

# Transparent MRI-Based <sup>18</sup>F-Florbetapir Amyloid PET: SUVR/Centiloid Comparison with syngo.via in Down Syndrome

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## Introduction

Amyloid PET Standardized Uptake Value Ratio (SUVR) and Centiloid (CL) scale are standardized quantitative scales to estimate amyloid plaque density in the brain. SUVR can vary across cohorts due to differences in motion handling, PET frame combination, reference-region definition, and ROI implementation methods. Transparent workflows are needed to support reproducibility and ensure accurate cross-method comparisons, particularly in motion-prone populations such as individuals with Down syndrome (DS).

## Methods

Four DS cases from the ABC-DS cohort at the University of Kentucky with <sup>18</sup>F-florbetapir PET were processed using an MRI-guided FreeSurfer workflow and compared with syngo.via (proprietary commercial Siemens software) outputs. Sequential 5-minute PET volumes (20 minutes total, when available) were motion-handled via rigid alignment and combined into a static image using count-preserving volume summation (summation of aligned frames rather than averaging). PET-to-T1 registration was performed using MRI-based co-registration. To improve comparability with syngo.via reporting (by Dr. RHK), cortical regions were aggregated into lobe-level ROIs when ROI-level commercial outputs were available. SUVR was computed using two reference regions: cerebellar gray (CG) and whole cerebellum (WC). Centiloid scale were generated with alignment to the standard cortical target VOI and/or method calibration to support cross-method comparability.

## Results

Our MRI-based PET quantification pipeline showed strong agreement with the commercial Syngo software across cortical amyloid ROIs. Both methods demonstrated similar regional uptake patterns, with the highest SUVR observed in the precuneus and the lowest in frontal/temporal regions. Using cerebellar gray normalization, the average global SUVR across subjects was approximately 1.23, with only small differences between commercial and pipeline-derived measurements, supporting the reliability of the proposed pipeline for florbetapir SUVR and Centiloid estimation.

