

INTRODUCTION

Reflexion™ X1 is the first Biology guided Radiation Therapy (BgRT) machine which is capable of using real time positron emissions with the goal of delivering highly conformal radiation dose distributions around targets and organs at risk. A patient Plan QA program was developed to meet guidelines for IMRT, SBRT, and SRS pre-treatment QA. The Plan QA method developed at this time for the SNC ArcCHECK 4D Diode Array phantom with Multi-Plug accessory.

METHOD

Steps:

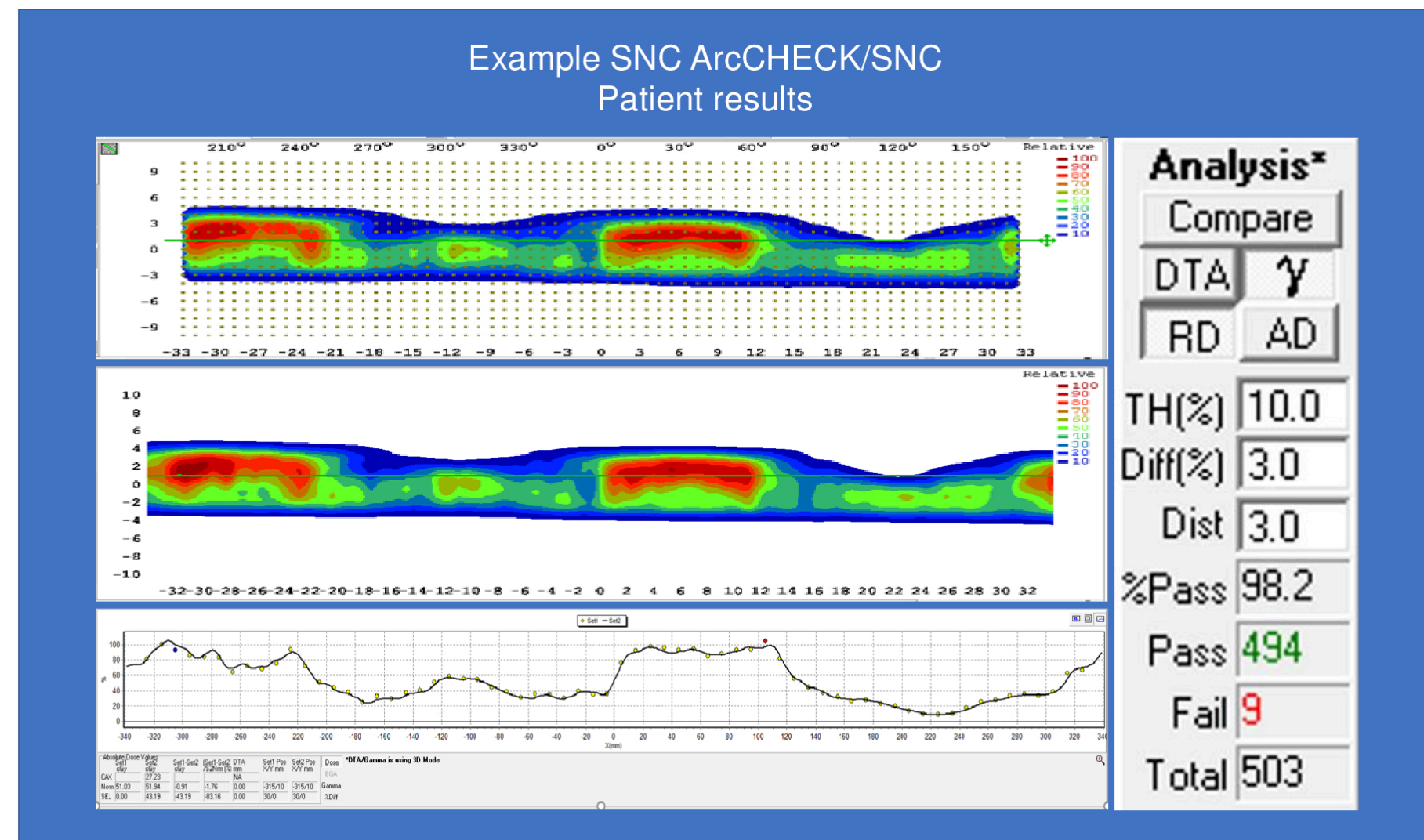
- 1) Create Patient Treatment Plan in Reflexion TPS.
- 2) Once complete, use the Reflexion TPS to generate a QA plan by forward projecting treatment plan fluence to SNC ArcCHECK planning CT.
- 3) In order to ensure ability to position ArcCHECK at center of PlanQA dose without causing bore-couch collision, plan fluence is rotated to position dose cloud along + IEC-Z axis. No other plan fluence changes introduced except gantry angle offset.
- 4) ArcCHECK is setup to lasers with MultiPlug Insert. Ion chamber may be optionally inserted for absolute point dose measurement.
- 5) Deliver QA Plan to ArcCHECK and record measurement with SNC Patient software.
- 6) Export QA RT Dose file and load into SNC Patient software.
- 7) Use SNC Patient to evaluate DTA and gamma criteria passing rates per recent industry guidelines, i.e. AAPM TG-218.

RESULTS

A set of plans were selected to evaluate the Reflexion PlanQA. These plans included several of the AAPM TG-119 commissioning validation plans, as well as several clinical plans developed by the City of Hope Medical Center using anonymized patient data for the Reflexion TPS.

Use of the SNC ArcCHECK, as a True Composite pre-treatment IMRT method, meets the recommendations of the AAPM TG-218 report.

Treatment Plan	Gamma Passing Criteria (3%/3 mm)
TG-119 – Prostate	98.2 %
TG-119 – Head & Neck	99.1 %
TG-119 – C-Shape	99.7 %
City of Hope – Lung SBRT	96.4 %
City of Hope - Prostate	99.9 %



AIM

Pre-treatment IMRT QA is an expected and important component of a safe, reliable clinical treatment QA program. Developing a PlanQA method for a new radiotherapy platform is essential for patient treatment. Due to distinct system aspects such as rapid gantry rotation (60 RPM), rapid beam delivery (100 Hz firing frequency), and small field sizes (as low as 10 mm x 6.25 mm), there are a number of challenges to tackle from a technology standpoint. The aim of this poster is to demonstrate that the PlanQA method for Reflexion's X1 system is effective and clinically relevant.

CONCLUSIONS

Pre-treatment IMRT QA for the Reflexion X1 using the PlanQA method developed meets commonly accepted clinical standards and tolerances for accuracy and safety.

ACKNOWLEDGEMENTS

We would like to thank City of Hope Medical Center for all their help with testing the clinical use of the Reflexion TPS, and Sun Nuclear for their continued support and engagement in developing a robust QA program.

REFERENCES

Miften, Moyed, et al. "Tolerance limits and methodologies for IMRT measurement-based verification QA: recommendations of AAPM Task Group No. 218." *Medical physics* 45.4 (2018): e53-e83.

CONTACT INFORMATION

Daniel Zaks - dzaks@reflexion.com