

# 가 Gadolinium Chelate Mangafodipir Trisodium

1

MR : Gd - DTPA Mn - DPDP

가 : 42 ( : =25:17) T1 -

2 , 1 , 15 , 13 , 9 , 2 ,

Mn - DPDP T1 - Gd - DTPA Gd - DTPA

(n=6) (n=35) (n=6)

38 가 23 (n=40)

(n=2) , (n=13), (n=2), (n=2)

(n=5)

MR : Gd - DTPA Mn - DPDP 가

lumine(Gd - DTPA) MR Gadopentetate Dimeg - 가 Mn - DPDP 가

CT (1), 가 11). (6 -

Mangafodipir Trisodium(Mn - DPDP) (Mn<sup>2+</sup>) DPDP(dipyridoxyl diphosphate)가 MR 가 (2 - 6). T1 - 가 Mn - DPDP 가 Gd - DTPA 가 Mn - DPDP 가 (7, 8, 12). , Mn - DPDP Gd - DTPA 가 Mn - DPDP , 1) 2)

가 Gadolinium Chelate Mangafodipir Trisodium

. Gd - DPTA Magnevist (Schering AG, Berlin, Germany) 0.1 mmol/kg 2 cc

, Gd - DTPA 18 (

17 MRI ) 45 ( ) T1 - , 120

42 25:17 ( ) T1 - 가

, 53 (31 - 77 ) 18 MR Mn -

, 9 , 6 DPDP Teslascan (Nyco - med Amersham, Nycomed Imaging AS, Oslo, Norway) 0.5 ml/kg 3 ml

(focal nodular hyperplasia) 1 가

. 10 , 8 (flushing) . 가

, 1 MR T1 -

가 가 Mn - DPDP

( - fetoprotein) (400 ng/ml ) 98 59 ± 14 ( ± 1 STD) .

, Gd - DTPA MRI 가 Mn - DPDP

(ring) 17 42

29 ± 12 .

