Stroke after TAVR 3
Importance and Methods of Neurocognitive Functional Assessments

Ronald M. Lazar, PhD, FAHA, FAAN

Professor of Neuropsychology

Department of Neurology

Columbia University Medical Center, NY

Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship	Company
• Consulting Fees/Honoraria/Advisory Board	• Claret Medical Inc

Vascular Cognitive Impairment[1]

Vascular Dementia ⟷ ***Vascular Mild Cognitive Impairment***

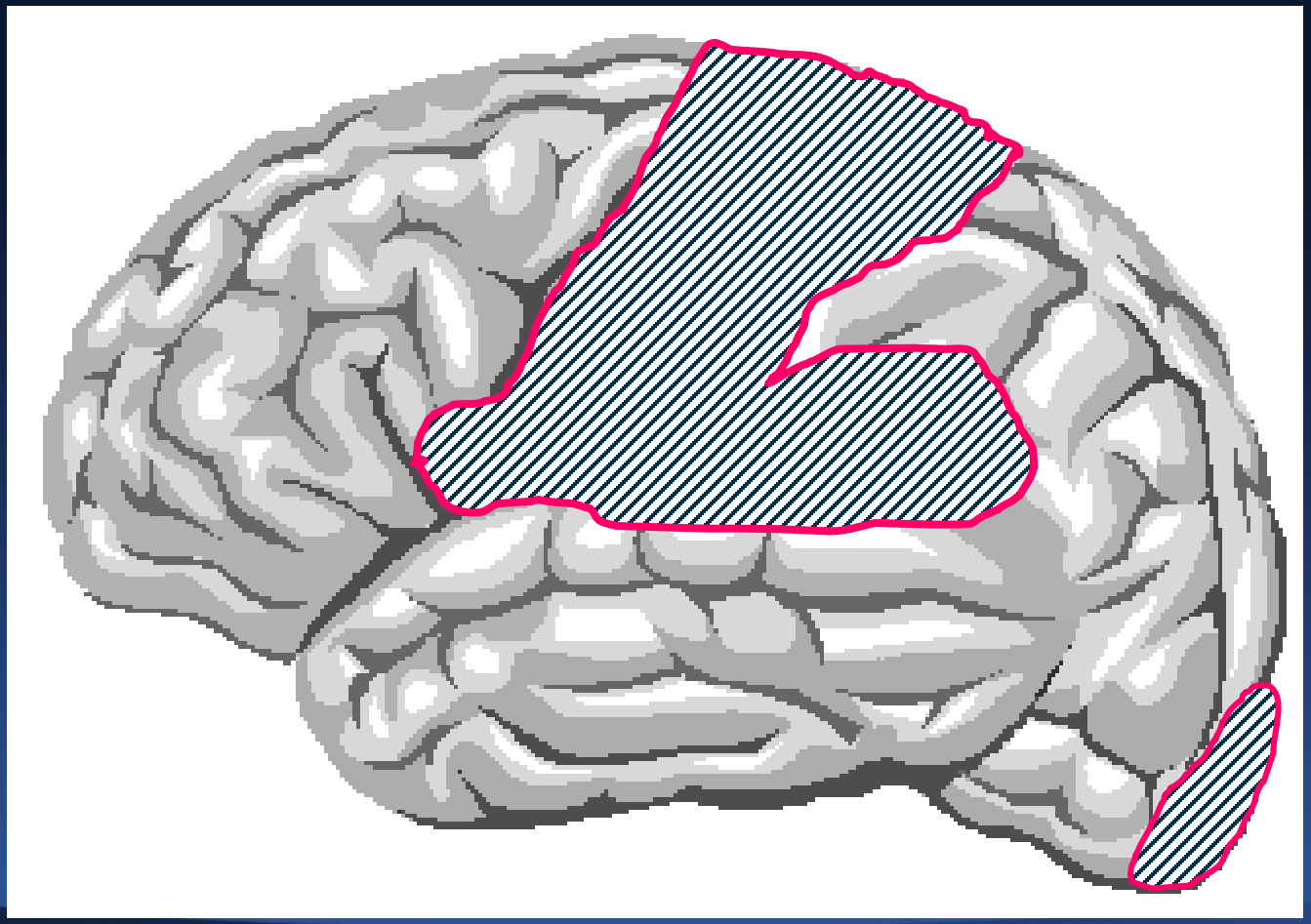
No Stroke

- Language
- Visual-Spatial Skills
- Attention and Concentration
- Memory
- Executive Function
- Processing Speed

