



:

.  
: 1992 2000 131  
104 , 27 , 54.4 (16 - 79 )  
. Seldinger ,  
1 × 3 mm 2 × 3 mm 2 × 5 mm  
:  
: 131 34 (26.0%) 22 ,  
12 . Kaplan - Meier  
1 88.8%, 1 79.9%, 2 77.3%  
(tortuosity) 3 ,  
3 , 가  
2 ,  
1 9 . 13  
. 161 8 (6%), 8 (6%),  
7 (5%) , 1 (0.7%), 1 (0.7%)  
.

:

1973 Remy (1) BAE  
(bronchial artery embolization, BAE) , (6)  
BAE  
(1 - 5). BAE  
(6 - 14). (1,  
, 2, 6, 14) ,  
(7 - (7, 12,  
13) , 15).  
PVA (polyvinyl alcohol particles, 350 -  
500 μ), glue (n - butyl cyanoacrylate, NBCA),

1)  
2)

1992 2000 9 168 가

PVA 11 142  
가 131  
104 , 27 , 54.4 (16 - 79 )  
(n=42, 28.4%), (n=29, 19.6%)  
(n=33, 22.3%)  
104 (70.3%)  
PCR (poly -  
merized chain reaction)  
(high -  
resolution computerized tomography, HRCT)  
가  
(n=18, 12.2%), (n=13, 8.8%),  
(n=5, 3.4%), (n=4, 2.7%), (n=3, 2.0%),  
(n=1, 0.7%)  
5 4 (Table  
1).  
300 mL  
100 mL 가 30 , 100 - 500 mL 73 , 500  
mL 28

**Table 1.** Underlying Causes of Hemoptysis

Underlying causes	No. of patients (%)
Tuberculosis	104 (70.3)
Active type	29
Inactive type	42
Tuberculous bronchiectasis	33
Non-TBC bronchiectasis	18 (12.1)
Aspergilloma*	13 (8.8)
Chronic bronchitis**	5 (3.4)
Lung cancer	4 (2.7)
Lung abscess	3 (2.0)
Bacterial pneumonia	1 (0.7)
Total	148

\*, \*\* : All patients with aspergilloma and 4 of 5 patients with chronic bronchitis were combined with tuberculosis.

:  
HRCT  
Seldinger  
Pigtail catheter (Merit  
Medial System, South - Jourdan, Utah, U.S.A.)  
5F Cobra catheter (Cook,  
Bloomington, IN, U.S.A.) 5F Right Left Bronchial  
catheter (Clinical supply, Gifu, Japan)가 ,  
96  
3F (Microferret , Cook, Bloomington, IN, U.S.A.)  
(n=87), (n=82),  
(n=31), (n=22), 가  
(n=7) 가 (8)  
(Fig. 1).  
gelatin sponge (Gelfoam ,  
Pharmacia and Upjohn, Kalamazoo, MI, U.S.A.)  
, (n=9) PVA (n=2)  
1 × 3 mm ,  
2 × 3 mm, 2 × 5 mm  
Visipaque (320mg I/mL, Nycomed  
Ireland, Cork, Ireland) , Multistar  
T.O.P. (Siemens, Erlangen, Germany)  
100 cc 가 2  
BAE  
1 84

**Table 2.** Target Arteries for Embolization

Arteries	Number
Bronchial artery	180
Right bronchial artery	96
Left bronchial artery	58
Both bronchial artery	26
Intercostal artery	52
Internal mammary artery	28
Lateral thoracic artery	26
Superior thoracic artery	6
Thyrocervical artery	4
Inferior phrenic artery	2
Costocervical artery	1
Thoracoacromial artery	1
Total	300

22.7

Kaplan - Meier

131

300

161

180 (60%),

52 (17.3%),

28 (9.3%),

26 (8.7%)

6 (2%),

4 (1.3%),

2 (0.67%),

가

1 (0.33%)

(Table 2).

