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*Small bronchiectases and bronchiolectases in high resolution  
computed tomography (HRCT)*

Bronchiectases occur in areas of fibrosis, where they represent irreversible changes. Computed tomography of lung is considered the diagnostic method of choice in revealing bronchiectases. Large bronchiectases form characteristic patterns, and are visible even on plain chest radiograms. Small bronchiectases and bronchiolectases may not be visible even in conventional CT. HRCT is a diagnostic method, which optimizes the spatial resolution and achieves the best quality of lung images.

The aim of the study is evaluation of diagnostic value of HRCT in revealing small bronchiectases and bronchiolectases.

MATERIAL AND METHODS

The material comprises a group of 38 patients, 21 men and 17 women, aged between 23 and 74 years. The HRCT examination was performed due to interstitial lung diseases. The scanning was performed in prone, supine and lateral positions. The collimation of the scans was 2 mm. Scans were obtained at the levels of radiographic changes, most often fibrotic.

RESULTS

In 8 patients the dilated bronchi formed annular, thick-wall lucencies, with accompanying small, round opacities (Fig.1). This picture in the diagnostics of bronchiectases is called the "signet-ring sign". In 3 cases the emphysematous bullas coexisted. In 5 patients the bilateral bronchiectases were localized mainly in the central lung areas (Fig. 2). In 3 patients, small thin-wall bronchiectases form a "clusters of grapes", and were localized mainly in the peripheral and parabasal areas (Fig. 3). Thick-wall, bronchiectases with peribronchial fibrosis, peripheral, about 2 cm from pleura were seen in 6 patients.

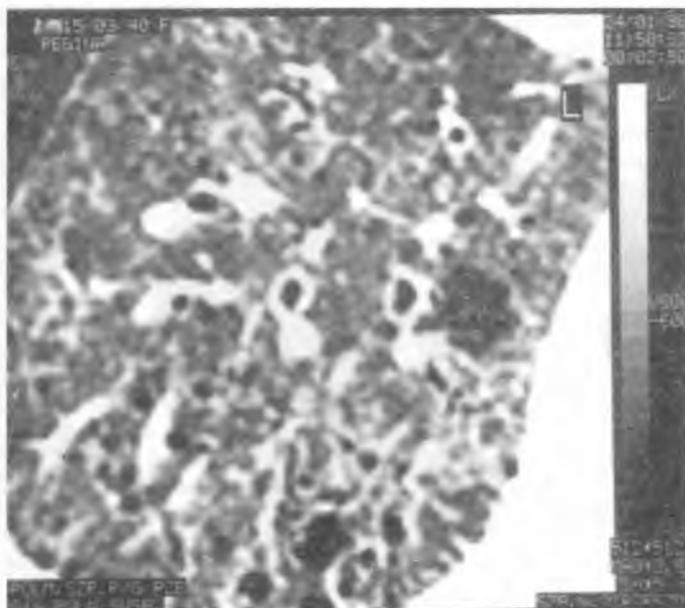


Fig. 1. Thick-wall bronchiectases with spread nodules. The round emphysematous bulla



