

# **Are contours required for MRI cervical brachytherapy planning? A dosimetric comparison.**

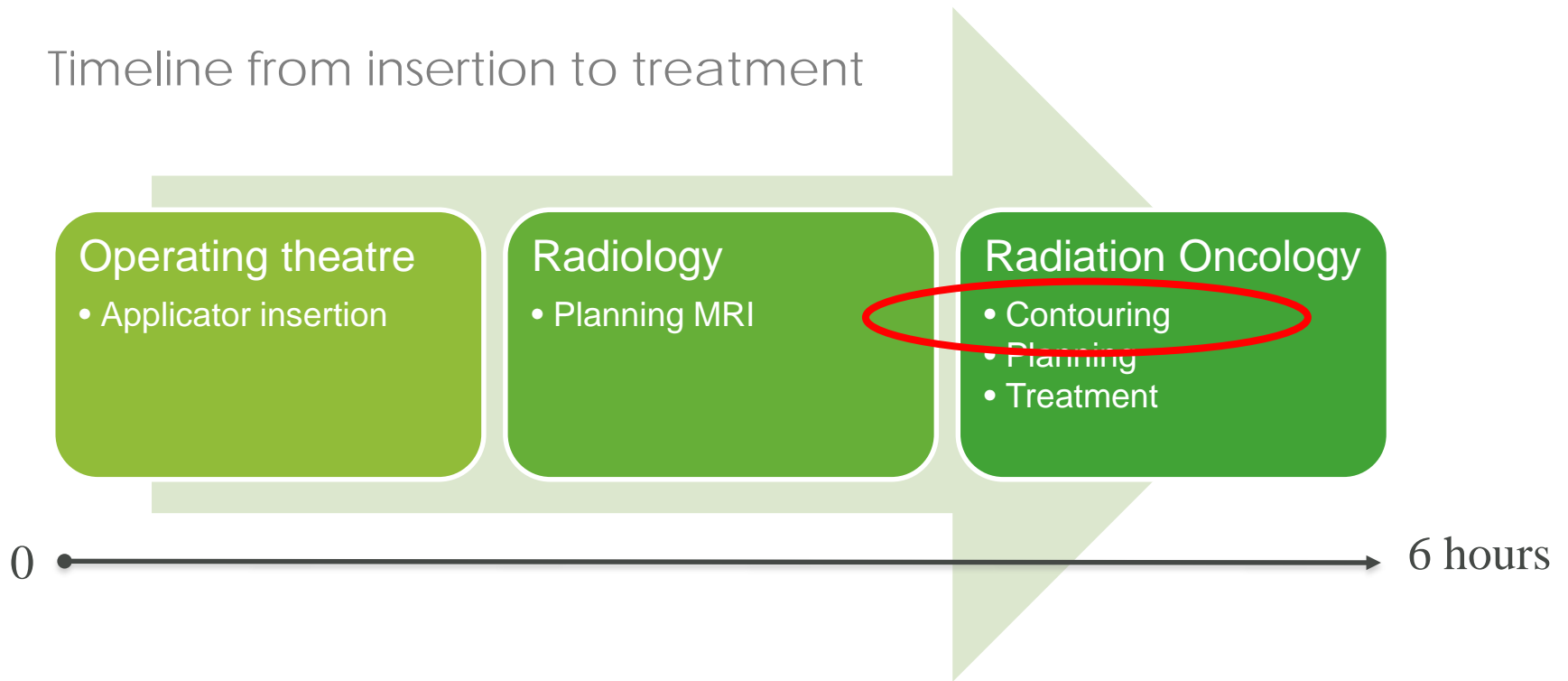
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# Background

- High dose rate brachytherapy (HDRBT) is part of the gold standard treatment for cervical cancer.
- Timeline from insertion to treatment



# Purpose

- Compare plan quality with and without the use of contours:
  - High risk clinical target volume (HR-CTV)
  - Organs at risk (OARs)

# Methods

- Ten consecutive patients with cervical cancer
- Adaptive MRI planned HDRBT at Austin Health.
- Two treatment plans created (Non Vol/ Vol)
  
- **Non Vol Plan**
  - Prior to HR-CTV or OARs contouring
  - Experienced brachytherapist created plan by visually sculpturing dose to the cervix whilst avoiding dose to OARs.

# Methods cont...

- Vol Plan :
  - HR-CTV (RO) and OARs (RT) contoured
    - Rectum
    - Bladder
    - Sigmoid
    - Bowel
  - Same brachytherapist generated plan to cover HR-CTV whilst maintaining OAR constraints.

