PORTAL PERFUSION ASSESSMENT IN THE LIVER WITH PORTAL SPIN LABELING AT 3 TESLA MRI

Takeshi Yoshikawa[1], Nobukazu Aoyama[2], Yoshiharu Ohno[1], Akira Suwa[3], Katsusuke Kyotani[2], Tomonori Kanda[1], Naoki Kanata[1], Hisanobu Koyama[1], Kazuhiro Kitajima[1], Satoru Takahashi[1], Hideaki Kawamitsu[2], and Kazuro Sugimura[1]

[1]Radiology, Kobe University Graduate School of Medicine, Kobe, Hyogo, Japan, [2]Division of Radiology, Kobe University Hospital, Kobe, Hyogo, Japan, [3]Philips Electronics Japan, Tokyo, Japan

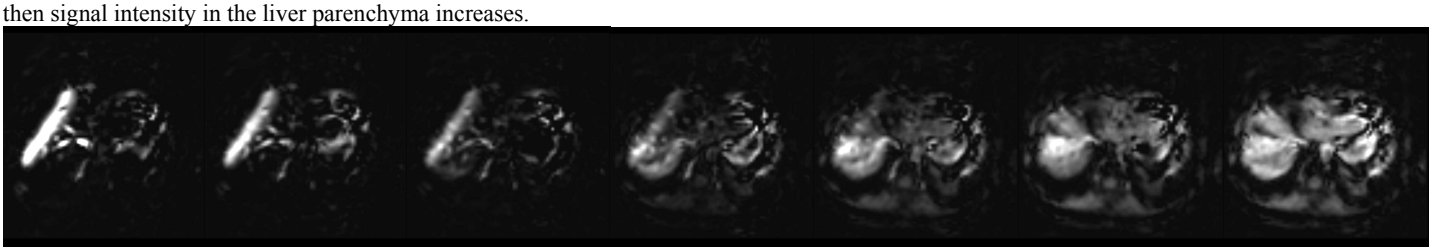
Introduction: The evaluation of portal perfusion in the liver parenchyma and tumors separately from arterial perfusion is an essential step for both diagnosis and management of various liver diseases and tumors. However, to date, we have only invasive imaging techniques such as CT during arterio-portography (CTAP). On the other hand, improvements of arterial spin labeling (ASL) technique at 3T-MRI units have been reported recently. The purpose of this study was to develop and assess portal spin labeling (PSL) technique for evaluation of portal perfusion in the liver and liver tumors.

Materials and Methods: This study comprised 31 patients (21 men and 12 women, mean age: 66.2 years) who were suspected to have malignant liver tumor, all of whom underwent MR examination at a 3T scanner (Achieva 3T, Philips Healthcare, Best, the Netherland). PSL images were obtained with multiphasic GRE-EPI with pseudo-continuous ASL (pCASL) technique (TR/TE/FA=200/7.2/40, matrix: 64 x 64, slice thickness: 10mm, slice number: 5, nominal scan time: 54sec, respiratory triggered, NEX: 4) 1.2 – 2.4 sec after the start of application of pCASL (7 phases). Increase of signal intensity in the liver parenchyma was visually scored on a 4-point scale (1: no increase, 2: slight, 3: obvious, 4: marked). The phase with maximal intensity increase in the liver parenchyma was recorded. In 15 liver tumors in12 patients (5 lesions were clinically diagnosed, 10 pathologically), portal perfusion in liver tumors was visually assessed.

Results: Signal intensity in the liver parenchyma was markedly increased in 10 patients, obviously in 5, and slightly in 9. In 7 patients, increase of signal intensity in the liver parenchyma was not observed. Maximal intensity increase in the liver parenchyma was seen 2.0-2.4 seconds in 17 patients, 1.6-1.8 seconds in 3 patients, and 1.2-1.4 in 4 patients after the start of application of pCASL. A typical pattern of signal increase is shown in Fig 1. In assessment of portal perfusion in liver tumors, perfusion decrease or defect was observed in 5 tumors with a diameter of more than 30 mm. The representative cases are shown in Figs 2 & 3.

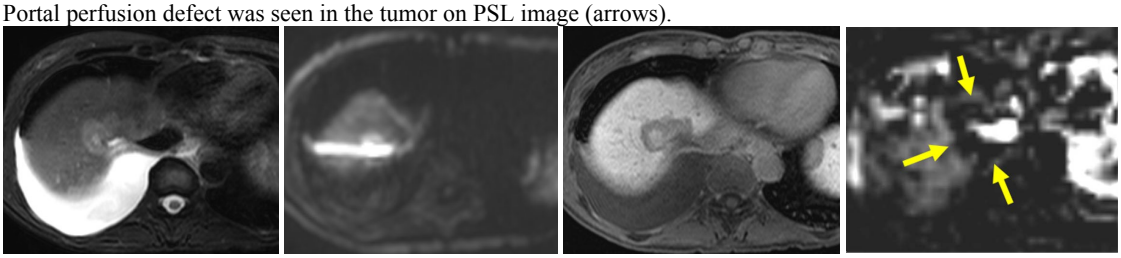
Conclusion: Our results suggested that portal perfusion in the liver and liver tumors can be evaluated by PSL separately from arterial perfusion.

Fig. 1. Sequential PSL images.
Signal increase in the liver can be seen 1.8 – 2.4 sec after the start of application of pCASL. Firstly, signal intensity in the portal branches increases, then signal intensity in the liver parenchyma increases.



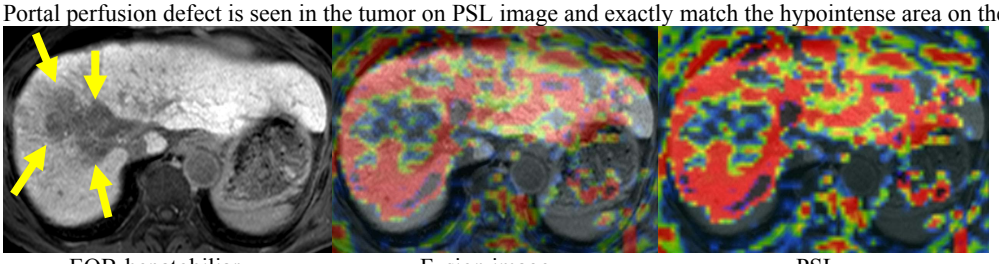
1.2 sec 1.4 sec 1.6 sec 1.8 sec 2.0 sec 2.2 sec 2.4 sec

Fig. 2. A 55-year- old woman with cholangiocellular carcinoma in the left medial and right anterior segments.
Portal perfusion defect was seen in the tumor on PSL image (arrows).



T2WI DWI EOB-hepatobiliary PSL

Fig. 3. A 66-year-old man with hepatocellular carcinoma in the right anterior segment.
Portal perfusion defect is seen in the tumor on PSL image and exactly match the hypointense area on the EOB-hepatobiliary (arrows).



EOB-hepatobiliary Fusion image PSL