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# Summary of HDR brachytherapy for the Pivotal Boost trial

Lucy Partridge

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# Introduction

- A phase III randomised controlled trial of prostate and pelvis versus prostate alone radiotherapy with or without prostate boost
- Target disease
  - Histologically confirmed adenocarcinoma of the prostate
  - Localised high risk or locally advanced disease
  - Intermediate risk disease



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# Introduction

- Study objectives
  - To evaluate the benefits of;
  - Pelvis lymph node radiotherapy
  - HDR brachytherapy in patients with no boost volume
  - Focal boost IMRT or focal HDR boost in patients with a boost volume on staging MRI



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# Introduction

- Trial population and treatment
  - Patients receiving radical radiotherapy for localised, node negative prostate cancer.
  - Patients will be allocated to one of four treatment arms;
    - ❖ A: prostate alone IMRT
    - ❖ B: prostate and pelvic IMRT
    - ❖ C: prostate IMRT and prostate boost
    - ❖ D: prostate and pelvic IMRT and prostate boost



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# Introduction

- The boost can be delivered as;
  - Whole gland high dose rate brachytherapy (HDRB)
  - Focal boost high dose rate brachytherapy
  - IMRT
- Randomisation into arms C and D depend on the boost volume identified by MRI and patient suitability in the case of HDRB.



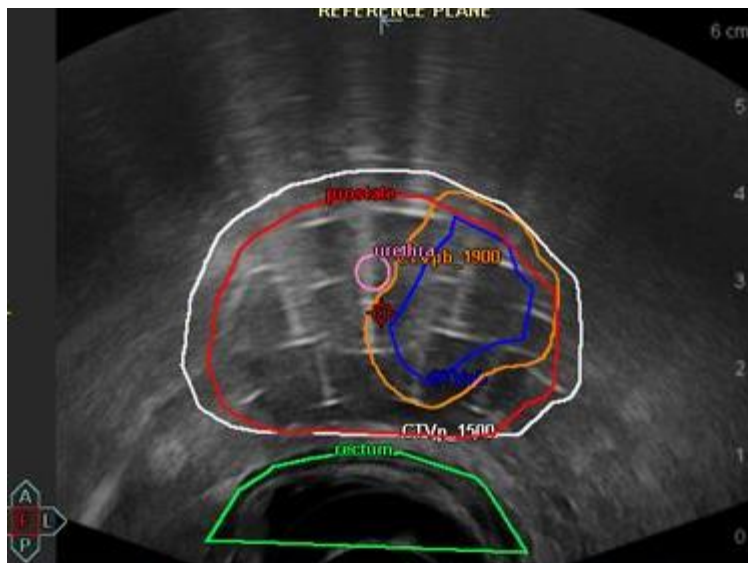
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## Planning

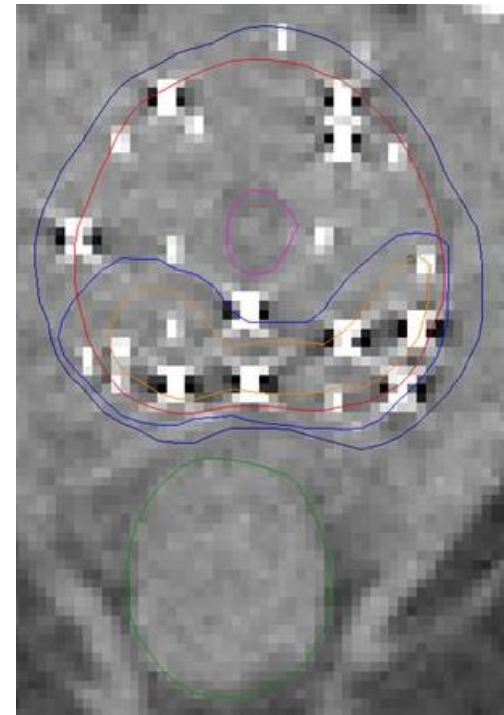
- High dose rate brachytherapy delivered as 15 Gy to the whole gland in 1 fraction
- In conjunction with 37.5 Gy in 15 fractions IMRT
- Patients suitable for HDR focal boost can have up to 50% of the gland boosted to up to 19 Gy.
- The boost volume can be delineated to two ways;
  - Boost volume planning where a boost CTV is contoured
  - Boost sector planning, only available to Oncentra Prostate users, divides the prostate into 12 sectors.



