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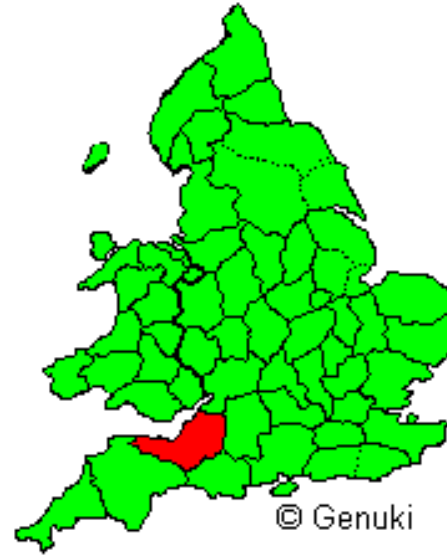
Analysis of Applied CBCT Shifts in Radical Thorax Radiotherapy: A Comparative Study of Tattoo vs SGRT set ups using CBCT Imaging

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Radiographer

About us...

- We opened in 2009
- 3 x Elekta Versa HD Linacs
- 1 x Phillips Aquilion CT scanner
- 1 x Superficial unit
- Align RT on each linac
- Sim RT in CT



Background and rationale...

- Our aim is to offer tattoo free radiotherapy to every patient, as we recognise that patients would prefer not to have a permanent reminder of their treatment (Moser et al, 2019)
- In January 2024 we successfully implemented Align RT, phasing our approach we transitioned to tattoo free treatments within two weeks
- A dedicated subgroup was established for each treatment site
- We are now 11 months from implementation

What is SGRT?

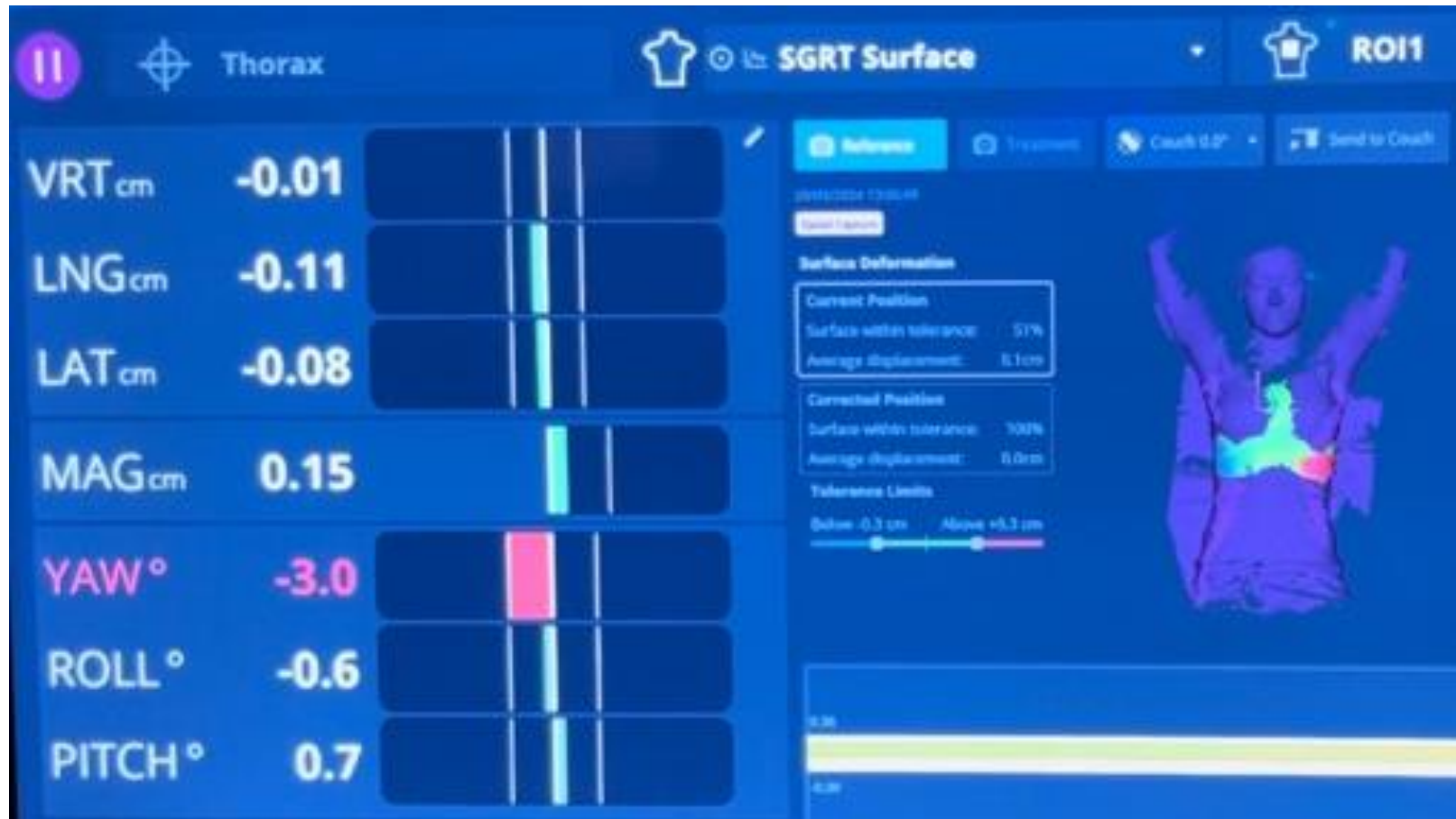
Surface guided radiotherapy allows the real time tracking of the patient's surface. Using a non-invasive approach, optimising accuracy and patient comfort.