Gd - DTPA Mn - DPDP

가

. Gd - DTPA

Gd - DTPA Mn - DPDP

Mn - DPDP Mn - DPDP Gd - DTPA T1 -

DPDP , Gd - DTPA Mn -

40 , Gd -

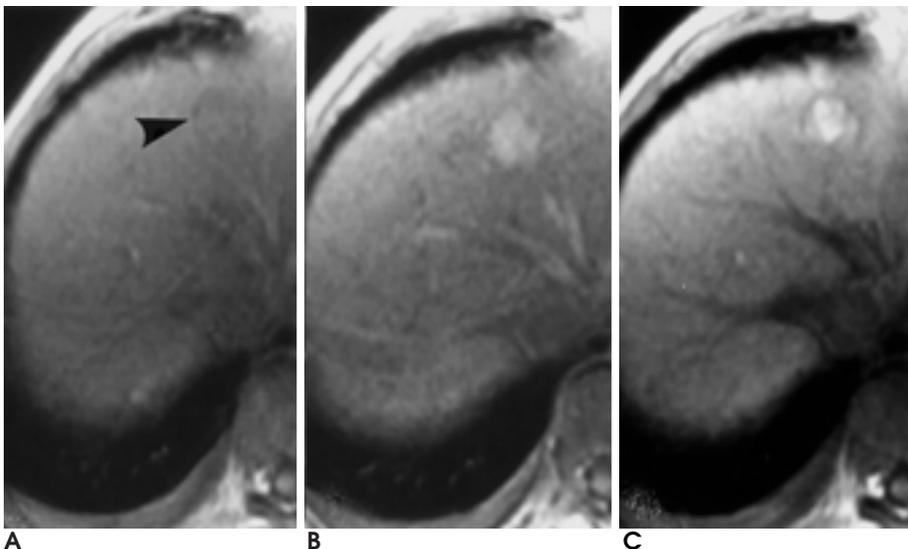
MR 1.5 Tesla 24 , Gd -

GE Signa MR/i(General Electrics, Milwaukee, WI, U.S.A.) , DTPA T2 - Gd - DTPA

18 Magnetom Vision(Siemens Medical Systems, Iselin, NJ, U.S.A.) . Gd - DTPA

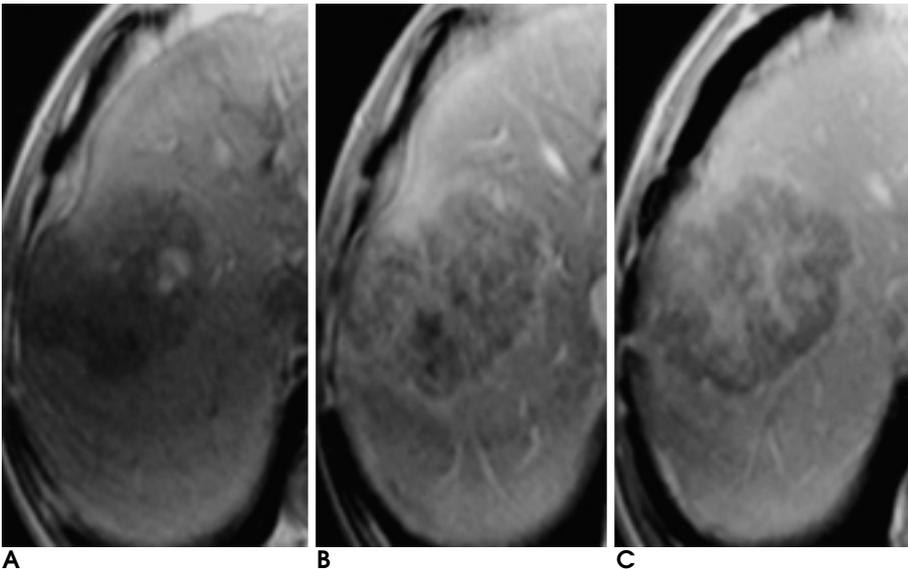
T1 - (TR=140 msec, TE=4 msec, flip angle=80 ° , =8 mm) T2 - (echo train)

(TR=4000 msec, TE=90 msec, =8 mm)

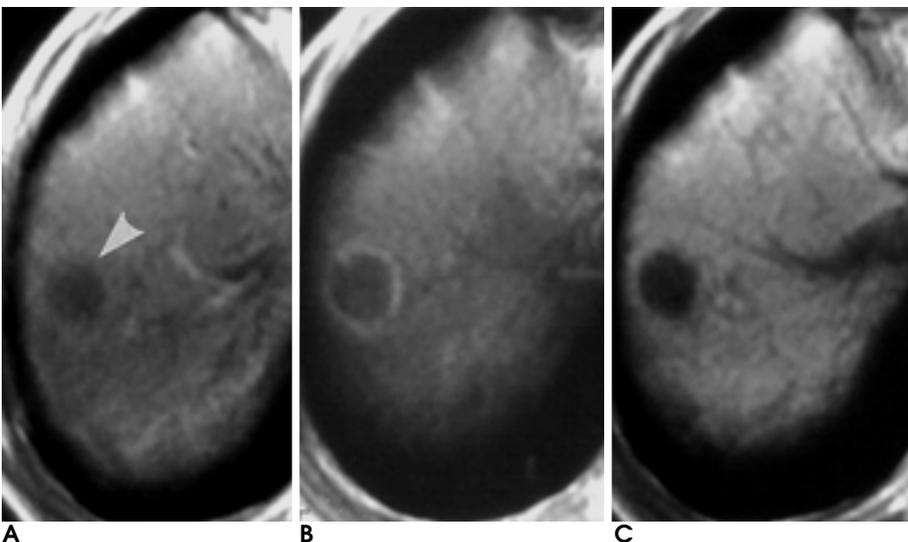


**Fig. 1.** A 56-year-old man with hepatocellular carcinoma. Precontrast T1-weighted SGE image (A) shows a 2.0 cm size slightly hypointense mass (arrowhead) with inhomogeneous signal intensity in segment 4 of liver, which demonstrates homogeneous contrast enhancement on 18-second gadolinium-enhanced SGE image (B) and hyperintense enhancement on post-Gd-post-Mn SGE image (C).