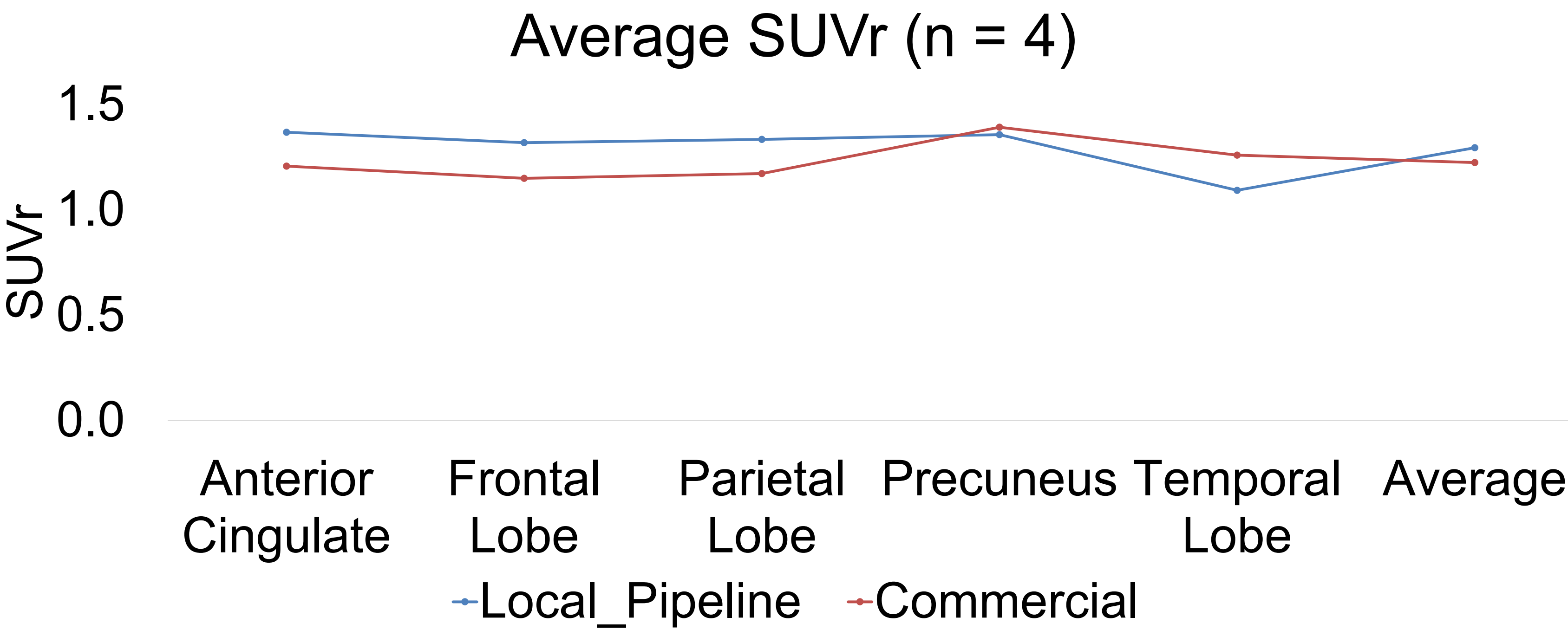


Figure 1: Average SUVR calculated by in house pipeline vs. commercial (n = 4)

Table 1: SUVR calculated by in house pipeline vs. commercial (n = 4)

|                    |      |      |      |      |      |
|--------------------|------|------|------|------|------|
| Anterior cingulate | 1.35 | 1.48 | 1.38 | 1.27 | 1.37 |
| Frontal lobe       | 1.41 | 1.36 | 1.33 | 1.17 | 1.32 |
| Parietal lobe      | 1.46 | 1.32 | 1.37 | 1.19 | 1.34 |
| Precuneus          | 1.61 | 1.4  | 1.22 | 1.20 | 1.36 |
| Temporal lobe      | 1.20 | 1.12 | 0.96 | 1.10 | 1.09 |
| average            | 1.41 | 1.34 | 1.25 | 1.19 | 1.30 |

Table 2: SUVR calculated by commercial software (syngo.via) pipeline vs. commercial (n = 4)

|                    |      |      |      |      |      |
|--------------------|------|------|------|------|------|
| Anterior cingulate | 1.16 | 1.11 | 1.46 | 1.10 | 1.21 |
| Frontal lobe       | 1.03 | 1.13 | 1.39 | 1.05 | 1.15 |
| Parietal lobe      | 1.21 | 1.24 | 1.12 | 1.12 | 1.17 |
| Precuneus          | 1.43 | 1.40 | 1.62 | 1.12 | 1.39 |
| Temporal lobe      | 1.31 | 1.23 | 1.29 | 1.21 | 1.26 |
| average            | 1.20 | 1.23 | 1.34 | 1.13 | 1.23 |