# Methods cont...

Schedule	TARGET STRUCTURE			OAR - EQD 2 (3)			
	HR-CTV			BLADDER		RECTUM SIGMOID/BOWEL	
	D90 (Gy) EQD 2 (10)			D 2cc (Gy)		D 2cc (Gy)	
	Planning Aim	Minimum		Planning Aim	Tolerance	Planning Aim	Tolerance
<b>Total EBRT+BT (EQD)</b>	<b>&gt; 90</b>	<b>&lt; 95</b>	<b>≥ 85</b>	<b>&lt; 80</b>	<b>&lt; 90</b>	<b>&lt; 65</b>	<b>&lt; 75</b>
<b><u>With EBRT 45Gy in 25# - Dose</u></b>							
HDR Dose	D90 (Gy) - Dose			D 2cc (Gy) - Dose		D 2cc (Gy) - Dose	
<b>8.6Gy/3#</b>	<b>&gt; 9.40</b>	<b>&lt; 10.1</b>	<b>≥ 8.80</b>	<b>&lt; 6.50</b>	<b>&lt; 7.45</b>	<b>&lt; 4.70</b>	<b>&lt; 5.90</b>
<b>7.0Gy/4#</b>	<b>&gt; 7.80</b>	<b>&lt; 8.30</b>	<b>≥ 7.15</b>	<b>&lt; 5.45</b>	<b>&lt; 6.29</b>	<b>&lt; 3.95</b>	<b>&lt; 4.95</b>

# Methods cont....

- DVH parameters for both plans

<b>Bladder D2cc</b>
Rectum D2cc
Bowel D2cc
Sigmoid D2cc
HR-CTV D90

- Statistics
  - Descriptive statistics (mean, standard deviation)
  - Paired t-test

# Results

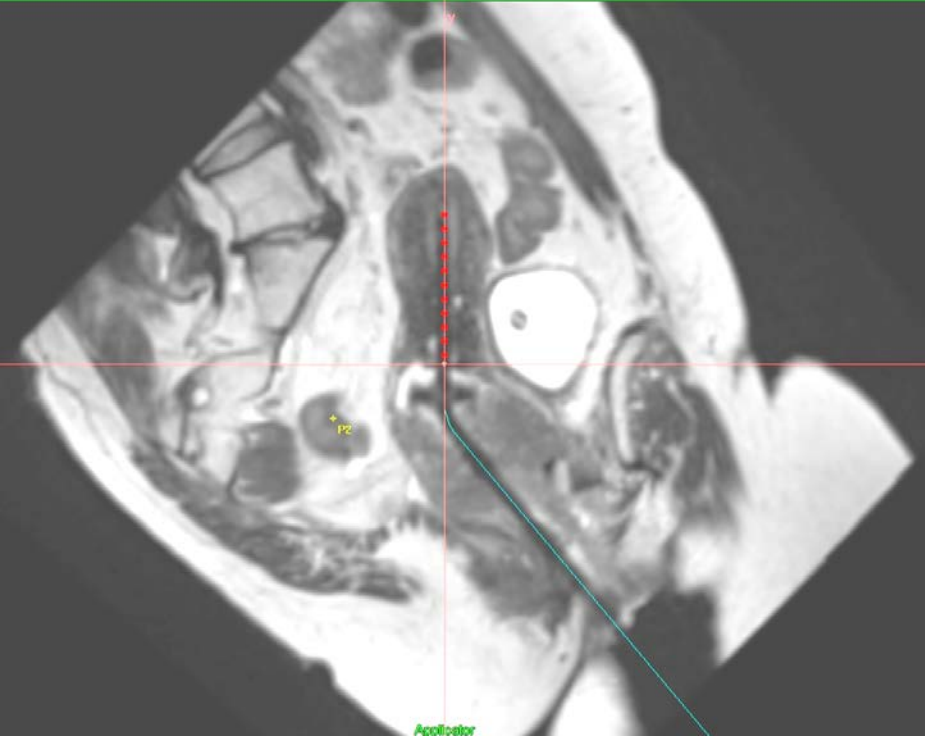
- 10 patients
  - Stage IB1-III B cervical cancer
  - External beam radiotherapy 45Gy/25# to pelvis
    - » +/- chemotherapy
    - » +/- nodal boost
  
- HDRBT Dose
  - 8.6Gy x 3# (n=4pts)
  - 7Gy x 4# (n=6pts)