Fig. 2. The bronchiectases in the posterior lung areas

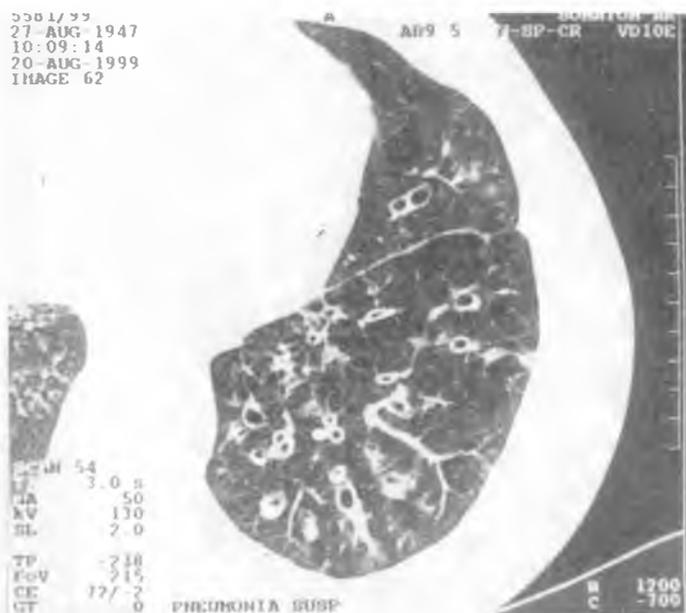


Fig. 3. Small thin-wall bronchiectases

## DISCUSSION

The diameter of the lung artery and adjacent bronchus are similar, although the artery may appear a little larger, especially in dependant lung areas. The presence of bronchus with larger diameter than adjacent artery indicates its dilatation (4).

The bronchiectases are defined as localized, irreversible dilatation of the bronchial tree (2,5,9,12,13). They usually result from chronic inflammation, but obturation and congenital abnormalities may also contribute (2). Other reasons include cystic fibrosis, allergic bronchopulmonary aspergillosis, mucoviscidosis, tuberculosis, diskinctic cilia syndrome (3). Large number of bronchiectases are idiopathic, without evident reasons (9). The central bronchiectases are the most frequent in allergic bronchopulmonary aspergillosis (8,9). Depending on their morphology, they are divided into three types, cylindrical, cystic and varicose (7,13).

The mildest form of the disease is cylindrical bronchiectases. In HRCT they form thick-wall densities, extending into the lung periphery, without normal tapering, while normal bronchi are not visible in peripheral lung areas, 2 cm from pleura (3,6). Depending on the their orientation relative to the scan plane they can simulate "tram track" or can show "signet-ring sign". The dilatation of the bronchi larger than the diameter of adjacent arteries is responsible for the "signet-ring sign", lack of tapering of bronchi lying in the scan plane, visibility of them in the peripheral 2 cm of lung are characteristic features of cylindrical bronchiectases (3,6,7). Ecstatic bronchi containing fluid or mucus appear as tubular opacities (6,7).

Varicose bronchiectases are similar to cylindrical, but the bronchial walls are more irregular, and can have a beaded appearance, called "string of pearls". The traction bronchiectases often appears varicose (3,9,13).

Cystic bronchiectases form a group or cluster of air- or fluid-filled cysts, giving the appearance of a "cluster of grapes". They are often patchy in distribution, allowing

differentiating from a cystic lung disease. The air-fluid levels, especially in dependant portion of cystic dilated bronchi, are not usually seen in patients with lung cysts (3,9,13).

In patients with lung fibrosis, traction by fibrous tissue on the walls of bronchi results in irregular bronchial dilatation, or bronchiectases, which are typically "varicose" in appearance (12). Traction bronchiectases usually involve the segmental and subsegmental bronchi, small peripheral bronchi or bronchioles. Dilatation of intralobular bronchioles, because of surrounding fibrosis, form traction bronchiolectases. Because of peripheral interstitial thickening, the bronchial walls can appear to measure several millimeters in thickness (9). Traction bronchiectases and bronchiolectases are most often seen in areas of the most severe fibrosis, usually in association with honeycombing. In peribronchovascular interstitial thickening the relations of diameters of bronchi and adjacent arteries are preserved, and they have approximately the same diameters (4,10,13). The sensitivity of HRCT in revealing the bronchiectases is 60–80%, and specificity 86–100% (7,12). The motion artifacts are visible at the left lung base (13). They form the streaks radiate from the edges of vessels or other visible structures, which therefore resemble stars. The small lucent areas that may be seen between these streaks may be mistaken for dilated bronchi (11). The major fissure, usually on the left, vessels or bronchi, may be seen as double because of cardiac pulsation or respiratory movements. This appearance can mimic bronchiectases (13).

The traction bronchiectases and the honeycombing are evidence of severe fibrosis and irreversibility of changes (1).

## CONCLUSIONS

In diagnosis of bronchiectases, HRCT is a diagnostic method of choice. The picture of large bronchiectases is typical. In diagnosis of small bronchiectases and bronchiolectases the knowledge of typical HRCT patterns is essential. They include "signet-ring sign", "tram track", lack of normal tapering, visibility of bronchi in peripheral lung areas, within 2 cm from the parietal pleura. In varicose bronchiectases, the "string of pearls" and in cystic "cluster of grapes" are typical appearances.

