

뇌동맥류성 지주막하출혈 환자에서 증상적 혈관 연축과 예후에 관여하는 요소들에 대한 분석*

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= Abstract =

An Analysis of Factors Related to Symptomatic Vasospasm and Outcome in Patients with Aneurysmal Subarachnoid Hemorrhage

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Symptomatic vasospasm is still one of the major causes of death and disability in patients who suffer an aneurysmal subarachnoid hemorrhage(SAH). To identify risk factors related to symptomatic vasospasm, to determine the outcome in patients with SAH, and to determine the differences identified risk factors between patients with good and bad outcomes, we performed this retrospective study.

From a total of 279 SAH patients who were admitted to our hospital between January 1993 and December 1995, 212 were chosen for study. These were patients who had been admitted within 7 days of SAH, had undergone brain computed tomography(CT) within 3 days of SAH and had survived more than 6 days after SAH.

Nine variables were examined as to their relationship to symptomatic vasospasm : age, sex, admission day after SAH, hypertension history, frequency of SAH, clinical grade, CT grade, operation day after SAH, and outcome. Data were analyzed by the univariate and multivariate logistic regression method using the Statistical Analysis System(SAS).

Symptomatic vasospasm was demonstrated in 30 cases(14.2%). Univariate analysis showed that admission more than 4 days after SAH($p=0.07$), clinical grades ($p=0.001$), and CT grade ($p=0.00001$) were associated with a higher risk of symptomatic vasospasm. When study cases were grouped into either good or bad outcome groups, and multivariate logistic regression analysis was performed, these factors were associated with a higher risk of symptomatic vasospasm only in the good outcome group.

This suggests that there is a group of patients with a predisposition to symptomatic vasospasm that is independent of these risk factors, and that in these patients, the outcome may be worse.

KEY WORDS : Cerebral aneurysm · Symptomatic vasospasm · Risk factor · Statistical analysis · Logistic regression · Outcome.

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Total cases of subarachnoid hemorrhage(SAH) ----- 279 case:
 Study group ----- 212 case:
 Criteria : a. Admission within 7 days of SAH
 b. CT undergone within 3 days of SAH
 c. Survival for more than 6 days after SAH
 Excluded cases ----- 67 case:
 a. Unruptured aneurysm
 b. Nonvisualized aneurysm
 c. Admission more than 7 days after SAH
 d. CT undergone more than 3 days after SAH
 e. Died or was discharged within 6 days of SAH

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가 (univariate analysis)

(multiple logistic regression analysis)

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1. 분석 대상

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가 67

(Table 1).

Statistical Analysis System(SAS)
(SAS Institute. Cary, North Carolina)³⁴⁾

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결 과

1. 분석 대상군의 변수의 특성

212 가 131 , 가 80 ,
13 78 54 .
30 (14.5%) 30
8 (27%), 22 (73%)
182 105 (58%),
77 (42%) (Fig. 1).
CT 30 가 9 (30%), 21
(70%) , 182 CT 129
(71%), 53 (29%) (Fig. 2).

Table 2

30 14 (47%) ,
182 110 (61%) 0

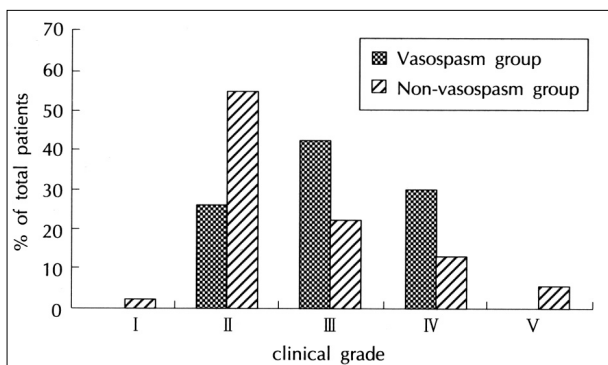


Fig. 1. The difference of the clinical grade between symptomatic vasospasm group and non-vasospasm group.

3 (Table 3).

30 가
가 16 , 5 가 14 ,
182 가 가 165 ,
8 가 17 (Table 4).

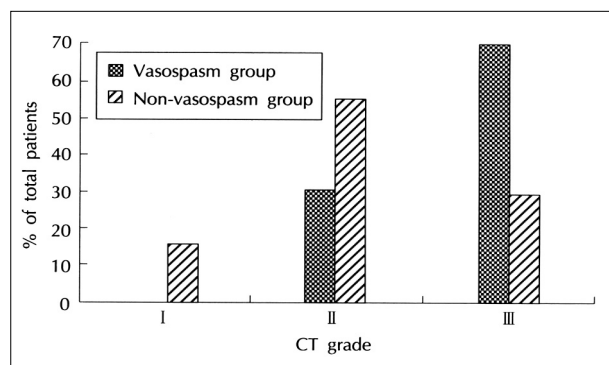


Fig. 2. The difference of the CT grade between symptomatic vasospasm group and non-vasospasm group.

