

뇌동정맥기형의 혈관조영 검사상 출혈위험 인자*

권오기 · 한대희 · 정영섭 · 오창완 · 한문희**

= Abstract =

Angiographic Hemorrhagic Risk Factors of Cerebral Arteriovenous Malformations

O-Ki Kwon, M.D., Dae Hee Han, M.D., Young Seob Chung, M.D.,
Chang Wan Oh, M.D., Moon Hee Han, M.D.**

Department of Neurosurgery, Radiology, ** Seoul National University, College of
Medicine, Seoul, Korea

Objective : The authors reviewed 280 cases with intracranial arteriovenous malformations(AVMs) to identify risk factors of hemorrhage.

Patients and Methods : From 1983 to 1997, a total 280 patients with AVMs were treated. Among them, 64% had a history of hemorrhage. Angiograms were retrospectively analyzed with particular attention to the size of the AVM, venous drainage, the location of the AVM and presence of associated aneurysm or varix. These characteristics were statistically analysed in relation to occurrence of hemorrhage.

Results : A single variate analysis demonstrated that small size($p=0.0003$), deep venous drainage($p=0.025$) and periventricular location($p<0.0001$) had a strong positive correlation. Associated aneurysms and varices were not found as hemorrhagic risk factors. A multivariate analysis revealed that the size of the AVM was most significant hemorrhagic factor($p=0.0003$) followed by deep venous drainage($p=0.025$). AVMs with small size and deep venous drainage bled more frequently regardless of their locations.

Conclusion : These data would be useful in identifying patients at higher risk for developing hemorrhage of intracranial AVMs.

KEY WORDS : Intracranial arteriovenous malformation · Angiography · Hemorrhage risk factor.

서 론

가

가,
가

가
가

4).

가

가

가 가

가

가

가

(nidus),

)

가

대상 및 방법

1983 1 1997 12

가 가 280

1.83 : 1 29.5 (29.5 ± 13 ,

27), 3 , 70 . 280

180 64.3%

35.7% (74)

3cm 'small', 3cm

6cm 'medium', 6cm 'large'

. Small 120 (42.9%), medium 112

(40.0%), large 48 (17.1%)

3.77cm(3.77 ± 2.16cm, = 3.5cm)

가

41

가

43 (15.4%),

52 (18.6%),

185 (66.1%) 가 31

(perinidal, intranidal an-

eurysm)가 18 , (feeding artery)

12 , 가 1

가 36

Chi - square test, Fisher's exact test,

ANOVA, logistic regression test

결 과

(Table 1).

2.55cm)

4.72cm(4.72 ± 1.71cm) (p<0.0001).

가

5cm 75

가 6.18cm

(6.18 ± 1.20cm)

7.12cm(7.12 ± 2.2cm, p=0.034)

(Fig.

(Fig.

1)

2)

가

(Table 1).

가

75%

68% , 가 61.1%

Table 1. Statistical analysis of various characteristics of AVM

Characteristics	Number	% of hemorrhage	p-value
Total	280	64.3	
AVM location			
Frontal	72	50	
Temporal	57	68	
Parietal	65	61.5	
Occipital	22	50	
Thalamus	22	95.5	
Cerebellum	17	82.4	
Corpus callosum	12	80	
Ventricle	7	100	
Basal ganglia	6	50	
Periventricular location			<0.0001
Periventricular	41	90.2	
Nonperiventricular	239	59.8	
AVM size			<0.0001
Small (<3cm)	120	77.5	
Medium(3 - 6cm)	112	61.6	
Large (>6cm)	48	37.5	
Venous drainage			0.001
Superficial	185	57.8	
Mixed	52	67.3	
Deep	43	88.4	
Aneurysm(arterial)			0.416
With aneurysm	31	67.7	
Without aneurysm	249	63.9	
Varix(venous)			0.401
With varix	36	61.6	
Without varix	244	64.8	

AVM : arteriovenous malformation

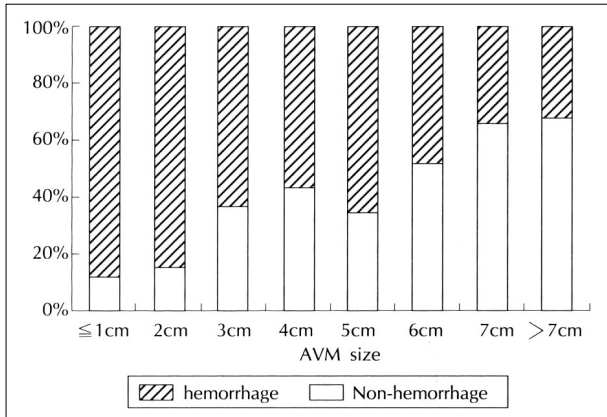


Fig. 1. AVM size and hemorrhage.

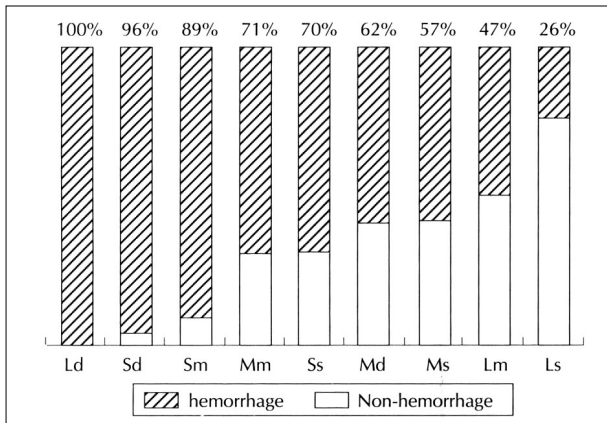


Fig. 2. Size-venous drainage and hemorrhage size : L(large), M(medium), S(small) venous drainage : d(deep), m (mixed), s(superficial).

