Heterogeneous origin and evolution of microbleeds in cerebral small vessel disease

Kim Wiegertjes¹, A. ter Telgte¹, F. H. B. M. Schreuder¹, A. M. Tuladhar¹, H. J. Kuijf², S. Ropele³, J. P. Marques⁴, B. Gesierich⁵, M. Huebner⁵, D. G. Norris⁴, M. Duering⁵, C. J. M. Klijn¹ & F-E de Leeuw¹

¹Radboud University Medical Centre, Donders Institute for Brain, Cognition and Behaviour, Centre for Cognitive Neuroscience, Department of Neurology, Nijmegen, The Netherlands; ²Image Sciences Institute, University Medical Center Utrecht, Utrecht, the Netherlands; ³Medical University of Graz, Department of Neurology, Graz, Austria; ⁴Radboud University, Donders Institute for Brain, Cognition and Behaviour, Centre for Cognitive Neuroimaging, Nijmegen, the Netherlands; ⁵Institute for Stroke and Dementia Research (ISD), University Hospital LMU, Munich, Germany

INTRODUCTION

- Cerebral microbleeds are assumed to be chronic lesions with a primary haemorrhagic origin
- These assumptions have both been challenged by recent imaging and histopathological studies

AIM

We investigated the origin and evolution of microbleeds in our high frequency imaging RUN DMC-IntENSE study

RUN DMC - IntENSE

PARTICIPANTS

- 54 individuals from the RUN DMC study with mild to severe CSVD on previous MRIs (2006-2015)
- Exclusion criteria: other causes of ischemic stroke (e.g. carotid stenosis, atrial fibrillation) dementia, parkinsonism
- Monthly 3T MRI for 10 consecutive months, including susceptibility weighted imaging (SWI) for microbleed detection

ANALYSIS

- SWI images of all 10 months screened for cerebral microbleeds using a semi-automatic segmentation tool
- Location determined based on MARS scale

RESULTS

PREVALENCE AND LOCATION

- 26 participants had a total of 56 microbleeds at baseline (48%)
- 45 lobar (80%), 8 deep (15%), 3 infratentorial (5%)

ORIGIN AND EVOLUTION

- 1 microbleed disappeared
- 9 new microbleeds in 6 individuals:
 - 7 were a primary haemorrhage (78%) and 2 co-located with a hyperintense lesion on DWI (22%) indicating haemorrhagic infarcts

EVOLUTION OF MICROBLEEDS

DISAPPEARING

PRIMARY MICROBLEED

HAEMORRHAGIC TRANSFORMATION

CONCLUSION

- MRI-defined microbleeds of similar appearance can have a heterogeneous etiology, that is a primary haemorrhage or ischemia
- Over time, new microbleeds may appear but they can also vanish

The origin as well as the evolution of microbleeds in SVD is heterogeneous