The major HRCT findings correlated to pathology are summarized as follows.

1. Centrilobular diseases
   
   (1) Pulmonary emphysema
   
   Early centrilobular emphysema starts from the proximal portion of the pulmonary acinus where respiratory bronchioles and neighboring alveoli are distributed. Typical CT findings are low-attenuation areas (LAA) surrounded by perilobular normal lung. Such LAA lacks a distinct wall. Pulmonary arteries within LAA are isolated and narrowed. The disease is more prevalent in upper lobe than in lower lobe.

   (2) Pulmonary tuberculosis
   
   Pulmonary tuberculosis forms highly contrasting consolidation and nodules. The centrilobular tuberculous nodule is made, simultaneously involving the terminal and respiratory bronchioles at its center and adjacent alveoli. The nodule grows up to 2 mm in diameter, exceeding the size of the respiratory bronchiole, whose diameter is about 0.5 mm.

   Furthermore, ultra-fine branched nodules (tree-in-bud appearance) are produced frequently in pulmonary tuberculosis where the lumens of bronchioles, alveolar ducts and sacks are filled with compact caseous materials. This pathologic change is more specific than centrilobular nodules for the differential diagnosis of pulmonary tuberculosis.

   Other well-known diseases producing centrilobular nodules are bacterial bronchopneumonia, diffuse panbronchiolitis (DPB), pneumoconiosis, Langerhans cell histiocytosis and hypersensitivity pneumonitis (HP).

2. Perilobular diseases
   
   (1) Idiopathic pulmonary fibrosis
   
   IPF/UIP, the major category of IIPs, is characterized by subpleural and paraseptal fibrosis. In addition, the early pathologic change of IPF/UIP shown in biopsied lung specimens is fibrosis of alveoli next to the intra-lobular venule. The HRCT features of such a pathologic change correspond to short linear opacities connected perpendicularly to the pleura.
(2) Honeycomb lung

The pleural surface is smooth in normal lung. However, it becomes irregular in honeycomb lung. Macroscopically, the rugged pleural surface comprises a collection of small hills 2-3 mm in diameter and valleys surrounding these hills. The cut surface of such lung specimens showed that the hills and valleys correspond to subpleural micro-cysts and fibrotic walls, respectively. The latter are formed by perilobular and periacinar fibrosis. The HRCT features of honeycomb lung include a rugged pleural surface caused by polygonal multiple cysts, whose diameter ranges from 1 to 10 mm. Honeycomb lung develops along lateral surfaces of the lung, but is relatively scarce along interlobar surfaces.

3. Combined pulmonary fibrosis with emphysema

This smoking-related disease is characterized by a wide pathological spectrum. The histological pattern of fibrosis may be UIP, NSIP or unclassifiable IP. One of the most important HRCT features of the disease is walled LAA. Namely, centrilobular emphysematous space is bordered by a distinct wall and thin pulmonary arteries denuded of alveoli are found within the walled LAA.

4. Diseases extending along lymphatic channels

Lymphangiosis carcinomatosa is a classic disease characterized by thickening of bronchovascular bundle, interlobular septum and pleura caused by the lymphatic spread of tumors. These abnormalities were visualized successfully by postmortem radiography. Similar HRCT features are demonstrated in cases of interstitial edema, pulmonary sarcoidosis and lymphoproliferative disorders.

Kerley’s A and B lines are shown in chest radiographs of interstitial edema. The latter short lines are caused by thickened interlobular septa, while the former long lines are caused by thickened intersegmental or intersubsegmental septa.

5. Diseases of pulmonary vessels

Thromboembolism is a common disease in which local pulmonary arteries are blocked and dilated. Contact radiography could show coagulated blood that fills the lumen of the involved vessel several centimeters in length. A similar change was shown in the case of intravascular metastasis of cancer. In such a case, small pulmonary arteries become dilated, whereas the corresponding pulmonary vein remains normal. In some cases of tumor thrombus, perivascular tumor is added to the original size of the dilated vessel. Another important cause of local vascular dilatation is septic emboli.
6. Diseases of alveoli

A dissecting microscope is an essential tool to recognize details of morphological changes of alveolar disease. Diffuse alveolar damage (DAD) is an important disease in which the two compartments of lung parenchyma become separated by the disease. Namely, the back-to-back alveoli are isolated from the air passages (alveolar ducts and sacs) by the formation of hyaline membranes that plug alveolar entrances. On the other hand, the air passages are dilated. The major HRCT feature of DAD is diffuse ground glass attenuation in the posterior aspect of both lungs.

Non-mucinous adenocarcinoma with lepidic growth is suitable to appreciate thickening of back-to-back alveoli. A magnified view can identify thickened back-to-back alveoli from air passages left within the tumor. Such pathological features are responsible for producing ground glass attenuation in HRCT.