



P3.393: Stromal Positive Areas of α-SMA and Vimentin Are Associated With Aggressiveness and Survival in Thymic Epithelial Tumors

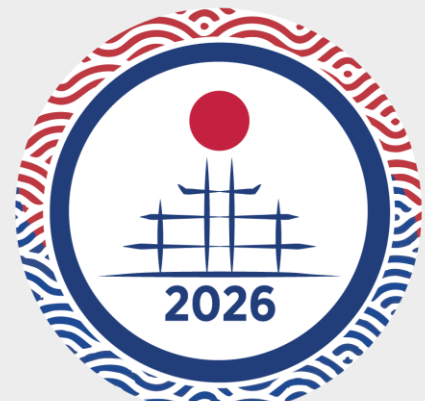
Daichi Kakibuchi¹, Satoru Okada¹, Chiaki Nakazono¹, Masanori Shimomura^{1,2}, Tatsuo Furuya¹, Atsuki Uchibori¹, Tomoki Nishimura¹, Kenji Kameyama¹, Reona Shimegi¹, Yuki Taniguchi¹, Ryota Dobashi¹, Aya Miyagawa³, Masayoshi Inoue¹

¹ Division of Thoracic Surgery, Department of Surgery, Kyoto Prefectural University of Medicine, Graduate School of Medical Science, Kyoto, Japan

² Division of Thoracic Surgery, Japanese Red Cross Kyoto Daiichi Hospital, Kyoto, Japan

³ Department of Pathology and Applied Biology, Kyoto Prefectural University of Medicine, Graduate School of Medical Science, Kyoto, Japan

Correspondence: Daichi Kakibuchi, kakib91@koto.kpu-m.ac.jp



IASLC 2026 World
Conference on Lung Cancer

SEPTEMBER 12 – 15, 2026
SEOUL, REPUBLIC OF KOREA

1 Background & Aim

- Tumor stroma, including cancer-associated fibroblasts, contributes to cancer progression.

Belhabib et al., Cancers, 2021; Sahai et al., Nat Rev Cancer, 2020

- Minami et al. reported that intratumoral fibrous bands were associated with advanced Masaoka stage and shorter recurrence-free survival in thymoma.

Minami et al., Thorac Cancer, 2021

- However, the specific stromal features underlying these associations remain poorly characterized.

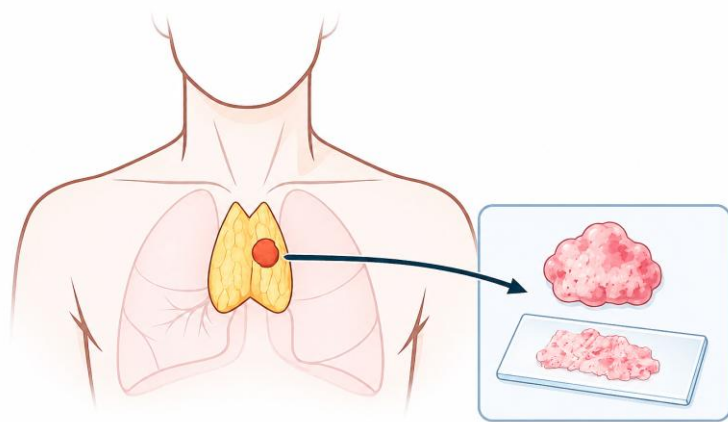
- We quantified α-SMA– and vimentin-positive stromal areas and assessed their associations with histology, stage, and survival.

