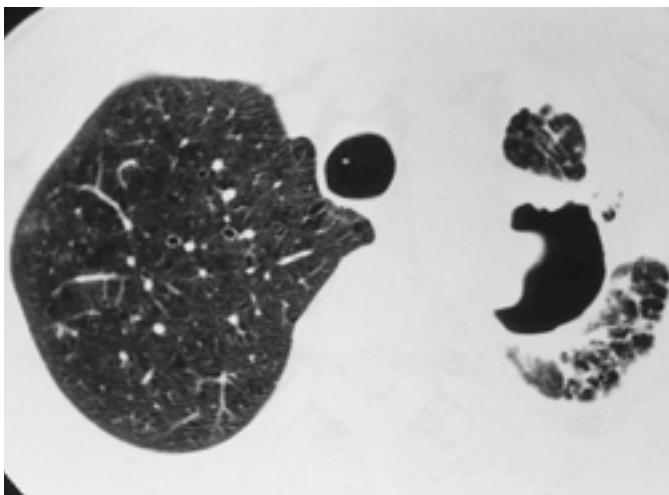


:
(HRCT) , HRCT
: 1997 6 1999 6
49 HRCT 25
, HRCT
2 6
,
. HRCT
HRCT
:
25 24
28 HRCT
10 8 (80.0%), 9 7 (77.8%), 30
21 (70.0%), 23 1 (4.3%)
:
HRCT
가 가 ,

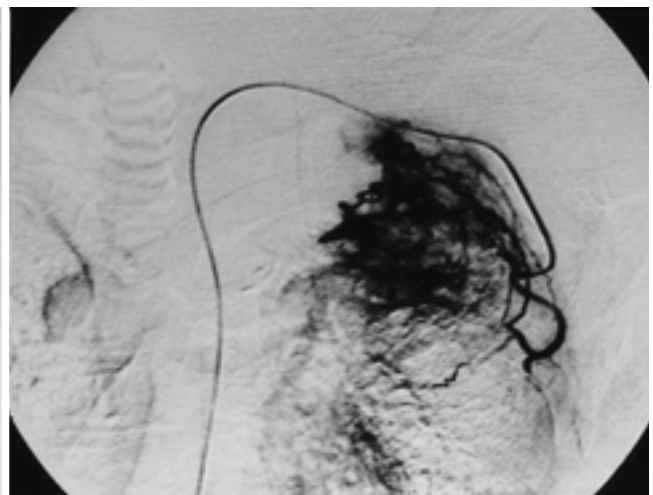
300 - 600 ml
(1).
50 - 60%
(4).
가
가
(1).
80%
20 - 30%
(2)
(3).
9%
가
(4).
1997 6 1999 6 300 cc
49
HRCT 25
(5),
(HRCT) (6).
Remy
HRCT
(2)

18 81 (47.6) ,
 16 , 9
 25 24 (96%)가
 8 , 1 (4%)가
 24 16
 , 8
 16 가 4
 tree - in - bud 3 11 HRCT
 HRCT 8 5
 , 3 HRCT
 25 9
 4 가
 , 5
 HRCT 15
 , 1

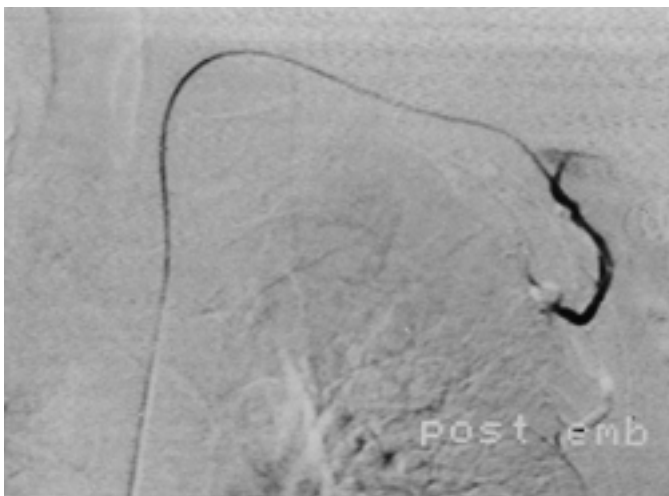
HRCT
 2 - 4 ml 4 - 6
 ,
 ,
 ,
 (2, 5). HRCT Somatom Plus S (Siemens,
 Erlangen, Germany) GE 9800 Quick (GE Medical System,
 Milwaukee, Wisconsin, U.S.A.)
 1 mm
 7 - 10 mm
 (window
 level) - 700 - - 750 HU, (window width) 1000 -
 1500 HU
 . HRCT
 (,)가