## Boost volume planning



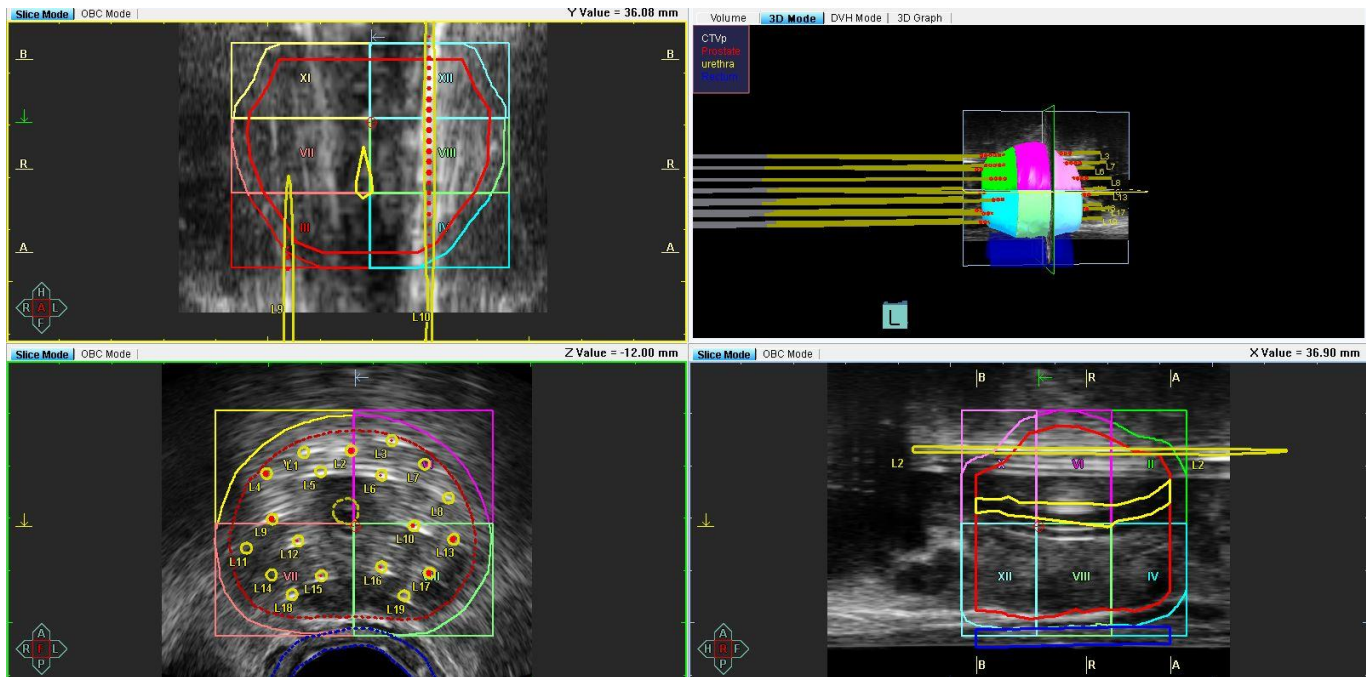
US based planning



CT based planning

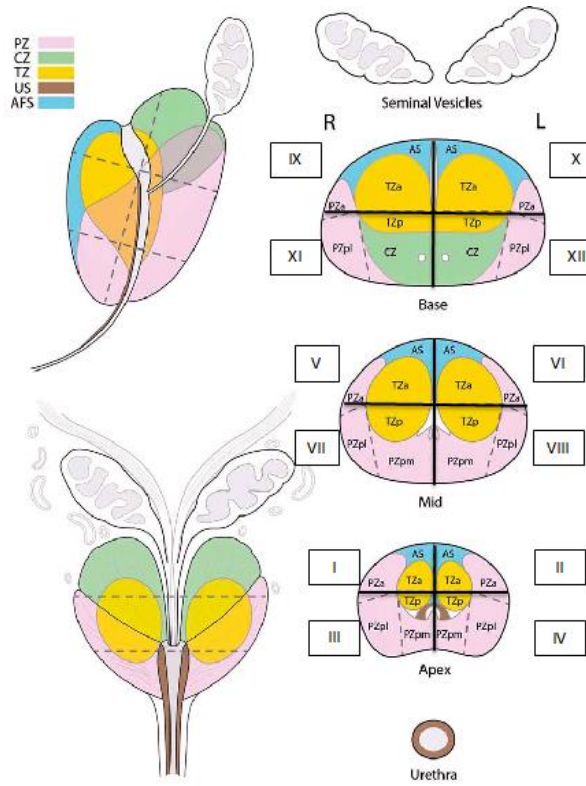


## Boost sector planning





## Boost sector planning



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## Benchmarking

- US and CT datasets can be downloaded from the RTTQA website
- Instructions for US based planning can be found in the latest guidelines
- CT based planning still work in progress at the moment, require input from Mount Vernon
- The Plan assessment form (PAF) can also be downloaded from the RTTQA website
- Once the plan has been approved locally, the completed PAF, image set, structure set and plan need to be exported using NHS SFTP (email [pivotalboost.trial@nhs.net](mailto:pivotalboost.trial@nhs.net))



## Benchmarking

### Filedepot

The screenshot shows a web-based file management interface. On the left is a navigation pane with a tree view of folders. The 'PivotalBoost' folder is selected. The main area displays a table of files within this folder. The table has columns for 'Filename', 'Date', and 'Action'. Each row includes a checkbox, a star icon, and a download icon.

Filename	Date	Action
Focal Boost Outlining Examples.zip	09/12/17	Download
HDR PIVOTALboost Benchmark Case.zip	01/03/18	Download
HDR PIVOTALboost PAF.xlsx	02/03/18	Download
PIVOTALboost Benchmark Cases 040517.zip	05/04/17	Download
PIVOTALboost boost contouring atlas.pdf	05/03/17	Download
PIVOTALboost PAF.xlsx	10/25/17	Download
PIVOTALboost pelvic node contouring atlas.pdf	05/04/17	Download
PIVOTALboost RT planning and delivery guidelines.pdf	09/12/17	Download
Workshop Talks.zip	10/27/17	Download

Screenshot from RTTQA website



## Plan assessment form

Dose to Prostate Target Volume			
