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Diffuse Panbronchiolitis: Chest Radiograph and HRCT Findings in 8 Patients*

Sung Wook Choo, M.D., Jung-Gi Im, M.D., Dae Young Kim, M.D., Man Chung Han, M.D.**

Department of Radiology, College of Medicine Seoul National University

— Abstract —

Eight patients with diffuse panbronchiolitis were evaluated with chest radiograph and high-resolution computed tomography(HRCT). Paients consisted of 5 med and 3 women, aged 27-75 years(average, 54 years). Chest radiographic findings were diffuse small nodular densities, linear shadows, and thickened bronchial wall predominantly in both lower lung fields. All 8 patients had pansinusitis. On HRCT, small nodules and branching linear structures, 1-3mm internal to the pleural surface, representing centrilobular bronchiolar lesions, were found along with thickening of medium and small sized bronchial wall. These nodules did not show coalescence.

In conclusion, chest radiographs were usually suggestive and high-resolution CT was diagnostic of diffuse panbronchiolitis.

Index Words: Bronchiolitis, 60.264
Lung, CT, 60.1211

Diffuse panbronchiolitis is a chronic inflammatory disease of the respiratory bronchioles of unknown etiology. Clinically, patients have symptoms of chronic obstructive lung disease and hypoxemia. However, radiologically diffuse panbronchiolitis is different from usual form of chronic obstructive lung disease as it shows small nodular opacities along with hyperinflated lung. The diseasse is prevalent in Japan(1). A case of diffuse panbronchioloitis in a second generation Korean male has been reported in Japan(2). However, there has been no reports of diffuse panbronchiolitis radiologically in Korean literatures yet. We believe that the diagnosis of diffuse panbronchiolitis in Korea was not made previously in clinical practice not because of absence of the disease but because of the ignorance of the disease. We report 8 Korean patients with diffuse panbronchiolitis diagnosed by clinical and radiological criteria in 8 patients and by lung biopsy in 2 patients, focusing on their radiographic and HRCT findings.

MATERIALS AND METHODS

The study group consisted of 8 patients, 5 men and 3 women, aged 27-75 years(mean 54 years). The diagnosis was based on the clinical, functional, and radiologic criteria of Homma et al s(1) description(Table 1). In 2 cases, histologic proof was obtained by means of open lung biopsy and transbronchial lung biopsy. CT scans were obtained with a CT/T 9800 scanner (General Electric

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** 충북대학교 의과대학 방사선과학교실
** *Department of Radiology, Cheungbuk National University College of Medicine*
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Table 1. Clinical Diagnostic Criteria by Homma et al.(1983)

1. Symptom:chronic cough, dyspnea on exertion, sputum
2. Phtsical sign:rales and rhonchi
3. Chest Radiograph:diffuse disseminated fine nodular shadows, mainly in the lower lung field with hyperinflation
4. Pulmonary Function Studies(involvement more than at least 3)
   a) FEV1*<70%
   b) VC**<80% predicted
   c) RV+>150% predicted
   d) Pa02++<80mmHg

*: forced expiratory volume in 1 second
**: vital capacity
+: residual volume
++: arterial 02 pressure

Medical System, Milwaukee). High-resolution CT (HRCT) scans were taken at 2cm intervals from the sternal notch to the dome of the diaphragm during breath-holding after deep inspiration. Technical factors were 1.5mm slice thickness, 2-second exposure time, 140 kVp, and 170mA, The images were reconstructed with a high spatial frequency algorithm (bone algorithm). Each image was targeted retrospectively with a field of view of 20-20cm. All images were photographed at the window width of 1000HU and the level of -700HU.

