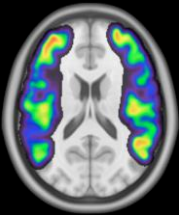


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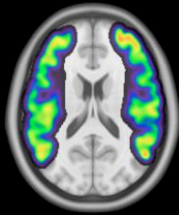
Treatment efficacy of asymptomatic carotid artery stenosis patients evaluated by clinically applicable hemodynamic MRI and cognitive testing

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ALFF - pre OP



ALFF - post OP



Session: **MRI in Diagnosis & Treatment of CVD**

Q&A: **Thursday Parallel 2**

Neurovascular imaging

Thursday, August 13, 2020

14:20 – 15:05 (UTC)



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08-14 August 2020

Declaration of Financial Interests or Relationships

Speaker Name: Stephan Kaczmarz

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) accounts for 10-20% of strokes¹

Effective² treatment by stenting (CAS) or endarterectomy (CEA) with substantial risks³

Hemodynamic biomarkers promising to improve treatment decisions⁴

Issue

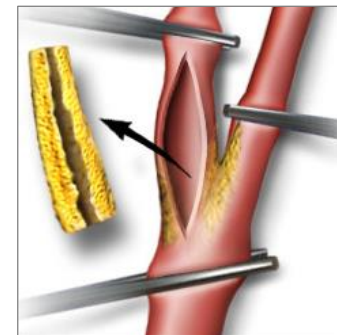
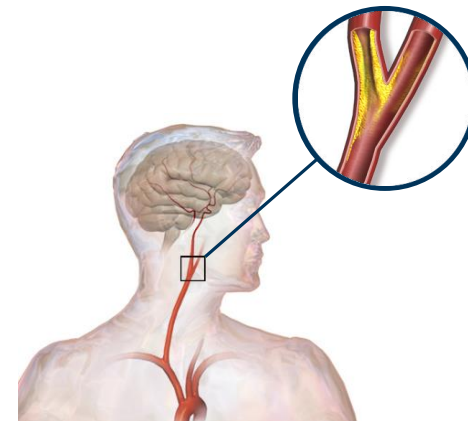
Hemodynamics currently unconsidered⁵
due to clinical applicable methods lacking

Hypothesis

Relative cerebral blood volume (rCBV)⁶, capillary transit-time heterogeneity (CTH)⁷,
and amplitude of low-frequency fluctuations (ALFF)⁸

Sensitivity to hemodynamic recovery after ICAS treatment

Investigate effects on cognition and lesions



Material & Methods

Participants

2x: Pre & post treatment



- 3T Philips Ingenia
- Software release 5.1.8
- Custom patches

- C-DAS
- 32ch head coil
- 16ch head-neck coil

16 ICAS



71.4 ± 5.8 y



- No strokes or injuries
- Asymptomatic
- Unilateral
- NASCET > 70%
- CAS & CEA treatment

