This article presents an interesting approach of coupled perfusion/permeability measurements on extra-axial brain tumors using perfusion CT with bolus injection. Unfairly, the authors state that DSC MRI is unable to accurately measure perfusion and permeability parameters because of its non-linear signal drop in the first pass bolus model.

Indeed, there might be saturation effects in the T2* and the T1-w sequences if the Gadolinium chelate concentration is too high, this effect increasing with the MRI field strength. To overcome this pitfall in DSC MRI, Gadolinium-chelate concentrations have to be very low (0.05 mmol/kg) in 1.5 and especially in 3 T MRI.

The authors also state that DSC MRI could not accurately measure perfusion parameters because of the bad differentiation between arterial and capillary compartments, resulting in wrong Arterial Input Function estimation, and furthermore, wrong CBV and CBF measurements.

Recent articles studied and compared different methods to accurately extract AIF from DSC MRI (Ducreux AJNR 2006; Thornton MRI 2006; Carpenter MRM 2006; Calamante MRM 2006;...), and the results obtained in volunteers and patients matched those obtained with the gold Standard PET. More, some Montecarlo simulations accurately assessed the feasibility and the accuracy of the AIF extraction using DSC MRI, as well as quantitative CBV, CBF and MTT measurements (Murase MRM 2003, Roberts MRM 2006, Koh Neuroimage 2006, ...).

Some algorithms do exist that can automatically extract the AIF, and there is no ‘qualitative’ nor ‘visual’ interpretation of such parameters, because exact measurements are made each and every time AIF extraction is performed by the algorithm (Mouridsen MRM 2006, Mlynash AJNR 2006; ...).

At last, new approaches in DSC MRI can also measure both permeability and perfusion parameters, and were also applied in brain tumors and succeed to correlate tumor grade with measured parameter (Law AJNR 2004, Boxerman AJNR 2006).

If Perfusion CT has a linear signal, it has also a very poor visualisation of the brain parenchyma compared to MRI. Both techniques (Perfusion CT and DSC MRI) can accurately measure perfusion and permeability parameters, and are complementary. But because of the huge literature on DSC MRI that demonstrate its ability to accurately quantify perfusion and permeability parameters, authors of this article should really moderate theirs comments on DSC MRI.

D. Ducreux
Service de neuroradiologie, CHU de Bicêtre, 78, rue du Général-Leclerc, 94275 Le Kremlin-Bicêtre cedex, France
E-mail address: denis.ducreux@bct.aphp.fr (D. Ducreux).

0150-9861/ $ - see front matter © 2007 Published by Elsevier Masson SAS.
doi:10.1016/j.neurad.2007.01.014

Response to M. Ducreux

We first wish to thank Professor Ducreux for his interesting comments, and especially for his very accurate discussion of the latest development regarding the arterial input function (AIF) in perfusion-weighted MR imaging (PWI) studies. We acknowledge that significant progress was made recently in order to improve the quantitative accuracy of PWI studies. We also acknowledge the superior contrast of MRI in assessing normal brain parenchyma and brain parenchymal lesions such as tumors.

With respect to the assessment of the blood-brain barrier permeability, we remain convinced that perfusion-CT (PCT) presents definitive advantages over PWI. PCT signal is indeed linearly proportional to iodinated contrast concentration and to iodinated contrast extravasation through a damaged blood-brain barrier. In PWI based on T2- or T2*-imaging, signal is the result of susceptibility. More specifically, it is generated by the magnetic gradient induced by the presence of gadolinium contrast within the vessels and the absence of contrast outside the vessels. The model subsequently used in most instances to interpret the observed drop in signal assumes a preserved integrity of the blood-brain barrier, and calculates a cerebral blood volume pro-