Pitfalls in the HRCT Diagnosis of Fibrosing Lung Disease

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Why consider fibrotic ILD and non-fibrotic ILD separately?

- Expectation of certain disease behavior
  - Idiopathic pulmonary fibrosis in particular
- Prospect of enrolment into drug trial
- Differential diagnosis much shorter (bonus!)

BASICS

HRCT signs of a predominantly fibrotic lung disease:

- Honeycombing
- Traction bronchiectasis
- Volume loss

Reliability of HRCT signs of fibrotic lung disease

(++++) = complete certainty

- Honeycomb pattern
  - +++(+)
- Traction bronchiectasis
  - ++(+)
- Volume loss
  - +
Honeycomb pattern

Traction bronchiectasis

Volume loss

Honeycombing

Identification of honeycombing on HRCT - cardinal sign of UIP

- **False positive identification**
  - Centrilobular/paraseptal emphysema
e.g. superimposed on NSIP
  - Severe traction bronchiolectasis
  - Other cystic conditions e.g. Langerhans CH

- **(False negative)**
  - Microcystic or microscopic honeycombing (path)
**Lung biopsy:** Fibrotic NSIP and centrilobular emphysema

**Interobserver variability in the CT assessment of honeycombing in the lungs**

*Historically poor: Lynch et al (2005) $\kappa = 0.31$
- 43 observers (!)
- Honeycombing present definitely yes (5) thro’ definitely not (1)
- Agreement with reference standard moderate $\kappa = 0.43 - 0.58$
- In 29% disagreement on presence/absence
- Sources of disagreement: traction bx, cysts and superimposed emphysema

*Watadani et al Radiology 2013;266:207*

**Identification of traction bronchiectasis on HRCT**

- False positive identification
  - Within honeycombing
  - Dilated bronchi within OP
  - Airway dilatation in acute lung injury
  - Conspicuous, but not dilated, bronchi within GGO

- False negative
  - Within honeycombing (usually advanced)
Observer agreement for traction bronchiectasis in various FLD

- Fibrotic IIPs (UIP and NSIP)
  - Edey 2011 Eur Radiol
- Rheumatoid Arthritis-related FLD
  - Kim 2010 Eur Respir J
- Chronic hypersensitivity pneumonitis
  - Walsh SL 2012 Eur Radiol
- All comers connective tissue disease FLD
  - Walsh SL unpublished data

*Kappas for traction bronchiectasis = 0.58 - 0.69*

Study by Sakai et al - in progress

Interlobular septal thickening in fibrosing lung disease

- A common feature in UIP – not really!
- Rarely conspicuous in NSIP
- If prominent, nodular and lower zone consider sarcoidosis as the cause of the FLD
- May be an early sign of supervening fibrosis in subacute hypersensitivity pneumonitis
Two examples of NSIP

Two examples of sarcoidosis

HRCT pointers to chronic hypersensitivity pneumonitis

- Lobules of decreased attenuation in spared (non-fibrotic) lung
- Septal thickening tends to be more prominent than in fibrotic IIPs
- Unusual distribution of fibrosis, particularly vague bronchocentricty in upper lobes
- Coexistent subacute changes - indistinct relatively low attenuation centrilobular nodules (rare)
Lobules of decreased attenuation in spared lung

Unusual distribution of fibrosis, particularly vague bronchcentricity in upper lobes

Chronic hypersensitivity with UIP features

Scheme for HRCT of fibrosing lung disease:

• Is it a fibrosing lung disease (3 signs)?
• If yes, is it classical UIP?
• If no, what are the choices?

Subpleural basal honeycombing ≡ UIP

Characteristic/Classical HRCT pattern of UIP

• Subpleural
• Basal
• Honeycombing

ALSO...

• ”Propeller blade” cranio-caudal distribution

• Absence of atypical features, in particular:
  – Lobules of decreased attenuation in spared lung
  – Consolidation
If not typical UIP:

- Non-classical UIP
  - Older increasing likelihood of UIP
  
- Non-specific interstitial pneumonia (NSIP)
- Chronic hypersensitivity pneumonitis
- Fibrotic sarcoidosis
- (Fibrosing variant of organizing pneumonia)

“Other HRCT diagnoses” in patients with biopsy proven UIP

- 3 observers assigned diagnoses to HRCTs of 123 cases (core of 55 patients with biopsy proven UIP)
- 34/55 (62%) considered not to be typical of UIP:
  - NSIP 18/34 (53%); HP (12%); sarcoidosis (9%)

A diagnosis of IPF is not excluded by HRCT appearances more suggestive of NSIP

Sverzellati et al Radiology 2010;254:957
Range of HRCT appearances of non-classical UIP

...not fully explored

Does a definite diagnosis of IPF/UIP matter?

• **YES!**
  – For the patient/doctor: prognosis
  – For exclusion of cryptic driver of the disease
  – For possible entry into drug trial

"If it behaves like UIP it is UIP..."

ATS/ERS statement - IIP update 2013:

<table>
<thead>
<tr>
<th>Clinical Behaviour</th>
<th>Treatment Goal</th>
<th>Monitoring Strategy</th>
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</thead>
<tbody>
<tr>
<td>Non-acute (e.g. acute exacerbation)</td>
<td>Involve pulm. input</td>
<td>Co-ordinate to confirm diagnosis</td>
</tr>
<tr>
<td>Acute exacerbation</td>
<td>Invasive procedures, init. intubation, inotropic support</td>
<td>Involve pulm. input</td>
</tr>
<tr>
<td>CT-confirmed</td>
<td>Step down medications</td>
<td>Co-ordinate to confirm diagnosis</td>
</tr>
</tbody>
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Acute exacerbation (accelerated phase) of IPF

Consensus on diagnosis and management

HR Collard et al, AJRCCM 2007;176: 636

Differential diagnosis for recent onset of widespread ground glass opacification in IPF/UIP:

- Accelerated phase of the disease
- Supervening heart failure (oedema)
- Opportunistic infection (PCP/CMV)
- Drug reaction – esp. novel drugs
- (Spurious – expiratory CT)
- (Spurious – contrast in CTPA)
Pulmonary oedema

Pt i
Pneumocystis pneumonia

Expiratory CT

CTPA (contrast)

**Points**

- Three basic signs of fibrosing lung disease
- Issues with certain identification of honeycombing and traction bronchiectasis
- Main HRCT differential of fibrosing lung disease is UIP -v- chronic HP/NSIP
- Considerations when HRCT appearances are suggestive of acute exacerbation