

Interstitial Lung Markings on HRCT Chest

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We undertook this study, with the objective of identifying various patterns through which the thickness of interstitium present. 25 patients of interstitial thickness on HRCT were taken. Interstitial thickening was subdivided into three groups. Smooth, Nodular and Irregular. Through this we narrowed the differential diagnosis list and helped the clinician in guiding through the diagnosis. 16 patients had irregular thickening, 5 had nodular thickening.

Key words. HRCT Chest, Interstitial thickening

HRCT chest is very sensitive in identifying the diseases that affect the lung parenchyma. The knowledge of anatomy is very essential in identifying the pathologies affecting the lung parenchyma. The structure of a lobule being prime importance, with central artery and bronchus the septa bounding the lobule. It is the interlobular septa and intralobular septa whose thickening points to the diagnosis and also the adjacent pleura is helpful as always.

Objective of the study

Following points were taken into consideration while undertaking this study

1. Identify the various patterns of interstitial septal thickenings.
2. Study each pattern relative of the diagnosis and its significance.

Patients and methods

25 patients were taken between January 2003 to June 2003, all of them had some sort of interstitial involvement, all of them had chest symptoms ranging from acute onset of breathlessness to industrial exposure and a few being known cases of carcinoma. We only took the admitted patients in the Mayo Hospital for the convenience that follow up on these patients could be gathered easily. They were scanned according to the following protocol

CT Chest HRCT without IV contrast

Slice thickness 1.5mm

Slice interval 10mm

Breath holding during every slice

Usually in prone position to avoid confusion with basal atelectasis. The machine was Toshiba Xvision/Ep Helical.

Results

We included only patients with interstitial thickenings. Three main categories were identified 1) Smooth septal thickening 2) Nodular septal thickening 3) Irregular septal thickening (Table). Out of the 5 nodular septal thickening, two were known patient of carcinoma thyroid, three had sarcoidosis. Out of 4 smooth septal thickening three had pulmonary edema, one was carcinoma of pancreas. In the irregular variety mostly was the idiopathic pulmonary fibrosis.

Major Finding	n=
Smooth septal thickening	4
Nodular septal thickening	5
Irregular septal thickening	16

Discussion

Thickening of the lung interstitium by fluid, Fibrous tissue, or because of interstitial infiltration by cells usually result in a pattern of reticular opacities as seen on HRCT. The easiest reticular pattern to recognize is interlobular septal thickening. Although thickening of interlobular septa is relatively common in patients with interstitial lung disease, it is uncommon as a predominant finding and has a limited differential diagnosis. On HRCT, numerous clearly visible interlobular septa almost always indicate the presence of an interstitial abnormality; only a few septa should be visible in normal patient. Septal thickening can be seen in the presence of interstitial fluid, infiltration, or fibrosis.

In the peripheral lung, thickened septa 1-2 cm in length may outline part of, or an entire lobule, and are usually seen extending to the pleural surface. In the central lung, the thickened septa can outline lobules that are 1-2.5cm in diameter, and appear polygonal, or sometimes hexagonal, in shape. Lobules delineated by thickened septa commonly contain a visible dot-like or branching central pulmonary artery. Septal thickening can be smooth, nodular, or irregular in contour in different pathologic processes.

Smooth septal thickening is usually seen in patients with lymphangitic spread of carcinoma or lymphoma, interstitial pulmonary edema, alveolar proteinosis (associated with ground-glass opacity), and some infections.

Nodular or "beaded" septal thickening occurs in lymphangitic spread of carcinoma or lymphoma, sarcoidosis, and silicosis.

In patients who have interstitial fibrosis, septal thickening visible on HRCT is often *irregular* in appearance, and associated with distortion of lung architecture.

Interlobular septa are contiguous with the subpleural interstitium. Usually thickening of interlobular septa is associated with thickening of the subpleural interstitium. Subpleural interstitial thickening can be difficult to see adjacent to the major fissures. Thus "thickening of the

fissure" can represent subpleural interstitial thickening. If the thickening is smooth, it may be difficult to distinguish from fissure fluid. If the thickening is irregular or nodular in appearance, an interstitial abnormality is more diagnosed.

Pulmonary lymphangitic carcinomatosis (PLC) is a term that refers to tumor growth in the lymphatic system of the lungs. It occurs most commonly in patients with carcinomas of the lung, breast, stomach, pancreas, prostate, cervix, or, as in this case, direct lymphatic spread of tumor from hilar or mediastinal lymph nodes. Symptoms of shortness of breath are common and can predate radiographic abnormalities.

