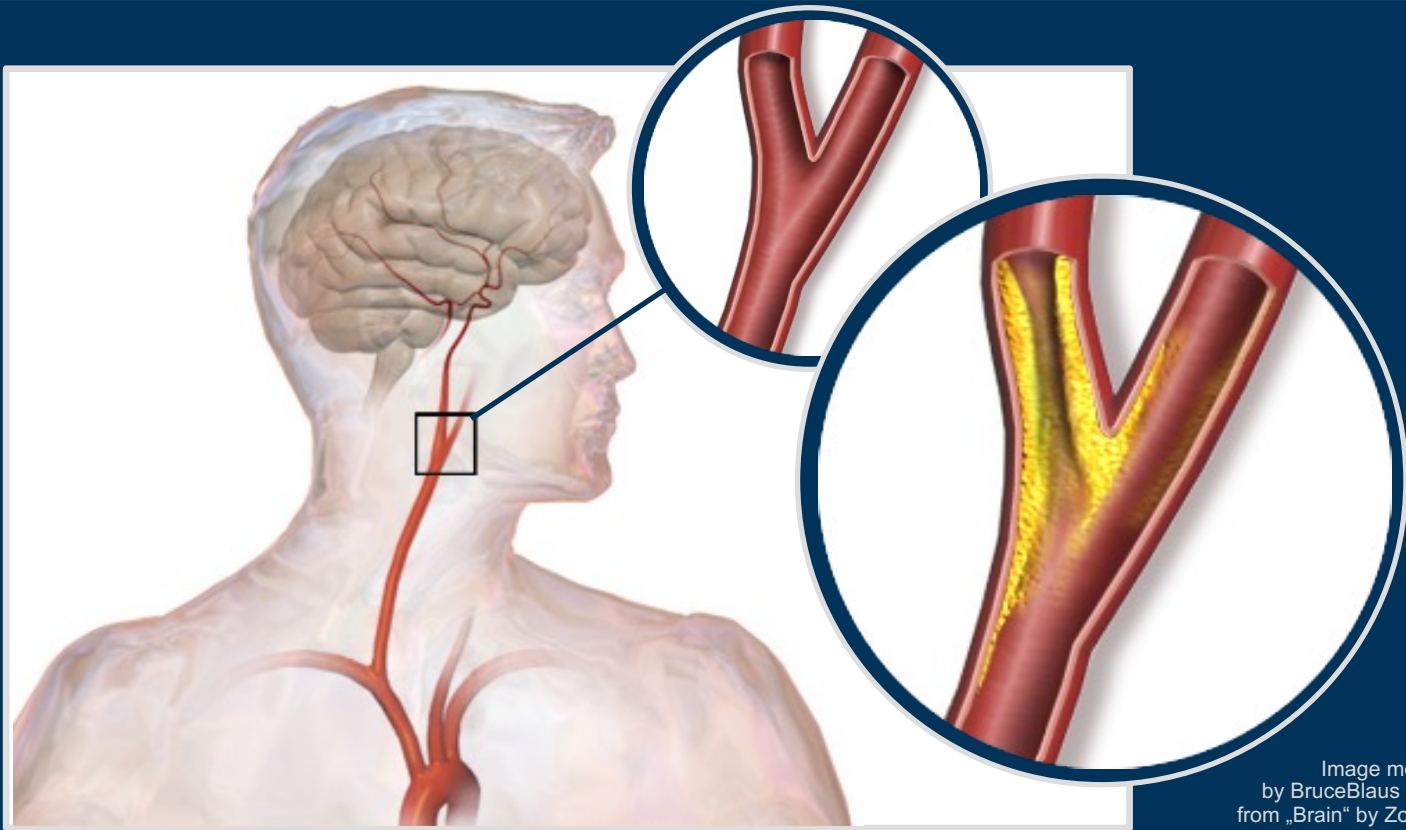# Visual attention bias correlates with a characteristic perfusion pattern in asymptomatic unilateral carotid artery stenosis

Jan Kufer[1], Jens Göttler[1,2], Kilian Weiss[3], Claus Zimmer[1], Fahmeed Hyder[2], Christine Preibisch[1,4], Stephan Kaczmarz[1,2,3]

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Purpose:

- Internal carotid artery stenosis (ICAS) known to cause hemodynamic changes and cognitive decline[1,2,3]

- Hypoperfusion has been linked to visual attention bias in ICAS before[4]

- Spatial covariance patterns of cerebral blood flow (CBF) promising to elucidate links between local perfusion alterations and cognitive performance in neurologic pathologies[5,6]

- **Aim: To derive a characteristic CBF pattern to understand relation of local CBF changes with visual attention bias in ICAS**

Image modified from „Carotid artery stenosis" by BruceBlaus licensed CC BY 3.0. Image modified from „Brain" by Zoë Austin licensed CC BY 3.0. Image from „Tomography" by Delwar Hossain licensed CC BY 3.0

