Clinical application of PLANET® Dose V3.2 on Single-Time-Point dosimetry in patients treated with [^{177}Lu]Lu-DOTA-TATE

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Keywords (3 max): single-time-point dosimetry, molecular radiotherapy

x Oral x Poster ☐ Special Issue

Abstract

a) Background: An absorbed dose-effect correlation was observed for [^{177}Lu]Lu-DOTATATE treatments in patients with neuroendocrine tumours, using a four-time-point (4TP) dosimetry protocol. However, reducing the number of time points would ease the workload and patient burden. Simplified approaches such as single-time-point (STP) dosimetry should therefore be investigated. This study examines the feasibility of implementing STP dosimetry using patient-specific pharmacokinetics from the first cycle.

b) Methods: For 25 patients, 4TP dosimetry was performed for the first and second treatment cycles, using PLANET® Dose V3.2 (Dosisoft, Cachan, France) with images acquired at 4, 24, 72, and 192 hours post-injection. For the second cycle, two STP-based approaches were then evaluated and compared with the 4TP reference results.

The first approach used the 4TP-absorbed dose from the first cycle, scaled by the volume-to-total counts ratio at 24 hours from both cycles. The second approach used the STP tool of ANET® Dose to assign pharmacokinetics from the first cycle to a single point at 24 or 72 hours.

c) Results: At 24 hours, the second approach showed smaller deviations from 4TP dosimetry than the proportional scaling approach. However, the best agreement was obtained with the second approach at 72 hours, with relative differences below 9% for liver and kidneys, and up to 20% for spleen and tumours.

d) Conclusion: STP dosimetry offers logistical advantages. This study shows it can yield results in good agreement with MTP dosimetry. Further research is needed to confirm whether absorbed dose–effect relationships are preserved.

e) References:
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