



## Early View

Research letter

# Lung involvement during the prediagnostic phase of idiopathic pleuroparenchymal fibroelastosis

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*Research letters*

**Lung involvement during the prediagnostic phase of idiopathic pleuroparenchymal fibroelastosis**

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***To the editor:***

Idiopathic pleuroparenchymal fibroelastosis (IPPF) is a rare interstitial pneumonia that predominantly affects the upper lung fields [1, 2]. A pulmonary apical cap (PAC) is an imaging finding resembling that for PPFE that does not show symptoms or progression [3, 4]. Some patients with PPFE have recognized lung involvement at the lung apex long before the diagnosis is actually made, findings that are indistinguishable from PAC based on temporal imaging data [5]. Clinically, it takes months to years from the first recognition of lung involvement to the diagnosis of PPFE [6, 7]. However, no study has yet focused on the progression of lung involvement or the clinical course before the diagnosis of IPPFE. The present study evaluated the prediagnostic clinical course in patients with IPPFE.

The Fukuoka University Chikushi Hospital Institutional Review Board approved the study protocol and waived the requirement for informed consent (approval number: C20-09-002). We examined consecutive patients who were diagnosed with IPPFE at Fukuoka University Chikushi Hospital from January 2010 to December 2020. We extracted patients who had had chest images collected for follow-up of lung involvement or other diseases or who had undergone medical checkups over a period of more than five years before the diagnosis of IPPFE. We reevaluated the patients to confirm the diagnosis according to the diagnostic criteria of IPPFE [7]. We extracted the first day that patients complained about the symptoms, the date of the diagnosis, and the last day of observation (death or last survival

follow-up) from the medical records. The date of the diagnosis was set as the date at which PPFÉ was first described as the diagnosis in the medical record. We defined apical fibrosis as linear or curved density at the lung apex on chest radiography or subpleural wedge-shaped consolidation at the lung apex on chest computed tomography (CT) [8, 9]. Two experienced pulmonary physicians (T.M. and Y.K.) evaluated all chest radiography and CT images collected before the diagnosis. The date of the first recognition of apical fibrosis was defined as the date on which either investigator first recognized apical fibrosis, and the deterioration date was defined as the date on which both investigators decided that apical fibrosis had worsened beyond the date of first recognition. Continuous data are shown as the group median [interquartile range], and categorical data are shown as the number (percentage).

A total of 49 patients were diagnosed with IPPFE during the period, and 20 patients were eligible for this study. The clinical characteristics of the enrolled patients were as follows: 15 men and 5 women; 74 (71–78) years old; body mass index of 18.9 (17.1–20.0) kg/m<sup>2</sup>; forced vital capacity of 2,115 (1,580–2,430) mL (68.2% [50.2%–84.7%]); and residual volume/total lung capacity of 0.48 (0.41–0.50) (119% [107%–131%]). Ten of the 20 patients (50%) were complicated with interstitial pneumonia other than PPFÉ in the lower lobes. The period from the oldest radiographic examination to the diagnosis was 7.82 (5.80–12.9) years. The mean frequency of radiological examinations before the diagnosis per patient was 1.59 times/year: 0.90 (0.53–1.41) times/year for chest radiography and 0.59 (0.27–0.74) times/year

for chest CT. The period from the first recognition of apical fibrosis to the last observation was 6.71 (6.14–9.98) years, consisting of 5.94 (5.40–7.35) years from the first recognition of apical fibrosis to the diagnosis and 0.93 (0.57–1.42) years from the diagnosis to the last observation. The percentage of the time from the diagnosis to the last observation against the time from the first recognition of apical fibrosis to the last observation was calculated to be 13.8% (0.93/6.71 years). The period from the first recognition of apical fibrosis to the deterioration was 5.38 (1.86–6.39) years. Eleven of the 20 patients (55%) had apical fibrosis that had not progressed for more than 5 years before the diagnosis. The period from the symptoms to the diagnosis was 1.66 (0.86–3.61) years. The results for each patient are shown in Figure 1.

