Results: The test cases were reproduced experimentally and the reference measurements were performed with the LIAC mobile IORT accelerator. The proposed test cases have shown a good agreement between measured and calculated dose distributions (at the surface, at the build-up depth and in clinically relevant points corresponding to the isodoses of 90% and 80%) in all the experimental setups containing both horizontal and lateral inhomogeneities, as reported in the figure for the homogeneous phantom test case.

Conclusion: The developed tool allows independent validation of algorithms implemented within CSRAD® and MC for absolute dose calculations. The method can test patient-like geometries and more complicated setups.

EP-1574
EpiDream: “All-in-One” model for EPID based quality controls
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Purpose or Objective: Linac or pre-treatment quality control applications are now commonly based on electronic portal imaging device (EPID) acquisitions due to the high spatial resolution and the ease of use of this detector. Several commercial solutions are available depending on the application. Indeed, commercial algorithms assume the EPID grey level is related to the absorbed dose delivered by the treatment beam. This hypothesis leads to the introduction of correction factors depending on geometric and beam conditions. Consequently, those algorithms are dedicated to a specific application. The goal of our work was then to develop an algorithm able to convert an EPID image into an absorbed dose to water matrix from a single model by energy beam. The study compared our algorithm EpiDream to EpiDose (Sun Nuclear), a commercial solution for EPID dosimetry.

Material and Methods: Two 6MV beams produced by two Clinac (Varian) equipped with AS1000 EPID were included in this study. EpiDream model was based on a set of homogeneous calibration acquisitions to establish a relation between the grey level and the absorbed dose to water for each acquisition frame at a reference depth and a specific arm-backscatter correction. The algorithm yielded to dose to water matrices for all type of fields used in routine (homogeneous fluence, IMRT and VMAT) at 5cm depth in water. EpiDose models were generated for IMRT and VMAT pre-treatment quality controls, applying first the RT Plan to the acquired image to compute the EPID based dose matrix. EpiDream and Epidose models were compared for 14 VMAT and 19 IMRT (Eclipse V10) pre-treatment quality controls using gamma pass rates (3%, 3mm). Moreover, the robustness of both algorithms was evaluated first, using gamma pass rates (2%, 2mm) for homogeneous fluence beams and second, using a fake RT Plan to convert EPID images into absorbed dose.

Results: For the modulated plans, the g-comparison led to a very good agreement between both EPID based dose matrices. The success rate was respectively 98.5±2.4% and 98.0±1.7% for VMAT and IMRT fields. Using the same models, the homogeneous beams comparison showed large discrepancies, with a low gamma pass rate (86.6±2.1%). However, EpiDream presented a good agreement with Eclipse RT Dose matrices (97.1±1.2%). So, unlike EpiDose, EpiDream can be used for many controls with a single model. In addition, as EpiDose converted the image into dose using some data extracted from the RT Plan, a fake RTplan led to a large error in the dose matrix. EpiDream algorithm, only based on the acquired image provided correct dose matrix. Discrepancies between both models were high with a gamma pass rate equal to 89.7±5.7%.

Conclusion: The EpiDream solution allows us to perform the quality control tests for machine and patient in a single application. The independence of the model with the irradiation conditions, except beam energy, ensures computing more consistent absorbed dose matrices compared to other algorithms.

EP-1575
The effect of dental implants on dose distributions calculated by AXB in head and neck IMRT cases
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Purpose or Objective: Acuros XB (AXB) has been implemented and available commercially for clinical use for several years. Different authors have reviewed the algorithm and demonstrated that AXB shows superior performance in dose estimation accuracy. In some cases, patients may be implanted with high density materials, AXB solves the deterministic solution of linear Boltzmann transport equation, in which the Hounsfield unit and the type of material must be input in order to calculate the dose distribution. However, there are only a few studies to evaluate the effect of high density material on dose distribution by AXB, and clinical data is still lacking. Moreover, most of the clinicians may not know the material of the dental implants. The universal assignment of material for permanent high density dental implants may contribute an uncertainty to the dose calculation. Therefore, the current study aims to investigate the impact of dental implants on dose distributions calculated by AXB in Head and Neck (H&N) IMRT cases and hence provide clinical suggestion to unknown dental material assumption for planning.

Material and Methods: Three materials were evaluated, namely: titanium alloy, zirconia and stainless steel. 50 patients with dental implants and treated with H&N IMRT were evenly divided into two groups according to the location of implants. AXB was used to recalculate the dose distribution, originally computed using Analytic Anisotropic Algorithm (AAA). The dosimetric data among material models were compared statistically. In addition, the dose distribution calculated by AXB were verified with measurements of parallel plate ionization chamber, radioclinic films and Gamma analysis.

Results: There were no sig. differences (P>0.05) among material models in the Planning Target Volume (PTV)