A



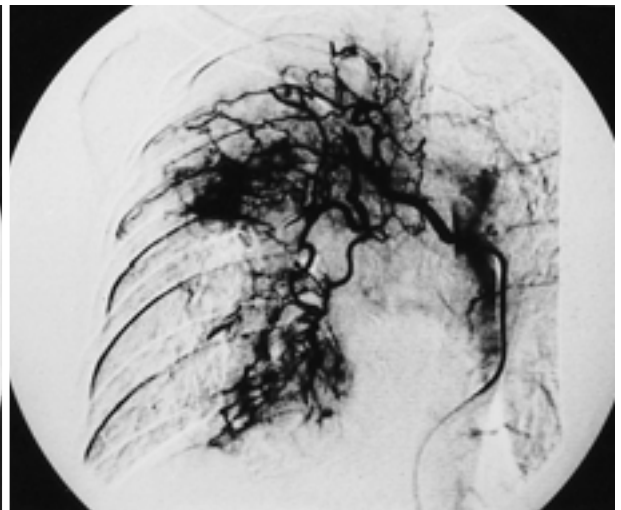
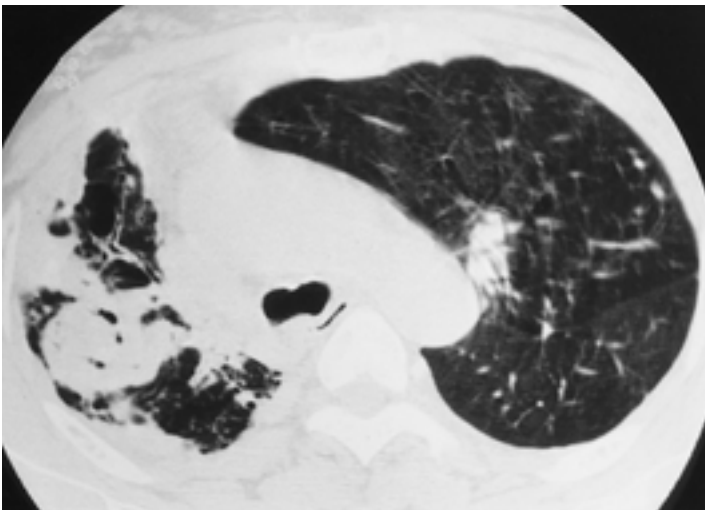
B



C

Fig. 1. 29-year-old man with partially treated pulmonary tuberculosis and massive hemoptysis of about 500 cc for 24 hours.
A. HRCT scan through the left upper lobe shows cavity with consolidation.
B. Left subclavian arteriogram shows hypertrophic and tortuous arteries in the left upper lobe.
C. After embolization with gelfoam, occlusion of the left subclavian arterial branch at proximal level is noted. During follow up, he complained no symptom.

HRCT 2 6 HRCT 24 9
 . HRCT 가 1 7 14 가 . 5 , 가 2
 , - 2 , 가 3 1
 . 2.1 cm (, 0.7 cm - 4.3 cm)
 24 8 10
 . 24 19
 30 . 14
 24 19
 47 , 12 14
 , 18 23
 . 25
 가 1 , 2
 HRCT , HRCT 24 28
 . 24
 HRCT 7 9
 , HRCT 7 (77.8%)
 가 (Fig. 1). - 가 8
 10 8 8 (80.0%)
 (Fig. 2). 19 30
 17 21 (70.0%)
 . 17 26 15 19
 (73.1%) (Fig. 3),
 2 (50.0%) 2 4
 23 1 (4.3%)



A **B**
Fig. 2. 54-year-old woman with pulmonary tuberculosis and recurrent massive hemoptysis of about 800 cc for 2 days.
A. HRCT scan through the right upper lobe shows air-meniscus sign with consolidation.
B. Selective right bronchial angiogram shows hypervascularity in the right upper and lower lung zones.

