

1

2 2

: 가

: 29

, Barrow

5 122 (48.8)

: 26 (90%)

3

. Barrow

, B

가 2 , C

가 1 , D

가 26

가 24 ,

가 5

8 (28%)

21 (72%)

8

11

(65%)

, 8 (28%)

, 2 (7%)

가

12

가

5 (42%),

5 (42%),

가

가 2

(16%)

17

,

14

(82%),

3 (18%)

:

29

27

D

10-

, Halbach (4)

15%

(1).

11.9%

(2).

가

, Barrow (5)

(3),

가 가

(6-12)

(4).

(9,10,13,14)

(11,12,15,16)

12

40

1

2

1998 5 15 1999 1 6

29

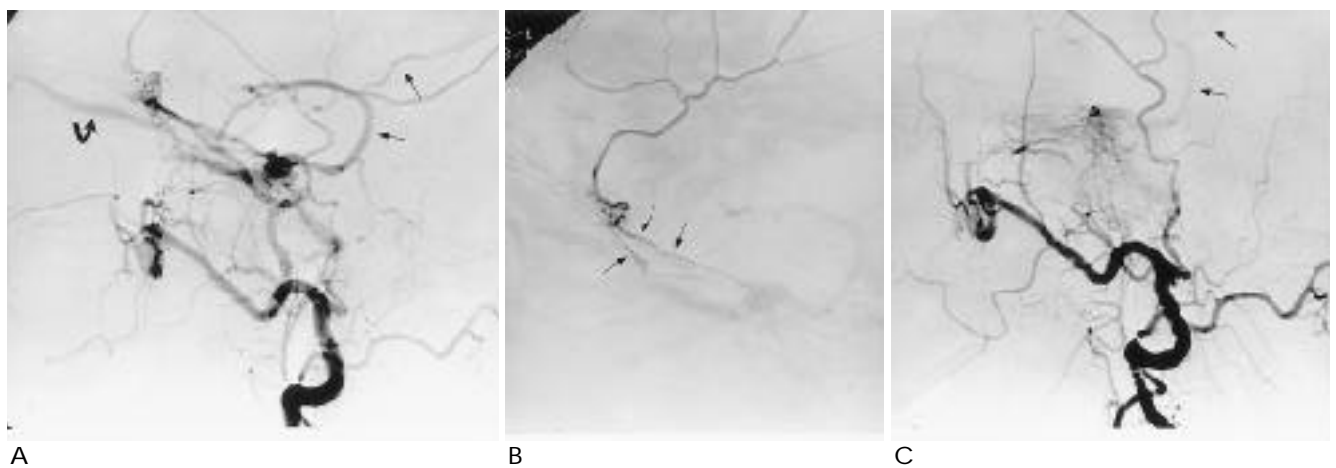


Fig. 1. Transarterial treatment(Case 11).
A. Lateral view of right external carotid angiogram shows a fistula in cavernous sinus. Multiple branches from internal maxillary artery feed a dural fistula with drainage into superior opthalmic vein(curved arrow) and cerebral cortical veins(arrows).
B. Lateral view of selective middle meningeal arteriogram demonstrates feeding vessel(arrows).
C. After embolization of middle meningeal and accessory meningeal arteries of external carotid artery, residual fistula is faintly noted but blood flow is markedly decreased(arrows).

inferolateral trunk
가
150-250 μ m
polyvinyl alcohol(PVA) (Contour™ emboli, ITC, Fremond, CA, USA), Coil(Platinum™ coil: Target therapeutics, Fremond, CA, USA; Tungsten™ coil: Balt, Montmorency, France), N-butyl 2-cyanoacrylate (Histoacryl blue, B. Braun, Melsungen, Germany), gelfoam (Gelfoam powder, upjohn, Kalamazoo, USA), silk

Coil(Platinum™ coil: Target therapeutics, Fremond, CA, USA; Tungsten™ coil: Balt, Montmorency, France; GDC coil: Target therapeutics, Fremond, CA, USA)

가 가

가

가 가

5 122 48.8

3

Table 1. Initial Clinical Symptoms

Clinical symptoms	Numbers
Chemosis	24
Proptosis	19
Diplopia	19
Headache	17
Ophthalmoplegia	15*
Bruit	13
Tinnitus	12
Decreased visual acuity	9
Eye ball pain	7
Dizziness	4
Neck stiffness	1
Loss of consciousness and right hemiplegia	1

*: Three patients showed only ophthalmoplegia.

