

Predictive Value of ¹⁸F-FDG PET/CT for Treatment Response of Lymph Node Metastases in NSCLC: Data from PANDA-1 Clinical Trial

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BACKGROUND

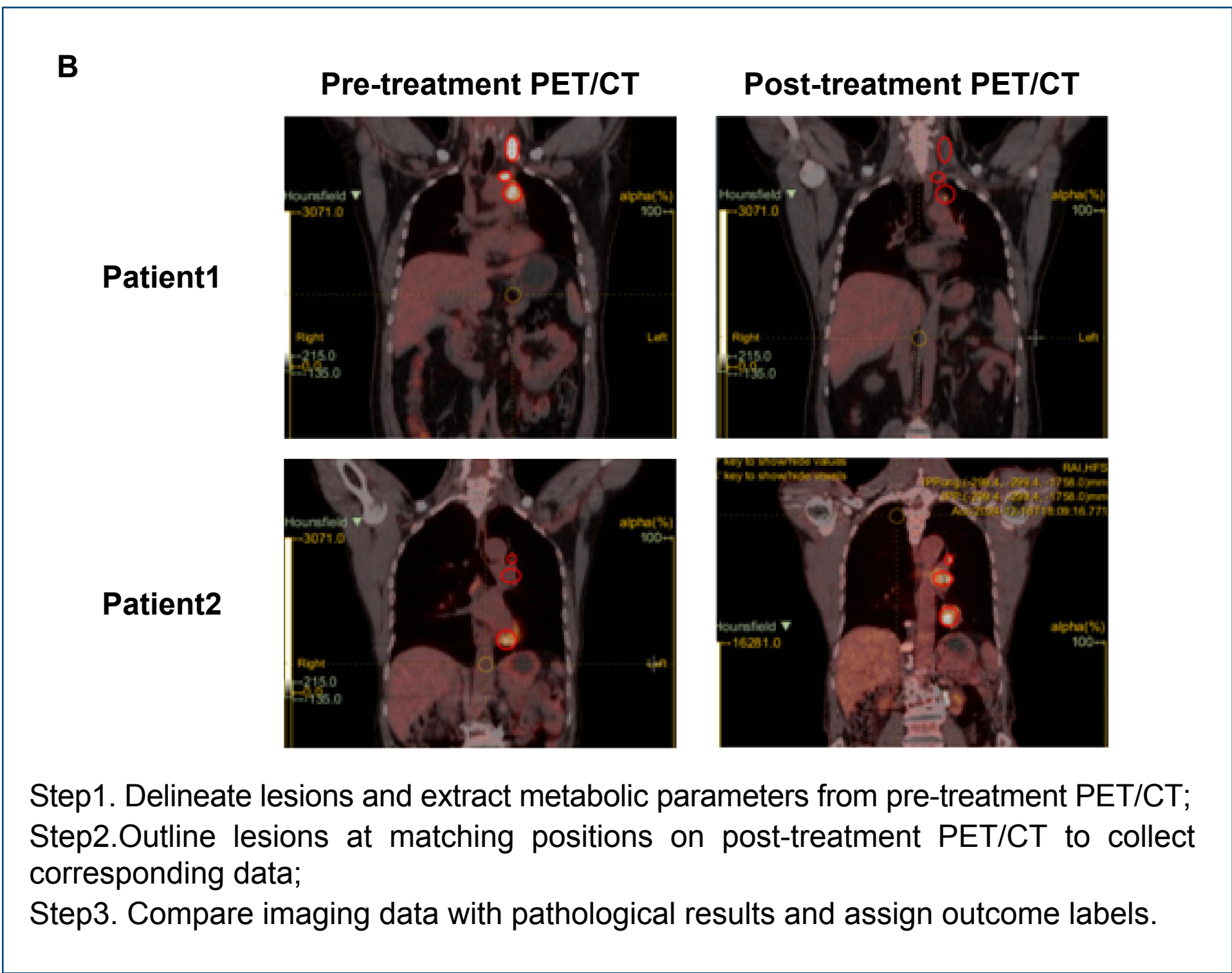
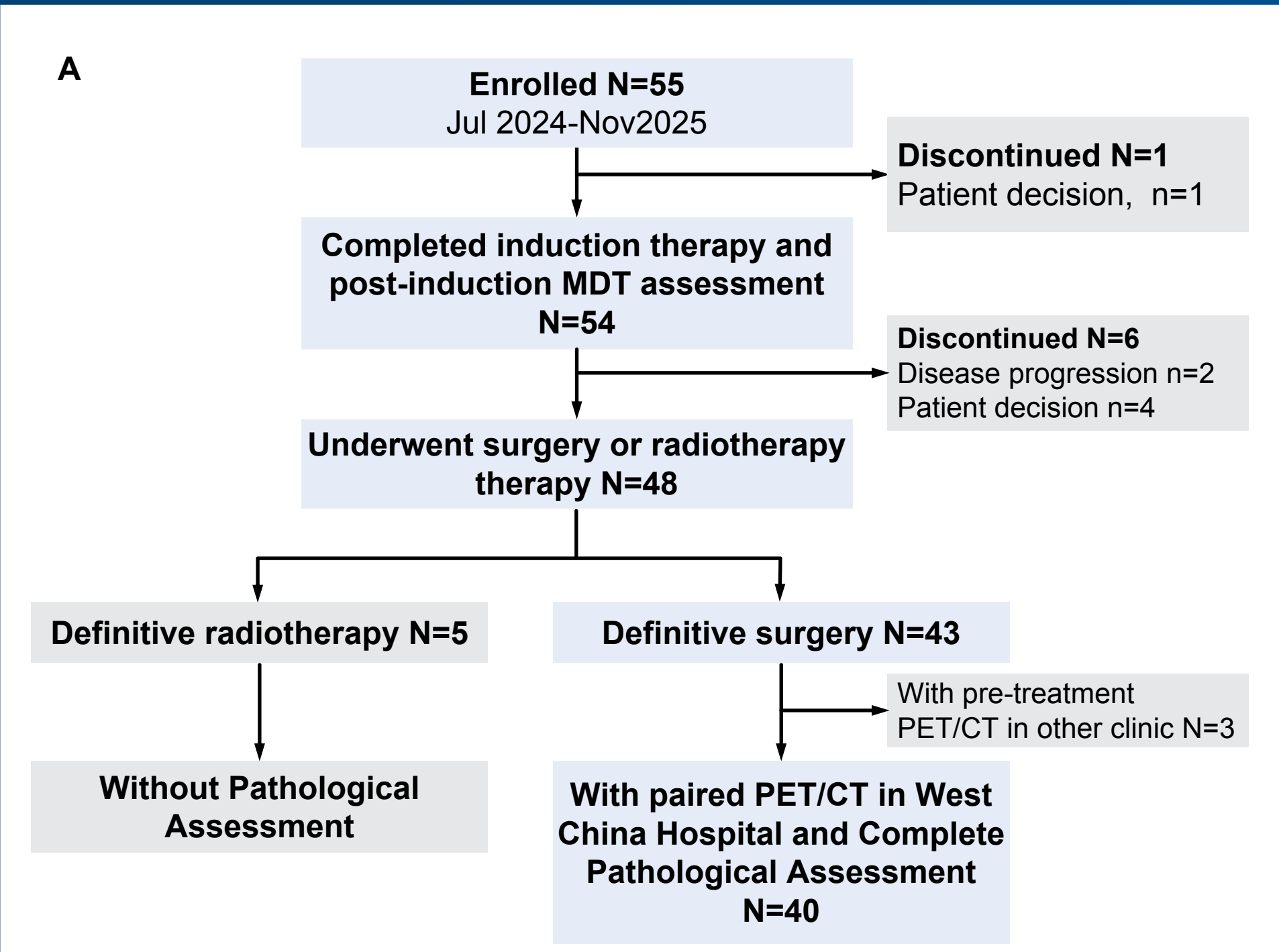
- Lymph node status is critical for NSCLC staging and surgical decision-making, yet accurately predicting nodal response to neoadjuvant chemioimmunotherapy remains challenging.
- Dynamic metabolic changes on PET/CT may improve response assessment; however, their value in evaluating nodal disease requires further validation.
- Using data from the phase II PANDA-1 trial, we evaluated the performance of PET/CT in predicting residual metastatic lymph nodes, with surgical pathology serving as the reference standard.

