

Evaluation of the angular accuracy influence over Octavius4D results for VMAT pre-treatment QA

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Purpose

Following the detection of an anomaly on Octavius4D pre-treatment QA results for some patients, an investigation to determine its origin was conducted. A problem was found on the angular measurements performed by the inclinometer.

The aim of this work is to study the influence of the angular accuracy on Octavius4D results and the ability of the Octavius4D system to detect angular deviations.

Methods

Measurements were performed using Octavius4D modular system and analysed using Verisoft 7.0 (PTW-Freiburg, Freiburg, Germany).

Measurements performed using the malfunctioning inclinometer for 61 patients undergoing VMAT treatments were compared with the same measurements carried out using a new inclinometer. Two different locations were analysed: 40 prostates and 21 pelvises (15 of them were prostates with SIB and 6 of them were gynaecologic pathologies).

3D gamma analysis was computed over the entire volume with acceptance criteria of 3% dose difference and 3mm distance to agreement. 2% - 2mm gamma test was also calculated. Dose differences were calculated referenced to the maximum dose in calculated volume and the threshold considered was 10% of the maximum dose.

The angular lectures of the inclinometer were obtained from .xcc raw files.

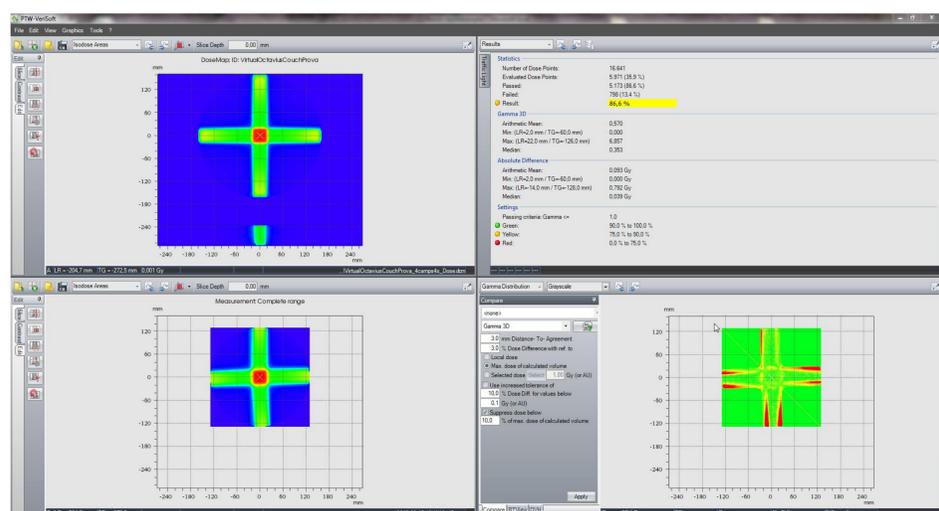


Figure 1

Results

Angle differences shown in the table correspond to the difference between the good inclinometer (new) and the malfunctioning one (old) when the gantry was at 180 degrees (where the greatest difference was observed) but they varied through the path of the gantry.

In several cases, the 3% - 3mm gamma criterion does not show any difference between measurements carried out using both inclinometers. The 2% - 2mm gamma criterion leads to a mean difference of 1.71% for prostates and 4.04% for pelvises.

In all cases, 3% - 3mm gamma passing rates (GPRs) were greater than 95%, making difficult to identify this problem by only applying this criterion.

It is observable a dependence of the results on the symmetry of the dose distribution. PTVs comprising only the prostate which are highly symmetrical had lesser variations than more complex treatments.

All results are summarized in Table 1.

The influence of the inclinometer lectures over the reconstruction of a 4-fields static treatment is shown in Figure 1.

Conclusions

2% dose difference and 2mm distance to agreement criterion showed better ability to find angular differences when performing gamma analysis for VMAT treatments. This can be potentially used to discover problems in gantry position but a further analysis must be performed.

		Mean	Std. Dev
Prostate	Angle diff. (°)	2.25	0.48
	Old 2%- 2mm GPR(%)	97.94	1.69
	New 2%- 2mm GPR (%)	99.65	0.24
	2%- 2mm GPR diff. (%)	1.71	1.59
	Old 3%- 3mm GPR (%)	99.77	0.32
	New 3%- 3mm GPR (%)	100.00	0.00
	3%- 3mm GPR diff. (%)	0.23	0.32
Pelvis	Angle diff. (°)	2.21	0.54
	Old 2%- 2mm GPR(%)	90.79	2.25
	New 2%- 2mm GPR (%)	94.83	1.93
	2%- 2mm GPR diff. (%)	4.04	2.34
	Old 3%- 3mm GPR (%)	98.40	0.64
	New 3%- 3mm GPR (%)	99.66	0.20
	3%- 3mm GPR diff. (%)	1.26	0.65

Table 1