가 . 6 8
11 11 , 6 가
가 (Table 1, 2). 4 4
HRCT - 가
2 2 , 2 1 , -

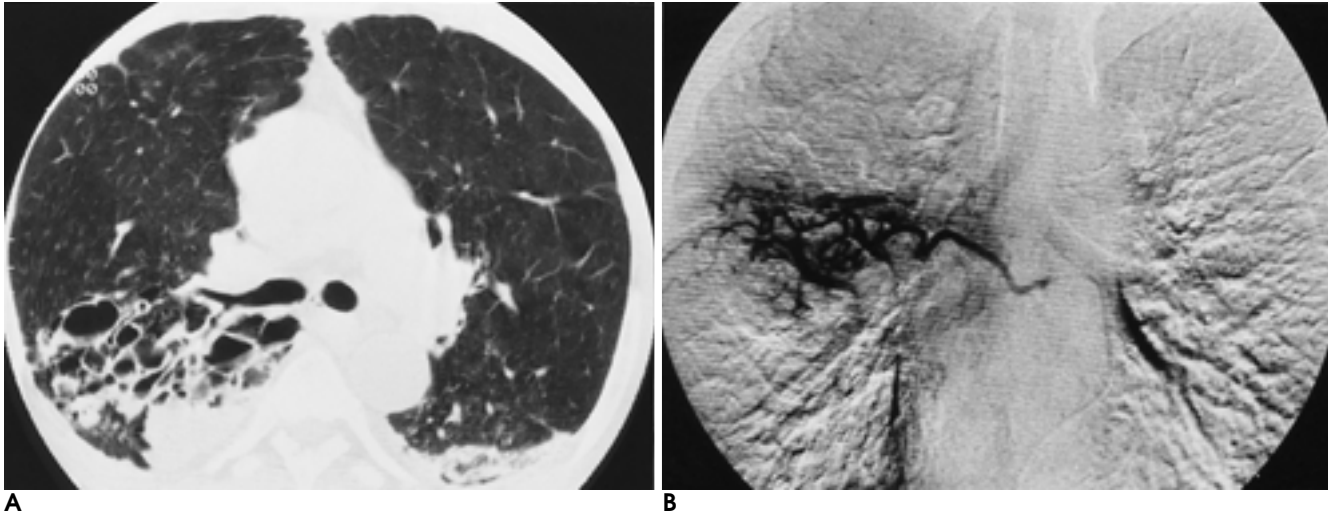


Fig. 3. 60-year-old man with clinically fully treated pulmonary tuberculosis and massive hemoptysis of about 300 cc for 12 hours.
A. HRCT scan through the right upper posterior segment shows bronchiectasis with consolidation.
B. Selective right bronchial angiogram shows hypertrophic and tortuous arteries in the right middle lung zone.

Table 1. Distribution of HRCT Findings and Hemorrhagic Foci of the Angiogram in the 25 Patients with Massive Hemoptysis

