

# PROTON THERAPY NCI PERSPECTIVE

**PROTON THERAPY  
NCI PERSPECTIVE**

***RESEARCH IS  
GOOD !!***

# **PROTON THERAPY VIKRAM'S PERSPECTIVE**

# COMPARING TREATMENTS FOR *COMMON* CANCERS

If I receive proton therapy:

- *Will I live longer?*
- *Will I live better (not suffer adverse effects)?*

## Question:

- Will I live longer?

## Answers:

- We don't yet know!
- It is possible that you may do worse.

## Question:

- Will I live better?

## Answers:

- We don't yet know!
- It is possible that you may do worse.

## SUMMARY

- The evidence that proton therapy has helped any cancer patient live either longer or with a better quality of life, in comparison to 3D-CRT, is almost non-existent.
- Furthermore, there is substantial risk that the outcomes may be worse after proton therapy.

- How could patients do WORSE after proton therapy than 'Conventional' RT?



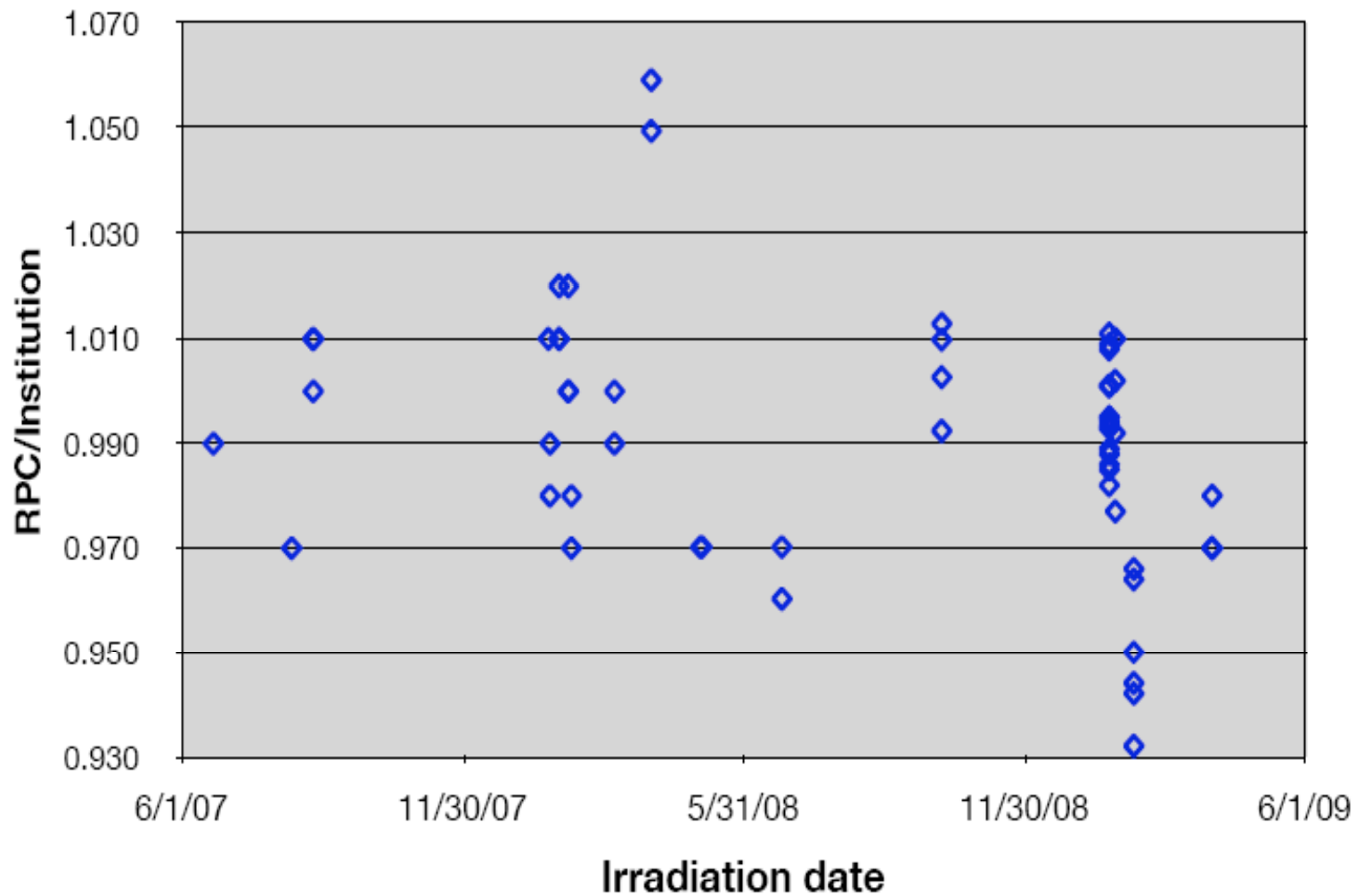
- There are numerous practical difficulties in defining the size, shape and deformation of the clinical target volume
- Output checks - Cause for concern
- Uncertainties plague the treatment planning for proton therapy, and
- Institutions have not yet demonstrated their ability to accurately irradiate even a stationary anthropomorphic phantom.

