

소아에서의 Coil 색전술의 임상체험

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Clinical Experience of Transcatheter Coil Embolization in Children

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ABSTRACT

Background : Transcatheter coil embolization has been described as a method of nonsurgical closure of variable pathologic vascular structures. This study was aimed to evaluate the outcome of transcatheter coil embolization in variable clinical conditions. **Methods and Results :** We collected data from patients' medical record and their cardiac angiography films. From January 1995 to June 1997, coil embolization was attempted in 51 patients who were 38 patients with systemic-pulmonary collaterals (5 patients have venous collaterals, too), six patients with venous collaterals, nine patients with patent ductus arteriosus (PDA), one patient with Blalock-Taussig shunt (BT shunt), one patient with coronary-right atrial fistula and one patient with coronary-right ventricular fistula. In 38 patients with systemic-pulmonary collaterals, 123 coils were inserted to 70 collaterals, therefore mean 1.79 ± 0.77 coils were inserted to one collateral. The results were complete occlusions (74%), incomplete occlusions (21%), and partial occlusions (4%). In six patients with venous collaterals, the outcomes were complete occlusions (50%) and incomplete occlusions (50%). In a patient with BT shunt, hemolytic anemia occurred in 1st attempt and in 2nd attempt, shunt was incompletely occluded and one coil was carried away and embolized the peripheral pulmonary artery. In nine patients with PDA, ten cases of transcatheter coil embolization was executed. Mean minimum ductal diameter was 2.1 ± 0.85 mm. The results were initial occlusion (30%), occlusion within one month (66%), and occlusion within one year (75%). Left pulmonary artery stenosis owing to coil insertion was not found. In one case of coil malposition, retrieval and reinsertion of coil was successful. In two patients who have coronary artery fistula, coil embolization was successfully executed without any complications. **Conclusions :** Transcatheter coil embolization executed in variable clinical conditions without significant complications. It was effective and safe nonsurgical method. (**Korean Circulation J 1998;28(4):691-699**)

KEY WORDS : Coil · Embolization.

서 론

Coil Gianturco ¹⁾ , 가 (PDA),
: 1998 2 2
: 1998 5 11
: , 110 - 744 28 Blalock - Taussig shunt(BT shunt), ²⁾ ³⁾
femoral artery pseudoaneurysm, ⁴⁾ Hemi - Fontan
azygos vein steal, ⁵⁾ internal mammary
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artery coronary bypass surgery coronary st -
eal syndrome⁶⁾ coil

가 coil .

5 10

PDA

coil

⁷⁻¹⁰⁾

PDA coil

coil

Gianturco coils(COOK Em -
bolization coils) 3 mm(catheter 40

mm), 5 mm(50 mm), 8 mm(5 mm), COOK Torn -
ado coil 2 mm(catheter 6 mm), CO -

OK Detachable Coil 5 mm, Complex Helical
Fibered Platinum Coil 5 mm(catheter

50 mm), 4 mm(40 mm), 7 mm(70 mm),
6 mm(60 mm), Spiral en tungstene coil

7 mm(catheter 150 mm), 5 mm
(125 mm), DUCT - OCCLUD(pfm) 7

mm, 9 mm , delivery sheath 4F, 5F
, wire 0.018 inch 0.035 inch

대상 및 방법

1995 1

1997 6

coil

51

결 과

51 coil , PDA Blalo -
ck - Taussig shunt(BT shunt) -

가 38 (5

) ,

가 6 , BT shunt 가 1 , PDA 가 9 ,

- 1 , -

1

가

가

(preOp.)

전신동맥-폐동맥 측부순환의 폐쇄

(postOp.)

