ABSTRACT SUBMISSION FORM

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6th MR in RT Symposium 2018

Name (First, last)	Emilia Persson
Mailing address (including province/state, country, postal/zip code)	Skåne University Hospital Klinikgatan 5 22185 Lund Sweden
Institution/organization	Department of Hematology, Oncology and Radiation Physics Skåne University Hospital
Position	Medical Physicist, PhD Student
Telephone (including country prefix)	+46(0)72-509 00 75
Email	Emilia.Persson@skane.se

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PRESENTATION TITLE

Clinical experience from MRI-only radiotherapy – pearls and pitfalls

AUTHOR(S)

Emilia Persson[1,2*]; Petra Ambolt[1]; Christian Gustafsson[1,2]; Joakim Nilsson[1]; Sven Bäck[1]; Silke Engelholm[1]; Lars E. Olsson[1,2]; Adalsteinn Gunnlaugsson[1]

[1]Department of Hematology, Oncology and Radiation Physics, Skåne University Hospital, Lund, Sweden
[2]Department of Medical Physics, Lund University, Malmö, Sweden

ABSTRACT

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Purpose:
The purpose of an MRI-only radiotherapy workflow is to eliminate image registration uncertainties and to exclude the CT therefore decreasing the workload and reducing costs. It may also present the possibility of reducing target volumes and improving adaptive MRI-based treatment strategies. To take full advantage of all the benefits, it is important to implement the technique in such a way that no new uncertainties or unnecessary tasks are introduced. This study aimed to safely implement MRI-only radiotherapy for prostate cancer patients and document potential pitfalls of the workflow.

Materials & Methods:
The MRI-only Prostate RadiOTherapy Excluding CT (MR-PROTECT) study is a prospective feasibility trial studying the MRI-only workflow. Twenty-eight patients have been included in the study. Using patient simulations, an adapted workflow was created. To safely implement this new technique, an initial QA program was integrated into the suggested workflow. An MRI-simulation (GE Discovery, 750w 3.0T) replaced the conventional CT-procedure. A treatment plan was created on a synthetic-CT (sCT, MriPlanner™, Spectronic Medical AB). A CT was acquired shortly after the MR examination, strictly used in the background for monitoring and evaluation of the implementation process. All decisions were based on the MRI-simulation information. The potential problems and pitfalls in the MRI-only workflow were identified and the QA program was continuously updated.

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Results:
27 of 28 patients successfully received an MRI-only treatment. One patient was excluded (too large for the desired FOV of the MR-scanner). The PTV mean dose difference was less than the chosen tolerance (1.0%) for 24 patients. The maximum difference was 1.1% (due to difference in the set up). The marker identification (100%) based on MR and patient positioning based on the identified marker coordinates were successfully performed for all patients.
Identified areas of attention included MR-scanner performance, thoroughly tested MRI-sequences, automatic checks of MR acquisition protocols and methods to minimise the risk for 'human errors" due to poor communication/documentation issues. The most commonly identified issue was related to patient size, showing the importance of having a technique which allows large FOVs, including the MR-scanner, dedicated coils and the sCT software.
The QA now includes e.g. large-FOV geometric tests, automated MR acquisition parameters checks, automatic plan parameter checks, sCT visual checks and digital checklists. In addition, QA-techniques for independent checks of marker identification and sCT have been developed (separate abstracts).

Conclusions:
We have identified a set of tasks to be performed to avoid the most common potential problems in an MRI-only workflow. By documentation and consistent QA program updates along with education, identified problems could be avoided and the CT could successfully be excluded for prostate patients. This is, to our knowledge, the first documented clinical implementation of an MRI-only workflow, performing every step and taking every decision on MR-data only, with an independent CT in the background. This makes a strong foundation for a safe delivery of MRI-only treatments in the future.
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