

FLAIR : CT, T2 ,
MR 1

2 . . . 3 . 3 . . .

: CT, T2 , fluid-
attenuated inversion-recovery (FLAIR) MR
:
CT , CT 2 MR 16 CT, T2 ,
FLAIR MR 2
가 ,
CT , MR
가 CT
MR (contrast-to-noise ratio, CNR)
:
CT 13 (81%) , FLAIR 10 (63%), T2 7(44%)
CNR 30%, CT 15%, FLAIR
18%, T2 16% ,
($P < .004$).
:
CT가 FLAIR T2

(5-7).

CT MR(T2 2가
) , MR 가 ,
CT MR
CT, T2 , FLAIR
MR
(lesion detection rate)
가
(water molecule)
(signal attenuation) , MR
T1 T2
T2
1997 2 1998 8
6 CT , CT 2
MR 16
CT MR

1
2
3
1999 3 15 1999 5 27
1

가 13 , 가 3
 40 90 63.1 98.9msec) single shot EPI (TR 6,500msec, TE
 b value 900sec/mm²
 CT 1 6 3.7 x, y, z 3
 , CT MR 30 2 가
 1.2 (;) CT, T2
 10 , FLAIR
 , (,
 . CT
 1 14 5.3 , 8
 MR 2 CT , T2
 CT HiSpeed Advantage(GE Medical Systems, FLAIR 가
 Milwaukee, Wisconsin, U.S.A.) . CT MR
 5mm
 . MR 1.5T (Signa; GE Medical
 Systems, Milwaukee, Wisconsin, U.S.A.) 2 가
 2mm, 5mm 가
 (TR 3,666msec, effective TE 104msec) T2
 , FLAIR (TR 10,000msec, ef-
 fective TE 123msec, TI 2,200)
 (percent agreement) k 가

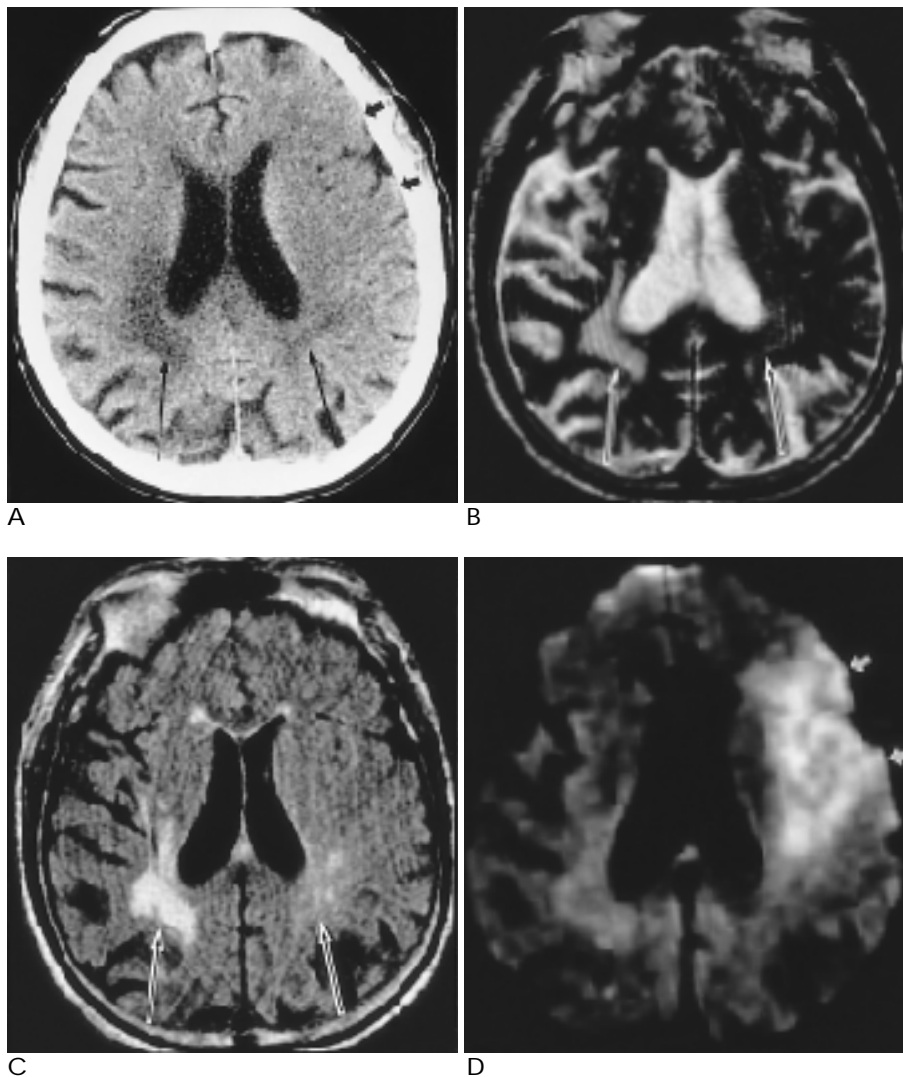
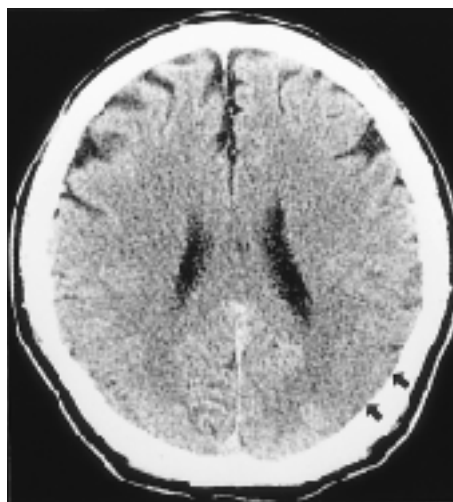


