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Reliable and Quantitative Instant Single-Time Point Dosimetry in Radioligand Therapy

Keywords Radioligand therapy, [^{177}Lu]Lu-PSMA 617, Machine Learning, Single Time Point Dosimetry

Inventors Prof Dr. Kuangyu Shi, Carlos Vinícius Gomes Ferreira, Prof Dr. Ali Afshar-Oromieh, Prof Dr. Axel Rominger, Dr. Song Xue

Reference Presentations of the findings by Gomes et al. at EANM and PSMR in 2024.

Background: Dosimetry is crucial for safe and effective radioligand therapy (RLT) as it measures the distribution of radiation doses within the body. Traditionally, this is achieved through the multiple time point (MTP) method, which requires several imaging sessions. However, this method is expensive, time-consuming, and burdensome for patients.

Innovation: The proposed method, Instant Single Time Point (iSTP) dosimetry, uses machine learning to predict the effective half-life (T_{eff}) of organs based on pre-therapy PET data and patient clinical information. This approach requires only a single imaging session posttherapy. Data from 15 patients with metastatic castration-resistant prostate cancer were analyzed. These patients underwent PET imaging before their first RLT cycle. A machine learning model was developed to predict T_{eff} for the kidneys (left and right), liver, and spleen. The iSTP method's results were compared with the traditional MTP method and the Hänscheid method:

- Our method showed an average error rate of about 23% in predicting T_{eff} for various organs.
- Dosimetry results at early time points (2h, 24h, 48h, 72h) showed minimal deviations, underscoring the method's reliability.
- Compared to the Hänscheid method, the iSTP method showed significant differences at an early time point of 2h but no significant differences at later time points.

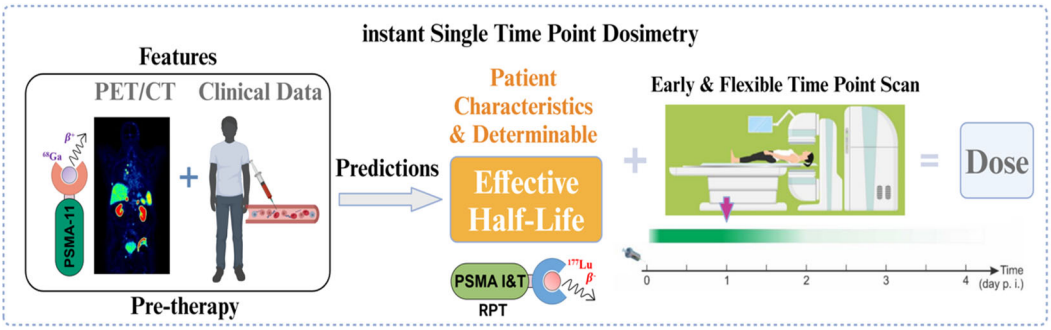

Figure 1: Concept of instant single time point dosimetry in PSMA radioligand therapy.

⇨ **The invention enables:**

- Reduction of the number of required imaging sessions
- Less burden on patients and lower costs
- Rapid and individualized dosimetry, enhancing clinical applicability

Patent Status International Patent Application filed

Contact *Unitectra, Technology Transfer University Bern, Dr. Martin Binggeli, Hochschulstrasse 6, CH-3012 Bern, +41 (0)31 684 3231, mail@unitectra.ch*