1.Marshall & Lazar, 2011; Gorelick et al, AHA,2011

Neurological Adverse Events in Destination LVAD

Brain Regions Assessed by NIH Stroke Scale



Impact of Cognitive Impairment

- ***Difficulty following instructions***
- ***Unable to comply with a complex medical protocol***
- ***Unable to provide informed consent for procedures***
- ***Difficulty in reacting appropriately to a medical emergency***

- **Memory Impairment highly correlated with 30-day re-admission in elderly with CHF (Ketterer, et al, 2014)**
- **Elevated risk of stroke in older persons with cognitive impairment (Ferrucci et al, 1996)**

Cardiovascular Disease and Dementia: The Context

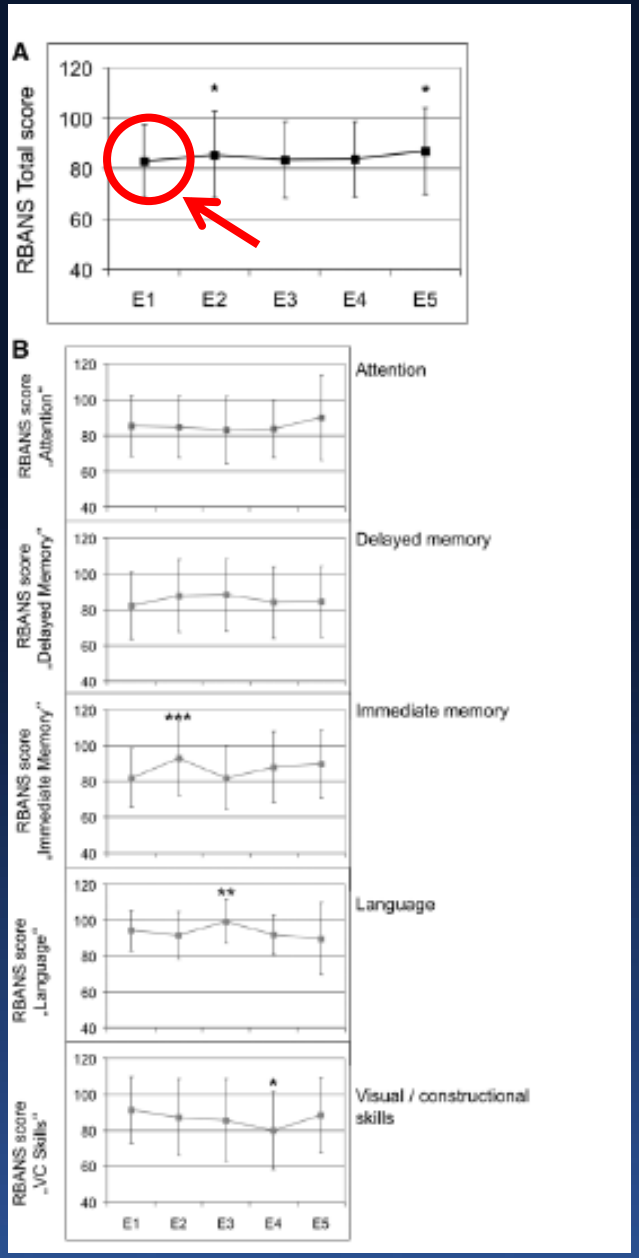
Heart Disease Risk Factors

- Coronary Artery Disease
- Atrial Fibrillation
- Myocardia Infarction
- Heart Failure
- Valve Disease

- ❑ Left atrial dysfunction increased with mitral disease, contributing to AF, increases risk of dementia[1]
- ❑ In CHS, those w/o stroke with L sided annular or valvular calcification had 33% greater risk of silent brain infarcts[2]
- ❑ Autopsy findings: significant aortic/mitral valve damage in individuals with AD[3]