Patient No.	Age/Sex	HRCT findings						Arterial
		Cavity	Air-meniscus sign	Bronchial dilatation	GGO	Consolidation	Fibrotic Scar	Embolization
1	18/F	LUL	LUL	RUL,LUL	RLL,LUL,LLL		RLL,LLL	RUL,LUL
2	55/M	RUL	RUL,RLL		RUL,RLL,LLL	RML	RLL	RUL
3	29/M	LUL		LUL	LUL,LLL	LUL	LLL	LUL
4	28/F	LUL		RLL	LLL			LUL
5	39/F	RUL,RML,RLL		RUL,RML,RLL	RUL,RML,RLL		RUL	RLL
6	57/M	RUL			RUL,RML,RLL		RML	RUL
7	32/M	LUL			LUL,LLL	LUL,LLL	LLL	LUL
8	70/M		LUL	LUL	RML,RLL,LUL,LLL		RLL,LLL	LUL
9	54/F		RUL	RUL,RLL		RUL		RUL,RLL
10	60/M		LUL	RUL,LLL			RUL	LUL
11	70/M		RUL	RUL,LLL		LLL	LLL	RUL(IC)
12	65/F		RUL,LLL			LLL	LLL	RUL
13	74/F		RLL		RUL,RLL,LLL	RLL	LLL	RLL(IC)
14	32/M			LLL	LLL	LUL,LLL	LUL	LLL
15	57/M			LLL	RLL,LLL		RLL	LLL
16	61/M			RUL,LUL	RLL,LUL	RLL		RUL,LUL
17	22/M			RUL,RML	RLL			RML
18	34/F			RML,RLL	RML			RML
19	25/M			RUL	RUL,RLL	RUL		RUL(SC)
20	17/M			LLL	RML,RLL,LUL,LLL		RLL,LUL	LLL
21	81/F			RML	RUL,RML,RLL,LLL	RML	RUL,RLL,LLL	RML
22	43/M			RUL,LUL			LUL	RUL,LUL
23	58/M			LLL	RUL,LUL,LLL		RUL	LLL
24	60/M			RUL,RLL	RUL,RML,LUL	LUL	LUL	RUL
25	49/F			RML	RML,RLL			NA

GGO: ground-glass opacity, IC: intercostal artery, LLL: left lower lobe, LUL: left upper lobe, NA: not applicable, RLL: right lower lobe, RML: right middle lobe, RUL: right upper lobe, SC: subclavian arterial branch

Table 2. Corresponding Rate of HRCT Findings and Bleeding Foci of the Arteriography

HRCT findings	Corresponding Rate
Cavity	7/9 (77.8)
Air-meniscus sign	8/10 (80.0)
Bronchial dilatation with consolidation and/or GGO	19/26 (73.1)
Bronchial dilatation without consolidation and/or GGO	2/4 (50.0)
Fibrotic scar	1/23 (4.3)
Consolidation and/or GGO only	0/11 (0)

GGO: ground-glass opacity,

No: number of lobes of hemorrhagic foci/number of lobes of HRCT findings

Numbers in parentheses are percentages.

10 8
가 ,
(7, 15, 16, 20).
가 ,
(1, 18).
가 ,
가
(4).
,
가
Damiani (21)
HRCT (50%)
(40%) ,
, 10 - 20% 가 ,
(1, 7).
,
,
,
(8 - 10, 12, 13, 19).
,
HRCT가 (22).
(15, 16). 가 가
Rabkin (12) 가
, 가
,
(2, 3, 13, 14). HRCT (5),
Damiani (21) HRCT (6).
HRCT 97%
35%
1 (4%) HRCT
(15, 16). , 25 24 (96%) HRCT
Rasmussen (17)
Uflacker (18)
25 24 가 ,
, HRCT 77.8%,
가 80%, 70%
HRCT
(4).

1. Uflacker R, Kaemmerer, Neves C, et al. Management of massive hemoptysis by bronchial artery embolization. *Radiology* 1983;146: 627-634

2. Remy J, Voisin C, Dupuis C, et al. Traitement des hémoptysies par embolization de la circulation systemique. *Ann Radiol* 1974;17: 15-16

3. Keller FS, Rosch J, Loflin TG, Nath PH, McElvein RB. Nonbronchial systemic collateral arteries: significance in percutaneous embolotherapy for hemoptysis. *Radiology* 1987;164:687-692

4. 1994;30:1029-1034

5. Ramakantan R, Bandekar VG, Gandhi MS, Aulakh BG, Deshmukh HL. Massive hemoptysis due to pulmonary tuberculosis: control with bronchial artery embolization. *Radiology* 1996; 200:691-694

6. Najarian KE, Morris CS. Arterial embolization in the chest. *J Thorac Imaging* 1998;13:93-104

7. 1987;34:217-222

8. Harley JD, Killien FC, Peck AG. Massive hemoptysis controlled by

transcatheter embolization of bronchial arteries. *AJR Am J Roentgenol* 1977;128:302-307