2 Materials & Methods

Single-center retrospective cohort study

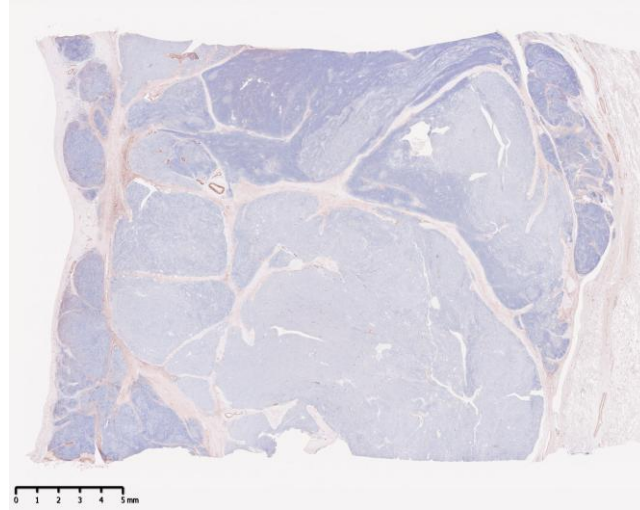
Study cohort

120 resected TETs



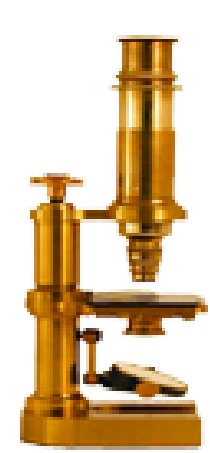
Immunohistochemistry

α-SMA and vimentin



Quantitative image analysis

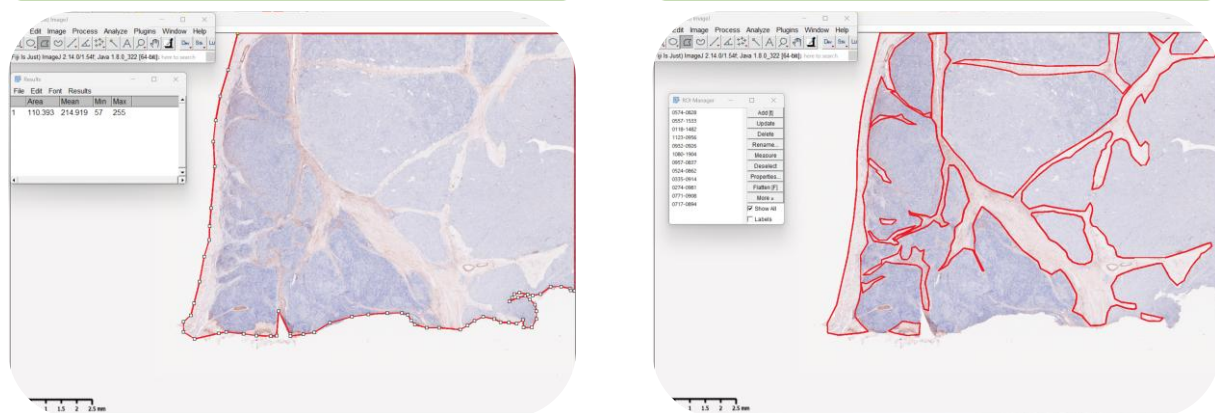
ImageJ



STEP 1 Stromal area ratio

What proportion of the tumor area is stroma?

① Tumor ROI ② Stroma ROI



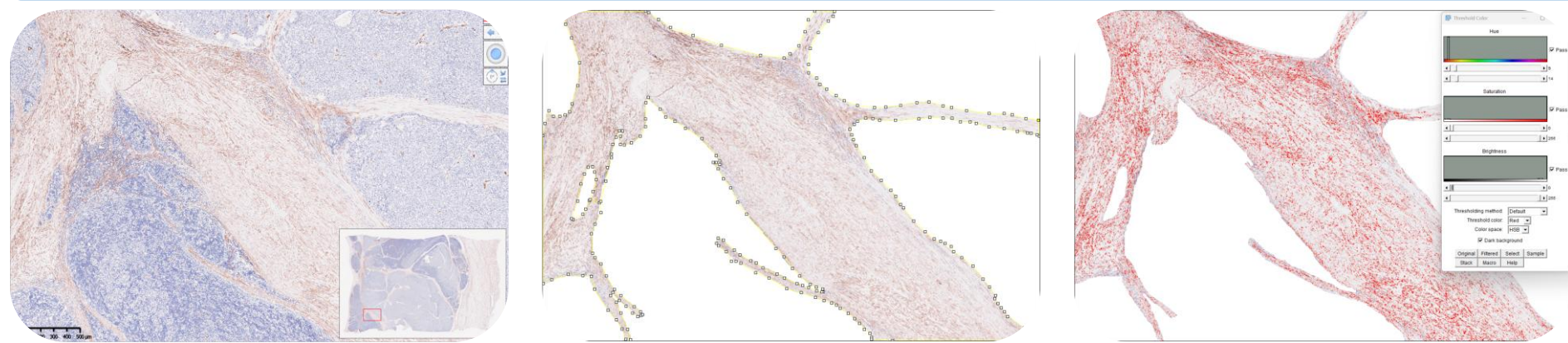
- Whole-section measurement
- Divide the whole section into 4 quadrants (Q1–Q4)
 - Delineate Tumor ROI and Stroma ROI in each quadrant
 - Sum the four areas, then calculate the stromal area ratio

$$\text{Stromal area ratio} = \frac{\sum \text{Stroma ROI area (Q1–Q4)}}{\sum \text{Tumor ROI area (Q1–Q4)}}$$

STEP 2 Marker-positive area ratio within stroma

Within sampled stroma, what proportion is DAB-positive?

① Original IHC image ② Stromal ROI ③ DAB+ area



- One stroma-rich high-power field per quadrant (q1–q4)
- Manually trace the stromal ROI; exclude tumor and large vessels
- Detect DAB+ pixels using the same fixed HSB threshold
- Average the four marker-positive area ratios

$$\text{Marker-positive area ratio (q1)} = \frac{\text{DAB+ area in stromal ROI (q1)}}{\text{stromal area in ROI (q1)}}$$

⇒ mean across 4 fields (q1–q4)

STEP 3 Positive area ratio (PR)

$$\text{PR (\%)} = \text{stromal area ratio (\%)} \times \text{mean marker-positive area ratio (\%)} \div 100$$

PR calculated separately for each marker
PR cutoff: 75th percentile (high: Q4; lower: Q1–Q3)

