

A Reproducible ASL Analysis Pipeline For Cerebral Blood Flow Quantification in A Nigerian Cohort (#1974)

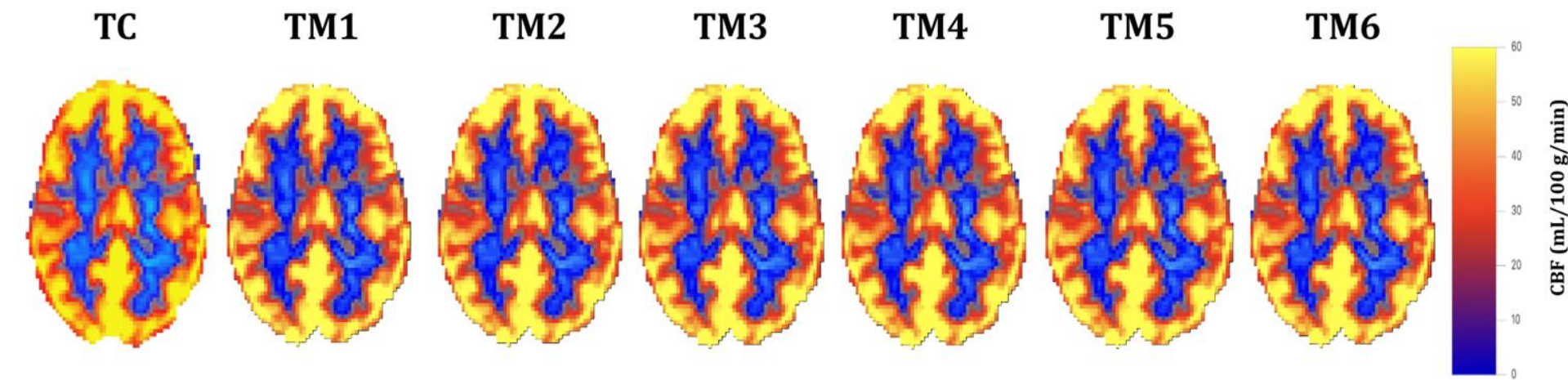


Figure 1: Group mean of cerebral blood flow (CBF) maps (n=14) analyzed by the CONNExIN Training Coordinator (TC) and six team members (TM1–TM6). No smoothing applied.

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We developed a reproducible, standardized ASL MRI analysis pipeline that enables reliable cerebral blood flow (CBF) quantification, offering a scalable solution for longitudinal Alzheimer's research in resource-constrained settings.

INTRODUCTION	METHODS	RESULTS	CONCLUSION	REFERENCES
Cerebral hypoperfusion is recognized as an early pathophysiological event in the Alzheimer’s disease (AD) continuum, preceding measurable cognitive decline and contributing to neurodegeneration¹. Arterial Spin Labeling (ASL) MRI provides a non-invasive, contrast-free measure of cerebral blood flow (CBF)², yet its application is limited in resource-constrained settings by protocol variability, technical gaps, and non-reproducible processing. To overcome these barriers, we developed a standardized ASL pipeline to improve reproducibility, facilitate knowledge transfer, and strengthen open-science.	We implemented a scalable perfusion analysis pipeline using Quantiphyse (v0.9.10)³. This was conducted as a training exercise within the 2025 CONNExIN program⁴. Six trainees applied the processing pipeline to a local dataset of fourteen healthy Nigerian adults collected as part of the Scan With Me (SWiM) program⁵. MRI data were acquired on a 1.5T United scanner with pseudo-continuous ASL (pCASL), along with T1-weighted MPRAGE processed using SynthStrip⁶. Data preprocessing and CBF quantification were performed using Quantiphyse, with our full protocol, including pipeline, configuration files, and visual guide, publicly available on protocols.io.	The CBF maps generated from our pipeline (Figure 1) showed excellent inter-rater reliability (ICC=0.998; 95% CI: 0.995-0.999). Mean CBF values remained remarkably stable across independent operators (Table 1). Comparing graphical user interface (GUI) (n = 4) to command line (CL) (n = 6) pipeline implementation revealed high precision, with minor differences (x < 0.02 ml/100g/min; <i>p</i> < 0.05) within clinically insignificant limits. This demonstrates high reproducibility across different user interfaces with no smoothing applied. (Figure 1).	We implemented an established analysis pipeline with minimal challenges, including memory and software limitations. Strong agreement with trainer analyses and near-perfect ICC scores demonstrate this robust ASL pipeline’s reproducibility for reliable CBF quantification. This pipeline offers a scalable solution for longitudinal Alzheimer’s research in Africa and other resource-constrained settings.	1) Yao et al., 2026 2) Detre et al., 1992 3) Craig et al., 2019 4) CONNExIN, 2024 5) Mumuni et al., 2025 6) Hoopes et al., 2022 CONTACT Isaac Tigbee (isaactigbee@gmail.com) 