

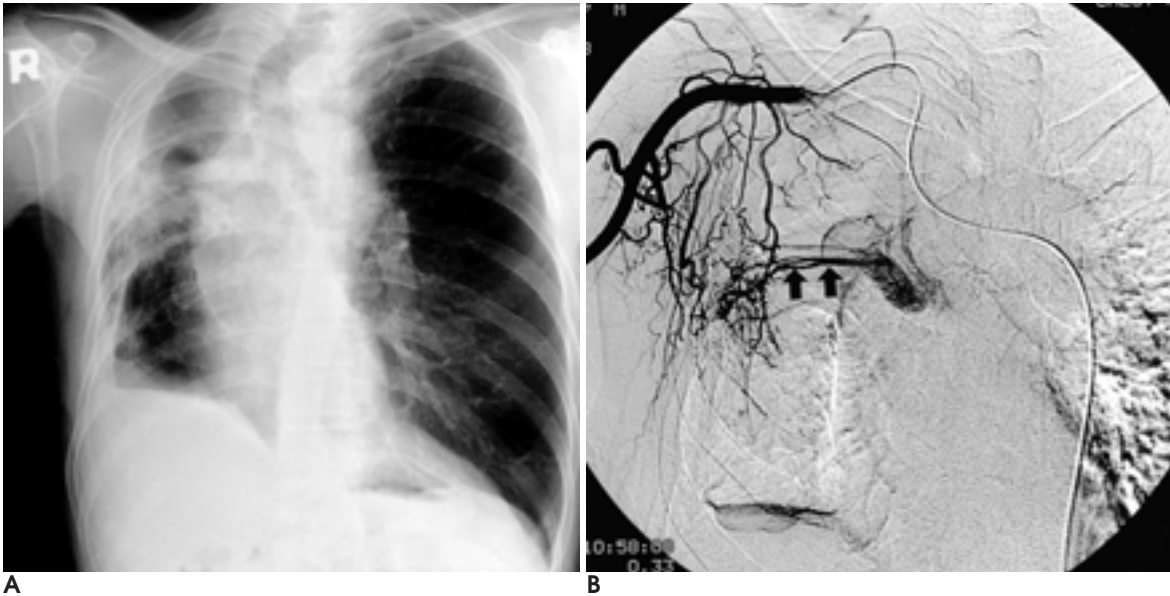
:  
 :  
 48 ( 39 , 9 , 51 )  
 65 ( 11, 20, 17)  
 (34 , 3 ), (11  
 ), (2 ), (1 )  
 : 가 44 34 (78%) , 가 21  
 6 (29%) , 85% 60%  
 가  
 가 45 35 (78%) , 20 5  
 (25%)  
 ( $p<.001$ ),  
 ( $p<.05$ )  
 :  
 가 , 가  
 가  
 1974 Remy (1)  
 NBFA 가 가  
 , , 가  
 , , ,  
 (2-5). NBFA  
 (nonbronchial feeding artery:  
 NBFA) 가  
 NBFA  
 . Keller (2) 1996 5 1999 10  
 NBFA 가 66  
 , NBFA 가 ( : 31 , : 17 ) 48  
 , Tamura (3) (6) 300 mL  
 가 27 , 가 21  
 가 39 , 가 9 , 14  
 81 51 . 34  
 ( 3 가 ), 11 ,  
 2001 5 24 2001 7 26  
 263

2 , 가 1 .  
 Seldinger  
 5 Fr (GRB , GLB , Clinical supply,  
 Gifu, Japan), 5 Fr Cobra (Cook, Blooming - ton, U.S.A.)  
 .  
 38 가 .  
 , 5 Fr Headhunter (Cordis, Florida, U.S.A.),  
 5 Fr Berenstein (Terumo, Tokyo, Japan)  
 . 3 Fr SP  
 (Terumo, Tokyo, Japan), MicroFerret (Cook,  
 Bloomington, U.S.A.) , 1 mm<sup>3</sup>  
 (Gelfoam , Pharmacia & Upjohn,  
 Kalamazoo, U.S.A.) 510 - 720  $\mu$ m ployvinyl alco -

