

MR

1

2

:

.

:

T1

40

,

,

가

가

,

,

,

,

,

.

,

,

:

($p=0.000$),

($p=0.002$).

가

가

($p=0.004$), 23

가

($p=0.002$).

:

.

T1

(border zone infarcts)

가

(2).

가

(pial collateral flow)

(1).

(cerebral digital subtraction angiography)

(MR perfusion image)

(ophthalmic artery)

T1

가

T1

1

2

2006 2

2007 1

가

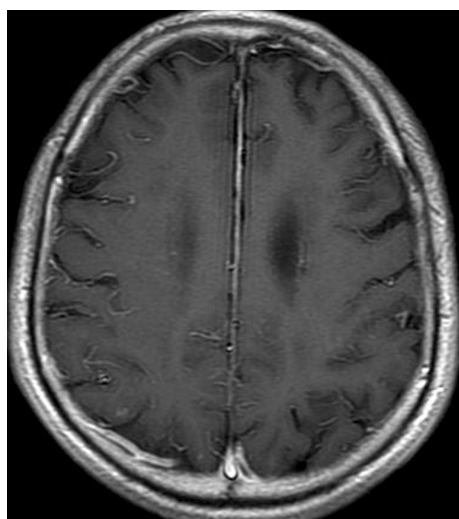
2006 ()

2007 4 2 2007 5 30

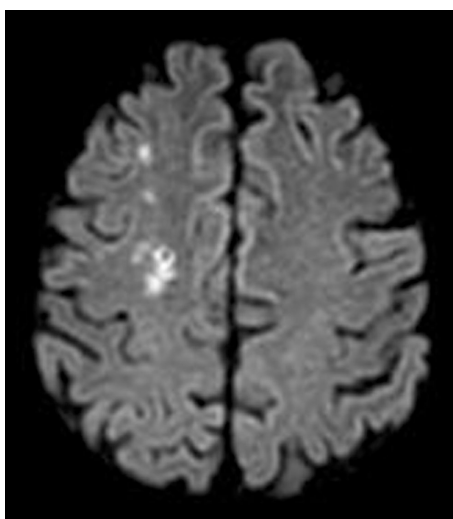
60

12 T1 1
 (middle cerebral artery) 3
 3 ,
 1 (meningioma)
 20 40
 가
 51 80
 67 29 11
 iodine 5 cc, 8 cc
 6 cc, 12 cc

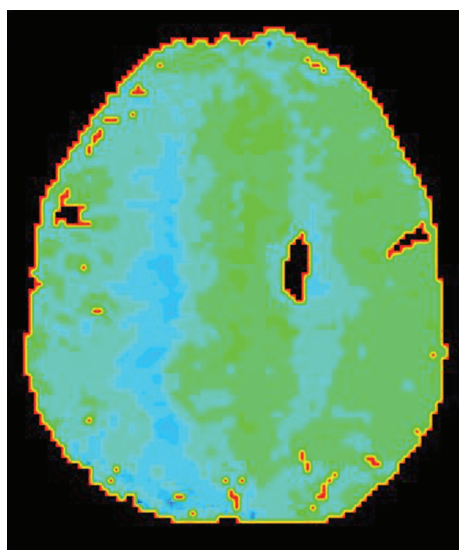
1.5 tesla (GE Signa EXCITE
 HD; GE Healthcare, Milwaukee, WI, U.S.A.) T2
 , FLAIR (fluid attenuated inversion recovery) ,
 T1 , T1 ,
 TOF (time of flight)
 T1 가 (Gadolinium)
 (Omniscan; Amersham Health - care, Oslo, Norway) 10 mL
 40 23
 . 가 20 mL 2 - 3 mL
 (MTT; mean transit time), (TTP;
 time to peak), (CBV; cerebral blood
 volume) 1



A



B



C



D

Fig. 1. Right carotid stenosis in 68-year-old male with transient left side weakness.

A. Contrast-enhanced T1-weighted MR image shows vascular enhancement of the right frontal lobe cortex.

B. Diffusion weighted image shows multiple nodular high signal intensity on the right deep white matter, which is border zone infarcts pattern.

C. The time delay on right hemisphere is noted on TTP (time to peak) map of MR perfusion study.

D. Neck lateral angiography with contrast injection of the right common carotid artery shows severe stenosis measured to 93% degree stenosis by NASCET method on cervical segment of right internal carotid artery.

가 T1

가 23

가 17

NIHSS가 0 17 7 (41.1%)

5 10

(3) 5 (50%) , 6 13 9 (69.2%)

NIHSS가

가 가

32% 100%

가 86.09% , 59.47%

가

($p=0.000$, t - test) (Fig. 2).