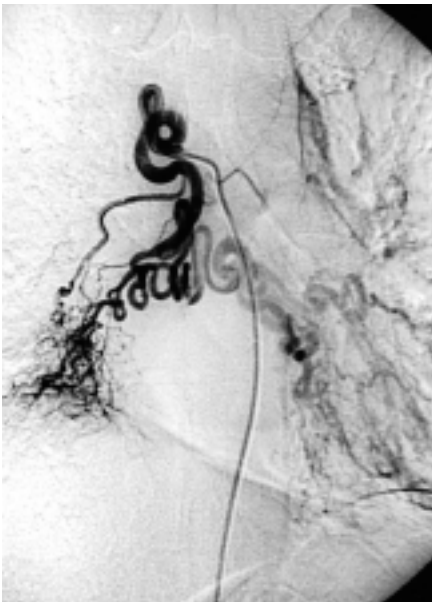
131

34

(26.0%),

22/131 (16.8%),

12/131



A



B



C



D



E

Fig. 1. Various angiographic findings in patients with hemoptysis.

A. Tortuous enlarged feeder

B. Broncho-pulmonary shunt

C. Pseudoaneurysm

D. Peribronchial hypervascularity

E. Extravasation of contrast media (black arrow)

(9.2%) (Fig. 2, 3).

가 가 22 4 2  
( Kaplan - Meier

)  
18 2 BAE (Table 3).

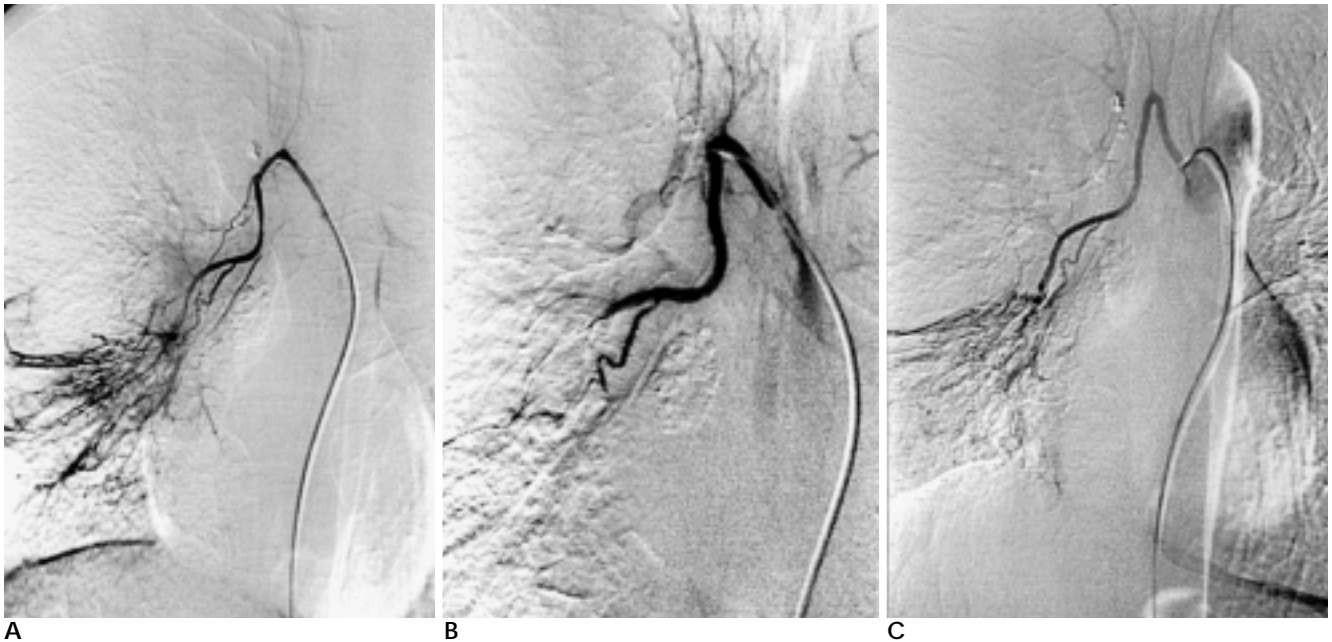


Fig. 2. Angiograms showing recurrence of hemoptysis from the same artery.  
A. Right bronchial artery(RBA) angiogram shows hypervascularity in its territory.  
B. RBA is completely occluded by Gelfoam torpedo.  
C. After 4 months, repeated angiogram demonstrates hypervascularity of previous RBA territory.