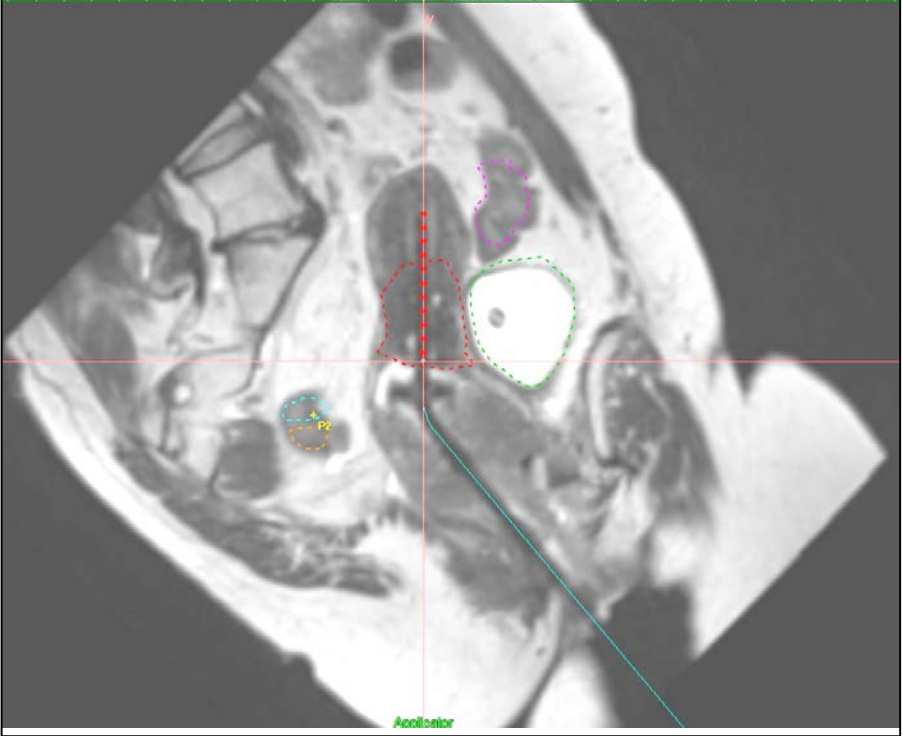
# Results cont...

- Applicators
  - Standard Tandem & ovoids = 8pts
  - Cylinder = 1pt
  - Utrecht = 1pt
  
