

1

2

2

:

: 1983 1997  
52 (direct)

: 52 45 (87%)  
35 (78%)

71% 88%  
가

3 6 가 2  
가 2 1

:

가

(Carotid-cavernous fistula, CCF)  
가 , 1980 가 (5), 1991 Guglielmi CCF  
(shunt) (10,11)  
(direct) Type A  
(1,2). 15  
가 , 52  
가 가  
1974 Serbinenko (3) coaxial  
Debrun (2)  
59%  
(6)

<sup>1</sup>  
<sup>2</sup>

52  
10 -68 ( 37 ) 가 41 , 가  
11  
(Table 1).  
가 (41 ), (39  
, (38 )  
(20 ), (15 ), (15 ), (13 ), (11 ), 52  
(10 )  
2 B-D (Becton-Dickinson, Rutherford, NJ)  
miniballoon 42  
Debrun (Debrun's detachable bal-  
loon catheters, Ingenor, Paris, France) 3  
1 self-sealed (Goldvalve  
balloon, Ingenor) 0.1-  
1.5cc  
9F C1  
C2  
coaxial catheter  
9  
4 , (2-8mm)  
6F Tracker 10  
18 (Target therapeutics, Fremont, U.S.A)  
roadmap

Table 1. Cause of 52 Direct Carotid-Cavernous Fistulas

Cause	Fistulas (n= 52)
Motor vehicle accident	34
Falling down	10
Sports injury	4
Ruptured aneurysm	1
Stab wound to orbit	3

Table 2. Outcome of 52 CCF Patients Treated with Detachable Balloons or Coils

Fistula occlusion	Patients (n= 52)	
Complete occlusion	45	
DB		34
DB and Coils		7
Coils		4
Partial occlusion	5	
DB		3(2*)
DB and Coils		2*
Coils		0
Surgery	2	

DB = Detachable Balloons ,  
\* Spontaneous occlusion in follow up angiography

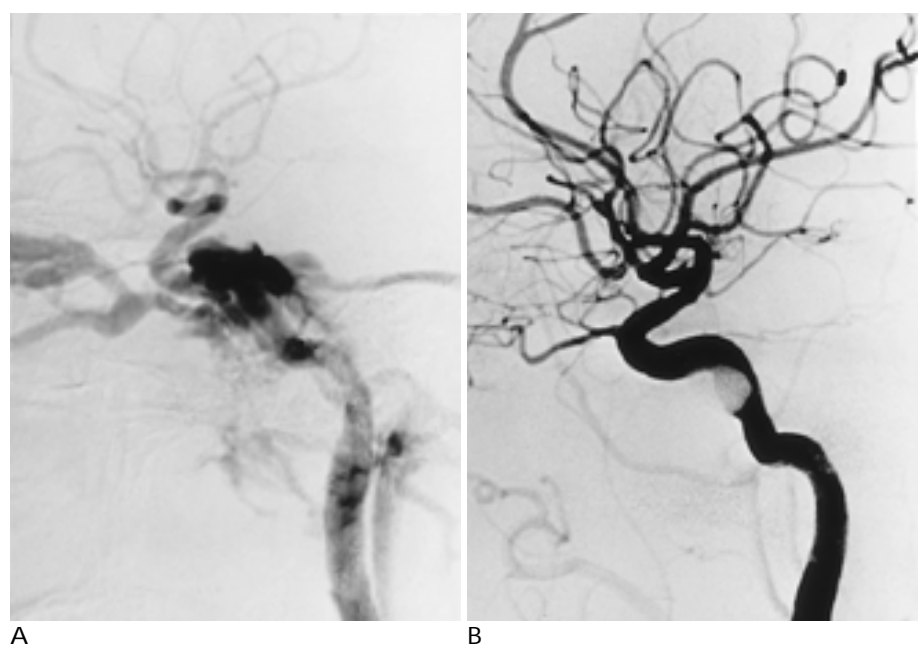


Fig. 1. A. Cerebral angiography reveals a fast flow fistula at the intracavernous internal carotid artery, and drained through the ophthalmic vein and petrosal sinus.  
B. CCF was treated by single balloon occlusion of the fistula placed by an I-CA approach, and angiography shows complete obliteration of the fistula with patent ICA lumen.

