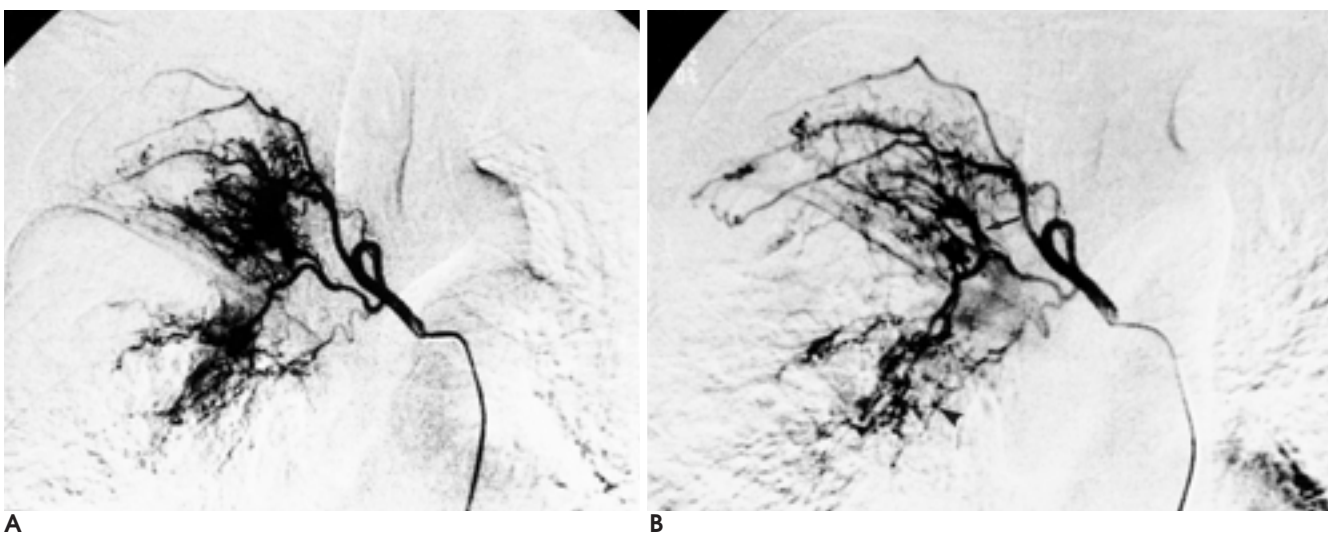




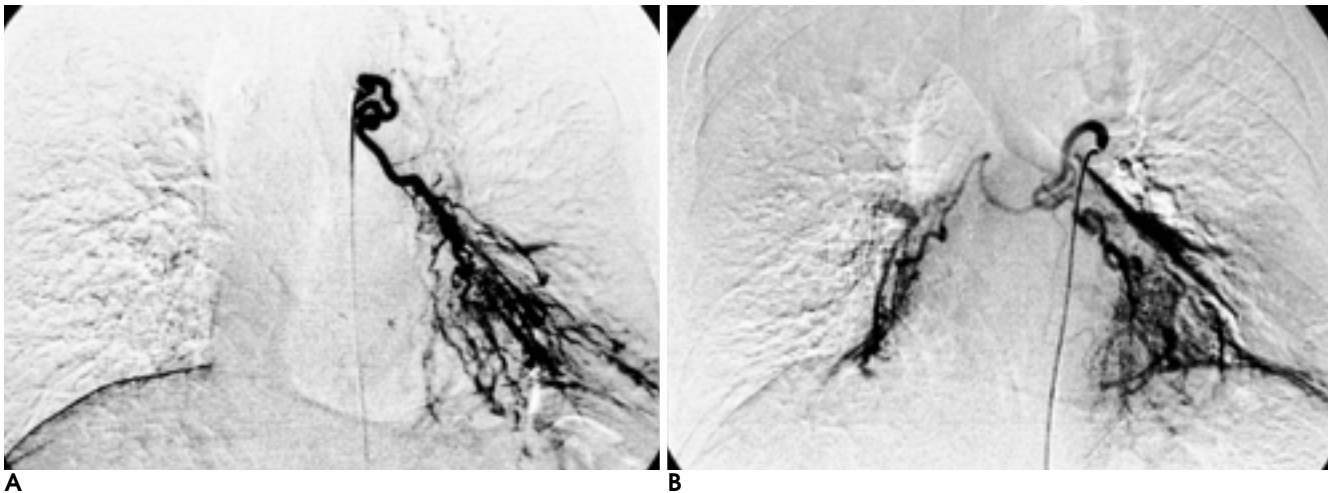
:  
 : 1996 10 2000 6  
 18 ( : 23 )  
 2 (Group I) 2 (Group II)  
 가 , ,  
 Chi-square test  
 : I 9 (Group I, n=10) II 9 (Group II, n=13)  
 . I ( n=29) 가 2 ,  
 가 27 II ( n=31) 가 2 ,  
 가 29  
 ( $x^2=0.005, p=0.945$ ). , I ( n=30)  
 10 II ( n=35) 20 ,  
 21 , 14  
 ( $x^2=0.308, p=0.579$ ).  
 , I ( 가 n=10) 1  
 (10.0%), 5 (50.0%), 4 (40.0%) , II ( 가  
 n=13)  
 12 (92.3%), 1 (7.7%) 2  
 ( $x^2=5.383, p=0.068$ ).  
 : 가

. 2  
 가 2  
 .  
 (1-3).  
 1974 Remy (4)  
 (1, 2). (5,  
 가 6). , (77-91%)  
 ( 43%)  
 가 (7-14).

1996 10 2000 12  
125 300 cc Upjohn, Kalamazoo, U.S.A.)  
18 , 23 가 가  
14 가  
2 2 1)  
9 (Group I, 10 ) 2 가  
9 (Group II, 13 ) 가  
(newly developed feeder) , 2)  
(previously embolized feeder, Fig. 1)  
, 3)  
4 6 (missed feeder, Fig. 2)  
Chi-square test  
가 ,  
p value가 0.05  
(MultiStar, Philips, Eindhoven, Netherlands)  
(HEAD-HUNTER, Cordis Europa N.V., Roden, Netherlands & COBRA, Terumo Corp. Toyko, Japan)  
2-4 ml 4-6 DSA(2-4 가 14 , 가 4 , I  
frame/sec) 3 French 가 7 , 가 2 , 2 가  
7 , 가 2 . 51.4 (9.5 , 35-73 )



**Fig. 1. A.** Right intercostobronchial trunk arteriography for initial bronchial artery embolization shows dilated right bronchial artery with neovascularity, periarterial diffusion, bronchopulmonary shunt, patchy parenchymal staining and thrombosis in distal branch of the bronchial artery. **B.** Bronchial angiography for control of recurrent hemoptysis after one month and 2 weeks. As compared with initial bronchial angiography, the neovascularity has been decreased, but there are bronchopulmonary shunt(long arrow) and development of small aneurysm(arrowhead) in the same area of initial lesions.



**Fig. 2. A.** Left bronchial angiography for initial bronchial artery embolization shows dilated left bronchial artery with neovascularity, periarterial diffusion, bronchopulmonary shunt and aneurysm. Three abnormal bronchial arteries were occluded during initial bronchial artery embolization. **B.** Another common bronchial angiography for control of recurrent hemoptysis after 8 days. This common bronchial artery is missed feeder during the initial bronchial artery embolization.

