Purpose: Dynamic susceptibility contrast (DSC) MRI technique can be used for brain tumor therapy response evaluation. However, the typical modeling (Eqs.1) is sometimes problematic in the vicinity of tumor due possibly to the disrupted microvascular environment associated with the disease. The example is well illustrated in Fig.1B, where some MRI time series curves (TSC) keep increasing beyond the baseline value after some time points, which is theoretically prohibited in the typical modeling. This behavior is not related to other systemic error such as motion or system instability, which can be verified by the steady TSC from a CSF region (Fig.1C).

To improve the utility of DSC-MRI even in the problematic, but highly interested, regions of the brain, the non-complying TSC was assumed legitimate and its increase rate, linked to the degree of contrast's leakage, was analyzed.

Methods: DSC-MRI (with manually injected multihance, 0.2 ml/kg) was applied for high grade brain tumor before and after radiation therapy. The scan technique was based on T2*-weighted PRESTO implemented on a Philips 1.5T scanner. The analysis of TSC was performed using an in-house software developed in MATLAB.

Results: The TSCs from several regions of interest (ROI) were obtained (Fig.1). Before radiation therapy, those from ROIs A and C increase beyond the baseline after about 60 frame that coincides with the passage of contrast in other complying TSC. The slope of increasing TSC was determined as shown in Figs.1B and 1D. After therapy (Fig 1D), the compliance of TSC in ROI C to the typical modeling was quite improved and the degree of leakage shown as slope, as well as the area of leakage (Fig 2), decreased after the therapy, suggesting the therapy possibly repaired the leakage.

Conclusion: A non-typical measurement was introduced to improve DSC-MRI's utility in the brain tumor therapy monitoring.

Funding Support, Disclosures, and Conflict of Interest:

American Cancer Society Institutional Research Grant/Upstate Cancer Research Institute