Example
30% stroma × 10% positive in stroma ÷ 100
= 3% PR

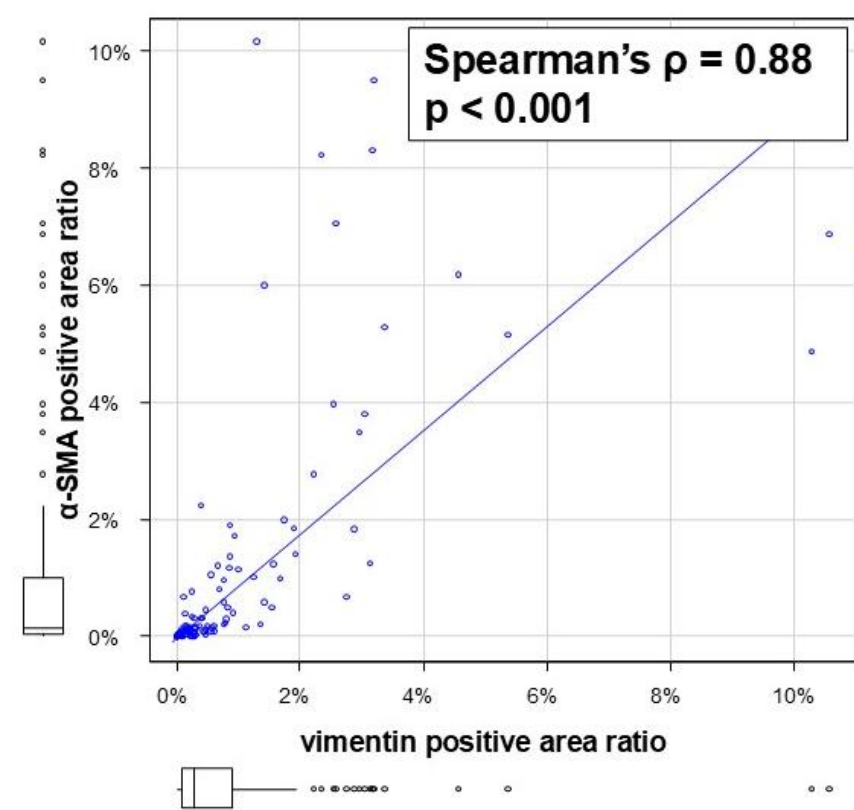
3 Patient characteristics

Variable	N (%) or median (IQR)
Age, years	63 (52–71)
Age: <60 / ≥60 years	52 (43.3) / 68 (56.7)
Sex: male / female	65 (54.2) / 55 (45.8)
Myasthenia gravis: present / absent	33 (27.5) / 87 (72.5)
Tumor size, cm	4.5 (3.0–6.1)
Tumor size: ≤5 / >5 cm	68 (56.7) / 52 (43.3)

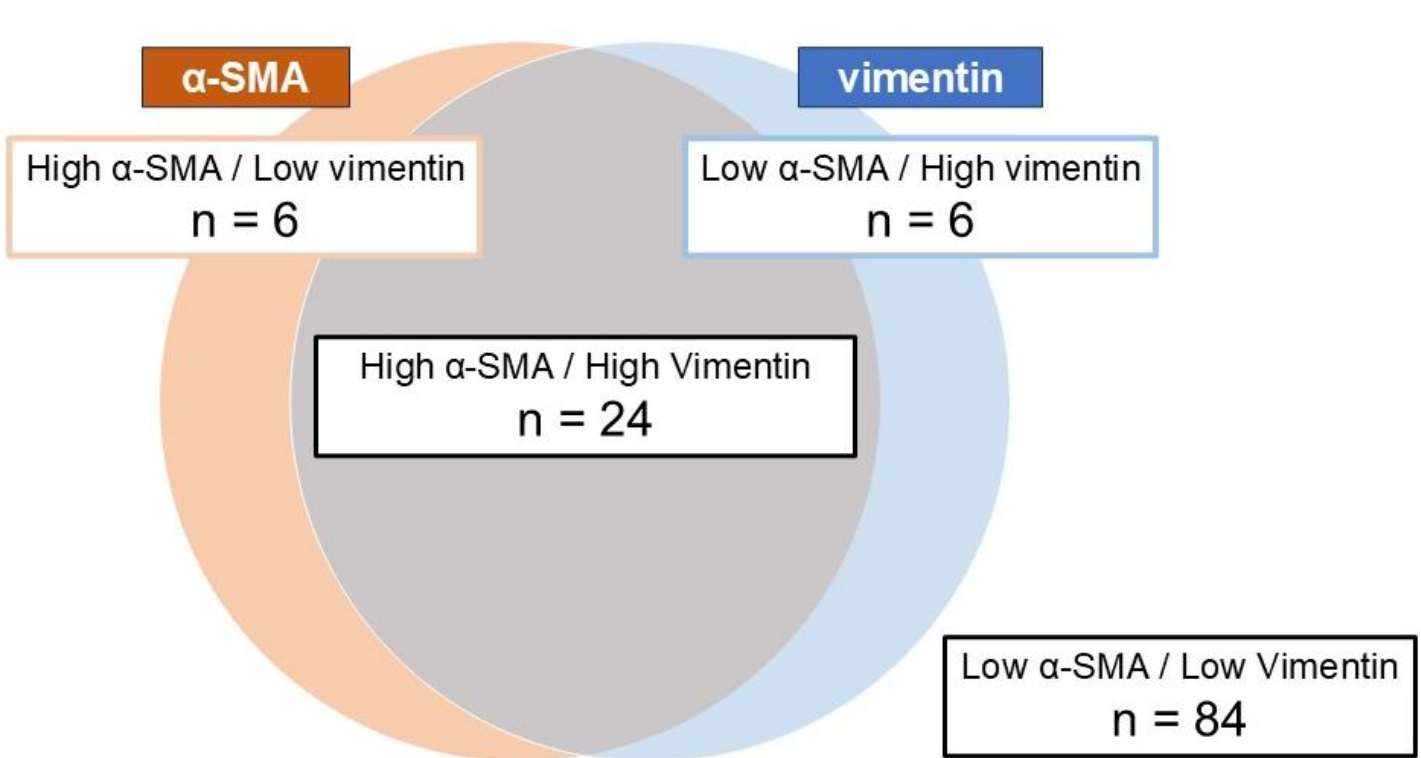
Variable	N (%)
WHO: A / AB / B1	15 (12.5) / 35 (29.2) / 13 (10.8)
WHO: B2 / B3 / carcinoma	27 (22.5) / 12 (10.0) / 18 (15.0)
Masaoka stage: I / II	38 (31.7) / 56 (46.7)
Masaoka stage: III / IV	16 (13.3) / 10 (8.3)
Resection status: R0 / R1–R2	102 (85.0) / 18 (15.0)

