Methods and materials: 3D Cheetaflex material (bolus) was examined both in a water tank and with CIRS anthropomorphic phantom, performing an end-to-end test. In water tank, a GafChromic EBT3-V3 film was oriented perpendicular to the source axis obtaining percentage depth dose (PDD) from 7 mm to 30 mm of distance from the source, with and without a bolus 5 mm thick. Two films were oriented parallel to the source at 5 mm and 15 mm of distance and results were compared with TG-43 implemented on Oncentra® Brachy treatment planning system (TPS). A set of CT images of CIRS phantom was acquired and a bolus with 7 trajectories (1 cm interdistance and 5mm from skin) was created. A new CT set of images with bolus and phantom was imported on TPS where a target was defined and a dose plan was created. Plan was delivered with two films positioned between two different slabs of phantom, at reciprocal distance of 2 cm, orientated perpendicularly to the source axis.

Results: PDDs show a maximum difference of 4.7% (average 2.2%). At 5 mm and at 15 mm, the gamma pass rate is 100% with tolerance 3%/2 mm DTA. Results of films placed intra-slabs show a high pass rate (>96%) with tolerances of 2% dose and 1mm DTA.

Conclusion: 3D material investigated is water equivalent at Ir-192 energies and is suitable for superficial brachytherapy.

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Young Investigator Grant – 2018 Grantee 15:45 – 16:05

The development of high quality training program for real tine trans rectal ultrasound low dose rate (LDR) prostate brachytherapy

Andrea J. Doyle [a], Deirdre M. King [b], Frank J. Sullivan [c,d], Dervil Cody [a], Jacinta E. Browne [e]

[a] *School of Physics, Medical Ultrasound Physics and Technology Group, Centre for Industrial & Engineering Optics, FOCAS, Technological University Dublin, Ireland*
[b] *Blackrock Clinic, Dublin, Ireland*
[c] *Hermitage Medical Clinic, Dublin, Ireland*
[d] *Prostate Cancer Institute, National University of Ireland, Galway, Ireland*
[e] *Department of Radiology, Mayo Clinic, Rochester, MN, USA*

Although ultrasound forms a critical component of transrectal ultrasound image guided brachytherapy for prostate cancer, ultrasound training is not required as part of radiation oncology training programs, nor does any objective competency measure exist to independently assess clinical performance [1]. Physical simulation training and objective clinical competency testing can provide a structured approach to training [2], but only if suitably challenging training devices are available which replicate the complex anatomy of the male pelvis and prostate. This study describes the iterative process in the development of a range of training devices which simulate both the anthropomorphic and sonographic characteristics of the different presentations of patient specific prostate cancer. The design of the clinical features involved selection of patient cases and then rapid prototyping the different anatomical features and inverse casting these features in tissue mimicking materials (TMM). Novel TMMs were developed that had the sonographic appearance of the prostate and overlying tissues, as well as having the relevant mechanical compliance to give the training devices required haptic feedback. These devices will be used in the development of a training programme and will complement the learner's development of the specific skills required for the procedure. The use of training strategies such as gamification allows trainees to track their own performance over time as well as relative to their peers; thereby, providing a structured and competitive approach to learning. The 3D prototyped clinical features in these devices provided a more clinically-relevant representation of the procedure, thus providing a more efficacious training opportunity.

References

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Joint Session 16:05 – 17:00

Radiation dosimetry across a variety of CBCT devices in radiology

Emer Kenny, David Caldwell, Mandy Lewis

Mater Misericordiae University Hospital, Ireland

Cone beam technology offers fast diagnosis at the point of care and is becoming more prominent in Radiology departments. Currently in our hospital we have an extremity CT, an O-arm and a number of C-arms offering 3D capabilities. Each of these modalities use wide cone beam CT technology to image the area of interest in one single rotation. Traditional CTDI metrics for radiation dosimetry in CT depend on a narrow beam geometry. Hence, the relevance of the CTDI as a dose indicator for wide beam scanning, which can be up to 400 mm for CBCT scans, has come under question due to underestimation of dose lying outside the 100 mm chamber length and CTDI phantoms being of insufficient length to achieve scatter equilibrium. In an attempt to better quantify the dose from wide-beam scanning, alternative methodologies have been developed which attempt to counter the limitations of the CTDI methodology. For the systems in our hospital, different manufacturers have stated a dose metric as either CTDI or DAP without noting the methodology used to calculate their measurements. In this study we utilised the CBCT methodology outlined in the IAEA Report 5. This method was chosen it is uses a standard CTDI dose phantom and pencil chamber, both of which are typically available to a diagnostic imaging physicist. Here we discuss our CBCT dose results together with the issues we faced in attempting to develop a common CBCT measurement protocol for our hospital. The measured results are compared to manufacturer's stated values, where available.

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EPA funded radon research in Ireland and its impact on the National Radon Control Strategy

Mark Foley [a], Stephanie Long [b], David Fenton [b], Le Chi Hung [c], Jamie Goggins [c], Marta Fuente [c]

[a] *National University of Ireland, Galway, Ireland*
[b] *Office of Radiological Protection, EPA, Ireland*
[c] *National University of Ireland, Galway, Ireland*

Radon is a radioactive gas formed in the ground by the radioactive decay of uranium which is present in all rocks and soils. It is