

## 수술 중 뇌동맥류 파열에 대한 임상 분석

백원철 · 고현송 · 김 윤

= Abstract =

## Clinical Analysis of Intraoperative Rupture of Cerebral Aneurysms

Won-Cheol Baek, M.D., Hyeon-Song Koh, M.D., Youn Kim, M.D.

Department of Neurosurgery, College of Medicine, Chungnam National University, Daejeon, Korea

**O**bjective : Intraoperative rupture of an intracranial aneurysm can interrupt a microsurgical procedure and jeopardize the patient's chance to favorable outcome. The purpose of this study was to analyse and evaluate intraoperative aneurysmal rupture and render ideal prevention and management to intraoperative rupture.

**Patients and Methods :** The authors retrospectively analysed the results of 609 patients who underwent cerebral aneurysm surgery from January 1991 to December 2000.

**Results :** 1) Intraoperative aneurysmal rupture occurred in 73 of 609 consecutive aneurysm surgery, so the incidence was about 12.0% and it was relatively lower than other reports.

2) Aneurysms arising from anterior communicating artery appeared more prone to intraoperative rupture.

3) The size of aneurysm and timing of operation didn't influence intraoperative aneurysmal rupture and temporary clipping didn't reduce the incidence of intraoperative aneurysmal rupture.

4) Intraoperative aneurysmal rupture occurred during three specific periods : (1) dissection stage in 61%, (2) clip application stage in 29 %, (3) pre-dissection stage in 10%.

5) In the patients with intraoperative aneurysmal rupture, surgical outcome was relatively good and there was no significant difference in outcome compared with unruptured group.

**Conclusion :** Our suggestion for prevention methods of intraoperative aneurysmal rupture are as follows : 1) minimal brain retraction, 2) sharp and careful aneurysmal neck dissection, 3) gentle clipping with proper clip selection etc.

Management methods after intraoperative aneurysmal rupture are as follows : 1) strong aspiration of bleeding point, 2) rapid application of temporary and/or tentative clip, 3) following rapid dissection of neck and proper clip application, 4) use of encircling clip etc.

**KEY WORDS :** Clinical Analysis · Intraoperative rupture · Cerebral aneurysms.

서 론

(intraoperative aneurysmal rupture)

가

가

## 대상 및 방법

1991 1 2000 12 10  
609  
73  
Glasgow outcome scale  
(GOS) Good recovery Moderate disability Good,  
Severe disability Vegetative state Poor  
Good, Poor, Dead 3 가 .

## 결 과

### 1. 연령 및 성별 분포

10 609  
73  
12.0%  
30 69 , 40 60  
가 가  
가 (Table 1).

### 2. 뇌동맥류의 위치

73  
(anterior communicating artery,  
A - com a.) 32 (43.8%) 가 ,  
(middle cerebral artery, MCA) 18 , (po-  
sterior communicating artery, P - com a.) 19 ,  
(vertebro - basilar artery, V -  
B) (Table 2).

**Table 1.** Age and Sex distribution in 73 patients who occurred intraoperative aneurysmal rupture

Age (year)	Male	Female	Total (%)
20 - 29	-	-	-
30 - 39	10	2	12(10.0)
40 - 49	7	10	17(30.0)
50 - 59	12	12	24(32.5)
60 - 69	4	16	20(27.5)
70	-	-	-
Total	33(42.5)	40(57.5)	73(100)

### 3. 뇌동맥류의 크기

가 82.5% , 4~10mm  
11mm , 3mm  
(Table 3).

### 4. 수술 시기

4 14

**Table 2.** Location of intraoperative ruptured aneurysms

	Location	No. of cases (%)
ICA	Bifurcation	1 ( 1.4)
	Ant.choroidal a	-
	P-com a	19(26.0)
	Ophthalmic a	-
ACA	ACA distal	1 ( 1.4)
	A-com a	32(43.8)
	A1	2( 2.7)
MCA	Bifurcation	18(24.7)
	M1	-
	M2	-
V-B	Basilar tip	-
	Basilar trunk	-
	PCA	-
	SCA	-
	PICA	-
Total		73(100)

**Table 3.** Size of intraoperative ruptured aneurysms

Size of aneurysm (mm)	No. of cases (%)
3	7 ( 9.5)
4 - 6	29(39.8)
7 - 10	32(43.9)
11 - 24	5 ( 6.8)
Total	73(100)

**Table 4.** Timing of operation of intraoperative ruptured aneurysms

Timing of operation (days)	No. of cases (%)
Early(0 - 3)	19(26.0)
Intermediate(4 - 14)	48(65.7)
Late(14<)	6 ( 8.3)
Total	73(100)

**Table 5.** Use of temporary clip before intraoperative aneurysmal rupture

Use of temporary clip	No. of cases (%)
Yes	59(80.8)
No	14(19.2)
Total	73(100)

