

Clinical and CT Radiomic Biomarkers for Predicting Pathological Response to Neoadjuvant Chemoimmunotherapy in NSCLC: A Preliminary Study

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INTRODUCTION

- Neoadjuvant chemoimmunotherapy (NCI) has improved outcomes in resectable NSCLC, with pathological complete response (pCR) rates of approximately 20-25% [1,2].
- Accurate preoperative prediction of pCR and major pathological response (MPR) could enable organ-preserving or surveillance-based strategies
- AIM:** This study aims to develop and evaluate a non-invasive predictive model integrating CT-based radiomics and clinical features for pCR/MPR in NSCLC patients treated with NCI.

METHODS

Patient Selection Criteria

- Retrospective multi-site cohort (n = 19).
- Eligibility criteria: stage IA-IIIB resectable NSCLC treated with NCI; pre- and post NCI CT scans within 8 months apart.

- Outcome: pCR/MPR vs others

Demographic, Clinical and Conventional Imaging Variables

- Age, Sex, Smoking Status, TNM stage, Histology.
- Conventional Pre-NCI CT and PET/CT: Tumor Size, Nodule Type, Location, SUV_{max}

Tumor Segmentation & CT- Radiomic Feature Extraction

- PyRadiomics

Data Analysis

- Univariate analysis for Demographic, Clinical and Conventional Imaging Variables

Prediction Model Development and Evaluation

- Radiomic model using logistic Regression
- Evaluate Model Performance : AUC, Sensitivity (SN), Specificity (SP)

DISCUSSION AND CONCLUSION

Actionable Take Away Message

- Pathological response (pCR/MPR) was significantly associated with a Δ CT-derived texture radiomic feature.
- Conventional CT tumor size and Δ tumor size may provide complementary information for predicting pathological response and should be further evaluated in larger studies.

Future Direction for Research

- Future integration of clinical, CT-derived radiomic, and PET-derived features may provide a non-invasive model to support personalized treatment strategies and surgical decision-making in resectable NSCLC.

REFERENCES & ACKNOWLEDGEMENTS

References

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Acknowledgments

- This work is kindly supported by the BC Cancer Foundation, British Columbia, Canada

Artificial Intelligence (AI) Use Disclaimer

- Artificial intelligence (ChatGPT, OpenAI) was used solely for language editing and improving clarity. The authors reviewed and approved all content and are responsible for its accuracy.

RESULTS

Table 1. Descriptive analysis of clinical, pathological and imaging variables between patients with pCR/MPR vs others on Pre-NCI CT imaging (significant level is $p < 0.05$)

Category	Variables	pCR/MPR (n = 7)	Not-pCR/MPR (n = 12)	p-value
Age		73.6 $\pm$ 5.3 (63–78)	66.4 $\pm$ 7.7 (53–78)	0.033
Sex	Male	6 (85.7%)	6 (50.0%)	0.173
	Female	1 (14.3%)	6 (50.0%)	0.472
Smoking status	Never	0 (0.0%)	2 (16.7%)	0.472
	Former	6 (85.7%)	7 (58.3%)	
	Current	1 (14.3%)	3 (25.0%)	
TNM Stage	IA2	0 (0.0%)	1 (8.3%)	0.369
	IB	2 (28.6%)	0 (0.0%)	
	IIA	1 (14.3%)	3 (25.0%)	
	IIB	1 (14.3%)	1 (8.3%)	
	IIIA	3 (42.9%)	4 (33.3%)	
	IIIB	0 (0.0%)	3 (25.0%)	
Histology	Adenocarcinoma	4 (57.1%)	8 (66.7%)	0.568
	Non-adenocarcinoma	2 (28.6%)	4 (33.3%)	
CT Tumor Size Dimension (mm)	Pre_NCI	44.1 $\pm$ 33.4 (9.9–108.5)	41.2 $\pm$ 18.0 (9.7–64.0)	0.967
	Post_NCI	37.0 $\pm$ 31.9 (7.8–99.1)	42.1 $\pm$ 21.8 (10.2–78.1)	0.444
	Delta_(Pre-Post)	7.1 $\pm$ 13.6 (–20.2–19.0)	–0.9 $\pm$ 12.6 (–24.1–26.5)	0.1
CT Nodule Type	Ground-glass	0 (0.0%)	1 (8.3%)	1
	Part-solid	0 (0.0%)	1 (8.3%)	
	Solid	7 (100.0%)	10 (83.3%)	
CT Tumor Location	Central	3 (42.9%)	5 (41.7%)	1
	Non-central	4 (57.1%)	7 (58.3%)	
PET/CT SUVmax		17.0 $\pm$ 12.0 (1.4–33.5)	10.0 $\pm$ 5.1 (0–16.7)	0.219

