index metric with 2%/2mm and 3%/3mm criteria was used in Film QA pro.

Results

Relative and absolute dose comparison was performed with 2%/2mm gamma analysis of 92, 85 and 86% for the main and the wing films respectively; increasing up to 98, 93 and 96% using conventional 3%/3mm criterion. Results are presented in Figure 2 with vertical and horizontal line profiles couple to an isodose map of the main film. Having high resolution data into two perpendicular planes in a cylindrical phantom is advantageous against the classical setup in a cubic slab phantom. It provides more information than a single film in a coronal plane and reflects a geometry closer to the anatomical region treated as recommended by the NCS report 28 [3].

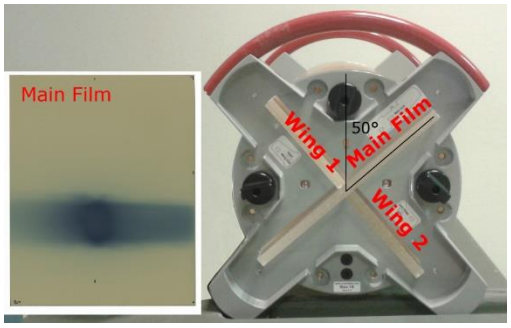

Figure 1. Adapted Delta4 phantom with film slabs. Left: Main film scanned image

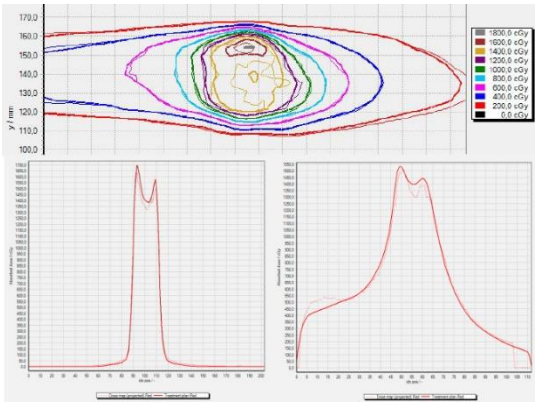

Figure 2. Film versus planned (solid line) isodose map and perpendicular dose profiles in the main plane

Conclusion

Pre-treatment QA for Lung SBRT VMAT based on EBT3 film inside the body of the Delta4 phantom is feasible. Advantages are high spatial resolution and two-plane dose information in a cylindrical phantom. Further evaluation for more cases and different prescription doses is necessary.

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[3] NCS Report 28-National Audit of Quality Assurance for Intensity Modulated Radiotherapy and Volumetric Modulated Arc Therapy- 2018

EP-1766 Application of Extended CT Scale and Metal Artefact Reduction Methods on Radiotherapy Planning

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Purpose or Objective

The main purpose was to investigate the effects of extended computed tomography (ECT) scale and single energy metal artifact reduction (SEMAR) algorithm on dose distribution during the use of metal implants in radiotherapy treatments using 3D-printed individualized phantoms.

Material and Methods

In this study, measurement was performed for both mandible and spinal titanium alloy implants. To evaluate the effect of these implants on real treatment case, three individualized phantoms were printed using MakerBot Replicator Z18 3D printer. In the first case, mandible implant was fixed to sawbone mandible model and it was placed inside of the individualized phantom. In the second and third case, two different spinal implants for C1-C3 and C4-C7 vertebra were instrumented to bone equivalent sawbone cervical vertebra model and these model were placed into the 3D-printed phantoms. CT scans of these phantoms were performed in two different step, with and without SEMAR methods, using Toshiba Aquilion LB CT simulator. In the treatment planning Varian Eclipse Version 7.1.3 TPS was used and measurement was performed on Varian Clinac DHX High Performance linear accelerator In the first case, IMRT plans were created for both standard CT Scale (from -1024 HU to 3071 HU) and ECT scale (from -1024 HU to 64.511 HU). In the second and third case, in addition to CT scale comparisons for 3D-CRT and IMRT techniques, effect of SEMAR methods on dose distribution were analyzed for 3D-CRT treatment plans. Measurements were performed with EBT3 gafchromic film and 5mm DTA/%5 DD criteria was used for gamma analysis criteria.

Results

In the first case, significant difference was not observed for SEMAR +/-, ECTS +/- since the implant used in the mandible phantom was thin and small so that it did not create dominant artifacts in the CT image. However, in C1-C3 and C4-C7 scenarios, it was observed that the ECT scale results were generally better (2-16% better) than SCT scale. When analyzing the gamma analysis data obtained for the planning of vertebral phantoms, no significant difference could be obtained from SEMAR +/- conditions.

Conclusion

in case of significant metal artefact, use of ECT scale can improve the dosimetric accuracy of treatment planning. However, in mandible implant dosimetrical differences were not found, since thin and small implants were prefferd in clinical use.

EP-1767 Validation and clinical use of a commercial Monte Carlo algorithm for Cyberknife patient-specific QA

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Purpose or Objective

To ensure safe dose delivery in radiotherapy, uncertainties and errors have to be minimized by an extended quality assurance (QA) protocol. An established part of this chain is pre-treatment verification of monitor units, which can be performed by an independent dose re-calculation. Especially for complex non-isocentric treatment plans as delivered by the Cyberknife with multi-leaf collimator (MLC), the traditional point-based MU verification does not suffice and a 3D dose recalculation is preferred for plan QA. The purpose of this work was to commission the first commercially available 3D Monte