Fig. 1. A 78 year-old man with right hemiplegia and altered mentality. (A) Axial unenhanced CT scan obtained within two and a half hours of symptom onset reveals subtle hypoattenuation with loss of gray-white matter interface in the left frontoparietal region(short arrows). Also note low attenuation lesions of chronic infarction in the bilateral deep periventricular white matter(long arrows). Axial T2-weighted MR (B) and axial fast FLAIR MR (C) images obtained two hours after CT scan show no definite increased signal intensity in the left frontoparietal region. The deep periventricular white matter lesions show high signal intensity(arrows). (D) Diffusion-weighted MR image demonstrates high signal intensity lesion in the left frontoparietal region(arrows).

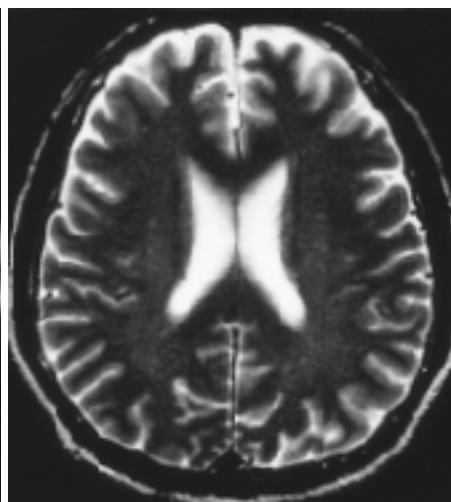
, Landis Koch (8) k 0.60 sub- , p value가 0.05
 stantial to excellent agreement 가 .
 (region-of-interest)
 CT (Hounsfield Units,
 HU) MR
 (contrast-to-noise ratio, CNR) [% CNR 가
 = $100 \times \left(\frac{\text{HU} - \text{HU}_{\text{HU}}}{\text{CNR}} \right)$ (Fig. 1-3). CT
 HU) / HU]. 13 (81%)
 CNR paired-samples t test 3), FLAIR 10 (63%) (Fig. 2, 3), T2

Table 1. Interobserver Agreement and k Value for Each Imaging Technique in Detection of Hyperacute Middle Cerebral Artery Territory Infarction(n= 16).

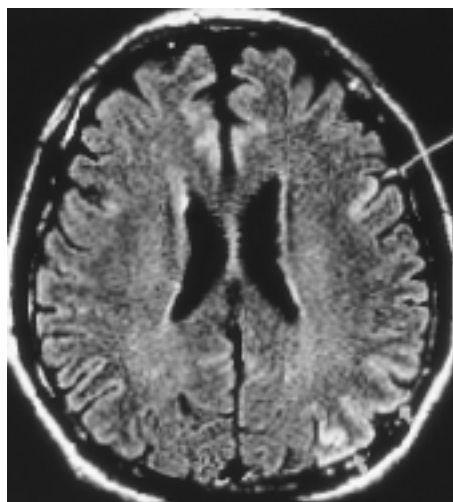
	Observer 1	Observer 2	Consensus (%)	Interobserver Agreement Rate (%)	k Value
Unenhanced CT	12	14	13(81)	88	0.60
T2-weighted MR	7	8	7(44)	94	0.88
Fast FLAIR MR	10	11	10(63)	94	0.86
Diffusion MR	16	16	16(100)	100	



