
Aligning the Pelvis:

How Split ROI Is Cutting the Noise in Radiation Therapy

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ICON
CANCER CENTRE



Introduction

- Region of Interest (ROI) is a critical tool to accurate patient setup
- SGRT system perform ridged image registration algorithms within the ROI
- Factors affecting motion monitoring accuracy :
 - *Respiratory Motion*
 - *Patients contour variation*
 - *Placement of sheets or aprons covering patient's genitals*

- Varian Truebeam equipped with AlignRT® SGRT system v6.3 at both ICON Gold Coast centres
- Majority of pelvis treatments are using two arc VMAT modality, with daily CBCT pre-treatment imaging

VRT (cm)	0.5
LNG (cm)	0.5
LAT (cm)	0.5
MAG (cm)	0.5
ROT (deg)	1
ROLL (deg)	1
PITCH (deg)	2

AlignRT® Pelvis Protocol Threshold



- Standardisation with ICON sites
 - *IDENTIFY® are used at majority of ICON sites (Threshold =0.5cm)*
- Respect the PTV margin for pelvis treatment at ICON
- Magnitude (MAG) set to 0.5cm is a conservative measures
 - *Usually default = 0.8 to 0.9cm*
- Studies by ICON SGRT technical streams showed alignment between both IDENTIFY® and AlignRT®

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AlignRT® Pelvis Protocol Threshold

Method

- Data from 30 patients (***30 using original ROI vs 30 using Split ROI***) underwent pelvic treatment across both ICON Gold Coast Centres
- Compare the average magnitude (MAG) values & treatment time between the use of original ROI and the split ROI to determine overall efficiency
- Average magnitude = combination of the translational movements

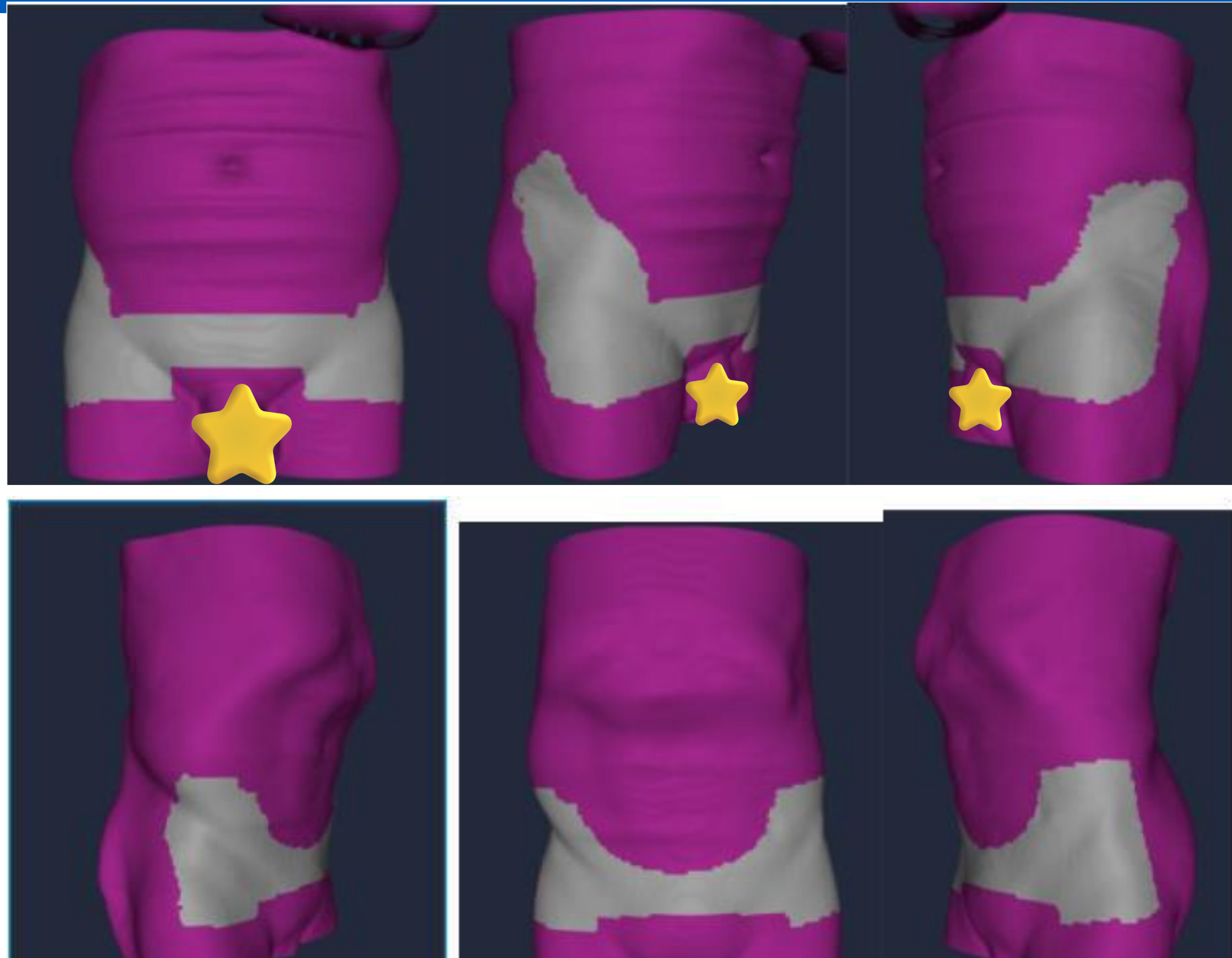
- Online couch correction position data obtained from “*Offline Review – Online OBI Match Result*” in ARIA
- 3D vector (MAG) value was calculated for each fraction and subsequently the average MAG value

