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ESTRO 2021

A Selection of Studies Featuring Sun Nuclear Solutions

Automated Machine QA Featuring SunCHECK™ Machine

PO-1720 SunCHECK Machine

SunCHECK Machine, an automated QA software solution: A centres 5 year experience evaluation

G. Martin, et al., The Clatterbridge Cancer Centre, Medical Physics, Liverpool, United Kingdom

- **"Purpose or Objective: Evaluate the key stages of the SunCHECK Machine implementation, including; initial viability, sensitivity testing, commissioning, long term use with 9 linacs and time saving quantification."**
- **"Materials and Methods:** Initial viability: Qualitatively compare the results of automated and manual analysis for MLC based QA only. Sensitivity testing: For a broader range of tests, performance was manually adjusted using independent methods to be outside of expected level/s…Long term use: The software has been used on 9 linacs for 1 year and now evaluated."
- "**Results**: Initial viability: A qualitative comparison of automated and manually analysed results showed good agreement and demonstrated a time saving benefit.
- "**Long Term use: For 12 months the platform has successfully completed all QA across 9 linacs, >95% without intervention.** Troubleshooting guides were produced for routine issues e.g. smooth profiles, adjust image registration, etc. SunCHECK Machine has enabled quantitative analysis of imaging tests where previous qualitative analysis was used."
- **"SunCHECK machine has saved 22hours and 43mins, per linac, per year…Conclusion: The platform provided significant efficiency and quality benefits to the department. The simplifications allow technicians to acquire and manage the QA, rather than physicists."**

Hear from the Author

Sunday, 29 August, 13:00 // Sun Nuclear Lunch Symposium, Rooms N107+108
Monday, 30 August, 10:05 // Sun Nuclear Booth #200

Clinical Experience with a Comprehensive & Automated Machine QA Platform
Greg Martin, M.S., Clatterbridge Cancer Centre, England

Machine QA Featuring IC PROFILER™

PO-1719 IC PROFILER

Incorporation of an agile test into the linacs QA to verify the beam focal spot

A. Garcia Sanz, et al., H.G.U. Gregorio Marañón, Servicio de Dosimetría y Radioprotección, Madrid, Spain

CT-to-Density Calibration QA Featuring Advanced Electron Density Phantom

PO-1569 Advanced Electron Density Phantom

Density calibrated cone-beam CT as a tool for adaptive radiotherapy

T.B. Nyeng, et al., Aarhus University Hospital, Department of Oncology, Section for Medical Physics, Aarhus, Denmark

- "Purpose or Objective…This study aims to investigate the accuracy of dose calculations on CBCTs for phantom and patient data, working towards automatic daily dose surveillance.
- "Materials and Methods: The HU to mass density calibration curves for eight Varian TrueBeam CBCT imagers were measured, using stoichiometric calibration. CBCT scans were acquired for a Gammex (Sun Nuclear) phantom simulating the head and neck (HN) or the pelvic region…"

Patient QA Featuring SunCHECK™ Patient – DoseCHECK™

PO-1904 DoseCHECK

Commissioning HyperArc for Single Targets including Benign Tumours

D. Egleston, R. Brass, The Clatterbridge Cancer Centre, Physics, Liverpool, United Kingdom

- **"Conclusion:** HyperArc™ is suitable for single-target SRS treatments for brain metastases, meningiomas, and acoustic neuromas, using reduced four arc geometries and normalising the prescription dose to 99% of the PTV as standard…DoseCHECK™, PDIP, and Octavius analysis verify dosimetric accuracy and plan deliverability."

PO-1841 DoseCHECK

Assessment of three software systems for the independent calculation of Eclipse HyperArc SRS plans

J. Calvo-Ortega, et al., hospital Quirónsalud Barcelona, Radiation Oncology, Barcelona, Spain

- **"Purpose or Objective:** To perform independent dosimetric check of Eclipse HyperArc (HA) SRS plans by using three different software, in the context of patient-specific quality assurance (PSQA).
- Materials and Methods: Fourteen HA SRS plans were included. Plans consisted of 4-5 non-coplanar VMAT arcs treating solitary lesions (3 cases) and multiple brain metastases with a single isocenter (11 cases, 2 to 35 targets per case). The target diameter ranged from 4 mm to 33 mm. Photon beams of 6 MV from a TrueBeam linac with a Millennium 120 MLC were used."
- Conclusion: Both DoseCheck and PRIMO (with the 6 MV Varian phase-space file) agree with Eclipse HyperArc calculations for a TrueBeam, with no need for the user to fine-tune the calculation parameters. The Mobius 3D default model, however, would need tuning to match HyperArc dose distributions"

PO-1605 DoseCHECK

Sensitivity of DoseCHECK and Mobius3D for patient-specific QA of Ethos Therapy on-line adaptive RT

E. Almond, et al., Queen's Hospital, Radiotherapy Physics, Romford, United Kingdom

PO-1833 DoseCHECK

Evaluating the ability of Sun Nuclear's DoseCHECK software to detect clinically significant errors

A. Starke, J. Poxon, N. MacDougall, Barts Health NHS Trust, Radiotherapy Physics, London, United Kingdom

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In-Vivo Patient QA

Featuring SunCHECK™ Patient — PerFRACTION™

SP-0028 PerFRACTION

Large scale clinical implementation of in vivo dosimetry - What value does it bring?