NASCET trial(North American Symptomatic Carotid Endarterectomy Trial)

(4) 가

NASCET trial

95 %

t -

(antegrade flow),

(retrograde flow), 가 가

6가

가 , 1 cm

(subcortical)

(small perforating artery infarcts), 1 cm

(pial infarcts), (territorial infarcts),

(border zone infarcts)

(5).

6가

(TTP map)

2

T -

p 0.05

(cervical segment)

29 가 , (communicating segment),

(cavernous segment), (petrous segment)

5 , 2 , 3

NIHSS(National Institute of Health Stroke Scale)

0 17 , NIHSS 5

가 10 NIHSS 6 13

T1

가 23

가 17

NIHSS가 0 17 7 (41.1%)

5 10

(3) 5 (50%) , 6 13 9 (69.2%)

NIHSS가

가 가

32% 100%

가 86.09% , 59.47%

가

($p=0.000$, t - test) (Fig. 2).

가 21

가 가 2 ,

가 가 11 , 가

가 가 6

33.3% 7

가 2

가

가

가 90.9%, 100%

가 ($p=0.002$, test) (Fig. 3).

12 가 ,

1 (small PAI), 1

(large PAI), 5 (pial infarcts), 3

(territorial infarcts), 7 (border zone

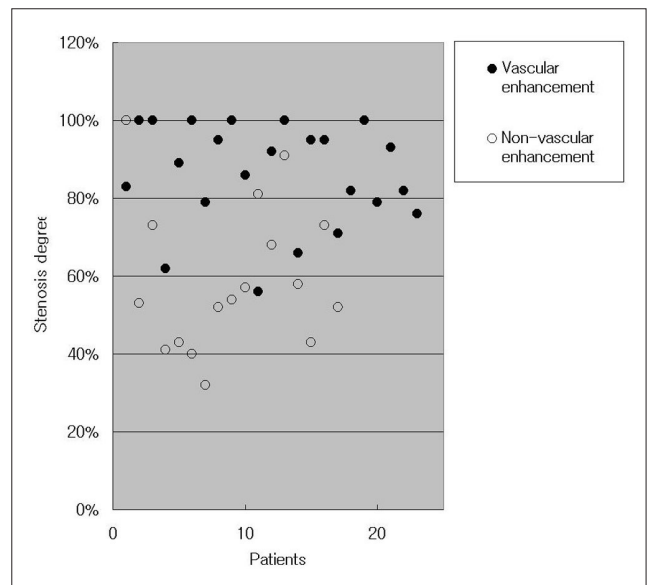


Fig. 2. The degree of carotid stenosis and vascular enhancement. The degree of carotid stenosis and the frequency of vascular enhancement correlated statistically ($p=0.000$).

infarcts)

7 . 4

가

1 가 16 , 가

가 17 가 가

가

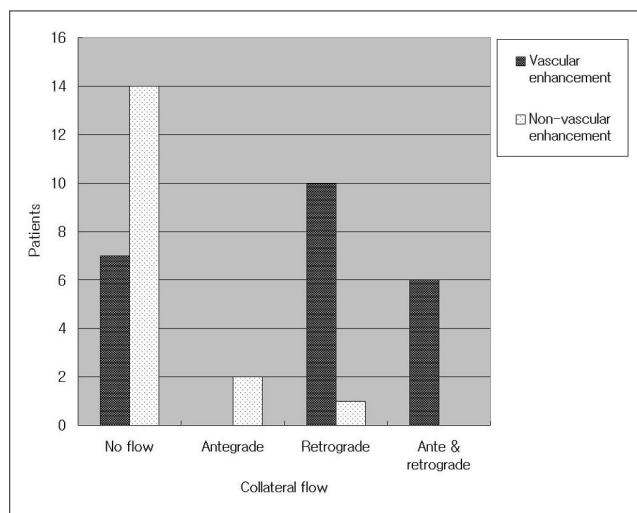


Fig. 3. Collateral flow and vascular enhancement. The presence of retrograde pial collateral flow and mixed form of antegrade and retrograde collateral flow on cerebral DSA (digital subtraction angiography) were related with the occurrence of vascular enhancement ($p=0.002$).

