

## 뇌동맥류 파열에 의한 뇌지주막하 출혈후 혈관 조영상 혈관연축과 임상적 혈관연축의 상관관계

서동상 · 김범태 · 임수빈 · 조성진 · 신원한 · 최순관 · 변박장

= Abstract =

### Correlation between Angiographic Vasospasm and Clinical Vasospasm following Aneurysmal Subarachnoid Hemorrhage

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**O**bjective : Delayed ischemic neurologic deficit(DIND) is one of the major complications following aneurysmal subarachnoid hemorrhage(SAH). However, the correlation between angiographic vasospasm(AV) and DIND after SAH is not precisely known. The authors investigated the timing, incidence, characteristics of DIND, and analyzed correlation between AV and DIND.

**Patients and Methods** : A series of 126 patients with SAH and performed cerebral angiography which, confirmed anterior circulation aneurysm, admitted to between January 1996 to December 1998, were studied retrospectively. A comparative analysis between group 1(G1) in which AV patients presented with DIND, and group 2(G2) patients did not DIND, were done. AV was graded according to location, distribution and degree. Location of vasospasm was classified as basal type(BT), distal type(DT). BT was involved horizontally and include the bilateral carotid systems, proximal middle cerebral artery(MCA) and proximal anterior cerebral artery(ACA). DT was involved vertically and include the MCA branches as they become vertically or posteriorly oriented and the ACA distal to the anterior communicating artery. BT and DT all defined either as localized type(LT) or combined type(CT). Distribution of vasospasm was classified as type 1, type 2 and type 3. Type 1 represents the involvement of bilateral carotid systems and bilateral anterior cerebral artery, type 2 was designed as one carotid system without involving anterior cerebral artery, and type 3 when only some portions of the anterior cerebral artery were involved, bilaterally. Degree of vasospasm was classified as mild(less than 25%), moderate(between 25 - 50%), severe(greater than 50%), and those were determined by comparing the caliber of the artery in vasospasm to that of the nearest area of apparently normal vessel.

**Results** : The incidence of AV & DIND was 57/126(45.2%), 29/126(23.0%), and timing of DIND was 9 days ( $\pm 4.1$ ) after initial hemorrhage. As for the location, BT was seen in 12 cases(40.0%), DT 11 cases(36.7%) and CT 7 cases (23.3%), respectively. Where as G1, BT was seen 5 cases(18.5%), DT 5 cases(18.5%) and CT 17 cases(63.0%), respectively in G2. CT AV was more correlated with DIND than LT AV( $p < 0.05$ ). For distribution, type 1 was seen in 16 cases(59.2%), type 2 4 cases(14.8%), type 3 7 cases(25.9%) in G1 where as type 1 was seen in 7 cases(23.3%), type 2 10 cases(33.3%), type 3 13(43.3%) in G2. Type 1 AV was well correlated with DIND unlike to type 2 or type 3 ( $p < 0.05$ ). As for the degree, mild was seen in 4 cases(14.8%), moderate 14 cases(51.9%), severe 9 cases (33.3%) in G1, and mild 16 cases(18.5%), moderate 11 cases(36.7%) and severe 3 cases(10.0%) in G2. Moderate to severe type AV was well correlated with DIND( $p < 0.05$ ).

**Conclusion** : These results indicate that it may be possible to predict DIND according to careful analysis of location, distribution, degree of AV in patients with aneurysmal SAH.

**KEY WORDS** : Delayed ischemic neurologic deficit · Angiographic vasospasm · Aneurysmal subarachnoid hemorrhag.

# 서론

가 (delayed ischemic neurologic deficits, DIND) 1)3) 가 5)14),

1) , 2)

## 대상 및 방법

1. 대 상  
1996 1 1998 12 3

126

2. 방 법

126

(angiographic vasospasm) (luminal narrowing of cerebral arteries) (delayed ischemic neurologic deficit)

15)20)

4 (± 4.2)

(1 ) ,

(2 ) (location), (dis-tribution), (degree)

1) 뇌혈관 조영상에서 혈관 연속의 위치 Newell<sup>16)</sup> (basal type, BT) (distal type, DT) 가

(localized type, LT) (combined type, CT)

(Fig. 1).

2) 뇌혈관 조영상에서 혈관 연속의 분포 Saito<sup>19)</sup>

(type ), (type ), (type )

(Fig. 2).

