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PS02.73

COMPARING TWO MONTE CARLO CODES TO SIMULATE THE IDEAL ACTIVITY OF A PHOSPHORUS-32 FILM SOURCE USING DOSE RATE OBTAINED BY CLINICAL APPLICATIONS

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Introduction: Phosphorus-32 encapsulated in a polymeric base is a promising source for brachytherapy, especially for intracavitary brachytherapy (IBT) [1, 2]. From the clinical studies published, a good dose rate for this source to have is 1 Gy/min [3, 4, 5]. A similar source has been developed with a new formulation. In this work, two Monte Carlo codes were compared to evaluate the ideal activity this source must have to deliver a 1 Gy/min dose rate.
Materials & Methods: TOPAS 3.8 [6] and MCNP6.2 [7] were used to model two simulations, both with the source centered in the origin point, above an isotropic volume of water 1 mm deep (2.5 cm³). The source has the decay properties of phosphorus-32, whose beta emission spectrum was extracted from the IAEA website. For TOPAS, EnergyDeposit scoring was used, and tally*F8 for MCNP. Dividing dose per decay by the dose rate of 1 Gy/min, the simulated source's total activity can be obtained.
Results: Table 1 shows the results for both simulations. Therefore, the source's initial activity must be between 2.13×10^9 Bq (57.44 mCi) and 2.19×10^9 Bq (59.06 mCi) to obtain the 1 Gy/min dose rate. With only a 2.8% difference between both codes' results, it is safe to assume that the simulations are reliable.
Summary: These results facilitate the source manufacturing, and, with them, it is possible to minimize the patient's exposure to radiation, while ensuring the quality of the treatment.
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Appendix: (figure or table)

Table 1
Results obtained from both the simulations.

Size	Code	Tally/Scoring	Histories	Depth (mm)	MeV	Dose (Gy)	Absolute uncertainty	Activity (Bq)	Activity (mCi)
5.0 × 5.0 ×	**MCNP6.2**	*F8	10000000	1	0.12	7.86×10^{-12}	0.05%	2.13×10^9	57.44
0.05 (cm)	**TOPAS**	EnergyDeposit	10000000	1	0.12	7.64×10^{-12}	0.05%	2.19×10^9	59.06

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OPTIMIZATION OF PATIENT-SPECIFIC QA IN A BUSY RT DEPARTMENT

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Introduction: Patient-specific quality assurance (PSQA) is essential for safe and effective radiation therapy. However, in busy departments, individually verifying each treatment plan creates a substantial workload for medical physicists and a high demand of machine time. The purpose of this study was to define strategies for optimizing patient-specific QA procedures while maintaining the high-quality standards.
Materials & Methods: We retrospectively analysed results from more than 1000 VMAT treatment plans and looked for correlations between plan characteristics and QA results. The plans were grouped by treatment site to test the possibility of creating class solutions for most common situations. Based on failing cases, we tried to identify predictive plan characteristics, namely related to its complexity, that could be used as a decision criterion to the need of an individual verification.
Results: Our global results are summarized in Table 1. Less than 3% of plans failed any of the tolerances. Less than 3% of plans failed any tolerance. Plan complexity and MLC over-modulation were factors associated with poorer QA results.
Based on this analysis we adapted our PSQA protocol for each treatment site or plan type.
Summary: By implementing these optimization strategies, we were able to achieve a balance between maintaining the highest quality standards for patient care and ensuring efficient resource utilization. It