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Evaluation of Anterior Cerebral Artery Flow Abnormalities on Transcranial Doppler Ultrasonography

Heui Cheun Park, M.D., Kyoung Kyune Park, M.D., Ho Won Lee, M.D.,
Jong Yeol Kim, M.D. Sung Pa Park, M.D., Bo Woo Jung, M.D.*, Chung Kyu Suh, M.D.

Department of Neurology, School of Medicine, Kyungpook National University
Department of Neurology, College of Medicine Pochon CHA University, Kumi CHA General Hospital*

Background : Anterior cerebral artery (ACA) flow abnormalities on a transcranial Doppler ultrasonography (TCD) represent various conditions, which include hyperemic collateral to the ipsilateral middle cerebral artery (iMCA) or contralateral internal carotid artery (cICA) pathology, and ipsilateral anterior cerebral artery (iACA) stenosis. However, studies related to these conditions have rarely been done. We evaluated the hemodynamic significance of ACA flow abnormalities on TCD without angiographic information. **Methods** : We analyzed TCD records, which were recruited consecutively during a 10-month period in our laboratory. ACA abnormalities on TCD were defined as follows: 1) mean flow velocities (mFV) of ACA>80 cm/sec; 2) ipsilateral mFV ACA/MCA> 1.2; 3) anterior cerebral artery velocity ratios (ACA VR)> 1.34. We then correlated TCD patterns with a magnetic resonance angiography (MRA) or trans-femoral cerebral angiography (TFCA). **Results** : Thirty-five patients were recruited to participate in this study. Based on MRA or TFCA, we found 4 patterns of vascular status which could explain the ACA abnormalities on the TCD. The iMCA pathology was demonstrated in 14 cases, cICA pathology in 11 cases, iACA stenosis in 3 cases, and cACA hypoplasia in 5 cases. Eight cases did not show any vascular pathology. **Conclusions** : ACA flow abnormalities should be evaluated with absolute flow velocity indices, as well as other indexes, which mostly signify hyperemic collateral flow to the iMCA or cICA steno-occlusion.

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Key Words : Anterior cerebral artery, Transcranial Doppler ultrasonography, Angiography

	nance angiography, MRA)		
	MRA		
(Transcranial Doppler ultrasonog-		TCD가	¹⁻³ TCD
raphy, TCD)	(Magnetic reso-	Willis	⁴
		가	가
		TCD	⁵
		TCD	⁶⁻⁸ TCD
		가	TCD
			^{6,7,9,10} TCD
		^{6,9,10}	TCD

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* Address for correspondence
Jong Yeol Kim, M.D.
Department of Neurology, School of Medicine,
Kyungpook National University
Samdeok-dong 2-ga 50, Jung-gu, Daegu, 700-721, Korea
Tel : +82-53-420-5760 Fax : +82-53-422-4265
E-mail : joykim@knu.ac.kr

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1,7,11, 7,8, 16

TCD TCD 가 Fischer

exact TCD (mFV>80

cm/sec, dampened wave⁷)

가

TCD

27%(45/168)

35 27 (77%)가

14 (40%),

11 (31%),

3 (9%), 5

(14%), 1 (2%),

가 8 (23%) (Table 1).

가 (6

가

가 가 (21 20

)

(p=0.003) (Table 2).

13 TCD TCD - 14

(Transfemoral cerebral angiog-

raphy, TFCA) MRA

2.5 (-3 14 , 19 TCD

가) MRA

10 TFCA 가 가

2.

TCD 2 가 , 가 ,^{1,7}

Transcan3-D (Eden Medical Electronics,

Germany) ,⁷⁻⁹ ,^{1,7,11}

4,14 가 ,¹⁷ ,

65~70 mm

1)

(mean flow velocity, mFV)가 80 cm/sec

14,15 2) / 가 1.2

14,15 3) (anterior cere-

bral artery velocity ratio, ACAVR)가 1.34^{8,15}

MRA 가 , (20)

가 ,^{2,3} (in situ thrombo-

(carotid duplex ultra-

sonography) , TFCA 가 2

NASCET 70% ,^{8,18}

Table 1. Summary of individual TCD results and angiographic findings

No.	Sex/Age	Index			Site of ACA Flow Abnormalities on TCD	Angiographic Findings
		a	b	c		
1	M/63	o	o	o	Right	iMCAO
2	M/60	o	o	o	Left	iMCAO
3	M/19*	o	o		Left	iMCAO
4	M/61		o	o	Left	iMCAO
5	M/67*	o		o	Right	iMCAS
6	M/56	o	o	o	Left	iMCAS
7	F/42	o			Right	iMCAS
8	M/47	o	o	o	Right	iMCAS
9	M/64	o	o	o	Left	iMCAS
10	M/49			o	Left	iMCAS
11	F/46	o	o		Left	iMCAS+iACAS
12	M/71	o		o	Right	iMCAS+iACAS
13	M/55	o		o	Right	iMCAS+cACA hypoplasia
14	M/47*	o	o	o	Right	iMCAS+cICAS
15	M/65	o	o		Left	cICA
16	F/57	o	o	o	Left	cICA
17	F/50*	o	o	o	Left	cICA
18	F/40	o			Left	cICA
19	M/42	o	o		Right	cICAS
20	M/58*	o		o	Left	cICAS
21	M/57	o			Left	cICAS
22	M/66		o		Left	both ICAS
23	M/52	o	o		Left	cICA+cACA aplasia
24	M/35	o	o		Left	cICAS+cACA aplasia
25	F/42	o	o		Left	cICAS+cACA hypoplasia
26	F/62			o	Right	cACA hypoplasia
27	F/70*	o	o	o	Left	iACAS
28	F/47	o			Right	Normal
29	M/62*		o	o	Left	Normal
30	F/33*			o	Left	Normal
31	F/26*	o	o	o	Left	Normal
32	M/55		o		Right	Normal
33	M/59	o			Left	Normal
34	M/71		o		Right	Normal
35	F/70	o			Left	Normal

TCD; transcranial doppler, ACA; anterior cerebral artery, cACA; contralateral anterior cerebral artery, iACAS; ipsilateral anterior cerebral artery stenosis, iMCAS; ipsilateral middle cerebral artery stenosis, iMCAO; ipsilateral middle cerebral artery occlusion, cICAS; contralateral internal carotid artery stenosis, cICA; contralateral internal carotid artery occlusion, a; anterior cerebral artery mean flow velocity > 80cm/sec; b; anterior cerebral artery mean flow velocity/middle cerebral artery mean flow velocity > 1.2; c, anterior cerebral artery velocity ratio > 1.34; *performed conventional angiography

Table 2. Correlation between ACA flow change indexes on TCD and angiographic findings in 35 cases

	Angiographic Findings			P (p<0.05)
	Abnormal	Normal	Total	
-	20(99.2%)	1(0.8%)	21(100%)	0.003
or	7(50%)	7(50%)	14(100%)	

ACA; anterior cerebral artery, ; anterior cerebral artery mean flow velocity > 80 cm/sec, ; anterior cerebral artery mean flow velocity/middle cerebral artery mean flow velocity ratio > 1.2 and anterior cerebral artery velocity ratio > 1.34, - ; fulfilled criteria and , P; 2-tailed p value by Fischer exact test, TCD; transcranial doppler

가 가

가 가 가

가 가 4,6,7,19

가 3 TCD

(12,16)^{4,9,10}

5 MRA

Zanette¹⁰

TCD

가

21, 24, 33) 가 3 (가

TCD

1 (22) 가

TCD

4 (1, 29, 31, 32) TCD

, TCD

2

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