E. Bossuyt, Iridium Netwerk, Medical Physics, Antwerp, Belgium

- Analysis of implementing in-vivo dosimetry with SunCHECK software to efficiently uncover errors during the radiation therapy treatment course
- "We analyzed results in both 2019 and 2020 for more than 7000 patients in total, including causes and actions for failed fractions…In-vivo analysis in 2019 showed 16% of fractions failed…Causes for failed in-vivo analysis included deviations in patient positioning (4,9%) and anatomy change (4,3%). In addition, errors in planning, imaging, treatment delivery, simulation, breath hold and positioning devices were detected."
- **"Based on these in vivo results, some permanent actions were taken for improving quality**, e.g. extra imaging for boost breast, extra education to the RTT's and extra help from dietitians. When analyzing results in 2020, it was seen **these actions had resulted in a reduction of failed fractions from 16% to 13%,** including a drop from 4,9% to 3,0% in patient positioning deviations and a drop from 4,3% to 3,3% in anatomy changes."

OC-0079 PerFRACTION

EPID in vivo dosimetry implementation world-wide: results of an ESTRO survey

M. Esposito, at al; Azienda Sanitaria USL Toscana Centro, S.C. Fisica Sanitaria Firenze-Empoli, Firenze, Italy

- **133 institutes participated in a 44-question survey created by an ESTRO Working group on in vivo dosimetry, including questions on "IVD software characteristics, software implementation and data analysis, and patients results"**
- "An average of 2657 patients (range 50-8000) and 10021 fractions (range 200-24000) were annually analyzed with fully automatic software, compared to 855 patients (range 100-2500) and 2791 fractions (range 1000-6575) with the partially automatic and 266 patients (range 20-1200) and 378 fractions (range 30-3500) with the software without automation."
- **"The percentage of all measurements with results out of institutional tolerance limits, was, on average, 14% with 10% standard deviation.**.. The actions taken after out of tolerance detection, were, on average: repetition of the IVD test 8.5%, instruction of the technician for improving the patient setup 3.8%, informing the radiation oncologist 0.9%, and replanning 1.6%."

FEATURED TALKS: In-Vivo Dosimetry

Saturday, 28 August, 8:45 // Room 2.1

Symposium: Clinical implementation of in vivo dosimetry

Sunday, 29 August, 10:05 // Sun Nuclear Booth #200

Clinical Experience on an Automated QA Platform in a Busy Multi-center Department

Evy Bossuyt, M.S., GZA Ziekenhuizen - Iridium Kankernetwerk, Wilrijk, Belgium

Saturday, 28 August, 15:35 // Sun Nuclear Booth #200

Sunday, 29 August, 13:00 // Sun Nuclear Lunch Symposium, Rooms N107+108

Improving QA Effectiveness with an Integrated, Automated Platform

Nuria Jornet, Ph.D., Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

PO-1614 PerFRACTION

Analysis of transit in vivo dosimetry for VMAT H&N treatments: weight loss and shoulders position

C. Anson Marcos, et al., Hospital de la Santa Creu i Sant Pau, Medical Physics, Barcelona, Spain

- **"Purpose or Objective:** The aim of this study is to present the results of transit in vivo dosimetry for head and neck (H&N) patients treated with VMAT. In particular we study the sensitivity of the system to detect patient weight loss and robustness of different treatment plan strategies to shoulders position."
- **"Conclusion**: Transit in vivo dosimetry allows to detect weight loss in H&N patients by assessing gamma passing rate tendency along treatment. The sensitivity for diameter changes is 72% and specificity 95%."

PH-0432 PerFRACTION

Treatment uncertainty for ultra- vs. standard-hypofractionated breast RT based on in-vivo dosimetry

Y.A.C. Fiagan, at al., Iridium Netwerk, Faculty of Medicine and Pharmacy, Vrije Universiteit Brussel, Brussels, Radiation Oncology, Antwerp, Belgium

Po-1634 PerFRACTION

Transit Dosimetry With Portal Images For Ultrahypofractionated Radiation Therapy For Breast Cancer

D. Hernandez, et al., h.U. La Princesa, Medical Physics, Madrid, Spain

Patient QA

Featuring SunCHECK™ Patient – PlanCHECK™ & PlanIQ™

PO-1709 PlanCHECK

Automation of DVH constraint checks and physics quality control improves patient safety

N. Jensen, I. Wahlstedt, Rigshospitalet, Oncology, Copenhagen, Denmark

- **"Purpose or Objective:** This study investigates whether patient safety can be enhanced by a quick implementation of a scripting based automated electronic checklist (PlanCheck) for physics quality control review (QCR)."
- **"Results**:…In the 47 breast cancer plans, retrospectively subjected to automated DVH check, 10 undocumented dose constraint violations were found, varying between 0.1 Gy and 14.5 Gy above clinical constraint."
- "**Conclusion:** We have shown that automating the physics QCR using a method demanding minimum time and programing skills improves patient safety compared to manual QCR by experienced medical physicists."