3) 뇌혈관 조영상에서 혈관 연속의 정도 Graham<sup>6)</sup>

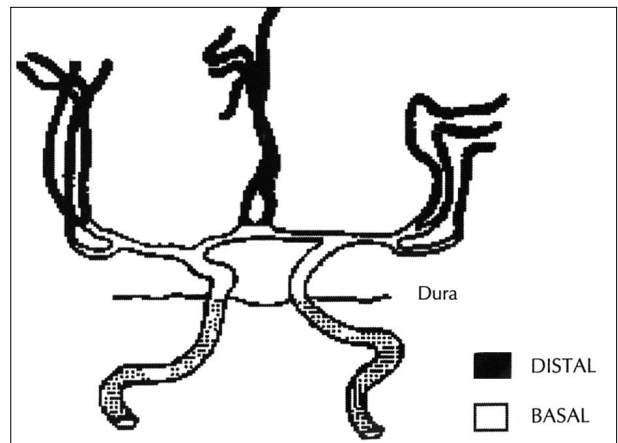


Fig. 1. Location of vasospasm. Illustration of the vessels classified as basal and distal in the middle cerebral artery (MCA) and anterior cerebral artery (ACA) distribution. Basal vessels are horizontal and include the bilateral carotid systems, proximal MCA and proximal ACA. Distal vessels are vertical and include the MCA branches as they become vertically or posteriorly oriented and the ACA distal to the anterior communicating artery (Newell DW, et al. Neurosurgery 27 : 574 - 577, 1990).

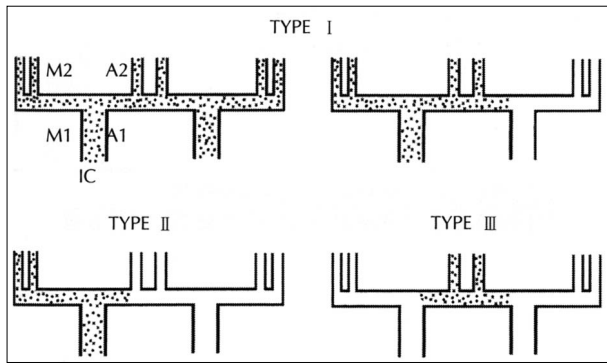


Fig. 2. Distribution of vasospasm. Type I = Bilateral carotid systems, unilateral carotid system & bilateral anterior cerebral artery Type II = One carotid system without involving anterior cerebral artery Type III = Only some portions of the anterior cerebral artery, bilaterally (Saito I, et al. J Neurosurg 51 : 468 - 475, 1979).

25% (mild),  
25~50% (moderate),  
(severe) 50%

PC SPSS chi-square  
test

결 과

1. 자연적 뇌허혈증의 빈도, 시기 및 임상 양상

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Table 1. Clinical summary of 29 delayed ischemic neurologic deficits patients

No	Sex/Age	Consciousness	HHgr	Fisher grade	Location	Day of angiography	Onset of DIND	GOS
1	F/74	Drowsy	3	4	MCA	1	9	D
2	F/54	Drowsy	3	3	A1	4	9	GR
3	M/41	Alert	2	3	p-com	2	9	MD
4	F/64	Alert	2	3	a-com	3	14	GR
5	M/43	Alert	2	3	a-com	13	20	MD
6	F/51	Alert	3	3	MCA	3	13	GR
7	F/55	Semicoma	5	3	MCA	4	1	SD
8	F/42	Semicoma	5	4	MCA	2	5	D
9	F/64	Coma	5	4	MCA	5	4	D
10	F/54	Alert	2	4	p-com	12	13	MD
11	F/61	Alert	2	2	a-com	14	10	GR
12	F/28	Drowsy	3	4	MCA	5	11	D
13	F/48	Semicoma	4	3	p-com	3	8	D
14	M/48	Alert	2	3	a-com	8	6	MD
15	F/57	Alert	1	4	MCA	3	7	D
16	F/52	Drowsy	3	3	MCA	3	4	GR
17	F/57	Drowsy	3	4	p-com	1	6	MD
18	M/57	Drowsy	3	3	a-com	2	8	GR
19	F/41	Drowsy	3	3	p-com	1	9	GR
20	M/50	Alert	2	3	a-com	3	11	GR
21	F/59	Stupor	4	4	p-com	2	5	SD
22	F/63	Alert	2	3	p-com	2	10	GR
23	F/59	Drowsy	3	4	Ant.choroidal	2	10	GR
24	F/68	Alert	2	3	p-com	6	9	GR
25	M/43	Alert	2	3	Ant.choroidal	3	7	GR
26	M/47	Stupor	4	4	A2	4	14	SD
27	F/56	Semicoma	5	3	p-com	4	7	D
28	F/54	Drowsy	3	3	a-com	3	13	GR
29	F/61	Semicoma	4	4	MCA	2	12	VS

HHgr = Hunt-Hess grade ; DIND = delayed ischemic neurologic deficits ; Day of Angiography = angiography performed day after initial subarachnoid hemorrhage ; GOS = Glasgow outcome scale ; GR = good recovery ; MD = moderate disability ; SD = severe disability ; VS = vegetative state ; D = death.

45.2% ,  
 29 23.0% 가 7 , 가 22 .  
 53.5 (±9.6) ,  
 9 (±4.1) (Table 1).  
 Hunt - Hess 1 1  
 , 2 10 , 3 10 , 4 4 , 5 4  
 9 , 9 , 7 , 2 ,  
 2 , CT Fisher 1  
 0 , 2 1 , 3 17 , 4 11  
 . 13 , 5 ,  
 3 , 1 , 7 . , 29  
 27  
 가 2 2

2. 뇌혈관 조영상 혈관 연속과 지연적 뇌허혈증간의 상관관계

1) 뇌혈관 조영상에서 혈관 연속의 위치  
 1 12 (40.0%), 11 (36.7%), 7 (23.3%) , 2 5 (18.5%), 5 (18.5%), 17 (63.0%)  
 . , ( ) 1 23 (76.7%), 2 10 (37.0%)  
 가  
 가 (p<0.05)  
 (Table 2).