가 , 가
가
가
가
24 , 19 , 19 ,
17 , 15 , 13 , 12 , 9 ,
7 , 4 , 1 , 1 (Table
1). 3
1
1
가 17 ,

Table 2. Symptom Presenting Sites according to Site of Unilateral CDAVF

Symptom sites	Numbers
Ipsilateral	19
Contralateral	0
Ipsilateral+ contralateral	5
Total	24

Table 3. Symptom Sites according to Site of Bilateral CDAVF

Symptom sites	Numbers
Unilateral	2
Bilateral	3
Total	5

7 , 가 5 , 5 (intercavernous coronary sinus) 3 2 19 , 5 13 (Table 2). 가 5 1 (Table 3). 3 (Table 4). 가 8 (28%) inferolat- 가 21 (72%) eral trunk meningohipophyseal trunk 19 Barrow B 2 , (65%), 8 (28%) , 2 (7%) C 1 , D 26 가 3 23 가 1 6 , 1 1

Table 4. Angiographic Findings of 29 Patients

Pt.No.	Sex	Age	Site	Feeding arteries	Draining veins	Type
1	F	58	R	EC(R)	CS-SOV	C
2	F	12	B	EC+ IC(RL)	CS(B)-SOV(B)+ IPS(B)+ CV	D
3	M	31	L	EC+ IC(RL)	CS-SOV+ IPS+ CV	D
4	F	44	L	EC+ IC(RL)	CS-SOV+ CV+ DV	D
5	F	27	L	EC+ IC(L)	CS-SOV+ CV	D
6	F	72	B	EC(R)+ IC(L)	CS(B)-SOV(R)+ IPS(R)	D
7	F	66	L	EC+ IC(RL)	CS-SOV+ IPS+ CV	D
8	F	62	L	EC+ IC(RL)	CS-SOV+ CV	D
9	F	53	B	EC(L)+ IC(RL)	CS(B)-SOV(L)+ CV(L)	D
10	F	59	L	EC+ IC(RL)	CS-SOV+ IPS+ PP	D
11	F	67	R	EC+ IC(RL)	CS-SOV+ IPS+ CV	D
12	F	49	L	EC+ IC(RL)	CS-SOV+ IPS+ CV	D
13	M	35	R	IC(R)	CS-SOV+ IPS+ CV	B
14	F	59	L	IC(L)	CS(L)-IPS(L), CS(L)-CS(R)-IPS(R)	B
15	F	47	L	EC(L)+ IC(L)	CS-SOV	D
16	F	64	L	EC+ IC(L)	CS-SOV+ IPS+ CV	D
17	F	52	R	EC+ IC(RL)	CS-SOV+ IPS, CS(R)-CS(L)-IPS(L)	D
18	F	56	L	EC+ IC(RL)	CS-SOV+ IPS+ CV+ DV	D
19	F	55	L	EC+ IC(RL)	CS(L)-CS(R)+ IPS(R)	D
20	M	36	L	EC+ IC(RL)	CS-SOV+ IPS+ CV+ DV	D
21	F	32	L	EC(L)+ IC(RL)	CS-IPS	D
22	F	66	L	EC+ IC(RL)	CS(L)-CS(R)-IPS(R)	D
23	M	39	L	EC+ IC(RL)	CS-SOV+ IPS	D
24	F	60	R	EC+ IC(RL)	CS-SOV+ IPS, CS(R)-CS(L)-IPS(L)	D
25	F	57	R	EC+ IC(RL)	CS-SOV+ IPS	D
26	F	59	B	EC+ IC(RL)	CS(B)-SOV(B)+ IPS(B)	D
27	F	60	B	EC+ IC(RL)	CS(B)-SOV(B)+ IPS(B)	D
28	F	57	L	EC+ IC(RL)	CS-SOV+ IPS	D
29	F	56	R	EC+ IC(RL)	CS-SOV+ IPS	D