Rationale for Baseline Neurocognitive and Brain Imaging

1.Boudoulas et al, 2003; 2. Rodriquez et al, 2011; 3. Corder et al, 2005



Cognitive Trajectory After Transcatheter Aortic Valve Implantation

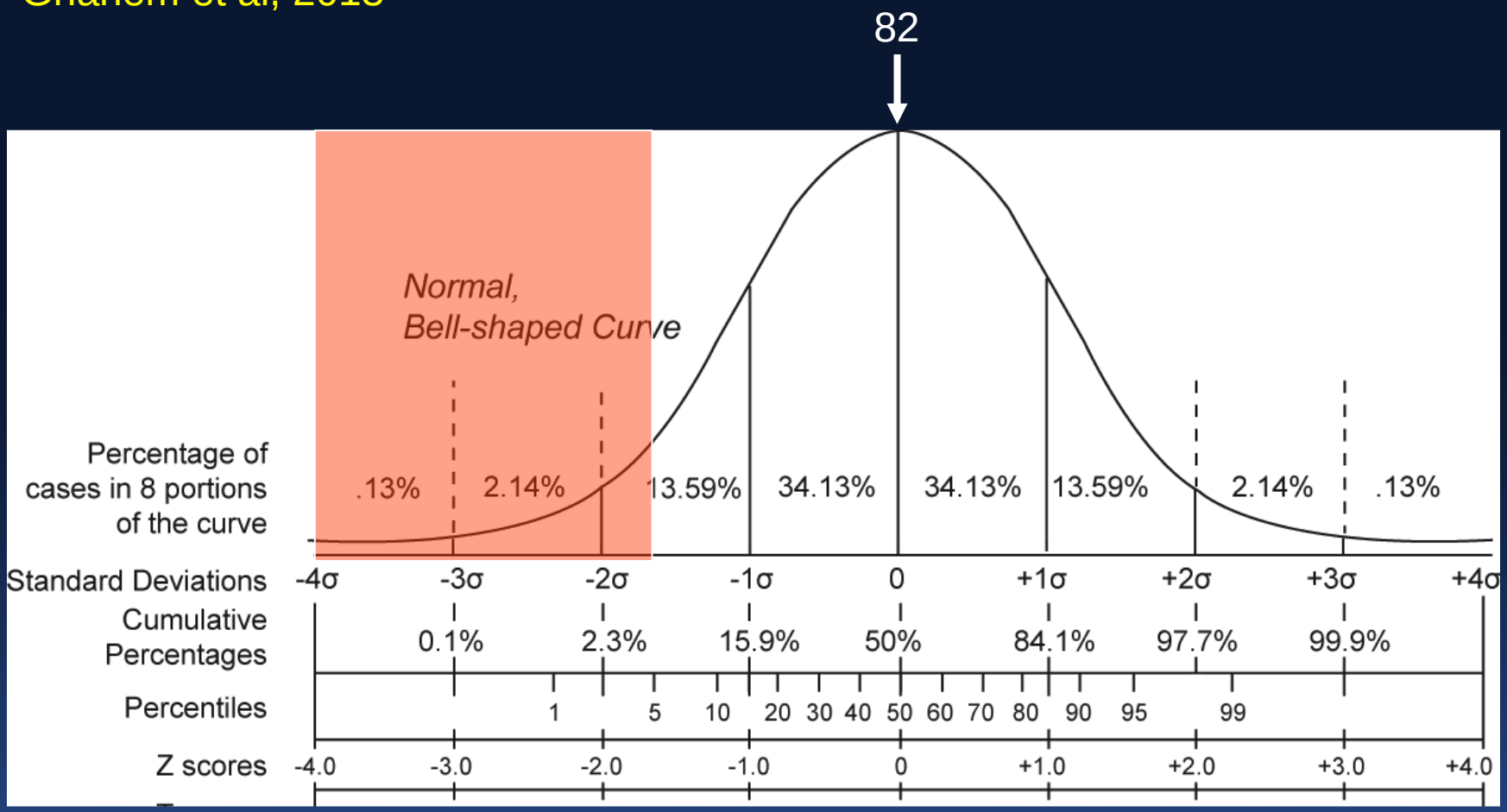
Ghanem et al, Circ Cardiovasc Interv, 2013

