**Conclusions:** Conventional criteria for accelerator QA have been implemented in a practical software tool. Furthermore, new concepts like relative flatness, relative symmetry and relative depth dose (RDD) as alternative for PDD are also available. For FFF-beams gamma analysis may be used to compare with baseline profiles. This approach can also be used for 2D-arrays. Flexible configuration makes the tool compliant with institution policies.

This tool, BistroMath, (http://bistromath.nl) can handle comparing data with stored reference data with a flexible this tool, BistroMath, (http://bistromath.nl) can handle comparing data with stored reference data with a flexible configuration makes the tool compliant with institution policies. For FFF-beams gamma analysis may be used to compare with baseline profiles. This approach can also be used for 2D-arrays. Flexible configuration makes the tool compliant with institution policies.

**Materials and Methods:** A hybrid LDR/HDR technique was developed, whereby LDR sources (I$^{125}$ seeds) were used as temporary implants for a delivery lasting 4 days. This treatment option provided lower long term morbidity, and better sparing of surrounding organs in comparison to a contemporary HDR delivery (I$^{192}$), external beam methods or surgery. The treatment involved the insertion of 6F plastic catheters in a HDR style implant, with the use of a custom made paediatric insertion template, which allowed a higher concentration of catheters and reduced the limitations of the smaller pubic arch on insertion. Fusion of ultrasound and CT was used as the imaging modality for the construction of the treatment plan. I$^{125}$ seeds were loaded into 4F catheters in a required arrangement to fulfil the plan, with the 4F catheters placed inside the 6F catheters to achieve the implant.

This study outlines the approach to the many challenges that needed to be overcome prior to attempting to deliver this novel technique: I$^{125}$ seeds of a higher activity than standard were required to deliver the prescribed dose within a four day treatment window. How can traditional seed implant software be used to calculate the delivered dose when calculations are performed as an extrapolation to infinite time? How can the dose calculations be verified independently? How many seeds would be required and what activity is needed? Could changes be made to the plan mid-delivery if inadequacies in the coverage were discovered? What are the safety implications for staff loading the higher activity seeds and for staff in the intensive care unit, where the delivery was performed?

**Results:** The team successfully delivered the treatment after fulfilling the requirements of the above challenges. 16 catheters were inserted into the patient, with 60 seeds of activity 4.40mCi each used in the treatment. 100 dummy seeds were initially loaded into the implanted catheters for CT imaging, giving the ability to see all possible locations for planning, from which 60 locations were selected. MRI scans were performed on day 2, in addition to daily X-rays, to ensure the integrity of the plan throughout the treatment. One adjustment to the plan was performed on day 2 of the treatment, with the movement of 5 seeds from high dose to low dose regions.

**Conclusions:** The team successfully resolved the challenges, despite this being a novel technique. The hybrid LDR/HDR brachytherapy technique was used to treat this particular patient. A protocol for the delivery of this technique for future cases is under development for use in Australian centres, where an appropriate team can be assembled.

**Materials and Methods:** 67 sliding window IMRT plans were measured using ArcCHECK (AC) and MapCHECK2 (MC) diode arrays (Sun Nuclear Corporation, Fl, USA). All MC measurements were performed at gantry 0° and water equivalent depth of 10 cm and 100 cm SDD. AC measurements were performed at the planned gantry angles.
with the AC set up as recommended by the manufacturer. All measurements were corrected for daily output variations. 3DVH software (Sun Nuclear Corporation, Fl, USA) was used to create a measurement guided 3D dose estimation in the patient’s planning CT. Plans were created in Eclipse TPS v11 using AAA and DVO v11.0.30 and delivered using a Varian 21iX linac (Varian Medical Systems, Ca, USA). The plans included both 6 and 10 MV photon energies and covered a range of treatment sites. The measured and planned 2D dose distributions were compared using a 2%G/2mm 2D gamma pass rate (GPR). The 3DVH and TPS 3D dose distributions were compared using a 2%G/2mm 3D GPR and DVH analysis for the PTV and OARs.

Results: AC and MC 2D GPRs are equivalent for plans with mean field area \(\leq 120 \text{ cm}^2\) (figure 1). However, after processing with 3DVH, calculated 3D GPRs for AC deteriorate significantly compared to MC, particularly for 10 MV plans. This is caused by the different processes involved in converting the AC and MC measurements to 3D dose distributions by 3DVH. For plans with a mean field area > 120 cm\(^2\) the 2D and 3D GPRs for AC are significantly worse than for MC. This may be due to the obliquity of the fields relative to the diodes at the edge of the array leading to shielding and directional dependence effects. The AC software does correct for these effects but our measurements suggest these corrections are not sufficient. Overall, MC based 3D dose estimations are in closer agreement with the TPS for all field sizes and energies.

Conclusions: For IMRT QA, ArcCHECK is not an ideal system for plans with field area > 120 cm\(^2\). For 3D dose estimation using 3DVH, the ArcCHECK performed significantly worse for 10 MV than for 6 MV plans. Overall, we found that the MapCHECK2 was more suitable than the ArcCHECK for 3D dose estimation using 3DVH.

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Evaluation of a dedicated brain metastases planning algorithm for radiosurgery: a new treatment paradigm
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Purpose/Objective: Stereotactic radiosurgery alone has become a popular treatment option in the management of patients with brain metastases. Multi- or single-isocenter dynamic conformal arcs (DCA) and volumetric modulated arc therapy (VMAT) are two common used delivery techniques. Recently, a dedicated inverse optimized brain metastases treatment planning solution using single isocenter multiple DCA has been developed, with intend to carefully balance normal tissue protection, target coverage and treatment speed. The purpose of the current study was to investigate the feasibility of this novel software and to benchmark it against well-established multi-isocenter DCA and single isocenter VMAT approaches.

Materials and Methods: Ten previously treated patients were selected representing a variable number of lesions, range of target sizes and shapes most frequently observed in the practice of SRS for brain metastases. Number of lesions ranged between 1 and 8. The original multi-isocenter DCA (MIDCA) treatment plans were replanned with both single-isocenter VMAT approach and the novel brain metastases tool (Elements, Brainlab AG, Germany). The treatment dose was 20 Gy at the 80% prescription isodose. For all the plans, the dose to the surrounding healthy brain tissue (brainstem, cochlea, optical nerve, eyes and lens) was optimized to minimize normal tissue complications. The plans were evaluated by calculation of Paddick conformity and gradient.