The ROYAL MARSDEN
NHS Foundation Trust

Bladder - Prostate Rhabdomyosarcoma:

The radiotherapists view

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NHS

Outline of talk

- Local Control in Bladder-Prostate RMS
- What is the role for Radiotherapy?
- Choosing between techniques

Bladder-Prostate RMS

- Localised ERMS
- 5yr FFS 75% and OS 84%
- Treatment failures 60% local

- Localised non-ERMS
- 5yr FFS and OS 47%

- Metastatic RMS
- 5yr FFS 41% and OS 44%

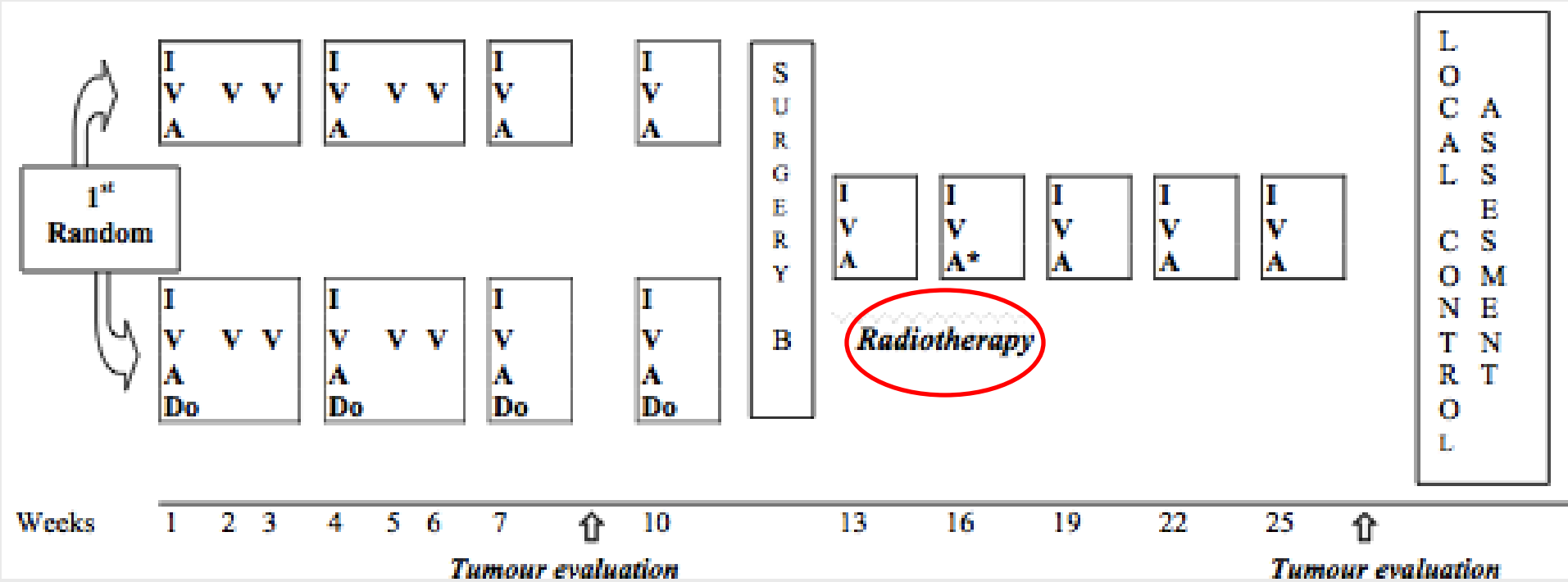
Rodeberg et al. Int J Cancer 2011

What is the role for radiotherapy

- IRS-II Trial
  - RT given after 8 weeks chemo
  - 5-year FFS of 58% and OS of 72%
- SIOP/ICG protocols
  - RT for poor response to initial chemo
  - Similar outcomes to IRS-II
- CWS-96 trial
  - Preop RT or primary RT: OS 88%
  - Incomplete surgery +/- RT: OS 40%

Efficacy versus late effects

Combined modality therapy


1st Random
I V A V V
I V A V V
I V A
I V A
I V A Do V V
I V A Do V V
I V A Do
I V A Do
SURGERY B
I V A
I V A*
I V A
I V A
I V A
Radiotherapy
LOCAL CONTROL ASSESMENT
Weeks
1 2 3 4 5 6 7 10 13 16 19 22 25
Tumour evaluation
Tumour evaluation

