

경동맥 내막 절제술중 뇌보호와 신경생리학적 검사의 의의*

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= Abstract =

Significance of Brain Protection and Neurophysiological Monitoring in Carotid Endarterectomy

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We present our results of carotid endarterectomy performed in 12 patients (bilateral in 2 patients) under prospective brain protection - monitoring protocol during the past two years. The protocol consists of induced hypertension, mild hypothermia, and pentothal burst suppression under bipolar two-channel compressed spectral array (CSA) monitoring. Eleven of the 12 patients recovered without any new deficit from the surgery, and this result was expected as their CSA monitoring showed no significant changes. One patient had multiple untreated aneurysms, and therefore, hypertension was not applied. This patient developed significant postoperative neurological deficits correlated well with the CSA changes. One of the major advantages of CSA monitoring is that dosage of thiopental sodium for burst suppression, that varied greatly from 1,016mg to 3,220mg, could be titrated on each patient based upon the CSA findings. Another important benefit of our brain protection - monitoring protocol is that unnecessary shunting procedure could be avoided. In conclusion, brain protection under CSA monitoring could prevent dangerous ischemic insults from circulatory disruption on already vulnerable ischemic hemisphere in patients requiring carotid endarterectomy.

KEY WORDS : Carotid endarterectomy · Brain protection · Compressed spectral array (CSA) · Mild hypothermia.

서 론

(Carotid endarterectomy)
(carotid stenosis)

연구대상 및 방법

1)2)9)13-18)20-22)27)29)32)

가

가

1996

1994

1

, 1995

8 Table 1

(MRI, MRA), (carotid Doppler), CT (3 - D CT angiography), SPECT scan, (digital subtraction angiography, DSA)

2. 진단 방법 , SPECT scan, CT (Digital Subtraction Angiography, DSA)

3. 수술 방법 가 2 , 가 7 , (external - internal arterial bypass, EIAB) 가 2 , (subclavian artery) (interposition saphenous vein graft) 가 1 , (stent) 가 1 (Table 1).

4. 수술전 처치 가 3 , 가 2 , 가 4 , 가 3 , 가 2 , (transient ischemic attack, TIA) 7 , 가 (reversible ischemic neurologic deficits, RIND) 1 , (complete stroke) 4

Table 1. Profile of 12 patients treated with carotid endarterectomy

Case No.	Age / Sex	Symptom*	% occlusion	Ulcer	Lesion side	Combined Op**	Occlusion time(min)	Complication	Results
1	62/M	TIA	95	N	Lt	EIAB(STA-MCA, Rt)	42		good
2	48/M	Infarction	95	Y	Rt	ISVG(Subclavian-ICA, Lt)	62		good
3	54/M	TIA	95	Y	Lt		75		good
		TIA		N	Rt		50		
4	56/M	TIA	90	Y	Rt		35	CN VII palsy	good
		TIA		N	Lt		52		
5	62/M	TIA	90	Y	Lt		35		good
6	68/F	Infarction	70	N	Lt	Unclipped multiple aneurysms-not operated	47	Right hemiparasis, fair SAH-2yrs later	fair
7	62/F	TIA	95	Y	Lt		22	CN XII palsy	good
8	54/F	TIA	100	N	Rt		32		good
9	52/M	RIND	80	Y	Lt		30		good
10	61/M	Infarction	95	Y	Lt	Stent(Lt)	47	ICH due to hyperperfusion	dead
11	59/M	Infarction	80	Y	Lt	EIAB(STA-MCA, Rt)	42		good
12	58/M	TIA	98	N	Lt		42		good

* : TIA = Transient ischemic attck, RIND = Reversible ischemic neurological deficit

** : EIAB(STA-MCA,Rt) = external internal arterial bypass(superficial temporal artery-middle cerebral artery, right) : ISVG (Subclavian-ICA, Lt) = interposition saphenous vein graff(subclavian-internal carotid artery, left)

5. 마 취
 35 40 torr
 enylephrine 20%
 (induced hypertension)

(sternocleido -
 mastoid muscle)
 (suprasternal notch)
 (retroaural)
 (retractor) (laryngeal nerve)
 가

6. 경동맥 결찰 및 뇌보호(brain protection) 방법
 22 75
 44 5 9
 33 (mild hypothermia)

(jugular vein)
 (common
 facial vein)
 (ca -
 rotid body)

(5) thiopental 1300 8000mg(3220mg)
 (9) 1000 1100
 mg(1016mg) burst suppression

(100U/kg) thiop -
 ental sodium 500mg bolus CSA
 burst suppression . 5

7. 수술중 환자 감시 방법

infusion pump
 thiopental sodium burst
 suppression . Phenylephrine

1) CSA(Compressed Spectral Array) 모니터링
 1994

burst suppression

Fast Fourier Transform
 (FFT) CSA

, malleable multiperforated suction tube
 가

가
 1). 1994 1997 4 el -
 ectrode monopolar monitoring system
 1997 2 elect -
 rode bipolar monitoring system

clamp

. 14
 , 1 CSA

(atherosclerotic plaque)
 (tunica media)

2) 수술중 경두개 도플러 검사
 , CSA
 (transcranial Doppler)
 2

2 5mm
 tack - up
 suture 가

8. 수술 기법
 30 40

6 - 0 monofilament Proline suture
 tack - up suture가 가 3

clamp 5
burst suppression

30 grade III

6
3
(cerebral reserve ca-
rse) (reve- capacity, CRC) 가 diamox SPECT scan

9. 수술후 처치 가

2
(superficial temporal artery - middle cerebral artery
bypass) , (subc-
lavian artery) (interposition saphe-
nous vein graft) 1 3

sodium nitroprusside 150
160mmHg 24
48 가

10. 치료 결과

13 hyperperfusion syndrome 3
1
가 가 2 ,
(marginal mandibular branch), (hypoglossal nerve)
(antiplatelet agents) 가 ,
TIA 1 가 ,
tack - up suture CT 6
13 가 30 2 SPECT scan

(thromboembolism)

48 stent 가 고 찰

Dysarthria TIA 62 6 7%
(stroke)
85% 2 3% 6).
가
, thiopental burst suppres-
sion CSA 가 ,
가 25 가 가
CSA frequency shift to left가 ,
amplitude 가 가

가
가
4)11)30),
induced hypertension

4. 양쪽 경동맥 내막 절제술

sinus) 가
18),
10)15)16),
6
가
가
2
4

5. 수술후 뇌출혈

hyperperfusion syndrome

Sundt³¹⁾
grade IV
Sundt grade IV
(chroni -

cally under - perfused)

가
5).
“ normal perfusion pressure brea -
kthrough ”²⁸⁾
2
7)19),
가

sodium nitroprusside

(carotid

6. 경동맥 협착증의 재발

Lattime¹²⁾ 30

가 0 8.2%
78%
가 1.3 37%
patch graft
가
4 5%⁷⁾²⁴⁾
가
2
8)12)24)

7. 치료결과 확인

CT (MRA)
CT

결 론

가 tack - up suture가
가 cholesterol 가

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