4 Results — Expression by subtype & stage

Correlation of PRs

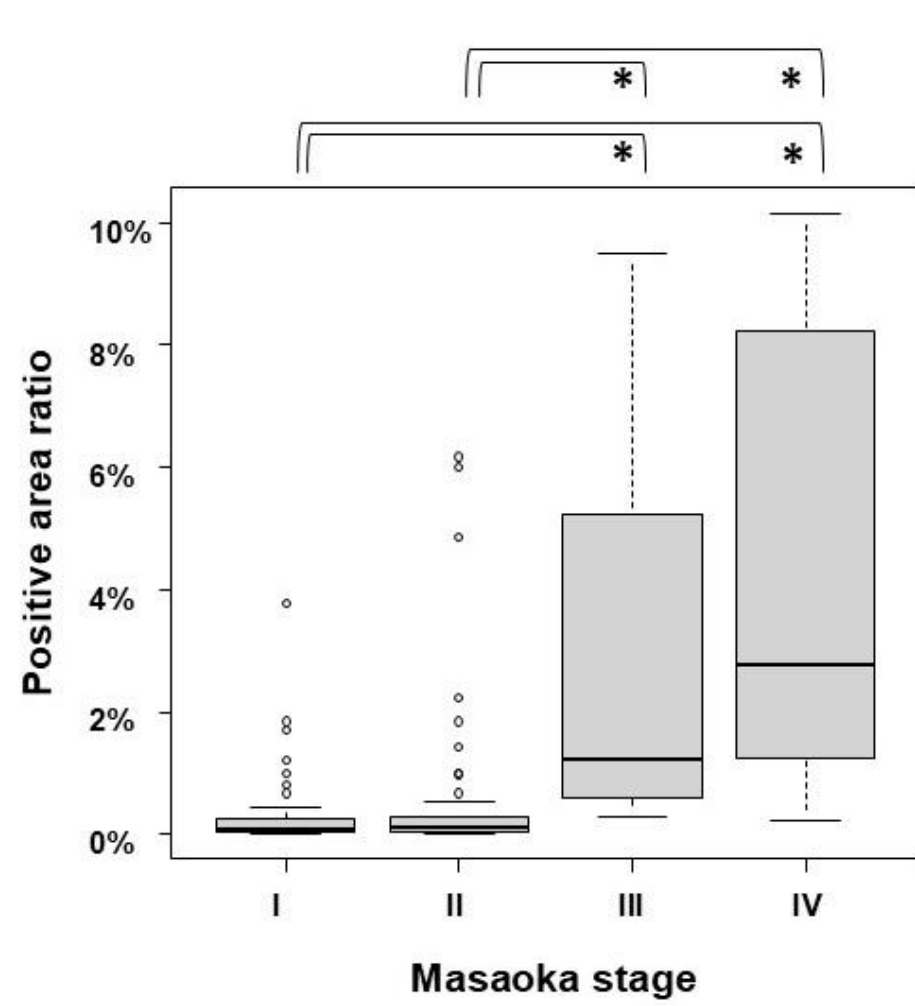
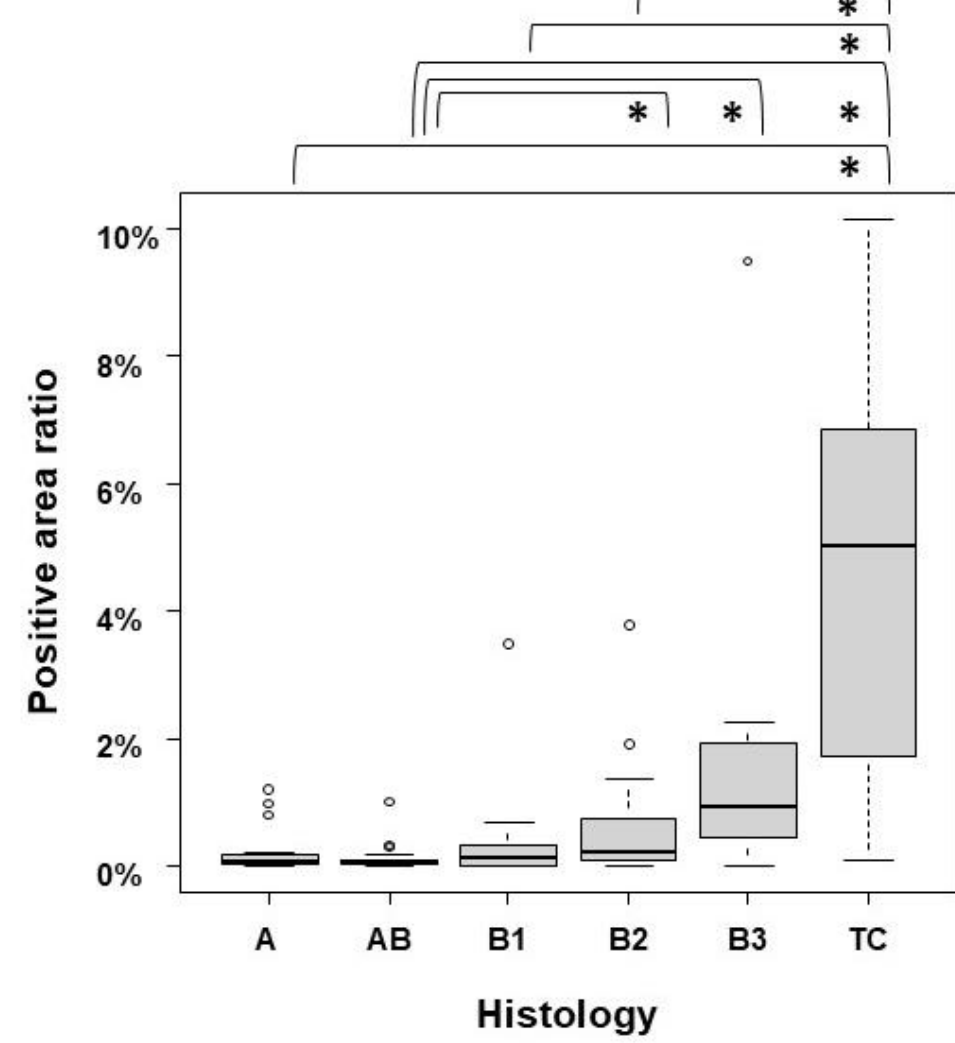