Postural video....



Deformation view...

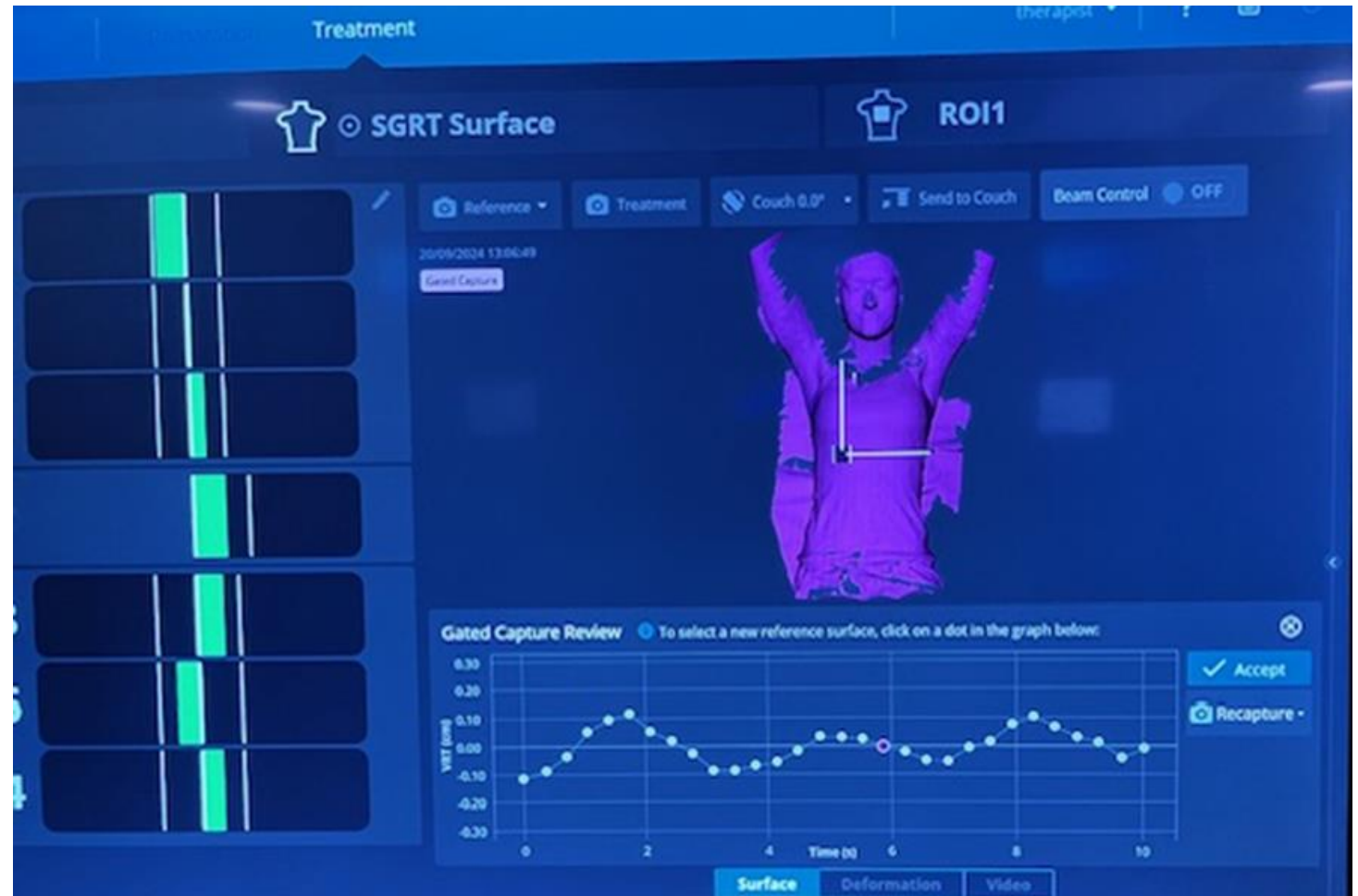


How we use SGRT for our thorax patient set ups...

- We position the patient so they fit the immobilisation comfortably and utilise the lasers and anatomical references to ensure straightness
- Turn on Align RT and use the postural video for gross alignment of the patient using all three camera positions to check position
- Fine adjustments can be made using the couch controls ensuring the deltas are as close to zero as possible
- When the patient is in an optimal position the deltas will turn green, the deformation view can also help with rotational error correction

How we use SGRT for monitoring thorax patients...

- We complete a gated capture for all thorax patients post CBCT imaging for monitoring during treatment



Question...