The early stage of PPFE is sometimes indistinguishable from PAC based on temporal imaging data [7]. Differentiating the two entities requires a retrospective review or prospective follow-up of the imaging data [3, 5, 7]. In this study, the period from the first recognition of apical fibrosis to the deterioration was 5.38 (1.86–6.39) years, suggesting the difficulty in differentiating PPFE from PAC by a short-term observation. PAC is a relatively common imaging finding. Renner et al. identified a unilateral PAC in 11.2% and a bilateral PAC in 10.9% by routine chest radiography [8]. Therefore, from a cost-effectiveness perspective, it might be wasteful to follow all patients with lung involvement at the lung apex. However, we should carefully examine the lung involvement of patients with apical fibrosis over a relatively long period, as the prediagnostic phase of PPFE is indistinguishable from PAC

by short-term observation. PPF E should be at least considered when patients with apical fibrosis complain of respiratory symptoms during the course of the disease.

Marinescu et al. recently described a patient with PAC that evolved into PPF E after lung surgery and speculated that the presence of PAC predisposes patients to PPF E development when faced with ongoing inflammatory injury [10]. Although the insults were unidentified in patients with IPPF E and whether this apical fibrosis should be recognized as PAC or an early phase of PPF E was an intrinsic problem, we showed that half of the patients with IPPF E had apical fibrosis that did not progress long before the diagnosis. The idea that PAC is a risk factor for PPF E may apply not only to post-operative PPF E but also to IPPF E. It may be necessary to recognize PAC and PPF E as part of the same spectrum rather than as separate concepts, as their pathology shares the common finding of subpleural fibroelastosis, aside from the extent of the lesion [3, 9]. Of note, Egashira et al. showed that the risk factors for progression of apical fibrosis in patients with apical fibrosis detected on daily computed tomography was a horizontal extent of apical fibrosis (proportion of lesion to the whole circumference at the most affected section) exceeding 25% [11]. Therefore, patients with extensive apical fibrosis might need to be radiologically followed for short-term observation.

The prognosis after the diagnosis of IPPF E is poor, with 5-year survival rates of 23.3%-58.9% [12-16]. The percentage of the time from the diagnosis to the last observation in the time from the first recognition of fibrosis to the last observation was 13.8%. Therefore, if the clinical

course of PPFE is perceived as the entire period with apical fibrosis, the duration of undiagnosed IPPFE in the presence of apical fibrosis may be much longer than the clinical course after the diagnosis.

In this study, 10 of the 20 patients were complicated with interstitial pneumonia other than PPFE in the lower lobes. The lower lobe lesions in these patients were radiologically classified as usual interstitial pneumonia (UIP) (n=4), probable UIP (n=3) or unclassifiable interstitial pneumonia (n=3), according to the official American Thoracic Society, European Respiratory Society, Japanese Respiratory Society, and Latin American Thoracic Society clinical practice guidelines of 2018 [17].

We believe that different pathologic processes are at work in the upper and lower lobes, as the pathology differs between PPFE and UIP. We previously suggested that UIP lesions in the lower lobes and PPFE lesions in the upper lobes might both be formed by abnormal healing processes caused by stimuli such as acute lung injury and inflammation, but the eventual pattern of abnormal healing may differ in the upper and lower lobes. In other words, interstitial inflammation and fibrosis as the initial stage might progress to honeycomb lung as end-stage fibrosis in the lower lobes of PPFE patients but be replaced by subpleural fibroelastosis in the upper lobes of PPFE patients [18]. Several limitations associated with the present study warrant mention. First, the timing of the diagnosis may vary, depending on whether or not the clinician is familiar with the diagnosis of PPFE. Second, there were 11 cases

(55%) in which apical fibrosis was already present at the initial radiological examination, suggesting that the period from the appearance of apical fibrosis to the diagnosis is longer in these cases. Given the absence of a control group of patients with PAC, it is impossible to suggest follow-up for all patients with PAC. In addition to the small sample size of the study, there were some cases in which the prognosis was not yet determined. In such cases, the observation period after diagnosis will be longer.

Patients with IPPFE sometimes have lung involvement at the lung apex long before the diagnosis. The prediagnostic phase with apical fibrosis was much longer than the postdiagnostic phase in patients with IPPFE. The prediagnostic phase of PPFE is indistinguishable from PAC on short-term observation.



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