

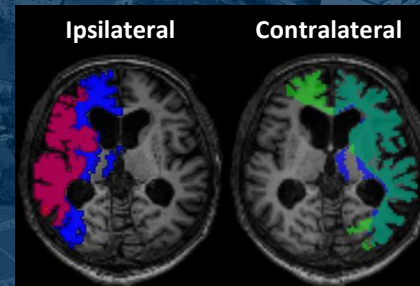
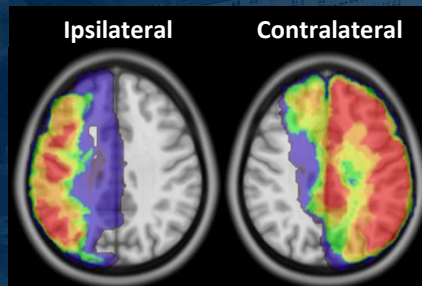
# 0070 Perfusion territory shifts in asymptomatic carotid artery stenosis measured by super selective arterial spin labelling

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Session: Perfusion: From Head to Toe

Time: 14:45 - 16:45

Room: ICC Capital Suite 8-9



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JOINT ANNUAL MEETING ISMRM-ESMRMB

ISMRT 31<sup>ST</sup> ANNUAL MEETING

07-12 MAY 2022 | LONDON, ENGLAND, UK

A HYBRID EXPERIENCE



# Declaration of Financial Interests or Relationships

Speaker Name: Gabriel Hoffmann

I have no financial interests or relationships to disclose with regard to the subject matter of this presentation.

## Motivation

### Background

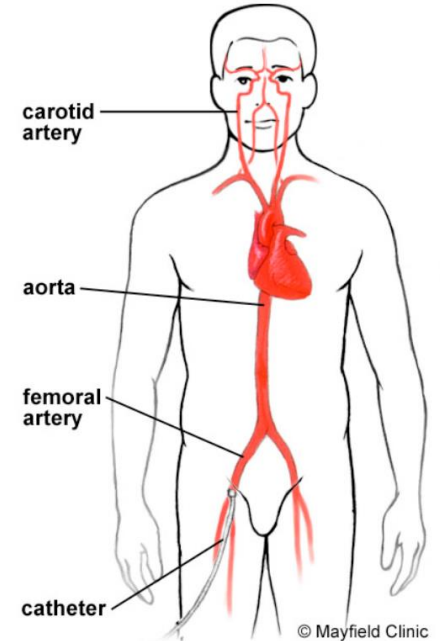
- Internal carotid artery stenosis (ICAS) major health risk in developed countries<sup>1,2</sup>
- Potentially protective pathways due to collateral flow<sup>3,4</sup>
- Clinically available digital subtraction angiography (DSA) highly invasive

### Purpose

- Non-invasive, quantitative measures of collateral blood crossflow to facilitate clinical decision making

### Hypothesis

- Super-selective ASL (ssASL)<sup>5</sup> provides non-invasive perfusion territory mapping
- Asymptomatic high-grade ICAS may induce shifts of vascular territories



1: Donahue, JCBFM, 2018

2: Petty, Stroke, 1999

3: Liebesking, Stroke, 2003

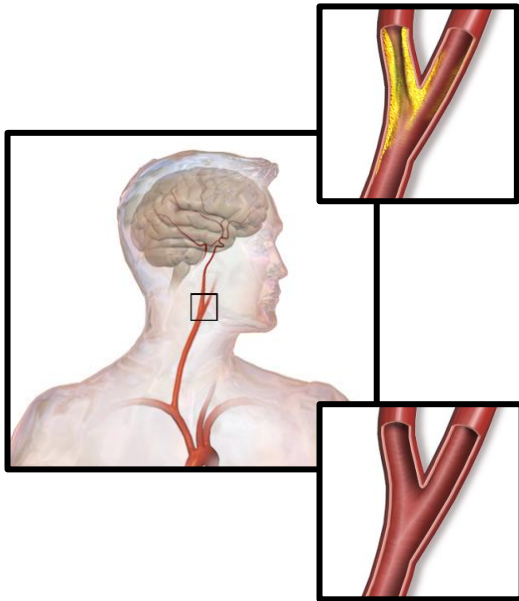
4: Jung, SwissMed, 2017

5: Helle, MRM, 2010

Image: UC Health, visited: 27.04.2022, [https://www.uchealth.com/wp-content/uploads/2013/01/PE-Angiogram\\_UCNI.pdf](https://www.uchealth.com/wp-content/uploads/2013/01/PE-Angiogram_UCNI.pdf)