Late sequelae

- Radiation induced fibrosis
- Increases with increasing RT dose

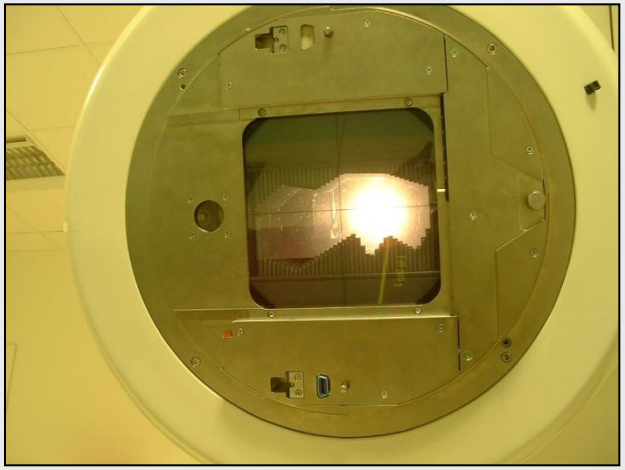
- **Bladder dysfunction**
- 17% of patients receiving <40 Gy having dysfunction *versus* 61% receiving >40 Gy.

Hays et al. J Pediatr Hematol Oncol 1995

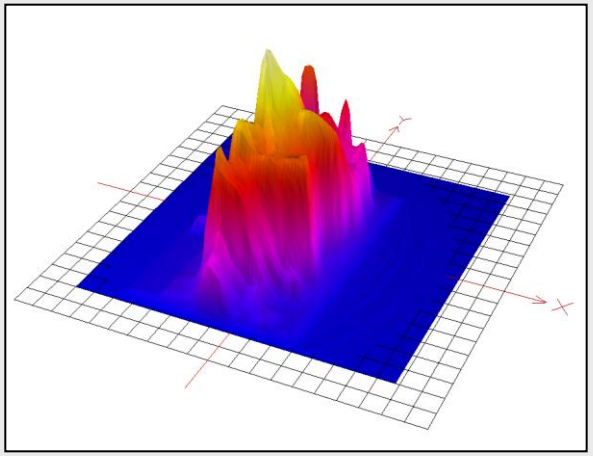
Current radiotherapy techniques

3D and beyond…

- Transition from
  - 3D Conformal

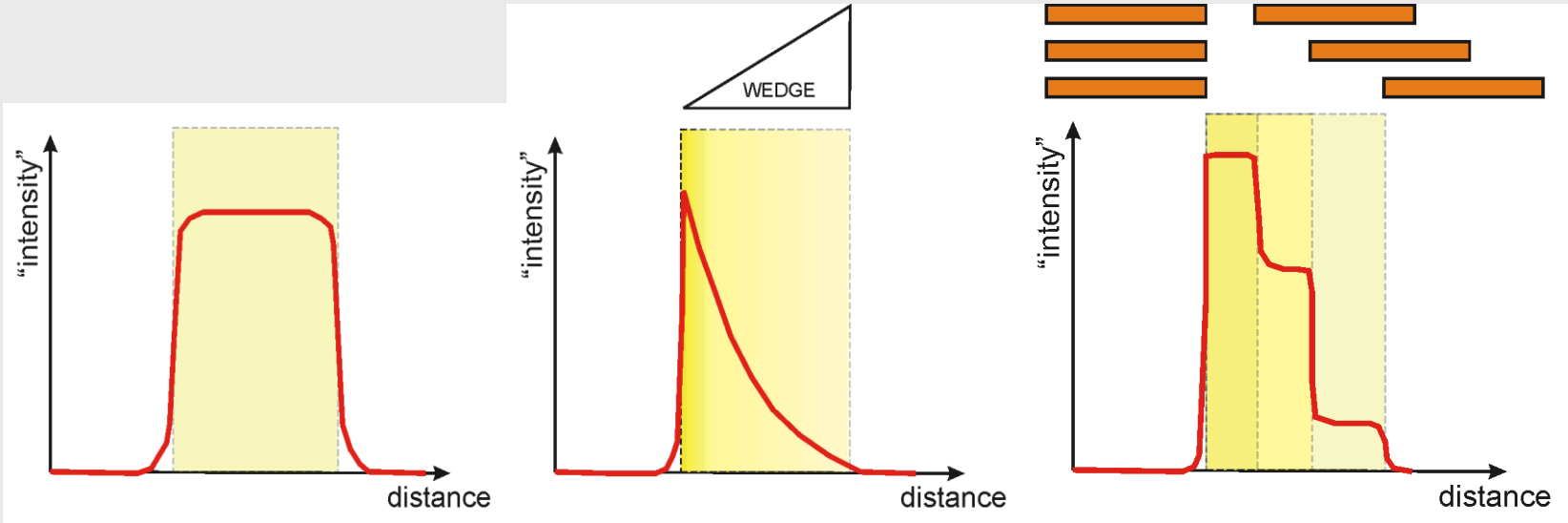


- To
  - IMRT



Improving conformality

- Changing intensity across the beam