N=111
E1 = Baseline
E2 = 3 Days
E3 = 90 Days
E4 = 1 Yr
E5 = 2 Yrs
Cognitive Task: RBANS (MEAN = 100, SD = 15)

RESULTS:

- **No change in cognition over time**
- **No association with cerebral embolism on DWI.**

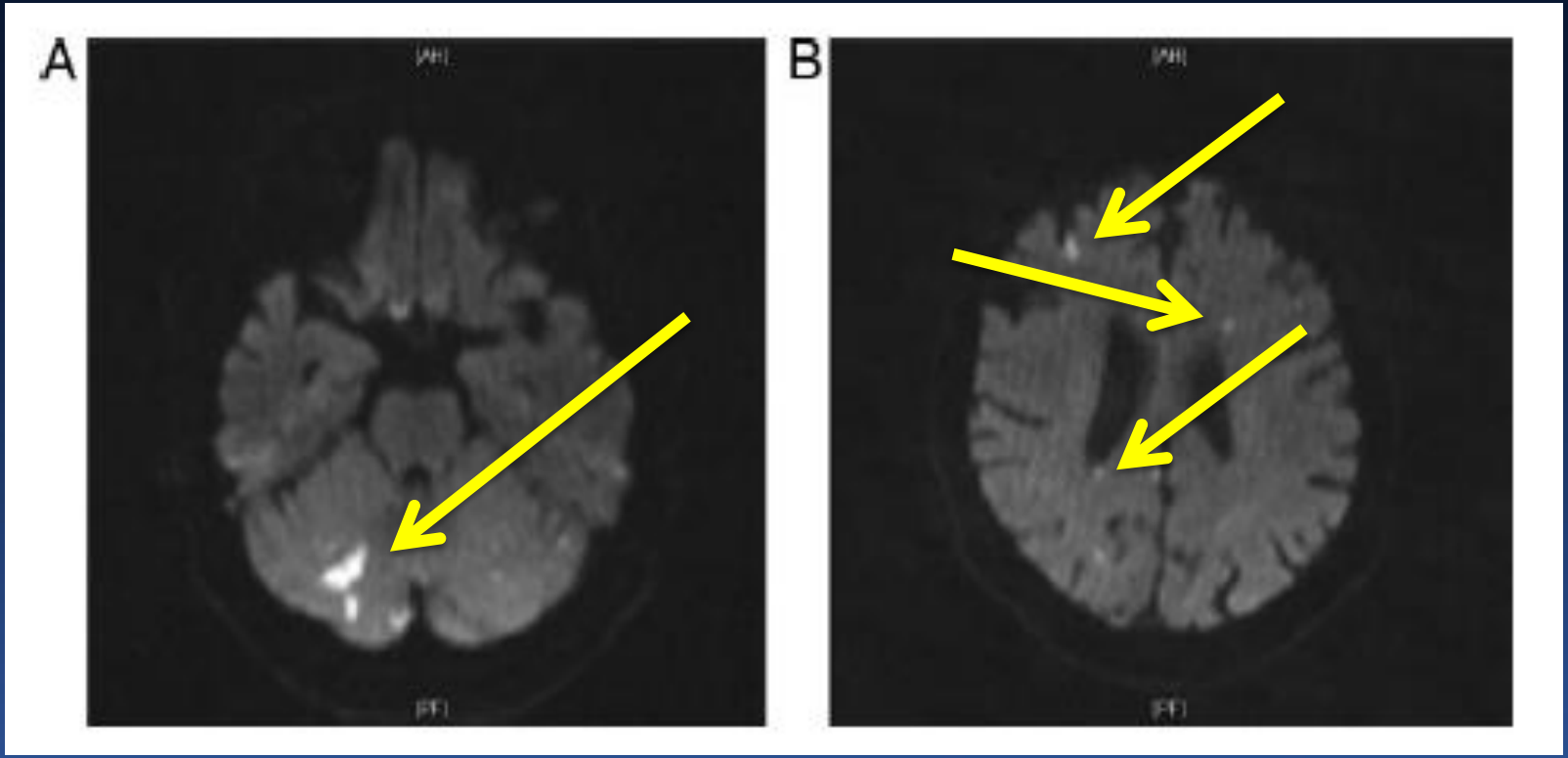
Ghanem et al, 2013



Cognitive Criterion for frank dementia (AD) = -2 SD < Normative Mean for Age

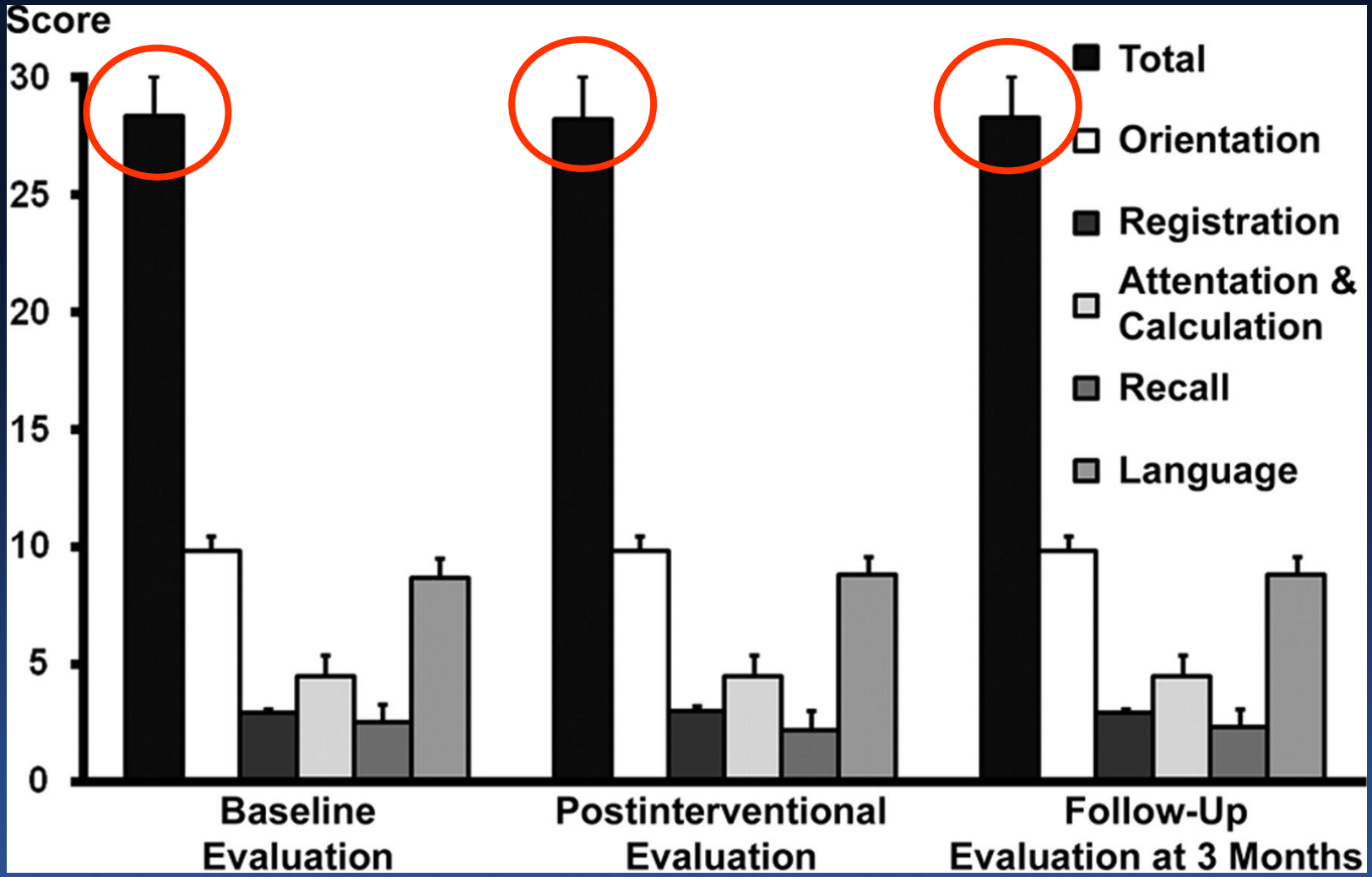
Does TAVI/TAVR Cause Cognitive Decline from Embolization?

