

CHANGES IN THORACIC BODY COMPOSITION AFTER INDUCTION CHEMOTHERAPY AND OUTCOMES IN PATIENTS WITH ACUTE LYMPHOBLASTIC LEUKEMIA



F. Rodríguez-Contreras^{1,2}, A. Muñoz-Pelayo¹, L. Valdez-Jacobo¹, M. Cruz-Martínez¹, J. Serrano-Heredia¹, J. Ontiveros-Austria¹,

F. Ríos-Olais¹, R. Demichelis-Gómez¹

1. Hematology and Oncology Department. Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubiran, Mexico City, Mexico
2. Universidad Nacional Autónoma de México, School of Medicine, Mexico City, Mexico

INTRODUCTION

Body composition has emerged as an important prognostic marker in adult acute lymphoblastic leukemia (ALL). Previous studies, including those from our group, demonstrated that baseline body composition at the L3 vertebral level and treatment-related weight changes are associated with overall survival (OS). However, whether longitudinal assessment of thoracic body composition provides additional prognostic information beyond baseline measurements remains unknown.

Specifically, the clinical relevance of changes in subcutaneous fat area (SFA) and paraspinal muscle area (PMA) at the T12 vertebral level following induction chemotherapy has not been investigated.

AIM

To quantify changes in thoracic subcutaneous fat and paraspinal muscle at the T12 vertebral level after induction chemotherapy and determine their association with relapse and OS in adults with newly diagnosed ALL.

METHOD

Study design: Retrospective, observational, single-centre analysis.

Inclusion criteria: Patients aged ≥ 18 years with diagnosed ALL who underwent CT imaging at diagnosis and at follow-up time point after induction at our institution.

Body composition changes were measured at the T12 level. Absolute and percentage changes were calculated. **Wilcoxon rank-sum test** were used to identify the differences in body composition changes by vital status and relapse

Relapse and OS were analysed with using Kaplan-Meier curves and Cox proportional hazards models

Clinically meaningful loss thresholds of $\geq 5\%$ and $\geq 10\%$ were evaluated.

CONCLUSIONS

Early changes in thoracic body composition after induction chemotherapy may provide clinically relevant prognostic information in adults with ALL. Greater subcutaneous fat loss was associated with mortality, whereas changes in paraspinal muscle area were not significantly associated with relapse or OS. These findings contrast with our previous observations suggesting a prognostic association between body composition recovery and outcomes, highlighting the potential heterogeneity of body composition changes across anatomical sites and treatment time points. Prospective studies with larger cohorts are needed to validate thoracic body composition as an imaging biomarker for treatment response and risk stratification.

RESULTS

A total of **46 adult patients** were included (58.7% male; median age 29 years, IQR 23–38). The median interval between baseline and post-induction CT scans was **5.4 months** (IQR 3.4–7.5). Over a median follow-up of **18.7 months**, 13 patients (28.3%) experienced disease relapse and 11 (23.9%) died.

Paraspinal Muscle Area (PMA): Paraspinal muscle loss at T12 was near-universal, with 80.4% of patients losing PMA (median decrease: -1.6 cm^2 , IQR -4.1 to -0.8) and 69.6% losing $\geq 10\%$ of baseline PMA. Changes in PMA were not significantly associated with vital status ($p=0.96$) or disease relapse ($p=0.75$).

Subcutaneous Fat Area (SFA): Changes in SFA were heterogeneous (median -5.9 cm^2 , IQR -40.8 to $+20.3$), with 41.3% losing $\geq 10\%$ of baseline SFA. Patients who died experienced significantly greater SFA loss compared to survivors (median -40.0 cm^2 vs $+5.9 \text{ cm}^2$, $p=0.036$).

Survival Analyses: In time-to-event analyses, post-induction ΔSFA was not significantly associated with overall survival (HR 2.30, 95% CI 0.61–8.75, $p=0.22$). Neither thoracic muscle nor fat changes were significantly associated with relapse ($p > 0.05$).