Overlap of high-PR groups

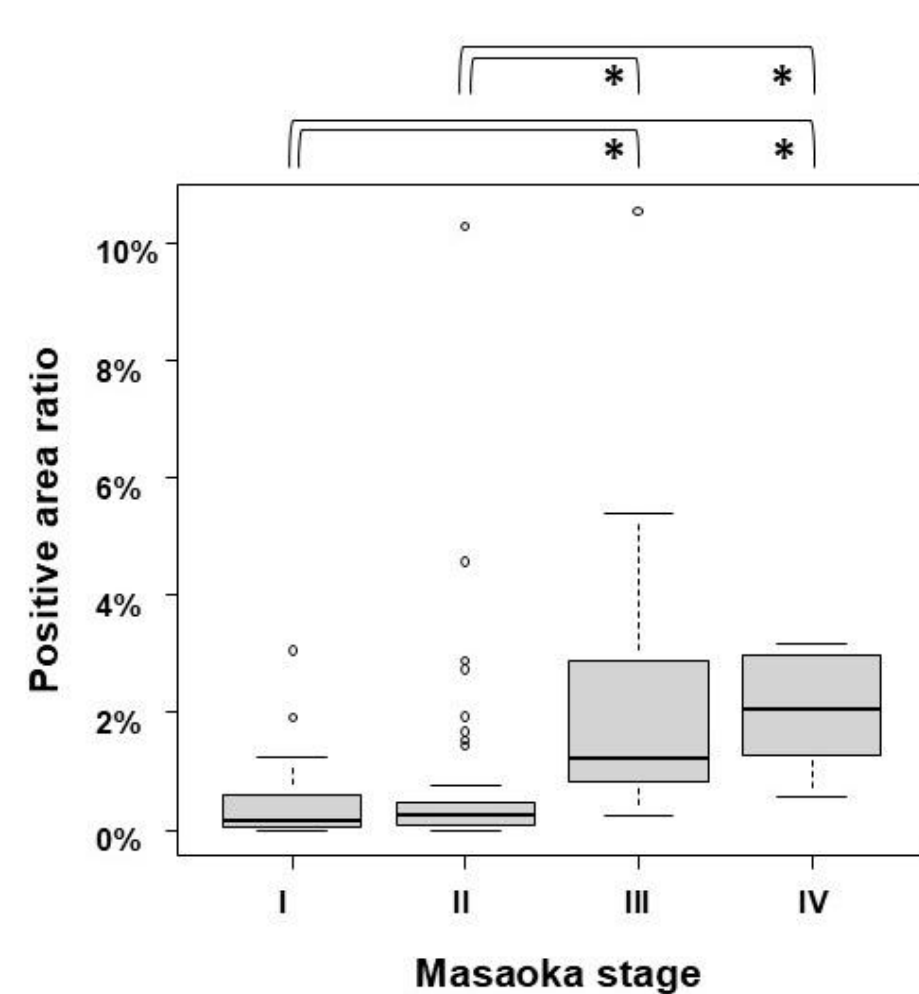
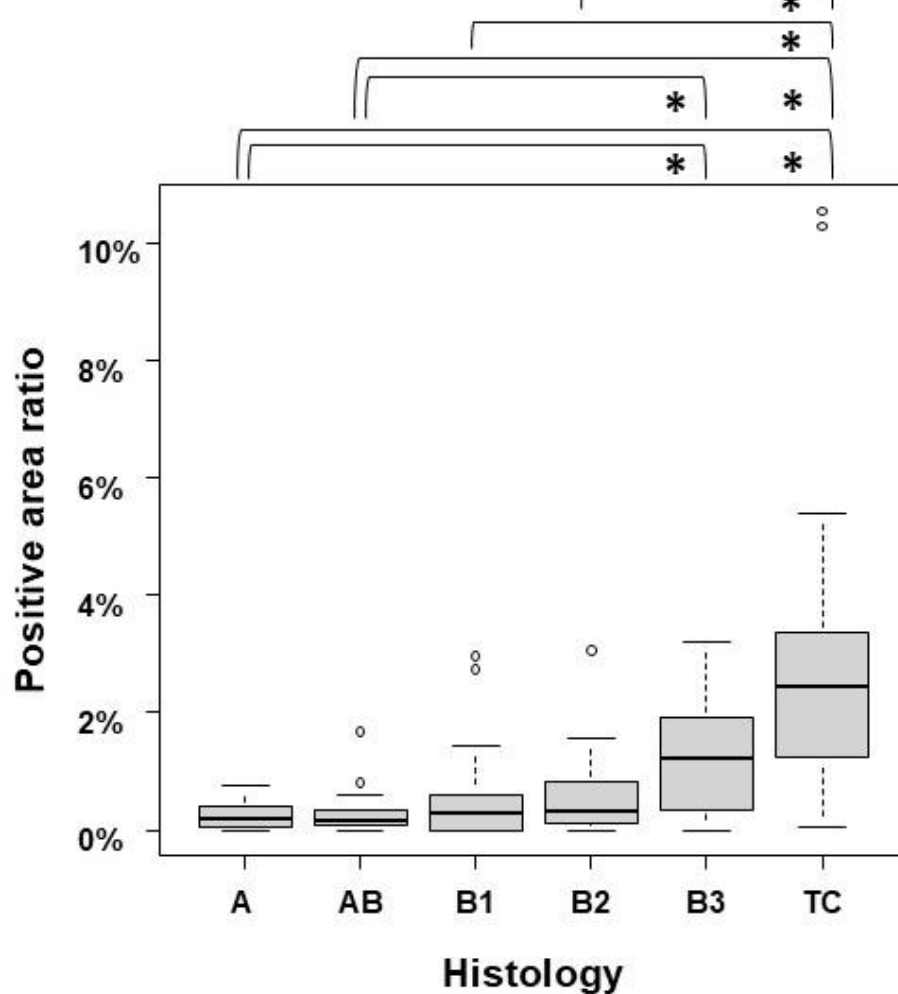