**Table 1.** Clinical Data of Patients with Recurrent Hemoptysis after Bronchial Artery Embolization

	Group I (n=9)	Group II (n=9)	Total (n=18)
Mean age(R) year	50.4 (42 - 57)	52.3 (35 - 73)	51.4 (35 - 73)
Sex			
Male	7	7	14
Female	2	2	4
Causes			
Tuberculosis	8	7	15
Aspergillosis	1	1	2
Idiopathic		1	1
Mean interval (SD, R) day	8.2 ( $\pm 3.8$ , 1 - 14)	249.4 ( $\pm 282.2$ , 15 - 1019)	144.9 ( $\pm 244.5$ , 1 - 1019)

Group I: Recurrent hemoptysis within 2weeks

Group II: Recurrent hemoptysis after 2weeks

R : range

SD: standard deviation

**Table 2.** Angiographic Findings in Case of Repeat Bronchial Artery Embolization\*

Findings	Group I(n=29)	Group II(n=31)	Total(n=60)
Direct sign	2	2	4
Extravasation	1	1	2
Thrombosis	1	1	2
Indirect sign	27	29	56
Neovascularity	8	7	15
Shunt	6	7	13
Aneurysm	4	8	12
Periarterial diffusion	9	7	16

\*:  $\chi^2=0.005$ ,  $p=0.945$

Group I: Recurrent hemoptysis within 2weeks

Group II: Recurrent hemoptysis after 2weeks

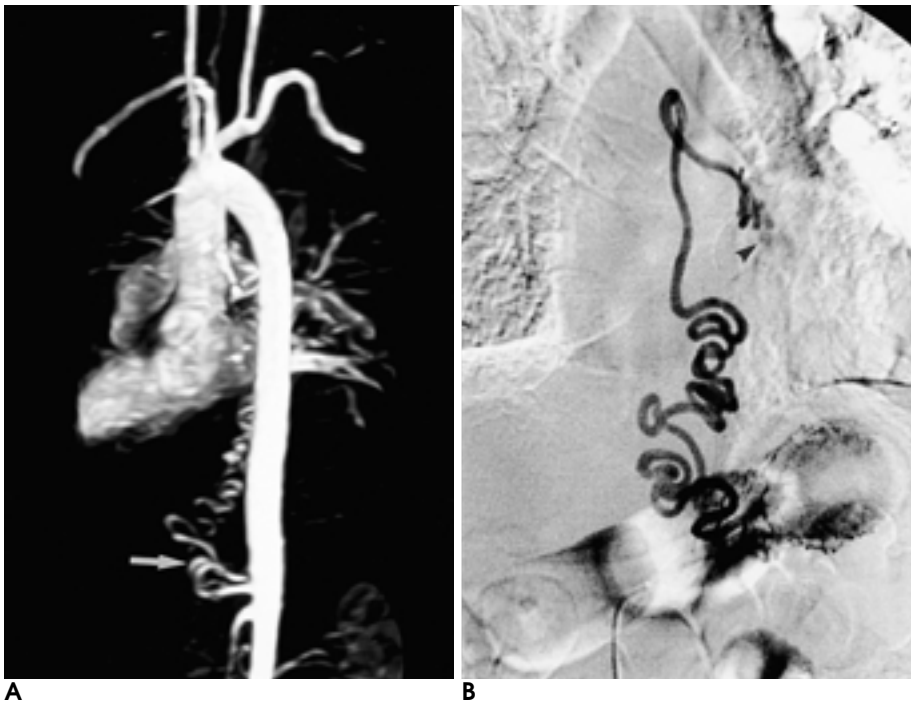
가 6 , 가 9 ,  
4 . II (n=31)  
I 1  
가 7 ,  
가 7 , 가 7 ,  
8 .  
( $\chi^2=0.005$ ,  $p=0.945$ ) (Table 2).  
I  
30 20 , 10  
5 , 6 ,  
(common trunk) 2 , (inter -  
costobronchial trunk) 4 , 3  
4 , 2 ,  
1 , 1 . II  
35 21