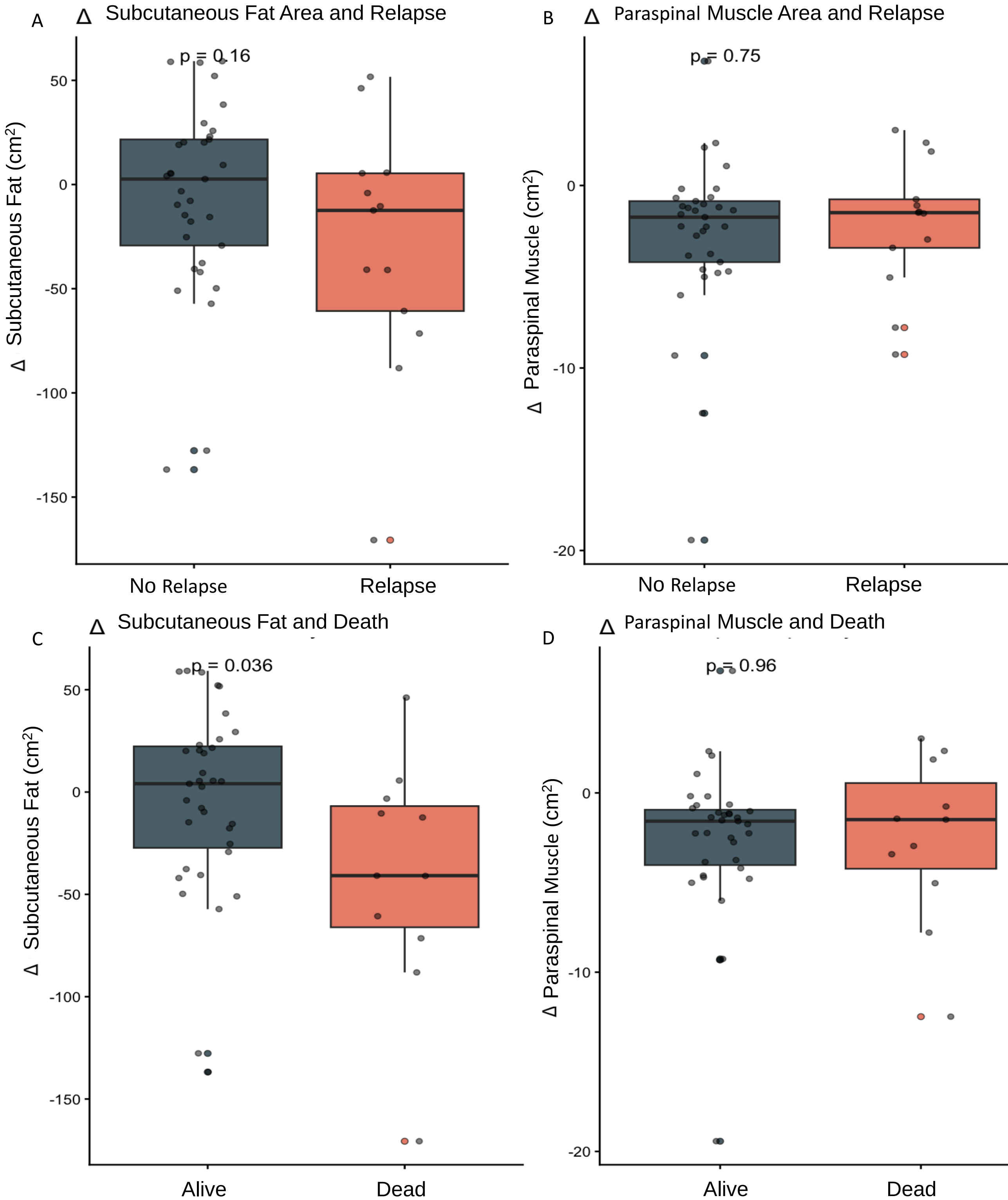


Figure 1. Post-induction changes (A) in thoracic body composition according to clinical events. Boxplots display the median, IQR, and individual data points at the T12 level for (A) SFA change by relapse status ($p = 0.16$); (B) PMA change by relapse status ($p = 0.75$); (C) SFA change by vital status, showing significantly greater loss in patients who died ($p = 0.036$); and (D) PMA change by vital status ($p = 0.96$). Differences were assessed using the Wilcoxon rank-sum test.

