# Optimization of Primovist-enhanced MR imaging protocol

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**Introduction:** Gd-EOB-DTPA (Primovist) is a paramagnetic extracellular and hepatocyte-targeted contrast agent, which enables both dynamic imaging and hepatocyte imaging. Although it has been documented that optimal timing of hepatocyte imaging is 20-45 minutes after administration [1], prolongation of examination time disturbs patients' throughput. We analyzed various timings of image acquisition to shorten Primovist-enhanced MR imaging protocol.

**Methods:** Since February 2008 through September 2008, we performed 250 Primovist-enhanced MR examinations using 1.5 tesla scanners (SIGNA ver. 12, GE) and analyzed imaging protocol in three issues among subgroups from 250 patients. 1) Timing of equilibrium phase, 2) Timing of hepatocyte phase (affect of serum bilirubin level), 3) Timing of diffusion-weighted imaging [DWI] (precontast versus postcontrast). Initially we set up a preliminary imaging protocol composed of in-&out-of phase fast SPGR, precontrast DWI (b=600), dynamic MR imaging [LAVA] using Fluoro-Trigger method with a co-injector system of 0.1 ml/kg of Primovist (4 seconds of injection duration) and 30 ml of saline flush, followed by fat-suppressed T2-weighted (T2W) fast SE and single-shot fast SE, postcontrast DWI, and hepatocyte phase LAVA obtained 10 minutes, 15 minutes, and 20 minutes after Primovist injection. Because gadolinium compounds did not deteriorate T2-weighted fast SE images [2], we placed T2W after Primovist injection to reduce examination time.

Table 1: Visualization of Portal Vein &Hepatic Vein in Primovist-Enhanced Dynamic MRI

| | PV | HV |
|---|---|---|
| Arterial | 3.7±1.1 | 1.0±0.0 |
| 1 min | 4.6±0.5 | 4.4±0.8 |
| 2 min | 3.3±0.6* | 3.4±0.8# |
| 3 min | 2.6±0.6* | 2.8±0.7# |
| | *P<0.001 | #P<0.05 |

Scoring (compared to the liver S.I.)
5: high
4: slightly high
3: iso-intensity
2: slightly low
1: low

**Results:** 1) timing of equilibrium phase [Table 1]. Hepatic vasculatures were more visualized 2 minutes after the initiation of Primovist injection than 3 minutes. 2) Timing of hepatocyte phase [Figure 1A, 1B]. Liver signal ratio (SR) increased as a function of elapsed time, but there was a significant difference of SR at each time point from 1 minute through 20 minutes after Primovist injection between normal and abnormal bilirubin groups. No statistically significant difference of SR was found from 10 minutes through 20 minutes after Primovist injection in normal bilirubin group, and from 1 minute through 20 minutes in abnormal bilirubin group. Tumor-liver contrast ratio (CR) showed no significant difference between 15 and 20 minutes after Primovist injection in abnormal bilirubin group. 3) Timing of DWI. DWI showed the same SR and ADC between pre and postcontrast acquisition and increased CR in postcontrast state [Figure 2].

**Discussion & Conclusion:** Our results indicated that lengthier delay time for the arterial phase and earlier timing for the equilibrium phase resulted in more optimal dynamic MR imaging. DWI could be obtained after Primovist injection. Serum bilirubin level affected the liver signal increase by Primovist [3]. In normal bilirubin group, imaging could be stopped 10 minutes after injection. In the abnormal bilirubin group, no more increase of SR and CR was observed 15 minutes and over after injection. Optimized protocol offered the shortening of Primovist-enhanced MR examination time without the impairment of diagnostic performance.

**References:** 1) Reimer P, et al. Radiology 199; 177, 1996. 2) Jeong YY et al. Radiology 219; 455, 2001. 3) Pascolo L, et al. Biochem Biophys Res Commun. 257; 746, 1999.