$$\text{Magnitude} = \sqrt{\text{Long}^2 + \text{Lat}^2 + \text{Vert}^2}$$

- Treatment time were obtained by a custom report in ARIA (*Treatment Sessions Time*) and exported to an average time calculator set up in Excel

Original ROI

- Result in shadowing created by pubic hair, linen or underwear = obstructing anterior part of ROI
- Large respiratory motion or patient contour changes will result with inaccurate vectors values
- Intermittent loss of ROI when patient's anatomy is obscured the ROI



New Split ROI

- Reduces influence of respiratory motion
- Reduce influence of patient's anatomy
- Quicker for SGRT system to determine patient position on the bed
 - *Especially, with the more irregular edges on ROI*



Note: Exclude thighs in the ROI unless is in the treatment field, as it will affect pitch values



Pros_Nodes ISO 1



SGRT BODY



PROS+NODES_6DOF

VRT_{cm} 0.06



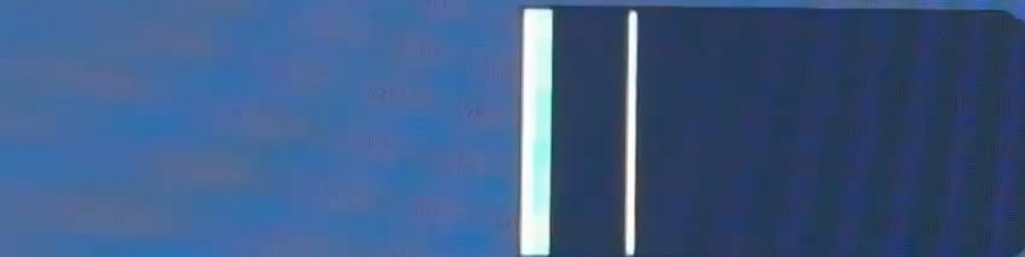
LNG_{cm} 0.05



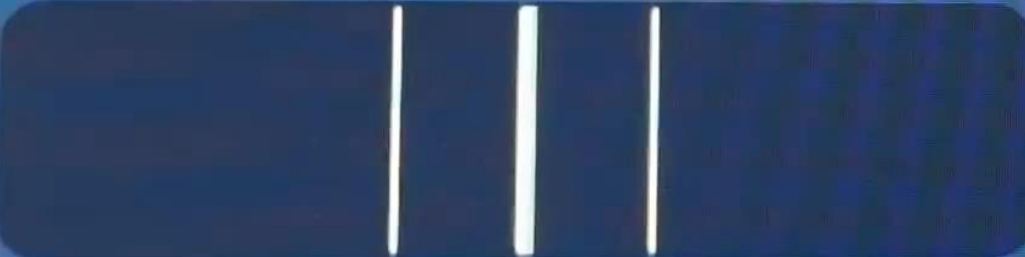
LAT_{cm} 0.01



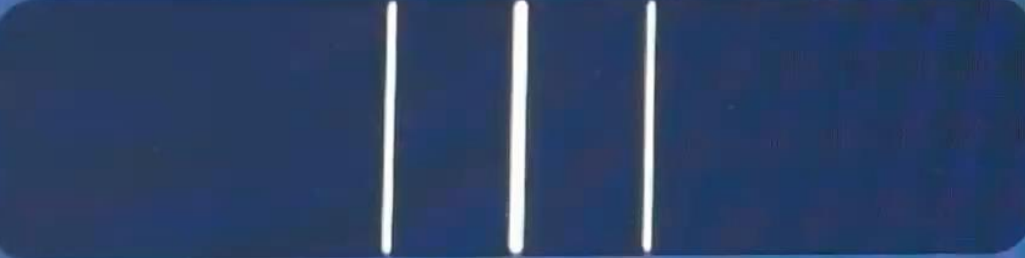
MAG_{cm} 0.08



RTN° 0.2



ROLL° 0.0



PITCH° -0.2



Reference

Treatment

Couch 0.0°

Send to Couch

Beam Control **ON**

19/02/2025 08:42:56

Surface Deformation

Current Position

Surface within tolerance: 100%

Average displacement: 0.0cm

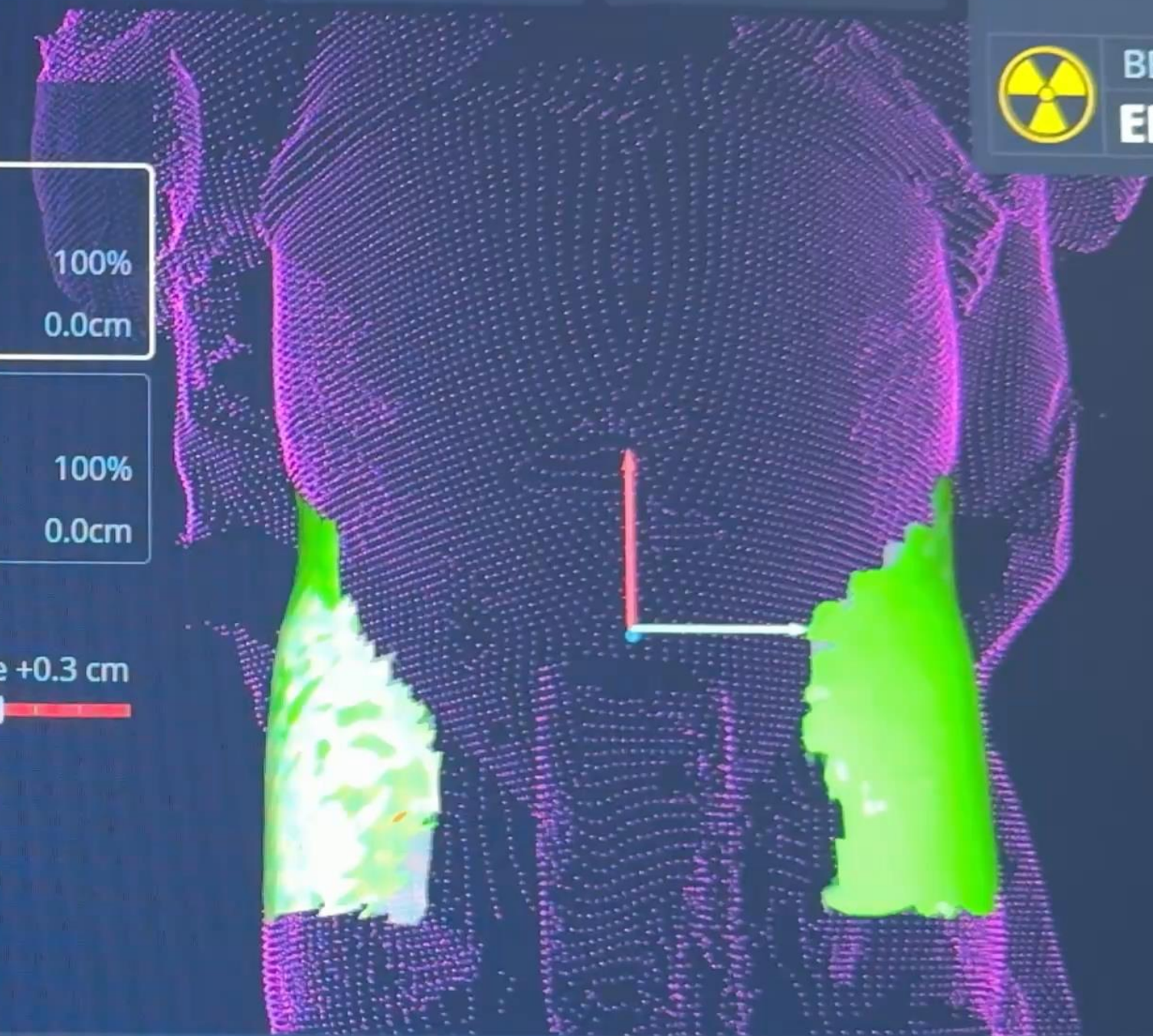
Corrected Position

Surface within tolerance: 100%

Average displacement: 0.0cm