9. Garzon AA, Cerruti MM, Golding ME. Exsanguinating hemoptysis. *J Thorac Cardiovasc Surg* 1982;84:829-833

10. Conlan A, Hurwitz S, Krige L, et al. Massive pulmonary hemoptysis. *J Thorac Cardiovasc Surg* 1983;85:120-124

11. MacErlean DP, Gray BJ, FitzGerald MX, et al. Bronchial artery embolization in the control of massive hemoptysis. *Br J Radiol* 1979;52:558-561

12. Rabkin JE, Astafiev VI, Gothman LN, et al. Transcatheter embolization in the management of pulmonary hemorrhage. *Radiology* 1987;163:361-365

13. Vujic I, Pyle R, Parker E, et al. Control of massive hemoptysis by embolization of intercostal arteries. *Radiology* 1980;137:617-620

14. Moore LB, McWey RE, Vujic I. Massive hemoptysis: control by embolization of the thyrocervical trunk. *Radiology* 1986;161:173-174

15. 1988;24:187-195

16. 1992;28:505-512

17. Remy J, Smith M, Lemaitre L, et al. Treatment of massive hemoptysis by occlusion of a Rasmussen Aneurysm. *AJR Am J Roentgenol* 1980;135:605-606

18. Uflacker R, Kaemmerer A, Picon PD, et al. Bronchial artery embolization in the management of hemoptysis: technical aspects and long-term results. *Radiology* 1985;157:637-644

19. Fellows KE, Stigol L, Schuster S, et al. Selective bronchial arteriography in patient with cystic fibrosis and massive hemoptysis. *Radiology* 1975;114:551-556

20. Stinger RV, Manguile VG. Hemoptysis of bronchial origin occurring in patients with arrested tuberculosis. *Am Rev Respir Dis* 1985; 131:115

21. Damiani G, Mariani P, Arborio G, Alineri S, Comalba G. High-resolution computed tomography (HRCT) versus bronchoscopy in predicting the need for bronchial embolization in hemoptysis. *Radiol Med* 1995;90:232-237

22. Weinberger SE, Braunwald E. *Cough and hemoptysis*. In Fauci AS, Braunwald E, Isselbacher KJ. eds. *Harrison's Principles of Internal Medicine*. 14th ed. New York: McGraw-Hill, 1998:194-198

High-resolution CT Features of Bleeding Foci in Patients with Massive Hemoptysis¹

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Purpose: To compare the high-resolution CT features of bleeding foci in patients with massive hemoptysis during embolization with those revealed by angiography.

Materials and Methods: Between June 1997 and June 1999, we evaluated 25 patients who from among a total of 49 with arterial embolization due to massive hemoptysis underwent HRCT prior to embolization. We retrospectively analyzed medical records, and angiographic and HRCT findings. The time interval between HRCT and arterial embolization varied from two hours to six days. Angiography indicated that the bronchial, intercostal and internal mammary artery, and branches of the subclavian, were the foci of bleeding, and indicated the location of these in each pulmonary lobe. The HRCT findings were evaluated in terms of cavity, air-meniscus sign, bronchial dilatation, consolidation, ground-glass opacity, and fibrotic scar. We analyzed the corresponding sites of HRCT and the angiographic findings of the foci of bleeding.

Results: In 24 of 25 patients, the foci of bleeding were angiographically confirmed, their presence being noted in 28 pulmonary lobes. HRCT findings corresponding to the bleeding foci revealed by angiography were the air-meniscus sign (8 of 10 lobes, 80.0%), cavity (7 of 9 lobes, 77.8%), bronchial dilatation (21 of 30 lobes, 70.0%), and fibrotic scar (1 of 23 lobes, 4.3%). The findings in areas of consolidation and/or ground-glass opacity only did not correspond, however.

Conclusion: As compared with those revealed by angiography, the HRCT features of bleeding foci in patients with massive hemoptysis during embolization are in order of frequency, the air-meniscus sign, cavity, and bronchial dilatation.

Index words : Angiography, comparative studies

Lung, CT

Lung, hemorrhage

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