Clinical Implementation of EPIbeam Portal Dosimetry and Workflow Determination

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Introduction

EPIbeam is a web-based software that facilitates patient specific quality assurance (PSQA) through use of the EPID which provides an alternative to phantom-based QA. Current procedures employ MapCHECK 2 (MC2) and SRS MapCHECK (SRS MC) from SNC. Investigation of the utility of portal dosimetry and where it fits into the patient QA process. Investigation was performed over all plans for typical workflow.

Methods

Calibration followed EPIbeam's outlined procedure. Measurements were compared to the planned dose distribution using gamma criteria. Analysis defined as passing with ≥95% agreement at 3%/2mm for IMRT/VMAT and 2%/1mm for SRS/SRT/SBRT with 10% threshold criteria. Passing rates were compared to phantom-based measurements currently used in our workflow. This being MC2 with MapPHAN sleeve and SRS MC in StereoPHAN insert from SNC. EPIbeam's position in the workflow was determined by measurement logistics (e.g. target volume, off-iso delivery, single-iso multitarget, non-coplanar fields, etc.) and QA performance compared to phantom-based measurements for various categories of plans.

Discussion

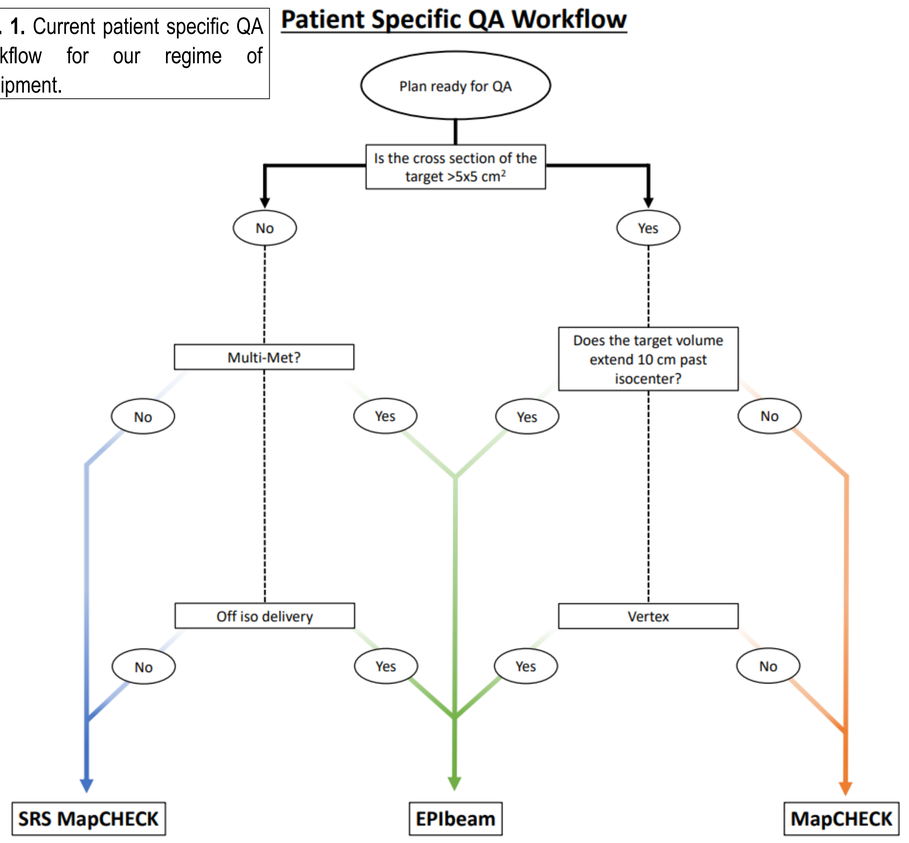
EPIbeam performed similar to the MC 2 device for IMRT/VMAT plans with 99.21% and 98.44% mean agreement respectively at 3%/2mm. However, the performance for stereotactic plans at 2%/1mm dropped notably. Mean agreement was 85.83% for EPIbeam, 91.39% for SRS MC, and 94.63% for MC 2. Based on recommendations from other sites using portal dosimetry, a tolerance of 2%/2mm for stereotactic plans was investigated. The same stereotactic plans had a mean agreement of 97.86% and 96.02% for EPIbeam and SRS MC respectively.

Conclusions

EPIbeam serves as another tool for patient specific QA. It can improve clinical efficiency by reducing setup time, particularly for QA measurements that require multiple shots or phantom shifts and automating aspects of data transfer. There is a vast increase in the amount of information gathered from EPIbeam due to the increased sensitivity and number of detectors. There is interest in investigating applicable passing criteria of 2%/2mm for stereotactic plans due to only three degrees of freedom in portal dosimetry versus six degrees of freedom with phantom-based measurements.

Results

Fig. 1. Current patient specific QA workflow for our regime of equipment.



