

: VIBE 가

1

2 2 3

: VIBE 가 ,
 : 2002 6 2003 6
 VIBE 49
 1)
 , 2) , 3)
 : T1 ($p < 0.001$, X^2 test), T2
 ($p < 0.01$, Fisher's exact test),
 ($p < 0.001$, X^2 test) VIBE
 ($p < 0.001$, Fisher's exact test) 가
 가
 :
 , VIBE 가

가 ,
 , (protein plug), ,
 (artifact)
 (Magnetic Resonance Cholangio-
 graphy)
 (Endoscopic retrograde Cholangiography)
 (1 - 5).
 가 (6 - 11),
 VIBE (Volumetric Interpolated breath - hold Examination)
 (12).

VIBE 가 ,
 (6 - 8). , 가
 ,
 가 (9, 10).

1

2

2

2002 6 2003 6

2005 1 11 2006 3 13

:
 VIBE 49 1) , 2) , 3)
 (53 , 24 , 74 ; ,
 26 , 23) . 24 .
 15 , 9 T1
 49 35 , 14 ,
 7 , 3 , 4 T2
 ()
 ,
 MR
 MR 1.5 T (Sonata;
 Siemens, Erlangen, Germany) (phased
 array multi-coil) , T1 -
 fast low-angle shot (FLASH) (TR=160 ms, TE=4.0 ms,
 =80° , [matrix number]=115×256) 가
 , T2 (TR=1000 ms, TE= 57 ms, =80° ; 가
 =115×256) , ,
 - (chemical shift-selective fat
 suppression) Fourier 2/3
 (multi-section half-Fourier acquisition single-shot
 turbo spin-echo, HASTE, TR= 1000 ms, TE=58 ms, SI pre = (SI post - SI pre)/SI pre × 100%,
 =134×256) SI post (13).
 (thick single-slice turbo spin-echo, TSE, TR=2800 ms, X² test Fisher 's exact test , p value
 TE=1100 ms, =240, =256×256) 가 0.05
 . T1 VIBE (Volume Interpolated
 Breathhold Examination)
 FLASH 3D (TR=3.8 ms, TE=1.67 ms, =10° ;
 =115×256-134×256, =2.5-3.0 mm,
 =64-80) , gadopentetate dimeglumine 0.1 mmol/kg 35 ,
 2 mL , 14 (7 , 3 , 4)
 30 (), 60 (), 90 (), 5 ()
)
 Table 1
 T1 27 (77%), 1 (7%)
 MRI PACS (Picture Archiving and Communications System) (m-view 5.3, Marotec Medical , T1 , 76%, 93%, 81% (Table 2), X²
 System; Seoul, Korea) test (p < 0.001).
 가 T2 17 (48%), 0 (0%)

Table 1. Comparison of MR Features of Stone and Tumor

Feature	No of lesion				<i>P</i>
	Stone (35)		Tumor (14)		
	+	-	+	-	
High SI* on T1WI	27	8	1	13	<0.001 (X ² test)
Dark SI on T2WI	18	17	0	14	<0.01 (Fisher 's exact test)
Smooth shape	26	9	3	11	<0.001 (X ² test)
Irregular shape	9	26	11	3	<0.001 (X ² test)
Enhancement	1	34	14	0	<0.001 (Fisher 's exact test)

*SI: Signal Intensity

T2
, 50%, 100%, 65% (Table 3), Fisher's exact test ($p < 0.01$).
(74%), 4 (28%), 76%, 71%,

Table 2. High SI of Intraluminal Filling Defect on T1WI

T1WI	Stone	Tumor
	27/35	1/14
Sensitivity	76%	
Specificity	93%	
Accuracy	81%	

Table 3. Dark SI of Intraluminal Filling Defect on T2WI

T2WI	Stone	Tumor
	18/35	0/14
Sensitivity	50%	
Specificity	100%	
Accuracy	65%	

75% (Table 4), X^2 test ($p < 0.001$).