	Group I(n= 30)	Group II(n = 35)	Total(n= 65)
Bronchial a.	20	21	41
Right bronchial a.	5	5	10
Left bronchial a.	6	6	12
Common bronchial a.	2		2
Rt. intercostobronchial a.	4	8	12
Lt. intercostobronchial a.	3	2	5
Non bronchial systemic a.	10	14	24
Right intercostal a.	4	6	10
Left intercostal a.	2	4	6
Lateral thoracic a.	2		2
Internal mammary a.		2	2
Costocervical trunk	1		1
Subscapular a.	1	2	3

Group II: Recurrent hemoptysis after 2weeks

	Group I(n = 10)	Group II(n = 13)	Total(n = 23)
Newly developed feeder	1		1
Previously embolized feeder	5	12	17
Missed feeder	4	1	5

Group II: Recurrent hemoptysis after 2weeks



**Fig. 3. A.** Contrast enhanced MR angiography before bronchial artery embolization. Tortuous & dilated accessory bronchial artery running toward left lower lobe, is arised from left gastric artery(arrow). **B.** Selective arteriography of the accessory bronchial artery reveals aneurysmal dilatation in left lower lobe(arrowhead).

가 가 II  
가 35 14 (40%)  
(13/60, 21.7%)  
(15/60, 25%), (12/60, 20%),  
(16/60, 26.7%)  
(13), (20)  
가  
(20)  
(left gastric artery)  
가 (Fig. 3).  
Rasmussen (21).  
Uflacker (7)  
(5, 20).  
(24/65, 36.9%)  
(41/65, 63.1%)  
가 30 I 10 (33.3%), 2  
II (9, 10 ) 가 5 , 가 4  
가 II (9, 13 )  
(12 )  
1  
( $\chi^2=5.383, p=0.068$ ) 2  
(92.3%)

594

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## Recurrent Bleeding After Arterial Embolization in Patients with Hemoptysis: Comparison of Angiographic Findings and Relapsing Period<sup>1</sup>

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**Purpose:** To describe the angiographic findings of patients with recurrent hemoptysis after bronchial artery embolization (BAE) according to the point at which relapse occurred.

**Materials and Methods:** From 125 patients who underwent BAE due to hemoptysis between 1996 and 2000, we selected 18 of 23 who underwent additional BAE due to recurrent bleeding after initial BAE. Depending on the point at which relapse occurred, they were divided into two groups (I and II, according to whether additional BAE was performed within two weeks of initial BAE or more than two weeks after this). We retrospectively compared the two groups in terms of angiographic findings, number of embolized arteries, and character of feeding arteries at initial and additional BAE.

**Results:** Nine patients in group I (additional BAE: n = 10) and nine in group II (additional BAE: n = 13) were admitted for recurrent hemoptysis within two weeks of initial BAE and more than two weeks after this, respectively. In group I (n = 29) and II (n = 31), angiography demonstrated two direct and 27 indirect, and two direct and 29 indirect signs of hemorrhage, respectively. No statistically significant differences were observed ( $\chi^2 = 0.005$ ,  $p = 0.945$ ). Among the embolized feeder vessels in group I (n = 30) there were 20 bronchial artery and 10 non bronchial systemic collaterals, while for group II (n = 35), the corresponding totals were 21 and 14. Again, no statistically significant differences were encountered ( $\chi^2 = 0.308$ ;  $p = 0.579$ ). In group I, feeders were newly developed in one case (10%), previously embolized in five (50%), and missed in four (40%), while in group two the corresponding figures were none, twelve (92.3%), and one (7.7%). No significant differences were noted, though the incidence of previously embolized feeders in Group II was very high ( $\chi^2 = 5.383$ ,  $p = 0.068$ ).

**Conclusion:** Among patients in whom hemoptysis after BAE recurred at different times, the angiographic findings and number of embolized arteries were not significantly different, but differences in the nature of the feeder were noted. Patients in whom hemoptysis recurred more than two weeks after BAE showed more recanalization of previously embolized feeders than those in whom there was recurrence within two weeks.

**Index words :** Lung, hemorrhage  
Arteries, therapeutic embolization  
Arteries, bronchial

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