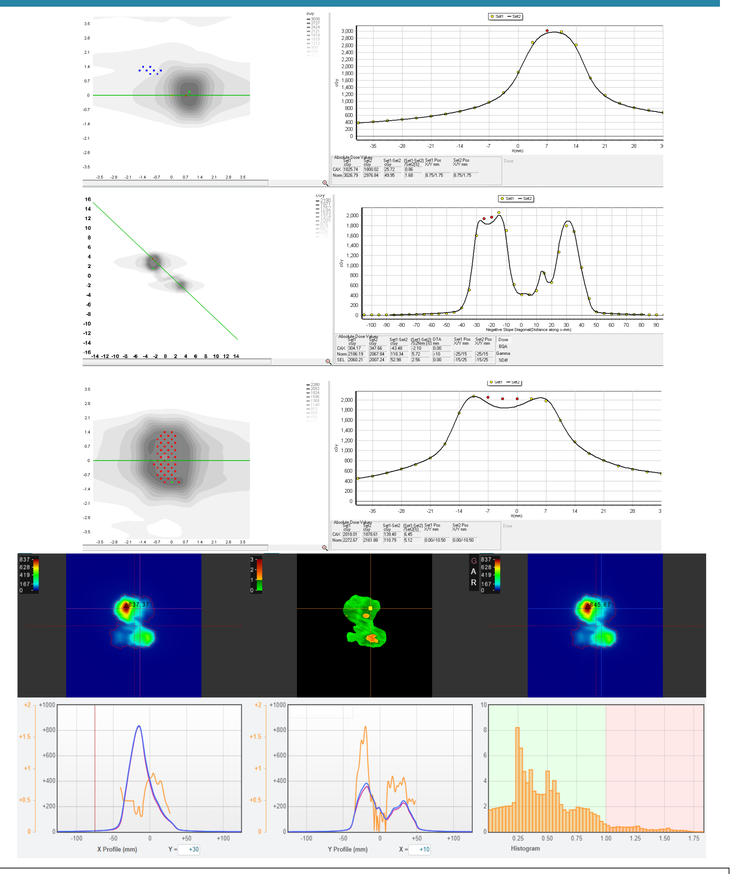
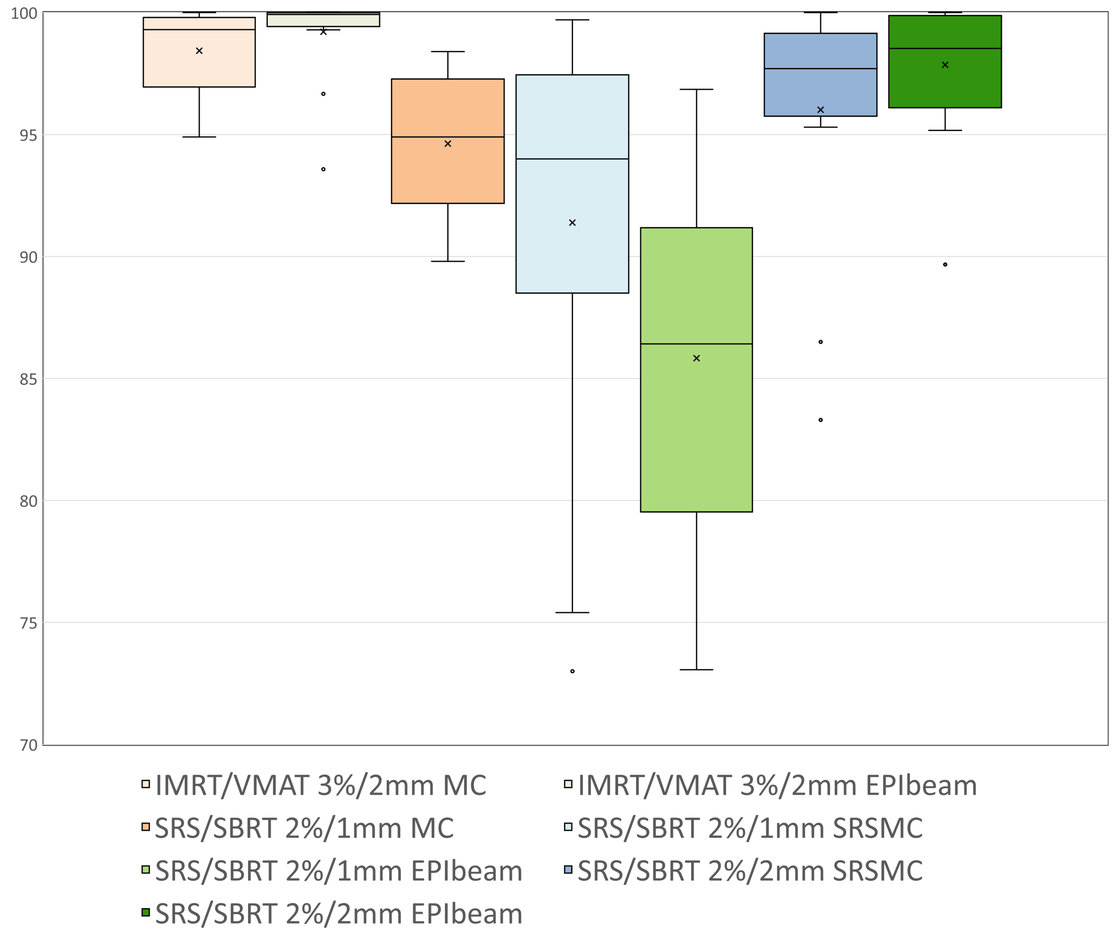


Fig. 2. Analysis for two metastatic lesions treated with a single isocenter. (A) SRS MapCHECK with appropriate shifts to center phantom inside each target. (B) MapCHECK in the coronal plane. (C) EPIbeam portal dosimetry. Planned distribution is displayed on the left and measured on the right. The center distribution illustrates the difference between the two datasets.

Fig. 3. Results from the three different criteria (3%/2mm, 2%/1mm, 2%/2mm) moving left to right for the three different devices (MC(orange), EPIbeam(green), SRS MC(blue)).



	Mean Passing %	Standard Deviation
IMRT/VMAT 3%/2mm MC	98.44%	±2.02
IMRT/VMAT 3%/2mm EPIbeam	99.21%	±1.87
SRS/SBRT 2%/1mm MC	94.63%	±2.58
SRS/SBRT 2%/1mm SRSMC	91.39%	±8.15
SRS/SBRT 2%/1mm EPIbeam	85.83%	±6.49
SRS/SBRT 2%/2mm SRSMC	96.02%	±4.98
SRS/SBRT 2%/2mm EPIbeam	97.86%	±2.86

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