## REFERENCES

1. Abehsera M. et al: Sarcoidosis with Pulmonary Fibrosis: CT Patterns and Correlation with Pulmonary Function. *AJR*, 174, 1751, 2000.
2. Austin J. et al: Glossary of Terms for CT of the Lungs: Recommendations of the Nomenclature Committee of the Fleischner Society. *Radiology*, 200, 327, 1996.
3. Cartier Y. et al: Accuracy of High-Resolution CT in the Differentiation of Specific Diseases. *AJR*, 173, 47, 1999.
4. Dederich S. et al: Interobserver variation in the diagnosis of bronchiectasis on high-resolution computed tomography. *Eur. Radiol.*, 6, 801, 1996.
5. Kang E. et al: Bronchiectasis: Comparison of Preoperative Thin-Section CT and Pathologic Findings in Resected Specimens. *Radiology*, 195, 649, 1995.
6. Kim J. et al: Cylindrical Bronchiectasis: Diagnostic Findings on Thin-Section CT. *AJR*, 168, 751, 1997.
7. Lucidarme O. et al: Bronchiectasis: Comparative Assessment with Thin-Section CT and Helical CT. *Radiology*, 200, 673, 1996.
8. McGuinness G. et al: Bronchiectasis: CT Evaluation. *AJR*, 160, 253, 1993.

9. Reiff D. et al: Ct Findings in Bronchiectasis: Limited Value in Distinguishing Between Idiopathic and Specific Types. *AJR*, 165, 261, 1995.
10. Santamaria F. et al: Cystic Fibrosis: When Should High-resolution Computed Tomography of the Chest Be Obtained? *Pediatrics*, 101, 908, 1998.
11. Schoepf U. et al: Electrocardiographically Gated Thin-Section CT of the Lung. *Radiology*, 212, 649, 1999.
12. van der Bruggen-Bogaarts B. et al: Assessment of Bronchiectasis: Comparison of HRST and Spiral Volumetric CT. *J. Comput. Assist. Tomogr.*, 20, 15, 1996.
13. Webb W. R., Müller N. L., Naidich D. P.: *High-Resolution CT of the Lung*. Lipincott-Raven, 1996.

## SUMMARY

Large bronchiectases form characteristic patterns, and are visible even on plain chest radiograms. Small bronchiectases and bronchiolectases may not be visible even in conventional CT. HRCT is a diagnostic method, which optimizes the spatial resolution and achieves the best quality of lung images, and therefore in diagnosis of bronchiectases HRCT is a diagnostic method of choice. In diagnosis of small bronchiectases and bronchiolectases the knowledge of typical HRCT patterns is essential. They include "signet-ring sign", "tram track", lack of normal tapering, visibility of bronchi in peripheral lung areas, within 2 cm from the parietal pleura. In varicose bronchiectases the "string of pearls" and in cystic "cluster of grapes" are typical appearances.

### Małe rozstrzenia oskrzeli i rozstrzenia oskrzelików w tomografii komputerowej wysokiej rozdzielczości (TKWR)

Duże rozstrzenia oskrzeli mają charakterystyczne obrazy i są widoczne nawet na radiogramach klatki piersiowej. Małe rozstrzenia oskrzeli i rozstrzenia oskrzelików w konwencjonalnej tomografii komputerowej mogą nawet nie być widoczne. Tomografia komputerowa wysokiej rozdzielczości jest techniką, której celem jest uzyskanie optymalnej rozdzielczości przestrzennej i jakości obrazów, dlatego w rozpoznawaniu rozstrzeni oskrzeli jest metodą diagnostyczną z wyboru. W rozpoznawaniu małych rozstrzeni oskrzeli i rozstrzeni oskrzelików istotna jest znajomość typowych obrazów w TKWR. Są to: objaw sygnetu, obraz torów tramwajowych, brak zwężania się oskrzela, widoczność oskrzeli w obwodowych partiach płuc, 2 cm od opłucnej ściennej. W rozstrzeniach żylakowatych typowy jest objaw sznura pereł, a w rozstrzeniach workowatych kiści winogron.