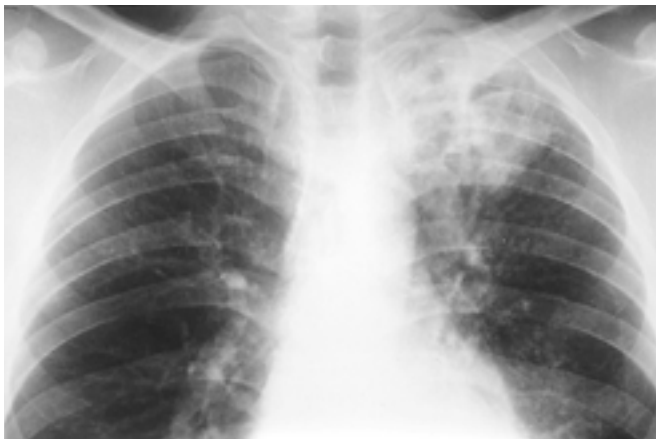


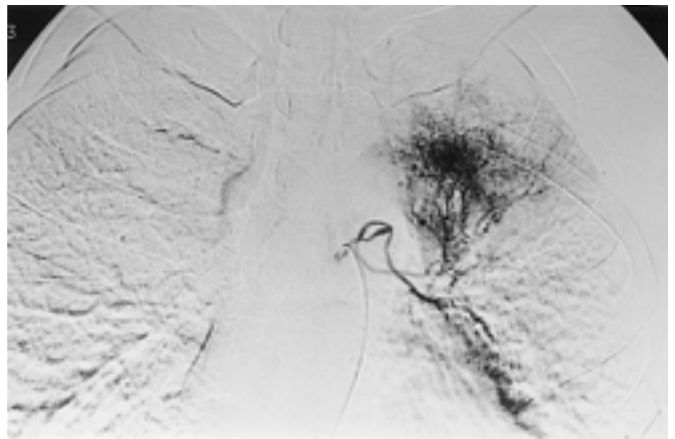
:
 : 265 가 206
 4 Type Type I , Type II ,
 , Type III Type I Type II
 Type IV
 4 Group Group I
 , Group II (internal mammary artery)
 (intercostal artery) , Group III Group I Group II
 Group IV 2
 (hypervascularity)
 6
 : (Type I)
 (Type II, III, IV) 가
 Type I 96% (47/49), Type II가 82% (36/44), Type III가
 70% (28/40) Type IV가 55% (40/73) 74% (151/206) . 6
 Type I 80% (36/45), Type II가 75% (30/40), Type III가 59%
 (20/34), Type IV가 48% (20/42) 66% (106/161)
 :
 가
 가
 (hemoptysis) 가 collaterals) (embolotherapy)가
 가 (1, 3 -
 6).
 , , (aspergilloma) , 가
 ,
 (1, 2).
 가

1992 3 1998 12
 265
 가 206 143
 , 63 36 (18 - 87)
 4 Type Type I
 (Fig. 1A), Type II
 , Type
 III Type I II
 Type IV
 (Fig. 2A, 3A)
 4 Group Group I
 (Fig. 1B), Group II
 가 , Group III Group
 I II 가
 Group IV 2
 (Fig. 3B)

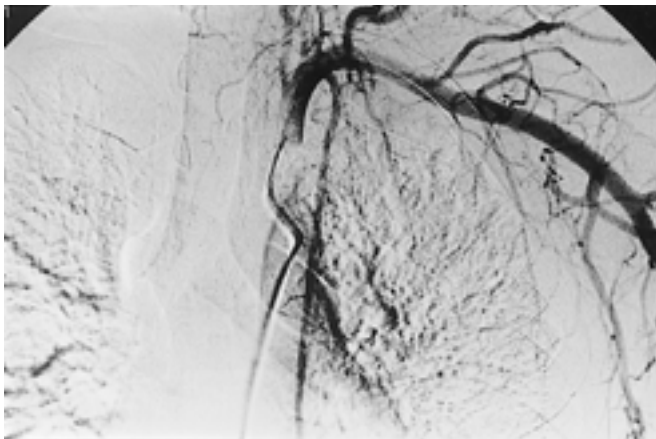
Type Group
 6
 Optimus DVI system (Philips, Eindhoven,
 DSA (4 frame/sec)
 (extravasation of the contrast) (Fig.
 3B)
 (shunt), (aneurysm)
 Gelfoam (2 × 2 ×
 2 mm, 1 × 1 × 1 mm) Ivalon(Polyvinyl alcohol)
 X -
 206 Type I
 49 , Type II 44 , Type III 40 ,
 Type IV 73 ,



A



B



C

Fig. 1. 30-year-old Male Patient

A. Chest radiograph shows ill-defined lung parenchymal lesion from pulmonary tuberculosis which confined to left upper lobe (Type I).