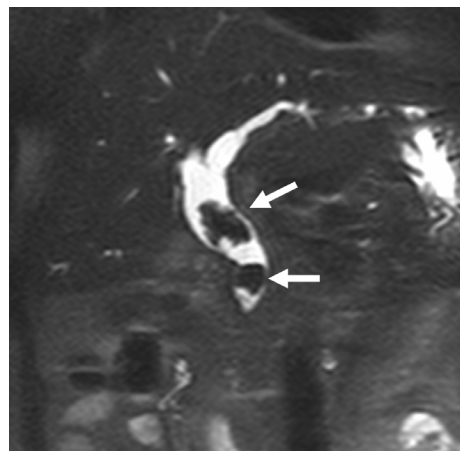
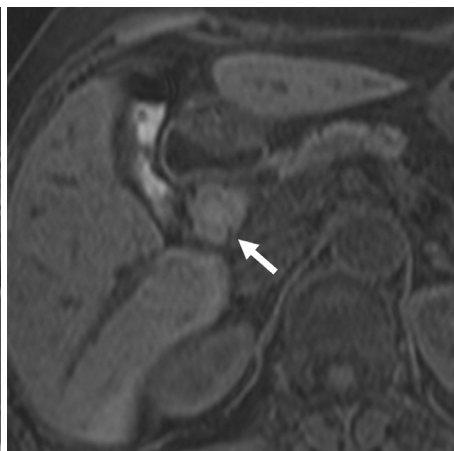
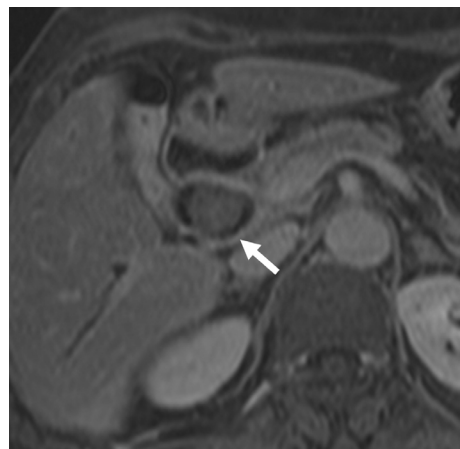
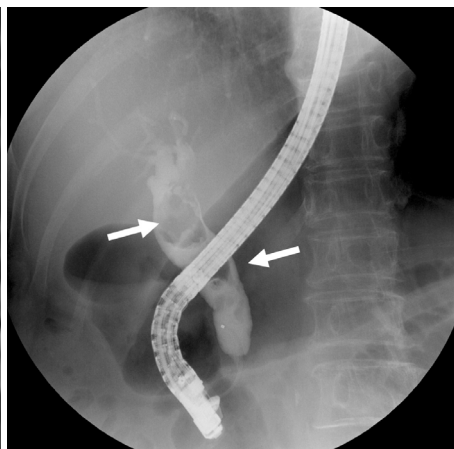
VIBE
(2%), 14 (100%)
100%, 93%, 97% (Table 5),
Fisher's exact test ($p < 0.001$)
가 가

Table 4. Smooth Contour of Intraluminal Filling Defect on T2WI

T2WI	Stone	Tumor
	26/35	4/14
Sensitivity	76%	
Specificity	71%	
Accuracy	75%	

Table 5. Enhancing Lesion of Intraluminal Filling Defect on VIBE

VIBE	Stone	Tumor
	1/35	14/14
Sensitivity	100%	
Specificity	93%	
Accuracy	97%	

**A****B****C****D****Fig. 1.** Multiple CBD stones in 75-year-old woman.

A. Fat-saturated Coronal Half Fourier RARE T2-weighted image shows multiple irregular-shaped dark signal voids (arrows) in dilated common bile duct.

B. The intraluminal filling defect (arrow) is hyperintense on T1-weighted image.

C. VIBE image shows no enhancement of the intraluminal filling defect (arrow).

D. ERCP image reveals multiple CBD stones as irregular filling defects (arrows).

1 VIBE

(12)

T1 T2

T2

T1

(9, 10).

T1 가 가

Safar (9)

T1

가 35 27

T2

T1

(Fig. 1),

(Fig. 2).

(11, 12).

(1 - 5).

90 - 100% (6 - 8).

96%

52

3

49 (microlithiasis)

2 - 3 mm

(6 -

T1 (77%) Lim (11)

T2

T1

(6 - 8).