17 HC



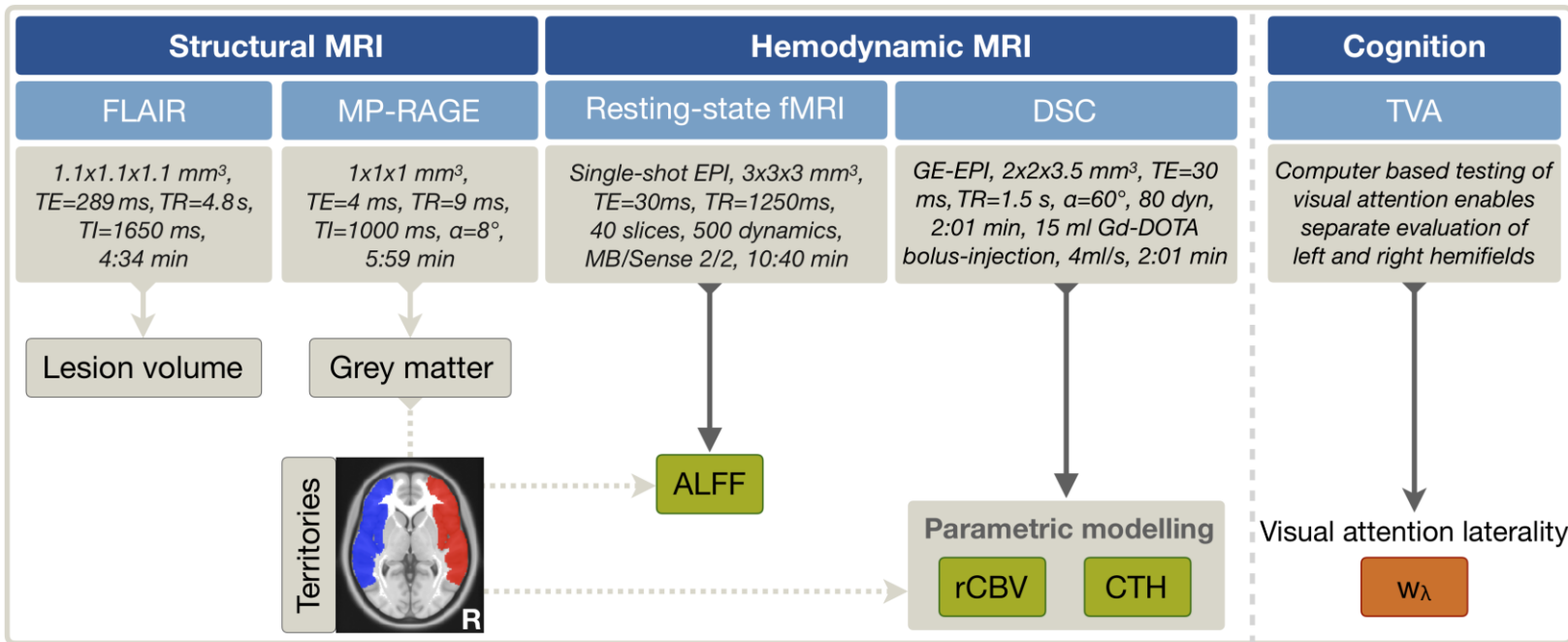
70.8 ± 5.3 y



- No strokes or injuries

Material & Methods

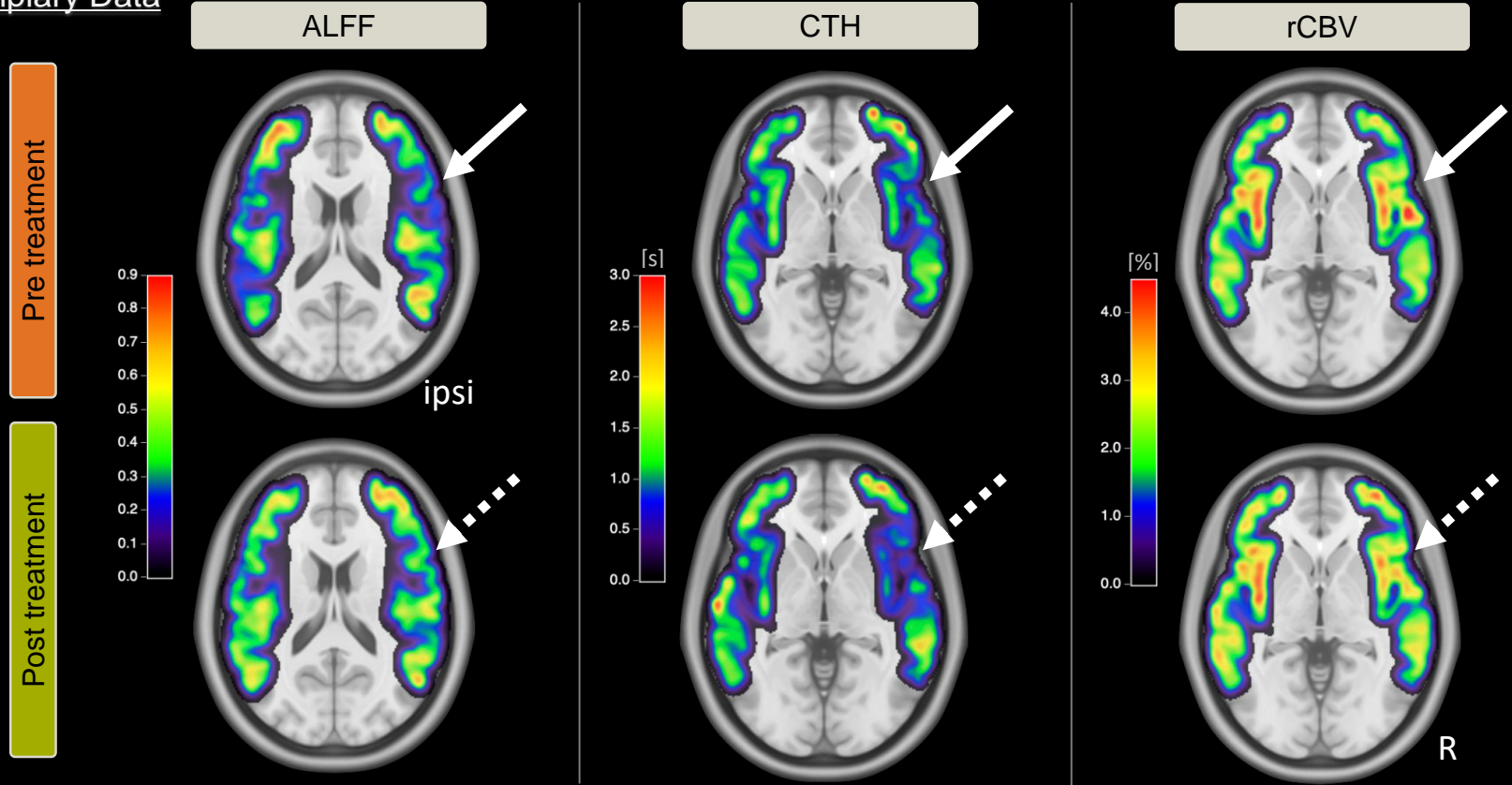
MR imaging protocol



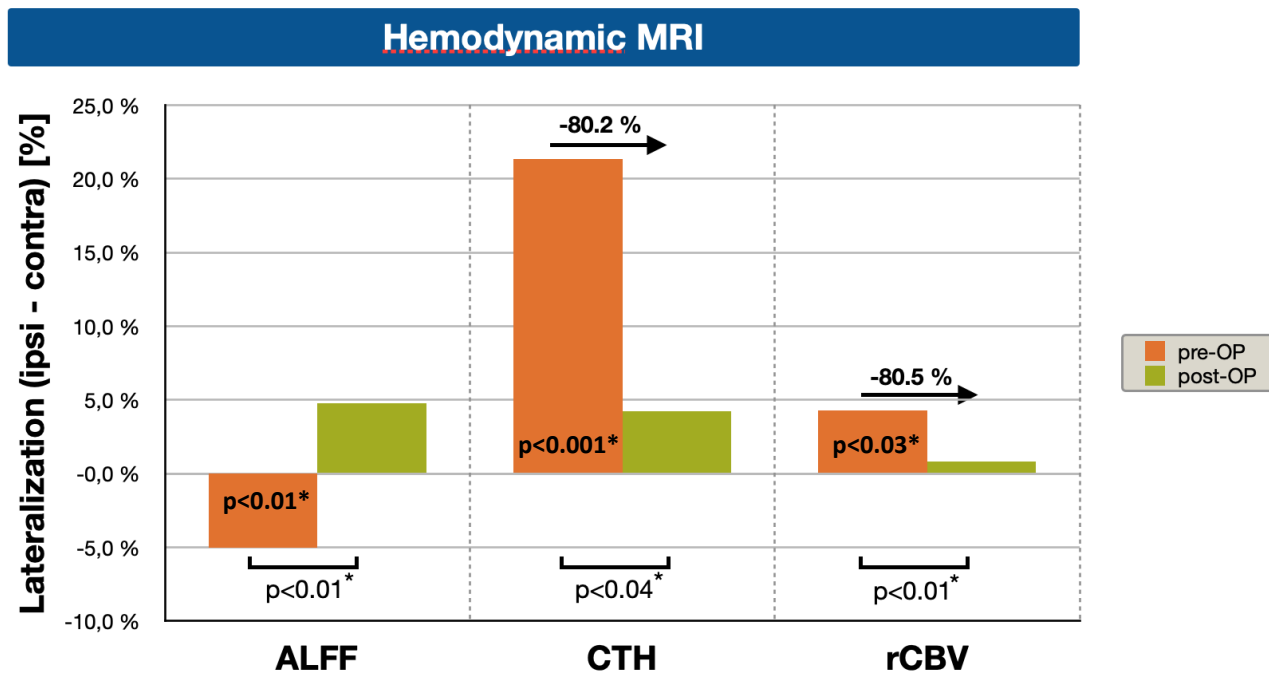
Results

Right sided ICAS-patient

Exemplary Data



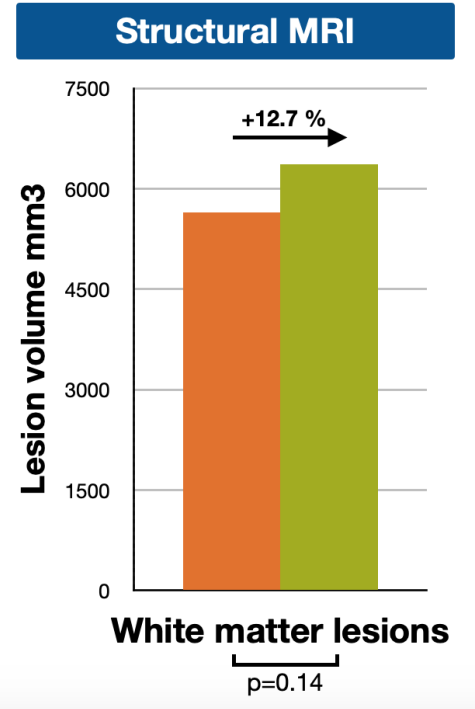
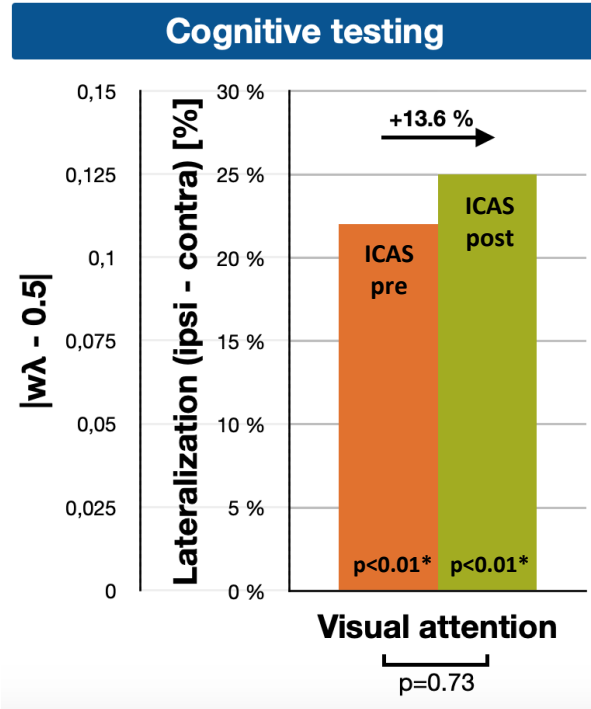
Results



Strong initial hemodynamic impairments

Post treatment recovery by $\approx 80\%$

Results



Remaining visual attention impairment

Slightly increased lesion load

Discussion

Revascularization effects in ICAS

Hemodynamics

ALFF, rCBV & CTH sensitive to hemodynamic ICAS impairments