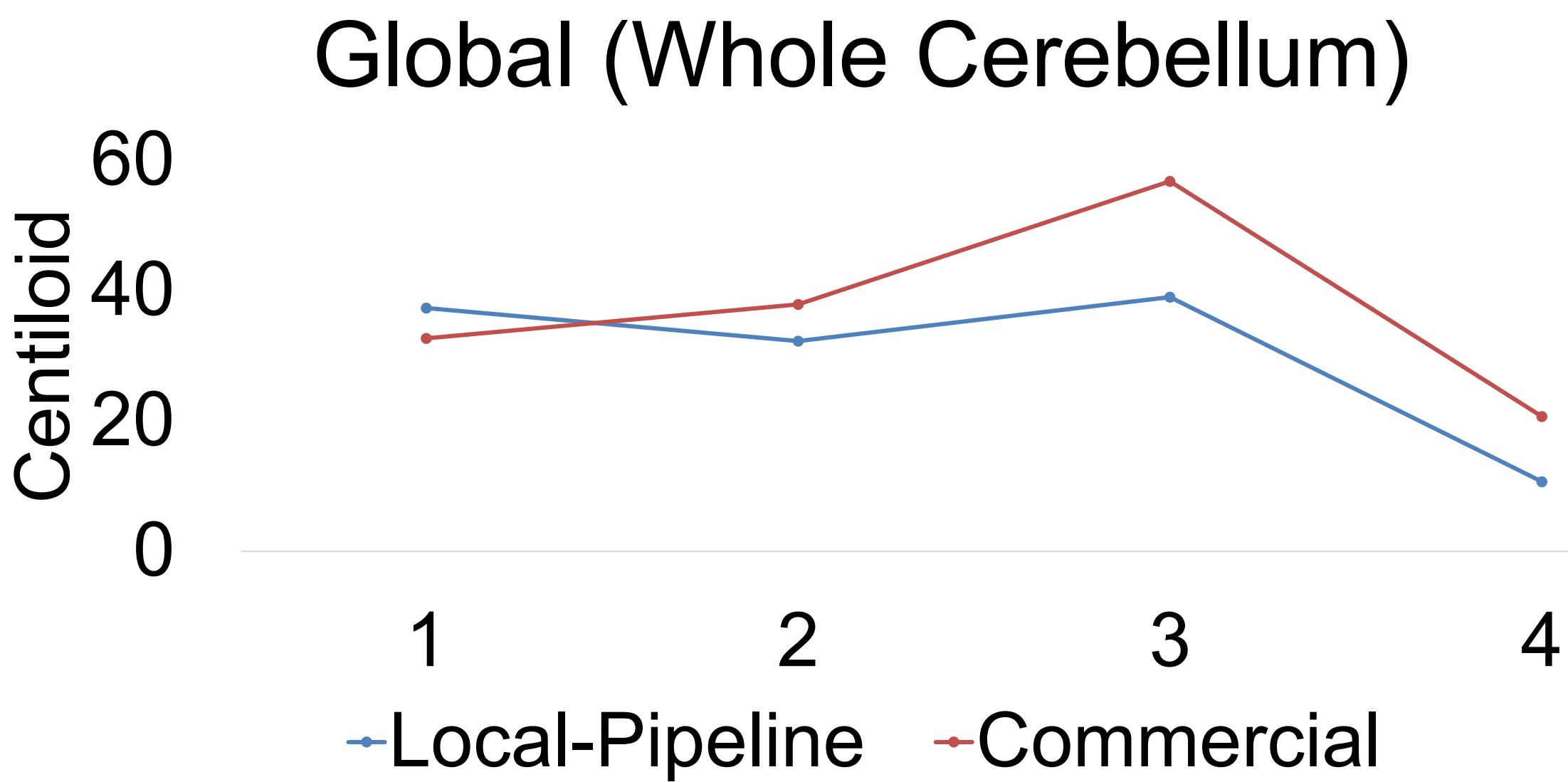


Figure 2: Centiloid calculated by in house pipeline vs. commercial (n = 4)

## Conclusions

A transparent MRI-based <sup>18</sup>F-florbetapir workflow with explicit motion handling and count-preserving frame summation showed case-dependent agreement with syngo.via, and reference-region selection materially influenced SUVR bias and Centiloid scale differences. These findings support standardized ROI mapping and careful calibration/VOI alignment when comparing Centiloid scale measures across cohorts.

## References

D. Ali, A. Bahrani, J. Barber, R. El Khouli, B. Gold, J. Harp, Y. Jiang, D. Wilcock, G. Jicha, "Amyloid-PET levels in the Precuneus and Posterior Cingulate Cortices are Associated with Executive Function Scores in Preclinical Alzheimer's Disease Prior to Overt Global Amyloid Positivity," Journal of Alzheimer's Disease, 2022, 88(3), 1127.

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