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High resolution computed tomography in sarcoidosis: typical findings

Sarcoidosis is a systemic disorder of unknown cause in which noncaseating granulomas occur. Granulomas form in lymphatic or perilymphatic distribution, along lymphatics and in peribronchovascular interstitium. In some cases the granulomas form in interlobular septa or subpleural interstitium. Nodular interstitial densities in parahilar lung regions are very typical of sarcoidosis, especially with coexistent hilar lymphadenopathy (3, 4, 5, 7).

In HRCT the appearance of pulmonary sarcoidosis may vary, and may masquerade many other diffuse interstitial lung diseases.

The aim of the study is the evaluation of the typical findings of sarcoidosis in HRCT, and assessment of their value in differential diagnosis.

MATERIAL AND METHODS

Material comprises a group of 17 patients with sarcoidosis, in whom HRCT examination was performed. The scanning was performed from lung apices to the level of diaphragm, at full inspiration with patients in a supine position. Additional expiratory scans were performed to diagnose air-trapping, and in case of subpleural densities in posterior, dependent lung areas additional scans were obtained in a prone patient's position.

RESULTS

Ground glass opacities were found in 13 patients (p=0.006) (Fig. 1). They form irregular areas of increased density, without obscuring underlying vessels (Fig. 2). Usually they affected upper lung areas. Consolidation was seen in four, obscuring underlying vessels (Fig. 3). Small nodules were seen in all 17 patients (Fig. 4), and were typically distributed in peribronchovascular and subpleural lung areas (p=0.003). They were usually from 2 to 5 mm in diameter, well defined. In some regions confluent nodules form conglomerates of nodules. The interface sign was seen in 10 patients, and peribronchovascular thickenings in 16. Thickening of the interlobular septa was seen in 15 cases (p=0.003), and parenchymal bands were seen in nine. Subpleural thickenings were seen in 6 patients, and bronchiectases in seven (Fig. 5). Air trapping was seen in five patients. Conglomerates of masses and large nodules were seen in three patients, with coexistent traction bronchiectases and honeycombing (Fig. 6) as a result of fibrosis.

Fig. 1. Increased lung density without obscuring underlying vessels – ground glass opacities

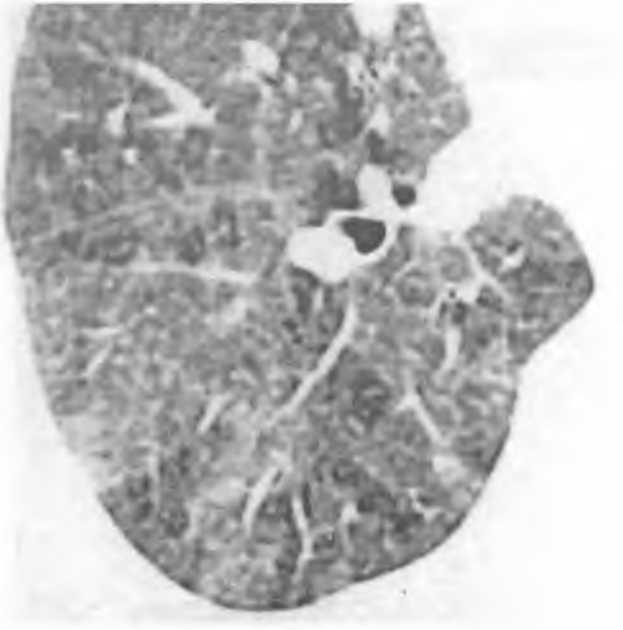

Fig. 2. Irregular, patchy areas of ground glass opacity. Peribronchovascular interstitial thickenings

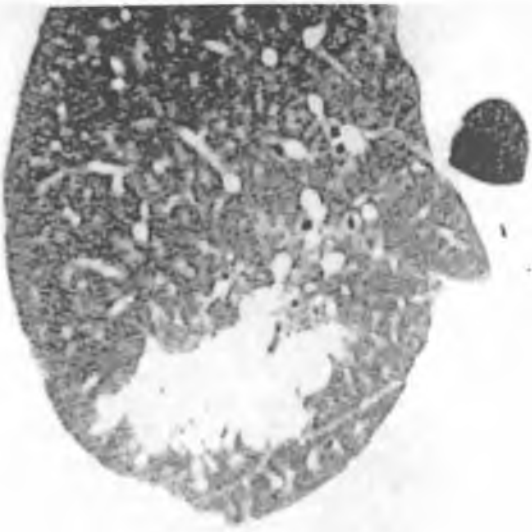

Fig. 3. Consolidations obscuring underlying vessels in the posterior part of the lung. Bronchiectases and peribronchovascular thickening

