Editorial

High Resolution Computed Tomography findings in Idiopathic Pulmonary Fibrosis

Paschalis Ntolios, MD, MSc,
Demosthenes Bouros, MD, PhD, FCCP

Department of Pneumonology, Medical School, Democritus University of Thrace and University Hospital of Alexandroupolis, Greece

Idiopathic Pulmonary Fibrosis (IPF) is a refractory and lethal fibroproliferative lung disorder of unknown etiology. It is characterized by histopathologic/radiologic pattern of **Usual Interstitial Pneumonia (UIP)** and represents the most common Idiopathic Interstitial Pneumonia (IIP). Its prognosis is dismal, with survival ranging from 3 to 5 years from the time of diagnosis[1]. The last decade has seen notable progress in our understanding of the pathogenesis of IPF and recently the first drug for the treatment of the disease was approved[2-4].

The 2011 joined ATS/ERS/JRS/ALAT statement revised the criteria for diagnosing IPF. According to this, the diagnosis of IPF requires:

1. Exclusion of any other known cause of ILD
2. The presence of UIP pattern on HRCT or
3. Specific combinations of possible UIP or non-UIP HRCT and histopathologic findings on surgical lung biopsy.

According to the above, histopathology is not always necessary, since a portion of patients (up to 50%) with definite UIP pattern on HRCT along with compatible clinical presentation and exclusion of known causes of Interstitial Lung Disease (ILD) (i.e. connective tissue disease, drug-related ILD, hypersensitivity pneumonitis) can be diagnosed with IPF without undergoing surgical lung biopsy[1,5]. This is an important update, since surgical lung biopsy carries important mortality[6]. However, a surgical lung biopsy is still needed in patients with possible UIP pattern on HRCT or in cases with HRCT inconsistent with UIP to confirm the diagnosis. Nevertheless, HRCT is essential for the evaluation and diagnosis of the ILD patient.

The **accuracy** of HRCT for the diagnosis of IPF has been studied and documented in several studies and positive predictive value of HRCT can be up to 90-100%[7-10]. In spite of these studies being biased because of selection of patients with a UIP pattern on histopathology, UIP pattern on HRCT in combination with clinical presentation and elimination of other known causes of ILD is highly accurate[1].

The **definite UIP** criteria on HRCT (Table 1) are: (1) subpleural and basal predominance, (2) reticular abnormalities, (3) honeycombing with or without traction bronchiectasis and (4) absence of any feature inconsistent with UIP (1). Honeycombing, which is the hallmark of UIP on HRCT, represents fibrotic lung tissue with complete loss of normal alveolar architecture, containing multiple, subpleural, thick-walled cysts (Figure 1). Their diameter can be

Corespondence:
Prof. Demosthenes Bouros MD, PhD, FCCP
Head, Dept. of Pneumonology, Medical School,
Democritus University of Thrace,
Alexandroupolis 68100, Greece
Tel. & Fax: +30 25510 75096
E-mail: debouros@gmail.com

TABLE 1. HRCT criteria for UIP pattern (reference 1).

Definite UIP Pattern	Possible UIP Pattern	Inconsistent with UIP pattern
1. Subpleural, basal predominance	Subpleural, basal predominance	1. Upper or midlung predominance
2. Reticular abnormality	Reticular abnormality	2. Peribronchovascular predominance
3. Honeycombing with or without traction bronchiectasis	Absent	3. Extensive ground glass opacities (GGO) (GGO>reticular abnormality).
4. Absence of inconsistent with UIP pattern features	Absence of inconsistent with UIP pattern features	4. Profuse micronodules (bilateral, predominant upper lobes)
		5. Discrete cysts (multiple, bilateral, away from areas of honeycombing)
		6. Diffuse mosaic attenuation / air trapping (bilateral, ≥3 lobes)
		7. Consolidation in bronchopulmonary segment (s) / lobe (s)

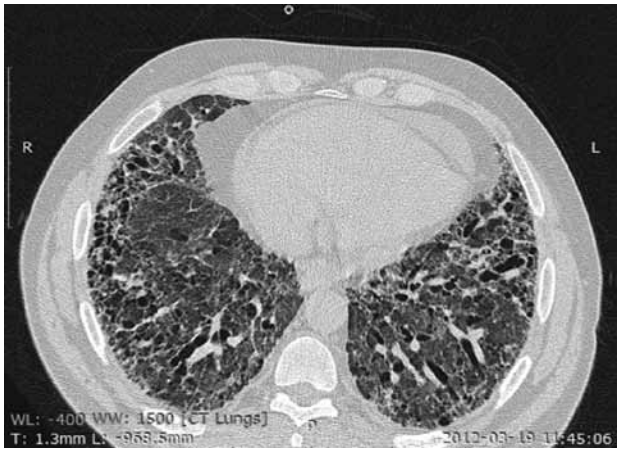

FIGURE 1. UIP pattern: reticular pattern, basal predominance/ subpleural distribution of lessions, presence of honeycombing, traction bronchiectasis and absence of findings inconsistent with UIP.

as large as 2.5 cm, but typically are in the range of 3-10 mm[11]. Ground glass can be present but should be less extensive than reticulation. Mediastinal lymph node enlargement (up to 1.5 cm) is not considered inconsistent with UIP[11]. On the contrary, upper or mid-lung or peribronchovascular predominance, extensive ground glass opacities, micronodular pattern, diffuse cysts outside honeycombing areas, mosaic attenuation and air trapping, consolidation and pleural disease (i.e. pleural plagues) are inconsistent with UIP[1].