'How does the implementation of Surface Guided Radiation Therapy (SGRT) compare to traditional tattoo-based positioning in terms of translational shift accuracy?'

Methodology...

Inclusion criteria:

- Patients receiving radical thorax treatment.
- Imaged daily using the local departmental protocol of CBCT with daily error correction.
- Standard immobilisation devices used including a wingstep and knee rest

Patient selection:

- 10 patients were consecutively selected from each group

Data collection:

- Translational shifts were collected retrospectively from the Mosaiq software.
- 262 CBCT images were included from the tattoo group, 258 images included from the SGRT group

CBCT applied shift...

CBCT images were matched by different therapeutic radiographers in both groups.

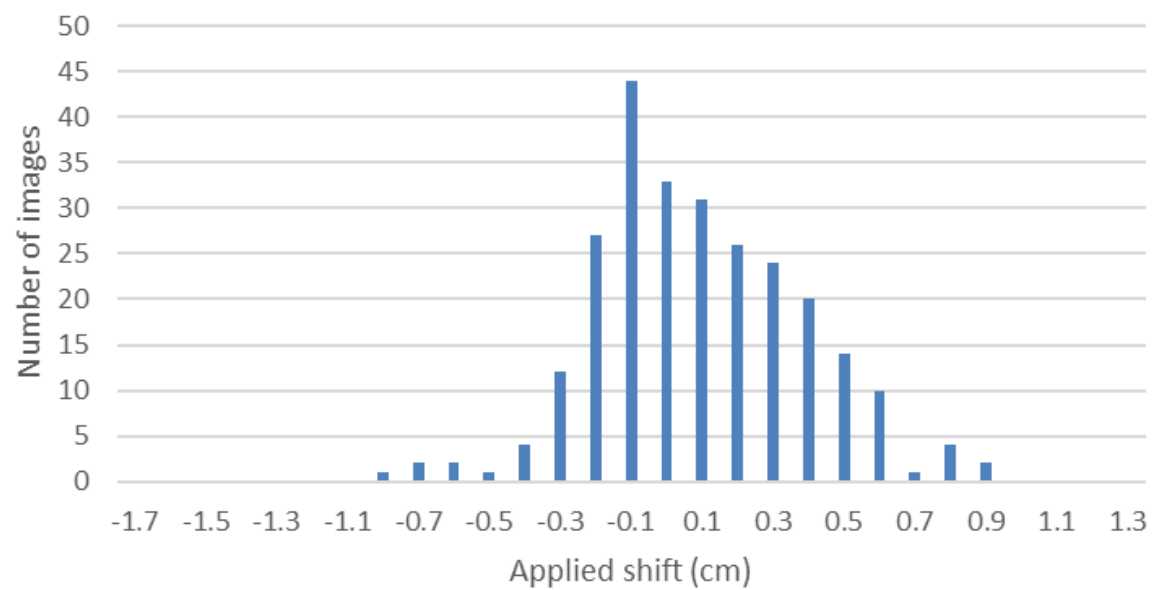
An online and offline match was completed, and the online values were used in the data collection.