B. Left bronchial arteriogram shows hypervascularity (Group I).

C. There are no evidence of abnormality on left subclavian arteriogram.

Group I 85 , Group II 49 , Group III 34 ,
Group IV 47 , (Type I)
(Type II), (Type III),
(Type IV)
가
(Table 1).

Type
Type I 49 (100%), Type II가
44 (100%), Type III가 40 (100%), Type IV가 73
(100%) 206 (100%)가
Type I 2 (4%), Type II가 14 (32%), Type
III가 23 (58%), Type IV가 56 (77%)

Table 1. Comparison of Plain Chest Radiographs with Angiographic Findings.

	Type I (n = 49)	Type II (n = 44)	Type III (n = 40)	Type IV (n = 73)	Total (n = 206)
Group I	40	24	10	11	85
Group II	8	15	11	11	45
Group III	0	3	13	13	29
Group IV	1	2	6	38	47

Table 2. Angiographic Findings According to Plain Chest Radiographs

	Type I (n = 49)	Type II (n = 44)	Type III (n = 40)	Type IV (n = 73)	Total (n = 206)
Hypervascularity	49	44	40	73	206
Hypertrophied vessel	2	14	23	56	95
Shunt	8	10	13	48	79
Aneurysm	0	0	4	19	23
Extravasation of contrast	0	0	0	5	5

Type I 8 (16%), Type II가
10 (23%), Type III가 13 (33%), Type IV가 48 (66%)
가
Type I II
Type III 4 (10%) Type IV 19 (26%)
가
Type I, II, III Type IV 5 (7%)
가 (Fig. 2B) (Table 2).

252 ,
135 , 69 , (thyrocervical artery) 32
, (costocervical artery) 20 , (thoracoacromial artery) 50 , (lateral thoracic artery)
36 , (subscapular artery) 4 . Type
Table 3 .

Type
I 47 (96%), Type II가 36 (82%), Type III가 28
(70%), Type IV가 40 (55%) , 151 (73%)
가 166 6
() Type I 36 (80%),
Type II가 30 (75%), Type III가 20 (59%), Type IV가
20 (48%) 106 (66%) (Table 4).

Table 3. Number of Embolized Vessel According to Type of Pulmonary Tuberculosis

	Type I	Type II	Type III	Type IV	Total
Bronchial artery	53	52	49	98	252
Intercostal artery	8	22	26	79	135
Internal mammary artery	3	5	15	46	69
Thyrocervical artery	1	1	4	26	32
Costocervical artery	0	0	3	17	20
Thoracoacromial artery	0	1	10	39	50
Lateral thoracic artery	0	3	2	31	36
Subscapular artery	0	0	0	4	4



A

Fig. 2. 44-year-old Male Patient

A. Chest radiograph shows pleural infiltrates which have extended beyond the apex with associated volume loss of the right hemithorax (Type IV).



B

B. Right bronchial arteriogram shows direct extravasation (arrows) of contrast materials. This patient expired during angiography procedure.

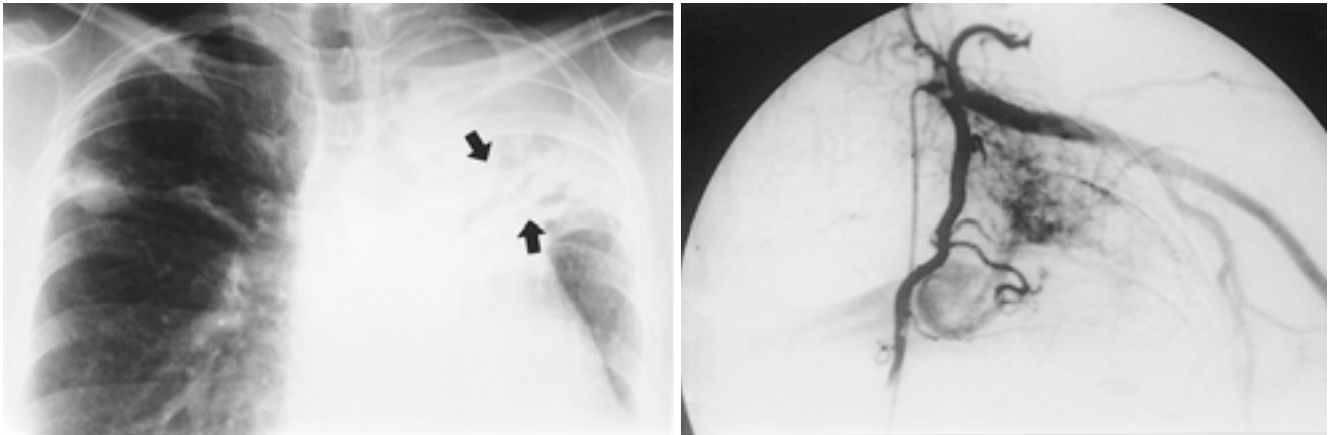


Fig. 3. 48-year-old Female Patient
A. Chest radiograph shows lung parenchymal lesion with inner branching pattern (arrows) of radiolucencies (bronchiectasis) and pleural infiltrates which have extended beyond the apex in the left hemithorax (Type IV).
B. Left subclavian arteriogram shows hypervascularities (Group IV)