## Methods

### Participants



#### ICAS

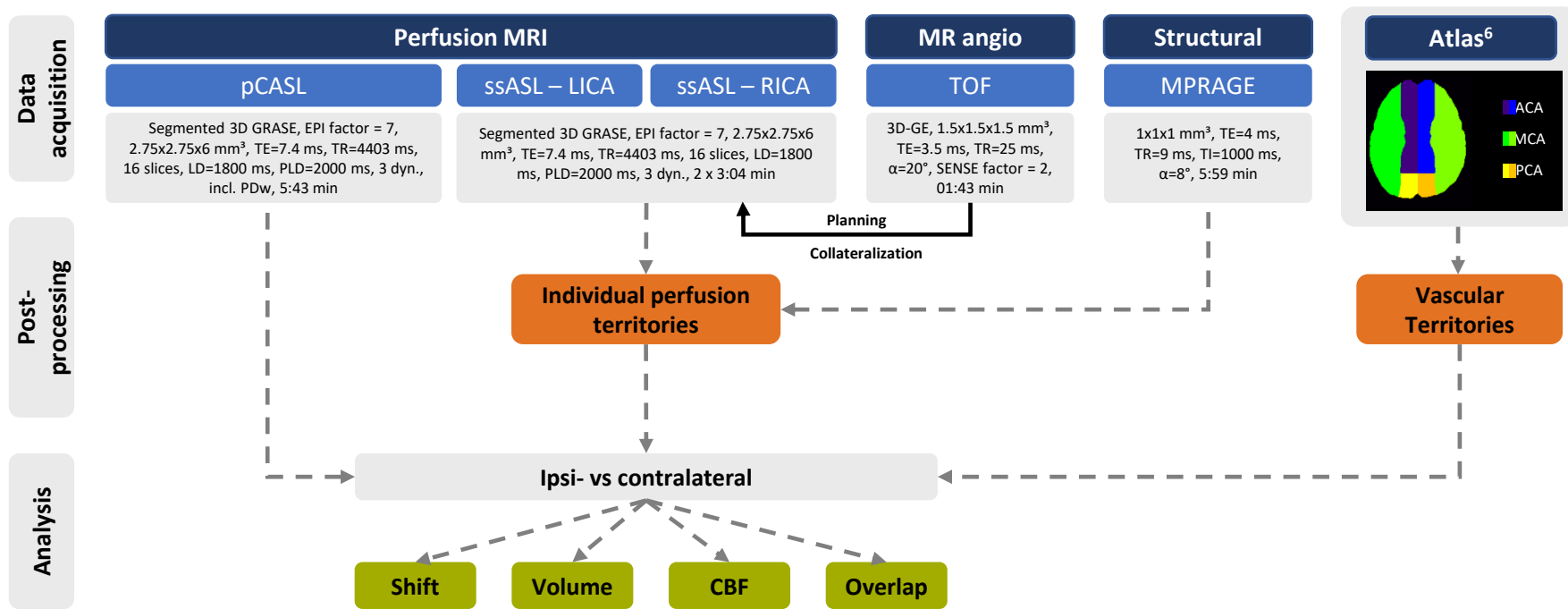
- 5 patients (mean age 73 y)
- 4 female / 1 male
- Good collateralization status
- Asymptomatic
- Unilateral & high-grade stenosis (>70% NASCET)

