

3

1

2

3

: 3 (3-dimensional Fourier transformation magnetic resonance dacryocystography : MR DCG) 가 , MR DCG

: 3 DFT constructive interference in steady state (CISS) 3DFT fast low-angle shot (FLASH) 3 10 MR DCG

Gadolinium- (Gd-DTPA : saline = 1:100, 1:50, 1:25) 가 MR DCG

: MR MR , 3 , 10 MR DCG 5 , 5 , 2 , 4 1 , 5 , 2 3DFT CISS 3DFT FLASH

: MR DCG

3 , 1997 6 8 10 MR DCG

가

3 dimensional Fourier transformation (3DFT) constructive interference in steady state (CISS) 3DFT fast low-angle shot (FLASH) 3 30 27 , 26 가 3 , 7 24 75 60 Gadolinium-DTPA (Magnevist, Schering, Germany) , 가 MR MR

1:100, 1:50, 1:25

MR 5

5

MR 1-2ml

1  
2  
3

1998 8 14

1998 11 26

1.5T Magnetom Vision (Siemens, Erlangen, Germany)  
 3DFT CISS 3DFT FLASH  
 3DFT CISS  
 TR/TE/FA 12/6/70°, 3DFT FLASH  
 TR/TE/FA 22/10/50°  
 matrix  
 256 × 256, 14cm, slab thickness 66mm, 1.5mm  
 MIP(maximum intensity projection)  
 MR DCG  
 circular polarized head coil

가  
 , MR  
 1:50  
 3DFT CISS 3DFT FLASH MR DCG  
 가

MR  
 MR  
 가  
 (Fig.1,2).  
 5  
 가 , 1:25 MR

3

3  
 10 , 20  
 4 , 1  
 , 5  
 , 2  
 1 MR DCG  
 (Fig. 3,4).  
 1/3 1/2  
 2 MR DCG  
 4  
 5 MR DCG  
 (Fig.5),  
 (Fig.3, Table 1).  
 8 MR D-  
 CG  
 CISS 3D FLASH  
 3D

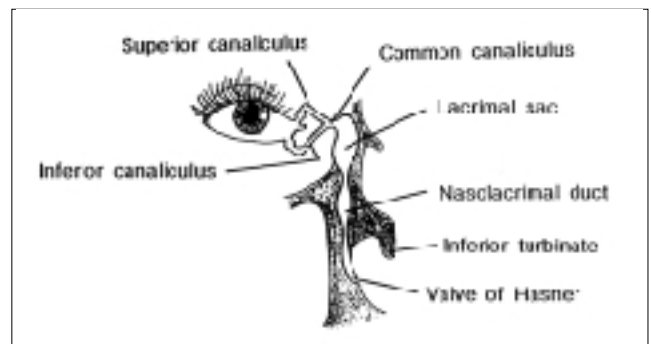


Fig. 1. Normal anatomy of nasolacrimal drainage system (Adapted from ref. 1).