  - Intensity modulated radiotherapy
  - Inverse-planned
    - sliding window step and shoot



Conformality

What is the role for Intensity Modulated Radiotherapy?

Pros

- Improved dose conformity and homogeneity
- Greater sparing of Organs at risk (OAR)
- Concomitant boost
- Available in UK

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Cons

- Low dose bath effect
- Potential for increased second cancers

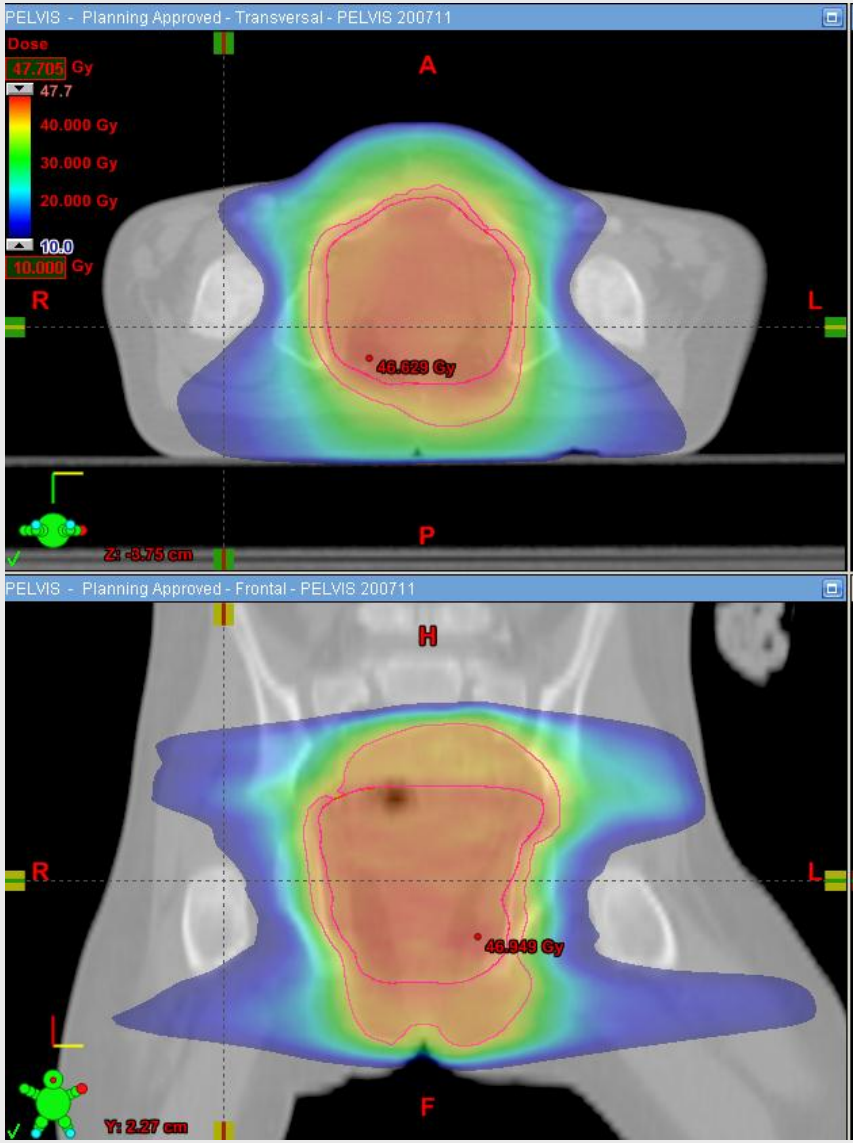
Which technique- fixed field vs arc?