We do not have any 6 degree of freedom couches

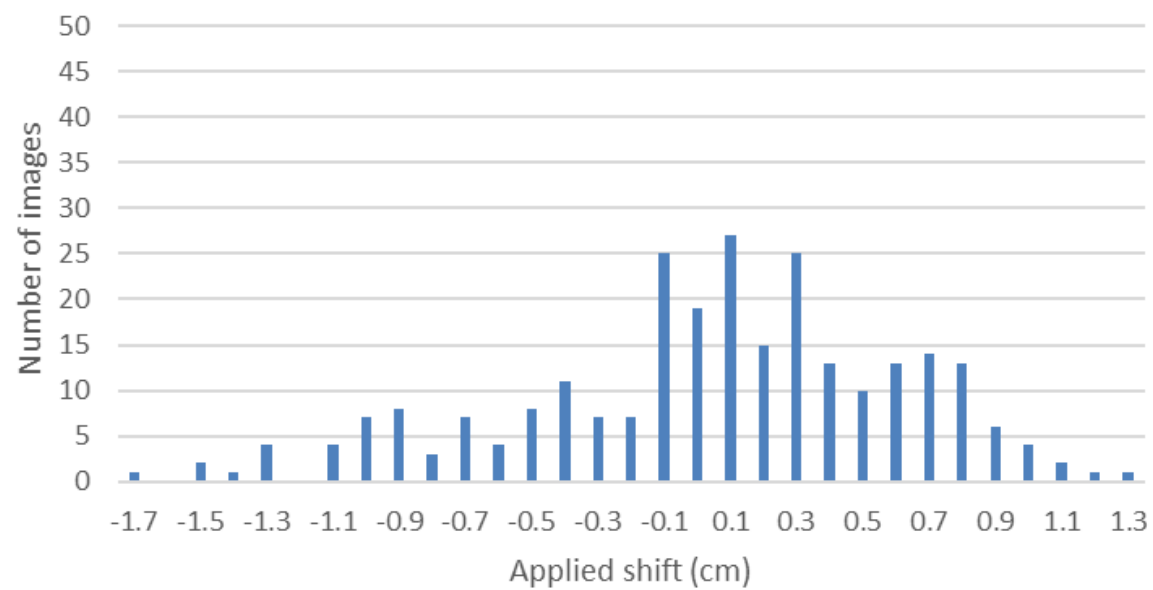
Results...