42 15 , 13 , 9 , 6 (17.1%)  
 2 , 2 , 1 . (Fig. 1), T1 -  
 42 94 Gd - DTPA T1 - 6 (17.1%)  
 Gd - DTPA Mn - DPDP (post - Gd - post - 12 5 (41.7%)  
 Mn) T1 - , 7 (58.3%) 가 1.0 - 6.5 cm( 2.3 cm) Gd -  
 , Gd - DTPA 가 post - DTPA  
 Gd - post - Mn , post - Gd - post - Mn 38 (95.0%)  
 가 (Fig. 3), 2 (5.0%)  
 (n=35) 가 0.8 - 13 cm( 3.2 cm)  
 Gd - DTPA 31 (88.6%) , (n=13) 가 0.8 - 4.0 cm( 3.1 cm) Gd -  
 4 (11.4%) DTPA , post - Gd - post - Mn  
 가 가 (Fig. 4).  
 post - Gd - post - Mn T1 -

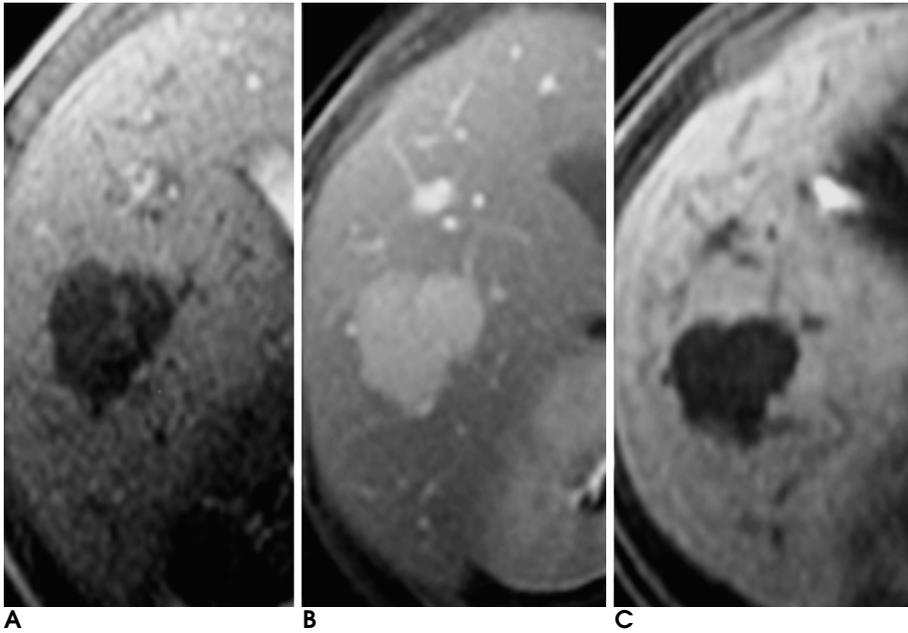


**Fig. 2.** A 60-year-old man with hepatocellular carcinoma. Precontrast T1-weighted SGE image (A) shows a 8.5 cm size hypointense mass with internal high signal intensity area in segment 8 of liver, which shows mild and heterogeneous contrast enhancement on 18-second gadolinium-enhanced SGE image (B) and heterogeneous, mainly central, contrast enhancement on post-Gd-post-Mn SGE image (C).