- 72 plans generated
  - 36 Non Vol
  - 36 Vol

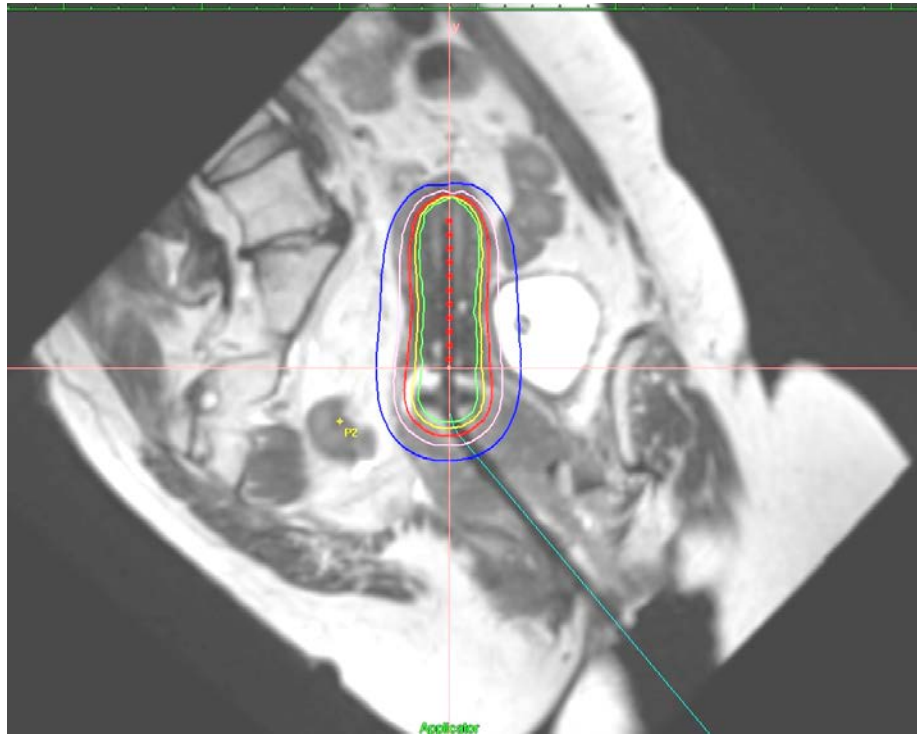
Non vol plan



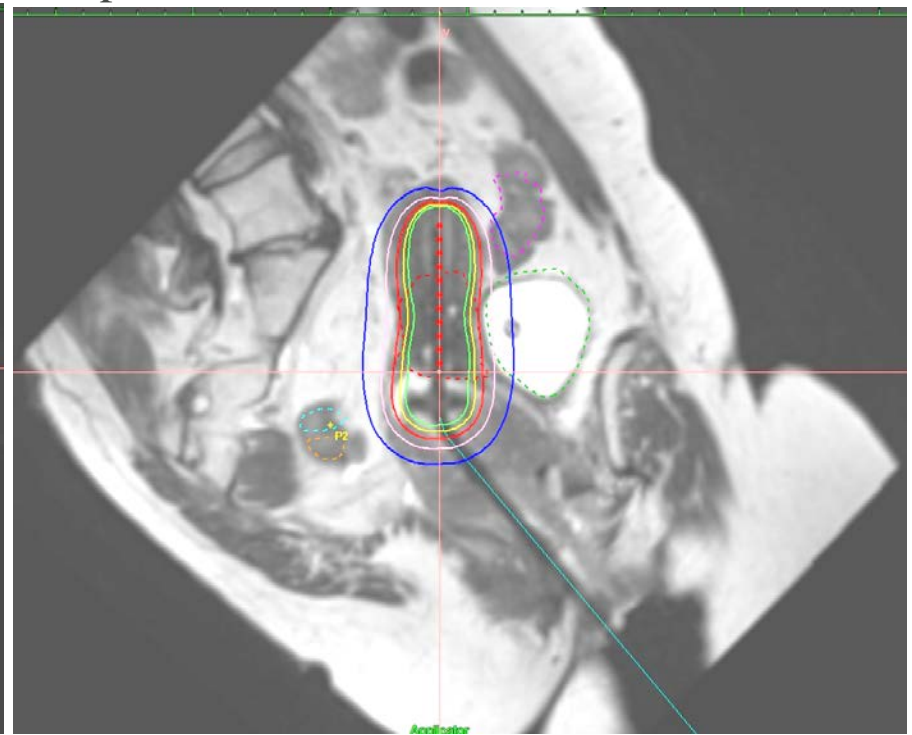
Vol plan