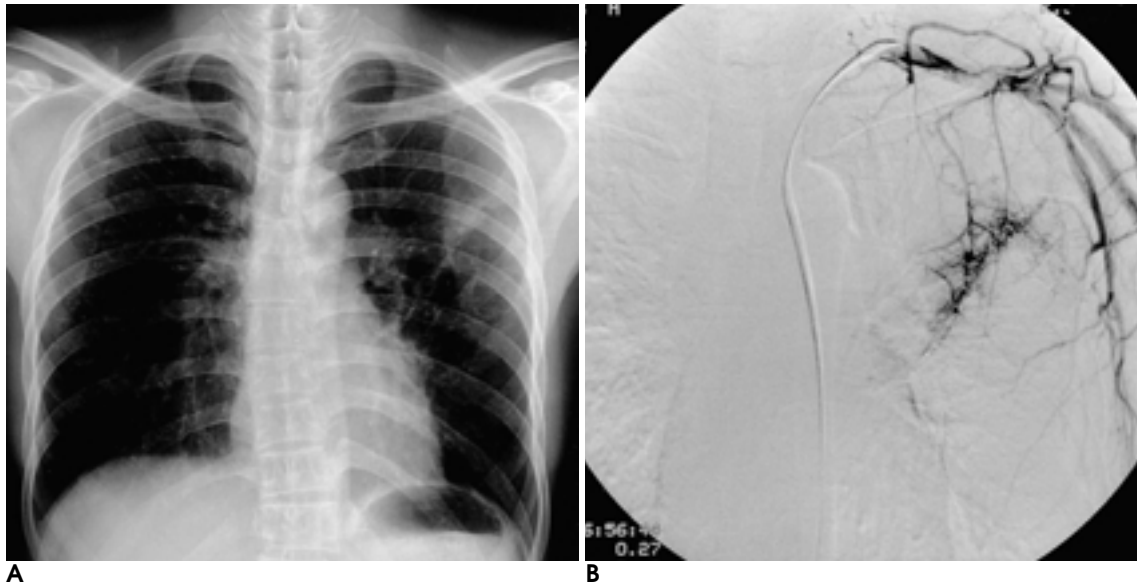
**Table 1.** Nonbronchial Systemic Feeding Arteries in 48 Patients with Hemoptysis

Arteries	Number of patients
Intercostal	26
Internal mammary	19
Thoracoacromial	14
Lateral thoracic	10
Thyrocervical	4
Thoracodorsal	3

hol (Ivalon , Cook, Bloomington, U.S.A.)가 .  
 , blushing  
 가 13  
 가 33  
 (27%), NBFA 가 2 (4%) NBFA가  
 (69%), NBFA 35 (73%) . NBFA  
 (intercostal artery) 26 가 ,  
 (internal mammary artery), (thora -  
 coacromial artery) (Table 1).  
 , 가  
 . (distortion)  
 0.5 cm 1 , 0.5 -  
 1 cm 2 , 1 cm 3 ,  
 (costophrenic angle)  
 1/4 가 1 , 1/4 - 1/2  
 2 , 1/2 3 .  
 1 , 1 , 1  
 .  
 (blood - tinged sputum)  
 48 17 , 11 , 20



**Fig. 1.** A 59-year-old man with massive hemoptysis. Radiograph (A) shows severe pleural thickening and parenchymal distortion in right thorax, findings of long-standing pulmonary tuberculosis. Right subclavian angiogram (B) shows hypervascularity, vascular blush, and systemic-to-pulmonary shunt (arrows) feeding from lateral thoracic and thoracoacromial arteries.



**Fig. 2.** A 36-year-old man with massive hemoptysis. Chest radiograph (A) shows nodular and linear opacities in left upper lung consistent with pulmonary tuberculosis. Although there is no pleural thickening or parenchymal distortion in radiograph, left subclavian angiogram (B) shows hypervascularity and vascular blush feeding from branches of thoracoacromial artery. Systemic-to-pulmonary shunt was seen on the late-phase image (not shown).