#### Healthy controls (HC)

- 8 HC (mean age 39 y)
- 7 female / 1 male

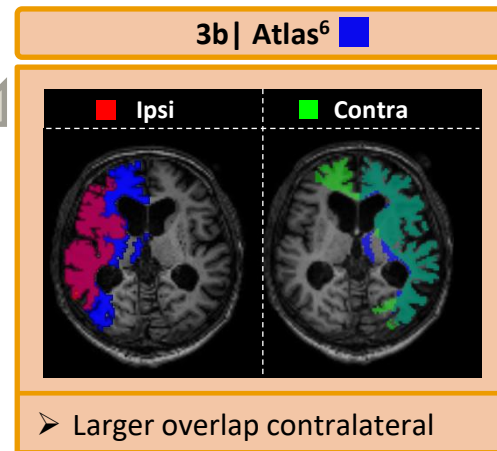
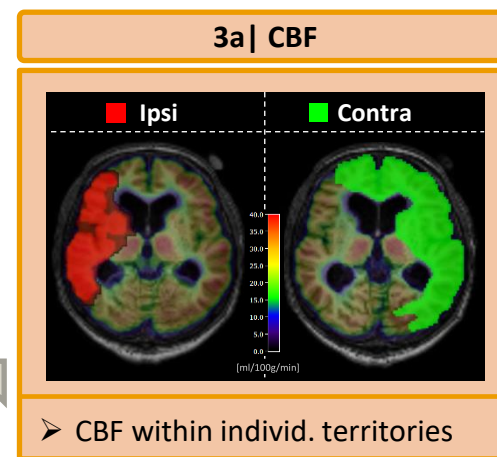
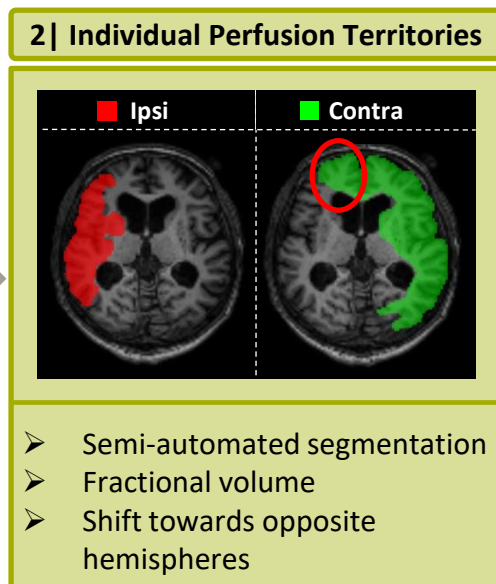
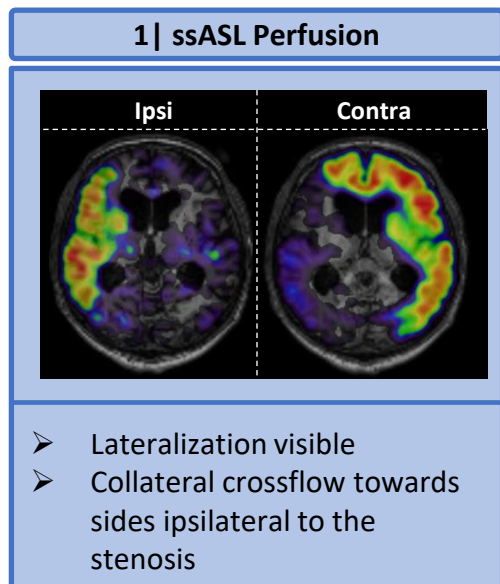
## Methods