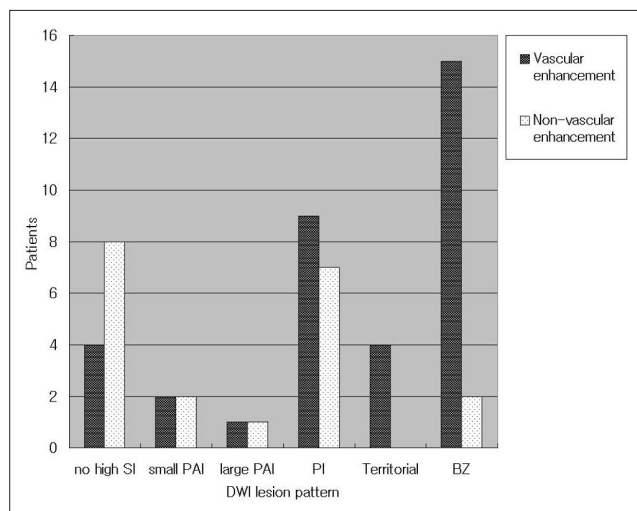


Fig. 4. DWI lesion pattern and vascular enhancement. The presence of border zone infarcts pattern on DWI was related with the occurrence of vascular enhancement ($p=0.004$). (SI: signal intensity, DWI: diffusion weighted image, PAI: perforating artery infarcts, PI: pial infarcts, Territorial: territorial infarcts, BZ: border zone infarcts)

17 15 (88.23%)

23

8 (34.78%)

가 ($p=0.004$, test), 가 (Fig. 4).

23 , 2 , 11 10 2

2 , 9 (81.81%)

가 ($p=0.002$, test) (Fig. 5).

T1

가

가

가

가

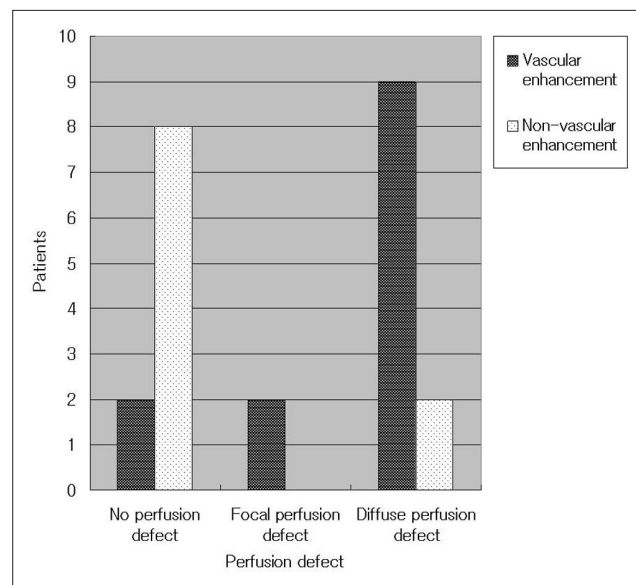


Fig. 5. Perfusion defect and vascular enhancement. In 23 patients with MR perfusion study, the presence of perfusion defect was related with the occurrence of vascular enhancement ($p=0.002$).

24

(1).

가

(6, 7) 가

T2

, FLAIR

, TOF (time of flight)

T1

가

가

T1

Essig (3)

가

가

가 가

가

가

(8),

가 75%

95%

가

(6).

가

(pial infarcts)

(border zone infarcts)

(Lee) (5)

가 가

가

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The Significance of Vascular MR Contrast Enhancement in Carotid Stenosis¹

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Purpose: To determine the significance of vascular MR contrast enhancement in carotid stenosis.

Materials and Methods: Forty patients that had angiographically proved carotid stenosis were selected for the study. A blind interpretation of vascular enhancement on an enhanced T1 weighted image, the lesion pattern on a DWI (diffusion weighted image), a perfusion defect on a MR perfusion image, the degree of stenosis, and collateral flow on cerebral DSA (digital subtraction angiography) was made by two observers, retrospectively. DWI lesion patterns were classified as having no high signal intensity, small PAI (perforating artery infarcts), large PAI, pial infarcts, territorial infarcts, and border zone infarcts. We evaluated the statistical correlation between vascular enhancement and the degree of stenosis, collateral flow, the DWI lesion pattern and the presence of a perfusion defect, respectively.

Results: The degree of carotid stenosis and the frequency of vascular enhancement correlated statistically ($p=0.000$). The presence of retrograde collateral flow on cerebral DSA and the border zone infarcts pattern on DWI were related with the occurrence of vascular enhancement ($p=0.002$, $p=0.004$). In 23 patients that underwent a MR perfusion study, the presence of a perfusion defect was also related to the occurrence of vascular enhancement ($p=0.002$).

Conclusion: Vascular MR contrast enhancement may indicate a cerebral hypoperfusion in carotid stenosis.

Index words : Carotid arteries, Stenosis or occlusion

Brain, MR

Magnetic resonance (MR), contrast enhancement

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