T2

가

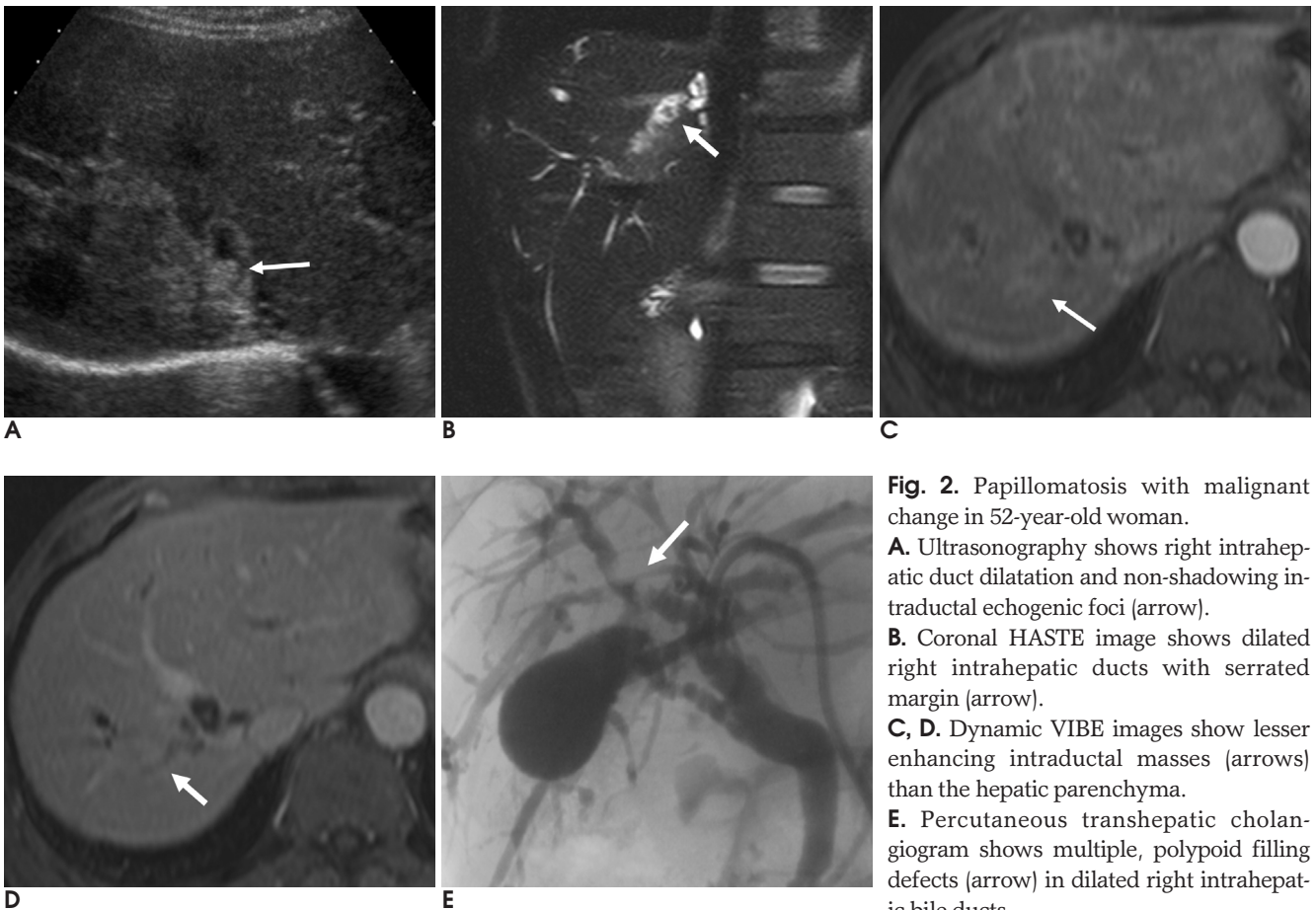


Fig. 2. Papillomatosis with malignant change in 52-year-old woman.

A. Ultrasonography shows right intrahepatic duct dilatation and non-shadowing intraductal echogenic foci (arrow).

B. Coronal HASTE image shows dilated right intrahepatic ducts with serrated margin (arrow).

C, D. Dynamic VIBE images show lesser enhancing intraductal masses (arrows) than the hepatic parenchyma.

E. Percutaneous transhepatic cholangiogram shows multiple, polypoid filling defects (arrow) in dilated right intrahepatic bile ducts.