2) 뇌혈관 조영상에서 혈관 연속의 분포  
 1 16 (59.2%), 4 (14.8%), 7 (25.9%) , 2 7 (23.3%), 10 (33.3%), 13 (43.3%)  
 가

가 (p<0.05)(Table 3).  
 3) 뇌혈관 조영상에서 혈관 연속의 정도  
 1 4 (14.8%), 14 (51.9%), 9 (33.3%) , 2 16 (18.5%), 11 (36.7%), 3 (10.0%)  
 가 (p<0.05)(Table 4).

ble 4).

Table 2. Correlation between location of angiographic vasospasm & DIND

Location	DIND(+) (n=27) DIND(-) (n=30)		p value	
	No. (%)	No. (%)		
LT	BT	5 (18.5)	12 (40.0)	p<0.05
	DT	5 (18.5)	11 (36.7)	
CT		17 (63.0)	7 (23.3)	

DIND = delayed ischemic neurologic deficits ; DIND(+) = yes, (-) = no ; LT = localized type ; BT = basal type ; DT = distal type ; CT = combined type

Table 3. Correlation between distribution of angiographic vasospasm & DIND

Type	DIND(+) (n=27) DIND(-) (n=30)		p value
	No. (%)	No. (%)	
Type	16 (59.2)	7 (23.3)	p<0.05
Type	4 (14.8)	10 (33.3)	
Type	7 (25.9)	13 (43.3)	

DIND = delayed ischemic neurologic deficits ; DIND(+) = yes, (-) = no

Table 4. Correlation between degree of angiographic vasospasm & DIND

Degree	DIND(+) (n=27) DIND(-) (n=30)		p value
	No. (%)	No. (%)	
Mild	4 (14.8)	16 (53.3)	p<0.05
Moderate	14 (51.9)	11 (36.7)	
Severe	9 (33.3)	3 (10.0)	

DIND = delayed ischemic neurologic deficits ; DIND(+) = yes, (-) = no ; Mild = less than 25%, Moderate = between 25 - 50%, Severe = greater than 50%

고찰

1951  
 Ecker Reimenschneider<sup>3)</sup>  
 가  
 (delayed ischemic neurologic deficits, DIND)

1)<sup>3)</sup>

가  
 nitric oxide(NO), cGMP, endothelin(ET), protein kinase C(PKC)<sup>21)</sup>  
 , NO , guanylate cyclase 가 cGMP 가 endothelin(ET)  
 NO 가

protein kinase C (PKC) 가 , 가 K<sup>+</sup> channels (depolarization) 가 , (depolarization)<sup>8)21)</sup> , 가 Alkock Drake<sup>8)</sup> 가 Nii - zuma<sup>10)</sup> 가 , 가 40~70% , 20~30% , 9)11) 가 45.2%, 23.0% , 가 5)10) , 가 , 가 Fisher<sup>5)</sup> 4~12 , Newell<sup>16)</sup> , 68 4 , 9 가 , 가 , 가 , 가 , 가 , 50%, 가 CT , TCD 가 120cm/s , 7.5%, 42.5% Bergvall<sup>2)</sup> SPECT, Xenon-CT, PET 가 , nimodipine calcium channel blocker 가 , 4)7)12) , (localized type, LT) , (combined type, CT) , 1)12)13)18) Fisher<sup>5)</sup> 가 18.5% , 37.0% , 가 가 63.0% , Fletcher<sup>8)</sup> 60 , Saito<sup>19)</sup> 120

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P1, P2, P3, P4  
P1,  
P2,  
P3,  
P4 P1 15.7%,  
P2 27.2%, P3 20.5%, P4 20.5% P1 15.7%,  
Niizuma<sup>10)</sup> 797 (±4.2)  
, 9 (±4.1)  
2)  
가  
23.6%, 가  
44.5%, 31.9% 가 50%  
Saito<sup>19)</sup> P1, P2  
, P3 , P4  
가 57.2%,  
14.8%, 25.9%  
Graham<sup>6)</sup> Davis<sup>13)17)</sup>  
, 가  
25% , 25~50%  
50%  
, 29  
6 23  
Newell<sup>16)</sup>  
가 25%  
1 4 (14.8%), 14  
(51.9%), 9 (33.3%) , 2 16  
(18.5%), 11 (36.7%), 3 (10.0%)  
가  
가  
가  
가 50%

## 결론

1)  
45.2%, 23.0%  
4  
9 (±4.1)  
2)  
가  
가  
가 50%  
• : 1999 12 13  
• : 2000 9 25  
• :  
420 - 020 1174  
: 032) 621 - 5289, : 032) 621 - 5018  
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