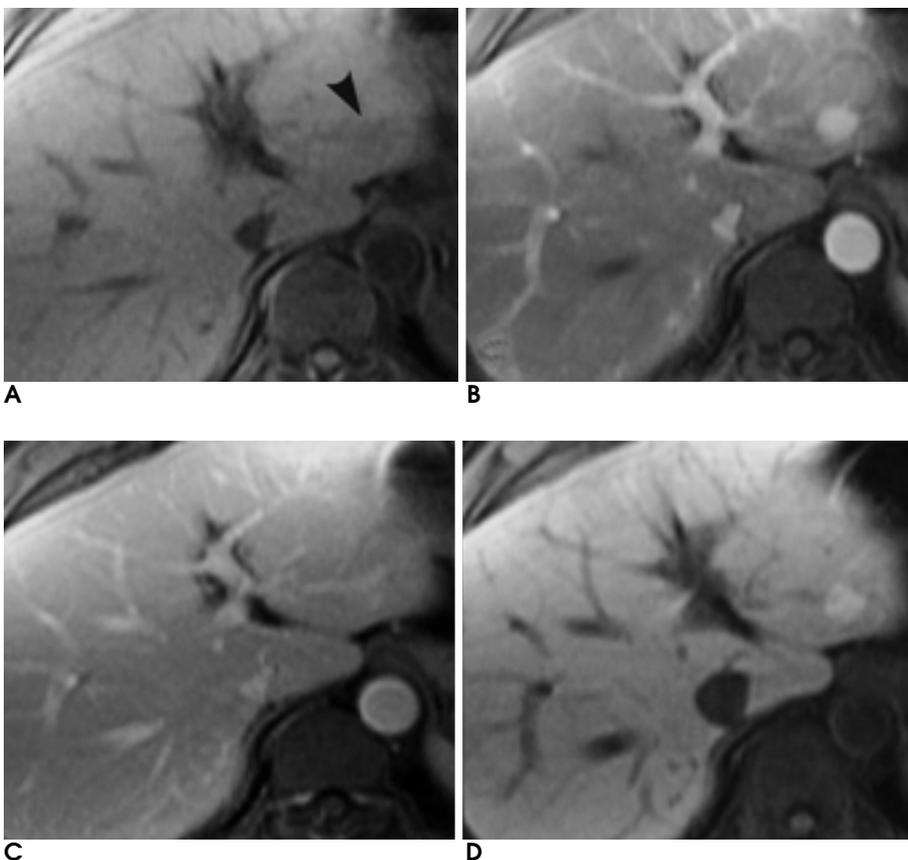


**Fig. 3.** A 74-year-old woman with liver metastasis from colon cancer. Precontrast T1-weighted SGE image (A) shows a 15 mm size hypointense mass (arrowhead) in segment 8 of liver, which reveals peripheral ring-like enhancement on 45-second gadolinium-enhanced SGE image (B). On post-Gd-post-Mn SGE image (C), the mass shows negligible contrast enhancement. This mass was pathologically confirmed as a metastatic adenocarcinoma from colon cancer by wedge resection during operation.

: 가 Gadolinium Chelate Mangafodipir Trisodium  
 (n=2) 가 1.2 - 2.6 cm( 1.9 (Fig. 5)  
 cm) Gd - DTPA (n=2, 10.3 cm) Gd - DTPA  
 가, , post - Gd - post - Mn  
 Gd - post - Mn (n=2, 3.8 cm) Gd - DTPA  
 1 (50.0%) , 1 (50.0%) , post - Gd -



**Fig. 4.** A 36-year-old woman with hemangioma. Precontrast T1-weighted SGE image (A) shows a 3 cm size slightly lobulated hypointense mass in segment 6 of liver, which demonstrates homogeneous enhancement on 120-second fat-suppressed gadolinium-enhanced SGE image (B) and no contrast enhancement on post-Gd-post-Mn SGE image (C).