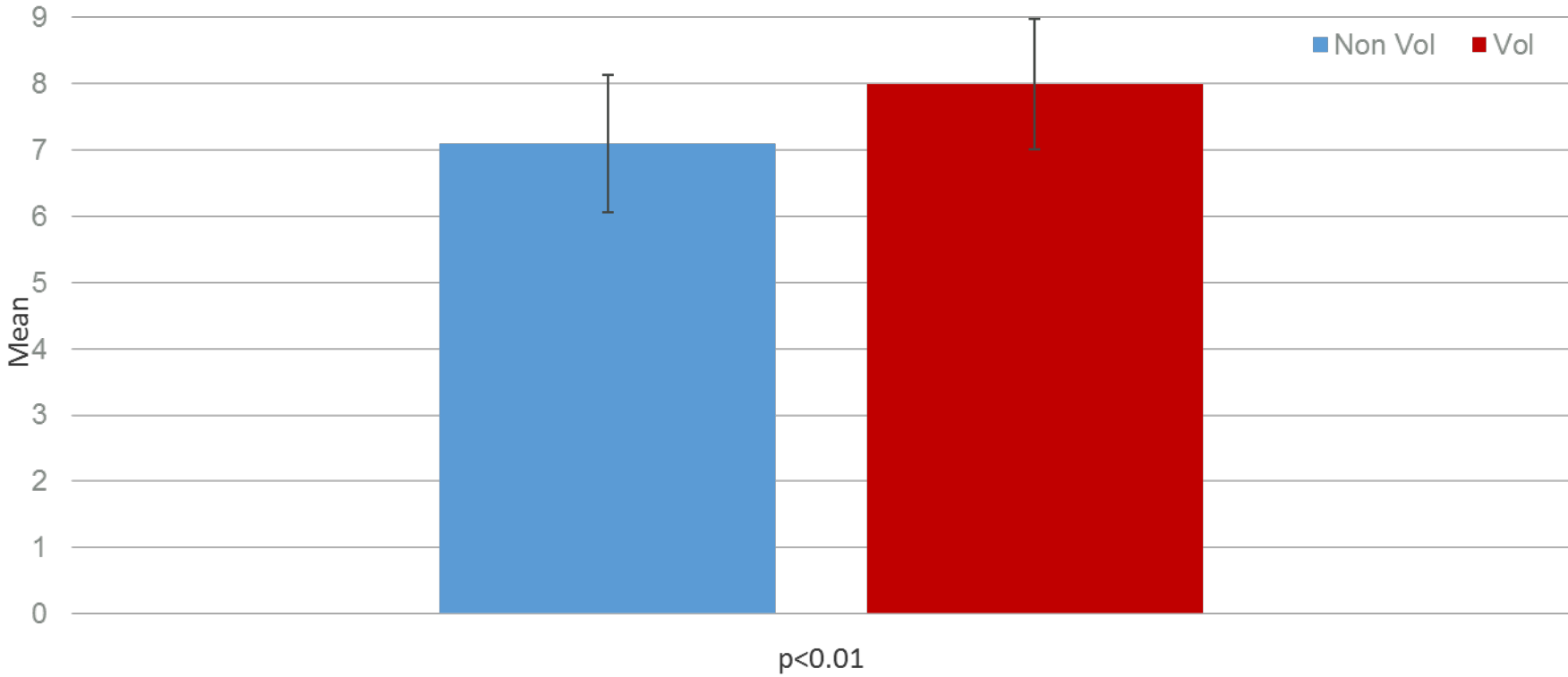
Non vol plan



Vol plan

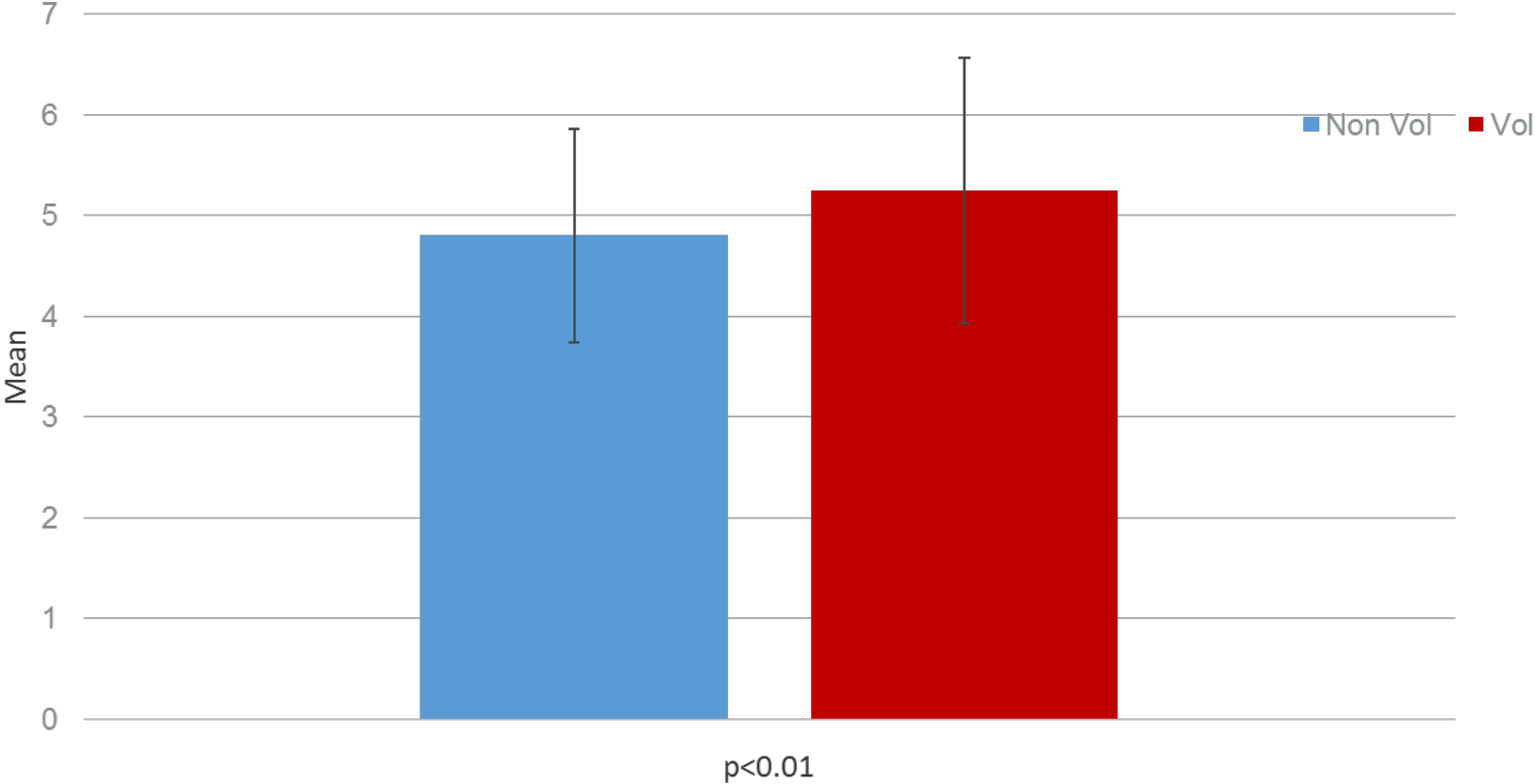


# HR-CTV D90



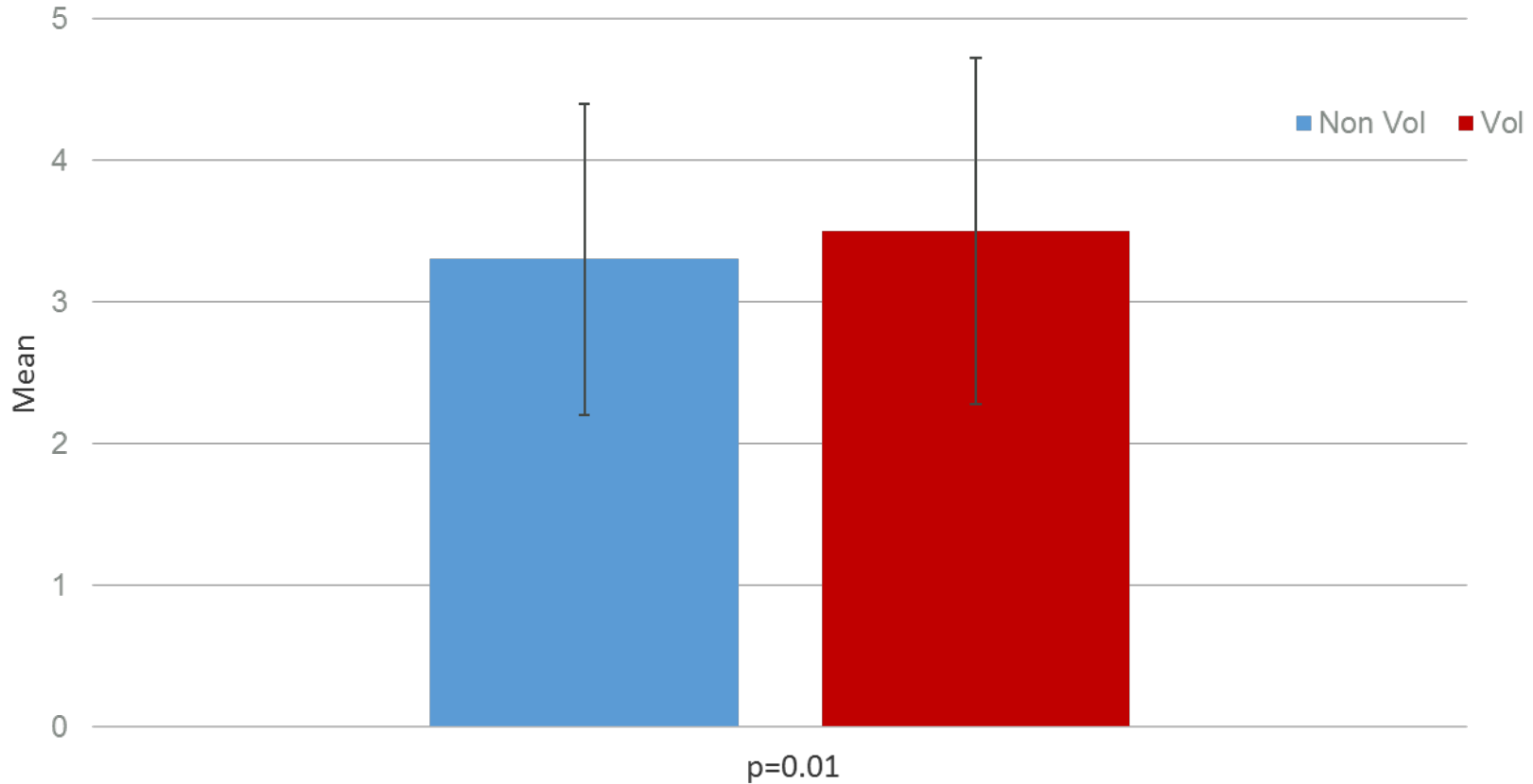
