

MRI and SPECT Imaging Biomarkers for Evaluating Rhenium-186 Nanoliposome Therapy in Recurrent Glioblastoma

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Background

- Recurrent glioblastoma (rGBM) remains a major therapeutic challenge.
- Targeted radiotherapy can improve local tumor control while reducing toxicity to normal brain tissue.
- Phase 2 clinical trial: ¹⁸⁶RNL (>100Gy) shows promising improvements in overall survival (OS). The representative patient examples are in Fig. 1 and Fig. 2.
- Objective: Evaluate efficacy of ¹⁸⁶RNL therapy using MRI and SPECT imaging biomarkers.

Methods

- Cohort: 26 rGBM patients.
- Imaging: Longitudinal MRI and SPECT.
- Tumor volume based on $\Delta T1$ (pre vs post 3D T1 weighted images).
- 100Gy treatment volume based on SPECT.
- Treatment coverage ratio (TCR), Standardized relative cerebral blood volume (srCBV), Time to maximum (Tmax), Time to peak (TTP), Mean transit time (MTT) etc. were calculated.
- The image processing flow is detailed in Fig.3.

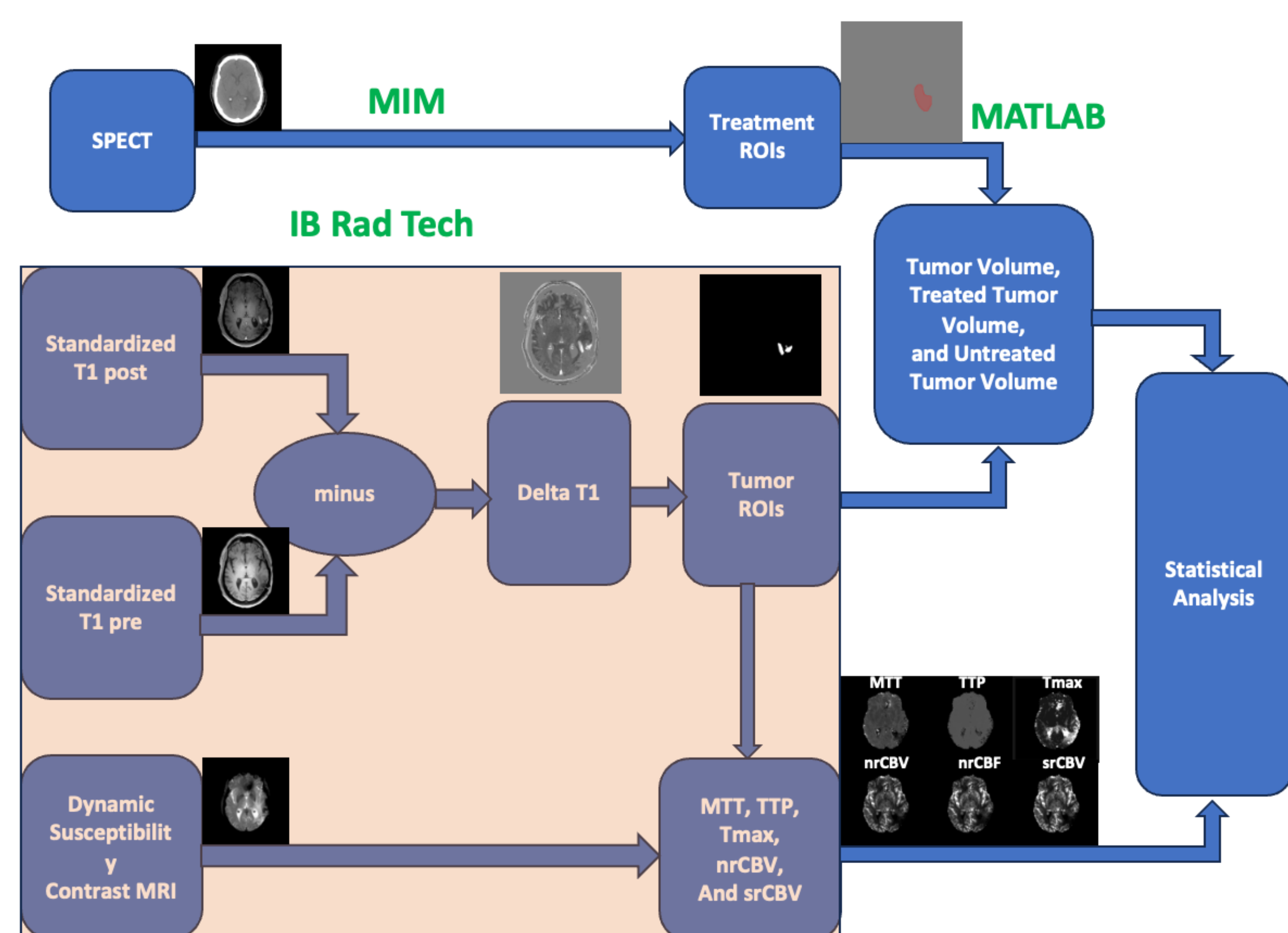


Fig. 3 Image Processing Workflow

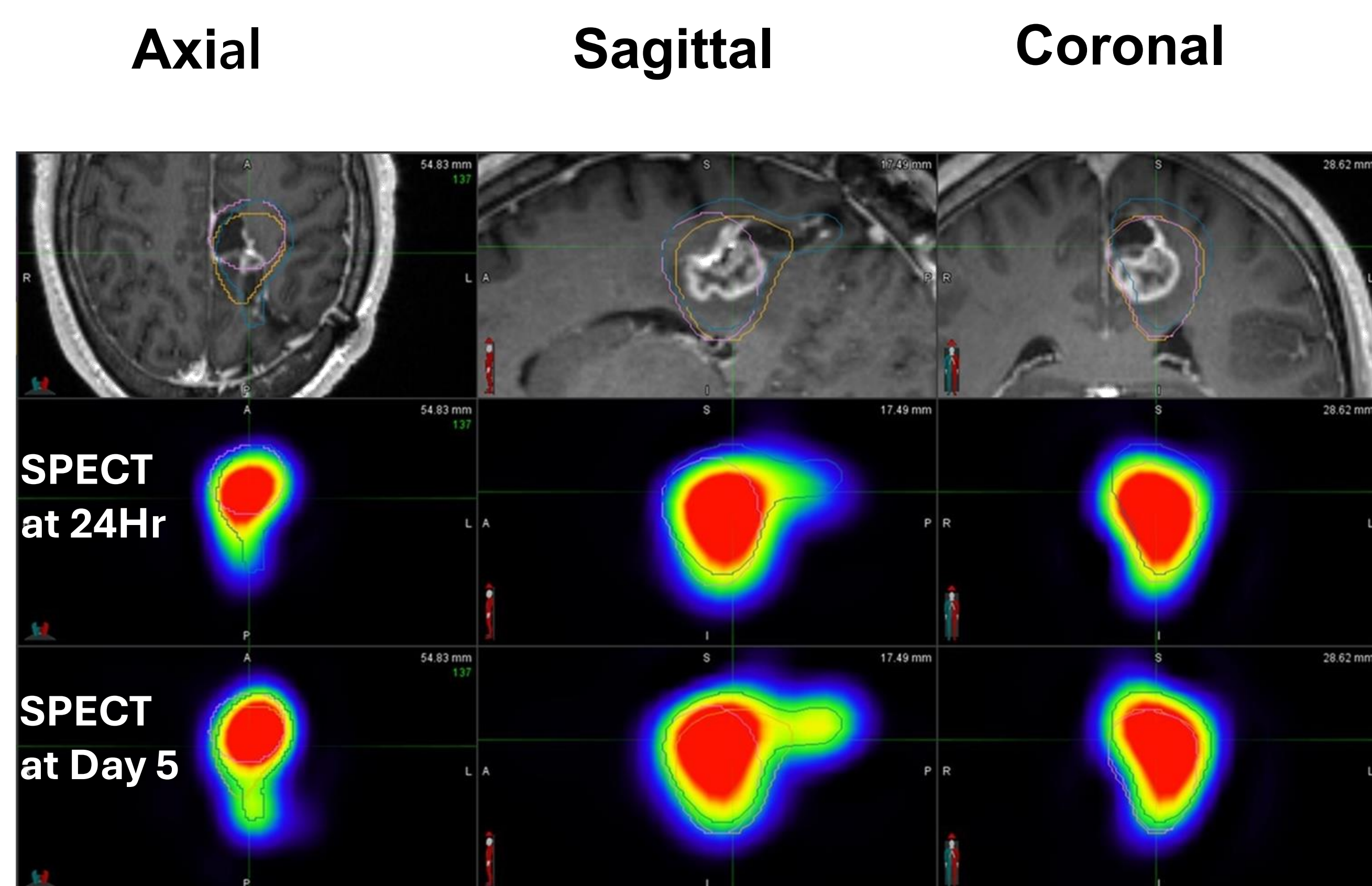


Fig. 1 Patient Example: 01-014

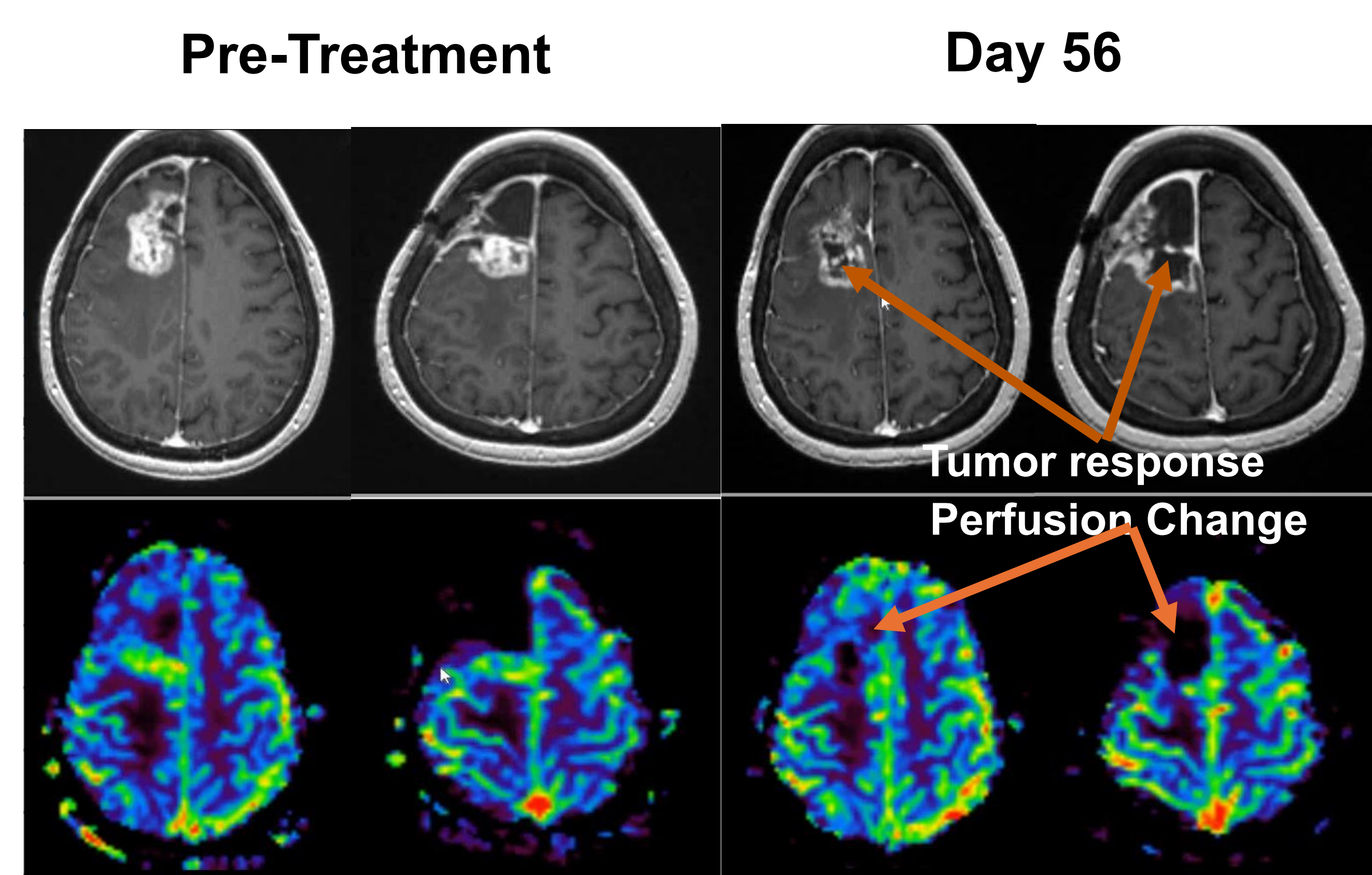


Fig. 2 Patient Example 01-017

Results

- ¹⁸⁶RNL dose positively correlate with TCR ($r=0.722$, $p<0.001$). Negative correlations: MTT ($r=-0.499$, $p=0.008$), tumor volume ($r=-0.379$, $p=0.0226$). TTP positively correlated with PFS ($r=0.504$, $p=0.0166$). OS negatively associated with tumor volume ($r=-0.392$, $p=0.0293$) and MTT ($r=-0.429$, $p=0.0464$).

- Based on a Wilcoxon Signed Rank test on within-subject differences of repeated paired measurements in N=23 patients receiving ¹⁸⁶RNL treatment, **untreated tumor volume was significantly increased relative to treated tumor volume ($p<0.001$)**. Fig. 4.

