Dear Editor-in-Chief,

Attached you find our manuscript “Limitations of traditional models for perfusion”, describing important limitations of traditional models for cerebral blood flow (CBF) estimation. We show that for high image resolution, traditional models for CBF estimation (deconvolution and maximum slope) will overestimate actual perfusion when applied locally.

Specifically, we have developed and implemented a PDE model for both blood flow and indicator dilution in the capillary system. We show both analytically and experimentally that the PDE model can be regarded as a coupled set of traditional one-compartment models. We also demonstrate that traditional models will overestimate perfusion if they are applied to only sub-units of the system.

Experimental results of real patient data are also provided, indicating that the effect of overestimation might also be found on coarse scale in real imaging applications.

Our main finding is that awareness should be draw to potentially inaccurate perfusion estimates in clinical applications. For the task of future perfusion estimations we suggest that continuous and coupled PDE models are developed.

A preliminary version of related work has been submitted as an abstract, not as a proceedings paper, to the ESMRMB 2016.

Best regards

Constantin Sandmann

On behalf of

Erlend Hodneland, Erik Hanson, Alexander Malyshev, Arvid Lundervold and Jan Modersitzki.