**Table 2.** Correlation between Underlying Diseases and the Presence of Nonbronchial Feeding Arteries on Angiography in 48 Patients with Hemoptysis

Disease	Nonbronchial Collaterals on Angiography		Total
	Negative	Positive	
Tuberculosis*	8	26	34
Bronchiectasis	7	4	11
Others †	0	3	3
Total	15	33	48

\* Includes 3 tuberculous patients with aspergilloma

† Includes 2 with paragonimiasis and 1 with metastatic tumor

65  
(hemithorax),  
NBFA  
Chi-square test, Fisher's exact test, Spearman's correlation  
(SPSS, Chicago, IL, U.S.A.).

NBFA  
34 (76%)  
NBFA가 14 (50%)  
( $p=0.72$ ).  
4 (36%) NBFA가  
( $p=.026$  Fisher's exact test) (Table 2).  
65  
44 (78%) NBFA가 (Fig. 1),  
가 21 (29%)  
(Fig. 2) ( $p<.001$ ),  
60% NBFA 85%  
(Table 3).  
가 2, 3 (5 mm) NBFA  
가 2 (68%) 80%  
가 1 (1/4)  
) 90% NBFA가 2, 3  
NBFA

(Table 4).  
45 (78%)  
NBFA가 (Fig. 1), 20  
5 (25%) NBFA가 (Fig. 2) ( $p<.001$ ) 88%  
60%  
34 (78%) 11 (36%)  
15 (43%) NBFA가  
( $p=.015$ ) (Table 3).  
43 (81%) NBFA가  
가 6 (17%) NBFA가  
( $p=.004$ , Fisher's exact test).  
가 1, 3  
10  
6  
3  
1

**Table 3.** Correlation between Simple Radiographic Findings and the Presence of Nonbronchial Feeding Arteries on Angiography in 65 Hemithoraces

Findings	Nonbrochial Feeders		Total	p-value*
	Negative (n = 25)	Positive (n = 40)		
<b><i>Pleural thickening</i></b>				< .001
Negative	15 (71)	6 (29)	21	
Positive	10 (23)	34 (78)	44	
<b><i>Parenchymal distortion</i></b>				< .001
Negative	15 (75)	5 (25)	20	
Positive	10 (22)	35 (78)	45	
<b><i>Location of abnormality</i></b>				.015
Upper	9 (26)	25 (74)	34	
Lower	8 (73)	3 (27)	11	
Both	4 (27)	11 (73)	15	
Normal	4 (80)	1 (20)	5	

\* by Chi-square test  
Numbers in parentheses are percentages.

**Table 4.** Correlation between the Grade of Pleural Thickening and the Presence of Nonbronchial Feeding Arteries on Angiography in 65 Hemithoraces

Findings	Nonbronchial Feeders		Total	Correlation* Coefficient
	Positive (n = 25)	Posi (n = 40)		
<i>Pleural thickening (thickness)</i>				.457 ( $p < .05$ )
0 (No thickening)	15 (71)	6 (29)	21	
1 (< 5 mm)	5 (42)	7 (58)	12	
2 (5-10 mm)	0 (0)	7 (100)	7	
3 (> 10 mm)	5 (20)	20 (80)	25	
<i>Pleural thickening (area)</i>				.310 ( $p < .01$ )
0 (No thickening)	15 (71)	6 (29)	21	
1 (< 1/4)	2 (10)	18 (90)	20	
2 (1/4-1/2)	4 (40)	6 (60)	10	
3 (> 1/2)	4 (29)	10 (71)	14	

\* by Spearman 's correlation  
Numbers in parentheses are percentages.

**Table 5.** Correlation of Radiologic Findings and Result of Bleeding Control

		< 1week			< 1month			> 1month		
		C	I	P	C	I	P	C	I	P
Pleural Thickening on radiograph	+	20	14	1.000	15	15	.738	8	9	.673
	-	8	6		7	5		5	3	
Collateral Vessels on Angiography	+	20	13	.755	12	17	.047	7	10	.202
	-	8	7		10	3		6	2	

C, complete hemostasis; I, incomplete hemostasis; P, by Fisher's exact test.

