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PULMONARY MANIFESTATION OF SARCOIDOSIS DETECTED WITH HIGH RESOLUTION COMPUTED TOMOGRAPHY

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Abstract

Sarcoidosis is a multisystemic disease of unknown etiology that mostly affects the lung parenchyma with interstitial and granulomatous changes of varying intensity and expression depending on the stage of the disease. In addition to the parenchyma and interstitium, the mediastinal lymph nodes are also very often affected.

To analyze the distribution and characteristics of interstitial lung lesions and the involvement of mediastinal lymph nodes in pulmonary sarcoidosis by the method of high-resolution computed tomography.

15 patients diagnosed with pulmonary sarcoidosis were included in the study. Computed tomography with high resolution was made on 128 slice CT scanner PHILIPS INCISIVE, using 1 mm thin-slice thickness and high spatial frequencies algorithm for image reconstruction. Lymph nodes are classified as hilar and mediastinal with a maximum diameter of short axis of more than 10 mm taken as their enlargement. Pulmonary changes are classified as nodules, reticular opacities, fibrous lesions, ground glass opacities and consolidations. The predominant distribution of lesions in the upper and middle zones of the lungs compared to the lower zones was noted. The disease is graded in 5 stages with the Scadding classification.

15 cases of patients diagnosed with sarcoidosis were analyzed all of whom are women in the age group of 30-60 years old. Two patient are in stage I and three are in III stage of the disease, 6 patients are in stage II of sarcoidosis and 4 are in stage IV of the disease. Dry cough as a symptom predominates in all patients, while dyspnea is graded according to the mMRC scale. Mediastinal lymphadenopathy with and without calcifications was present in 11 patients. The type of lung changes as well as their distribution are presented in graphs.

HRCT is the method of choice in the evaluation of pathological changes in pulmonary sarcoidosis. It very precisely shows us the characteristic appearance of nodules and lesions, their distribution and atypical changes and helps us in grading the disease and its treatment.

Key words: lung, sarcoidosis, interstitial lung disease, HRCT.

Introduction

Sarcoidosis is a multisystemic disease of unknown etiology that very often affects the lung parenchyma with interstitial and granulomatous changes of varying intensity and expression depending on the stage of the disease. Very often mediastinal lymph nodes are affected with changes of various types [1]. There is a wide spectrum of radiological findings providing challenges to radiologist.

Sarcoidosis mainly affects adults over the age of 40 (with a peak in the third decade of life) and has a prevalence of 10-20 cases per 100,000 population. The disease is diffusely spread throughout the world and both sexes are almost equally affected [2].

Pulmonary involvement is the most common finding (90%) with predominant symptoms of dry cough and dyspnea. It is estimated that 20% of the patients develop chronic lung disease leading to pulmonary fibrosis. Systemic symptoms and symptoms involving other organs are in a significantly smaller percentage (20-30%).

The prevalence of the disease is higher among non-smokers than among smokers and is more common in certain occupational groups, such as nurses, firefighters, transport and service workers, although the cause is unknown [2].

Imaging methods such as high-resolution computed tomography (HRCT) play a key role in the diagnosis and monitoring of patients. This is due to the fact that the plain radiogram of the lungs has numerous limitations, including insufficient resolution for the detection of parenchymal abnormalities and for the detection of hilar and mediastinal adenopathy.

HRCT has a greater superiority than conventional computed tomography for the detection and assessment of subtle parenchymal lesions and abnormalities of lung structures [3].

It helps us in the prognostic development of the disease and the appropriate treatment. The most important prognostic-predictive factor is the extension of fibrotic changes, i.e. the extension of honeycombing changes and reticulation detected on HRCT [4], i.e. it allows us to accurately grade the degrees of the disease with the Scadding Staging System. In the advanced stages of sarcoidosis, reticular shadow zones, traction bronchiectasis, architectural distortion of the parenchyma, honeycomb lung, bullae and paracicatricial emphysema are seen in the upper and middle lung zones. The lung bases are usually spared [4].

HRCT is the method of choice for a complete chest examination and detection of possible myocardial involvement in sarcoidosis. It also aids in the diagnosis of disease in patients with unusual radiological findings and atypical pulmonary presentations.

The aim of the study is to analyze the distribution and characteristics of interstitial lung lesions and involvement of mediastinal lymph nodes in pulmonary sarcoidosis using the HRCT method.

Material and methods

The study included 15 cases of patients (all women) with pulmonary sarcoidosis. The patients were clinically evaluated, and the diagnosis was confirmed at the Clinic for Pulmonology and Allergology - Skopje. HRCT was performed on a 128-slice PHILIPS INCISIVE computed tomography scanner, using 1 mm thickness of sections and high spatial frequencies algorithm for image reconstruction.

The images were evaluated using appropriate lung and mediastinal windows. Lymph nodes were classified as hilar and mediastinal with maximum short axis diameter (MSAD), more than 10 mm taken as their enlargement.