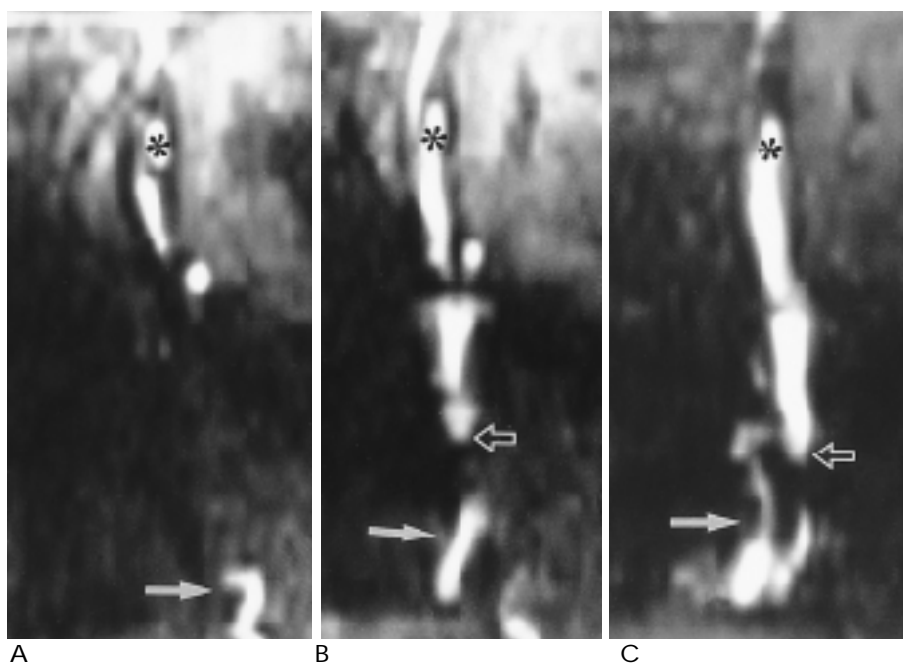


Fig. 2. 3DFT FLASH MR DCG in a normal volunteer obtained with instillation of 1:50 Gd-DTPA solution.  
 A. MR DCG with 5 drops instillation on erect position prior to MRI.  
 B. MR DCG with 5 drops instillation on supine position prior to MRI.  
 C. MR DCG with continuous instillation on supine position during MRI.  
 Drainage into inferior turbinate (solid arrow) is observed with suggested inferior opening of nasolacrimal duct (valve of Hasner) (open arrow) and lacrimal sac (asterix).

Site of Obstruction	Conventional DCG	3D CISS MR DCG	3D FLASH MR DCG
Normal	8	8	8
Common canaliculus	4	5(non-visualization)	5(non-visualization)
Lacrimal sac	1		
Nasolacrimal duct	7	7	7
incomplete	2	2	2
complete	5	5	5

B. Digital subtraction DCG shows segmental stenosis of NLD at level of NLD in right (arrows) and complete obstruction at level of lacrimal sac in left.

617

MR

가

가

(8).

CT

가

MR

Goldberg

MR

가

가

가

MR

가

1:25

(2).

MR

orbital surface-coil

head coil

T1 T2

MR

(9). 1993 Goldberg (10)

가 가

MR

3DFT MRI

가 CISS

FLASH

FLASH

(Mxy)

(spoiling: incoherent steady state)

gradient RF

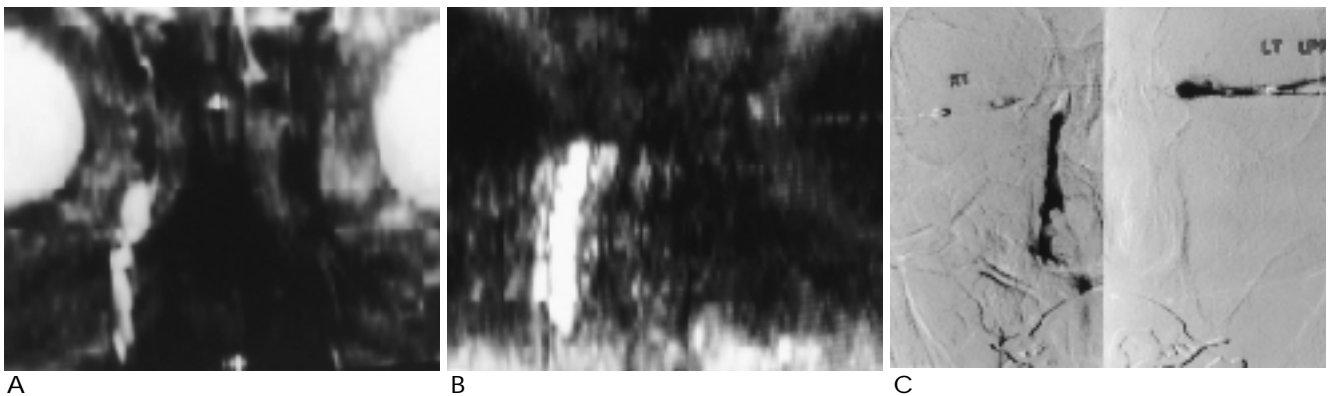
Slice selection

가

MR

5

가



A B C

Fig. 4. 65-year-old woman complaining left side epiphora.  
A, B. Left nasolacrimal duct(NLD) is not visualized on 3D CISS (A) and FLASH (B) MR DCG.  
C. Digital subtraction DCG shows complete obstruction at level of common canaliculi in left.  
Right NLD is well visualized on 3D MR and digital subtraction DCG.