The diagnosis of IPF can be established by specific combinations of HRCT and histopathology pattern, given that clinical criteria are satisfied and known causes of ILD are eliminated. Specifically, a UIP pattern on HRCT is enough for the diagnosis of the disease in combination with any pattern on histopathology that is not inconsistent with UIP. A possible UIP pattern on HRCT has to be combined with a definite or probable UIP pattern on histopathology for a definite diagnosis; while a possible UIP pattern or unclassifiable fibrosis surgical lung biopsy makes the diagnosis probable but not certain. Last, a HRCT pattern inconsistent with UIP, even combined with a UIP histopathologic pattern renders the diagnosis of IPF uncertain[1]. The above are summarized in Table 2.

TABLE 2. Combinations of HRCT and histopathology for the diagnosis of IPF (reference 1).

HRCT pattern	Histopathologic pattern	IPF
UIP	UIP Probable UIP Possible UIP Non-classifiable fibrosis	YES
	Not UIP	NO
Possible UIP	UIP Probable UIP	YES
	Possible UIP Non-classifiable fibrosis	Probable
	Not UIP	NO
Inconsistent with UIP	UIP	Possible
	Probable UIP Possible UIP Non-classifiable fibrosis Not UIP	NO

Three typical HRCT images that are usually seen in an ILD clinic are presented below. In the first image (Figure 1), the typical UIP pattern along with a typical clinical presentation is sufficient for diagnosing the disease (definite UIP). A HRCT similar to the second image (Figure 2) is consistent with possible UIP and would require histopathology (UIP pattern on surgical lung biopsy) for confirmation of IPF, while a HRCT similar to the third one (Figure 3) is inconsistent with UIP and consequently with the diagnosis of IPF. Emphysema may also be present in a number of patients with a history of heavy smoking (Figure 4)[12].

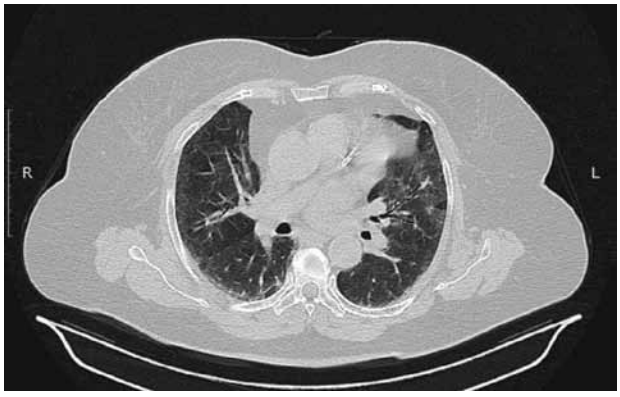

FIGURE 2. Possible UIP pattern: reticular pattern, basal predominance/subpleural distribution of lessions, absence of honeycombing, absence of traction bronchiectasis and findings inconsistent with UIP.

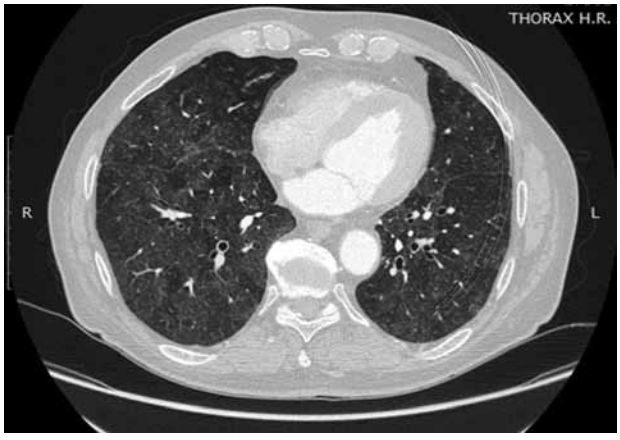

FIGURE 3. Inconsistent with UIP pattern: extensive ground glass opacities (GGO>reticular abnormality), upper and mid lung, patchy appearance.

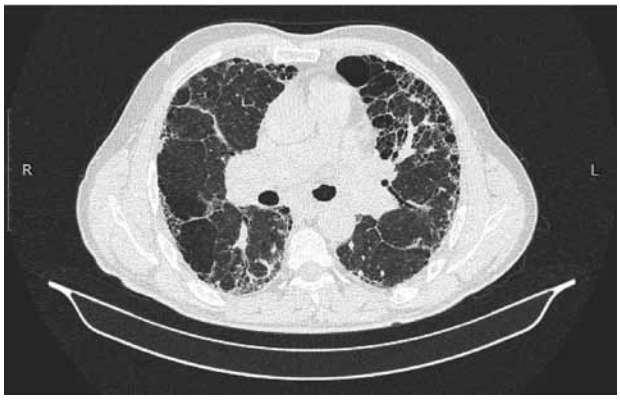

FIGURE 4. Combined Pulmonary Fibrosis Empysema in a 59 year-old patient, ex-smoker (60 pack-years), FVC 68% pred, FEV1/FVC 80, TLco 22% pred), SaO2 92% at rest (FiO2 21%). Extensive paraseptal emphysema with subpleural distribution reticulations, presence of honeycombing, and traction bronchiectasis.

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