Chronic vasodilation indicated^{1,2} with additional capillary dysfunction³

Improved hemodynamic status after treatment - in accordance with literature³⁻⁶

Cognition

Persisting cognitive impairments after treatment⁷

Cognitive impairments might be irreversible

Postoperative damage⁸ by micro emboly⁹ compensates Δ CTH recovery¹⁰

¹Vagal et al. AJNR 2009, ²Donahue et al. JCBFM 2018, ³Arsava et al. Eur Stroke J 2018, ⁴Mandell et al. AJNR 2011, ⁵Sam et al. BMJ open 2015, ⁶Fierstra et al. Strok 2011, ⁷Schroder et al. NI Clinical 2019, ⁸Nanba et al. Cerebrovasc Dis 2012, ⁹Maggio et al. Cerebrovasc Dis Extra 2017, ¹⁰Ostergaard & Jespersen, Curr Neurol Neurosci Rep 2015.

Summary

Perfusion Borderzones
Schmitzer et al.
Talk #1280

WMH Formation in ICAS
Kaczmarz et al.
Poster #1449

Oxygen Diffusivity
Kufer et al.
Talk #1108

Clinically applicable hemodynamic imaging MR protocol

CTH easily applicable & very sensitive

No cognitive improvements

Hemodynamic imaging promising to improve ICAS treatment decisions,
future investigations of individual stroke predictions of high interest

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**Thank you very much
for your attention!**

 @SKaczmarz
@NMRMgroup

