Comparison between CT and Orthogonal Based Calculation of ICRU Rectal and Bladder Doses During Intracavity Brachytherapy for Cervix Cancer- Are Orthogonal Films now Obsolete?

Alison Cameron[1], Helen Coomber[2], Chris French[2], Paul Cornes[1]

[1]Oncology Department, Bristol Haematology Oncology Centre (BHOC), UK;
[2]Radiotherapy Physics Unit, BHOC, UK

Email: alison.cameron@ubht.nhs.uk

Method

Treatment of cervix cancer with radical primary radiotherapy includes intrauterine brachytherapy using a single intrauterine tube and 2 vaginal colpostats. All patients between 17/06/2005-28/04/2006, on their first intracavity treatment, had a CT scan of the pelvis at 2mm slice intervals and digitalised A-P and lateral films taken. Standard plans were applied to these images, with the dose defined at point A, using the Varian brachytherapy planning system (BrachyVision). ICRU-38 Rectal and Bladder points were identified and doses at these points recorded. The paired t-test was used to determine if there was a statistically significant difference between the doses calculated in an individual patient using CT or orthogonal imaging.

Results

24 patients were analysed. For the ICRU rectal point the mean dose difference was 4.02% (1.43-6.60%; $p<0.01$) between CT and orthogonal based calculations of dose. Similarly the ICRU bladder point mean dose difference was 3.81% (1.48-6.15%; $p<0.01$).

	Mean Difference Dose (%)	Standard Error of Mean	Significance level
ICRU Rectal Point	4.02%	1.29	$p<0.01$
ICRU Bladder Point	3.81%	1.17	$p<0.01$

Fig 1 Lateral x-ray with applicators in-situ to demonstrate the ICRU Rectal and Bladder Points

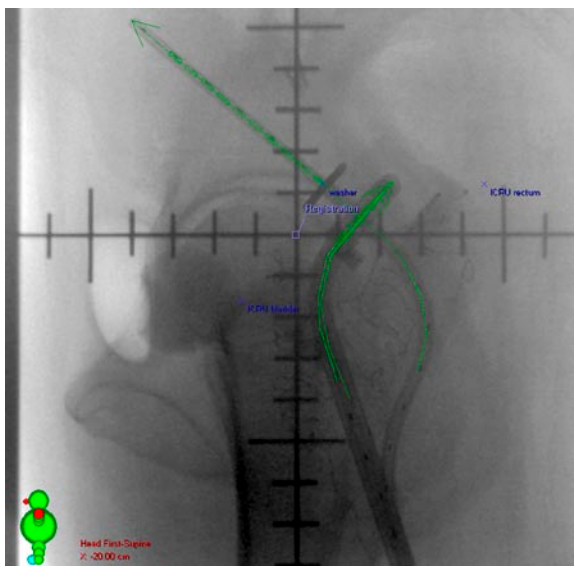


Fig 2 Axial CT scan at level of external cervical os to demonstrate the ICRU Rectal point

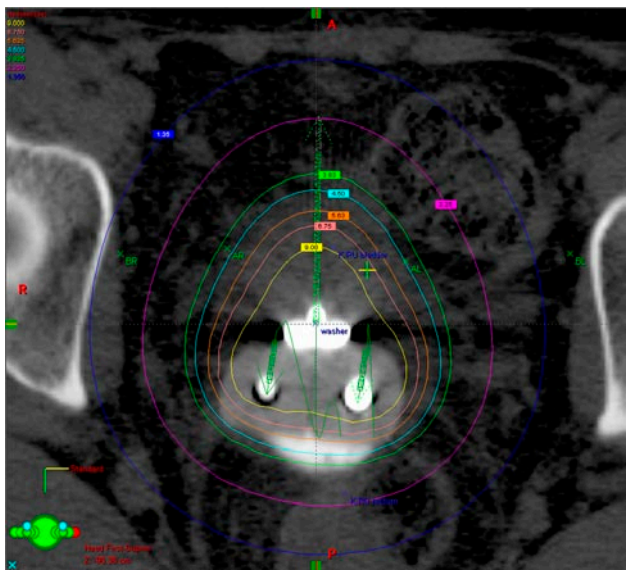
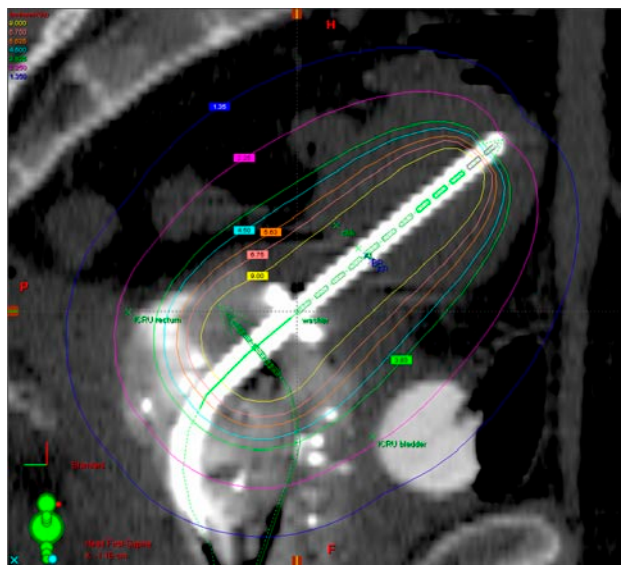


Fig 3 Sagittal CT scan though centre of applicator to demonstrate both ICRU Rectal and Bladder Points



Conclusion

There is a statistically significant difference between ICRU rectal and bladder doses when calculated with CT or orthogonal imaging of about 4%. We believe that for some patients this is potentially clinically significant too. Approximately 6% of patients receiving radical radiotherapy for cervix cancer, despite being within dose constraints for ICRU bladder and rectal points, develop serious bowel or bladder toxicity. It is possible that some of this toxicity may be due to the inaccuracy in measurement of the ICRU bladder and rectal point from orthogonal images as documented in this report.

In addition, many centres are developing their brachytherapy services and introducing 3D planning. ESTRO guidelines mandate that doses to the ICRU bladder and rectal points should continue to be recorded as well as volumetric data. Centres need to be aware that changing to 3D estimation of these points may result in a clinically significant change in dose to these points; each centre may need to repeat this study with their planning system during the transition period.

United Bristol Healthcare NHS Trust