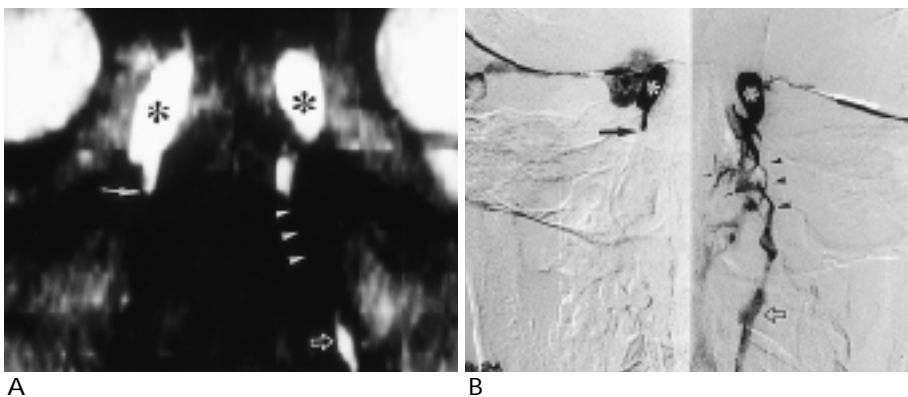


Fig. 5. 24-year-old man complaining right side epiphora. He had operation of left nasolacrimal duct (NLD) due to obstruction 1 year ago.

A. 3D CISS MR DCG shows obstruction at level of NLD in right (arrow). Segmental non-visualization of NLD (arrowheads) but drainage into inferior turbinate (open arrow) is observed in left. Lacrimal sacs are distended (asterix).

B. Digital subtraction DCG shows complete obstruction at level of NLD (arrow) in right and postoperative stenosis (arrowheads) and leakage (small arrows) but satisfactory drainage into inferior turbinate (open arrow) in left.

stenosis (arrowheads) and leakage (small arrows) but satisfactory drainage into inferior turbinate (open arrow) in left.

30  
T1 (11). FLASH MR 3DFT MR DCG  
MR DCG  
T1 3DFT 1.5mm  
(MIP)  
CISS true FISP (fast  
imaging in steady state)  
(alternating: +/-)  
(nonalternating: +/+)  
CISS 가  
가 sequence (con-  
structive interference) (12-14).  
3DFT  
T2 가  
가 MR  
DCG  
FLASH Gd T1 CISS T2  
, axial image CISS SNR  
3D  
3D MR DCG  
가가  
(Fig. 3). 3D MR DCG  
(Fig.1)  
. Nixon (3)  
가  
3D MR DCG가  
가  
가  
(endoscopic intranasal dacryocystorhinostomy)  
(15).  
가

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### 3 DFT Magnetic Resonance Dacryocystography in the Evaluation of Epiphora<sup>1</sup>

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**Purpose :** To evaluate the feasibility of 3-dimensional Fourier transformation magnetic resonance dacryocystography (3DFT MR DCG: MR DCG) and its diagnostic efficacy in patients with epiphora.

**Materials and Methods :** Three normal volunteers and ten patients complaining of epiphora were studied by MR DCG using 3DFT CISS and 3DFT FLASH techniques. In normal volunteers, MR DCG was obtained by instillation of diluted Gd-DTPA solutions of different concentrations (Gd-DTPA : saline= 1:100, 1:50, 1:25) using various instillation methods. In patients with epiphora, MR DCG was compared with conventional DCG.

**Results :** In normal volunteers, the best image was obtained with the continuous instillation method during MR scanning. In all normal volunteers, MR DCG demonstrated the entire course of the nasolacrimal duct (NLD). In patients with epiphora, however, there were five cases in which MR DCG failed to visualize the NLD, as well as five cases of occlusion and two of stenosis at the level of the proximal NLD. These findings corresponded with conventional DCG findings as four cases of occlusion at the level of the common canaliculi, one case of lacrimal sac, five cases of occlusion and two cases of stenosis at the level of the proximal NLD. There was no significant difference between MR DCG findings using 3DFT CISS and 3DFT FLASH MR techniques.

**Conclusion :** MR DCG can detect the correct level of obstruction and differentiate between occlusion and stenosis of the NLD in patients with obstruction of the lacrimal drainage system. It may be a useful diagnostic method for investigating complicated cases in which conventional DCG is not possible due to post-surgical or traumatic obstruction.

**Index words :** Magnetic resonance(MR), comparative studies  
Magnetic resonance(MR), three-dimensional  
Lacrimal gland and duct, radiography

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