Key MR-Guided RT QA Publications

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ArcCHECK®-MR

Clinical Experience of Patient-Specific QA for Online Adaptive Radiotherapy Using Elekta Unity MR-Linac

J Yang, et al., UT MD Anderson Cancer Center, Houston, TX, AAPM 2019

- Successfully used ArcCHECK-MR for Patient-Specific QA on 1.5T MR-Linac.

"Our patient-specific QA procedure ensured a safe delivery of online adaptive plan using the Unity MR Linac."

Measurement validation of treatment planning for a MR-Linac

X Chen, Dept of Radiation Oncology, Medical College of Wisconsin,
J Appl Clin Med Phys 2019:20:7:28-38

- Study using IC PROFILER-MR and ArcCHECK-MR to confirm that 1.5T Unity's MR affects were correctly accounted for in the TPS.
- ArcCHECK results were excellent, ~99% passing rates

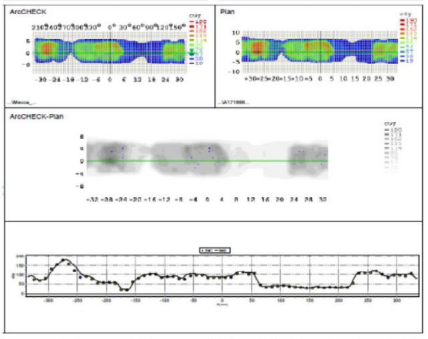


Fig. 7. A comparison of measured and calculated dose maps for an IMRT plan. Top left: Dose distribution of the QA plan on ArcCheck CT; Top right: Dose distributions on the patient CT; Bottom: Comparisons of doses measured (ArcCheck) and calculated (Plan) as analyzed with SNC Patient™.

First MR-Guided Online Adaptive Patient Treatment in North America On An In-Room High Field (1.5 T) MRI Linac

S Vedam, et al., MD Anderson Cancer Center, Houston, TX, AAPM 2019

- Used ArcCHECK-MR for Patient-Specific QA on first adaptive treatments on Elekta's new Unity 1.5T MR-Linac.

Comprehensive commissioning of MR-Linac online adaptive radiotherapy QA

O. Green, et al. Washington University School of Medicine, Radiation Oncology- Physics Division, Saint Louis, USA, ESTRO 2019

- Validated ArcCHECK-MR as part of a quality assurance process for online adaptive radiotherapy (ART) performed with a MRIdian MR-Linac.

"The complexity of online adaptation necessitates not only thorough commissioning but the establishment of on-going comprehensive quality assurance for each fraction that includes not only a phantom-less QA but also a method to ensure that all other components of the plan are accounted for and checked."

Performance of a cylindrical diode array for use in a 1.5 T MR-linac

Houweling A. et al., Physics in Medicine and Biology, 61(3) (2014)

- Study examining the performance characteristics of the ArcCHECK-MR in a transverse 1.5T magnetic field.

"The short term reproducibility, dose linearity, dose rate dependence, field size dependence, dose per pulse dependence and inter-diode variation of the ArcCHECK-MR diodes were not influenced by the presence of a 1.5 T magnetic field. Therefore, the ArcCHECK-MR can be used for QA of patient plans in the MR-linac."

No significant differences between the performance of the MR-linac and the clinical linac were observed.

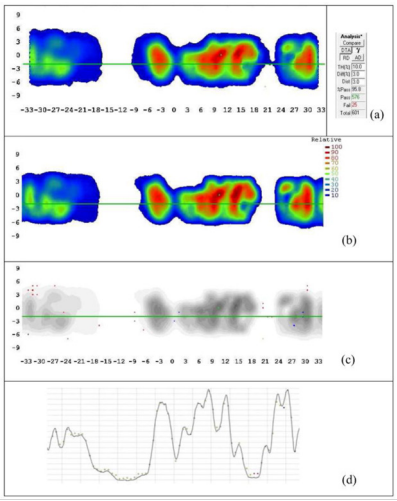
Patient-specific quality assurance for the delivery of (60)Co intensity modulated radiation therapy subject to a 0.35-T lateral magnetic field.

Li HH. et al., Int J Radiat Oncol Biol Phys, 91(1):65-72 (2015)

- This publication reviews a patient specific dosimetry quality assurance (QA) program for IMRT using ViewRay®, the first commercial magnetic resonance imaging-guided RT device.

Examines the use of ArcCHECK-MR as part of a patient-specific intensity modulated radiation therapy quality assurance (QA) program for ViewRay.

AC-MR measurements indicated the mean SD passing rate using 3% relative/3 mm gamma criteria was 98.9%.



IC PROFILER™-MR

Measurement validation of treatment planning for a MR-Linac

X Chen, Dept of Radiation Oncology, Medical College of Wisconsin, J Appl Clin Med Phys 2019:20:7:28-38

- Study using IC PROFILER-MR and ArcCHECK-MR to confirm that 1.5T Unity's MR affects were correctly accounted for in the TPS.

Performance of a multi-axis ionization chamber array in a 1.5 T magnetic field.

Smit K. et al., Physics in Medicine and Biology, 59(7) (2014)

- This publication investigates the performance of the IC PROFILERTM, a multi-axis ionization chamber array, in a 1.5 T magnetic field.

> *The linearity, reproducibility, pulse rate frequency dependence, panel orientation and ionization chamber shape are unaffected by the magnetic field.*
>
> *IC PROFILER™ dose profiles were compared with film dose profiles obtained simultaneously in the MR-linac. Deviation between the film and the IC PROFILER™ data was caused by the noise in the film, indicating correct performance of the IC PROFILER™ in the transverse 1.5 T magnetic field.*

The MD Anderson experience with 3D dosimetry and an MR-linac

Geoffrey S. Ibbott, Hannah J. Le and Yvonne Roe Department of Radiation Physics, UT MD Anderson Cancer Center, Houston, TX; 10th International Conference on 3D Radiation Dosimetry, IOP Conf. Series: Journal of Physics: Conf. Series1305 (2019) 012011k

- MRIdian publication on MR affects to beam; uses IC PROFILER-MR and ArcCHECK-MR.
- Shows good IC PROFILER-MR agreement when using MR-specific array calibration.
- On ArcCHECK-MR, user should use factory array calibration or perform the calibration on a standard (non-MR) linac until a similar MR-specific procedure is developed.

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