52 45 (87%) 35  
(78%) (Table 2, 3). 5 가 71%, 88%  
2  
(Fig. 1), 45 34 11 (Table 3). 9  
(Fig. 2), (Fig. 3) 8 1  
34 11 4  
1 2 1  
2 (Fig. 4). 1

Table 3. Preservation Rate of the ICA in CCF Patients Before and After Using Coils

ICA status	Before using coils (1983-1992)		After using coils (1993-1997)		Total	
	Treatment (n= 28)	%	Treatment (n= 17)	%	Patients (n= 45)	%
Preserved	DB (20)	71	DB (6) DB & Coils (5) Coils (4)	88	35	78
Occluded	DB (8)	29	DB & Coils (2)	12	10	22

DB = Detachable balloons

ICA = internal carotid artery

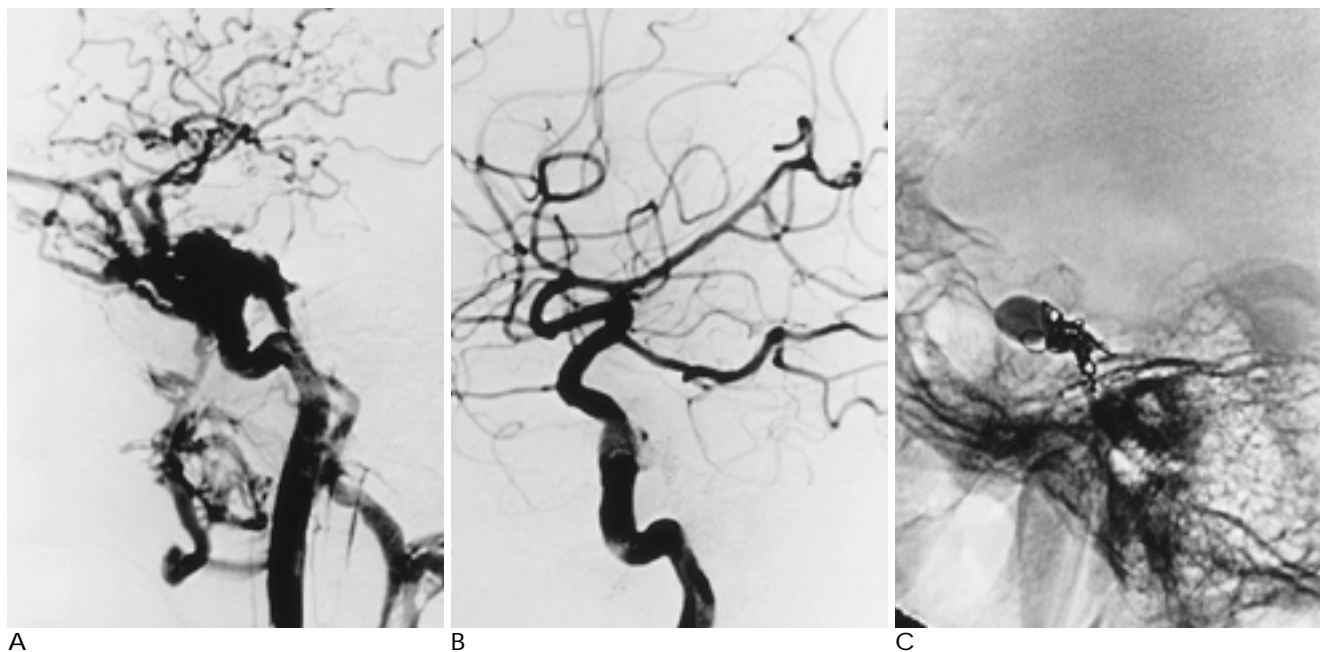


Fig. 2. A. Preembolization angiography shows a carotid-cavernous fistula draining through the ophthalmic vein, inferior petrosal sinus and cortical vein.