. Coil 5

38 가

10

5

, 3

occlusion, CO),

가

(complete

2 , 1 3 43

clusion, SO),

(subtotal oc -

가

coil

가 Table 1

(partial occlusion)

6 5 \pm 5 6 (1 6

21 8) , 22.2 Kg \pm 15.5

Kg(10.6 Kg 77.8 Kg), 20 :

23 . 가 70 int -

PDA

ca -

theter

ernal mammary arteries, intercostal arteries, thy -

-

rocervical arteries subclavian arteries, aorta

. Gianturco coil 3 mm, 5 mm, 8 mm

Table 1. Results of systemic-pulmonary collaterals transcatheter coil embolization

Diagnosis	No. of case	No. of vessel	No. of coil	Indication		Result		
				pre Op.	post Op.	CO	SO	PO
PS or PA + VSD	8	14	24	4	4	13	1	
PS or PA + SV	16	24	53	7	9	19	5	
PS or PA + DORV	5	9	14	2	4	5	2	2
TOF	7	13	18	5	2	8	5	
TA	5	8	12		5	5	2	1
TGA	1	3	2		2	2		

CO : complete occlusion, SO : subtotal occlusion, PO : partial occlusion, PS : pulmonary stenosis, PA : pulmonary atresia, VSD : ventricular septal defect, SV : single ventricle, DORV : double outlet of right ventricle, TOF : tetralogy of Fallot, TA : tricuspid atresia, TGA : transposition of great artery. (one case was excluded, because angiography films not available)

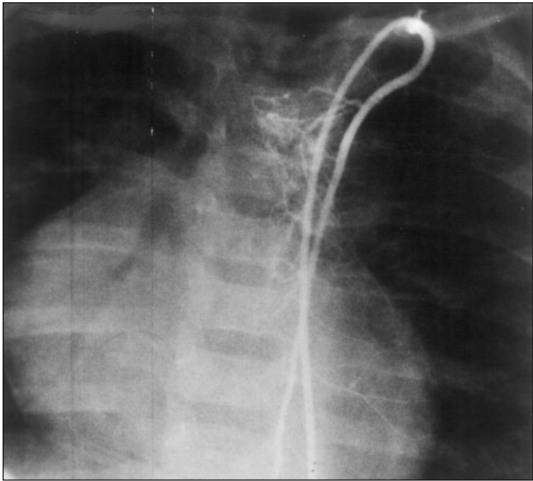


Fig. 1. Pre-embolization angiography showing systemic-pulmonary collateral (left internal mammary artery).

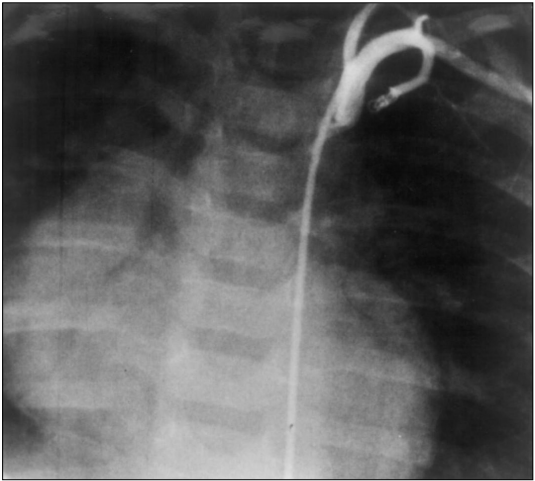


Fig. 2. After coil (Gianturco, 3 mm diameter) insertion, collateral was completely occluded.

가 , 123 가
1.79 0.77 가
52 (74%), 15
(21%), 3 (4%)
1 (Figs. 1 and 2)
24 20.7 (10
30).
가 19 , 1 coil 11
coil
정맥간 측부순환의 폐쇄
6 가 Fontan
가
24 , inominate vein - ,

inominate vein - coronary sinus, - coronary sinus venous coil . Gianturco coil 3 mm, 5 mm, 8 mm , 3 , 3 7 7) , 17.9±5.1 Kg(13.05 Kg 28.5 Kg) , 3 : 6 .