Table 4. Hemostatic Effects of Embolization

	Early	Long-term
Type I	47/49 (96%)	36/45 (80%)
Type II	36/44 (82%)	30/40 (75%)
Type III	28/40 (70%)	20/34 (59%)
Type IV	40/73 (55%)	20/42 (48%)

4 (9%), Type III가 1 (2.5%), Type IV가 15 (21%)
 Type I .
 가
 (erosion),
 가 (3).
 가
 가
 Ferris (16) 25
 Uflacker (10) 75
 3
 Type IV
 5
 가
 (3).
 (therapeutic indication)
 (severity) (volume of bleeding)
 (mild)
 (8).
 (2 - 6).
 (chemotherapy) 10, 11, 14, 15, 17 - 21).
 (phrenic artery),
 Keller
 (9).
 (15)

48

28 (58%)

가

가

가

가

(transpleural nonbronchial collaterals)

가

(cystic

가

fibrosis)

(parietal pleura)

(visceral pleura)

(17).

가

Type IV

Type

(3)

가

Uflacker

(10) 77%, Remy (11) 84%, Rabkin (12) 91%,

Hayakawa (13) 86%, Ramakantan (14) 73%

(3) 85.2%, (4)

84%

72 - 80%

가

(3) 43.8%, (4) 43%, (5)

38%

74%

66%

Type IV

48%

Type I

96% 80%

가

55%

Keller

(15)

가

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Effectiveness of Embolization for Management of Hemoptysis in Pulmonary Tuberculosis: Comparison of Chest Radiographic Study and Angiography¹

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Purpose: To compare the effectiveness of embolization of the bronchial artery embolization for the management of hemoptysis in pulmonary tuberculosis cases with the severity of lung parenchymal injury and pleural infiltration, as seen on plain chest radiographs, and with the findings of angiography of the bronchial artery.

Materials and Methods: Among 265 patients with hemoptysis due to pulmonary tuberculosis, the findings of plain chest radiography and angiography of the bronchial artery were comparatively analyzed in the 206 for whom the results of follow up were available. The chest radiographic findings were classified as follows: Type I refers to simple pulmonary tuberculosis; Type II includes cases in which pulmonary tuberculosis is complicated by bronchiectasis, aspergillosis, or cavitation; Type III is either Types I or II accompanied by pleural infiltrates limited to the lung apex, and Type IV includes cases in which pleural infiltrates have extended beyond the apex in the whole of the lung. Bronchial angiographic findings were divided into four groups: Group I consists of cases which show abnormalities of only the bronchial artery; Group II includes those in which abnormalities are seen in the bronchial artery and either the internal mammary or an intercostal artery; Group III comprises cases which belong to Group I or II and in which a branch of the subclavian artery is abnormal, and Group IV includes those in which abnormalities occur in at least two branches of the subclavian artery, or there is direct visualization of hypervascularity of this vessel. The initial post-embolic hemostatic effect and the results of follow up were studied over a six-month period.

Results: As compared with simple pulmonary tuberculosis (Type I), we found that as the severity of pleural infiltration and complications revealed by plain chest radiographs increased (Type II, III, IV), so did the severity of the manifestation of systemic collateral arteries other than the bronchial artery, as depicted by increase on bronchial angiography. Early post-embolic hemostasis occurred in 96% of Type-I cases (47/49), 82% of Type II (36/44), 70% of Type III (28/40), and 55% of Type IV (40/73). The average success rate was 74% (151/205). During the six month follow-up period, continued hemostasis was found in 80% of Type-I patients (36/45), 75% of Type II (30/40), 59% of Type III (20/34), and 48% of Type IV (20/42). The average long-term hemostasis rate was 66% (106/161).

Conclusion: Bronchial angiography shows that in systemic collateral arteries circulation increases very substantially, and in cases in which plain chest radiographs depict extensive pleural infiltration or complications associated with pulmonary tuberculosis, it is therefore difficult to expect good hemostatic results after embolization. In such instances we thus recommend aggressive treatment such as surgical intervention.

Index words : Tuberculosis, pulmonary

Lung, hemorrhage

Angiography

Arteries, therapeutic embolization

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