

허혈성 뇌졸중 환자에서 경식도 심초음파 소견

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The Findings of Transesophageal Echocardiography in the Evaluation of the Source of Ischemic Stroke

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ABSTRACT

Background and Objectives : Intracardiac pathology results in 15 -20% of ischemic stroke, but transthoracic echocardiography (TTE) has a number of limitations because of suboptimal precordial windows or ultrasound interference with prosthetic materials. Transesophageal echocardiography (TEE) provides superior resolution of basal structures such as the left atrium, left atrial appendage, mitral valvular apparatus, atrial septum, and aorta. The purpose of this study was to describe the various TEE findings which were sources of cerebral emboli.

Materials and Method : The study population was comprised of 122 patients (mean age : 54.5, male 83, female 39) who were admitted to Severance Hospital because of ischemic stroke from 1991 to 1997. All patients underwent TEE with agitated saline contrast administration. Patients without a definitive cardiac source of embolism underwent Holtor monitoring, internal carotid and cerebral angiography, as well as transcranial Doppler.

Results : 1) The number of patients diagnosed as cardioembolic stroke was 55 (45.1%). Atrial fibrillation was noted in 31 patients of cardioembolic stroke and it was the most frequent finding. Among these patients, 16 did not have any other cardiac problem. 2) We were able to find the possible source of embolism in 49 (40.2%) patients with TEE. Among these patients, 12 did not have dysrhythmia or any known previous heart problem. We found spontaneous echo contrast in the left atrium and left atrial appendage in 33 cases. There were 8 patients who had intracardiac thrombus. Among these patients, 6 patients had thrombi in the left atrial appendage, 1 in left atrium and 1 in left ventricular apex. We found patent foramen ovale in 3 cases and atrial aneurysm in 1 case. We found atheromatous plaque and/or thrombi of the aorta in 16 cases, while there were 4 cases where lesions located in the ascending aorta and aortic arch and which were considered as the source of embolism. Small thrombi in the left atrial appendage and left atrium were only detectable with TEE. **Conclusions** : We described TEE findings in ischemic stroke patients. And we assert TEE is a useful diagnostic tool in detecting the source of cardioembolic stroke and it may be used as a primary diagnostic tool in patients who are being evaluated for ischemic stroke. (**Korean Circulation J 1998;28(10):1746-1754**)

KEY WORDS : Transesophageal echocardiography · Ischemic stroke · Cardioembolic stroke.

: 1998 10 12

: 1998 10 20

: , 120 - 752

134

: (02) 361 - 7737 · : (02) 363 - 7690

서 론

(cerebral an -
giography), (transcranial Doppler),

방 법

15 20%
(transthora -
cic echocardiography : TTE) suboptimal precor -
dial windows, prosthetic material ultrasound int -
erference 가

Hewlett - Packard Sonos 1500
ATL UDI 3000 , 4
, 2% lidocaine viscus
5 10
diazepam 5 10 mg midazolam 2 6 mg

3 8%
(Transesophageal echocardi -
graphy : TEE)

(atrial septal aneurysm : ASA)
(patent foramen ovale : PFO) ,
(vegetation), spontaneous echo
contrast(SEC) ,
10
cc agitation

가 가
가 가
가 가 .¹⁾
(transesopha -
geal echocardiography : TEE)

valsalva
(fossa ovalis) (bulging out) 15 mm
가 15 mm
0.5 inch S -
VHS tape 2

대상 및 방법

대 상

1991 3 1997 6
가 가 98
24 122
(83 , 39 , 54.5)

가
가
(transient ischemic attack, TIA)
(minor stroke)

결 과

Baseline clinical and imaging study
 122
 19
 64 , 12
 27
 19
 가 가 17
 5
 1
 1 , 가 (Ta-
 kayasu's arteritis) 10
 가 2 cm (internal capsule),
 가 , (penetrating branch) 1
 64 가
 (52.5%)
 (Holtor monitoring) , 55 (45.1%) 가 ,
 가 9 (7.1%)
 31 가
 9 3
 6
 (Table 1).

Table 1. Patients characteristics and classifications of ischemic stroke

Sex	Male	83
	Female	39
Cause	Thrombosis	
	Atherosclerosis	17
	Vasculitis	1
	Congenital anomaly	1
	Embolism	
	Atherothrombotic arterial source	
	Ascending aorta, aortic arch	3
	Carotid artery system	6
	Cardiac source	55
	Lacunar infarct	12
Unknown	27	
Total	122	

Echocardiographic finding

가 49 (40.2%)

spontaneous echo contrast 122

33

8

1

6

1

3

가 5

가

가

가 1 (regional wall motion abnormality)가

1

2

가

16

4

7.3%

3

가 1 (Table 2).

