corporation VIRTUAL QA & DOSIMETRY SYMPOSIUM **CALA Poster Competition**

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ntroduction

The use of intensity-modulated techniques on radiosurgery has evolved, achieving high doses, great conformation, and precision. However, the increasing complexity highlights the need for Patient-Specific QA (PSQA). Currently, there are different tools to confront this challenge, and it is recommended to establish a methodology with acceptance criteria according to technical documents such as TG-218 and TG-101 [1; 2].

The purpose of this study is to assess different tools available on CEMENER for the PSQA of Stereotactic Radiosurgery (SRS) treatments, establishing a methodology.

Methods ------

For the measurements, an EPID Portal Imaging system, aS1200, the SRS-MapCheck® (SRS-MC) detector, and Gafchromic[™] EBT3 films are used. The last two must be used in conjunction with the StereoPhan[™] (Fig. 1). In previous works, the characterization, the acceptance, and commissioning of the systems were performed [3, 4].

Clinical cases were selected, and different plan complexity designed using Dynamic Arc (Dyn Arc), static gantry IMRT, and VMAT techniques. Applying the 3 PSQA systems, the performance was analyzed, and gamma index evaluated applying 3 criteria:

- \rightarrow Criterion 1: 1mm-3%;
- → Criterion 2: 1mm-5%; ≻ Threshold 10%, Global Normalization. Absolute Dose \rightarrow Criterion 3: 2mm-3%;

A statistical study and comparisons of the results were performed. A developed software (SD) was used which analyzes the distance between opposing leaves on the Multileaf Collimator, to recognize complex plan designs and deliveries.



→ Fig. 1: EPID aS1200 (left). SRS-MC inside StereoPhan™ (center). Gafchromic inside Stereophan™ (right).

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Patient- Specific QA commissioning for **Stereotactic Radiosurgery**



Fundación Centro de Medicina Nuclear y Molecular entre Ríos (CEMENER), Oro Verde, Argentina – ---- Results y Discussion -

All of those are presented as suitable for the PSQA in SRS, observed complex VMAT solutions presenting very small with a clear differentiation on EPID, in the use of time required.

Fig. 2 presents the percentage of points that meet all the criteria established for each clinical case. On the left are the results in EPID, in the center those of SRS-MC and on the right Gafchromic[™].

The 3 systems show proper performance on all systems evaluated. However, some results on EPID displayed a solutions required in SRS planning, incorporate assessment remarked different behavior compared to those obtained by tools for these situations, and investigate the calculation Gafchromic[™] or SRS-MC. The results of EPID have a model for small fields. It is also necessary to have greater number of points satisfying the criteria compared to measurement systems for the PSQA in SRS, which include GafchromicTM and SRS-MC. Analyzing the cases the calculation algorithm.



right Gafchromic[™].

Conclusions

The SRS-MC is the most appropriate tool for our service in SRS Patient-Specific QA. It is easy to use, instantaneous readings, and absolute dose measurement. It also allows us to evaluate the calculation algorithm itself, a relevant point in the obtained results. Tolerance and Action Limits were established with gamma passing rate of 95% applying criterion 1 and 2 respectively. During an evaluation period, both EPID and SRS-MC will be used for PSQA in SRS to improve the knowledge. Gafchromic[™] will be applied when TL is exceeded. Complex Plan design will be evaluated to avoid solutions required in VMAT as well as the performance of the calculation model.

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Table 1 lists the main features of the evaluated systems. qualitatively and using the developed software (Fig. 3), we segments.

> This behavior shows a probable issue in the calculation model. We may infer that in these cases the delivery is performed effectively, but the calculated dose on the patient do not. The EPID does not contemplate this situation since it uses a Portal Dose Image Prediction algorithm (PDIP).

> Based on results, there is an evident need to limit the







Description	EPID	EBT3 + STEREOPHAN™	SRS-MC + STEREOPHAN™
Туре	Perpendicular FbyF	True Composite	True Composite
Resolution	High	High	Media
Include Gtry/Cam/ MU	Partial	YES	YES
Absolute Dose	YES (*)	YES	YES
Algorithm Evaluation	NO	YES	YES
Dose close to patient	NO	YES	YES
Clinical interpretation	Media	High	High
Availability of result	Immediate	Late	Immediate
Complexity	Very Low	High	Low
Time Consuming	Very Low	High	Low

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Table 1: Comparison between measurement systems. (*) EPID evaluates Counting Units, not Absorbed dose.

--- References

1 - AAPM Report Task Group 218. "Tolerance limits and methodologies for IMRT measurement-based verification QA". Recommendations. 2017.

2 - AAPM Report Task Group 101. "Stereotactic body radiation therapy". 2010.

3 - N. Larragueta; "Caracterización del sistema SRS MapCheck[™] para control de calidad en Radiocirugía[™]. CALA Poster Competition.

4 - A. Mancuzzo; "Evaluación del Modelo EPID As1200 y puesta en funcionamiento de la dosimetría portal para diferentes energías de fotones". Tesis de Maestría. 2017.