

3

1

2 2 2

: 3 (3-dimensional CT angiography, 3D-CTA) . 가 3D-CTA . 3D-CTA CT 가 SSD 3 . 2 , 3D-CTA : 36 40 가 2- 12mm(5.5mm) . 10 . 1 가 85.2%, 82.7% . 2 가 93.5% 89.1% . 2 86%, 87% (Kappa value 0.58, 0.59). : 3D CTA 85%

3D-CTA

가
가

(1).

1998 1 1998 6 CT 가 3D-C- 46 TA

(turbulent flow)

(2).

(helical) (computed tomogra- 가 32 , 14 (M- phy, CT) CTA(CT angiography) RI) 가 17 , 가 29 , 31 80 (3,4). CT 가 50 .

3D-CTA CT (HiSpeed Advantage, GE Medical Systems, Milwaukee, USA)

가 3D-CTA

120ml (Ultravist 300, Schering, Berlin, Germany) 3.0ml/sec 19

40 , 20 CT .

35

1mm, (pitch) 1:1 ,

1999 1 6 1999 3 30 . 0.5mm SSD(Shaded surface dis-

play) , , SSD 80-120HU 32 30
 280HU
 (anterior view) (posterior view) 45
 (superior view) 15 3
 21
 (Advantx
 LCN, GE Medical system, Milwaukee, USA)
 (femoral artery)
 (internal carotid artery) (ver-
 tebral artery)
 (oblique view), (tran-
 sorbital view) 가
 가 2
 가
 3D-CTA
 Kappa statistic
 36 40
 4 2
 가 (Table 1). 10

Table 1. Angiographic Findings

Category	Number in study
Patient	46
Negative on DSA	10
Patient with aneurysm on DSA	36
	32 with 1 aneurysm
	4 with 2 aneurysms
Total number of aneurysm	40

DSA: digital subtraction angiography

. CT 32 30
 가
 MRI 가 14
 6 8 가
 (anterior communicating artery) 16 ,
 (posterior communicating artery)
 (bifurcation of middle cerebral artery)
 7 ,
 9 , 3 , (anterior cerebral artery : A1 1 , A2 2) 3 , (ophthalmic artery) (basilar artery) 1
 2 ~ 12mm , 10-12mm가 2 , 7-9mm
 가 10 , 4-6mm가 19 , 1-3mm가 9 5.7mm
 (Table 2).
 2 ~ 12mm 5.5mm 가
 3D-CTA 2 가 40
 38 36 (Table 3, Fig. 1). 1 35 , 1
 , 2 , 8 ,
 38, 2, 6, 8 . 2
 34 , 2 , 3 , 7 ,
 36, 4, 5, 7 (Table 2).
 Table 4
 . 2
 85%, 83% 94%, 89%
 .
 86%, 87% , Kappa statistic (Kappa value 0.58, 0.59).
 CT 32
 2 3D-CTA 30
 가 94% 87%, 91% 가
 (Kappa value 0.68) .
 2 2 4
 . 2 가 2 , 가
 2-4mm ,
 . 2 7-9mm

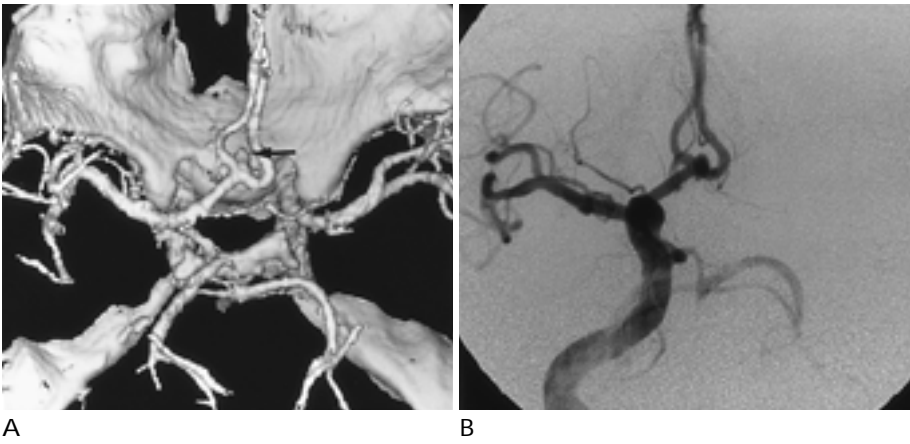
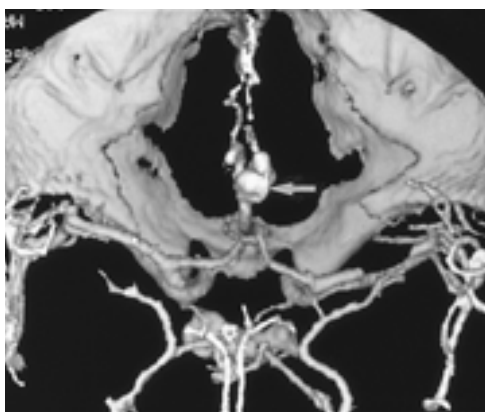