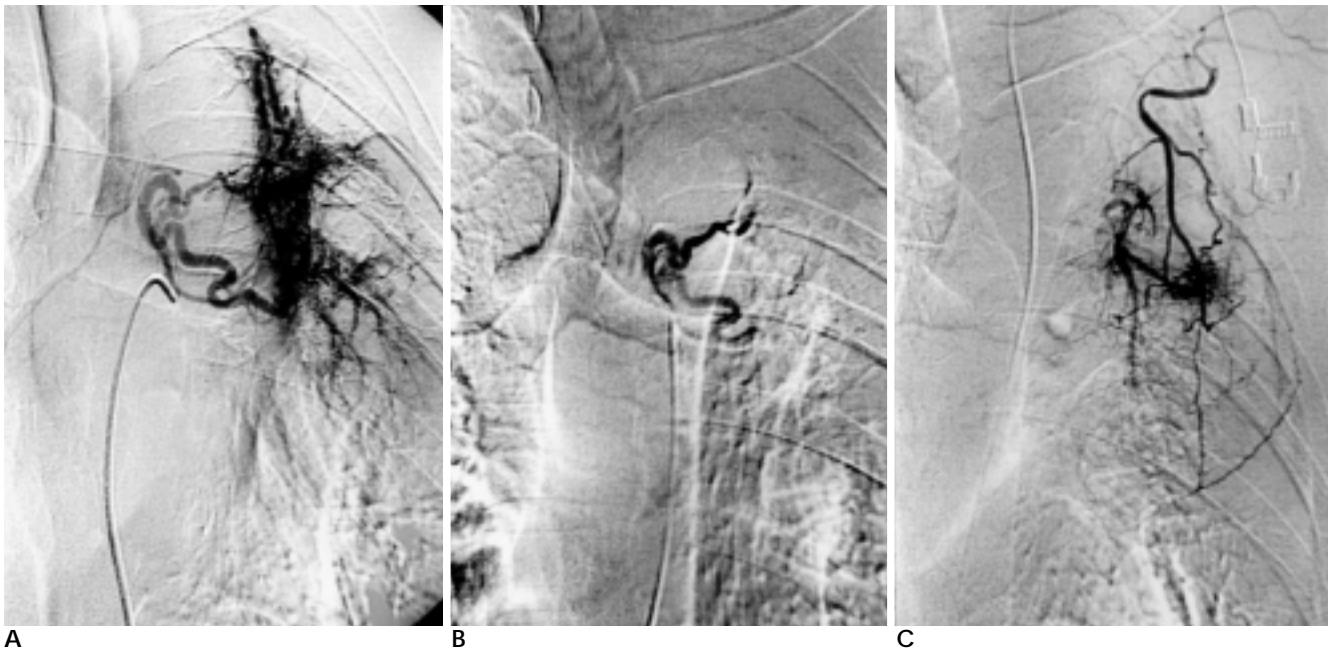


Fig. 3. Angiograms showing recurrence of hemoptysis from the different artery.  
A. Left bronchial artery(LBA) angiogram shows tortuous enlargement of LBA and hypervascularity in the left upper lung zone.  
B. LBA is completely occluded by Gelfoam torpedo.  
C. After 8 months selective lateral thoracic artery angiogram shows hypervascularity and shunt into the superior pulmonary vein in the left upper lung zone.

**Table 3.** Total Cumulative Control Rate After Bronchial Artery Embolization

Follow-up Period (Months)	Total		Same Artery		Different Artery	
	No. of Patient	Control Rate (%)	No. of Patient	Control Rate (%)	No. of Patient	Control Rate (%)
1	21	83.4	14	88.8	7	94.4
3	26	77.9	18	84.3	8	93.3
6	29	74.0	20	81.7	9	91.9
12	31	70.8	21	79.9	10	90.5
24	34	60.3	22	77.3	12	83.2

1 83.4%, 3 77.9%, 1 70.8%, 2 60.3%  
 , 1 88.8%, 3  
 84.3%, 1 79.9%, 2 77.3%  
 1 94.4%, 3 93.3%, 1 90.5%, 2 83.2%  
 .  
 14/22 (63.6%) , 1 13/22  
 (59.1%) . 84 17  
 . 7/12 (58.3%) 1  
 . 25  
 .  
 9/131 (6.9%)

13/131 (9.9%)

1)  
 가 3 , 2)  
 가 3 , 3)  
 가 2 , 4)  
 가 1 .

