Purpose/Objective: To assess the attenuation of the couch top and how to simulate it in VMAT treatments.

Materials and Methods: The analysis of the attenuation of the IGRT couch top in a Varian Clinac iX with 6 MV were made using a cylindrical phantom (ArcCheck® from Sun Nuclear) with a PTW31010 chamber in its center. Measurements were made for 6 MV and field sizes of 3cmx3cm, 5cmx5cm and 10cmx10cm. A CT of the table was performed to determine its geometry and detect possible inhomogeneities. A simple model of the couch top consisting on a layer of density 1 g/cm³ was introduced on a Pinnacle® 10000XL/PRO, Philips. The thickness of this layer was changed iteratively until the best agreement with the measurements was achieved. The model was tested in several VMAT plans using the gamma criteria as well as with the dose distribution estimated with Sun Nuclear 3DVH® software.

Results: In the conditions of the measurements, the attenuation of the couch was around 2.3% for the head position and 2.8% for the body position. The couch model, while simple, reproduced the measured attenuation for all the field sizes and gantry angles within 0.8%. A script was written to automatically include the couch model as a ROI on the CT images.

Gamma index metric in VMAT prostate and ORL treatments with the couch top model included in both the planning and the CT images of the ArcCheck phantom, showed good agreement (3%/3 mm better than 98% in most of the cases).

Conclusions: The table couch must be considered in any VMAT plan to get accurate results. The simple methodology followed in our hospital is exposed in this work, showing a good agreement with direct attenuation measurements as well as with dose distribution on patients.

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Commissioning of volumetric modulated arc therapy and patient QA with Octavius 2DArray and Gafchromic EBT3 films
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Purpose/Objective: To present preliminary tests and procedures we implemented for commissioning volumetric modulated arc therapy (VMAT) on a commercial linac (Synergy S with Beam Modulator MLC, Elekta) and to perform routine patient-specific QA dosimetry.

Materials and Methods: Commissioning tests included: evaluation of beam flatness and symmetry at variable dose rates, tests on the calibration of MLC position, and evaluation of the global rotational delivery accuracy during VMAT. Beam flatness and symmetry were tested measuring photon 6MV beam profiles with a 2D ion chamber array (Octavius Detector 729, PTW) inserted in an octagonal shape phantom (Octavius II, PTW) at the cardinal gantry angles, in directions both parallel (G-T) and perpendicular (A-B) to the gantry rotation axis. Dose rate was varied from approximately 600 MU/min down to 40 MU/min.

The MLC leaves calibration was investigated by irradiating a stripe ‘garden-fence’ test on a Gafchromic EBT3 film (ISP), at cardinal gantry angles. A 1cm x 16cm field was delivered from A to B, at 1 cm intervals across the field. Films were digitized by a flatbed professional scanner (Expression 10000XL/PRO, Epson). The dose profiles over adjacent segments were measured to detect potential leaf positioning errors (software PicodosePRO, Tecnologie Avanzate).

Global rotational delivery accuracy during VMAT was tested by measuring the absolute doses resulting from five fully-dynamic prescriptions (dose-rate, gantry, leaves). Measures were performed in one point with a ion chamber (PTW Farmer 0.6cc) inserted in the Octavius phantom and compared to TPS calculations.

Finally, 21 VMAT prostate treatment plans were generated on real CT scans (TPS Monaco, Elekta). Plans were copied-to-phantom and sent to linac record and verify (Mosaiq, Elekta), then verified with the 2D array in phantom and compared with the TPS dose calculation in coronal plane of isocentre via local gamma analysis (3%, 3-mm distance-to-agreement criteria, software Verisoft, PTW).

Five out of 21 plans were also verified with EBT3 films in Octavius phantom to be compared both with the 2D array measurements and with the TPS dose calculation; these evaluations are now in progress.

Results: Beam flatness and symmetry in the G-T direction resulted respectively within ±5% and ±2% at all dose rates, while in the A-B direction the beam is less flat and symmetric as the dose rate is below 100 MU/min.

Stripe tests on MLC leaf calibration showed variations in dose profile of about ±3% at the match lines and results were consistent between all gravitational conditions.

Measurements of VMAT global rotational delivery accuracy were consistent with TPS calculation within ±3%.

About patient-specific QA dosimetry, measurements showed a very good agreement with computed doses: indeed, the gamma passing-rate was > 95% for all plans (ex. in Fig.1).

Conclusions: Preliminary tests we performed so far showed that Octavius dosimetry system in combination with EBT3 Gafchromic films proved to be a fast, complete and reliable method for commissioning and QA of VMAT procedures.