

F - 18 FDG - PET ¹

: FDG - PET
 : 가 11 FDG - PET CT
 . CT , FDG - PET
 FDG 가 가 2.5
 Pearson's
 : 11 19 , 8
 , 3 1.3 - 6.4 cm(, 3.6 cm)
 . 0.5~8.1(, 3.8) , 0.4~5.9(
 , 2.9) . 12 (63%) 가 2.5
 (r=0.225).
 : FDG - PET 가 2.9

(progressive massive fibrosis, PMF) FDG - PET
 (silicotic nodule)
 , (1, 2).
 (computed tomography: CT)

(3, 4). 2003 2 2006 5
 가 , 가
 CT 11
 가 (5). , 54 - 82 (, 67) . 9
 , 9 - 21 (, 14)
 FDG - PET (F - 18 - fluorodeoxyglucose positron
 emission tomography) (6 - 8), FDG 10 , 17 , 10 - 12
 가

가 CT CT ,

CT 가 FDG-PET CT , , ,

FDG-PET 4-21 (, 9)

가

PET (peak standardized uptake value, peak SUV)

CT PET (mean SUV)

CT Somatom Sensation 16(Siemens Medical Solutions, Forchheim, Germany) (ROI: region of interest) FDG 가

6 mm, 6 mm , CT 1 mm, 10 mm 120 kVp, 130effective mAs 100 mL iopromide(Ultravist 300; Schering, Berlin, Germany) 3 mL FDG-PET Pearson's

PACS(Centricity; GE Medical Systems, Milwaukee, Wis) . $p = 0.05$. SPSS(version 10.0, Chicago, Illinois, U.S.A.)

PET Allegro(Phillips, Cleveland, OH, U.S.A.) 6 CT 가 2.5

370 mBq F-18 FDG FDG-PET 가 FDG CT

93 mg/dL (63~122 mg/dL) . CT

40-60 . CT FDG 가

30-40 FDG-PET 1

PET 128×128 matrix 3D RAMLA(Row - Action Maximum - Likelihood) 1 CT

CT PET 가 CT , 가 PET 11 19 가 (Table 1).

Table 1. Summary of CT Features and FDG-PET Findings of Progressive Massive Fibrosis in 11 Patients with Pneumoconiosis

Case No.	Patient Data Age (year)	Sex	CT Findings		PET Findings	
			Location	Size (cm)	Peak SUV	Mean SUV
1	66	M	RUL	3.4	0.5	0.4
2	68	M	BUL	3.6 / 1.5	4.6 / 3.9	3.1 / 2.9
3	61	M	BUL	3.3 / 4.8	8.1 / 5.8	5.8 / 4.5
4	65	M	BUL	3.3 / 4.3	2.0 / 2.3	1.6 / 1.9
5	73	M	BUL	3.7 / 3.3	3.7 / 4.6	2.6 / 3.3
6	63	M	BUL	6.4 / 1.4	5.8 / 3.9	4.3 / 2.8
7	68	M	BUL	3.8 / 1.3	6.0 / 2.3	4.5 / 2.0
8	71	M	BUL	5.4 / 2.5	2.3 / 2.2	1.5 / 1.8
9	66	M	RUL	3.9	4.1	3.5
10	54	M	RUL	2.8	3.8	3.2
11	82	M	BUL	6.2 / 2.8	3.7 / 2.5	3.2 / 2.1
Mean	67			3.6 ± 1.4	3.8 ± 1.8	2.9 ± 1.3

Note. SUV = standardized uptake value, M= male, and R(B)UL = right (both) upper lobe. (Right/Left)