B, C. CCF was treated by a balloon placed by an ICA approach, and also treated by coils by a venous approach. Complete obliteration of fistula can be seen.

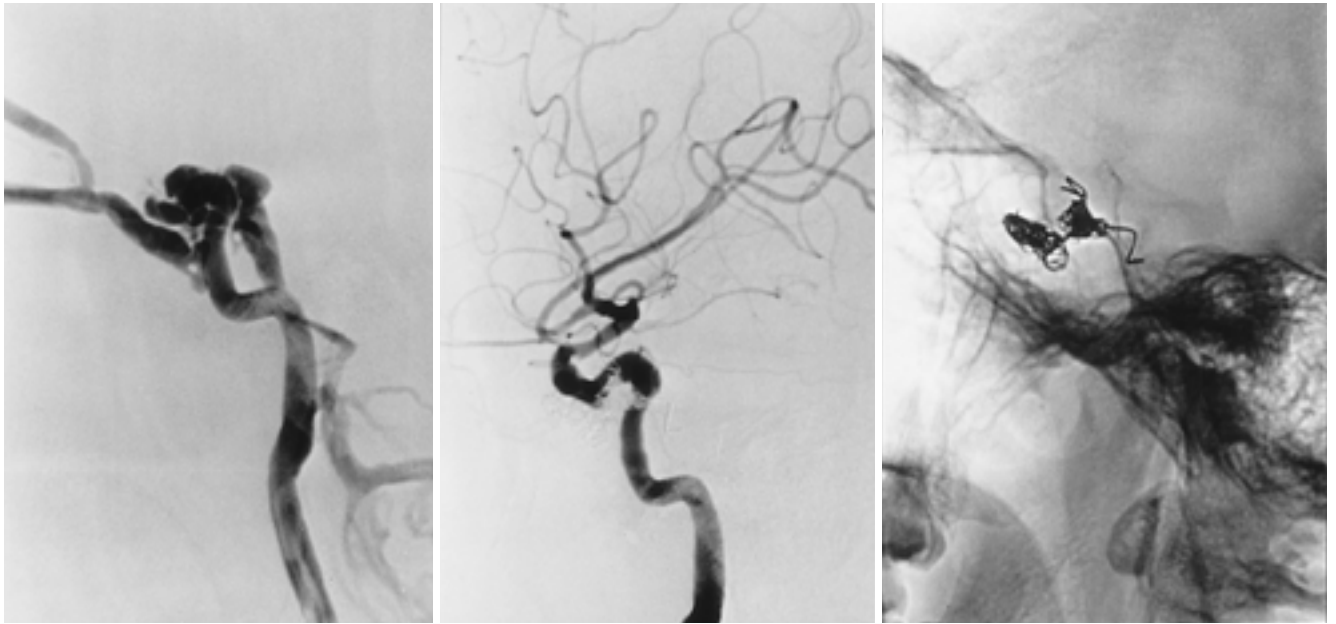


Fig. 3. A. Preembolization angiography shows a carotid-cavernous fistula draining through the superior ophthalmic vein and inferior petrosal sinus.  
B, C. CCF was treated by coils only, placed by a venous approach, after failure of the transarterial approach.