**Fig. 5.** A 38-year-old man with focal nodular hyperplasia. Precontrast T1-weighted SGE image (A) shows a 1.2 cm size hypointense mass (arrowhead) in the lateral segment of liver, which demonstrates homogeneous enhancement on 18-second gadolinium-enhanced SGE image (B) and nearly isointensity to liver parenchyma on 120-second gadolinium-enhanced SGE image (C). This mass shows slightly hyperintense enhancement on post-Gd-post-Mn SGE image (D), which was histologically confirmed as a focal nodular hyperplasia by surgical resection.

post - Mn MR, post - Gd - post - Mn MR  
 Mn - DPDP MR Gd - DTPA가 Gd - DTPA ( 40 )  
 , 31 (70.5%) Mn - DPDP Gd - DTPA  
 Gd - DTPA가 ,  
 가 (5 , 11.4%) 가  
 , 24 가  
 (11, 12, 18). Gd - DTPA  
 CT Gd - DTPA Mn - DPDP  
 MR 가 (13). ,  
 Gd - DTPA Mn - DPDP (islet cell tumor)  
 가 (19 - 21).  
 , Gd - DTPA Mn - DPDP MR  
 14). 가 (7, 8, 13,  
 Mn - DPDP ,  
 , (relaxivity) , 가 MR 가  
 , Mn - DPDP 20 ,  
 , 가  
 MR Gd - DTPA  
 (hepatic adenoma)  
 16). 가 ,  
 4 Mn - DPDP 24 ,  
 (6 - 11).  
 Mn - DPDP T2 -  
 가 , , Mn - DPDP  
 가 가 , T2 가 T2 -  
 , T2 -  
 가 ( , , ) post - Gd - post - Mn  
 , 가 가 , 42 18  
 , 가 ( 9 (n=13)  
 , , ) 가 가 ,  
 (8, 16). post - Gd - post - Mn 가  
 6 , post - Gd - post - Mn  
 1 ,  
 Edmonson - Steiner 's nulcer Grade II/III 가 12  
 가 (34.2%) 2  
 (5.0%) ,  
 Mn - DPDP MR ,  
 (11, 17), ,  
 Gd - DTPA 가 가 MR

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Gd - DTPA Mn - DPDP  
MR 가

Gd - DTPA

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## MRI after Sequential Use of Gadolinium Chelate and Mangafodipir Trisodium for the Evaluation of Focal Liver Lesions: Study of Image Findings and Safety<sup>1</sup>

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**Purpose:** To assess the feasibility of sequentially administering Gd-DTPA and Mn-DPDP for the MR imaging of focal hepatic lesions, and to investigate whether the procedures involved led to any adverse effects.

**Materials and Methods:** Forty-two patients (M:F = 25:17) with suspected hepatic lesions underwent T1-weighted MR imaging procedures before and after Gd-DTPA enhancement, and after sequential Mn-DPDP administration. Two investigators reviewed the findings in terms of the size, number, morphology, and enhancement patterns of the lesions. Any adverse actions resulting from the procedures were noted.

**Results:** Fifteen patients had hepatocellular carcinoma (HCC,  $n = 35$ ), 13 showed liver metastases ( $n = 40$ ), nine had hemangioma ( $n = 13$ ), two had cholangiocarcinoma (CC,  $n = 2$ ), two had a liver abscess ( $n = 2$ ), and one had focal nodular hyperplasia (FNH,  $n = 2$ ). All focal hepatic lesions were clearly visible, with no difference in conspicuity between T1-weighted images obtained after Gd-DTPA administration and those obtained after Gd-DTPA plus Mn-DPDP administration. After the latter procedure, 12 HCCs showed high or iso-signal intensity to liver parenchyma and 23 showed no contrast enhancement. Thirty-eight liver metastases showed no contrast enhancement, but in two cases ring enhancement was observed. In both cases of FNH, homogeneous enhancement was noted. No hemangiomas, CCs or abscesses demonstrated contrast enhancement. The only adverse reaction was five instances of facial flushing.

**Conclusion:** Hepatic MR imaging after sequential Gd-DTPA plus Mn-DPDP administration may be selectively useful in differentiating between hepatocellular and non-hepatocellular tumor. No technical difficulties or severe adverse reactions were encountered.

**Index words :** Liver, MR  
Gadolinium  
Manganese  
Magnetic resonance(MR), contrast enhancement

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