(Kahlert et al, Circulation 2010)



(Kahlert et al, Circulation 2010)

Figure 1. Detailed analysis of the MMSE results in TAVI patients.



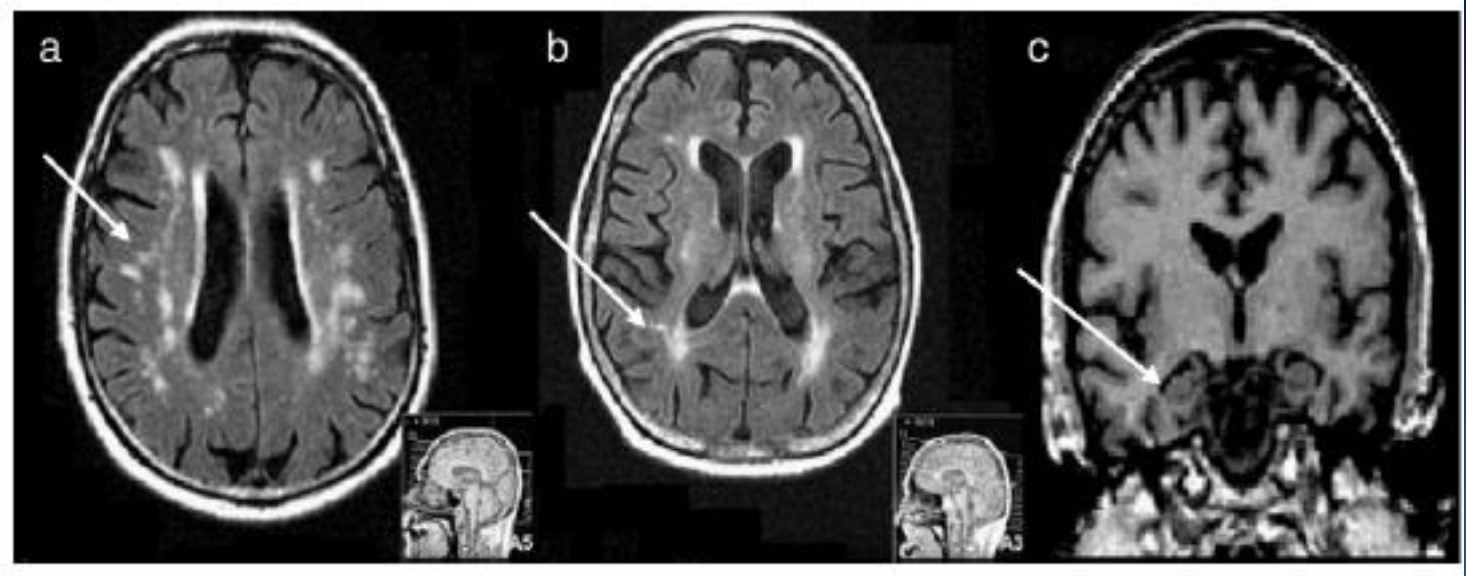
Brain magnetic resonance imaging abnormalities in patients with heart failure

Raymond L.C. Vogels [a,b,*], Wiesje M. van der Flier [b], Barbera van Harten [c], Alida A. Gouw [b], Philip Scheltens [b], Jutta M. Schroeder-Tanka [d], Henry C. Weinstein [a]

