# EOB-ENHANCED LIVER MRI: PARAMETER OPTIMIZATIONS OF POST-CONTRAST T2- AND DIFFUSION-WEIGHTED IMAGING.

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**Introduction:** Gd-EOB-DTPA(EOB)-enhanced liver MRI has been useful in detection and characterization of focal liver lesions. One of the major problems is long examination time because of the waiting time for hepatobiliary phase image. Possible solutions are shortening of the waiting time and post-contrast acquisitions of T2- and diffusion-weighted images. However, shortening of the waiting time may affect the diagnostic ability of hepatobiliary phase image and the effects of EOB on T2- and diffusion-weighted images are not fully assessed. Our purpose of this study was to optimize imaging parameters of Gd-EOB-DTPA-enhanced T2WI and DWI in phantom and clinical studies for time-saving liver MRI.

**Methods and Materials:** The phantom study was conducted using a 1.5-T MR scanner and diluted EOB and water phantoms. FSE-T2WI were obtained with TRs of 1000-5000 msec and TEs of 70-130 msec. SE-EPI-DWI were also obtained with TRs of 1000-5000, TEs of 60-120, and b values of 0-2000. The concentrations of EOB were ranged from 1/10000 to 1/50. SNRs and ADC values of the phantoms were measured.

In clinical study, consecutive 20 patients were eligible for this study. Breath-hold FSE-T2WI and respiratory-triggered SE-EPI-DWI were obtained before and 7-18 minutes after administration of EOB. Imaging parameters were set according to the results of phantom study. Overall image quality, artifacts from the vessels, and other artifacts were evaluated using a 3-point scale. Liver-to-spleen, liver-to-pancreas, and liver-to-muscle contrast, and ADC values of the liver, spleen, pancreas, kidney, and muscle, and CNRs and ADCs of hepatic lesions were measured and compared between pre- and post-contrast images.

**Results:** SNRs of the phantoms on both T2WI and DWI images increased with EOB concentration of 1/10000 to 1/500 and markedly decreased with higher, and the changes were severe with TR shorter than 3000. Changes of ADC values were severe with TR shorter than 3000, and b values more than 1500 or less than 1000.

In clinical study, artifacts from the vessels on T2WI increased and overall image quality degraded after EOB administration. Changes of image contrast were minimal on both images. CNRs of the benign lesions were decreased on T2WI. ADC changes were minimal.

**Discussions:** Recommended settings of scanning parameters are longer TR (> 3000msec) for T2WI and DWI, shorter TE (70 - 90 msec) for T2WI, shortest TE for DWI, and higher b values (1000 - 1500) for ADC measurement. There are limitations of this study. EOB concentration in tissues and tumors are unknown and EOB-liver phantom were not used.

**Conclusion:** On post-contrast T2WI and DWI images, signal intensities and ADC values are severely affected by EOB concentration unless imaging parameters are carefully chosen. Post-contrast T2WI and DWI should be carefully applied especially to rare conditions.

**Table 1.** Changes of Image Quality and Artifact on T2WI

| | Overall image quality | Artifacts from vessels | Artifacts due to other causes |
|---|---|---|---|
| Mean score | 2.1 | 2.6 | 2.2 |

**Table 2.** Changes of Image Quality and Artifact on DWI

| | Overall image quality | Signal homogeneity | Artifact |
|---|---|---|---|
| Mean score | 1.8 | 1.9 | 1.7 |

**Fig. 1.** Effect of EOB on T2WI: Artifacts
Enhancement was seen in major vessels. Artifacts from major vessels increased after administration.

Fig. 1

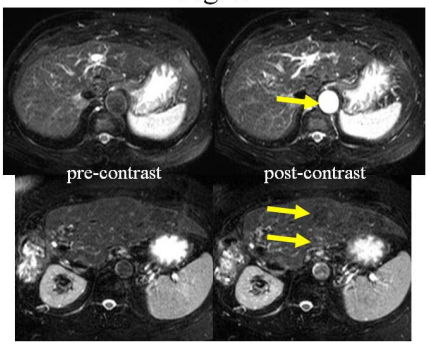


**Fig. 2.** Effect of EOB on T2WI: Contrast
Contrast changes could not be detected visually.

Fig. 2

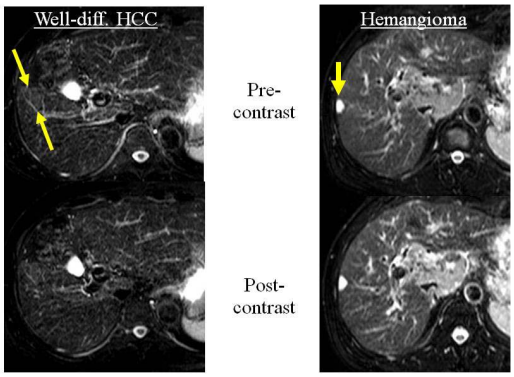


**Fig. 3.** Effect of EOB on DWI
Contrast changes could not be detected visually.

Fig. 3.