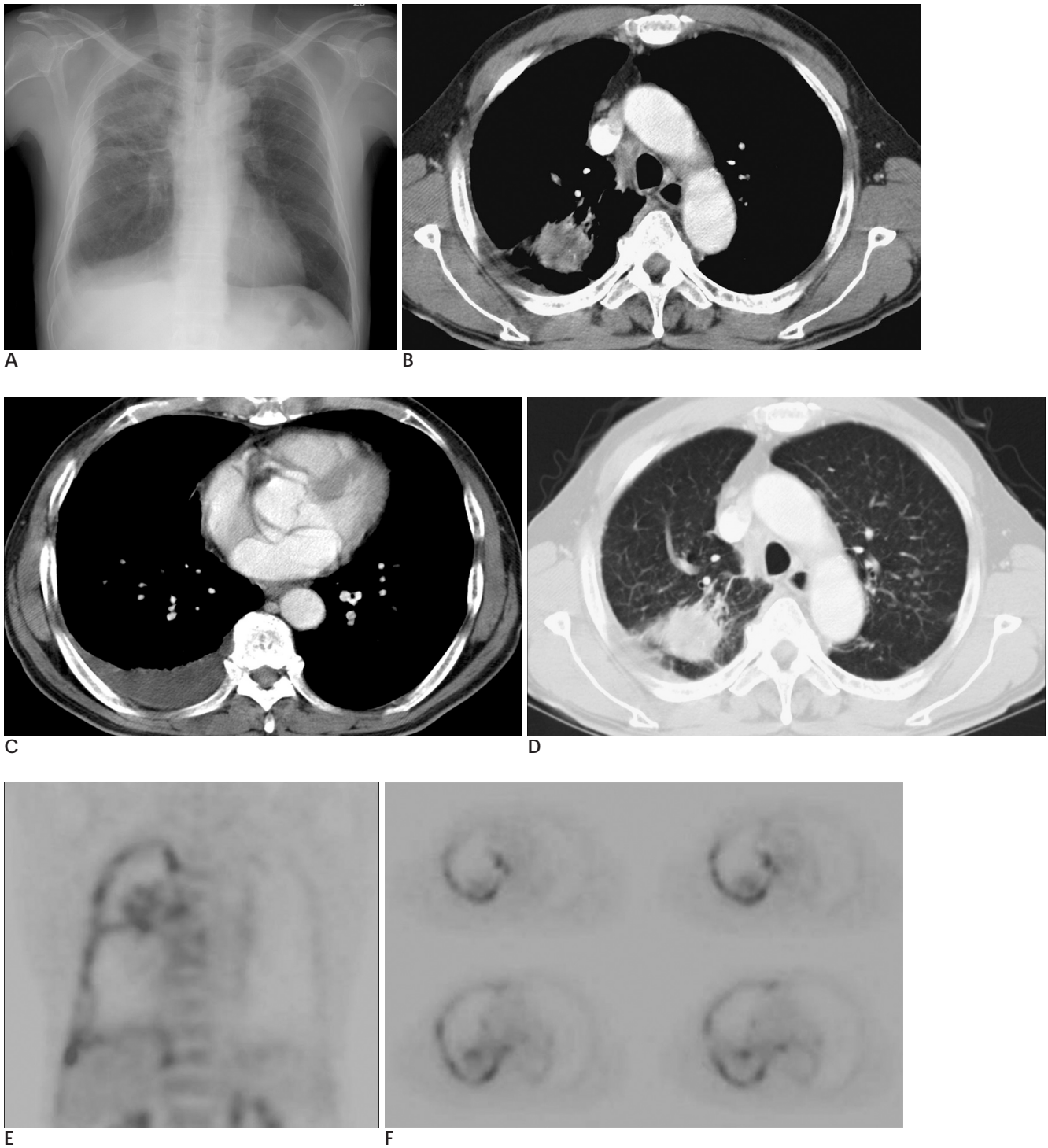


Fig. 1. Pneumoconiosis with progressive massive fibrosis (PMF) in a 66-year-old male.

A. Chest radiograph shows an irregular mass-like lesion in the right upper lobe. Multiple nodules are scattered in the upper lung zone of both lungs. The pleura is irregularly thickened with pleural effusion along the right chest wall.

B-D. Transverse contrast-enhanced CT scan (**B**) shows a heterogeneously enhancing mass in the right upper lobe, with irregular contour and calcifications. Pleural effusion with minimal pleural enhancement is noted in the right hemithorax (**C**). Small nodules are also seen in both upper lobes (**D**).

