



P2.259: A Predictive Model for the Risk of Severe Radiation-Induced Lymphopenia Following Thoracic Radiotherapy for Lung Cancer

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INTRODUCTION

- Radiation-induced lymphopenia (RIL) is common but often overlooked, compromising immunotherapy efficacy.
- Severe RIL (ALC < 0.5×10⁹/L) occurs in 55-78% of thoracic radiotherapy patients and is linked to poor survival.
- Objective: Build a robust, interpretable predictive model for severe RIL using routinely available variables.

METHODS

- Design: Single-center retrospective cohort (N=144, locally advanced NSCLC, VMAT).
- Definition: Severe RIL = ALC < 0.5×10⁹/L during radiotherapy or within 3 weeks after.
- Variable screening: Bootstrap- enhanced elastic net (1000 resamples).
- Modeling: Firth penalized logistic regression (EPV=12.8).
- Evaluation: AUC, calibration, DCA, SHAP, internal bootstrap validation.

DISCUSSION AND CONCLUSION

Conclusions

- A robust, interpretable model for severe RIL was developed using 5 routine variables.
- Good discrimination (corrected AUC = 0.742), calibration (Brier = 0.193), and clinical net benefit.
- Severe RIL independently associated with inferior OS (multivariate HR = 2.16, P = 0.020; exploratory).

Clinical Implications

- High-risk patients (CCRT, large PTV, high dose) → consider PTV optimization, chemo-free RT+ICI, or lymphocyte-sparing RT.
- Low-risk patients → standard radiotherapy but monitor ALC.
- Model can guide personalized radiotherapy-immunotherapy sequencing.

REFERENCES & ACKNOWLEDGEMENTS

REFERENCES

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Artificial Intelligence (AI) Use Disclaimer

DeepSeek V4 was used for language polishing and literature search assistance. All AI-generated outputs were reviewed, verified, and finalized by the authors, who take full responsibility for the content.

RESULTS

Severe RIL Incidence

44.4% (64/144).

Top 5 Predictors (selection frequency > 80%)

CCRT (97.0%), Standardized PTV (92.5%), Total dose (92.2%), Lobe location (88.3%, lower lobe showed a protective trend), Standardized PLT (85.3%).

SHAP Highlight

Total dose, CCRT, and PTV contributed 74.9% of total SHAP value (top 3 drivers).

Model Performance

Apparent AUC = 0.772, corrected AUC = 0.742, Brier = 0.193
Severe RIL independently associated with inferior OS (multivariate HR = 2.16, P = 0.020).

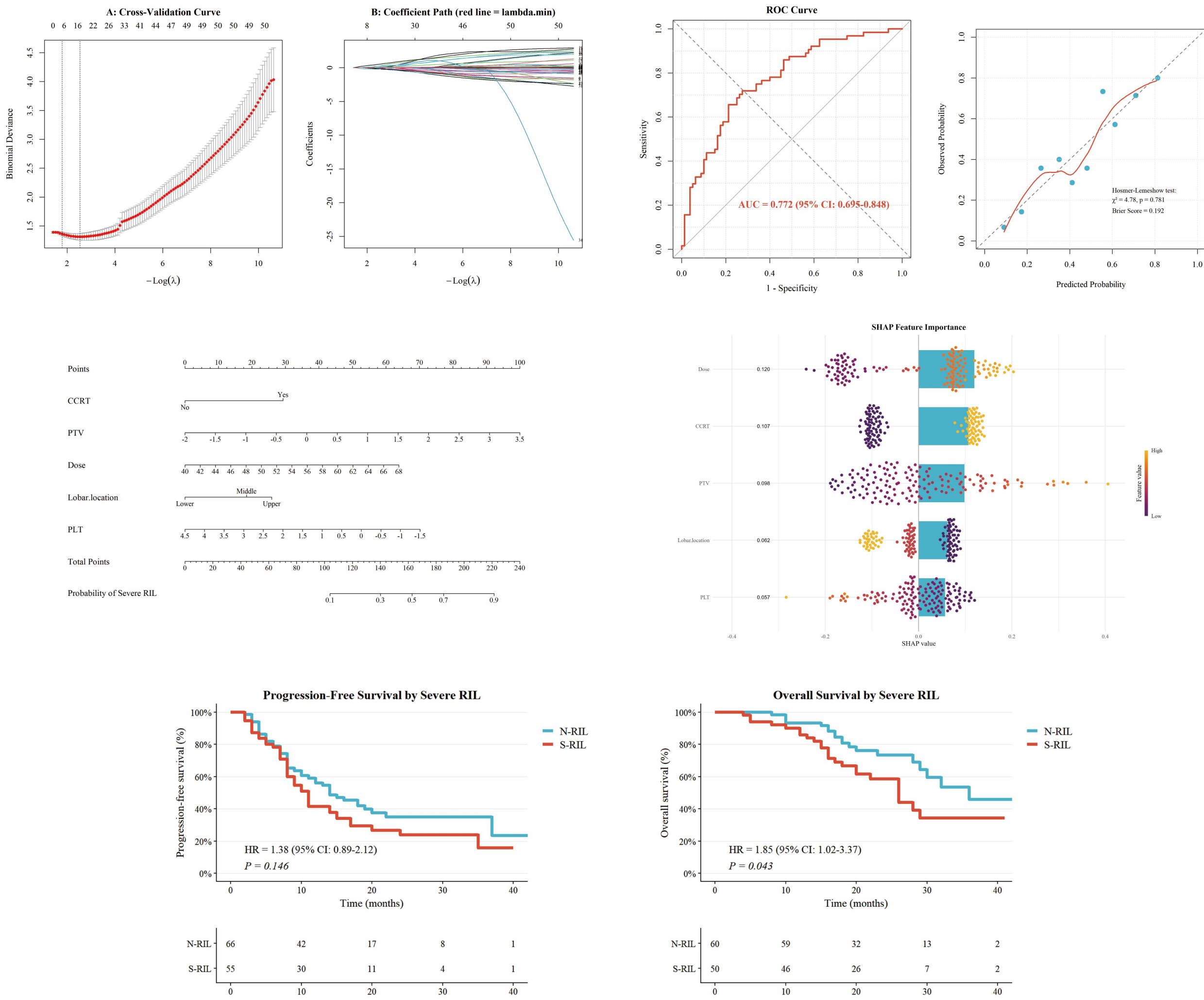


Figure 1. A Predictive Model For Severe RIL.