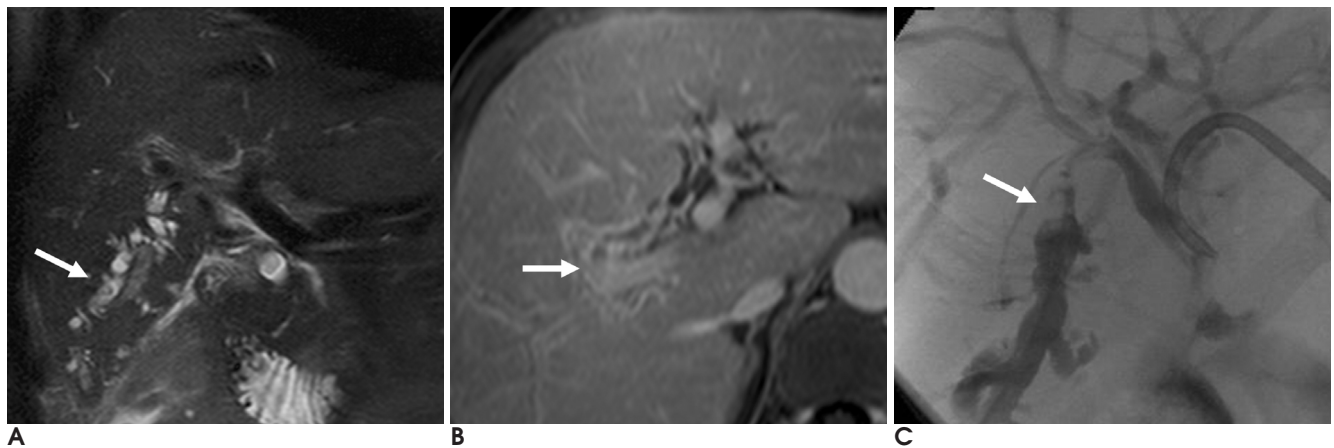


Fig. 3. Intrahepatic duct stone in 61-year-old man.

A. Coronal HASTE image shows dilated right intrahepatic ducts without evidence of intraluminal filling defect (arrow).

B. Dynamic VIBE images show enhancing intraductal lesion (arrows) with periductal enhancement which suggests accompanying cholangiohepatitis.

C. Percutaneous transhepatic cholangiogram shows smooth intraluminal filling defect (arrow) in dilated right intrahepatic bile ducts. The lesion was revealed as stone with inflamed granulation tissue from postoperative specimen.

T1 T2 , 2 - 3 mm , , (partial volume averaging) , VIBE 가 (14, 15) 가 가 . T1 가 , T2 , VIBE 1 . VIBE 가 (Fig. 3). VIBE 가 (12) T1 가 가 17 - 24% T1, T2 , VIBE 가 (artifact)

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Intraluminal Filling Defects of the Bile Ducts: Differentiation of Stones from Tumors-the Value of Magnetic Resonance Cholangiography in Conjunction with a 3D Spoiled Gradient Echo Gadolinium Enhanced Dynamic Sequence¹

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Purpose: We wanted to determinate the value of a dynamic volumetric interpolated breath-hold examination (VIBE) as a supplement to MR cholangiography for differentiating biliary stones from tumors when patient are suspected of having intraluminal filling defects on direct cholangiography.

Materials and Methods: A retrospective analysis was performed for 49 patients who underwent MRI among all the patients who showed intraluminal filling defects on direct cholangiography for evaluating the cause of their jaundice from June 2002 to June 2003. After dividing these patients into two groups, i.e., the group with stones and the group with tumors, we analyzed and compared each MR patterns of 1) signal intensity, 2) shape, and 3) enhancement.

Results: High signal intensity on T1-weighted images ($p < 0.001$, X^2 test), dark signal intensity on T2-weighted images ($p < 0.01$, Fisher's exact test) or smooth contour of intraluminal filling defects ($p < 0.001$, X^2 test) could be significantly suggestive findings of stone rather than a tumor mass. Dynamic VIBE is the most specific sequence for differentiating non-enhancing stone from an enhancing mass ($p < 0.001$, Fisher's exact test).

Conclusion: We showed that MR cholangiography, when added to the dynamic VIBE sequences, could be an important imaging technique for patients who are suspected of having intraluminal filling defects on direct cholangiography to differentiate stones from tumors. Especially, the addition of dynamic VIBE images can provide the increased level of confidence in the diagnosis.

Index words : Bile ducts, radiography
Bile ducts, calculi
Bile ducts, MR
Bile ducts, stenosis or obstruction

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