1 94.3%, 3 93.1%, 1 20).  
 88.2%, 2 85.1% (Table 4).  
 96 19 (19.8%) ,  
 8 (8.3%), 11 가  
 (11.5%)

8 (6%), 8 (6%), 7 (5%)  
 가 , 1 (0.7%),  
 1 (0.7%)  
 .  
 3-4  
 1 900cc  
 ,  
 . 1

**Table 4.** Cumulative Control Rate in Patients Undergoing Initial Successful BAE

Follow-up Period (Months)	Total	
	No. of Patient	Control Rate(%)
1	8	94.3
3	9	93.1
6	11	90.2
12	12	88.2
24	13	85.1

가 50%  
 (5). BAE ,  
 (1 - 5).  
 BAE  
 , (2, 7, 8, 9, 12, 19,  
 20). Uflacker (2) 76.6%,  
 72.7% , (19)  
 85.2%, 43.8% .  
 가 82%, 19% (6)  
 , Kato (7) 1 94%  
 (12)  
 79.6%, 55.8% , (20)  
 55% 96%  
 .  
 80 - 90% (1, 2, 3, 7, 8, 9).  
 131 BAE 1  
 83.4%, 3 77.9%, 1 70.8%, (24 - 84  
 ) 60.3% .  
 (1, 2, 9, 15, 19, 21)

:

1) BAE 22 1 13 1  
2) 14 , 1 (Table 3).  
(2, 7, 8). 9  
(22). 13 1 7 1 8  
Tanaka (6) 1 7 21 - 35  
, 87%  
BAE BAE (23).  
, 96 8  
(8/96 , 8.3%)  
가  
가  
BAE  
가 BAE PVA  
BAE 가  
가  
Tanaka (6) Kato  
(7)  
가  
가  
( ;  $n=22/131$  ,  
16.7%) (  $n=9/22$  ,  
40.9%), (  $n=13/22$  , 59.1%) 21 - 23 , 30 -  
( ;  $n=12/131$  , 9.2%) 35 (23). 1  
PVA,  
NBCA, (2, 5, 14, 23).  
가  
(1, 2, 6, 14), (2, 24, 25), (26), (22,  
(7, 12, 15) 26)  
PVA 40%  
(6), 가 (13, (Table 2), 2  
19, 22) 가  
(13, 19).  
가  
가  
BAE  
가  
BAE가  
가  
BAE  
가 24

가

151

가 1

, 3 - 4

(6, 9),

(16,

17).

(18),

(2),

(2,

9)

(8)

가

BAE

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## **Bronchial Artery and Non-bronchial Systemic Artery Embolization for the Treatment in Patients with Hemoptysis: Analysis of Efficacy of Gelfoam Single Use<sup>1</sup>**

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**Purpose:** To investigate the efficacy of Gelfoam single use for the management of hemoptysis by analyzing patients with recurrence in embolized artery and other artery, respectively.

**Materials and Methods:** Between 1992 and 2000, 131 patients (104 men and 27 women, mean age: 54.4 years) with hemoptysis underwent BAE using gelatin sponge only. After puncturing the femoral artery using the Seldinger method, angiographies of the thoracic aorta, the bronchial arteries, the intercostal arteries, and the systemic collaterals which were suspected of bleeding focus and embolization were performed. Gelfoam was used 1 × 3 mm and 2 × 3 mm or 2 × 5 mm by the diameter of feeding arteries. The cumulative hemoptysis control rate and recurrence rate were analyzed from the previously embolized vessels.

**Results:** Hemoptysis were recurred among 34 of 131 patients. Twenty-two patients had a recurrence from the same vessels and 12 from the different ones. Using the Kaplan-Meier method, the cumulative hemoptysis control rate was obtained in the patients with a recurrence from the same vessels: 88.8% in 1 month, 79.9% in 1 year, and 77.3% in 2 year. The reasons for recurrences of the same lesions are as follows; due to the tortuosity of the vessel ( $n=3$ ); partial embolization through the common trunk formation between bronchial and anterior spinal artery ( $n=3$ ); by vessel spasms or autogenous thrombus ( $n=2$ ); due to the contrast media hypersensitivity ( $n=1$ ). These 9 patients were not treated successfully. In the remaining 13 cases, hemoptysis were recurred due to recanalization of embolized vessels. Among 161 procedure, complications consisted of fever ( $n=8$ ), dyspnea ( $n=8$ ), mild chest discomfort ( $n=7$ ), lower back pain ( $n=1$ ), and transient lower leg paralysis ( $n=1$ ), which were improved within several days. There was no serious complication in this study.

**Conclusion:** Bronchial artery embolization using Gelfoam alone maybe effective and safe to control hemoptysis.

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

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