# Proton Facility Credentialing

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- \* NCI Guidelines mandate –
  - \* Questionnaire - sent to facilities by QARC
    - \* Completed by 4 of 5 centers
  - \* TLD monitoring
    - \* Mailed to all 5 centers
  - \* On-site dosimetry review visits
    - \* Purchased equipment, developing procedures
  - \* Anthropomorphic phantom
    - \* Modified existing pelvis phantom

Routine Annual Audits



# Phantoms

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- ~ Pelvis phantom has been developed
  - ~ Evaluation is under way, will be completed this summer
- ~ Lung phantom evaluation will begin this fall
  - ~ Evaluation of materials will be considerably more complex
  - ~ Likely to extend into next grant cycle

## CHALLENGES POSED BY THE PRECISION OF PROTONS

PTV coincides with the CTV, making it critical to:

- Know the 'correct' position, size and shape of the CTV and OAR
- In real-time account for (between and within fractions):
  - *changes in position*
  - *changes in size*
  - *changes in shape*

# THE EVIDENCE SO FAR

- Patients treated by photons plus protons for prostate cancer did not live any longer, but had worse toxicity than those receiving only photons.

*Shipley, IJROBP 32:3-12, 1995.*

*Gardner, J Urol 167:123, 2002.*

# LOW-RISK CaP

## BRACHYTHERAPY

Death in 3% by 5 years (none due to prostate cancer).

Long-term grade 3 toxicity in 2%.

ED in 9%.

Takes one day.

*[Lawton, 2007]*

## PROTONS

Death in 4% by 5 years (none due to prostate cancer).

Long-term grade 3 toxicity in 2%.

*ED N/A (? > 25%).*

Takes 7-8 weeks.

*[Zietman, 2005]*

# INTERMEDIATE/HIGH-RISK

*3D-CRT (~70 Gy) + ANDROGEN DEPRIVATION*

*No evidence yet that higher doses than ~70 Gy prolong survival, but they do increase urinary toxicity.*

## Intermed-Risk (STAD)

- Death in 12% by 5 years
  - None due to prostate ca.
- Toxicity:
  - Erectile dysfunction in 26%.
  - Gr 3 urinary toxicity in 4%.
  - Gr 3 diarrhea/rectal bleeding in 4%.

*[D'Amico, 2008]*

## High-Risk (LTAD)

- Death in 22% by 5 years
  - In 6% due to prostate ca.
- Toxicity:
  - Erectile Dysfunction in 68%.
  - Other Gr 3 or worse toxicity in 4%.

*[Bolla, 2002]*



## CA PROSTATE: SUMMARY OF THREE RANDOMIZED TRIALS

- Patients treated with protons suffered worse toxicity than those treated without protons.
- Patients receiving high dose RT (>75 Gy by photons, protons or both) suffered worse toxicity than those receiving a standard dose (~70 Gy).
- Patients treated with protons or high doses did not live any longer, even after 8-25 years follow-up.

*Shiple W, IJROBP 32:3-12, 1995.*

*Zietman AL, JAMA 294:1233-39, 2005.*

*Kuban DA. IJROBP 70:67-74, 2008.*

- Should we study proton therapy?
  - YES (Research is good)
- Should we use it outside of prospective trials?
  - NO (Patients may suffer).

# WE SHOULD STUDY PROTON THERAPY BECAUSE

- More than 50% of the patients develop local failure after radiochemotherapy for many common cancers:
  - *GBM*
  - *Esophagus*
  - *Locally Advanced H&N*
  - *Locally Advanced NSCLC*
  - *Pancreas*
  - *Etc.*

# WE SHOULD STUDY PROTON THERAPY BECAUSE

- More than 50% of the patients suffer grade 3 or worse toxicity during or after radiochemotherapy for many common cancers:
  - *Locally Advanced H&N*
  - *Esophagus*
  - *Locally Advanced NSCLC*
  - *Locally Advanced Anal*
  - *High-risk prostate*
  - *Etc.*

# SUMMARY-1

- We do not know if patients treated by protons live longer or better than those treated without protons.
- Without comparative trials we do not even know that they do as well as those treated without protons!

- **The problem is that comparative studies will be threatening to makers and sellers of costly goods and services that offer no benefit over existing alternatives.**

- ...advocating ignorance is not a winning political strategy, so the foes of CER have found spokespeople to make their case in moral and policy arguments.....warning that such knowledge will inexorably degrade the quality and accessibility of health care.

# SUMMARY-2

- Almost all children requiring RT, and as many adults as possible, should be prospectively enrolled on proton trials, to determine whether they benefit or not in terms of the tumor control or adverse effects.
- *Research is good! Even CER !!*



# Phantom Treatment

- ☞ Treatment plan created with a prescription of 6 Gy to the prostate
- ☞ Plan delivered 3 times with film and TLD inserted in phantom
- ☞ Plan accounting for difference in patient and material SP to be delivered in near future