Pulmonary changes (opacity) were classified as nodules (micronodules 1-4 mm and macronodules greater than 5 mm), reticular opacities, fibrous lesions, ground glass opacities and confluent consolidations. Nodular distribution was classified as perilymphatic, centrilobular, and randomized. The predominant distribution of lesions in different zones of the lungs (upper, middle and lower zones) was also noted.

The disease is graded with the Scadding classification in 5 stages. Stage zero (0) - where the radiogram of the lungs is normal, stage (I) - with mediastinal lymphadenopathy, stage (II) - with lymphadenopathy and parenchymal lung changes, stage (III) - only with parenchymal lesions and stage (IV) - with the advanced stage of pulmonary fibrosis [5].

Results

15 cases of patients with sarcoidosis were analyzed, all of whom are women in the age group of 30-60 years. According to the included age group, 4 of the patients are in stage IV of the disease, 6 patients are in stage II, 2 patients are in stage I and 3 are in stage III (tab. 1).

Dry cough as a clinical symptom predominated in all patients, followed by dyspnea which was graded according to the mMRC scale. Four patients had mMRC grade 0 (Table 2), 2 with grade 2 and one with grade 3.

Out of the total number of patients, 8 had the presence of mediastinal lymphadenopathy (Table 3). The presence of conglomerated lymph nodes was seen in 4 patients. Necrosis in the mediastinal lymph nodes was not seen in any case. Four patients were without the presence of enlarged lymph nodes.

Table 1. Distribution of patients based on age, gender and stage.

Gender	n
Female	15
Male	0
Age Group	n
20-30	1
30-40	2
40-50	3
50-60	7
60-70	2
Stage	n
0	0
I	2
II	6
III	3
IV	4
Total	15

Table 2. Symptoms of dry cough and dyspnea according m MRC scale.

Grade	**m MRC scale**
0	Breathlessness only strenuous exercise
1	Breathless when hurrying on the level or walking up a slight hill
2	Walks slower than other people of same age on the level due to shortness of breath or need to stop for breath when walking at own pace
3	Short of breath after walking few minutes on the level or about 100 yards (90m)
4	Too breathless to leave the house, or breathless when dressing or undressing

Symptoms	n
Dyspnea	4 patients in 0 stage
	4 patients in 1 stage
	2 patient in 3 stage
Dry cough	12

From the total number of patients, nodular calcifications were detected in 3, while one of them had egg-shell calcifications at the same time. (tab. 3, Figure 1)

Table 3. Pattern and distribution of mediastinal lymphadenopathy.

Mediastinal and hilar lymph nodes n=11					
Bilateral hilar adenopathy	Calcification		No calcification	Discrete nodes	Conglomerate nodes
	Punctiform	eggshell			
	4	2	6	7	4

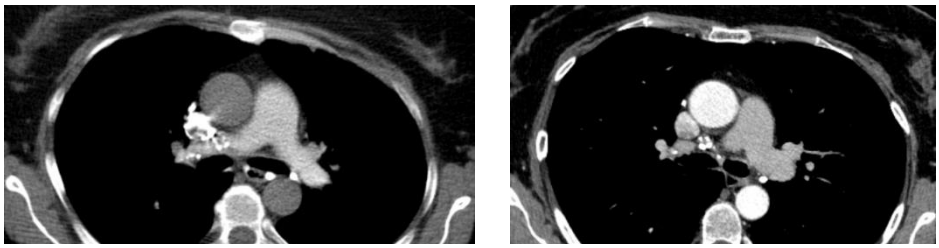

Fig 1. Punctiform and eggshell calcification in enlarged lymph nodes.

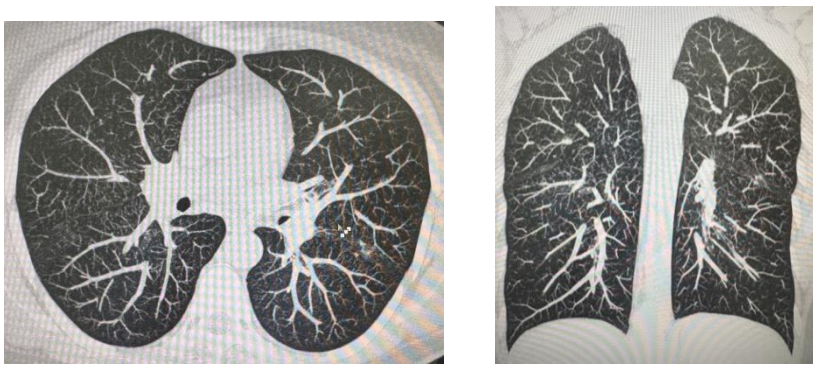

Fig 2. Symmetrical distribution of perilymphatic micronodules.