Table 2. Single and multivariate analysis of various hemorrhagic factors

Characteristics	p value		p value*	
	Single variate	Multivariate	Single variate	Multivariate
Sex	0.315	0.589	0.451	0.839
Age	0.232	0.591	0.257	0.507
Periventricular location	<0.0001	0.053	0.001	0.521
Varix	0.401	0.731	0.557	0.831
Aneurysm	0.416	0.580	0.464	0.592
Deep venous drainage	0.001	0.025	<0.0001	0.048
Size	<0.0001	0.0003	<0.0001	0.0009

* : Excluding cases with mixed venous drainage

(corpus callosum) (logistic regression test)

2

(Table 2).

가 가

가

가

가

가

가
고 찰
가
가

가

가 가

가

가

가

가

가

가

가

가
 Marks ⁵⁾ 65 가
 가
 가
 (negative
 correlation)가 (angiomatous ch-
 ange), 가
 . Tur- 가 5cm
 jman ¹²⁾ 가
 , Willinsky 가
¹³⁾ 가
 가 가

유출 정맥

크 기

가 , 가 ,
²⁾⁷⁾⁸⁾ ¹²⁾
 가 가
 6cm 1cm 가 가
 216 가 가 가
 216 가 가
 (Ohm's law) 가
 가
 (Q= P/R Q=flow, P=pressure, R=resistance). 가
 가

Spetzler ¹⁰⁾

Chappell ¹⁾

Sorimachi ⁹⁾

terminal branch()

65% transient branch()

81%

Marks ⁵⁾

95%,

50%,

37%

transient

branch

가

가 (5)12)13) (가) 가

가

가

Graf ²⁾ 6.3%

1% 가

(),

위 치

, Vinuela ¹²⁾ 53 (가) 가

) 78%

Marks ⁵⁾ 96%

결 론

가 가

가 (가)

³⁾⁶⁾ 가 ¹⁾¹¹⁾

가

가

가

- : 1999 7 9
- : 2000 8 30
- : 100 - 032 2가 85

: 02) 2270 - 0032, : 02) 2270 - 0474
E - mail : kwonoki@thrunet.com 110 - 744

동 맥 류

가 Willis 4가 1)

3) (intranidal, perinidal aneurysm) . Willinsky ¹³⁾ 75%

가 가 가

4) (arterial phase)

References

- 1) Chappell PM, Steinberg GK, Marks MP : *Clinically documented hemorrhage in cerebral arteriovenous malformations : MR characteristics. Radiology 183 : 719-724, 1992*
- 2) Graf CJ, Perret GE, Torner JC : *Bleeding from cerebral arteriovenous malformations as part of their natural history. J Neurosurg 58 : 331-337, 1983*
- 3) Hassler W, Steinmetz H : *Cerebral hemodynamics in angioma patients : an intraoperative study. J Neurosurg 67 : 822-831, 1987*
- 4) Heros RC, Tu YK : *Is surgical therapy needed for unruptured arteriovenous malformations? Neurology 37 : 279-286, 1987*

- 5) Marks MP, Lane B, Steinberg GK, Chang PJ : *Hemorrhage in intracerebral arteriovenous malformations : angiographic determinants. Radiology 176 : 807-813, 1990*
- 6) Nornes H, Grip A : *Hemodynamic aspects of cerebral arteriovenous malformations. J Neurosurg 53 : 456-464, 1980*
- 7) Pasqualin A, Barone G, Cioffi F, Rosta L, Scienza R, Da Pian R : *The relevance of anatomic and hemodynamic factors to a classification of cerebral arteriovenous malformations. Neurosurgery 28 : 370-379, 1991*
- 8) Sisti MB, Kader A, Stein BM : *Microsurgery for 67 intracranial arteriovenous malformations less than 3cm in diameter. J Neurosurg 79 : 653-660, 1993*
- 9) Sorimachi T, Takeuchi S, Koike T, Minakawa T, Abe H, Tanaka R : *Blood pressure monitoring in feeding arteries of cerebral arteriovenous malformations during embolization : a preventive role in hemodynamic complications. Neurosurgery 37 : 1041-1048, 1995*
- 10) Spetzler RF, Hargraves RW, McCormick PW, Zabramski JM, Flom RA, Zimmerman RS : *Relationship of perfusion pressure and size to risk of hemorrhage from arteriovenous malformations. J Neurosurg 76 : 918-923, 1992*
- 11) Turjman F, Massoud T, Vinuela F, Sayre JW, Guglielmi G, Duckwiler G : *Correlation of the angioarchitectural features of cerebral arteriovenous malformations with clinical presentation of hemorrhage. Neurosurgery 37 : 856-862, 1995*
- 12) Vinuela F, Nombela L, Roach MR, Fox AJ, Pelz DM : *Stenotic and occlusive disease of the venous drainage system of deep brain AVM's. J Neurosurg 63 : 180-184, 1985*
- 13) Willinsky R, Lasjaunias P, Terbrugge K, Pruvost P : *Brain arteriovenous malformations : analysis of the angio-architecture in relationship to hemorrhage (based on 152 patients explored and/or treated at the hospital de Bicetre between 1981 and 1986). J Neuroradiol 15 : 225-237, 1988*