가 37(30.3%)

30 (54.5%)

Electrocardiography

35

31

3

1

가 2

16

19

3

1

Grade II

가 10

가

가 1

가

10

7

가 4

3

가

가 1

Table 2. Transesophageal echocardiographic findings in 55 patients diagnosed as cardiogenic cerebral embolism

Findings	Number of patients	percent
Dysrhythmia		
Non-valvular atrial fibrillation	16	29.1%
Valvular atrial fibrillation	19	34.5%
Intracardiac thrombus	8	14.6%
Thrombus in left atrial appendage	6	10.9%
Thrombus in left atrium	1	1.8%
Thrombus in left ventricle	1	1.8%
Spontaneous echo contrast in left atrium and/ or left atrial appendage	33	60.0%
Mitral and/or aortic valve insufficiency	30	54.5%
Left ventricular dysfunction	10	54.5%
Prosthetic valve	4	7.3%
Vegitation	3	5.5%
Patent foramen ovale	3	5.5%
Mitral valve prolapse	2	3.6%
Interatrial septal aneurysm	1	1.8%
Mitral annulus calcification	1	1.8%

가 . 가 4 (Table 3).
 35 19 spo -
 ntaneous echo contrast가
 11 , 4 , 가
 Frequency of abnormal findings in each ischemic stroke

Table 3. Heart problems associated with dysrhythmia in cardioembolic stroke patients

Associated heart problem	Site	Number of patients
Thrombus	Left atrium	1
	Left atrial appendage	5
Previous thromboembolic events	Central nervous system	8
	Systemic embolism	1
	Central nervous system and systemic	1
Swirling	Left atrium	11
	Left atrial appendage	4
	Left atrium and left atrial appendage	4
Valvular dysfunction	Mitral valve dysfunction	10
	Aortic valve dysfunction	1
	Multi-valvular dysfunction	4
	Prosthetic valve	2
Right to left shunt		1
Left ventricular dysfunction		8

Table 4. Frequency of abnormal findings in each ischemic stroke

Findings	Thrombosis (n=19)	Embolism (n=64)	Lacunar infarct (n=12)	Unknown origin (n=27)
Dysrhythmia				
Non-valvular atrial fibrillation	3	13	1	
Valvular atrial fibrillation		18		
Intracardiac thrombus				
Thrombus in left atrial appendage		6		
Thrombus in left atrium		1		
Thrombus in left ventricle		1		
Spontaneous echo contrast		32	1	
Left ventricular dysfunction		9	1	
Regional wall motion abnormality		2		1
Prosthetic valve replacement		4		
Vegitation		3		
Patent foramen ovale		3		
Mitral valve prolapse		2		
Interatrial septal aneurysm		1		
Mitral annulus calcification		1		
Cor triatriatum				1
Atheromatous plaque				
Ascending and aortic arch	2	4		1
Descending aorta	4	3		2
Aortic dissection		2		

spontaneous (anterior cerebral artery territory) 2 (4.4%),
 echo contrast (middle cerebral artery territory) 29 (64.4%),
 (posterior cerebral artery territory) 4 (8.9%),
 (anterior inferior cerebellar artery territory) 1 (2.2%),
 (posterior inferior cerebellar artery territory) 2 (4.4%),
 (internal carotid artery territory) 1 (2.2%),
 가 5 (11.1%)

Affected cerebral arteries and brain lesion in embolic stroke (Table 5).

45

Table 5. Affected cerebral artery in embolic stroke patients evaluated with cerebral angiography

Affected arter	Number of patients	Percent
Anterior cerebral artery	2	4.4%
Middle cerebral artery	29	64.4%
Posterior cerebral artery	4	8.9%
Anterior inferior cerebellar artery	1	2.2%
Posterior inferior cerebellar artery	2	4.4%
Internal carotid artery	1	2.2%
Multiple arterial involvement	5	11.1%
Normal	1	2.2%
Total	45	

가 24, 2, 8,
 6, 5, 3,
 가 6, 8, 2,
 4, 가 2,
 가 6,
 가 5,
 가 9 (Table 6).

Miscellaneous lesions found with TTE

Spontaneous echo contrast, (right to left shunt),

Table 6. brain lesions in patients with cardioembolic stroke detected by CT and/or MRI

Location of brain lesions	Bumber of patients	Percent
Cerebral hemisphere	24	61.5%
Frontal	2	5.1%
Parietal	8	20.5%
Temporal	6	15.4%
Occipital	5	12.8%
Subcortical area	3	7.7%
Cerebellum	6	15.4%
Basal ganglia	8	20.5%
Pons	2	5.1%
Thalamus	4	10.2%
Multiple brain lesion	9	23.1%
Miscellaneous		
Previous brain lesion	6	15.4%
Lacunar infarct	5	12.8%
Normal imaging study	2	5.1%
Total	39	

가 (dyskinesia)