✓ α-SMA and vimentin PRs were strongly correlated.

α-SMA positive area ratio



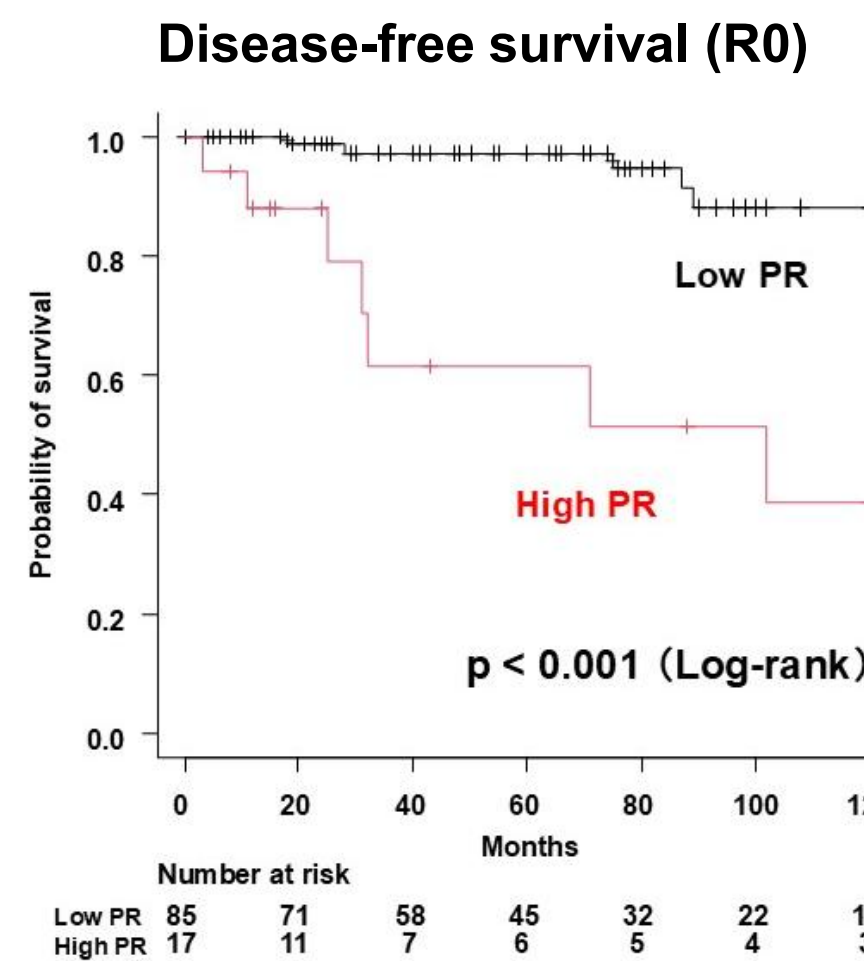
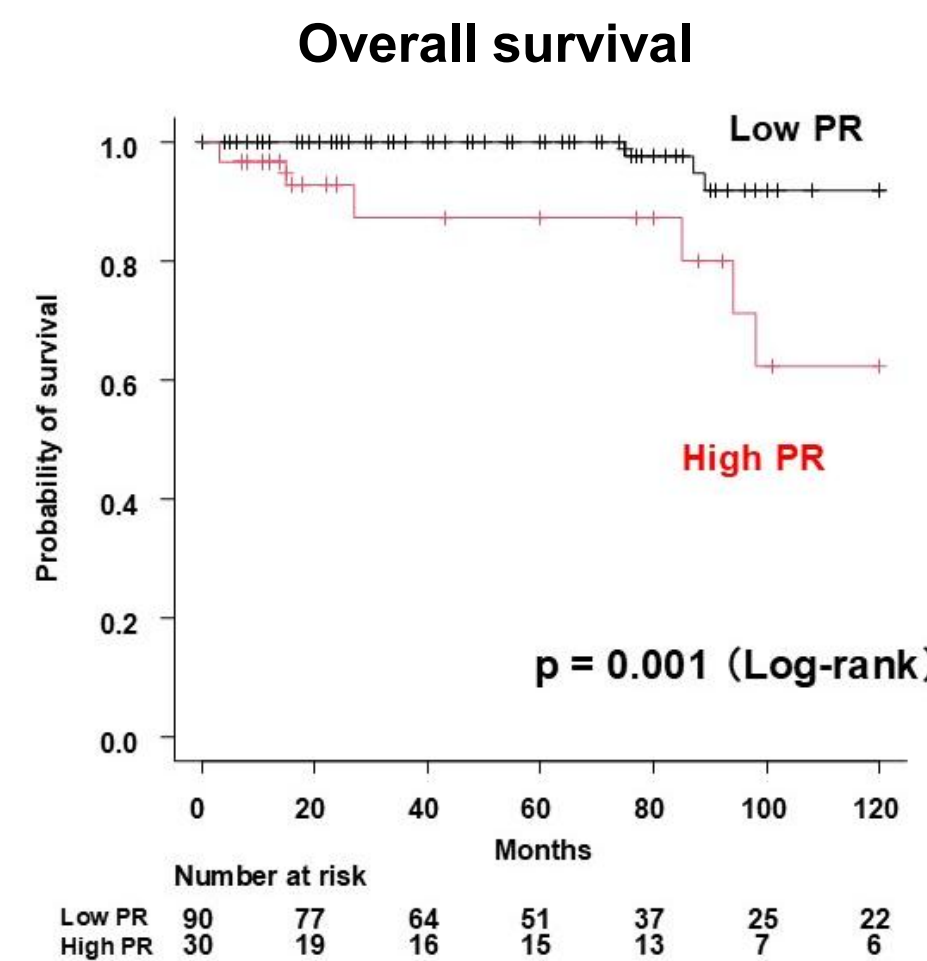
Vimentin positive area ratio



