BHPA 2020 abstract submission form

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I. Author information

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II. Abstract information

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Beldart, SBRT, VMAT, dose verification, EPR dosimetry, film dosimetry, mailed auditing

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BELdART-SBRT: a national mailed audit program for Lung SBRT

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Introduction

NuTeC is developing a mailed audit program for lung SBRT using a combination of radiochromic film and alanine/EPR dosimetry. The project is supported by the Belgian College of Radiation Oncology and FOD healthcare.

Material and methods

The audit program features the IMRT Virtual Water Dose Verification Phantom (Standard Imaging Inc., Middleton, Wi, USA) containing a set of lung inserts and a bone equivalent plug for the spine. Films can be placed in the coronal orientation. The lung inserts are modified with a 3D printed PLA box with 20% infill containing an imprint derived from a patient contour and filled with a silicone mixture simulating tumour tissue. The small box also contains a hole for an alanine pellet in the centre of the contour. The phantom contains film/alanine detectors through the centre of the tumour. The film detectors are large enough to encompass different tissues (e.g. tumour, lung, soft tissue). Another film piece is placed on top of the lungs, which is an interface region. End-To-End (E2E) tests were performed with different TPS' to observe the audit procedure. The films were evaluated with gamma analysis [1] using the 5%/1mm criteria with global normalization and 10 % threshold.

Results

Table 1 and Table 2 show the alanine and film results respectively. In two cases, the measured dose was > 3% than calculated. The film results show that the deviations are observed at the interface regions (predominantly at the border of the tumour), which is expected. For the test using the Monte Carlo algorithm, the passing rate is very low for the film placed on top of the lungs. The placement of the film at the interface region seems to allow testing the handling of the TPS' of large non-uniformities.

Table 1: alanine results of the pellet placed in the centre of the tumour tissue.

Algorithm	D_{TPS}(Gy)	$D_{measured}$(Gy)	Unc. $D_{measured}$(%)	δ (%)
CCC	20.475	21.175	0.827	3.306
Monte Carlo	20.641	21.708	0.826	4.915
Convolution-Superposition	18.157	18.298	0.839	0.771
CCC	20.602	20.951	0.706	1.662
AAA	22.272	22.436	0.832	0.730

Table 2: Film results using gamma analysis with 5%/1mm criteria.

	Gamma evaluation passing rate (5%/1mm TH = 10%)	
	Above lungs	**Through tumour**
CCC	99.92	98.71
Monte Carlo	71.6	97.16
Convolution-superposition	99.93	98.09
CCC	99.83	99.25
AAA	99.38	97.02

Conclusion

The tests show promising results for the SBRT audits in evaluating the dosimetric accuracy. The audit program is very close to being launched.

Acknowledgements and potential conflicts of interest

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No conflict of interest.

References

[1] Low, William, Harms, Mutic and Purdy, A technique for the quantitative evaluation of dose distributions, Med. Phys. 25(5), March 1998.