DAVF : dural arteriovenous fistula

EC : external carotid artery

SOV : superior ophthalmic vein

DV : deep vein

L : left

R : right

IC : internal carotid artery

IPS : inferior petrosal sinus

PP : pterygoid plexus

B : both

CS : cavernous sinus

CV : cortical vein

가 4 , 1
가 2

가

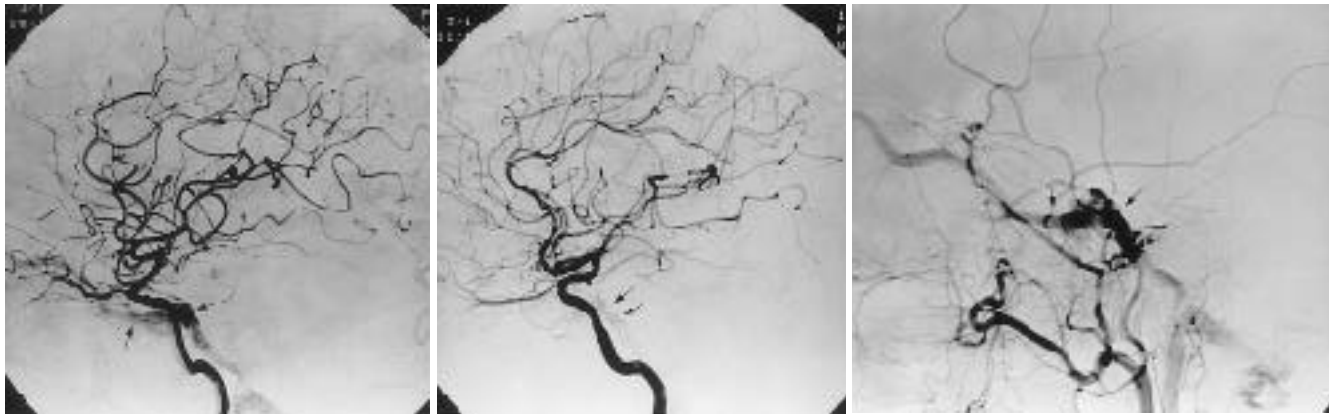
29 16 (55%) 2

가

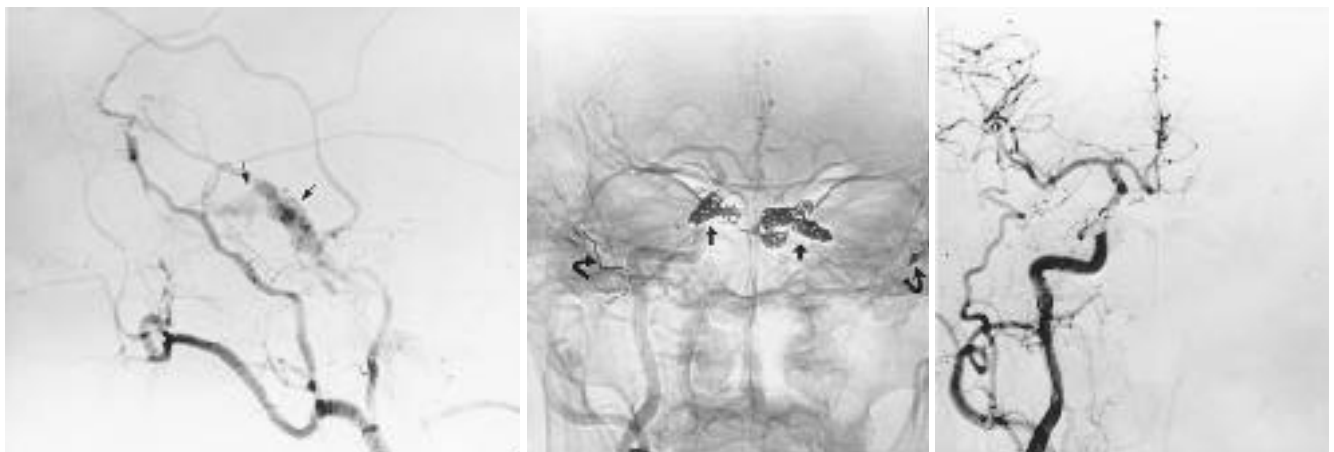
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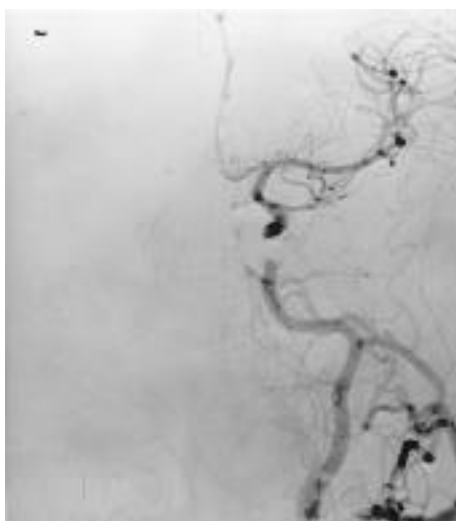
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A B C



D E F



G

Fig. 2. Transvenous treatment(Case 26). Lateral views of selective left(A) and right(B) internal and left(C) and right(D) external carotid angiograms show dural arteriovenous fistula fed by both internal and external carotid arteries bilaterally(arrows). E : Cavernous sinus is thrombosed by coil embolization(straight arrows) and additionally external carotid arteries are embolized(curved arrows). Anteroposterior views of immediate follow up right(F) and left(G) common carotid angiograms show complete treatment.