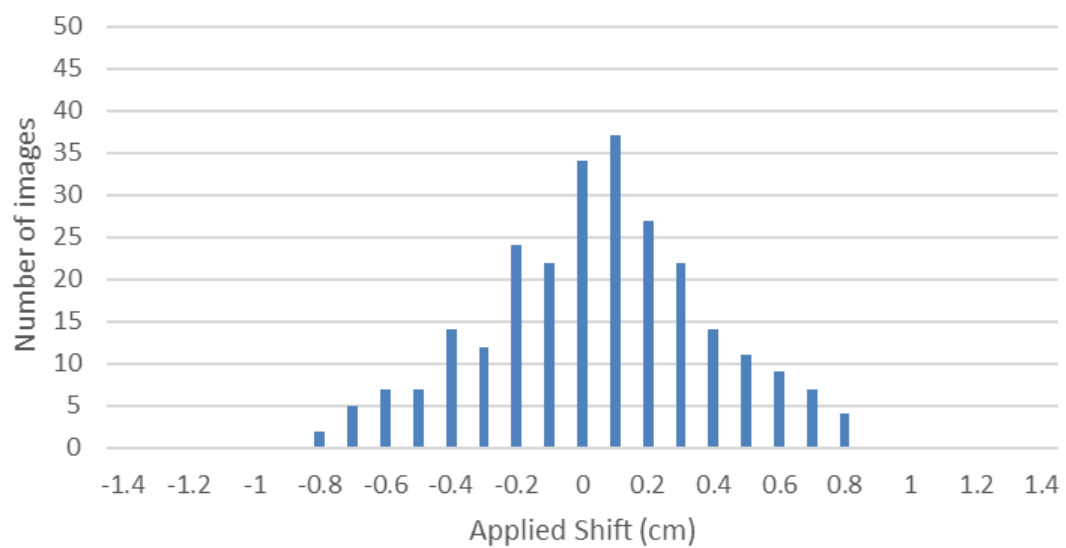
Lateral applied shifts - SGRT



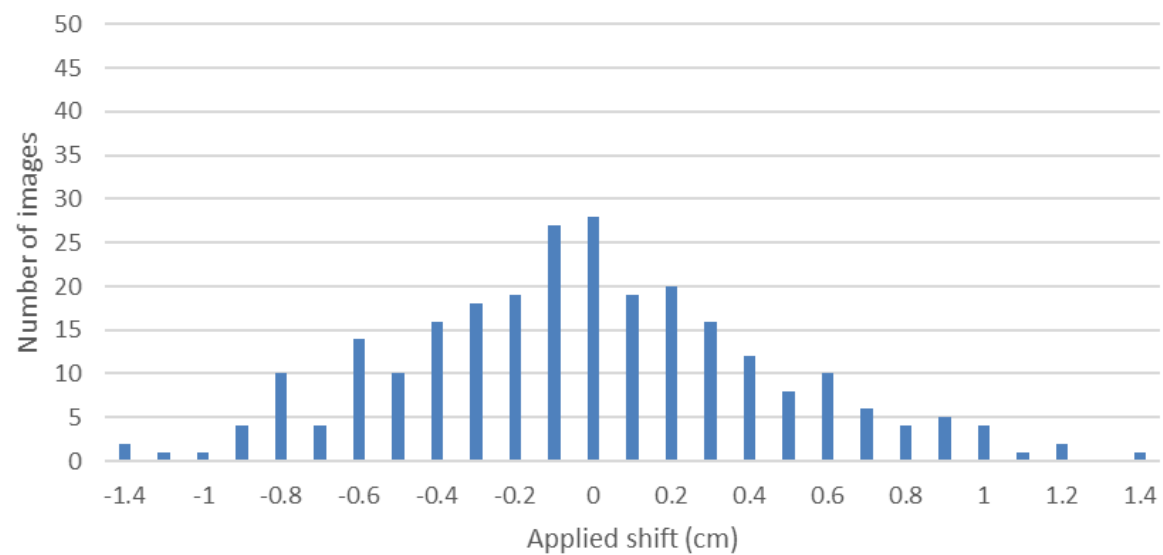
Lateral applied shifts - Tattoo



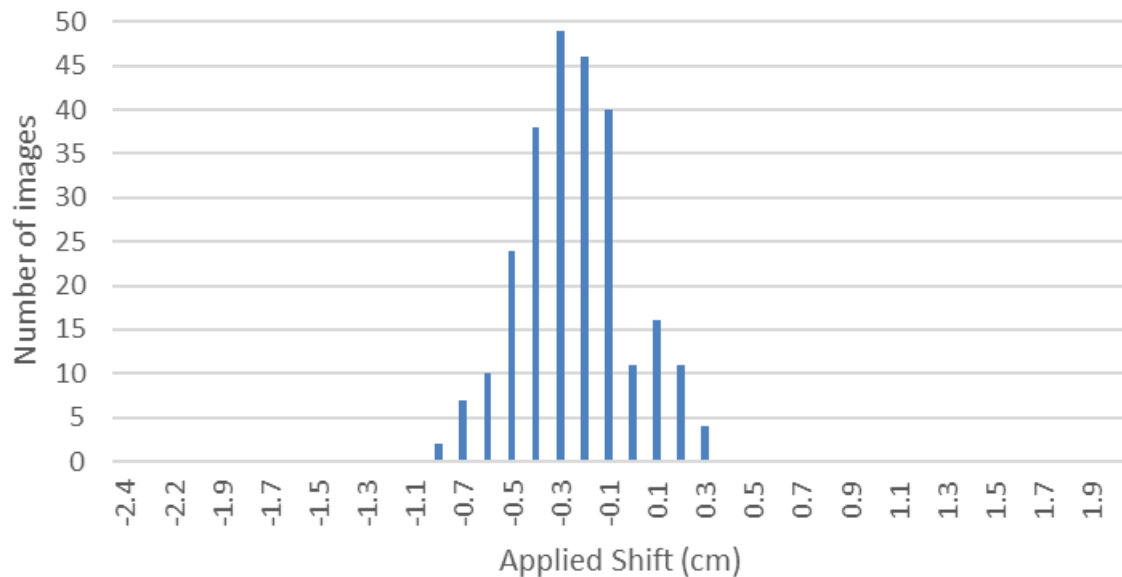
Superior/Inferior Applied Shift - SGRT



Superior/Inferior Applied Shift - Tattoo

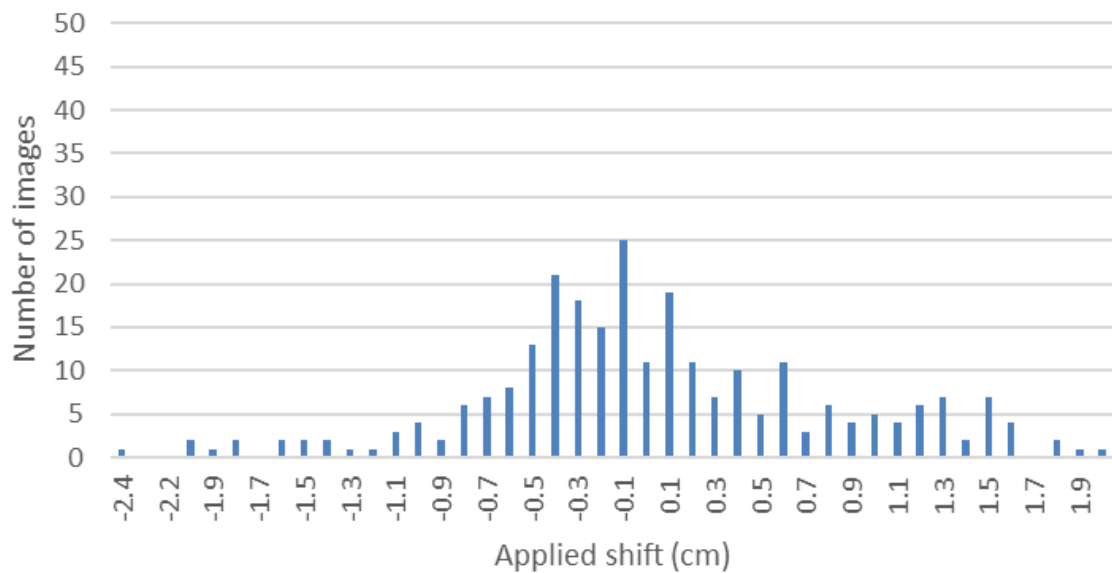


Anterior/Posterior Applied Shift - SGRT