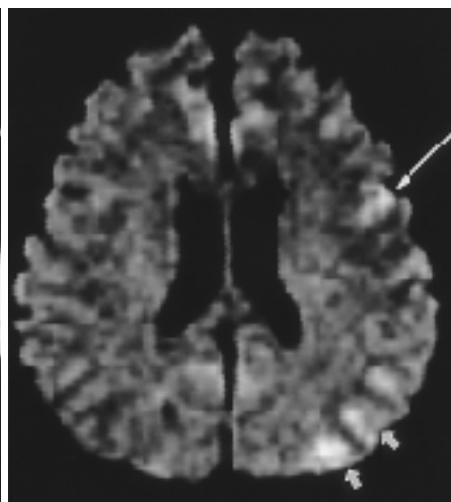
A



B



C



D

Fig. 2. A 59 year-old man with aphasia.

A. Axial unenhanced CT scan obtained within five and a half hours of symptom onset reveals subtle hypoattenuation in the left parietal lobe(arrows).

B. Axial T2-weighted MR image obtained fifty minutes after CT scan shows no definite signal abnormality.

C. Axial fast FLAIR MR image shows high signal intensity lesion in the cortex of the left parietal lobe(short arrows). There is another high intensity lesion in the left frontal lobe(long arrow).

D. Diffusion-weighted MR image also shows high signal intensity lesions in the left parietal(short arrows) and frontal lobes(long arrow).

7(44%) T2 16% ± 13, CT 15% ± 8.3 (p < .004) 가

(Fig. 3).

(= 100%) , T2 FLAIR 15 (= 94%, $k = 0.88, 0.86$) , CT 14 (= 88%, $k = 0.60$) (Table 1). 가