가 10 , 가 6
4
가
가 , 3
가
6
10
가 12 , 가 17
가 , 1 C
가
D (Fig. 1) 11
가 , 5 (46%)
2 (18%) 가 (Table
5) 가 2 1
가
15 D (Fig. 2)
가 6 , 가 9

Table 5. Results of Endovascular Treatment of 29 Patients

Pt.No.	Embolitic material		Angiographic result*	Follow up months	Clinical result#
	A	V			
1	Coil+ PVA		Complete	5	Cure
2	NBCA		Partial	5	Cure
3	PVA+ NBCA+ coil		Partial	74	Improve
4	PVA		Partial	45	Cure
5	PVA		Partial	122	Cure
6	PVA		Partial	106	Improve
7	PVA		Partial	52	Improve
8	PVA		Partial	95	Aggravation
9	PVA+ coil		Partial	54	Aggravation
10	PVA		Partial	48	Cure
11	PVA+ NBCA+ coil		Partial	10	Improve
12	PVA+ NBCA+ coil		Partial	9	Improve
13		Coil	Complete	74	Cure
14		Coil	Partial	5	Cure
15	PVA	Coil	Complete	95	Cure
16	PVA	Coil	Partial	96	Cure
17	PVA	Coil	Partial	61	Improve
18	PVA	Coil	Complete	74	Cure
19	PVA	Coil	Partial	25	Cure
20	PVA+ NBCA+ gelfoam	Coil	Complete	111	Cure
21	PVA+ coil	Coil	Complete	40	Cure
22	PVA+ coil	Coil	Partial	39	Cure
23	PVA+ NBCA+ coil	Coil	Complete	62	Cure
24	PVA+ coil+ silk	Coil	Partial	58	Improve
25	PVA+ coil	Coil	Partial	22	Improve
26	PVA+ coil	Coil	Complete	59	Cure
27	PVA+ NBCA+ coil	Coil	Partial	22	Cure
28	PVA+ NBCA+ coil	Coil	Partial	10	Cure
29	PVA	Coil	Partial	7	Cure

PVA: polyvinyl alcohol NBCA: N-butyl 2-cyanoacrylate

A: transarterial route embolization V: transvenous route embolization

*, # : Results are the final follow up results

가 12 (80%), 3 (20%) (Table 5). 가 가

, 11 D , 5 (45%)

2 4 (36%) , 1 가 가

, 1 가 가

(11) (21,22)

, 4 가 , 1 (23)

가 , 가 (9,11).

(6), (7), (11). Halbach (11) D

(electrothrombosis)(8), (9, 13,14), 13 10 (77%) 가 ,

(10) , 3 (23%) 가 .

(11,12,15,16) . Halbach (4) ,

, , , 가 ,

, , , 가 ,

, Barrow (5) 9 , 15 D 6 12 (80%) ,

3 (20%) 가 , 가 가 (11,24-26).

가 가 ,

(3) 가 가 ,

(17)가 가 , 1 가

(17-19) 가 가

가 가

가 가

16 55% 가

C 가 , D 가 가

가 가 가 가

(20). Debrun (14) D 25 가 가 (2,27,28). 가

12 (48 %) (3, 4, 6

1 C)

(8,29-31).

arterial steal
가

(31).

3

3

4

(2,27).

가

가

(2,27,32,33).

(35)

가

가

가 13

1

29

Barrow

, D

가 26

29

27

B

C

, D

가

가

가

가

가

가

가

가

가

(3,34).

가

B

가

가

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Embolization of Dural Arteriovenous Fistulas Involving the Cavernous Sinus¹

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Purpose : To compare the results of endovascular treatment by using transarterial, transvenous, or a combined approach in cavernous dural arteriovenous fistulas(CDAVF).

Materials and Methods : Twenty-nine angiographically confirmed CDAVF patients underwent endovascular treatment. Initial presenting symptoms and the characteristics of CDAVF, as seen on angiograms, were investigated. Patients were divided according to Barrow's classification. Using embolic materials, endovascular treatment was performed transarterially or transvenously, and the clinical results were retrospectively evaluated during follow up ranging from 5 to 122(mean 48.8) months.

Results : All patients complained of ocular symptoms. Twenty six (90%) showed congestive symptoms related to superior ophthalmic vein drainage, but three presented with only ophthalmoplegia without congestion. According to Barrow's classification, patients were classified as follows : type B(n= 2), type C(n= 1), or type D(n= 26). Twenty-four patients had a unilateral CDAVF, and five a bilateral CDAVF. The results of angiographic treatment were as follows : completely treated in 8 cases(28%), partially treated in 21(72%). Clinical symptoms completely disappeared in 19 patients, for eight of these treatment was entirely angiographic, while for 11 it was partially angiographic. Clinical improvements were noted in eight patients, but in two, visual acuity progressively decreased. In 12 patients who underwent transarterial treatment, the clinical results were as follows : complete cure in five(42%), improvement in five(42%), and progressively decreasing visual acuity in two(16%). Among 17 patients who underwent transvenous or transvenous with transarterial treatment, complete cure was seen in 14(82%), and improvement in three(18%).

Conclusion : Twenty-seven of 29 CDAVF patients were completely cured or improved after endovascular treatment. For type-D patients, transvenous with transarterial treatment led to a higher cure rate than the transarterial approach alone.

Index words : Fistula, arteriovenous
Arteries, therapeutic blockade

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