Methods:

3T MRI
Philips Ingenia

10 ICAS — 73.5 ± 3.9 y — ♂ 7 ♀ 3
- No stroke or injuries
- Asymptomatic
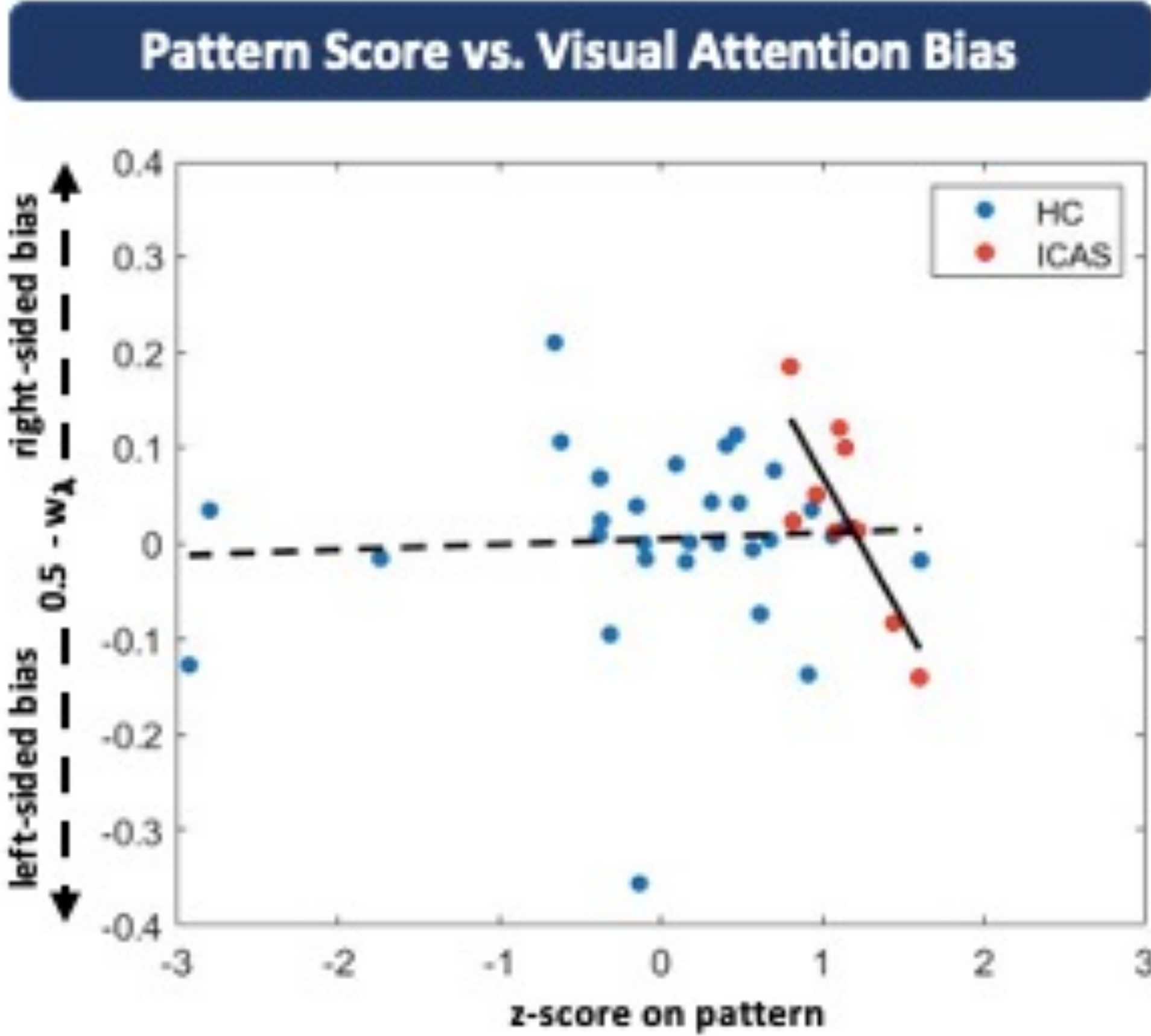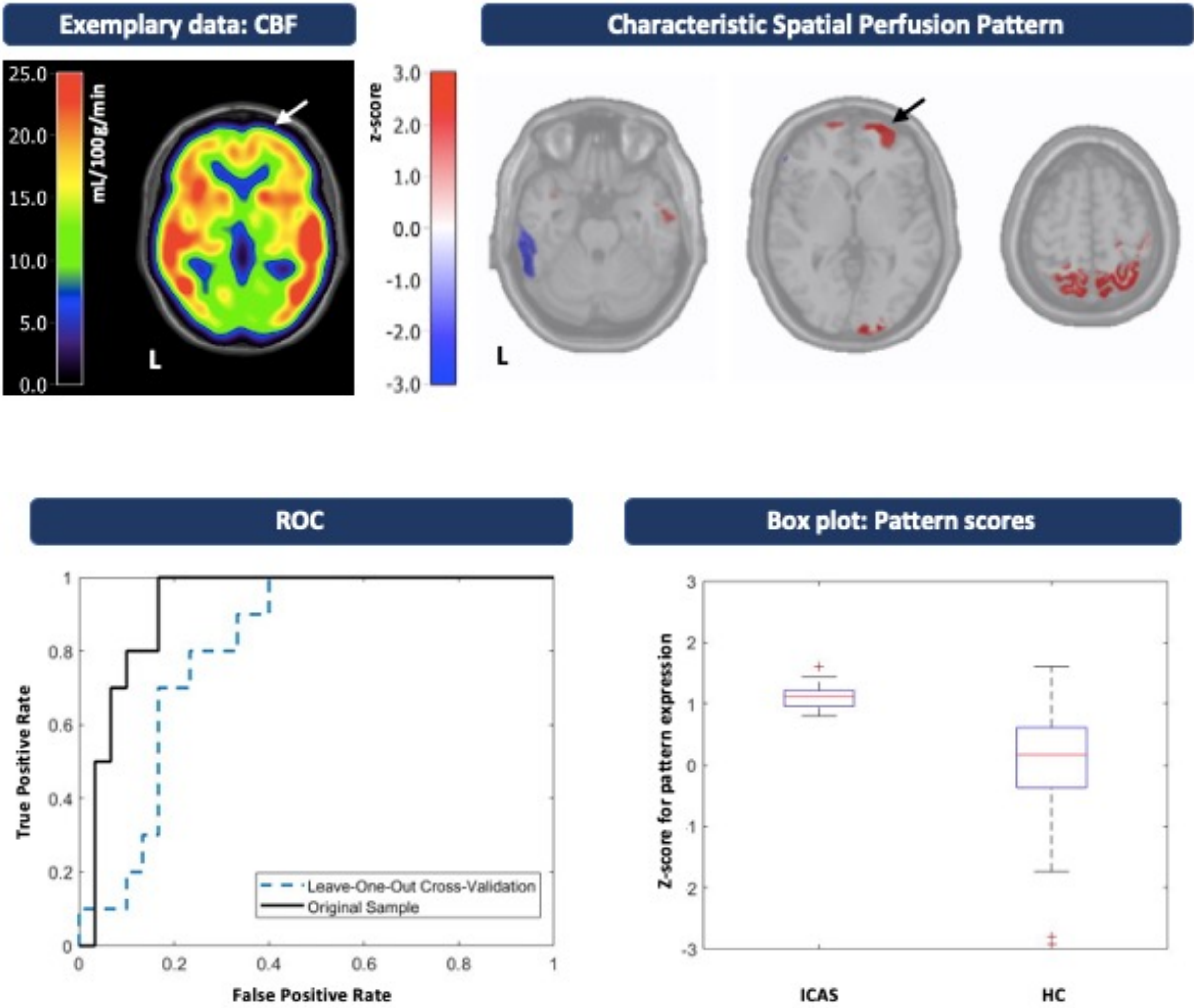- Unilateral – left sided
- NASCET > 70%