**Table 6.** Timing of rupture, preoperative clinical grade and surgical outcome

Timing of rupture	Total cases(%)	* Preoperative clinical grade		†Surgical outcome at discharge		
		Good	Poor	Good	Poor	Dead
Predissection	7( 9.6)	5	2	4	2	1
Anesth.induction	1	1	-	-	1	-
Dura opening	1	-	1	-	1	-
Cistern opening	5	4	1	4	1	-
Dissection	45(61.7)	30	15	35	9	1
Clip application	21(28.7)	13	8	18	3	-
Total	73(100)	48(65.8)	25(34.2)	56(76.7)	15(20.6)	2(2.7)

\* : Good : H-H grade I,II / Poor : H-H grade III,IV,V

† : Good : good recovery & moderate disability / Poor : severe disability & vegetative state by Glasgow outcome scale

가 48 (65.7%) 가 , 3  
 가 19 (26.0%), 14  
 6 (8.3%)  
 가 가 (Table 4).

**5. 일시적 모동맥 결찰 여부**

(temporary clipping)

(Table 5).

**6. 수술중 파열 시기, 수술전 임상 상태 및 예후**

(pre-dissection), (dissection), (clip application) 3가  
 가 45 (61.7%) 가  
 21 (28.7%) ,

7 (9.6%)가 Good  
 56 (76.7%), Poor가 15 (20.6%) , Dead가 2 (2.7%) (Table 6).

**7. 수술중 동맥류 파열군과 비파열군의 예후 비교**

가  
 (Table 7).

**8. 수술중 파열 뇌동맥류의 처치 방법**

(clipping) (wrapping) 가 가 50% ,  
 , 4  
 가 encircling clip(Sundt) 5%  
 graft clip) (Table 8). 24% 3)4)10)11)13)17)23)29)  
 clipping fibrin glue 가

**Table 7.** Comparison of outcome in intraoperative ruptured group versus unruptured group

*Surgical outcome	Ruptured group(%)	Unruptured group(%)
Good	56(76.7)	396(73.9)
Poor	15(20.6)	116(21.6)
Dead	2( 2.7)	24( 4.5)
Total	73(100)	536(100)

\* : Good : good recovery & moderate disability  
 Poor : severe disability & vegetative state by Glasgow outcome scale

**Table 8.** Method of management for intraoperative ruptured aneurysms

Method	No. of cases(%)
Clipping only	38(52.1)
Clipping+Wrapping	29(39.7)
Wrapping only	2( 2.7)
Others(encircling clip)	4( 5.5)
Total	73(100)

**고 찰**

가 가

14% 38% 3)4)10)11)13)17)21)23)29). 1 가

10 609 73 , 가

12% 가 , 가 3)4)25)

2 (2.7%) 가 가 (cotton)

17)23), 가 (bipolar electrocautery)

가 (temporary clip)

가 가

1)6)7), (tentative clipping)

가 가

가 가 61.7%가

11)13 - 15)23)24), 가 3)4)11)17),

가 가

12)16)19), 35

가 9 1

(temporary clipping) . Batjer 3)4) (blunt dissection) 가

가 가 (microscissor)

2)8)9)12)16)18 - 20)22)25 - 28), (arachnoid knife) (sharp dissection)

가 (intermittent mannitol, barbiturate) (clip application) 가

reperfusion) , 가

가 가

가 (pre-dissection stage) 가 가

가 (dissection stage), 가

(clip application stage) 가 (temporary clipping)

가 가 (bipolar

coagulation) 가 (gauze)  
(cotton)

- : 2001 6 28
  - : 2001 11 16
  - :
- 301 - 721 640

encircling clip

: 042) 220 - 7361, : 042) 220 - 7364  
E - mail : baekwonchari@hanmail.net

References

결 과

1991 1 2000 12 10  
609  
73  
1) 가 12.0%  
2) 가 가  
3)  
4) 가 가  
가 61.7% 가  
28.7%, 9.6%  
5) Good 76.7%,  
Poor 20.6%, 2.7%  
가  
(encircling clip )  
가 가  
가