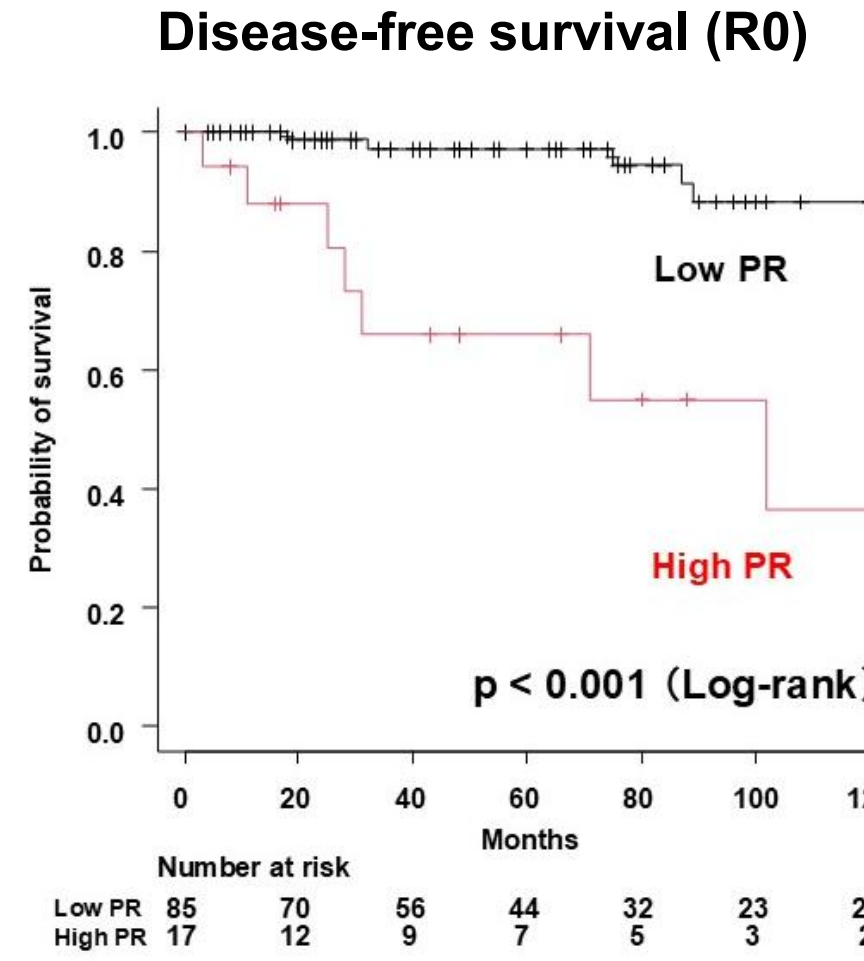
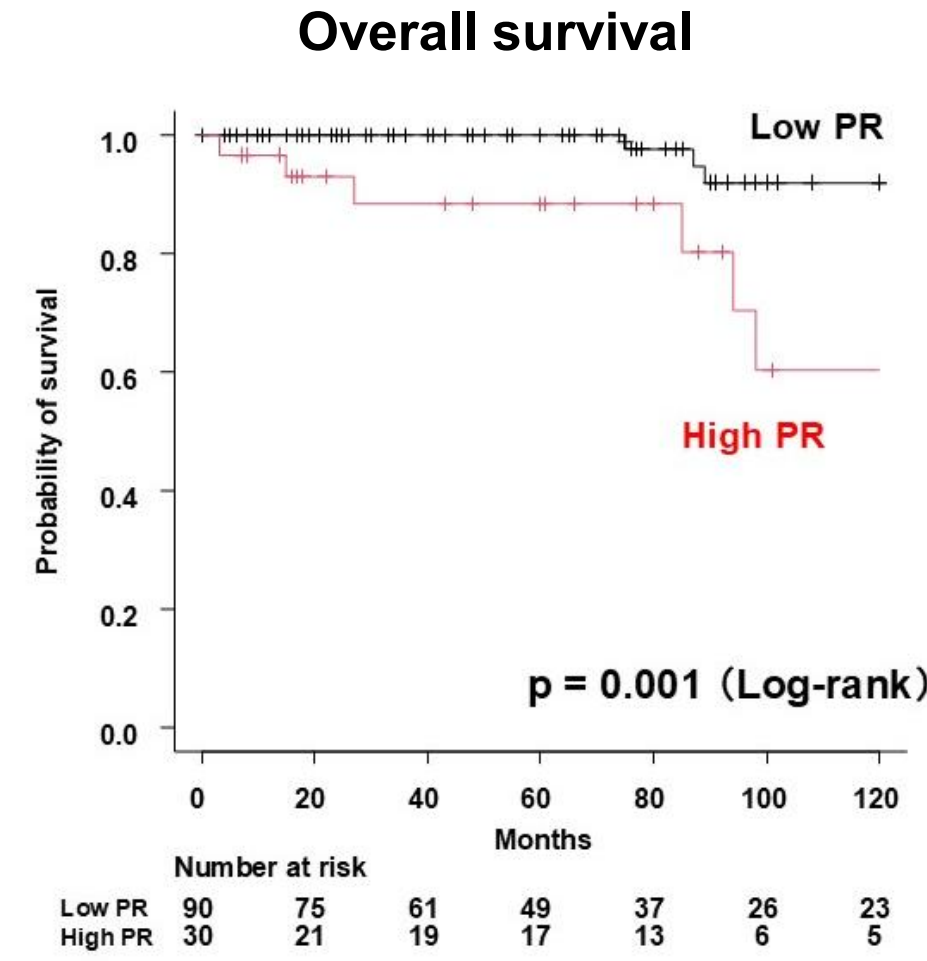
✓ Both PRs increased with histologic aggressiveness and advanced Masaoka stage.

5 Results — Survival analysis

α-SMA positive area ratio



Vimentin positive area ratio



✓ High PRs were significantly associated with shorter OS and DFS.

Multivariable Cox regression

Marker (Q4 vs Q1–3)	Overall survival HR (95% CI), p	Disease-free survival (R0) HR (95% CI), p
α-SMA PR	6.27 (1.25–31.5); p = 0.026	6.00 (1.19–30.2); p = 0.030
vimentin PR	6.38 (1.38–29.4); p = 0.017	9.03 (2.17–37.5); p = 0.002

Adjusted for histology (thymoma vs thymic carcinoma)
and Masaoka stage (I–II vs III–IV).

✓ After adjustment for histologic type and Masaoka stage, high PRs remained associated with shorter OS and DFS.

DISCUSSION & CONCLUSIONS

- ✓ α-SMA and vimentin PRs increased with histologic aggressiveness and advanced stage and were associated with shorter OS and DFS.
- ✓ Marker-positive stromal areas may reflect biologically active stromal phenotypes, including CAF-related components, in TETs.
- ✓ α-SMA and vimentin are not specific to CAFs; therefore, the findings should be interpreted as stromal phenotypes.
- ✓ Multiplex imaging and single-cell analyses are needed to characterize the underlying stromal cell populations.