

# INVESTIGATING THE CORRELATION BETWEEN SURFACE AND BONY ANATOMY USING 3D SURFACE AND PORTAL IMAGING

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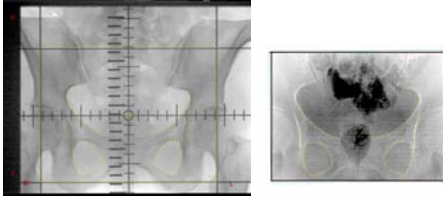
## Purpose/Objective:

This study investigates the relationship between 3D surface contours and internal bony anatomy in order to assess the use of surface imaging for patient set-up and position verification.

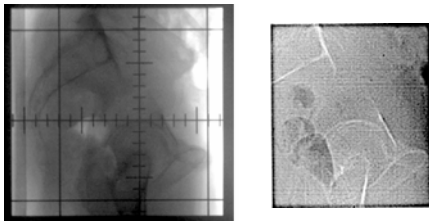
## Materials/ Methods:

A group of pelvic patients were studied throughout the duration of respective courses of radical EBRT. All of the study group were positioned by aligning skin tattoos with lasers, and were treated using a Varian 2100CD Linac.

1. Following set-up, AP and RT lat portal images ('PI's) were taken using a Varian EPID.

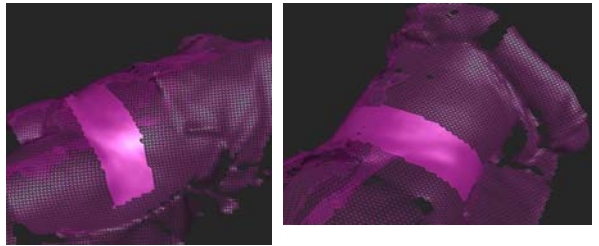


2. For each treatment fraction, the PIs were matched to the simulator reference using a Varian 'Vision' Portal Image workstation. The rotation and translation errors that were output were combined into a single PI error factor ('PIEF').



Normalised Portal image error factor

3. A 3D surface image was also captured using AlignRT, a real-time 3D surface imaging system



4. For each patient, the treatment surface with the minimum corresponding PI error was chosen as a reference and a region of interest ('ROI') was selected on the surface around the treatment isocentre, with care being taken to restrict the ROI to relatively rigid and stable anatomical areas. Surface data from all other fractions were projected to the reference ROI and the corresponding mean of the absolute projected distances, for each fraction, was computed.

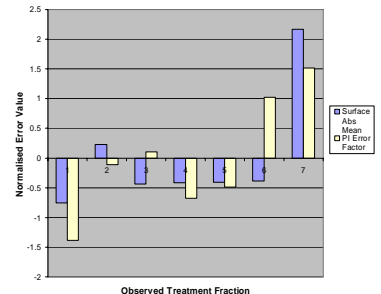
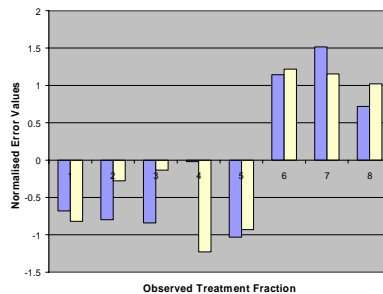
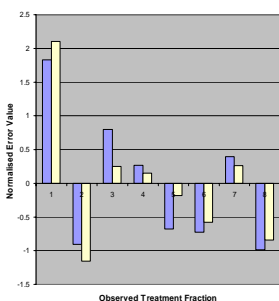
Normalised surface ROI projection errors (Abs Mean & RMS)

The Correlation Factor between these values was then computed

## Results:

Correlation factors between the PIEF and surface ROI projection errors were computed for each patient. The correlation between the PIEF and surface absolute mean ranged from 0.72 to 0.95 (-1.0 to +1.0) with a mean of 0.80 and SD of 0.09. The correlation between the PIEF and surface RMS ranged from 0.46 to 0.91 with a mean of 0.77 and SD of 0.18. The graphs below show the results of the computed errors (PIEF & Abs Mean) for three of the patients.

Overall Correlation	Abs Mean	RMS
Mean	0.80	0.77
SD	0.09	0.18
Min	0.72	0.46
Max	0.95	0.91



## Conclusions:

The above results suggest a strong correlation between relatively rigid regions of skin surface, as computed by AlignRT, and bony anatomy detected via portal imaging. Further work is ongoing to corroborate this trend on a broader range of patients. In addition, work is planned to explore to what extent using surface imaging during patient set-up may help to reduce portal image derived systematic and random set-up errors.