CT 1 (thrombolysis) 가

2 5 30 1 1 (9-12). T2 FLAIR

CNR (±) 30% ± 10 가 , FLAIR 18% ± 12, CT가

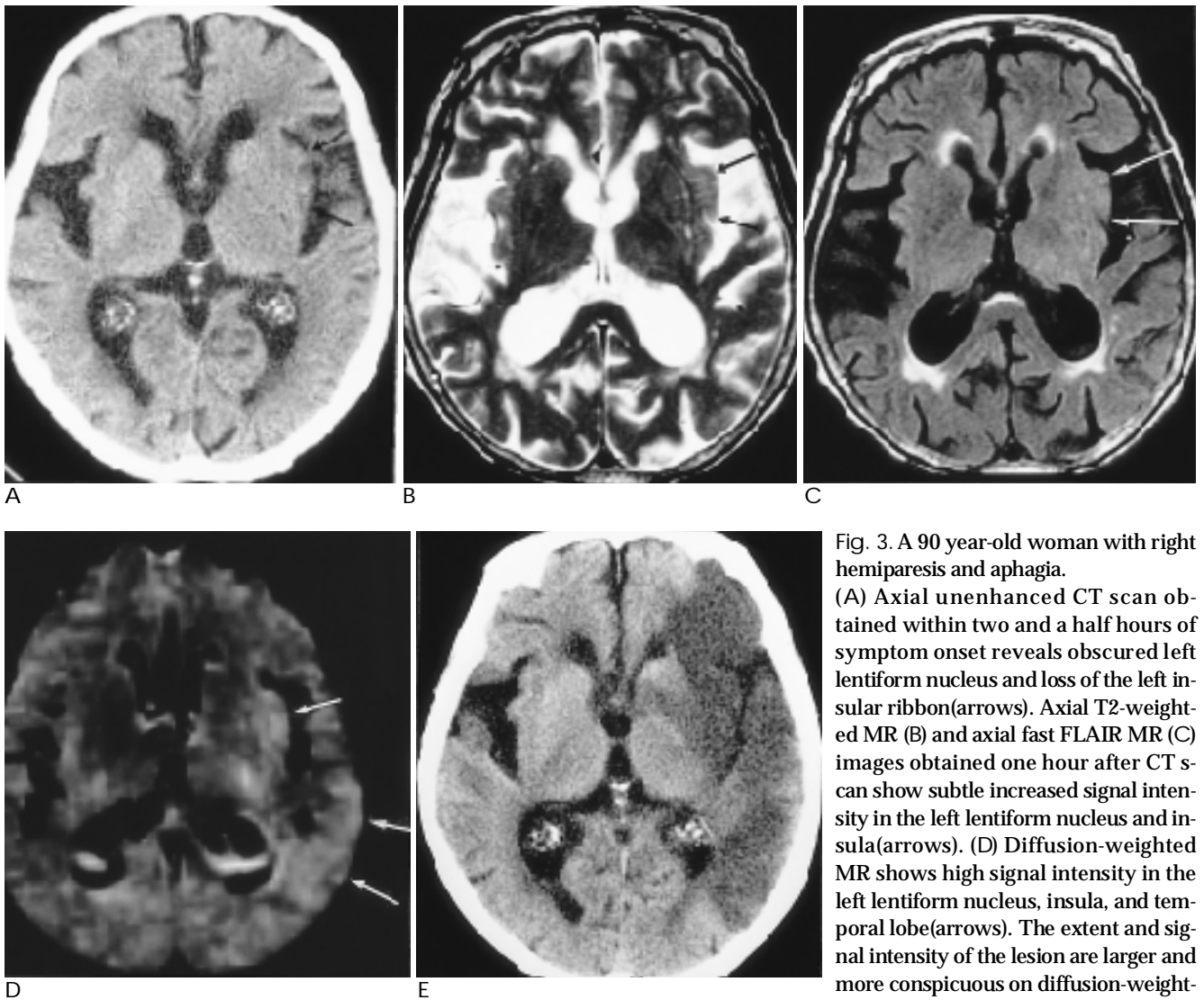


Fig. 3. A 90 year-old woman with right hemiparesis and aphagia. (A) Axial unenhanced CT scan obtained within two and a half hours of symptom onset reveals obscured left lentiform nucleus and loss of the left insular ribbon(arrows). Axial T2-weighted MR (B) and axial fast FLAIR MR (C) images obtained one hour after CT scan show subtle increased signal intensity in the left lentiform nucleus and insula(arrows). (D) Diffusion-weighted MR shows high signal intensity in the left lentiform nucleus, insula, and temporal lobe(arrows). The extent and signal intensity of the lesion are larger and more conspicuous on diffusion-weighted image than on CT, T2-weighted, and

FLAIR images. (E) Follow-up unenhanced CT scan obtained eight days after initial CT scan shows well-defined margin and increased extent of the lesion.

가
MR T2

CT 가 (5-7). 6 (T2
(9,10). CT (13) Gonzalez (20) 가 CT
CT 33% 100% 18%
가 45% MR MR
CT가 MR
, CT T2
(
CT T2
)

가
CT 6 가
CT 가 (1),
56% 95% 81%
(2,14-16),
(
CT)

CT MR
MR CT
, CT 가
MR FLAIR
T2
(7,21-23) T2
3 2 (Fig. 2)
CNR
CT FLAIR
CNR
T2

가
CT 가
6 가 CT CNR
가 Kummer (17) (window width)
, 56% ($k = 0.55$), 49% ($k = 0.58$) CNR
, 5 78%, 84% (20, 24).
88% ($k =$ CT, FLAIR T2
CT 80HU MR 700-800
CT 가
(20).
가
MR(T2 가
) CT 가
(18) 1 15 가
MR 가
Mohr (19) 가
MR CT

CT, MR, T2, FLAIR, 가 16, 가, 가, CT, FLAIR, T2

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Hyperacute Middle Cerebral Artery Territory Infarction: Comparison of Unenhanced CT, Spin-Echo T2-weighted, Fast FLAIR, and Diffusion-weighted MR Imaging¹

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Purpose : To compare the detection rate of unenhanced CT, spin-echo T2-weighted, fast fluid-attenuated inversion-recovery (FLAIR), and diffusion-weighted MR imaging in the diagnosis of hyperacute middle cerebral artery (MCA) territory infarction.

Materials and Methods : Sixteen patients with clinically proven hyperacute MCA territory infarction were evaluated with unenhanced CT and MR. All CT examinations were performed within six hours of the onset of symptoms and all MR studies were performed within two hours of CT. All images were evaluated independently by two radiologists in possession of brief clinical information. Positive imaging criteria were parenchymal hypoattenuation, as seen on CT, and increased signal intensity, as seen on MR. For quantitative analysis, we measured the attenuation and signal intensity of the lesion and contralateral normal parenchyma, and percentage contrast-to-noise ratios (CNRs) of the lesions were also calculated.

Results : Positive findings were detected in all patients on diffusion-weighted images, in 13 (81%) on CT, in 10 (63%) on fast FLAIR images, and in 7 (44%) on T2-weighted images. Lesion percentage CNRs were 30% for diffusion-weighted imaging, 15% for CT, 18% for FLAIR MR imaging, and 16% for T2-weighted MR imaging ($p < .004$ for diffusion-weighted imaging vs others).

Conclusion : For hyperacute MCA territory infarction, diffusion-weighted MR imaging was the most sensitive imaging technique and unenhanced CT was superior to fast FLAIR or T2-weighted imaging.

Index words : Brain, infarction

Brain, CT

Brain, MR

Magnetic resonance (MR), pulse sequences

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