E, F. Coronal (**E**) and axial (**F**) FDG-PET images show a ring-shaped FDG uptake in PMF and an irregular FDG uptake along the pleura with the mean SUV of 0.4. Biopsy results failed to reveal pulmonary tuberculosis in PMF and the pleura.

0.8
 , 3
 1.3~6.4 cm(, 3.6 cm)
 CT
 (Fig. 1).

FDG FDG - PET
 . FDG - PET

0.5 - 8.1(, 3.8) ,
 0.4 - 5.9(, 2.9) . 19 7
 (36.8%) 가 2.5 , 12
 (63.2%) 2.5 (Fig. 2)(Table 1). CT
 FDG - PET

($r=0.225$)(Fig. 3).

가 12

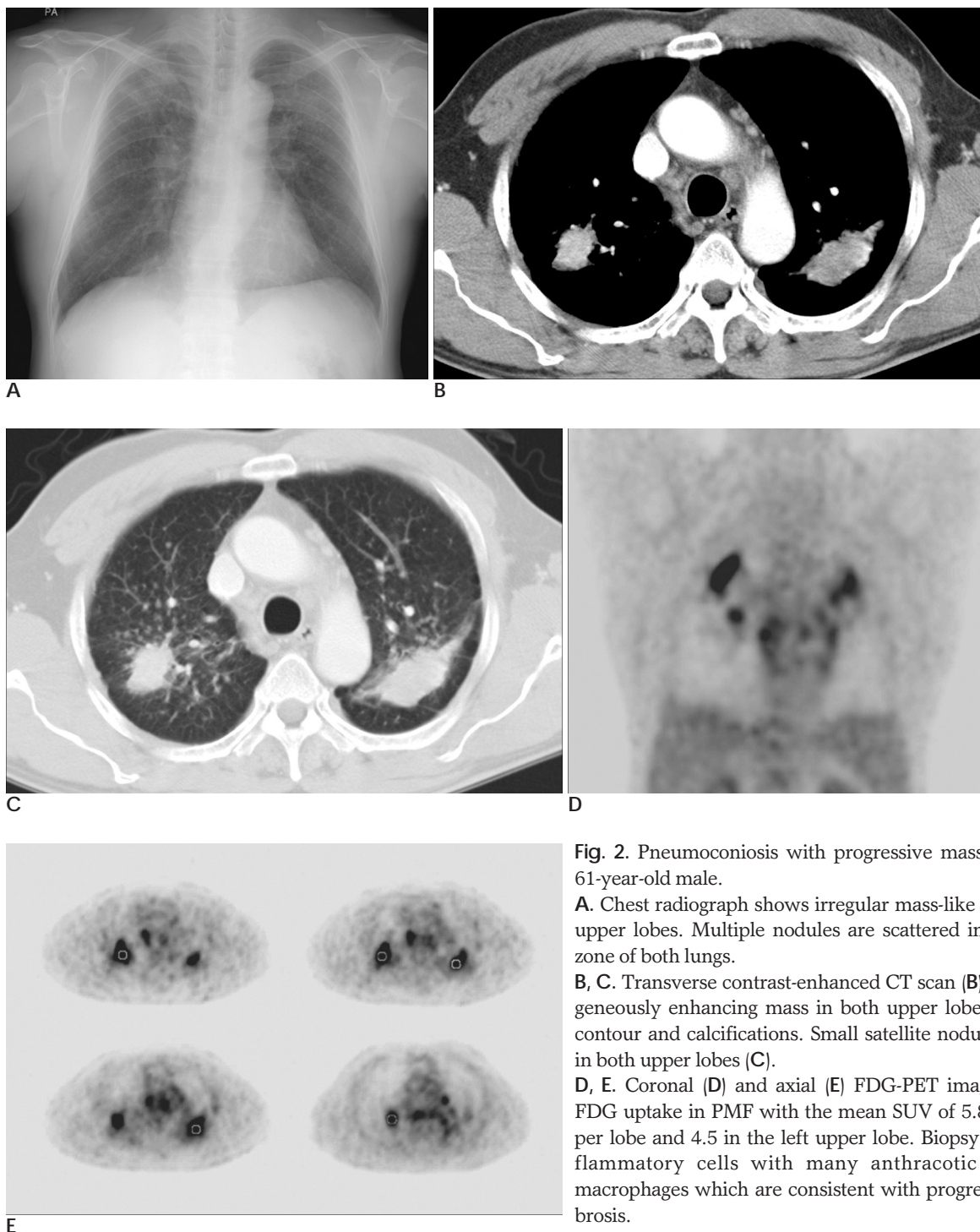


Fig. 2. Pneumoconiosis with progressive massive fibrosis in a 61-year-old male.

