

Comparison of Arterial Spin Labeling and Dynamic Susceptibility Contrast Imaging in Glioma

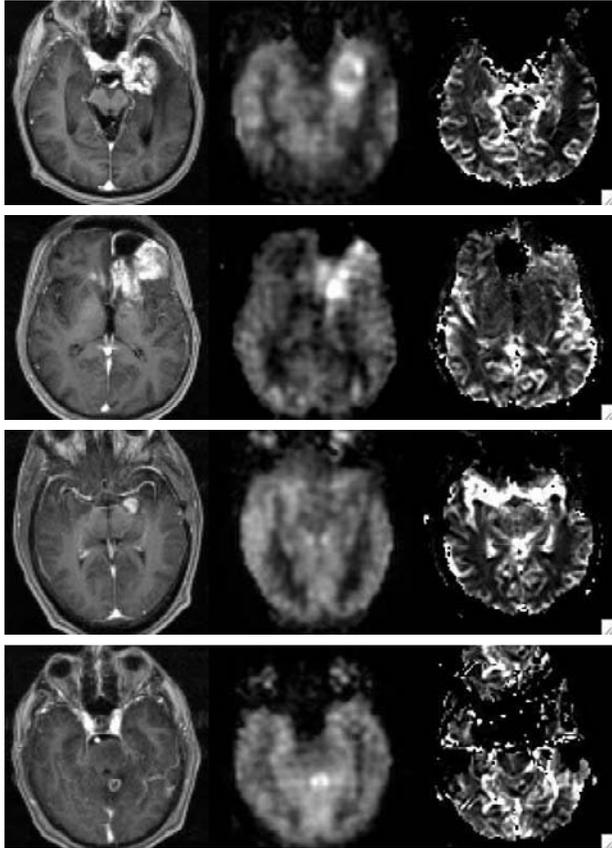
B. Appignani¹, E. T. Wong¹, D. B. Hackney¹, D. C. Alsop¹

¹Beth Israel Deaconess Medical Center, Boston, MA, United States

Introduction: Contrast enhanced and T2 MRI are the clinical standard for the delineation of brain tumor size and growth. Limited specificity of CE MRI for determining tumor grade and detecting tumor recurrence has motivated the evaluation of functional imaging approaches in brain tumors, however. Dynamic susceptibility contrast(DSC) blood volume measures have been evaluated for grading and characterizing tumor recurrence in a number of studies(1,2). More recently, arterial spin labeling (ASL) blood flow MRI has demonstrated capability for determining tumor grade(3). While one study comparing CBV and ASL in glioma has been reported(4), improved methods and spatial coverage for ASL merit further exploration of this issue. Here we report the comparison of ASL and CBV results in a series of patients with glioma.

Materials and Methods: Twenty T2* DSC and ASL perfusion examinations were performed on a 3 Tesla imager as part of a clinical MRI evaluation of eighteen brain tumors at varying stages of therapy. T2* DSC was acquired with a gradient echo echoplanar sequence, 128x128, 24 cm FOV, 7mm slice thickness, TR 2s. ASL was acquired with a background suppressed, continuous arterial spin labeling sequence and a 3D stack of variable density spirals FSE imaging sequence in 5 minutes. ASL and T1 weighted post contrast images were resliced to the planes and thickness of the CBV images. CBV and ASL images were synchronously viewed, along with Gadolinium-enhanced T1-weighted anatomic scans. Regions of interest in the area of suspected tumor were drawn and average values were determined. Regions in contralateral temporal gray matter and deep white matter were also drawn.

Results: Tumor hyperperfusion on ASL was more prominent than blood volume in those tumors that showed elevation in either type of image, figure 1. Mean tumor to gray matter ratio was 1.05 ± 0.56 for ASL and 0.73 ± 0.48 for CBV. ASL and CBV were significantly correlated, $p < 0.02$, but with correlation coefficient of only 0.42, figure 2.



CE T1

ASL

CBV

Figure 1: Four example cases of ASL and CBV compared.

Conclusions: Correlation between CBV and ASL suggest blood volume and flow in tumors is coupled but correlation is much poorer than in a previous report.(4) Higher tumor to gray matter contrast and absence of bright vascular artifacts and susceptibility signal loss in ASL make tumor detection and delineation much easier.

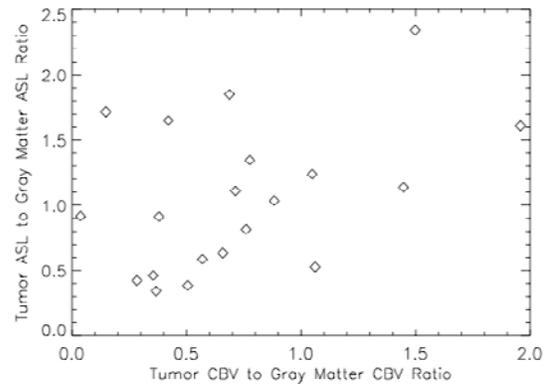


Figure 2.

1. Aronen HJ et al. Acta Radiol. 36: 520-8 (1995)
2. Covarrubias DJ et al., Oncologist 9:528-37 (2004)
3. Wolf RL et al. J Magn Reson Imaging. 22:475-82 (2005)
4. Warmuth C et al. Radiology 228:523-32 (2003)