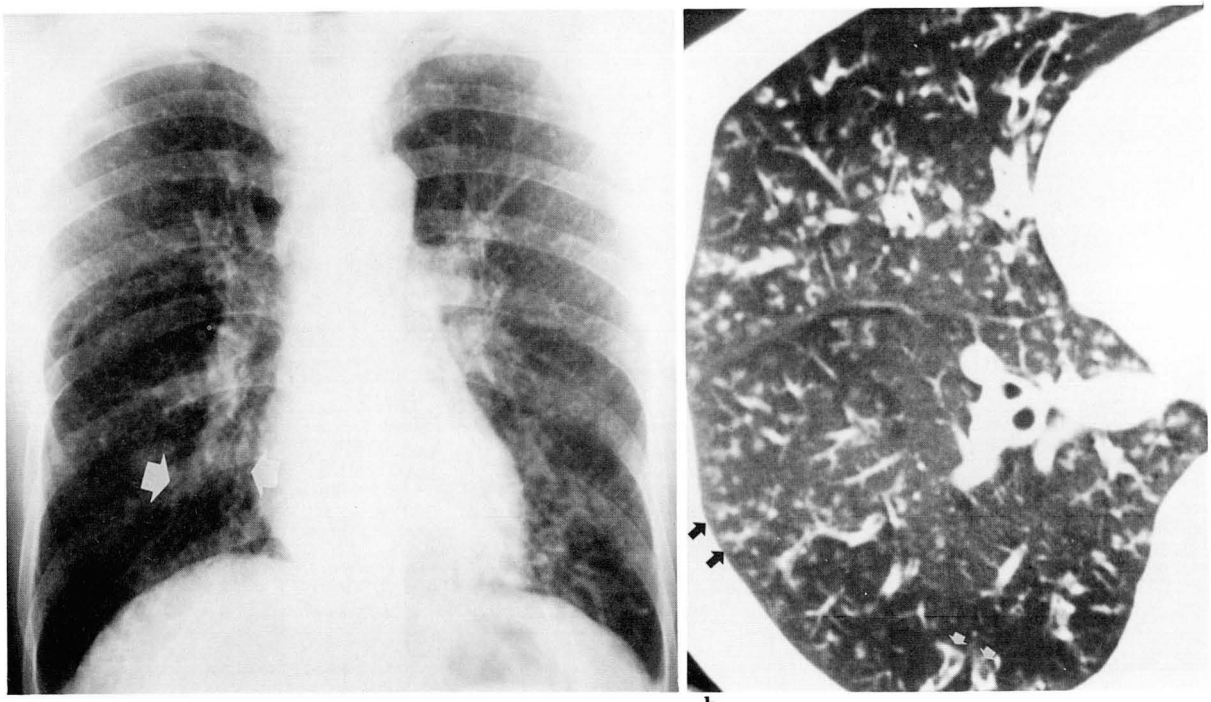
RESULTS

Presenting clinical symptoms and signs were

Table 2. Summary of 8 Patients with Diffuse Panbrochiloitis

case/age/sex	PFT*	Symptom & sing
1/27/m	FEV1:2.04L(59%) FVC**:3.14(75.1%) Pa02:77mmHg	worsening productive cough for 7 yrs
2/48/M	FEV1:1.37L(50.7%) FVC:2.28L(62.3%) RV:3.66L(254%) Pa02:70mmHg	chronic cough, sputum increasing dyspnea on exertion for 20 yrs
3/57/F	FEV1:1.11L(56.1%) FVC:1.41L(60.8%) RV:2.58L(169.7%)	worsenin productive cough and dyspnea for for 7 yrs
4/59/M	FEV1:0.72L(34.3%) FVC:2.04L(52.2%) Pa02:58mmHg	dyspnea, productive cough for 38 yrs
5/51/F	FEV1:0.74L(35.9%) FVC:1.14L(48.7%) Pa02:68mmHg	productive cough for 20 yrs
6/47/F	FEV1:1.15L(52.3%) FVC:1.48L(52.3%) RV:3.61(214.9%)	dyspnea and productive cough for 10 yrs
7/56/M	FEV1:0.71L(27.8%) FVC:1.34L(37.3%) RV:3.61L(224.9%)	productive cough for 8 yrs
8/75/M	FEV1:0.86L(42.0%) FVC:1.56L(42.0%) Pa02:60mmHg	dyspnea and procuctive cough for 4 yrs

*: pulmonary functuon test
**: forced vital capacity



a b

Fig. 1. A 27-year-old male with productive cough for 7 years (case 1)
a. Chest radiograph shows hyperinflation with diffuse nodular and linear shadow (2-4mm) in both lower lung field. Thickened bronchial wall with tram line (white arrows) seen in both lower lung fields.
b. HRCT shows centrilobular nocules 2-3mm inside the pleural surface (arrows) and bronchiectasis of small and medium sized bronchi (white arrows).

chronic productive cough, dyspnea, inspiratory rale and crackles on both lung fields (Table 2). Pulmonary function test of the eight patients revealed forced expiratory 1-second volume (FEV1) in the range of 28-59% of the predicted (mean 42.3%). Arterial oxygen pressure measured in patients ranged from 58 to 77mmHg (mean 66.6 mmHg). All patients had paranasal sinusitis demonstrated on PNS view. Chest radiographs showed 2-3mm sized small fine nodular opacities and linear shadows scattered predominantly in both lower lung fields(Fig 1.a). Bronchial wall thickenin and tram line shadows suggesting bronchiectasis in both lower lung fields were seen in all patients(Fig 1.a,2.a). On HRCT, all patients showed diffuse nodular or branching linear lesions predominantly in subpleural area, invariably 2-3mm internal to the pleural surface, suggesting centrilobular lesions(Fig 1.b,2.b). Those lesions were more prominent in basal lung fields. Also the lungs were hyperinflated especially in peripheral lung fields and bronchiectasis of small and medium sized bronchi were seen in all patients(Fig 1.b). Open lung biopsy specimen showed peribrobnchiolar inflammatory cell infiltration and fibrosis(Fig 2.c).