Spontaneous echo contrast 122 ³⁾ 10

33 가 1

16 4

2 2

8 3 2 4%

가 , 4

가 , 5

가 , 1 (double valve replacement) 1

3 2

spontaneous echo contrast가

Lechat 965 27.3%

고 찰 ⁴⁻⁶⁾ 2.5%

가 3

가 2 1

(vertebr - spontaneous echo contrast가

obasilar system), , 2

(non - valvular atrial fibrillation), 가 ,

가 가 2% ⁷⁾

(substrate) 가 가 38%, ⁸⁾

²⁾ 16 60%,

29.1% 90%

⁹⁾ Amarengo (ulcerated plaque)

1 90% ¹⁰⁾

7 8% (prot -

cluding aortic atheroma)가

33%

¹¹⁾

가 Spontaneous echo contrast, (right to left shunt),

가

가

¹²⁾

8 (14.5%)

9

가 5

1 ,

가

요 약

2 ,

가 1

연구배경 :

15 20%

(anti - phospholipid antibody syndrome, factor deficiency)

(transthoracic echocardiography : TTE) suboptimal precordial windows, prosthetic material ultrasound interference 가

80%, 가 10%

10%,

¹³⁾

가

3 8% (Transesophageal echocardiography : TEE)

(minor

가

stroke)

가 50 75%

가 가

(arterial dissection),

(transesophageal echocardiography : TEE)

가

가

가

가

대상 및 방법 :

가

1991 3 1997 6

가 TEE가

가

가가

122 (

83 , 39 , 54.5)

결 과 :

55
 (45.1%) 31 가
 16
 49
 12 (16.0%)
 spontaneous echo con -
 trast 33 ,
 30 , 10
 8 , 6 ,
 1 , 1 가
 3 , 2 ,
 1
 4 , 16
 4
 결 론 :

12%
 40%
 spontaneous
 echo contrast,
 가

중심 단어 :

REFERENCES

- 1) Harvey F. *Echocardiography in Braunwald etc. (eds. Heart disease, 5th Ed.; Philadelphia. Saunders;1997. p.57-9.*
- 2) Hart RG. *Cardiogenic embolism to the brain. Lancet 1992; 339:589-94.*
- 3) *Cardiogenic brain embolism. Cerebral embolism task force. Arch. Neurol 1986;43:71-84.*
- 4) Lechat P, Mas JL, Lascault G, Loron P, Theard H, Kli-mazac H, et al. *Prevalence of patent foramen ovale in pati-ents with stroke. N Engl J Med 1988;318:1148-52.*
- 5) Karnik R, Stollberger C, Valentin A, Winkler WB, Slany J. *Detection of patent foramen ovale by transcranial con-trast Doppler ultrasound. Am J Cardiology 1992;69:560-2.*
- 6) Cabanes L, Mas JL, Cohen A, Amarenco P, Cabanes PA, Oubary P, Chedru F, et al. *Atrial septal aneurysm and pate-nt foramen ovale as risk factors for cryptogenic stroke in patients less than 55 years of age. A study using transes-ophageal echocardiography. Stroke 1993;24:1865-75.*
- 7) Amarenco P, Cohen A, Tzourio C, Bertrand B, Hommel M, Bosson G, et al. *Atheromatous disease of the aortic arch and the risk of ischemic stroke. N Engl J Med 1994;331: 1474-9.*
- 8) Demopoulos LA, Tunick PA, Bernstein NE, Perez JL, Kron-zon I. *Protruding atheromas of the aortic arch in sympt-omatic patients with carotid artery disease. Am Heart J 1995;129:40-4.*
- 9) Fazio GP, Redberg RF, Winslow T, Schiller NB. *Trans-eso-phageal echocardiographically detected atheroscler-otic aortic plaque is a marker for coronary artery disease. J Am Coll Cardiol 1993;21:144-50.*
- 10) Amarenco P, Duyckaerts C, Tzourio C, Henin D, Bous-ser MG, Hauw JJ. *The prevalence of ulcerated plaques in the aortic arch in patients with stroke. N Engl J Med 1992;326:221-5.*
- 11) Tunick PA, Rosenzweig BP, Katz ES, Freedberg RS, Perez JL, Kronzon I. *High risk for vascular events in pa-tients with protruding aortic atheromas: A prospective stu-dy. J Am Coll Cardiol 1994;23:1085-90.*
- 12) Jones EF, Kalman JM, Calafiore P, Tonkin AM, Donnan GA. *Proximal aortic atheroma An independent risk factor for cerebral ischemia. Stroke 1995;26:218-24.*
- 13) J. Donald Easton Stephen L. Hause, Joseph B. Martin. *Ce-rebrovascular Disease in Fauci, Braunwald, Isselbacher, Wilson, Martin, Kasper; Hause, Longo (eds); Principles of internal medicine, 14th Ed; New York. McGraw-Hill;1997. p.2325-2542.*