**Supplementary Materials**

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**Figure S1.** Comparison of OEF and *v* obtained by QQ-NET and mcQQ-NET in the simulated brain (Test Data 1). OEFavg and *v*avg indicate the average OEF and *v* maps, respectively, from five trials. OEFavg and *v*avg are shown in the unit of [%]. The numbers in yellow and black represent the mean error in the whole brain and lesion, respectively. QQ-NET showed higher OEFavg and *v*avg than the ground truth in low OEF lesions. Compared to QQ-NET, mcQQ-NET demonstrated a smaller bias in OEFavg and *v*avg in the lesion.

A group of images of a brain

Description automatically generated

**Figure S2.** Comparison of OEF, *v*, R2, and maps between QQ-NET and mcQQ-NET in a stroke patient imaged 4 days post stroke onset (Test Data 2). mcQQ-NET provided low OEF and low *v* values in the DWI-defined lesion.