A. Chest radiograph shows irregular mass-like shadows in both upper lobes. Multiple nodules are scattered in the upper lung zone of both lungs.

B, C. Transverse contrast-enhanced CT scan (**B**) shows a heterogeneously enhancing mass in both upper lobes, with irregular contour and calcifications. Small satellite nodules are also seen in both upper lobes (**C**).

D, E. Coronal (**D**) and axial (**E**) FDG-PET images show strong FDG uptake in PMF with the mean SUV of 5.8 in the right upper lobe and 4.5 in the left upper lobe. Biopsy results show inflammatory cells with many anthracotic pigment-laden macrophages which are consistent with progressive massive fibrosis.

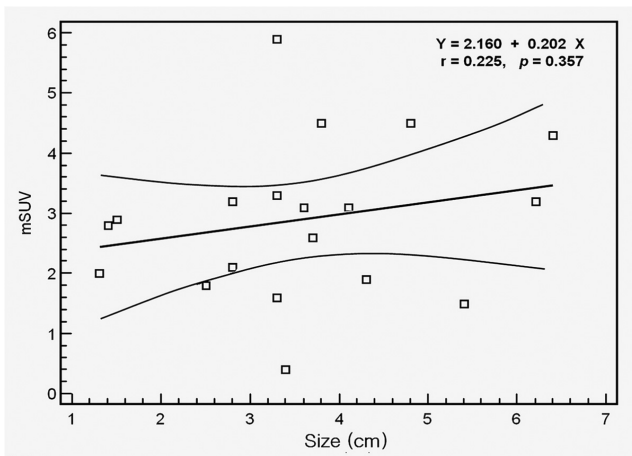


Fig. 3. The mean SUV plotted against the sizes of PMF by linear regression. The slope was 0.202, with a correlation coefficient of 0.225, and a p value 0.357 ($Y = 2.160 + 0.202 X$, $r = 0.225$). These results show that the size of PMF measured on the CT images does not correlate with the results of the mean SUV of PMF measured on the FDG-PET images.

FDG - PET 가 0.4
1
(Fig. 1).
1

1 cm
(2).
(3 - 5, 9 - 11).
CT
CT
(4, 10).
가 , CT
(5, 6,
11).
FDG - PET 가
가 (12, 13).
가
, FDG - PET
(6).
Alavi (14) 가
가 , Kavanagh (7), O'Connell
(8) FDG - PET
가

7 가 2.5
, 12 2.5
가 2.5
, FDG
(7).
FDG
FDG - PET
가
가
CT
가 , FDG - PET
가
FDG -
PET
FDG - PET
가 2.9

1. Spencer H. *Pathology of the lung* 4th ed. Oxford: Pergamon Press, 1985
2. Green FH, Laqueur WA. Coal workers' pneumoconiosis. *Pathol Annu* 1980;15:333-410
3. Worrell JA, Carroll FE Jr., Pendergrass HP, O'Donnell D. Coal worker's pneumoconiosis CT assessment in exposed workers in correlation with radiographic findings. *Invest Radiol* 1992;27:98-100
4. Remy-Jardin M, Degreffe JM, Beuscart R, Voisin C, Remy J. Coal worker's pneumoconiosis: CT assessment in exposed workers and correlation with radiographic findings. *Radiology* 1990;177:363-371
5. Williams JL, Moller GA. Solitary mass in the lungs of coal miners. *Am J Roentgenol Radium Ther Nucl Med* 1973;117:765-770
6. Bandoh S, Fujita J, Yamamoto Y, Nishiyama Y, Ueda Y, Tojo Y, et al. A case of lung cancer associated with pneumoconiosis diagnosed by fluorine-18 fluorodeoxyglucose positron emission tomography. *Ann Nucl Med* 2003;17:597-600
7. Kavanagh PV, Stevenson AW, Chen MY, Clark PB. Nonneoplastic diseases in the chest showing increased activity on FDG PET. *AJR Am J Roentgenol* 2004;183:1133-1141
8. O'Connell M, Kennedy M. Progressive massive fibrosis secondary to pulmonary silicosis appearance on F-18 fluorodeoxyglucose PET/CT. *Clin Nucl Med* 2004;29:754-755
9. Begin R, Bergeron D, Samson L, Boctor M, Cantin A. CT assessment of silicosis in exposed workers. *AJR Am J Roentgenol* 1987;