- 1) Adams HP, Kassell NF, Kongable GA, Torner JC : *Intracranial operation within seven days of aneurysmal subarachnoid hemorrhage. Arch Neurol* 45 : 1065-1069, 1988
- 2) Bailes JE, Deeb ZL, Wilson JA, Jungreis CA, Horton JA : *Intraoperative angiography and temporary balloon occlusion of the basilar artery as an adjunct to surgical clipping : Technical note. Neurosurgery* 30 : 949-953, 1992
- 3) Batjer H, Samson D : *Intraoperative aneurysmal rupture : Incidence, outcome, and suggestions for surgical management. Neurosurgery* 18 : 701-707, 1986
- 4) Batjer H, Samson D : *Intraoperative aneurysm rupture, in Wilkins Rengachary, Neurosurgery, ed 2, 1996, vol 2, pp2277-2282*
- 5) Chandler JP, Getch CC, Batjer HH : *Intraoperative aneurysm rupture and complication avoidance. Neurosurg Clin N Am* 9 : 861-868, 1998
- 6) Chyatte D, Fode N, Sundt TM : *Early versus late intracranial aneurysm surgery in subarachnoid hemorrhage. J Neurosurg* 69 : 326-331, 1988
- 7) Disney L, Weir B, Petruck K : *Effect on management mortality of a deliberate policy of early operation on supratentorial aneurysms. Neurosurgery* 20 : 695-700, 1987
- 8) Farrar JK, Gamache FW, Ferguson GG, Barter J, Varkey GP, Drake CGI : *Effects of profound hypotension on cerebral blood flow during surgery for intracranial aneurysms. J Neurosurg* 55 : 857-864, 1981
- 9) Fujita S, Kawaguchi T : *Monitoring of direct cortical responses during temporary arterial occlusion at aneurysm surgery. Acta Neurochir (Wein)* 101 : 23-28, 1989
- 10) Houkin K, Kuroda S, Takahashi A, Takikawa S, Ishikawa T, Yoshimoto T, et al : *Intra-operative premature rupture of the cerebral aneurysms. Analysis of the causes and management. Acta Neurochir (wien)* 141 : 1255-1263, 1999
- 11) Hwang SN, Park K, Kim YB, Min BK, Suk JS, Choi DY : *Intraoperative rupture of the intracranial arterial aneurysm. J Korean Neurosurg Soc* 22 (6) : 749-753, 1993
- 12) Jabre A, Symon L : *Temporary vascular occlusion during aneurysm surgery. Surg Neurol* 27 : 47-63, 1987
- 13) Kassell NF, Boarini DJ, Adams HP, Sahs AL, Graf CJ, Torner JC, et al : *Overall management of ruptured aneurysm : Comparison of early and late operation. Neurosurgery* 9 : 120-128, 1981

- 14) Kassell NF, Torner JC : *Aneurysmal rebleeding. A preliminary report from the Cooperative Aneurysm Study. Neurosurgery* 13 : 479-481, 1983
- 15) Koenig GH : *Aneurysm surgery in a community setting. Neurosurgery* 22 : 501-502, 1988
- 16) Kourtopoulos H, West KA, Bolander HG : *Clinical experience with the use of a temporary clip for intracranial aneurysm surgery. Analysis of eighteen cases. Acta Neurochir* 70 : 59-64, 1984
- 17) Lee HK, Song JH : *Intraoperative aneurysmal rupture : Incidence, Cause, and Considerations in the Management. J Korean Neurosurg Soc* 25 (5) : 1023-1028, 1996
- 18) Le Roux PD, Elliot JP, Newell DW, Grady MS, Winn HR : *The incidence of surgical complications is similar in good and poor grade patients undergoing repair of ruptured anterior circulation aneurysms : a retrospective review of 355 patients. Neurosurgery* 38 : 887-893, 1996
- 19) Mizoi K, Yoshimoto T : *Intraoperative monitoring of the somatosensory evoked potentials and cerebral blood flow during aneurysm surgery. Safety evaluation for temporary vascular occlusion. Neurol Med Chir (Tokyo)* 31 : 318-325, 1991
- 20) Ogawa A, Sato H, Sakurai Y, Yoshimoto T : *Limitation of temporary vascular occlusion during aneurysm surgery. Surg Neurol* 36 : 453-457, 1981
- 21) Paul RL, Arnold JG Jr : *Operative factors influencing mortality in intracranial aneurysm surgery : Analysis of 186 consecutive cases. J Neurosurg* 32 : 289-294, 1970
- 22) Pinaud M, Souron R, Lelausque JN : *Cerebral blood flow and cerebral oxygen consumption during nitroprusside induced hypotension to less than 50mmHg. Anesthesiology* 70 : 255-260, 1989
- 23) Schramm J, Cedzich C : *Outcome and management of Intraoperative Aneurysm rupture. Surg Neurol* 40 : 26-30, 1993
- 24) Solomon RA, Fink ME : *Current strategies for the management of aneurysmal subarachnoid hemorrhage. Arch Neurol* 44 : 769-774, 1987
- 25) Sundt TM : *Surgical techniques for the saccular and giant intracranial aneurysms. Williams & Wilkins, 1990, pp45*
- 26) Suzuki J, Fujimoto S, Mizoi K, Oba M : *The protective effect of combined administration of antioxidants and perfluorochemicals on cerebral ischemia. Stroke* 15 : 672-679, 1984
- 27) Suzuki J, Kuak R, Okudaira Y : *The safe time limit of temporary clamping of cerebral arteries in the direct surgical treatment of cerebral aneurysm under moderate hypothermia, in Suzuki J (ed) : Cerebral Aneurysms. Tokyo, Neuron Publishing Co, 1987, pp326-329*
- 28) Tsementzis SA, Hitchcock ER : *Outcome from "rescue clipping" of ruptured intracranial aneurysms during induction anaesthesia and endotracheal intubation. J Neuro Neurosurg Psych* 48 : 160-163, 1985
- 29) Yasui T, Sakamoto H, Kishi H, Koimiyama M, Iwai Y, Yamana K, et al : *Intraoperative aneurysmal rupture at the neck. No Shinkei Geka* 25 : 271-276, 1997