Comparison of Technologist Extremity Exposure and Administration Efficiency Between Methods for ^{177}Lu-PSMA-617 (Pluvicto™) Therapy

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Introduction

Radioligand therapy with [^{177}Lu]Lu-PSMA-617 (Pluvicto™) is used in the treatment of metastatic prostate cancer. Following recent approval by Health Canada, clinical demand has increased across Ontario.

Multiple administration methods are approved by Novartis, including vial (peristaltic pump), syringe (shielded), and gravity infusion. These methods differ in technologist radiation exposure, administration time, and workflow.

However, there is limited clinical evidence comparing their safety and efficiency. In addition, limited data exist comparing technologist extremity exposure during Pluvicto administration to standard PET procedures, making it difficult to contextualize occupational exposure.

Objectives

Primary: Compare technologist extremity exposure per administration normalized to administered activity between the vial and syringe methods.

Secondary: Compare total administration time between the vial and syringe methods.

Tertiary: Compare technologist extremity exposure during PET and the Pluvicto administration methods.

Quaternary: Compare surface contamination risk between methods using standardized wipe testing.

Materials & Methods

Prospective observational cohort study

Study arms : Vial method, Syringe method, PET injections

Eligible participants: Full Time Nuclear Medicine Technologists

Data collected: Extremity radiation dose, Total administration time, Net activity, Surface Contaminations

Compared the two administration methods using both Welch's two-sample and the Mann–Whitney U, along with a within-technologist paired analysis to account for technologist variability.

No changes were made to standard patient care. Safety thresholds were established in consultation with the Radiation Safety Office, with predefined limits triggering immediate review

Results

- 32 Pluvicto administrations: 18 syringe cases and 14 vial cases; 53 PET administrations

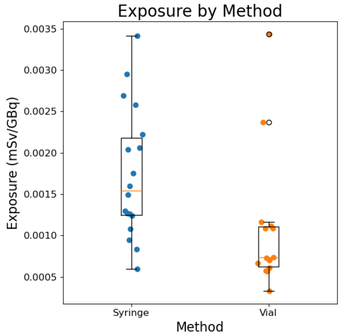

Figure 1. Distribution of extremity radiation exposure (mSv/GBq) by administration method.

- A statistically significant difference in exposure was observed between methods using the Welch t-test ($p = 0.032$) and the Mann–Whitney test ($p = 0.0059$).
- A statistically significant difference in administration time was observed (Mann–Whitney $p = 2.70 \times 10^{-6}$), indicating substantially shorter procedures with the syringe method.

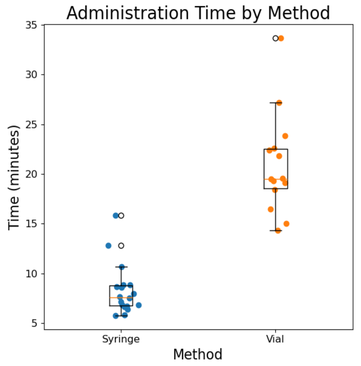

Figure 2. Distribution of administration time (minutes) by method.

- Within-technologist, paired analysis was not statistically significant ($p = 0.16$), due to limited data, suggesting the need for further study to evaluate operator-level effects.
- PET administrations demonstrated substantially higher normalized extremity exposure (mean = 0.0213 mSv/GBq) compared to both syringe (mean = 0.00174 mSv/GBq) and vial methods (mean = 0.00108 mSv/GBq).
- Contamination incidents were minimal and not significant across all methods.

Method	Exposure (mSv/GBq)	Reading (mSv)	Time (min)
PET	0.0210	0.0054	—
Syringe	0.0017	0.0130	8.31
Vial	0.0011	0.0080	20.9

Table 1. Summary of mean exposure, total reading, and administration time across PET, syringe, and vial methods.

Discussion

Significant increase in extremity exposure was observed in syringe method.

Vial method required >2× administration time, reflecting increased setup and handling.

Pump issues during vial method may prolong in-room time, increasing exposure beyond syringe levels.

10 cc lead syringe shield method was proposed. Result showed similar time and equal or lower exposure, but results remains preliminary.

Further investigation should evaluate alternative methods (10 cc vs 20 cc lead shields), pump improvements, technologist variability.

Conclusion

The syringe method results in higher extremity radiation exposure, while the vial method provides lower exposure at the cost of significantly increased administration time.

Based on observed trends, a practical rule can be proposed:
≤ 10 mL dose → use 10 cc lead syringe shield
> 10 mL dose → use vial method

Method selection should also consider real-world constraints, including time, scheduling demands, workflow reliability.

Overall, optimal administration should be adapted to both dose volume and clinical workflow, rather than a fixed method.