- Intensity Modulated Arc Therapy (IMAT)
- Rotational cone beams with gantry motion during beam on
- Ability to vary MLC aperture, dose rate and gantry speed
- Similar conformity to fixed field IMRT

- Potential benefits in Paediatrics
  - Reduced Monitor Units
  - Faster treatment delivery

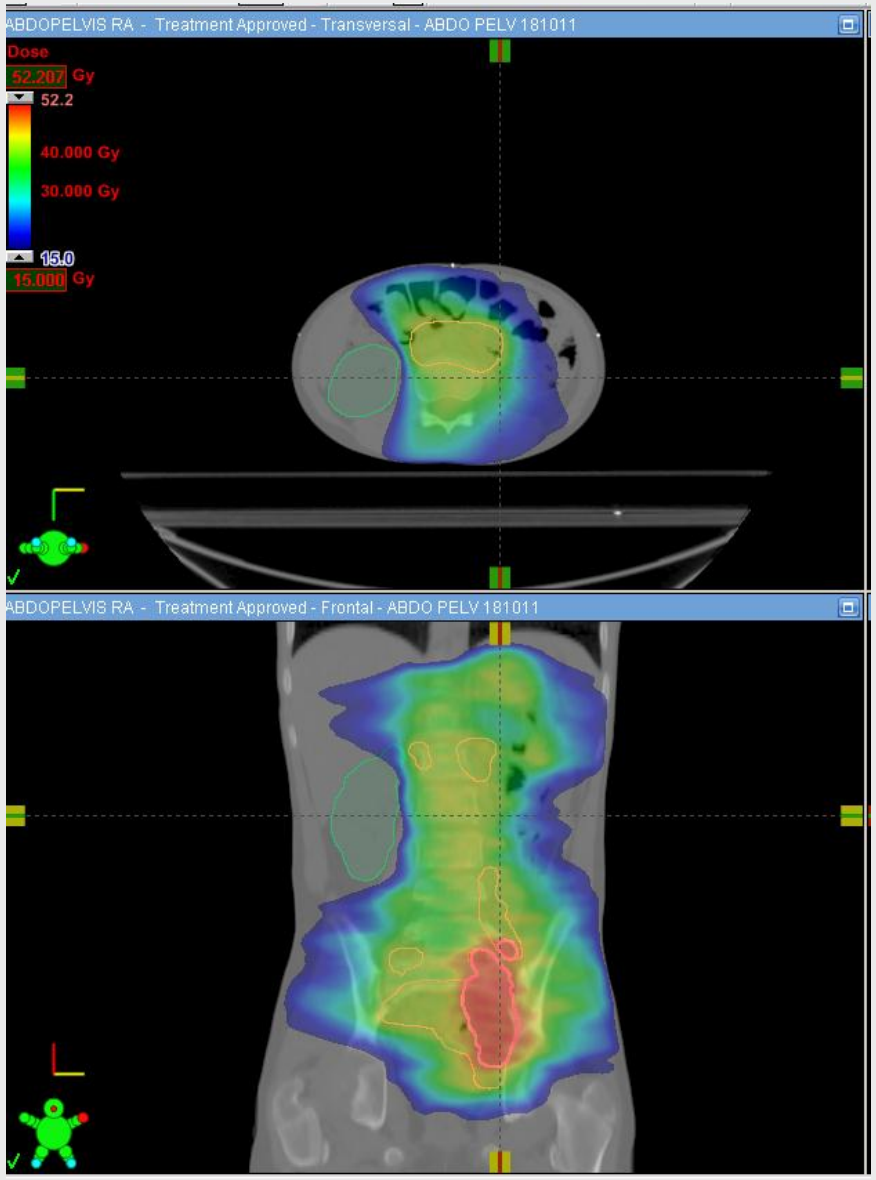
Localised ERMS prostate-bladder base

- High risk group B
- Radical prostatectomy
  - +ve margins
- Radical RT: IMAT



Metastatic ERMS

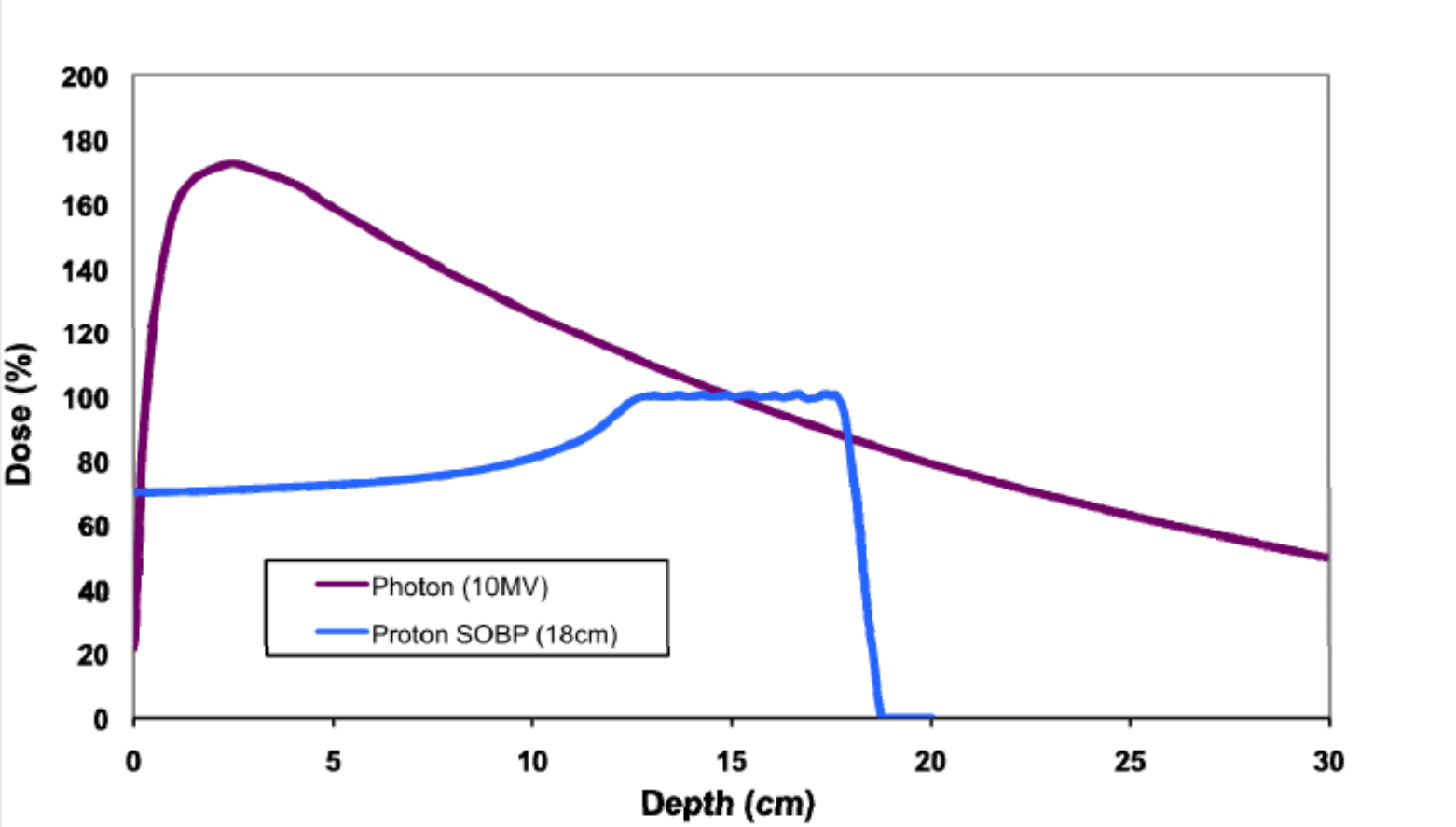
- Large pelvic tumour with para-aortic, left suprarenal and left cervical LNs
- BERNIE study
  - IVADo
- Surgical resection of pelvic mass
- Macroscopic residual disease internal iliac vessels



Principles for approval and funding of Proton Therapy abroad in UK

- Curative Intent
- Good PFS
- No coincident diagnoses likely to limit 5yr survival
- **No metastatic disease**
- **Rhabdomyosarcoma**
  - Orbit
  - Parameningeal and Head & Neck
  - **Pelvis**
- **Age <16years**