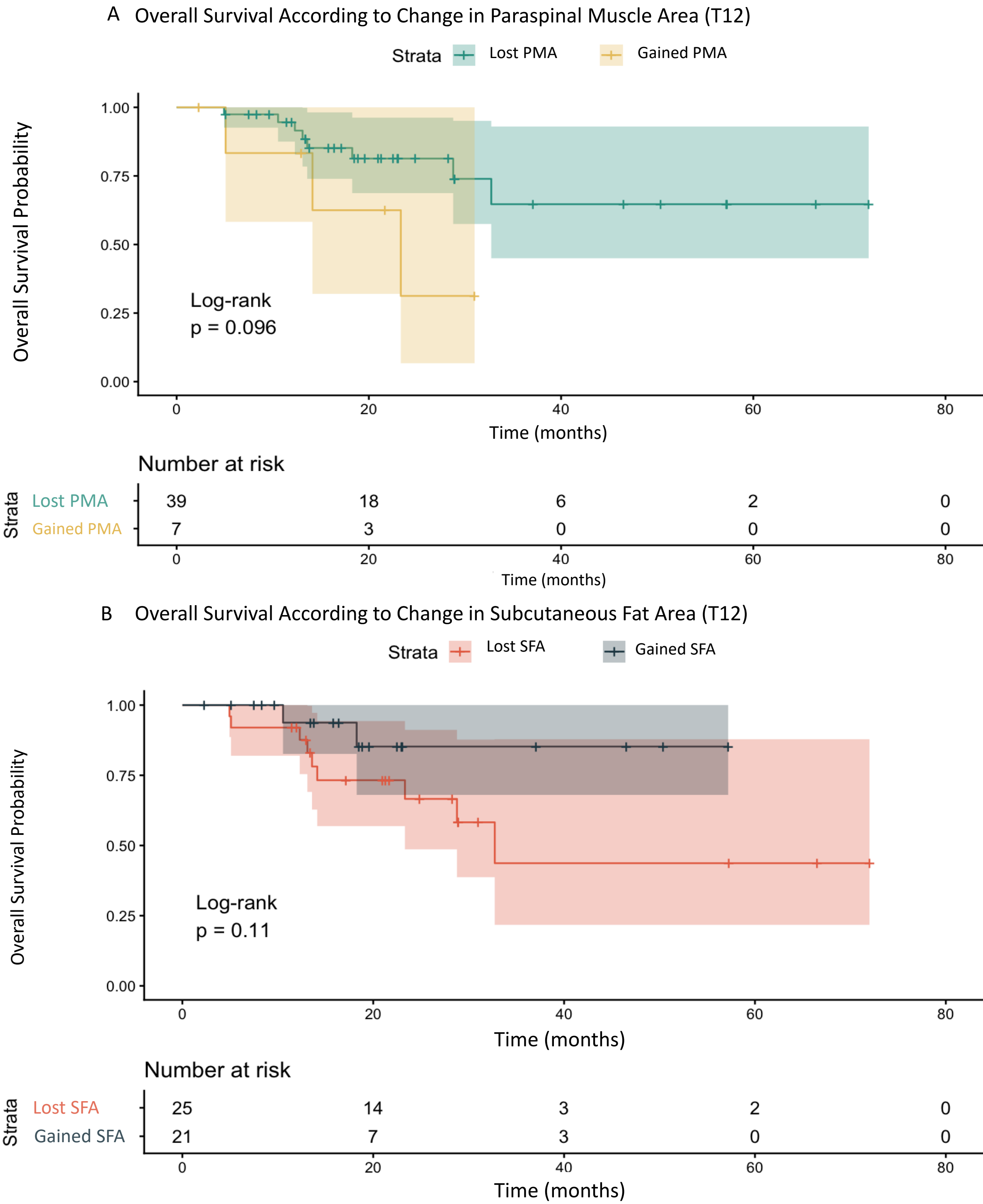


Figure 2. Overall survival according to changes in thoracic body composition at T12. Kaplan-Meier curves show overall survival according to loss or gain of (A) paraspinal muscle area and (B) subcutaneous fat area following induction chemotherapy. Survival was compared using the log-rank test.

ACKNOWLEDGEMENTS

We thank the Hematology Department at the Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán for their support in this project. We are especially grateful to the patients whose participation made this research possible.

CONTACT INFORMATION

Email: fridacntras57@gmail.com / robertademichelis@gmail.com

✉ @FridaRodr1 / @RobertaDemiche3

REFERENCES

- Rios-Olais FA**, Gil-Lopez F, Mora-Cañas A, Zalapa-Soto J, Rosales-Sotomayor G, Gabutti-Thomas A, et al. The prognostic impact of body composition assessed by computed tomography in adult patients with newly diagnosed acute lymphoblastic leukemia. Clin Nutr ESPEN [Internet]. 2025;66:539–46 [doi:10.1016/j.clnesp.2025.02.010](https://doi.org/10.1016/j.clnesp.2025.02.010)
- Kaltenhauser S**, Niessen C, Zeman F, Stroszczyński C, Zorger N, Grosse J, et al. Diagnosis of sarcopenia on thoracic computed tomography and its association with postoperative survival after anatomic lung cancer resection. Sci Rep [Internet]. 2023;13(1):18450 [doi:10.1038/s41598-023-45583-5](https://doi.org/10.1038/s41598-023-45583-5)
- Tolonen A**, Pakarinen T, Sassi A, Kyttä J, Cancino W, Rinta-Kiikka I, et al. Methodology, clinical applications, and future directions of body composition analysis using computed tomography (CT) images: A review. Eur J Radiol [Internet]. 2021;145(109943):109943. [doi:10.1016/j.ejrad.2021.109943](https://doi.org/10.1016/j.ejrad.2021.109943)
- Itonaga T**, Matsuda F, Hirano N, Maeda M, Suenobu S, Ihara K. Sarcopenia in children with acute leukemia worsened after induction therapy. Endocr J [Internet]. 2025;72(9):1023–30 [doi:10.1507/endocrj.EJ25-0055](https://doi.org/10.1507/endocrj.EJ25-0055)