- Significantly higher (i.e. better coverage) with Vol Plan

# Bladder D2cc



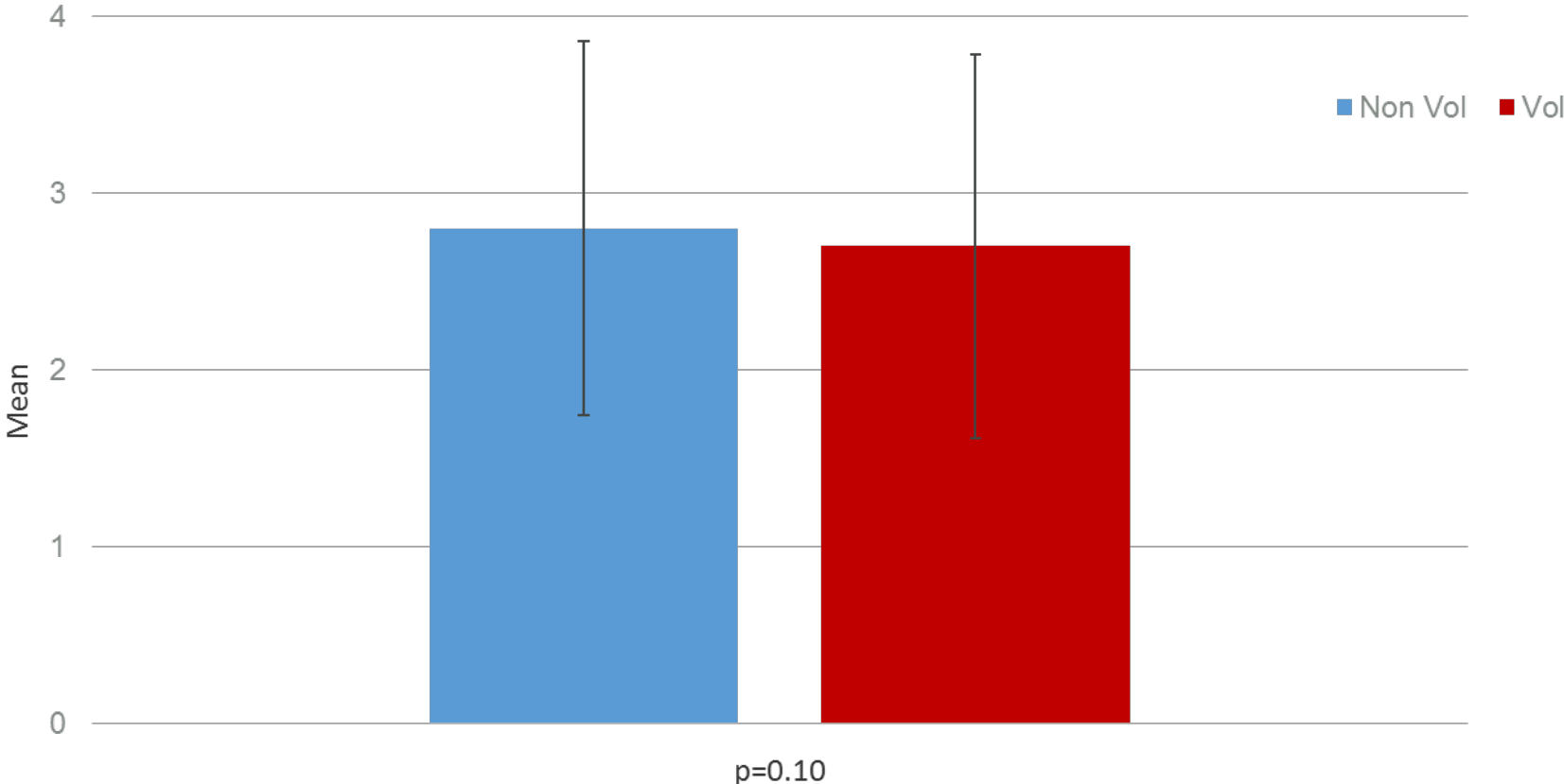
- Significantly lower dose with Non Vol Plan