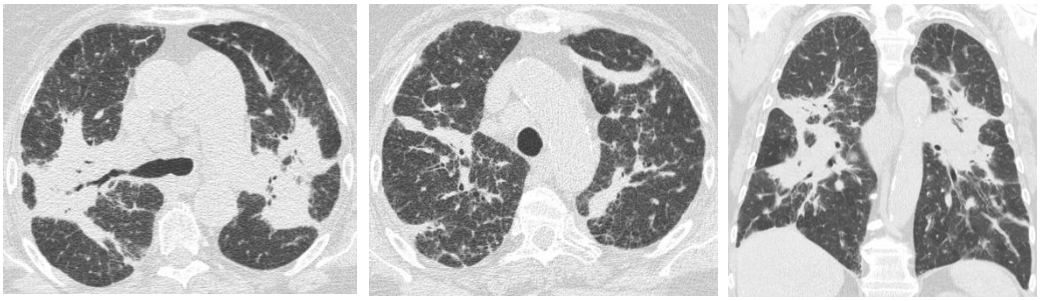

Fig 3. IV Stage of sarcoidosis.

Of the analyzed patients, 4 were in stage IV of the disease, with present fibrosis, reticular opacities and traction bronchiectasis (Figure 3). In six patients there were typical micronodular changes with perilymphatic distribution, while in three patients the finding consisted of atypical

changes in terms of consolidations, confluent conglomerated opacities, changes of ground glass type, of which in one of them fibrogranulomas were present bilaterally (tab. 4). No patient had a pleural effusion or pleural calcifications.

Table 4. Presentation and distribution of lung lesions

Lung lesions n=13		
Parenchymal lesions		IV stage of sarcoidosis with fibrosis and traction bronchiectasis
Typical pattern with perilymphatic distribution	Atypical pattern of patchy ground glass consolidations and fibronodes	
6	3	4

The distribution of lung changes in more than half of the patients (9) were typically distributed in the upper and middle parts, while in (4) patients they had a diffuse distribution sparing the lung bases.

Table 5. Distribution of lang nodules.

Distribution of lesions n=13	
Upper and middle zones	Diffuse distribution with free bases
9	4

Discussion

Sarcoidosis is a multisystemic disease of unknown etiology. Pulmonary involvement is the most common presentation of the disease. The largest number of patients in the general literature have stage I of the disease, which presents with mediastinal adenopathy (40-50%). Then comes stage II of the disease, which presents with lymphadenopathy and pulmonary involvement (25-30%) [2,3,6].

In this study, 2 patient was in stage I and 6 in stage II. This variation, as well as the fact that all our patients were women, is due to the very small series of patients and the fact that they were already previously diagnosed as sarcoidosis.

Hilar and mediastinal gland involvement is seen in 50-90% of patients. In our case it is 11 patients [2,7,8].

Lymphadenopathy in sarcoidosis is usually not necrotizing and it is bilateral and symmetrical. Conglomerated lymph nodes were seen in 4 of the patients. Nodular calcifications are usually seen in long-standing disease and may be amorphous, punctiform, and egg-shell. This type of calcification is seen in sarcoidosis although it can also be seen in other conditions such as silicosis. They were seen in 5 of the patients, while one of them had punctiform and egg-shell at the same time. No necrosis was detected in the lymph nodes in our patients.

Perilymphatic distribution of micronodules is a characteristic sign of sarcoidosis (Figure 2). The nodules are usually sharply circumscribed and have a bilateral and generally symmetrical distribution and mainly involve the upper and middle parts of the lungs [2,9,10].

Nodules are commonly seen along the peribronchovascular interstitium and in the subpleural zones. Interlobular septal nodules are less common. Nodules can merge into larger nodules. We see a typical presentation of perilymphatic nodules in 6 of our cases, while 4 of the patients with fibrosis and traction bronchiectasis are in stage IV of sarcoidosis.

Atypical pulmonary lesions in sarcoidosis consist of large pulmonary fibronodules and masses of irregular consolidations, ground-glass opacities, and mosaic attenuation. These opacities represent confluent nodules in the interstitium or acini of the lung parenchyma and are seen in 10-40% of patients. They are often superimposed in the background and with interstitial nodules [1,11,16]. In our case, they are present in 3 patients.

Fibrosis, bullae, and subpleural honeycombing are seen in advanced sarcoidosis predominantly in the upper and middle lung lobes, while extensive fibrosis and tractional bronchiectasis are seen in end-stage disease.

Regarding the professional occupation in this group of patients with sarcoidosis, three are nurses, one is a hygienist, one is a production administrator in a chemical industry, one is a dispatcher, one is an office worker, one teacher and the rest are housewives. The prevalence of the disease in certain professions worldwide corresponds to our group, although the cause remains unknown.

The capabilities of HRCT for thin-section imaging and high spatial reconstruction to generate quality images result in better characterization and determination of abnormalities of the lung parenchyma and interstitium. HRCT is superior to conventional CT for showing subtle parenchymal lesions and helps differentiate active lesions from terminal changes.

Conclusion

HRCT is the method of choice in the evaluation of pathological changes in pulmonary sarcoidosis. It shows us very precisely the characteristic appearance of nodules and lesions, their distribution and atypical changes. It helps guide appropriate therapy by differentiating active lesions from irreversible fibrosis.

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