On HRCT, PLC is often characterized by interlobular septal thickening of fissures, and thickening of the peribronchovascular interstitium. The thickening septa are most often smooth, but septal nodules may sometimes be seen. Because lung architecture is preserved, lobes outlined by thick septa have a normal appearance. Four factors account for interstitial thickening seen on HRCT in patients with PLC. These are (1) tumor filling pulmonary vessels or lymphatic, (2) the presence of tumor within the interstitium, (3) distention of vessels or lymphatic channels distal to central vascular or lymphatic tumor emboli, and (4) interstitial edema or fibrosis secondary to the presence of interstitial tumor.^{6,7}

In approximately 50% of patients, the abnormalities of PLC appear focal or unilateral rather than diffuse. This finding is helpful in distinguishing PLC from other causes of interlobular septal thickening. Hilar lymphadenopathy is visible on CT in 50% of patients with PLC.

In addition to interlobular septal thickening and thickening of fissures, thickening of the interstitium surrounding vessels and bronchi in the parahilar lung ("peribronchial cuffing") is a common finding in lymphangitic carcinomatosis.

Since the thickened peribronchovascular interstitium cannot be distinguished from the underlying opacity of the bronchial wall or pulmonary artery, this finding is usually perceived on HRCT as: 1) an increase in bronchial wall thickness; and 2) an increase in diameter of pulmonary artery branches. Bronchial wall thickening or "peribronchial cuffing" is the easiest of these two findings to recognize.

As with interlobular septal thickening, thickening of the peribronchovascular interstitium can appear smooth, nodular, or irregular in different diseases. Smooth peribronchovascular interstitial thickening is most common in patients with lymphangitic spread of carcinoma and interstitial pulmonary edema. Nodular thickening of the peribronchovascular interstitium is particularly common in sarcoidosis and lymphangitic spread of carcinoma. Hydrostatic pulmonary edema generally results in a combination of septal thickening and ground-glass opacity, but septal thickening or ground glass opacity can predominate in individual cases. There is a tendency for hydrostatic edema

to have a parahilar and gravitational distribution, but this is not always visible. Thickening of the parahilar peribronchovascular interstitium (peribronchial cuffing), and fissural thickening are also common. Patients with pulmonary edema are not generally imaged using HRCT, as their diagnosis is usually based on a combination of clinical and chest radiographic findings. However, knowledge of the HRCT appearance of pulmonary edema can be helpful in avoiding misdiagnosis.

Sarcoid granulomas frequently cause nodular thickening of the peribronchovascular interstitium on HRCT, and extensive peribronchovascular nodularity is characteristic and highly suggestive of this disease. Subpleural nodules are also typical of sarcoidosis.^{4,5}

Another hallmark of IPF on HRCT is its patchy distribution. Areas of mild and severe fibrosis, mild and marked inflammatory activity, and normal lung are often present in the same patient, in the lung, and in the same lobe. On HRCT, IPF is characterized by the presence of reticular opacities, which correspond to areas of irregular fibrosis and reflect the typical pathologic features of UIP.

Conclusion

Chest X-ray are and will remain the initial investigation of choice in patients with chest symptoms, however with the evolution of CT scanners, the sensitivity of CT scan has increased many folds especially in the diseases involving the interstitium,^{8,9,10}

References

1. Padley S P G, Adler B. High-resolution computed tomography of the chest current indications. *J Thorac Imag* 1992 8:189.
2. Muller N. Computed tomography of chronic diffuse infiltrative lung disease. *Am Rev Respir Dis* 1993 142: 1206-1215.
3. Muller N. L, Miller R. R Computed tomography of chronic diffuse infiltrative lung disease (2). *Am Rev Respir Dis* 1990 142: 1440-1448.
4. Muller N.L. Clinical value of high resolution CT in chronic diffuse lung disease. *AJR* 1980 157:1163-1170.
5. Hansell D M. High-resolution computed tomography in extrinsic allergic alveolitis. *Clin Radiol* 1992 43:8-12.
6. Stein M G et al. Pulmonary lymphangitic spread of carcinoma: Appearance on CT scans. *Radiology* 1991 162:371-375.
7. Akira M, Yamamoto S, Yokoyama K, Kita N, Morinaga K, Higashitara T, Kozuka T Asbestosis: High-resolution CT-pathologic correlation. *Radiology* 1987 176:389-394.
8. Mathieson J R, Mayo J R et al. Chronic diffuse infiltrative lung disease: comparison of diagnostic accuracy of CT and chest radiography. *Radiology* 1990 171:111-116.
9. Padley S P G, Hansell D M, Flower C D R, Jennings P. Comparative accuracy of high resolution computed tomography and chest radiography in the diagnosis of chronic diffuse infiltrative lung disease. *Clin Radiol* 1989 44:227-231.
10. Grenier P, Valeyre D et al. Chronic diffuse interstitial lung disease: diagnostic value of chest radiography and high-resolution CT.