Fig. 1. Patient with 3-mm anterior communicating artery aneurysm.
 A. Superior view of 3 dimensional CT shows an aneurysm arising from the anterior communicating artery (arrow).
 B. Digital subtraction angiogram depicts the aneurysm similarly to A.

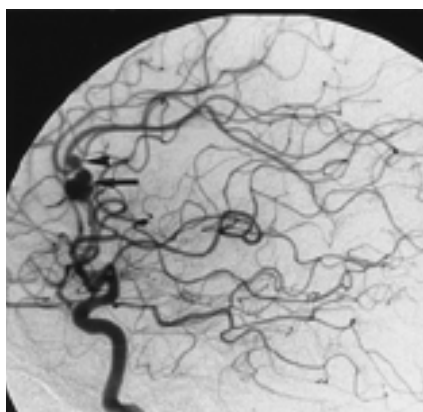
2
1 2 6 5 (Fig. 2). 3
3). (Fig. 3D-CTA가
2 3D-CTA
95%, 90%
3D-CTA
90 ~ 96% (5-7).
CT 57%, 58%
77-87% (8,9).
가

Table 2. Sensitivity vs. Size of Aneurysm on 3D-CT Angiogram in the Blind Study by Two Observers

Location	Size in Largest Dimension(mm)				Total
Observer 1					
	1-3	4-6	7-9	10-12	
Carotid, cavernous	2/2	1/1			3/3(100%)
Carotid, ophthalmic		1/1			1/1(100%)
Carotid, Pco A	2/2	2/3	2/2		6/7(85.7%)
A1		1/1			1/1(100%)
Aco complex	2/2	8/8	5/5	1/1	16/16(100%)
A2 and Distal	0/1		1/1		1/2(50%)
M1/M2	1/1	5/5	2/2	1/1	9/9(100%)
Basilar tip	1/1				1/1(100%)
Total	8/9	18/19	10/10	2/2	38/40
Sensitivity	88.9%	94.7%	100%	100%	95%
Observer 2					
	1-3	4-6	7-9	10-12	
Carotid, cavernous	2/2	1/1			3/3(100%)
Carotid, ophthalmic		1/1			1/1(100%)
Carotid, Pco A	2/2	2/3	1/2		5/7(71.4%)
A1		1/1			1/1(100%)
Aco	2/2	8/8	4/5	1/1	15/16(93.8%)
A2 and Distal	0/1		1/1		1/2(50%)
M1/M2	1/1	5/5	2/2	1/1	9/9(100%)
Basilar tip	1/1				1/1(100%)
Total	8/9	18/19	8/10	2/2	36/40
Sensitivity	88.9%	94.7%	80%	100%	90%



A



B

Fig. 2. False negative case in patient with multiple aneurysms.

A. 3 dimensional CT angiogram shows 10-mm multilobulated aneurysm (arrow) from left A2 segment.

B. Digital subtraction angiogram demonstrates another small aneurysm (arrowhead) in the left pericallosal artery other than large multilobulated aneurysm (arrow).