### Image acquisition and parameters



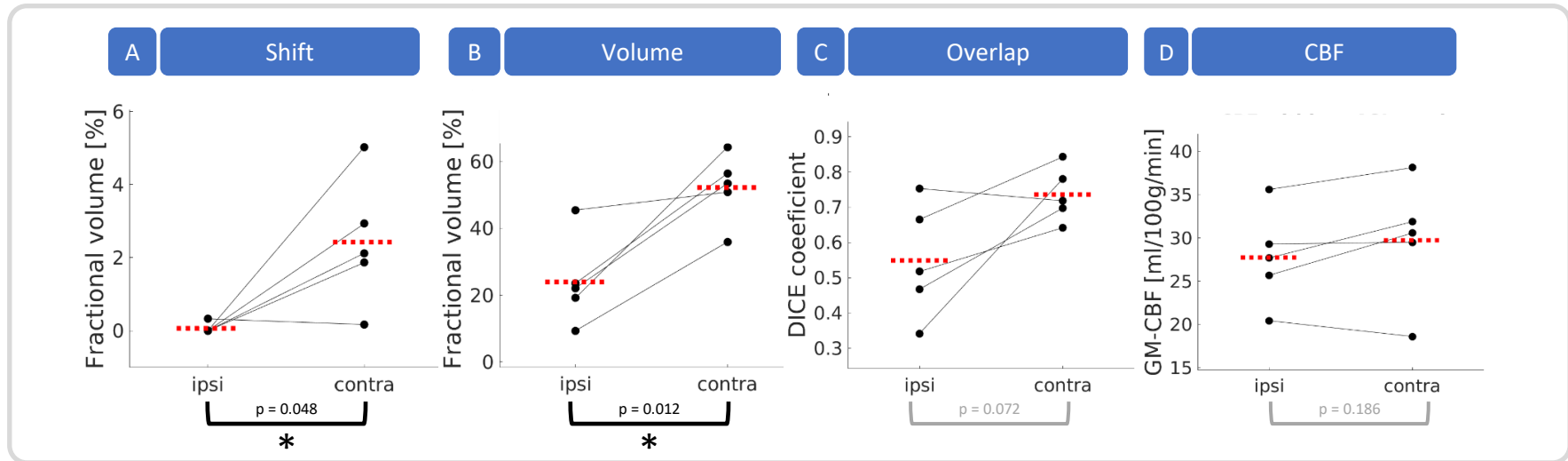
## Results

### Exemplary Data



## Results

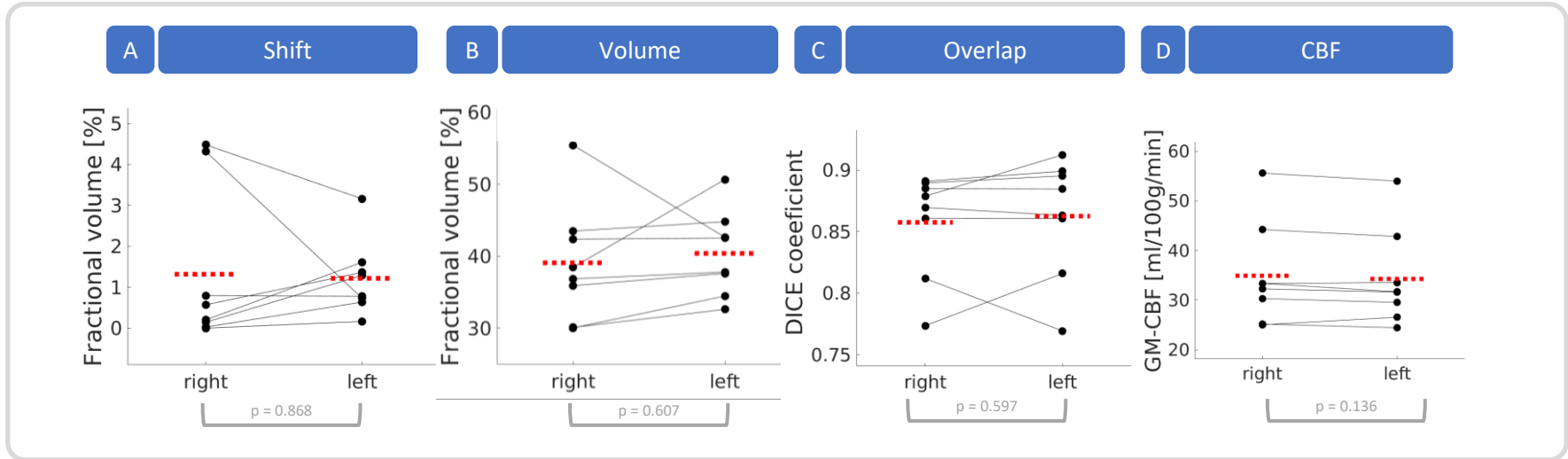
## Group level – ICAS



- Shifts of perfusion territories
- Larger volume contralateral
- Trends for larger CBF & overlap for contralateral hemispheres