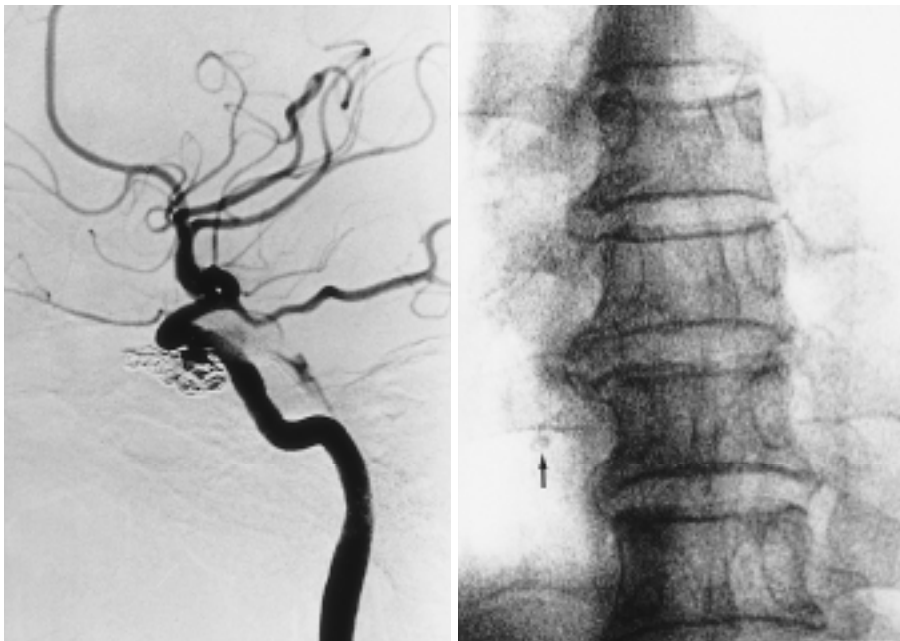


Fig. 4. A. Using the balloon and coils, CCF was treated. Small residual fistula draining into the inferior petrosal sinus can be seen. Spontaneous delayed occlusion of the fistula occurred in this patient.  
B. Plain radiograph shows migration of a coil to a pulmonary vessel in this patient (arrow).

A

B

2

3

6

. 2

1

2

2

. 1

(Fig. 4). 1

50%

가

. 1

가

가

2

3 6

(1). 1

Serbinenko Debrun 1 50%

50%

가 self-sealed

(Goldvalve balloon, Ingenor)

가 (2-4).

가

(45-90%) (4,7,8) 가 87%

78%

가 78%

가

가

(5,9)

가

가

가 (2-8mm)

가

Guglielmi (10,11)

GDC

GDC가

가

11 13

가

가

(12)

(2)

7

4 2

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## Endovascular Treatment of Direct Carotid Cavernous Fistulas Using Detachable Balloon(s) and Coils<sup>1</sup>

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**Purpose :** To evaluate the merits of this technique and to provide a standard for comparison with future treatment alternatives.

**Materials and Methods :** We retrospectively reviewed the records of 52 patients with direct CCF treated at the Yonsei Medical Center between 1983 and 1997 by transarterial or transvenous embolization using detachable balloon(s) and/or coils.

**Results :** Among the 52 cases, 51 were traumatic in origin, while only one was the result of a ruptured aneurysm. The three most common presentations were chemosis, bruit, and pulsatile proptosis. Forty-five patients were successfully treated with detachable balloon(s) and/or coils and internal carotid blood flow was preserved in 35. When coils were used (1993-7), the ICA preservation rate was higher than when they were not used (1983-92). To confirm statistical significance, however, more studies are needed. Four patients who initially presented with incomplete occlusion showed spontaneous occlusion on follow up angiography. In two patients, surgical ligation was performed because embolization failed and there was incomplete occlusion of the fistula. We experienced complications such as transient 3rd and 6th cranial nerve palsy, migration of deflated balloons and coils to the lung, and loss of vision.

**Conclusion :** Transarterial and transvenous embolization with detachable balloon(s) and/or coils provides a high rate of fistula obliteration with low morbidity. In particular, the use of coils led to an increased rate of ICA preservation, thus and is considered as a good treatment modality for CCF obliteration.

**Index words :** Fistula, carotid-cavernous  
Carotid arteries, therapeutic blockade

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