Table 2. Characteristic differences between symptomatic vasospasm group and non-vasospasm group in the general population

Variables	Vasospasm group(N = 30)	Non-vasospasm group(N = 182)	Total (N = 212)
Age			
Range	43 - 71	13 - 78	13 - 78
Mean	56.07	52.64	53.13
Sex			
Male	8	73	81
Female	22	109	131
Hypertension Hx			
Yes	12	53	65
No	18	129	147
Frequency of SAH			
Single	26	158	184
Multiple	4	24	28
Admission day after SAH*			
Three days or less	26	174	200
Four days or more	4	8	12

* : P = 0.07

Abbreviation : SAH = subarachnoid hemorrhage ; Hx = history

Table 3. Differences in operation day after subarachnoid hemorrhage between symptomatic vasospasm group and non-vasospasm group

Operation day	Vasospasm group(N = 30)	Non-vasospasm group (N = 182*/op. = 179)
0 - 3 day	14	110
4 - 7 day	3	19
> 8 day	13	50

*Three cases were non-surgical.

Vasospasm group vs. non-vasospasm group : p > 0.05

Table 7. The results of multivariate logistic regression analysis of symptomatic vasospasm-related risk factors within good and bad outcome subgroups*

	Variables	Relative risk	Significance
Good outcome group	Admission day after SAH	4.53	0.0401
	Clinical grade	4.98	0.0074
	CT grade	8.79	0.0003
Bad outcome group	Admission day after SAH	NS	NS
	Clinical grade	NS	NS
	CT grade	NS	NS

*Good outcome¹³⁾ includes good recovery and moderate disability.

Bad outcome includes severe disability, vegetative state and death.

Abbreviation : SAH = subarachnoid hemorrhage ; CT = computed tomography ; NS = no significance

Table 8. Correlation between variables and outcome

Variables	Correlation coefficient	Significance
Admission day after SAH	0.0832	0.228
Clinical grade	0.4660	0.000*
CT grade	0.1619	0.018*
Operation day after SAH	0.0089	0.898
Age	0.542	0.432
Symptomatic vasospasm	0.2821	0.000*
Sex	0.0822	0.234
Hypertension Hx	0.0120	0.862
Frequency of SAH	0.1090	0.114

*Variables associated with outcome

Abbreviations : SAH = subarachnoid hemorrhage ;

CT = computed tomography ; Hx = history

4. 치료결과가 양호한 군과 불량한 군에서 증상적 혈관 연축에 대한 위험인자들의 다중지수 회귀분석

3

가 3

가 - 4.98 , CT 가 - 8.79 가 (Table 7).

5. 증상적 혈관 연축 및 이의 위험 요소들과 치료결과와의 상관관계

Spearman (r = 0.47), CT (r = 0.16) (r = 0.28)

(p = 0.07), 가 (p = 0.23)(Table 8).