# Results

## Group level – HC



➤ No significant differences between left & right hemispheres

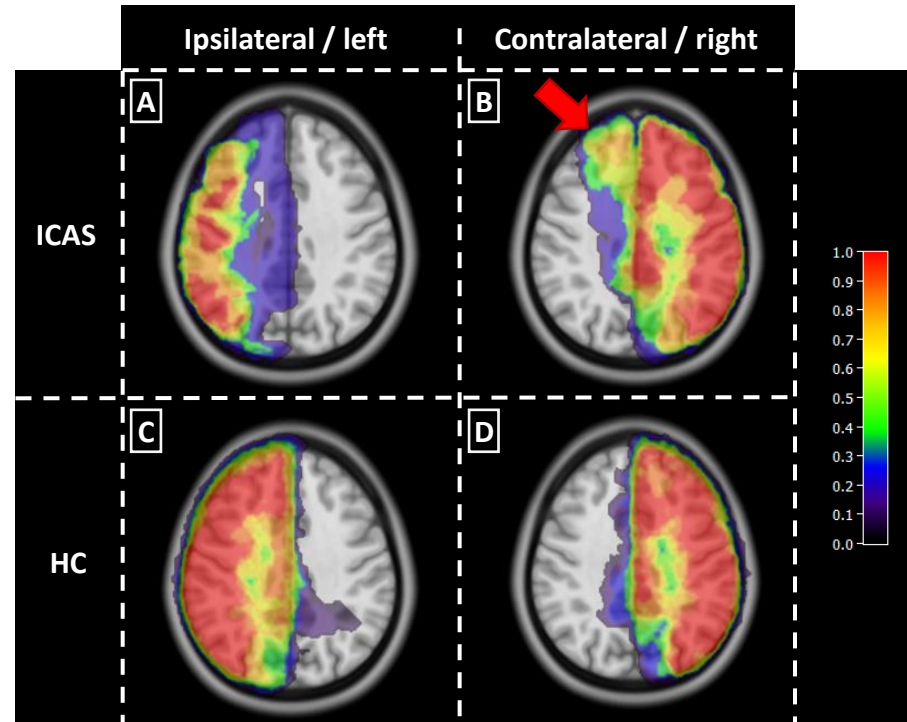


## Results

### Group level – ICAS vs HC Part I

MNI based probability maps

- Collateral blood flow for ICAS
- Symmetric perfusion for HC



## Results

### Group level – ICAS vs HC Part II

Interhemispheric differences:

$$\Delta P = P_{\text{contra/left}} - P_{\text{ipsi/right}} ; \quad P \in \{\text{Shift; Volume, CBF; Overlap}\}$$

➤ Significantly larger differences for ICAS compared to HC

	Shift [%]			Volume [%]			CBF [ml/100g/min]			Overlap		
	ipsi/right	Contra/left	$\Delta$ Shift	ipsi/right	Contra/left	$\Delta$ Volume	ipsi/right	Contra/left	$\Delta$ CBF	ipsi/right	Contra/left	$\Delta$ Overlap
ICAS	0.07	2.42	2.35*	23.93	52.18	28.25*	27.75	29.75	2.00	0.55	0.74	0.19
HC	1.32	1.22	-0.10	39.11	40.41	1.30	34.91	34.27	-0.64	0.86	0.86	0.00

## Discussion & Summary

### Discussion

Collateral blood flow towards hypo perfused regions of the stenosed ICA, similarly to symptomatic ICAS<sup>7,8</sup>

Shifts at borderzones of vascular territories – in agreement with literature<sup>9,10,11</sup>

### Summary

Asymptomatic ICAS induces shifts of perfusion territories

Quantitative measures for collateral blood supply based on easy applicable ssASL technique

Combination with non-invasive time-resolved selective ASL-angiography may reveal additional collateral blood supply information<sup>12</sup>

# Thank you for your attention!

We want to highly appreciate the support by:

German Research Foundation (DFG)  
Dr. Ing. Leonhard-Lorenz Stiftung