30 HC — 70.3 ± 4.9 y — ♂ 13 ♀ 17
- No stroke or injuries

➤ **CBF maps by pCASL** according to latest recommendations[2,7]

➤ **Principal component analysis** (PCA) applied to derive **spatial covariance patterns** following an established method[5,6,8]

➤ **Disease-related components combined in logistic regression model**[5,8] and pattern re-derived using leave-one-out cross-validation (LOOCV)[5]

➤ Patterns scores correlated with TVA-based **visual attention bias**[9]

Results:

Exemplary data: CBF

Characteristic Spatial Perfusion Pattern

Pattern Score vs. Visual Attention Bias

ROC

Box plot: Pattern scores

➤ **Pattern distinguishes ICAS and HC** (AUC = 0.93 original sample, 0.81 for LOOCV)

➤ Leftward **visual attention bias** associated with **pattern score in patients** (r = -0.80)

➤ **Specificity confirmed** by lack of relationship in HC

Discussion:

- Spatial CBF pattern highly specific for patients

- Ipsilateral hypoperfusion and contralateral WSA[10] involvement

- Leave-one-out cross-validation indicated generalizability

- Disease pattern associated with ipsilateral attention bias as expected[4]

Conclusions:

- **Characteristic cerfusion pattern identified in asymptomatic unilateral (left-sided) ICAS**

- **Visual attention deficit related to pattern expression**

References:

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5: Melzer et al., Brain 2011
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