고 찰

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References

- 1) Auer LM : *Acute operation and preventive nimodipine improve outcome in patients with ruptured cerebral aneurysms. Neurosurgery* 15 : 57-66, 1984
- 2) Black PM : *Hydrocephalus and vasospasm after subarachnoid hemorrhage from ruptured intracranial aneurysms. Neurosurgery* 18 : 12-16, 1986
- 3) Boecher-Schwarz HG, Ungersboeck K, Ulrich P, et al : *Transcranial Doppler diagnosis of cerebral vasospasm following subarachnoid haemorrhage : Correlation and analysis of results in relation to the age of patients. Acta Neurochir(Wien)* 127 : 32-36, 1994
- 4) Choi YM, Jahng TA, Kang SD, et al : *Clinical parameters associated with vasospasm in early-operated aneurysmal subarachnoid hemorrhage. J Kor Neurosurg Soc* 24 : 1504-1509, 1995
- 5) Disney L, Weir B, Petruk K : *Effect on management mortality of a deliberate policy of early operation on supratentorial aneurysms. Neurosurgery* 20 : 695-701, 1987
- 6) Dorsch NWC, King MT : *A review of cerebral vasospasm in aneurysmal subarachnoid haemorrhage. Part : incidence and effects. J Clin Neuroscience* 1 : 19-26, 1994
- 7) Dorsch NWC : *A review of cerebral vasospasm in aneurysmal subarachnoid haemorrhage. Part : management. J Clin Neuroscience* 1 : 78-92, 1994
- 8) Fisher CM, Kistler JP, Davis JM : *Relation of cerebral vasospasm to subarachnoid hemorrhage visualized by computerized tomographic scanning. Neurosurgery* 6 : 1-8, 1980
- 9) Giannotta SL, McGillicuddy JE, Kindt GW : *Diagnosis and treatment of postoperative cerebral vasospasm. Surg Neurol* 8 : 286-290, 1977
- 10) Gilsbach JM, Harders AG : *Morbidity and mortality after early aneurysm surgery-a prospective study with nimodipine prevention. Acta Neurochir(Wien)* 96 : 1-7, 1989
- 11) Hijdra A, Braakman R, van Gijn J, et al : *Aneurysmal subarachnoid hemorrhage. Complications and outcome in a hospital population. Stroke* 18 : 1061-1067, 1987
- 12) Hunt WE, Hess RM : *Surgical risk as related to time of intervention in the repair of intracranial aneurysms. J Neurosurg* 28 : 14-20, 1968
- 13) Jennett B, Bond M : *Assessment of outcome after severe brain damage. A practical scale. The Lancet* 1 : 480-484, 1975
- 14) Kang SD, Kim HK, Park KW, et al : *Risk factors contributing to symptomatic vasospasm in aneurysmal subarachnoid hemorrhage. J Kor Neurosurg Soc* 18 : 400-408, 1989
- 15) Kassell NF, Sasaki T, Colohan ART, et al : *Cerebral vasospasm following aneurysmal subarachnoid hemorrhage. Stroke* 16 : 562-572, 1985
- 16) Kassell NF, Torner JC, Haley EC, et al : *The international co-operative study on the timing of aneurysmal surgery. Part : Overall management results. J Neurosurg* 73 : 18-36, 1990
- 17) Kassell NF, Shaffrey ME, Shaffrey CI : *Cerebral vasospasm following aneurysmal subarachnoid hemorrhage, in Apuzzo MLJ(ed): Brain surgery. Complication avoidance and management, ed 1. New York : Churchill Livingstone* 1 : 847-856, 1993
- 18) Kim JY, Yim MB, Lee JK, et al : *Significance of cranial computed tomography in aneurysmal subarachnoid hemorrhage. J Kor Neurosurg Soc* 14 : 637-646, 1985
- 19) Kosnik EJ, Hunt WE : *Postoperative hypertension in the management of patients with intracranial arterial aneurysms. J Neurosurg* 45 : 148-154, 1976
- 20) Ljunggren B, Brandt L, Sveland H, et al : *Outcome in 60 consecutive patients treated with early aneurysm operation and intravenous nimodipine. J Neurosurg* 61 : 864-873, 1984
- 21) Ljunggren B, Sveland H, Brandt L, et al : *Early operation and overall outcome in aneurysmal subarachnoid hemorrhage. J Neurosurg* 62 : 547-551, 1985
- 22) Mizukami M, Kawase T, Usami T, et al : *Prevention of vasospasm by early operation with removal of subarachnoid blood. Neurosurgery* 10 : 301-307, 1982
- 23) hman J, Heiskanen O : *Effect of nimodipine on the outcome of patients after aneurysmal subarachnoid hemorrhage and surgery. J Neurosurg* 69 : 683-686, 1988
- 24) hman J, Servo A, Heiskanen O : *Risk factors for cerebral infarction in good-grade patients after aneurysmal subarachnoid hemorrhage and surgery : A prospective study. J Neurosurg* 74 : 14-20, 1991
- 25) Oritano TC, Wascher TM, Reichman H, et al : *Sustained increased cerebral blood flow with prophylactic hypertensive hypervolemic hemodilution("Triple-H " Therapy) after subarachnoid hemorrhage. Neurosurgery* 27 : 729-740, 1990
- 26) østergaard JR, Kristensen BQ, Svehag S, et al : *Immune complexes and complement activation following rupture of intracranial saccular aneurysms. J Neurosurg* 66 : 891-897, 1987
- 27) østergaard JR : *Risk factors in intracranial saccular aneurysms. Aspects of the formation and rupture of aneurysms, and the development of cerebral vasospasm. Acta Neurol Scand* 80 : 81-98, 1989
- 28) Pellettieri L, Carlsson CA, Lindholm L : *Is vasospasm following subarachnoid hemorrhage an immunoreactive disease? Experientia* 37 : 1170-1171, 1981
- 29) Pellettieri L, Nilsson B, Carlsson CA, et al : *Serum immunocomplexes in patients with subarachnoid hemorrhage. Neurosurgery* 19 : 767-771, 1986
- 30) Pickard JD, Murray GD, Illingworth R, et al : *Effect of oral nimodipine on cerebral infarction and outcome after subarachnoid hemorrhage : British aneurysm nimodipine trial. BMJ* 298 : 636-642, 1989

- 31) Rabb CH, Tang G, Chin LS, et al : *A statistical analysis of factors related to symptomatic cerebral vasospasm. Acta Neurochir (Wien)* 127 : 27-31, 1994
- 32) Ryba M, Jarzabek-Chorzelska M, Chorzelski T, et al : *Is vascular angiopathy following intracranial aneurysm rupture immunologically mediated? Acta Neurochir (Wien)* 117 : 34-37, 1992
- 33) Ryba M, Grieb P, Pastuszko M, et al : *Impaired in vitro proliferative response of suppressor lymphocytes in patients with subarachnoid haemorrhage from ruptured intracranial aneurysm. Acta Neurochir (Wien)* 122 : 240-243, 1993
- 34) SAS Institute, Inc : *SAS/STAT Users Guide. Release 6.03, SAS Institute, Inc, Cary, North Carolina, USA, 1988*
- 35) Yim MB, Lee JC, Son EI, Kim DW, et al : *Seasonal and diurnal variations and predisposing factors to cerebral aneurysm rupture. J Kor Neurosurg Soc* 25 : 1029-1035, 1996