- 148:509-514
10. Bergin CJ, Muller NL, Vedral S, Chan-Yeung M. CT in silicosis: correlation with plain films and pulmonary function tests. *AJR Am J Roentgenol* 1986;146:477-483
 11. Hirakata K. Pathologic-HRCT correlation of pneumoconiosis--a study on inflation-fixed lungs. *Nippon Igaku Hoshasen Gakkai Zasshi* 1992;52:35-51
 12. Yang SN, Liang JA, Lin FJ, Kwan AS, Kao CH, Shen YY. Differentiating benign and malignant pulmonary lesions with FDG-PET. *Anticancer Res* 2001;21:4153-4157
 13. Costa DC, Visvikis D, Crosdale I, Pigden I, Townsend C, Bomanji J, et al. Positron emission and computed X-ray tomography: a coming together. *Nucl Med Commun* 2003;24:351-358
 14. Alavi A, Gupta N, Alberini JL, Hickeson M, Adam LE, Bhargava P, et al. Positron emission tomography imaging in nonmalignant thoracic disorders. *Semin Nucl Med* 2002;32:293-321

J Korean Radiol Soc 2008;59:255 - 260

F-18 FDG PET Features of Progressive Massive Fibrosis in Patients with Pneumoconiosis¹

Sang Min Lee, M.D., Tae Hoon Kim, M.D., Jae Hoon Lee, M.D.,
Young Hoon Ryu, M.D., Sang Jin Kim, M.D.

¹Department of Radiology, Yonsei University College of Medicine

Purpose: To evaluate the fluorodeoxyglucose positron emission tomography (FDG-PET) features of progressive massive fibrosis (PMF) in patients with pneumoconiosis.

Materials and Methods: FDG-PET and chest CT scans were performed in 11 patients with pneumoconiosis and PMF on chest radiographs. We evaluated the size, location, maximum, and mean of the standardized uptake value (SUV) for the PMF. A fine needle aspiration biopsy was performed in patients with a mean SUV of > 2.5 to exclude lung malignancies or pulmonary tuberculosis. A Pearson's correlation was performed to determine if a correlation exists if between the sizes and the mean SUV of the PMF.

Results: A total of 19 masses from 11 patients were located in the upper lobes (bilateral in eight and right in three). The sizes of the lesions ranged from 1.3 to 6.4 cm (mean = 3.6 cm). The maximum SUV was 0.5 to 8.1 (mean = 3.8) and the mean SUV was 0.4 to 5.9 cm (mean = 2.9 cm). Lung malignancies or tuberculosis were not identified in the 12 lesions (63%) with a mean SUV of >2.5. The sizes of the PMF did not correlate well with the mean SUV ($r = 0.225$).

Conclusion: FDG-PET scans can show PMFs as regions of increased metabolic activity (mean SUV, 2.9) without evidence of lung cancer or pulmonary tuberculosis. No correlation between the sizes of PMF and the mean SUV was found.

Index words : Pneumoconiosis
Pulmonary fibrosis
Tomography, X-Ray Computed
Fluorodeoxyglucose F18
Positron-emission tomography
Lung

Address reprint requests to : Tae Hoon Kim, M.D., Ph.D., Department of Radiology, Yonsei University Health System, 146-95, Dogok-dong, Gangnam-gu, Seoul 135-720, South Korea.
Tel. 82-2-2019-3510 Fax. 82-2-3462-5472 E-mail: thkim1@yuhs.ac