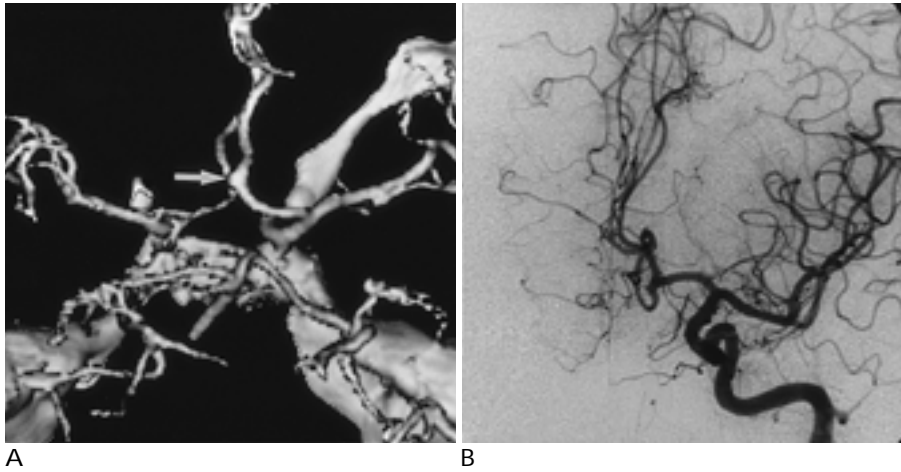


Fig. 3. False positive case of observer 1. A. 3 dimensional CT angiogram shows a small aneurysm-like structure (arrow) in the anterior communicating artery. B. Digital subtraction angiogram reveals the tortuous anterior communicating artery without aneurysm.

3D-CTA가
6 5 2 3 가 가 3mm
가
(over reading) 가
가 2
(10).
2 2~4mm 3D-CTA
(5). 2 7-9mm
2 가 1

Table 3. Analysis of Aneurysm Detection with 3-D CTA

Observer 1

		DSA		Total
		(+)	(-)	
CTA	(+)	35(38)	2(6)	37(44)
	(-)	1(2)	8(8)	9(10)
Total		36(40)	10(14)	46(54)

Observer 2

		DSA		Total
		(+)	(-)	
CTA	(+)	34(36)	3(5)	37(41)
	(-)	2(4)	7(7)	9(11)
Total		36(40)	10(12)	46(52)

No. (No.): Patient No. (Aneurysm No.)

CT 2 32 가
McCormick 2 (11) 가
가 , 5mm
3%
4mm
가

Table 4. Comparison of Value of 3D-CTA in the Identifying Aneurysms

	All aneurysms		All patients	
	Observer 1	Observer 2	Observer 1	Observer 2
Sensitivity	38/40(95%)	36/40(90%)	35/36(97.2%)	34/36(94.4%)
Specificity	8/14(57.1%)	7/12(58.3%)	8/10(80%)	7/10(70%)
Accuracy	46/54(85.2%)	43/52(82.7%)	43/46(93.5%)	41/46(89.1%)
Positive PV	38/44(86.4%)	36/41(87.8%)	35/37(94.6%)	34/37(91.9%)
Negative PV	8/10(80%)	7/11(63.6%)	8/ 9(88.9%)	7/9(77.8%)

가
3D-CTA CT
SSD
3
(12).
가 3D-CTA
3D-CTA
가 CT
CT
가 (13).
3D-CTA
가
Kappa statistic
가 가
3
가,

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Diagnostic Accuracy of Three-dimensional CT Angiography in Intracranial Aneurysms¹

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Purpose: To determine the accuracy of three-dimensional CT angiography (CTA) in the diagnosis of intracranial aneurysms.

Materials and Methods: 3D-CTA was performed in 46 consecutive patients with subarachnoid hemorrhage or suspected intracranial aneurysm. Images were obtained using a helical CT scanner and the SSD technique. 3-D CTA findings were reviewed retrospectively and independently in blind fashion by two neuroradiologists. Digital subtraction angiography (DSA) was used as the reference standard.

Results: DSA revealed, in 36 patients, 40 aneurysms ranging from 2 mm to 12 mm in maximal diameter, and negative findings in 10 patients. For observer 1, the accuracy of 3D-CTA for all aneurysms and all patients was 85.2% and 82.7%, respectively. For observer 2, the respective figures were 94.6% and 91.9%. The agreement rates between the two observers were 86% for all aneurysms and 87% for all patients (Kappa value 0.58, 0.59).

Conclusion: Three-dimensional CTA is a useful imaging technique for the diagnosis of intracranial aneurysms, with an accuracy of over 85%.

Index words : Aneurysm, cerebral

Computed Tomography(CT), angiography

Computed Tomography(CT), comparative studies

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