Single Ventricle 가 Coil 15 , / 1 1.7, 10 1.52 7 1 1.17

Blalock-Taussig shunt의 폐쇄 . PDA 2.1±0.85 mm(2 8 pulmonary atresia with intact 1.2 mm 4.3 mm) . coil ventricular septum, hypoplastic right ventricle 1 . 2 DUCT-OCCLUD(pfm), bidirectional cavo-pulmonary shunt(BCPS) 8 Gianturco coil . Coil , BT shunt coil PDA Ratio 2.72±0.69(1.7 . 8 mm Gianturco coil 1 4.2) . PDA approach 6 transve- 가 , haptoglobin<40 mg/dL, plasma nous , 4 transarterial . hemoglobin 69 mg/dL, indirect hemoglobinemia, 3 (30%), 1 blood urea/creatinine , hemoglobin level 6 (1 66%), 1 7.8 g/dL . 9 6 (2 75%) coil 17 . 가 . 가 2 1 3 6 coil 5 mm Gianturco , recanalization , coils , 3 mm coil 1 가 . Recanalization , 3 . 1 (4 , 5 , 6) Doppler 가 2 m/sec , 3 Rashkind Double - Umbrella Device(Umbrella)

Table 2. Results of PDA transcatheter coil embolization

Case	Gender	Age	Heart murmur	Ductal diameter	Coil type	Coil diameter	Ratio	Approach	Previous ligation / umbrella	Complication	Occlusion	Last F / U time
1	F	3 y1m	+	4.3 mm	pfm	9 mm	2.1	V	- / -	-	1 wk	21 m
2	M	5 y2m	+	2.5 mm	pfm	7 mm	2.8	V	- / -	-	Not	22 m
3	M	7 y7m	-	2.0 mm	G	5 mm	2.5	A	+ / -	-	1 m	14 m
4	F	2 y	+	2.0 mm	G	5 mm	2.5	V	- / +	-	Not	4 m
5	M	3 y3m	+	1.7 mm	G	5 mm	2.9	A	- / +	-	Not	12 m
6	F	3 y	+	1.8 mm	G	5 mm	1.7	V	- / +	-	Initial	1 m
7	F	4 y6m	+	1.2 mm		3 mm	4.2	V	- / -	-	3 wk	6 m
8	F	6 y9m	+	2.0 mm	G	5 mm	2.5	V	- / -	-	Not	*
9	M	7 y	-	2.0 mm	G	5 mm	2.5	A	- / -	-	Initial	8 day
10	F	4 y2m	+	1.6 mm	G	5 mm	3.1	A	- / -	+	Initial	1 m

Ratio : Coil diameter÷Ductal diameter, F/U : follow up, V : transvenous, A : transarterial, y : year, m : month, wk : week, pfm : DUCT-OCCLUD diabol shape double cone coil, G : Gianturco coil, D : COOK Detachable coil, Not : Not occluded, Initial : initially occluded, * : follow up loss after catheterization

, 4 가 2.5 m/sec
2.0 m/sec , 5 6 mm 1
- 가
15 mmHg, 5 mmHg . 1 (10)
coil

관상동맥-우심방루
4 11

, ECG ST segment, T wave, Q wave



Fig. 3. Pre-embolization angiography showing coronary fistula draining to right ventricle.



Fig. 4. After multiple coil embolization, coronary fistula was completely occluded.

, Gianturco coils 8 mm 1 , 5
, small leakage , 1
가 .

관상동맥-우심실루

7 8

ECG

. 5 2 coil

, Complex Helical Fibered Platinum Coils 6 ,
COOK Tornado coils 4 , Spiral tungstene coils
6 (Figs.
3 and 4)

고 안

1) -

,
,¹⁹⁾
Left - to - Right shunt

cardiopulmonary bypass

가 .²⁰⁾ 가
collaterals

가 ,
. ²¹⁾

, 가

Sharma ²⁰⁾ 67 Fail
5 82%(51/
62), 11%(7/62), 6%(4/62)
가
Sharma ²⁰⁾ coil arterial pr -
essure tracing damping pressure
curve가 upstroke ,