DISCUSSION

Diffuse panbronchiolitis is a disease manifested by chronic inflammation localized mainly in the region of the respiratory bronchioles, just distal to the terminal bronchioles. In the initial stage, symptoms consist of chronic cough, exertional dyspnea, wheezing, and hypoxemia. As the disease progresses, inflammatory signs such as yellowish sputum and fever become prominent. These signs and symptoms of obstructive respiratory functional impairment, occasional wheezing, coughing, and sputum resemble the feature of emphysema, bronchial asthma, or chronic bronchitis, reapectively. In the advanced

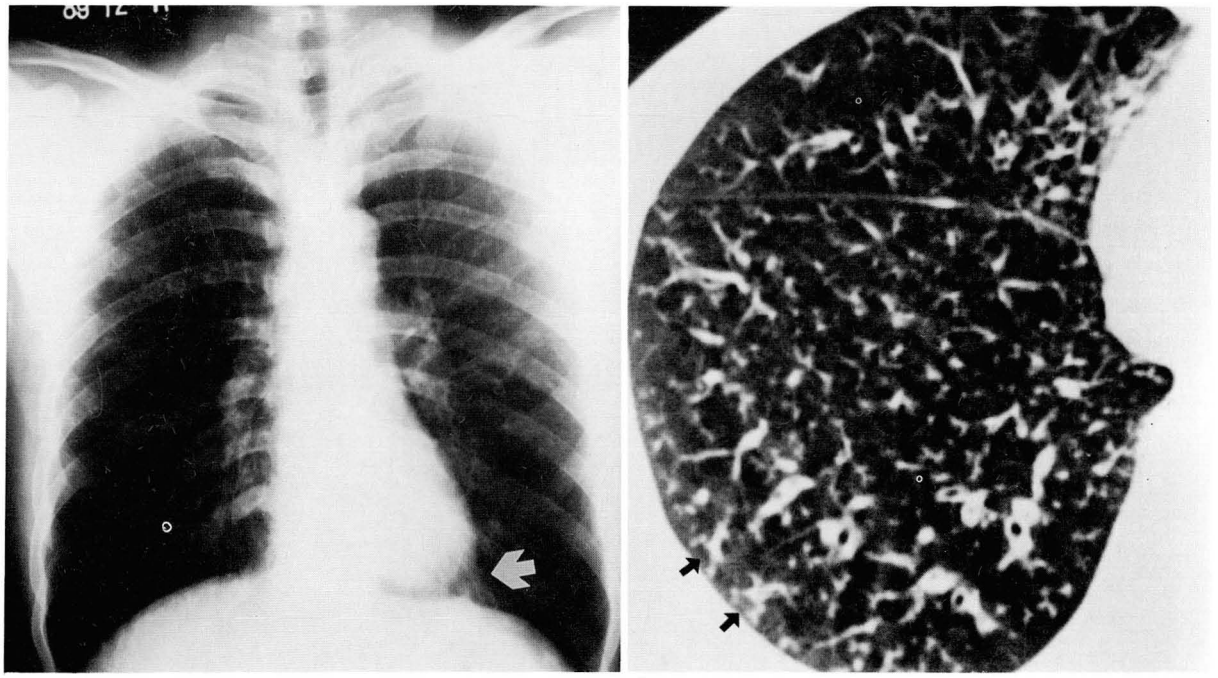


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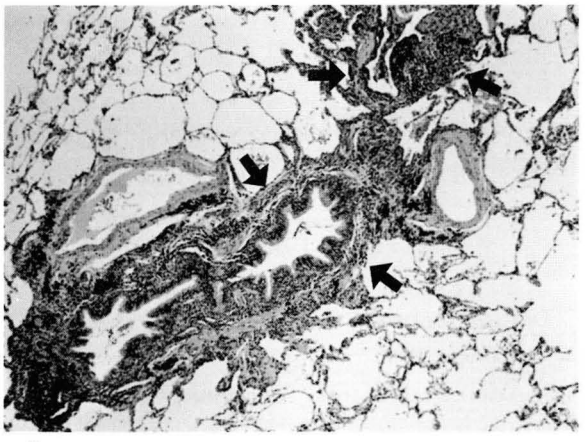
Fig. 2. A 48-year-old male with cough and dyspnea for 20 years(case 2)
a. Chestradiograph shows hyperinflated lung with diffuse small nodular densities(1-3mm) and thickened bronchial wall (white arrow) in both lower lung fields.
b. HRCT shows nodular and branchin linear structure (arrows) 1-3mm inside pleural surface representing bronchiolar lesions within central portion of the secondary pulmonary lobule.