European J Heart Failure, 2007

HF

- ***N = 58***
- ***NYHA II, III and IV***
- ***Age ≥ 50 Yrs old***



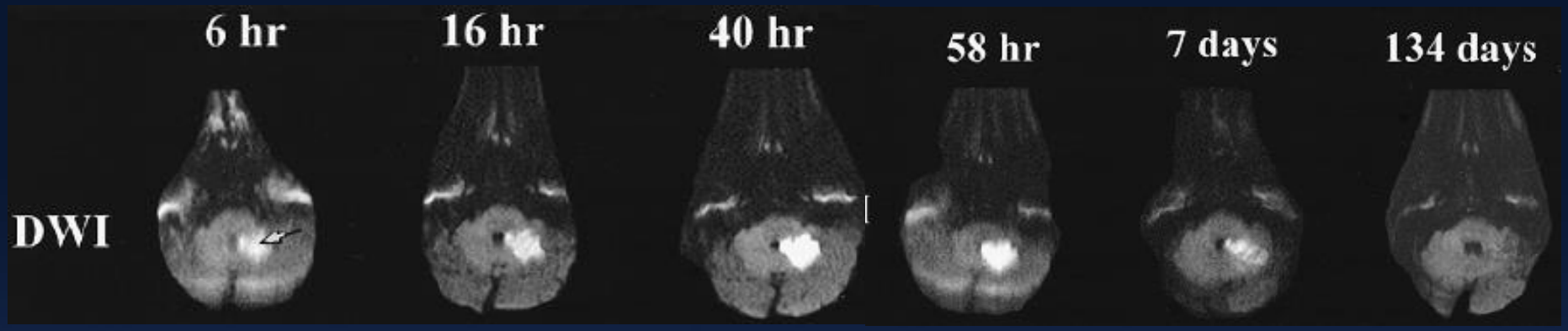
Transcranial Doppler Blood Flow Assessment in Patients With Mild Heart Failure: Correlates With Neuroimaging and Cognitive Performance

Vogels et al, Congestive Heart Failure, 2008

Neuropsych Domain	HF (n=43)	Cardiac Controls (n=33)	Healthy Control (n=22)	P
MMSE	27.6 (2.1)	27.5 (1.97)	28.1 (1.91)	.361
Language	–0.11 (0.77)	–0.04 (0.77)	0.35 (0.71)	.212
Visuospatial function	–0.10 (0.52)	0.15 (0.37)	0.25 (0.70)	.050
Memory	–0.23 (0.60)	0.10 (0.53)	0.27 (0.93)	.014
Executive function	–0.16 (0.56)	0.05 (0.54)	0.33 (0.64)	.029
Mental speed/attention	–0.12 (0.59)	0.08 (0.52)	0.24 (0.75)	.044
Overall cognitive score	–0.14 (0.44)	0.05 (0.38)	0.29 (0.60)	.003

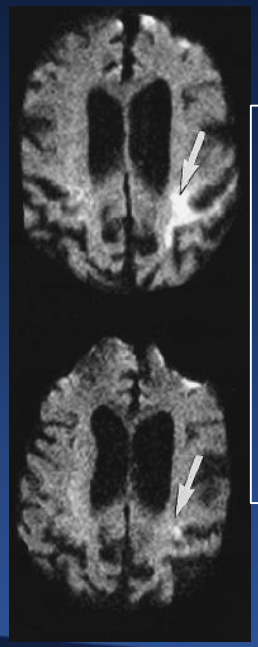
The Evolution of the DWI Signal over Time

Schaefer et al, 2000, Radiology



2 Hours

3 Days



Possible Solutions:

- Pre: DWI (Catheter-related events) and FLAIR (chronic disease)
- 3 – 7 Days after Procedure: DWI
- 30 Days after Procedure: FLAIR

Silent Brain Infarction: *Future Risk*
Population-Based Studies

- Presence of silent brain infarcts increases risk of future stroke 2 – 4x *(Bernick et al, 2001; Vermeer et al, 2003; Vermeer et al, 2007)*
- Stroke risk is highest with silent brain infarction and severe white matter disease *(Kuller al al, 2004)*
- Silent infarcts unmask underlying Alzheimer's disease, especially with new infarcts after baseline *(Vermeer, 2003)*
- Rotterdam Scan Study showed that presence of silent infarction doubled risk of dementia *(Vermeer, 2003)*

Conclusions

- The questions regarding neurocognition after TAVR/TAVI remain unanswered.
- Neurocognitive batteries need to be comprehensive with good sensitivity and specificity to the underlying pathology.
- Imaging should take advantage of the more powerful 3.0 Tesla technology, both for DWI in the acute stage and FLAIR in the chronic period.
- Baseline assessments need to take into consideration the impact of the disease before treatment, including brain perfusion.