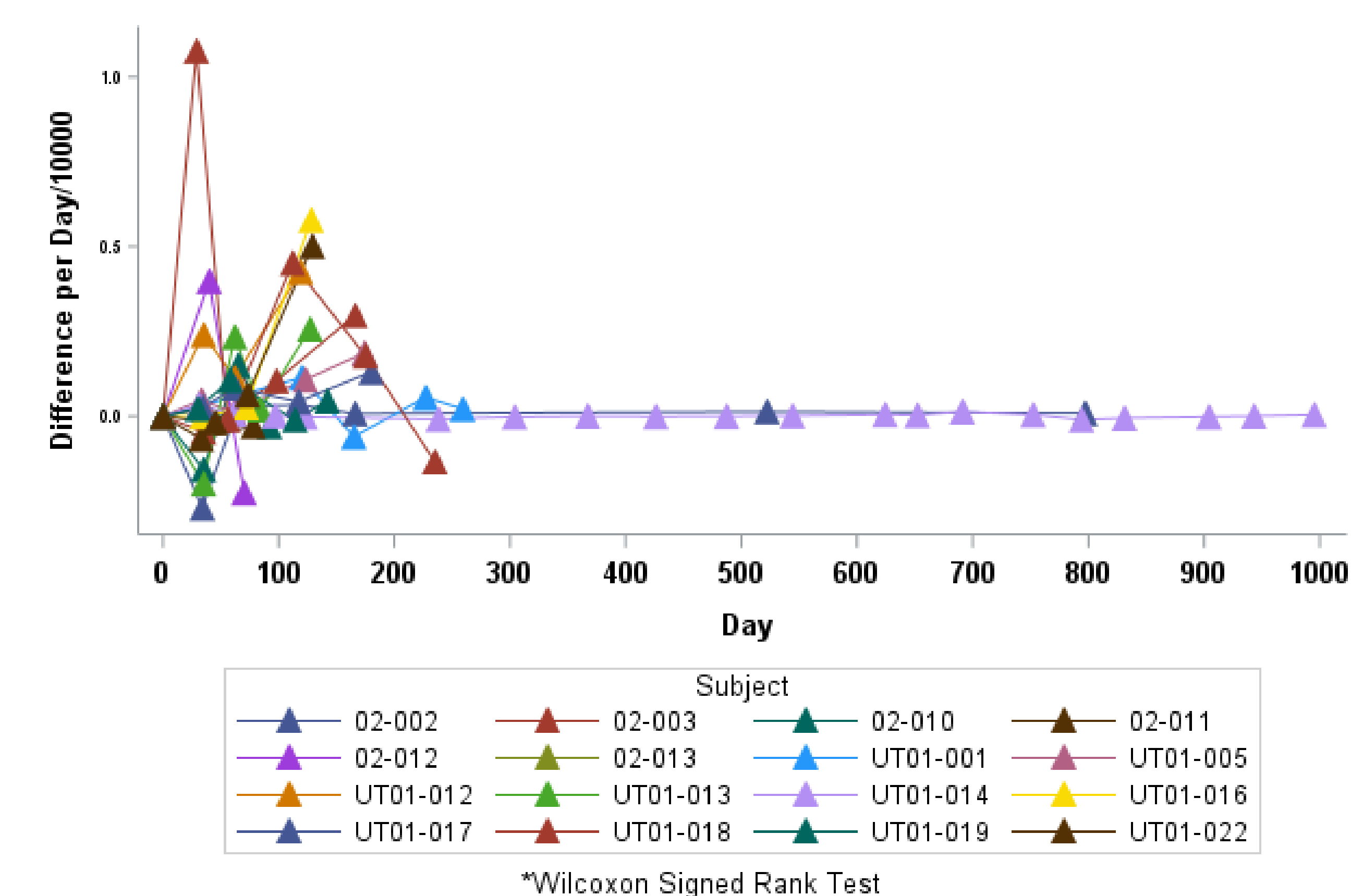


Fig. 4 Paired Tumor Volume Differences per Day, Untreated-Treated*

Conclusion

- MRI combine SPECT effectively evaluate ¹⁸⁶RNL treatment in rGBM.
- TCR, MTT, TTP are predictors of response and outcomes.
- Imaging biomarkers may guide patient-specific planning.

References

- Brenner, A.J., Patel, T., Bao, A. *et al.* Convection enhanced delivery of Rhenium (¹⁸⁶Re) Obisbameda (¹⁸⁶RNL) in recurrent glioma: a multicenter, single arm, phase 1 clinical trial. *Nat Commun* **16**, 2079 (2025). <https://doi.org/10.1038/s41467-025-57263-1>

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