# Rectum D2cc



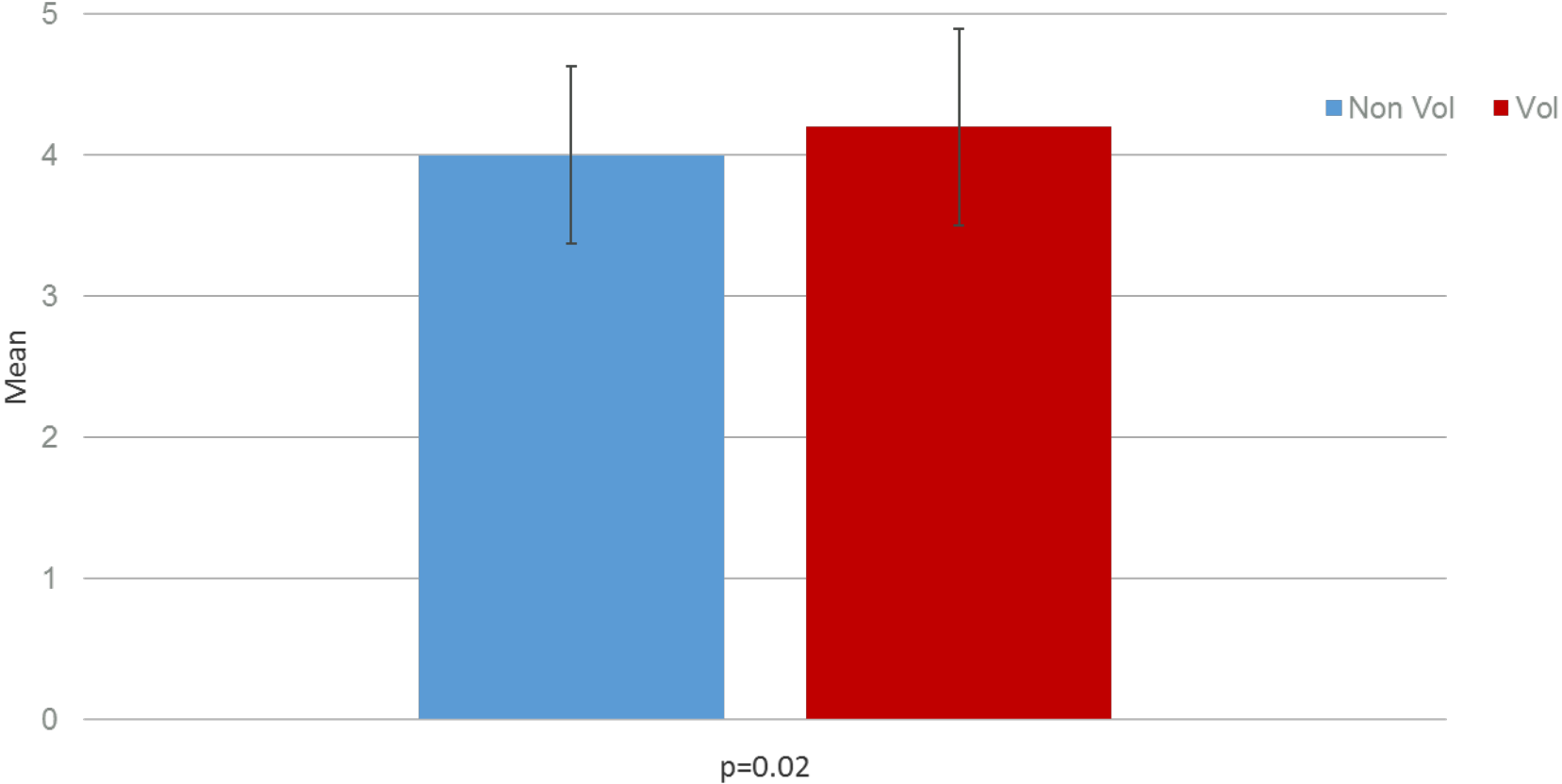
- Significantly lower dose with Non Vol Plan