가 28 (38%)

가 17 (53%)

가 9 (30%)

가 29 (30%)

(Table 5).

(Table 5).

가  
가  
가  
(systemic - pulmonary anastomoses)  
NBFA  
NBFA가  
가  
NBFA가  
가  
(7, 8).  
Keller (2)  
NBFA가  
Tamura (3)  
가  
가  
(3, 9).  
NBFA가  
가  
(6)  
(Type I),  
(Type II),  
(Type III),  
(Type IV)  
NBFA  
가  
Type III IV Type I, II  
NBFA  
가  
NBFA  
11 7  
가  
가 NBFA  
가  
NBFA  
NBFA가  
NBFA가  
NBFA  
가  
77% NBFA가  
29% NBFA  
85%  
60%  
가 80% 가  
가 NBFA가  
가  
NBFA 가 (Table 4).  
78% NBFA가  
25% NBFA가 88%  
60%  
11 (17%)  
가  
가  
가  
6 3 NBFA  
NBFA  
NBFA가  
가  
NBFA가  
가  
NBFA  
가  
NBFA  
가  
(15).  
NBFA  
가  
(4), Jardin Remy (5)  
NBFA  
11 7  
NBFA가  
NBFA가  
NBFA  
가  
NBFA  
가  
(14)  
15 8  
20 3  
(12)  
가  
NBFA  
가  
(5, 13,  
4 -  
30 - 45%  
73%  
가 NBFA가  
NBFA  
가  
34 26 (76%) NBFA  
11 4

•

(36%) NBFA가  
(Table 2). NBFA 가  
NBFA  
Rabkin (1)  
306  
28 26  
Remi - Jardin (17) 17  
가  
가  
가 NBFA 가  
(Table 5). Tamura (3) (6)  
“ blood - tinged sputum ”  
가  
NBFA  
가 NBFA 가  
(inferior phrenic artery)  
가 NBFA  
Keller (2) 20 3 (13)  
194 1 , (6), (16) 1  
Im (18)  
CT  
(extrapleural fat layer)  
가  
Im NBFA가 CT  
(4 8 )  
가  
(apicolateral)  
(innermost intercostal muscle) (subcostal muscle)  
가 가  
(19).

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## Nonbronchial Systemic Feeding Arteries in Patients with Hemoptysis: Predictive Factors at Radiography<sup>1</sup>

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**Purpose:** To determine the radiographic findings which predict the presence of nonbronchial systemic feeding arteries (NBFAs) in patients undergoing embolotherapy to control hemoptysis.

**Materials and Methods:** In 48 patients (39 men and 9 women; mean age, 51 years) who underwent embolotherapeutic procedures for controlling hemoptysis, selective angiography was performed at the intercostal, subclavian and bronchial arteries in 65 hemithoraces (right 11, left 20, bilateral 17). Underlying diseases were tuberculosis (n = 34, including three patients with aspergilloma), bronchiectasis (n = 11), paragonimiasis (n = 2) and metastatic cancer (n = 1). The presence of NBFA at angiography was correlated with radiographic findings including pleural thickening, parenchymal distortion, and the location of lung lesions.

**Results:** NBFAs were found in 34 (77%) of 44 hemithoraces with pleural thickening, and in six (29%) of 21 without pleural thickening; the sensitivity and specificity of prediction were 85% and 60%, respectively. NBFAs were observed with greater frequency as the thickness of the pleura increased, and the extent of pleural thickening correlated less with the presence of NBFA than did thickness. NBFAs were found in 35 (78%) of 45 hemithoraces with parenchymal distortion, and in five (25%) of 20 without distortion ( $p < 0.001$ ). In addition, the distribution of the underlying disease in the upper lung zone showed close correlation with the presence of NBFAs ( $p < 0.05$ ).

**Conclusion:** In patients with hemoptysis, the pleural thickening revealed by radiography has a high sensitivity and a relatively low specificity for predicting the presence of NBFA, and patients with parenchymal distortion and upper lung lesions have a high incidence of NBFA.

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

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