

Educational Point / Counter Point: Educational Point/ Counter Point: Has Photon RT Hit the Limits?

Bulent Aydogan, PhD

Associate Professor and Director of Medical Physics at UIC
University of Chicago



Speakers

Stephen Hahn, MD

Professor and Chair of Radiation Oncology, UT MD
Anderson Cancer Center

Harald Paganetti, PhD

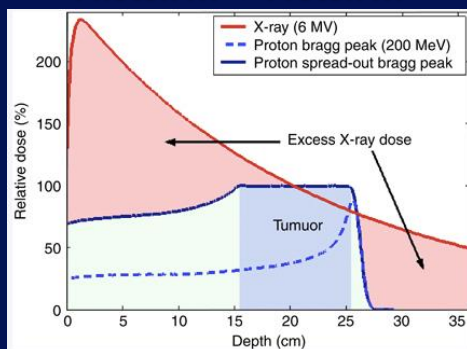
Professor and Director of Research , MGH

Cedric Yu, PhD

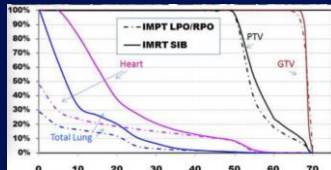
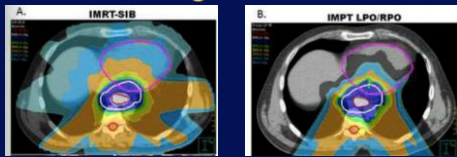
Professor of Radiation Oncology, University of Maryland
President and CEO, Xcision Medical Systems, LLC



Photon RT -> Proton RT



Proton=Conformal Dose & Less Integral Dose



IMPT v.s. IMRT
James Welsh et al
Int. J Rad Oncol
Biol Phys
81(3), 2011



Photon RT -> Proton RT



"We've found a mass. The good news is we have weapons of mass destruction."



SIR, MAY I HAVE FIVE MINUTES OF YOUR TIME?

SURE, I CAN DO 9:30 TO 9:35 NEXT TUESDAY...

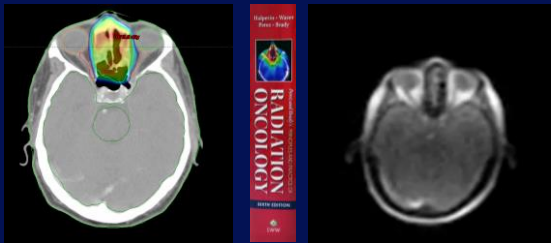


Do we need much higher dose conformality than photon can provide?

- A. Yes
- B. No



Organ motion



Courtesy of S. Mutic



Considering the fact that there are considerable uncertainties in RT from target definition to set up to organ motion to the extent of micro disease, do we want higher dose conformality than photon RT can provide?

- A. Yes
- B. No



Does proton beam produce superior dose distributions over IMRT for prostate cancer?

- A. Yes
- B. No



Rep Pract Oncol Radiother. 2013 Nov; 18(6): 338–342.
Published online 2013 Jul 3. doi: [10.1016/j.rpor.2013.06.001](https://doi.org/10.1016/j.rpor.2013.06.001)

Proton beam and prostate cancer: An evolving debate

Anthony Zietman^a

The work of the Massachusetts General Hospital has tested a number of hypotheses:



Does proton beam produce superior dose distributions over IMRT for prostate cancer?

The answer is mixed. There is undoubtedly less of a “dose bath” to the anterior and posterior tissues but more radiation passes through the femoral heads and, because of beam uncertainty, the high-dose volume is actually a little larger with protons than IMRT.



Critical Organ Dose

- Two regions associated with morbidities (the prostatic urethra and peri-prostatic nerve bundles) are treated equally with the two techniques.
- The volume of rectum treated likely depends more on image guidance, choice of margins, and the use or not of a rectal balloon than it does the delivery technique.

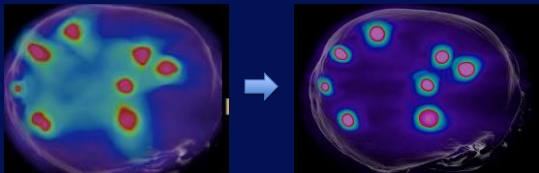


Can photon RT continue to improve in order to provide the dose conformity needed to further cancer care?

- A. Yes
- B. No



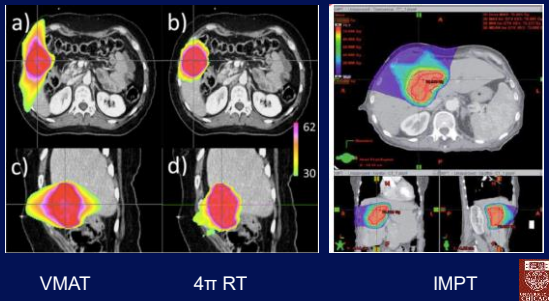
Improvement in photon RT



MORE Degrees of Freedom

4π Non-Coplanar Liver SBRT: A Novel Delivery Technique

Peng Dong, PhD, Percy Lee, MD, Dan Ruan, PhD, Troy Long, BS, Edwin Romeijn, PhD, Yingli Yang, PhD, Daniel Low, PhD, Patrick Kupelian, MD, Ke Sheng, PhD



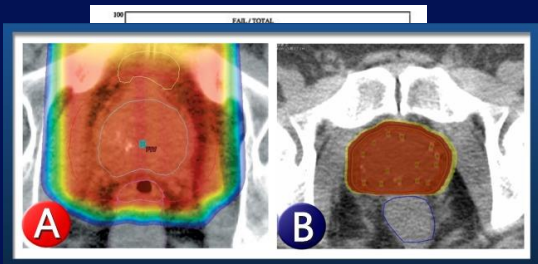
**Do we need clinical trial evidence
beyond planning comparison
evidence of improved dosimetry to
justify Proton RT?**

- A) Yes
- B) No

**The main reason we use proton to
treat prostate cancer is the need for
higher doses (more conformal) for
better outcome**

- 1. Yes
- 2. No

Brachy vs. Proton



Case-controlled study from the Massachusetts General Hospital comparing patients treated with either high-dose proton beam radiation or low dose-rate brachytherapy. Figure shows cumulative biochemical recurrence rates



Do we have enough scientific and clinical evidence to treat with protons?

- A) Yes
- B) No



Proton RT will be the eventual future standard for the radiation treatment of prostate.

- A) Yes
- B) No
- C) I am not sure



If you answered "NO" to the previous question. Which one of the followings had influenced your answer the most?

- A) Economics
- B) Lack of clinical evidence
- C) Organ motion
- D) Technology has not matured yet