Tolerance Limits

Below -0.3 cm Above +0.3 cm



0.30

-0.30

Coaching

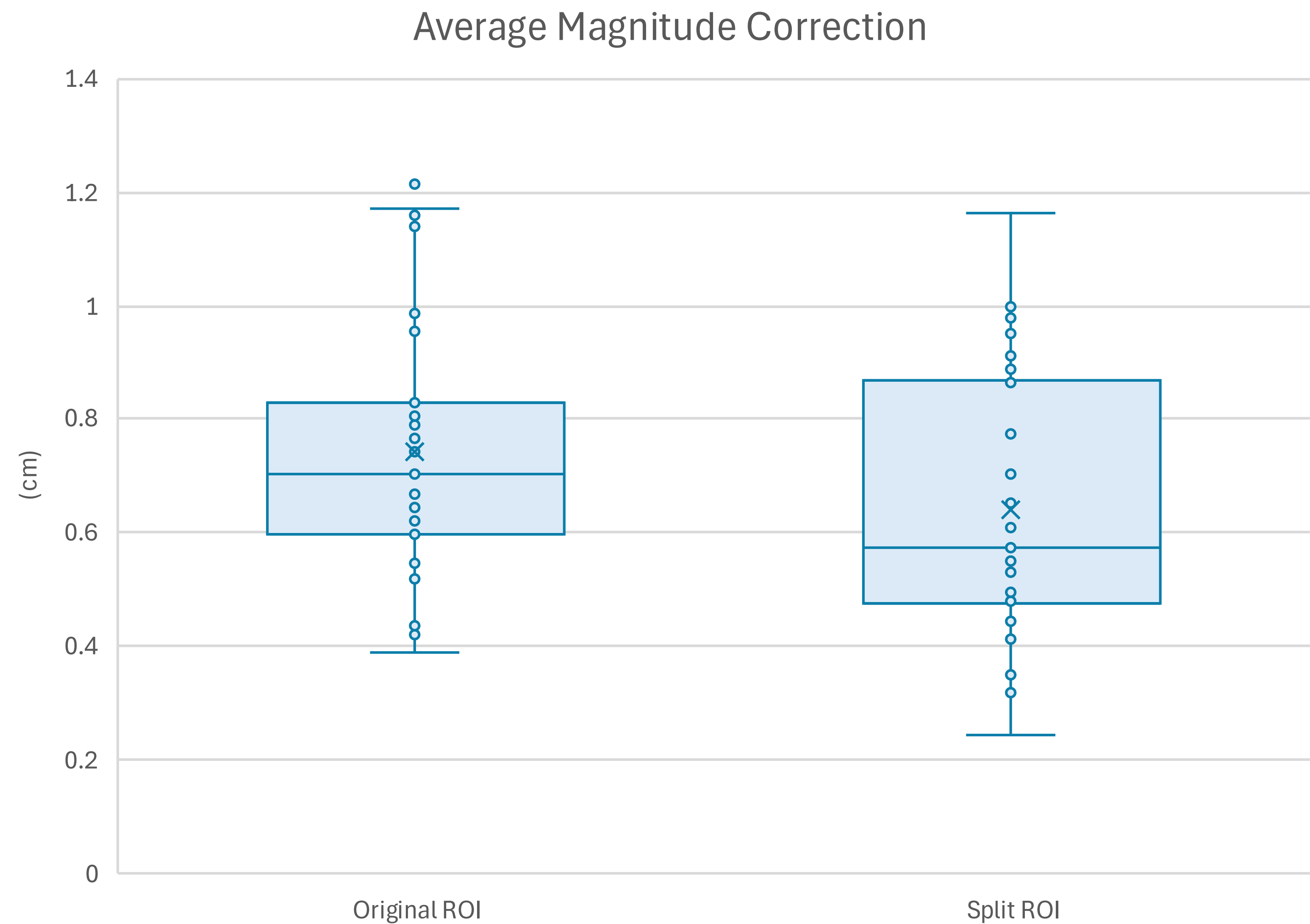
Surface

Deformation

Video

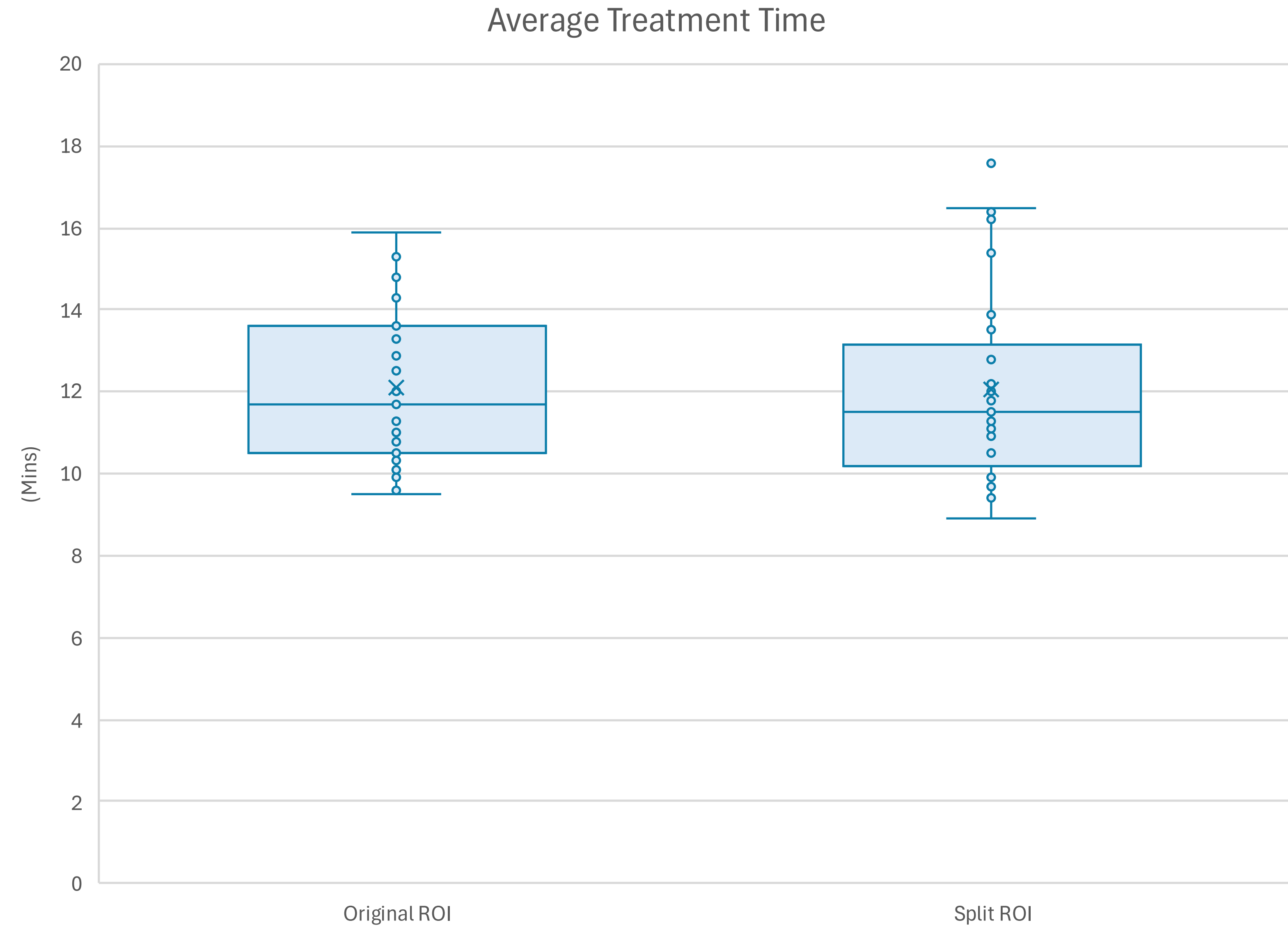
Results

	Original ROI	Split ROI
Total Average MAG (cm)	0.74	0.67
Standard Deviation	0.226	0.271
Min	0.39	0.24
Max	1.21	1.37



Results

	Original ROI	Split ROI
Total Average Time (Mins)	12.09	12.07
Standard Deviation	1.97	2.45
Min	9.5	8.9
Max	15.9	17.6



Feedbacks from the RTs

- Less adjustments required during Day 1 of the treatment
- Easier to reproduce the ROI
- Significant reduction of interruption during treatment
- More respective rotational shifts seen on the CBCT images
- Less concern about the placement of sheets over the pubis region

Limitations

- No magnitude monitoring data were collected, due to technical difficulties
- Treatment time report in ARIA (*Treatment Sessions*) includes activity start and end time.
 - *Time taken to review CBCT images by RT and Patient setup time affect the results*
- Few outliers in the data (i.e. Multiple sites and Palliative treatments)

Conclusion

- Demonstrated slight improvement in magnitude value compared to the original ROI
- Treatment time are almost identical
- Positive feedbacks from RT
- Further investigation is required to fully assess the effectiveness of the new ROI
(i.e intra-fraction magnitude monitoring data)

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