PO-1903 PlanIQ

Building and comparing treatment quality assessment algorithms among two different clinics

A. Scaggion, et al., Veneto Institute of Oncology IOV - IRCCS, Medical Physics Departement, Padova, Italy

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Patient QA Featuring ArcCHECK®

OC-0306 ArcCHECK

Performance evaluation of BgRT delivery directed at multiple PET-avid targets

O.M. Oderinde, et al., RefleXion Medical, Clinical and Medical Affairs, Hayward, USA

PD-0791 ArcCHECK

VMAT plan complexity in dose painting

A.M. Acosta Roa, et al., Oslo University Hospital, Department of Medical Physics, Oslo, Norway

PO-1546 ArcCHECK

Quality of adaptive treatment plan on a 0.35 T MR-Linac

I. Bessieres, et al., Centre Georges-François Leclerc, Medical Physics, Dijon, France

PO-1876 ArcCHECK

Procedure for total body irradiation (TBI) with Helical Tomotherapy

C. Ferrer, et al., H.U. La Paz, Medical Physics Department, Madrid, Spain

PO-1880 ArcCHECK

Dosimetric accuracy of dual isocenter irradiation in magnetic resonance guided radiotherapy system

L. Placidi, et al., Fondazione Policlinico Universitario A. Gemelli IRCCS, Radiation Oncology, Rome, Italy

PO-1881 ArcCHECK

Automatic VMAT treatment planning for left-sided breast cancer with lymph nodal involvement

K. Engstrøm, et al, Laboratory of Radiation Physics, Department of Oncology, Odense University Hospital, Odense, Denmark

Stereotactic QA Featuring SRS MapCHECK®

PO-1599 SRS MapCHECK

The impact of dose calculation algorithms and beam modelling on delivery accuracy in MBM SRS

J. Smeulders, et al., UZ Brussel, Radiotherapy, Brussels, Belgium

- “Average gamma passing rates (GPR) for field-by-field measurements with SRS MapCHECK were 82.20% ± 24.55%, 84.11% ± 23.28% and 94.82% ± 4.48% for doses calculated with PB2.0, PB3.0 and MC respectively.”
- “Conclusion: PB algorithms may not be sufficient to accurately predict dose distributions in single isocenter MBM SRS plans, especially in low dose regions. MC algorithms are recommended for plan verification.”

Stereotactic QA Featuring SRS MapCHECK®

PO-1649 SRS MapCHECK

Correcting isocentric shifts in plans for cerebral targets

S. Wegener, R. Schindhelm, O.A. Sauer, University of Wuerzburg, Radiation Oncology, Wuerzburg, Germany

- “Materials and Methods: Isocentric shifts were quantified for an Elekta Synergy Agility Linac using the QualiForMed ISO-CBCT+ test objects and software, yielding the shift between kV and MV isocenters, the gantry flex and wobble as well as the positions of the table and collimator rotation axes. Unmodified plans and modified plans, taking the isocentric shifts into account were measured using the Sun Nuclear SRS-MapCHECK….The unmodified plans were also measured on a second Linac, known to show the smallest geometric of the three available machines.”
- “Conclusion: It is feasible to correct geometrical deviations of a Linac during the planning process. The produced treatment plans showed improved agreement between measurement and calculation compared to unaltered plans.”

PO-1650 SRS MapCHECK

Investigating dosimetric accuracy of SRS treatment plans for brain metastases

G. Mok, et al., National Cancer Centre Singapore, Division of Radiation Oncology (DRO), Singapore, Singapore

PO-1739 SRS MapCHECK

Optimal threshold of model parameters for the respiratory tracking system with helical tomotherapy

W. Okada, et al., Takarazuka city hospital, Department of Radiotherapy, Takarazuka, Japan

PO-1769 SRS MapCHECK

Dosimetric consequences arising from beam interruptions with Catalyst – Deep inspiration breath hold

F. Orozco Martínez, et al., Hospital Universitario Ramón y Cajal, Medical Physics, Madrid, Spain

FEATURED TALKS: Stereotactic QA

Sunday, 29 August, 13:00 // Sun Nuclear Lunch Symposium, Rooms N107+108
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End-to-End Testing for SRS/SBRT with a High Density Diode Array

Nestor Chinillach, Ph.D., Hospital IMED, Valencia, Spain