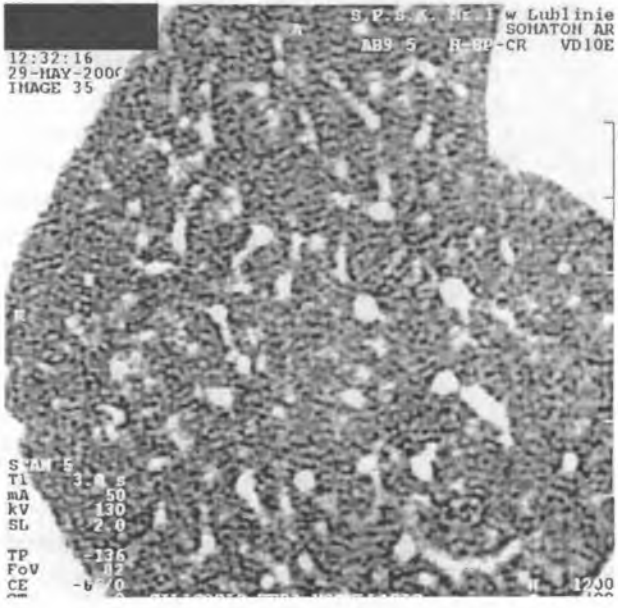

Fig. 4. Small nodules in a patient with sarcoidosis

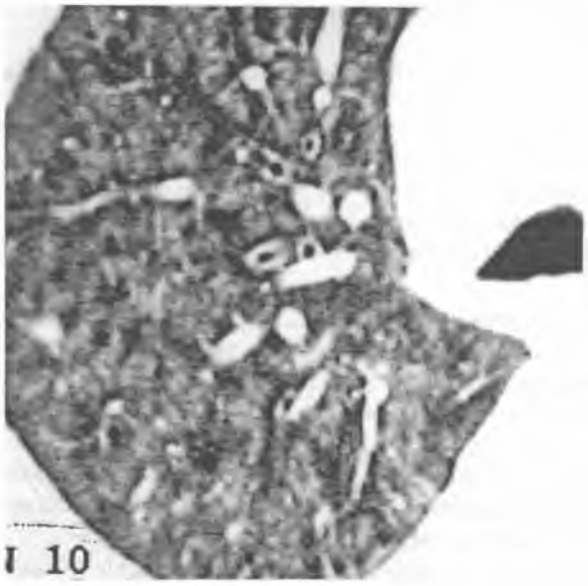

Fig. 5. Small nodules form ground glass opacities. Bronchiectases and peribronchovascular thickenings

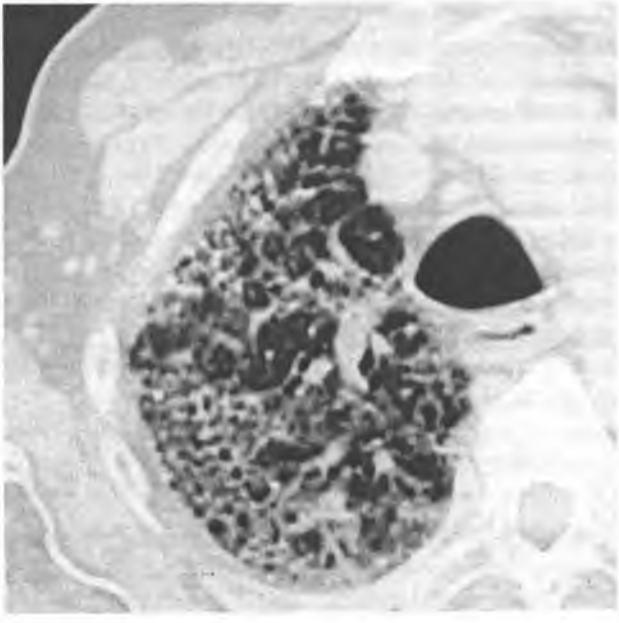

Fig. 6. Traction bronchiectases and honeycombing as a result of fibrosis in sarcoidosis

DISCUSSION

Smooth peribronchovascular interstitial thickening is the typical feature of sarcoidosis. Nodular appearance of peribronchovascular interstitium is seen in some cases of sarcoidosis, but is a typical feature of lymphangitic carcinomatosa (5, 6, 7).

Small, well-defined nodules in characteristic perilymphatic distribution are typical in pulmonary sarcoidosis. They are distributed in relation to subpleural surface, adjacent to major fissures, along thickened interlobular septa and adjacent to vessels. The pulmonary vessels may be irregularly enlarged as a result (5, 6, 7).

The nodules may be evenly distributed throughout both lungs, predominating in the upper and middle lung areas. In most cases nodules cluster in the parahilar and peribronchovascular regions, sparing of the lung periphery. They may also be grouped in small areas uni- or bilaterally (6, 7).

Confluence of granulomas may form large, mostly ill-defined opacities or consolidations. Nodular densities measuring between 1 and 4 cm in diameter are seen in 15–25% of patients (4, 6).

