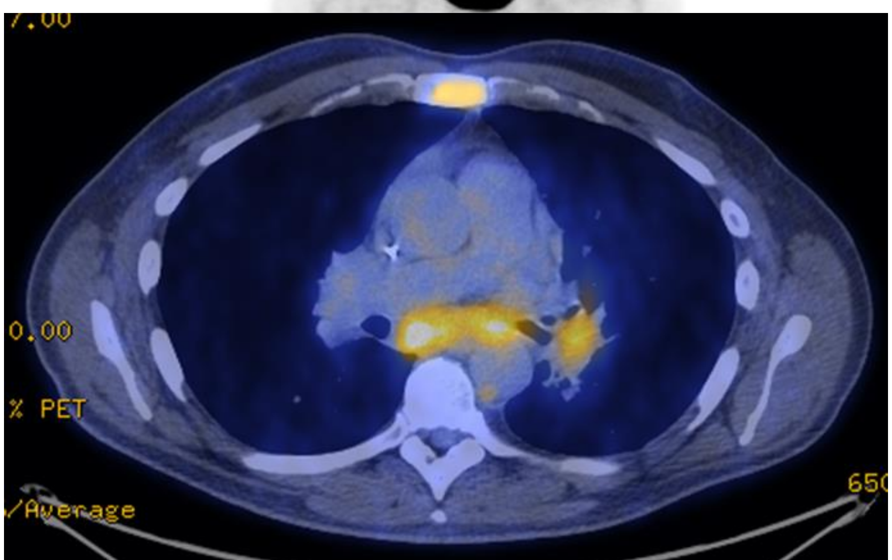
Effector Memory CD4+
T cells (CD45RA- CD62L-)

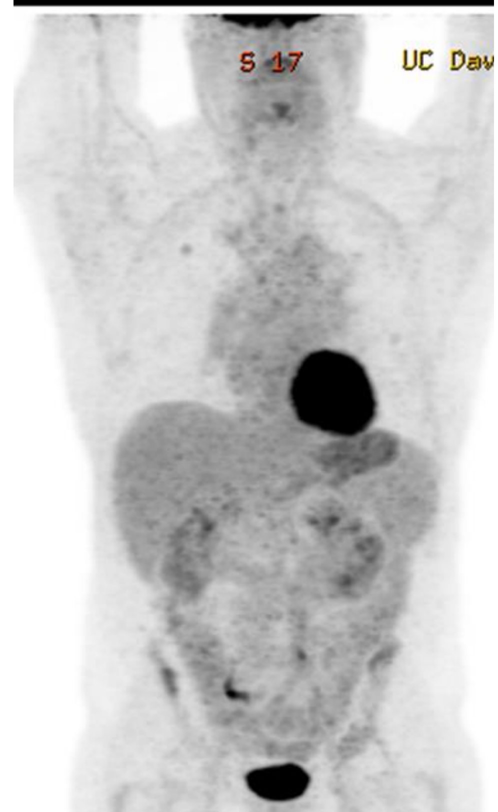
Central Memory CD4+
T cells (CD45RA- CD62L+)

Systemic Increase in Activated Memory CD4+ T-cells




SAR
UC Dav


7.00
0.00
% PET
/Average
650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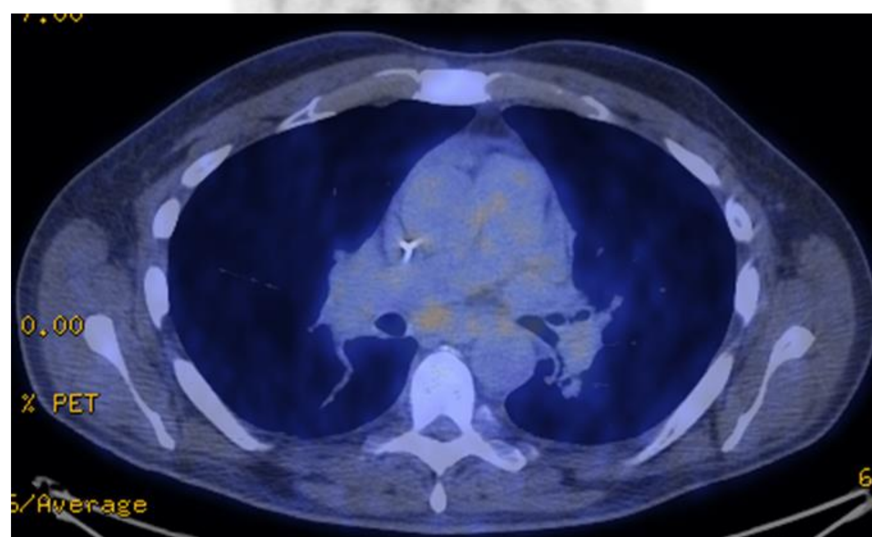
UC Dav


7.00
0.00
% PET
5/Average
65

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