- **69%** of images in the SGRT group had a vertical displacement of 3mm or less as opposed to **40%** in the tattoo based set up.
- The key finding from the study was that the vertical accuracy was improved with the SGRT set ups. This was a statistically significant result with a p-value of >0.05 .

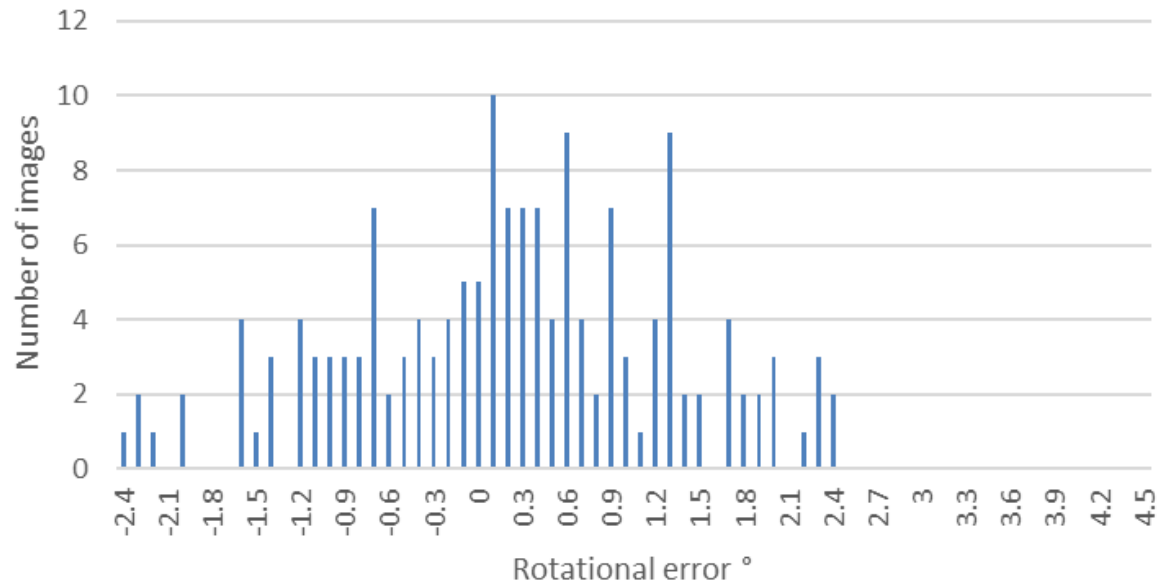
Anterior/Posterior Applied Shift - Tattoo