Patchy areas of ground glass opacities are also often seen in pulmonary sarcoidosis. They are rarely seen on plain chest radiographs, and in HRCT were described in 20–60% of cases. In most cases they are associated with small nodules (3, 5, 6, 7).

In some patients areas of air-trapping on expiratory scans are visible, representing obstructions of small airways (3, 4, 7).

In about 20% of cases, a pulmonary fibrosis develops with septal thickening, traction bronchiectases, and honeycombing. Conglomerate masses mostly in perihilar location represent areas of fibrosis which cause characteristic traction bronchiectasis (1, 5, 6).

The condition that most closely mimic the HRCT appearance of sarcoidosis are lymphangitic carcinomatosa, pneumoconiosis (6).

In all this disease small perilymphatic nodules are seen. The differences in predominant distribution occur, and the combination with the signs of fibrosis are key factors in differential diagnosis (6).

In sarcoidosis the nodules are predominantly located along the central bronchovascular bundle and in the subpleural area; in lymphangitis carcinomatosa nodules are mostly located in relation to interlobular septa and bronchovascular interstitium. In pneumoconiosis nodules are predominantly centrilobular and subpleural (6).

In pneumoconiosis, nodules are mostly evenly distributed throughout the whole lung, a finding which is much less typical of sarcoidosis.

Differentiation of conglomerate masses of fibrosis in sarcoidosis show presence of air bronchograms, which is not visible in silicosis pneumoconiosis (6).

Septal thickenings in sarcoidosis are not dominant features like in lymphangitic carcinomatosa, and usually are combined with findings of fibrosis and lung distortion. Fibrosis is not seen in lymphangitic carcinomatosa. However, in some patients HRCT the appearance of sarcoidosis and lymphangitic carcinomatosa may be indistinguishable (6).

CONCLUSIONS

The most typical HRCT finding in patients with sarcoidosis are small nodules. They are predominantly distributed adjacent to peribronchovascular and subpleural interstitium. Thickenings of peribronchovascular and septal interstitium are also often seen in sarcoidosis. Ground glass opacities are seen in early stages of sarcoidosis. Conglomerates of masses and large nodules may also be seen in advanced diseases, with traction bronchiectases and honeycombing as a result of fibrosis.

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SUMMARY

Sarcoidosis is a systemic disorder of unknown cause in which noncaseating granulomas occur. Granulomas are formed in lymphatic or perilymphatic distribution, along lymphatics and in peribronchovascular interstitium. In some cases the granulomas are formed in interlobular septa or subpleural interstitium. Nodular interstitial densities in parahilar lung regions are very typical of sarcoidosis, especially with coexistent hilar lymphadenopathy (3, 4, 5, 7). In HRCT the appearance of pulmonary sarcoidosis may vary, masquerading many other diffuse interstitial lung diseases. The aim of the study is the evaluation of the typical findings for sarcoidosis in HRCT, and assessment of their value in differential diagnosis. The most typical HRCT finding in patients with sarcoidosis are small nodules. They are predominantly distributed adjacent to peribronchovascular and subpleural interstitium. Thickenings of peribronchovascular and septal interstitium are also often seen in sarcoidosis. Ground glass opacities are seen in early stages of sarcoidosis. Conglomerates of masses and large nodules may also be seen in advanced diseases, with traction bronchiectases and honeycombing as a result of fibrosis.

Sarkoidoza w tomografii komputerowej wysokiej rozdzielczości

Sarkoidoza jest chorobą systemową o nieznanej etiologii, z nieserowaciejącymi ziarniniakami. Ziarniniaki tworzą się w lokalizacji okołolimfatycznej, wzdłuż naczyń limfatycznych i w sąsiedztwie śródmiąższu okołooskrzelowonaczyniowego. W niektórych przypadkach ziarniniaki tworzą się w przegrodach międzyzrazikowych lub w sąsiedztwie śródmiąższu podopłucnowego. Guzkowate zagęszczenia w przywnękowych obszarach płuc są bardzo typowe dla sarkoidozy, szczególnie z towarzyszącą wnękową limfadenopatią. W TKWR obraz sarkoidozy płucnej może być różny, przypominając inne choroby śródmiąższowe płuc. Celem pracy była ocena typowych dla sarkoidozy zmian stwierdzanych w badaniu TKWR i ocena ich wartości w diagnostyce różnicowej. Najbardziej typową zmianą w TKWR w sarkoidozie są małe guzki. Najczęściej dominują w obszarach okołooskrzelowonaczyniowych lub sąsiedztwie śródmiąższu podopłucnowego. Zagęszczenia śródmiąższu okołooskrzelowonaczyniowego i podopłucnowego są również częste. Zacienienia szkła mlecznego są częste we wczesnych stadiach choroby. Konglomeraty mas i duże guzki są typowe w fazie zaawansowanej, prowadząc do powstania rozstrzeni oskrzeli z pociągania i obrazów plastra miodu w wyniku włóknienia.