# Bowel D2cc



- Not significant

# Sigmoid D2cc

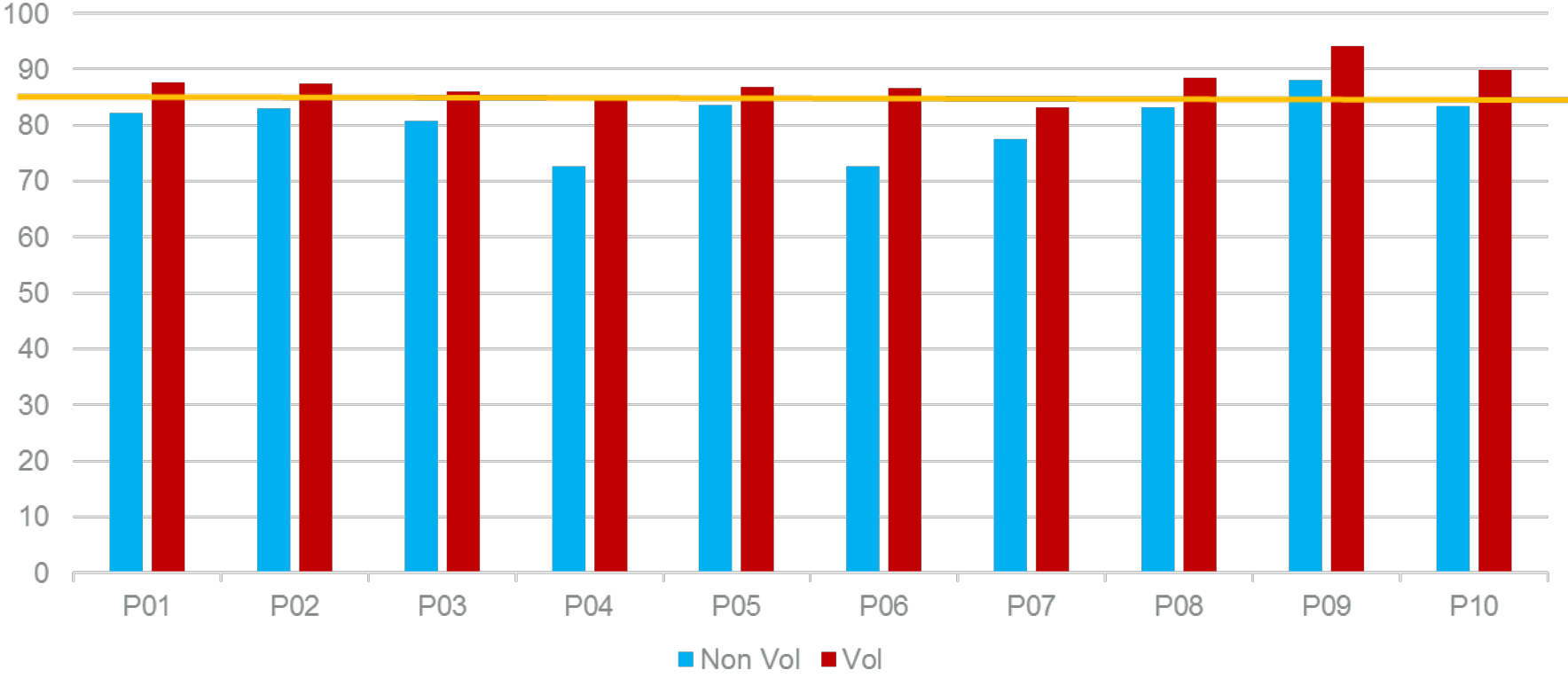


- Significantly lower dose with Non Vol Plan



# Department constraints met?

HR-CTV EQD2



# Conclusions

- Without contours, plans were more conservative
- Contours allow the brachytherapist to achieve better HR-CTV coverage by:
  - Shaping isodoses around clinically involved areas
  - Enables quantitative real time evaluation of OAR & HR-CTV
- Patient's optimal treatment outweighs waiting time

# Acknowledgements

Dr Carminia Lapuz

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Catherine Jager

Nicola Oliver

# Reference

A European study on **MRI-guided brachytherapy** in locally advanced cervical cancer – EMBRACE study (Endorsed by GEC ESTRO)

# Thank You!