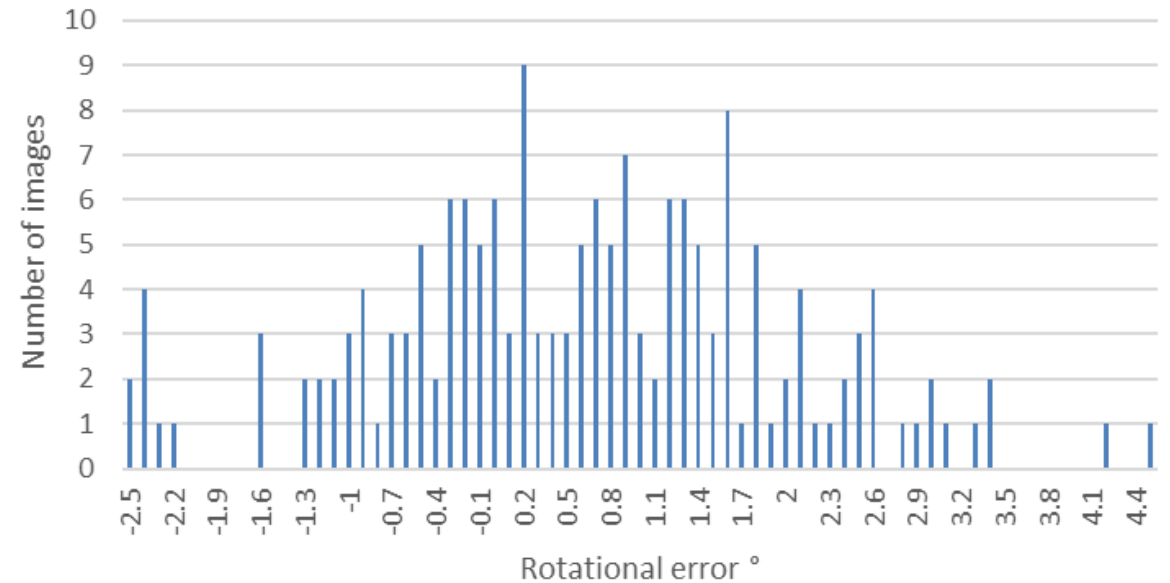
Rotational error...

- No significance in sagittal or coronal displacements.
- A statistically significant result for transverse rotational error with a p-value of >0.03

Transverse rotational error SGRT



Transverse rotational error Tattoo



Findings....

The findings from this study evidence that SGRT can be more accurate than tattoos for thorax set ups

This has meant:

- Less random error and more accuracy across all directions with the SGRT set up
- Less time applied to completing systematic trend corrections

Limitations of the study:

- Small cohort of patients

For our patients:

- Less chance of repeat imaging with almost no gross error
- Set ups are more efficient and less invasive, patients are moved less
- No tattoos
- Continuous monitoring

Future directions...

- Recapturing the patients' surface in the first week of treatment
- Time audit
- Cost effectiveness
- SABR - 15% decrease in concomitant imaging dose – continue to collect data (we don't treat many SABR patients currently)
- Staff learning
- Larger studies - this could provide stronger evidence and has the potential to minimise margins in radiotherapy



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- Thank you and questions

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