	Calculated dose [Gy]	Calculated volume [%]	Pass/Fail
<b>Prostate CTV:</b>	<b>CTVp_1500 (prostate+margin)</b>		
D90% $\geq$ 15Gy			Fail
V15Gy $\geq$ 95%			Fail
V22.5Gy $\leq$ 45%			Pass
V30Gy $\leq$ 15%			Pass

- PAF uses a traffic light system for DVH constraints



## Plan assessment form

Dose to Organs at Risk			
	Calculated dose [Gy]	Calculated volume [cc]	Pass/Fail
<b>Rectum</b>			
D2cc $\leq$ 11.8Gy			Pass
V15Gy=0cc			Pass
<b>Uretha</b>			
D10% $\leq$ 17.5Gy			Pass
D30% $\leq$ 16.5Gy			Pass
V22.5Gy=0cc			Pass



## Plan assessment form

For **arms C2 and D2 only** please complete the table below. Indicate the number of the sector(s) which have been boosted.  
For volume planning, provide the planning parameter for each CTVpb separately.  
Indicate the position of each boost volume/sector using the diagram on Page 2 for either method.

	Calculated dose [Gy]	Calculated volume [%]	Pass/Fail	Comments
<b>Focal Boost CTV: CTVpb_1900</b>				
D90% $\geq$ 19Gy *			Fail	
V19Gy $\geq$ 90% *			Fail	
V28.5Gy $\leq$ 45%			Pass	
V38Gy $\leq$ 15%			Pass	
<i>* Note: doses achieved may be limited by rectal/urethra dose</i>				



Plan assessment form

Sector planning	Sector 1	Sector 2	Sector 3
Location of sector			
Volume [cc]			
D90% [Gy]			
V19Gy [%]			
V28.5Gy [%]			
V38Gy [%]			
Sector planning	Sector 4	Sector 5	Sector 6
Location of sector			
Volume [cc]			
D90% [Gy]			
V19Gy [%]			
V28.5Gy [%]			
V38Gy [%]			



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## Contacts

- [Pivotalboost.trial@nhs.net](mailto:Pivotalboost.trial@nhs.net)
- Lucy Partridge – [lucy.partridge1@nhs.net](mailto:lucy.partridge1@nhs.net)
- Chris Lee – [c.lee3@nhs.net](mailto:c.lee3@nhs.net)





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**Thank you for listening**  
**Any Questions?**