. Coil

2) coil Umbrella ductal diameter
Hemi - Fontan Azygos Rao ²⁶⁾ Umbrella
vein steal , ⁵⁾ GI - large size sheath가
enn shunt Azygos vein steal , small sized PDA
²⁰⁾ , residual shunt가
6 coil ,
6 Fontan protrusion
shunt Nykanen ²⁷⁾ Umbrella occlusion
2 17% residual shunt가
. Umbrella coil 3F 5F
sheath . coil
3) BT shunt 1 Umbrella ²⁸⁾ coil
. Shim ²²⁾ PDA coil coils
8 mm, 5 mm coils 2 large sized PDA
small residual shunt , Rao ²⁶⁾ ductal
. 9 diameter 3.5 mm coil
가 6 g/dL coil 가 가 transcatheter occlusion
. Coil small residual shunt . Hijazi ¹¹⁾ 7 mm
가 , 4 mm large sized PDA
coils coil 19 2 6 coils
가 16 immediate occlusion
coil .
가 PDA 10 2
. Rosenthal ²³⁾ P - silent PDA
DA 8 mm coil 1 large residual silent PDA
shunt hemolysis , . PDA left -
large coil 1 right shunt , 0.45%
coils ²⁹⁾ , 0.5%
. Rosenthal ²³⁾ endocarditis silent
4) PDA transcatheter occlusion 가 PDA , Rao ²⁶⁾ PDA
Rashkind Double -
Umbrella Occlusion System(Umbrella) . silent PDA
small and medium sized PDA
occluding spring coil coil diameter ductal diameter
²⁴⁾ Zeevi ²⁵⁾ ductal diameter 2.5 mm 1.7 . Rothman ³⁰⁾ 30
PDA demographic, hemodynamic 2 3
, coil group Umbrella , 30 1.7
Coil group residual flow가 10 coil 1

1 ductal diameter가 2.5 transarterial approach³⁰⁾³¹⁾³⁴⁾
mm . Hijazi³¹⁾ ductal diameter 10 3 가
2.5 mm coil 1 2m/sec , 3 coil
. Umbrella
10 PDA coil 가 . Carey³⁵⁾ 25 Coil
30%, 1 가 75% , Hijazi³¹⁾ 6 가 1.5
coil 1 10 9 2.1m/sec , Nykanen²⁷⁾ Umbr -
, Rothman³⁰⁾ coil 1 ella 1.8 3m/sec 가
24 23 가 , coil BT sh -
. ductal diameter 2.1 mm unt systemic - pulmonary collate -
Hijazi 10 1.7 mm Rothman 24 rals, venous collaterals, - ,
1.7 mm , 가
1 3 , coil , ,
small leakage . 1 Coils
. , coil
가 1 , 1 가 ,
. Umbrella occlusion leakage coil
3 2 4 - coil
, Umbrella coil PDA
. coil
가 가 . PDA .
coil
,³²⁾ Umbrella 요 약
. De Moor³³⁾ Umbrella 15
coil 14 24 연구배경 :
. Rosenthal²³⁾ coil
coil 24 가 가 .
Umbrella 7 4 , coil
47 41 . 7
3 6 2 , 1 1 방법과 결과 :
. Umbrella 1995 1 1997 6
coil 가 coil 51
. 10 6 transvenous approach, 4
transarterial approach . 가 38 (5
가), 가 6 , BT
, transvenous approach가 coil aortic shunt 가 1 , 가 9 ,
loop 가 , 가 1 , 가
. 1 . - 38 ,
가 가 70 123 coil

1.79 ± 0.77 coil , 74%
 , 21% , 4%
 6 3 , 3
 . BT shunt coil 1
 coil
 . 9 PDA
 coil 10
 2.1 ± 0.85 mm 가 30%, 1
 가 66%, 1 75% . Coil

, 1 coil
 . 2
 coil

결 론 :

Coil

중심 단어 :

96

(02 - 96 - 107)

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