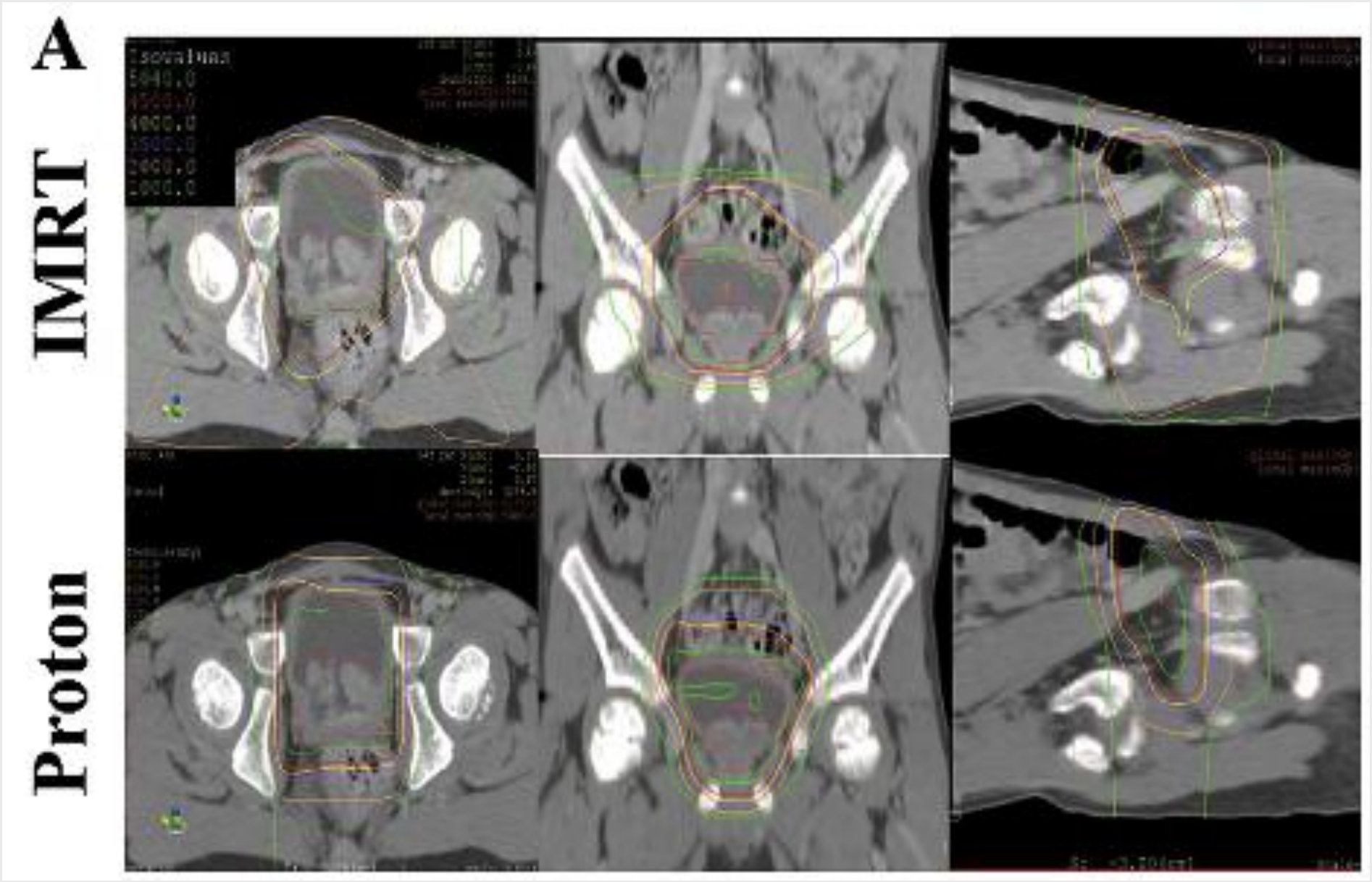
Why protons?


200
180
160
140
120
100
80
60
40
20
0
Dose (%)
0
5
10
15
20
25
30
Depth (cm)
Photon (10MV)
Proton SOBP (18cm)

Why protons?

- Proton radiotherapy compared to IMRT
- Single centre series
- Significant decrease in mean organ dose
  - bladder (25.1 CGE vs. 33.2 Gy; p=0.03)
  - testes (0.0 CGE vs. 0.6 Gy; p=0.016)
  - femoral heads (1.6 CGE vs. 10.6 Gy; p=0.016)
  - growth plates (21.7 CGE vs. 32.4 Gy; p=0.016)
  - pelvic bones (8.8 CGE vs. 13.5 Gy; p=0.016)

Cotter et al. IJROBP 2011



Cotter et al. IJROBP 2011

Conclusions

- EBRT remains an important component in the treatment of BP RMS
- Dosimetric benefits with IMAT/ IMRT
  - Improved sparing of OAR
  - **BUT** potential increase in risk of second cancers
- Definite role for metastatic disease
- Need to balance cure with potential late effects
- Potential benefits with Proton beam radiotherapy or Brachytherapy