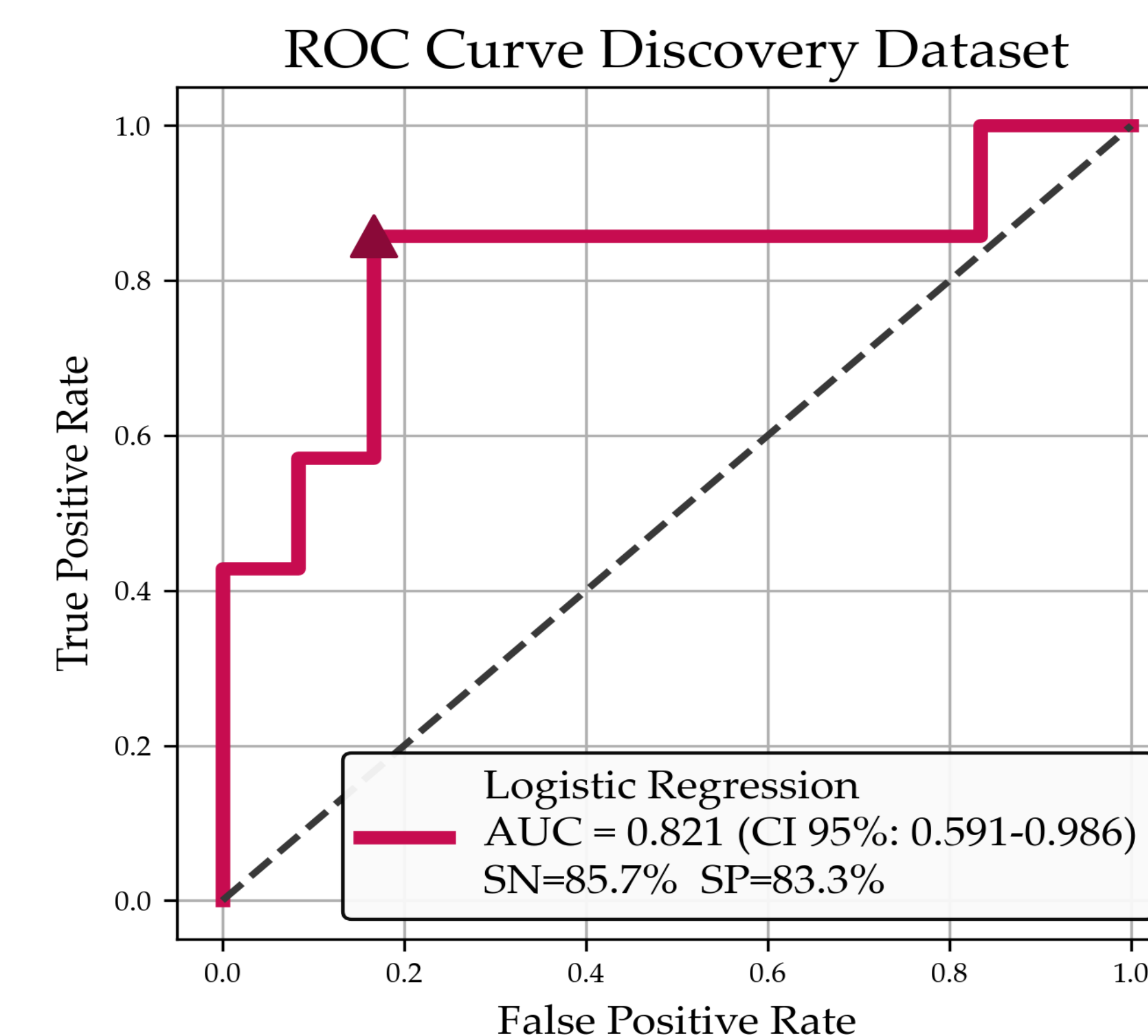


Figure 1. ROC curve of the logistic regression model for predicting pathological response (AUC = 0.82, sensitivity = 85.7%, specificity = 83.3%). The selected Δ texture radiomic feature differentiated pathological response groups and was included in the prediction model.