METHODS

- Patients from the PANDA-1 trial with paired pre- and post-treatment PET/CT scans, subsequent surgical resection, and pathological assessment were included.
- PET/CT lesion parameters were extracted using LIFEx (v26.3.6), including SUVmax, SUVmean, metabolic tumor volume (MTV), and total lesion glycolysis (TLG).
- Predictive parameters and their optimal cut-off values were identified using restricted cubic spline analysis and logistic regression in R.

RESULTS

Figure1. Patient flow diagram (A) and paired PET/CT analytical workflow (B)



- Forty patients with complete paired PET/CT scans were analyzed, comprising 40 primary lesions and 95 metastatic lymph nodes. Pathological assessment confirmed residual tumor in 18 primary lesions and 28 lymph nodes.
- Significant parameters included post-treatment SUVmax, Δ SUVmax (Difference between pre- and post-treatment), Δ MTV (Difference between pre- and post-treatment MTV) and TLG-Ratio (Ratio of post- to pre-treatment TLG).

Table1. Diagnostic performance of PET/CT metabolic parameters for predicting residual tumor in primary lesions and metastatic lymph nodes

Index	Groups	Mean $\pm$ SD	Cut-off value	Sensitivity (%)	Specificity (%)	AUC value	p value
SUVmax	All Lesions (n=135)	3.58 $\pm$ 0.42	3.61	80.43	74.16	0.817	<0.001
	Primary (n=40)	3.72 $\pm$ 0.38	3.45	100.00	72.73	0.889	<0.001
	Lymph Nodes (n=95)	3.51 $\pm$ 0.43	3.65	71.43	74.63	0.762	<0.001
Δ SUVmax	All Lesions (n=135)	28.67 $\pm$ 12.35	10.56	76.09	62.47	0.724	0.008
	Primary (n=40)	31.25 $\pm$ 11.89	12.14	70.59	68.42	0.728	0.036
	Lymph Nodes (n=95)	27.32 $\pm$ 12.41	1.87	69.29	82.09	0.498	0.068
Δ MTV (cm ³)	All Lesions (n=135)	8.25 $\pm$ 5.11	4.22	68.39	71.80	0.646	0.058
	Primary (n=40)	9.58 $\pm$ 4.87	5.27	70.59	73.68	0.703	0.047
	Lymph Nodes (n=95)	7.63 $\pm$ 5.15	3.19	67.86	67.76	0.649	0.062
TLG-Ratio	All Lesions (n=135)	0.35 $\pm$ 0.18	0.36	82.61	75.28	0.789	<0.001
	Primary (n=40)	0.39 $\pm$ 0.16	0.40	72.94	86.36	0.822	0.018
	Lymph Nodes (n=95)	0.33 $\pm$ 0.18	0.27	76.43	69.22	0.697	0.039
Logistic Regression Analysis	Primary Lesions (SUVmax+ Δ MTV)			94.44	77.27	0.912	0.003
	Lymph Nodes (SUVmax+ Δ MTV+TLG-Ratio)			82.61	79.38	0.815	0.012

- Post-treatment SUVmax cut-offs were 3.61 (all lesions), 3.45 (primary), and 3.65 (lymph nodes), with sensitivities of 80.43%, 100%, 71.43% and specificities of 74.16%, 72.73%, 74.63%.
- Δ SUVmax cut-offs were 10.56 (all lesions), 12.14 (primary), and 1.87 (lymph nodes), with sensitivities of 76.09%, 70.59%, 69.29% and specificities of 62.47%, 68.42%, 82.09%.
- Δ MTV cut-offs were 4.22 (all lesions), 5.27 (primary), and 3.19 (lymph nodes) cm³, with sensitivities of 68.39%, 70.59%, 67.86% and specificities of 71.8%, 73.68%, 67.76%.
- TLG-Ratio cut-offs were 0.36 (all lesions), 0.40 (primary), and 0.27 (lymph nodes), with sensitivities of 82.61%, 72.94%, 76.43% and specificities of 75.28%, 86.36%, 69.22%.
- After model fitting analysis by logistic regression, the model SUVmax+ Δ MTV improved prediction for primary lesions (sensitivity 94.44%, specificity 77.27% and AUC value 0.912).
- For lymph nodes, adding TLG-Ratio to SUVmax+ Δ MTV further improved performance (sensitivity 82.61%, specificity 79.38% and AUC value 0.815).

CONCLUSIONS

- The sensitivity and specificity of PET/CT in assessing treatment response in lymph nodes was lower than that in the primary tumors.
- Post-treatment SUVmax of ¹⁸F-FDG PET/CT is a good prognostic factor for residual tumor evaluation, while multi-index joint models are still necessary, especially for lymph node metastasis.

Abbreviations

AUC, Area Under ROC Curve; MTV, metabolic tumor volume; NSCLC, non-small cell lung cancer; PET/CT, positron emission tomography/computed tomography; SD, Standard Deviation; SUVmax, Maximum Standardized Uptake Value; SUVmean, Mean Standardized Uptake Value; TLG, total lesion glycolysis.

References

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- Liu J, et al. 2025 WCLC. MA01.05.

Disclosure

Dr. Li Tu and Dr. Jiawei Liu declare no conflict of interest

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