c

Fig. 2. c. Photomicrograph of open lung biopsy specimen shows remarkable thickening of the bronchiolar wall due to inflammatory cell infiltration and peribronchiolar fibrosis(arrows). Note that no changes in alveolar structure. (H&E, x200)

stage, the signs of large amounts of sputum and dilation of terminal conducting bronchiales resemble those of bronchiectasis. Patients finally come down to respiratory failure(3). It is important to distinguish this entity from those that are ordinarily grouped as chronic obstructive pulmonary disease because it often progresses rapidly(1).

Chronic panasal sinusitis is accompanied in more than 75% of the patients(1), as it is in our series(8 of 8 patients).

The macroscopic features of diffuse panbronchiolitis on cut surfaces of autopsied lung tissue are many fine yellowish nodules in the parenchymal area. Microscopically, accumulation of foamy histiocytes accompanied by infiltration of lymphocytes and plasma cells in the peribronchiolar area corresponds to the nodules observed macroscopically(4). In the advanced stage, secondary ectasia of the proximal terminal bronchioles develops due to narrowing and constriction of the respiratory bronchioles(4).

On chest radiographs, diffuse panbronchiolitis is characterized by small nodular shadows up to 2mm in diameter throughout both lung(1,5). On

CT scans, it has been reported to show nodules at the extreme ends of bronchovascular branchings, like a "tree in bud"(6). According to Reid and Simon(7), these nodules lie at the ends of second- or third-order branches in the secondary lobules which reflect the lesions of diffuse panbronchiolitis.

Masanori et al(3) classified high-resolution CT patterns of diffuse panbronchiolitis into four types which represent a spectrum of chronological sequences: small nodules around the ends of bronchovascular branchings(thpe I), small nodules in the centrilobular area connected with small branchin linear opacities(type II), nodules accompanied by ring-shaped or small ductal opacities connected to proximal bronchovascular bundles(type III), large cystic opacities accompanied by dilated proximal bronchi(type IV).

In conclusion, diffuse panbronchiloitis should be considered in patients with symptoms and signs of chronic obstructive pulmonary disease, who show small nodular opacities and hyperinflated lung on chest radiographs, even in Korea. HRCT findings are diagnostic along with clinical criteria of diffuse panbronchiolitis.

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〈국문 요약〉

미만성 세기관지염의 고해상 전산화 단층촬영 소견

서울대학교 의과대학 방사선과학교실, 충북대학교 의과대학 방사선과학교실*

주 성 욱·임 정 기·김 대 영*·한 만 청

미만성 세기관지염은 일본에 빈도가 높은것으로 알려져 있으며, 최근 한국에도 존재하고 있음이 밝혀지고 있으나 학술지에 발표된 바는 없다. 저자들은 전 례가 Homma등(1983)이 기술한 진단기준에 만족되고, 이 중 2례는 병리학적으로 확진된 8명의 한국인에서 발생한 미만성 세기관지염 환자를 대상으로 방사선학적 소견을 중심으로 분석하였다. 미만성 세기관지염 환자의 단순 흉부 X선의 특징적 소견은 양측 폐에 폐기종과, 주로 양하측 폐야의 변연부의 소결절들과 선상음영 그리고 기관지 확장증이었다. 또한 고해상 전산화 단층 촬영에서는 소결절들과 분지의 선상구조들이 흉막 1-3mm 안쪽으로 관찰되는데, 이들은 소엽 중심부와 세기관지 주위의 병변임을 나타내며 중형(medium-sized)과 소형(small-sized)기관지벽에 기관지 확장증을 나타내는 비후가 관찰되었다. 또한 이러한 결절들은 서로 융합되지 않는것으로 관찰되었다. 결론적으로 미만성 세기관지염은 한국에도 적지않은 환자가 있으리라 판단되며, 그의 방사선학적 소견은 특징적이어서 대부분 흉부X선에서 질환을 의심할 수 있으며, 고해상 CT에서도 보다 신뢰도 높은 진단에 이를 수 있다.

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