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CONNECTIVE TISSUE DISEASE-RELATED INTERSTITIAL LUNG DISEASE: COMPUTED TOMOGRAPHIC FEATURES

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Abstract:
Connective tissue diseases (CTD) include a spectrum of diseases affecting the connective tissue of the human body: they include autoimmune diseases characterized by chronic interstitial inflammation and fibrosis development. Pulmonary lesions may be misdiagnosed, since only in 20% of cases pulmonary changes precede bone and joint manifestations and in the early stages do not have a clear clinical picture. All pulmonary structures may be involved: pulmonary interstitium, airways, pleura, and respiratory muscles. Among these autoimmune diseases, rheumatoid arthritis (RA) is characterized by usual interstitial pneumonia (UIP), systemic lupus erythematosus (SLE) is characterized by the development of nonspecific interstitial pneumonia (NSIP) and lymphoacetabular interstitial pneumonia. Fibrotic NSIP may be an interstitial disease seen in patients with mixed connective tissue diseases (MCTD). This article shows CT findings to assist radiologists, pulmonologists, and rheumatologists in the diagnosis and management of this group of diseases.

Keywords: interstitial lung diseases (ILD), idiopathic interstitial pneumonia, common interstitial pneumonia, nonspecific interstitial pneumonia, lymphocytic interstitial pneumonia, "ground glass", reticular changes, "honeycomb lung".

INTRODUCTION.

A significant percentage (up to 80%) of diagnostic errors in ILD leads to untimely diagnosis (1.5-2 years after the first symptoms appear), late referral to a specialist and prescription of treatment. Despite the expansion of diagnostic capabilities (the use of high-resolution computed tomography (HRCT), morphological verification of changes in the parenchyma and interstitium, including the use of immunohistochemical markers), the diagnosis of ILD is very difficult today. Rheumatic diseases, especially systemic scleroderma (SSD), are often the causes of ILD, the frequency of lung lesions in rheumatoid arthritis (RA), polymyositis and cross syndromes is increasing (1,2). In recent decades, there has been a change in the radiologic picture of interstitial processes associated with various moments: a large number of radiation studies, polyprogamation, the use of modern methods of radiation diagnostics that allow to determine previously unknown PET-CT features (3,4). Knowledge of the features of modern radial semiotics of interstitial lung diseases is necessary for correct interpretation of research data.

PURPOSE. Detection of computed tomographic (CT) signs of interstitial lung lesions in patients with connective tissue diseases (rheumatoid arthritis and systemic lupus erythematosus).

MATERIAL AND METHODS

An extended analysis of clinical, radiological and computed tomographic data was performed in 10 patients (five patients with rheumatoid arthritis and five patients with systemic lupus Republican Research Centre of Emergency Medicine (RRCEM), in the therapeutic intensive care unit with symptoms of dyspnea, subfebrile temperature and chest pain. All patients had a long history with connective tissue diseases such as rheumatoid arthritis, systemic lupus erythematosus. All patients were hospitalized in the therapeutic intensive care unit. Radiologic examination was performed on the Apelem apparatus. Multispiral computed tomography (MSCT) of the chest organs was performed on the Aquilion Prime 160 MSCT machine (Canon MedicaSystem). Radiologic studies were compared with the clinical picture at different time periods of the disease.

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RESULTS.

According to the obtained data, in the clinical picture of patients on admission to the hospital from all symptoms prevailed signs of respiratory failure, which was manifested by increased heart rate, dyspnea, cyanosis, compensatory increase in blood pressure. Due to the fact that on the radiographs of admitted patients the changes were minimal (moderate enhancement of interstitial pattern in basal lung sections), all patients underwent computed tomography to clarify the diagnosis. Interstitial thickening of "ground glass" type was not detected in patients with SLE. In patients with RA the character of interstitial thickening of "ground glass" type was determined in three types: by the type of uniform diffuse thickening, in two patients, by the type of irregular diffuse thickening and by the type of irregular focal thickening. In 66% of cases "frosted glass" was asymmetrical and in all cases the process was localized predominantly in the basal parts of the lungs. Peripheral reticular changes were determined in all cases with RA and SLE. In one case of patients with SLE the process was localized in one lung, and in one patient in both lungs. In all patients with RA reticular changes were visualized in both lungs (Table 1).

Table 1.
CT scans in the examined patients in comparative aspect

Indicators		RA (n-5)		SLE (n-5)	
		absolute	relative (%)	absolute	relative (%)
ground glass	uniform diffuse	1	33	0	0
	irregular diffuse	1	33	0	0
	irregular focal (spotty)	3	33	0	0
The symmetry of "ground glass"	symmetrically	1	33	0	0
	unsymmetrically	4	66	0	0
Localization "ground glass"	more in the basal areas	5	100	0	0
Reticular changes in the periphery due to thickening of intra- and interdialleolar septa	in both lungs	5	100	2	50
	in one lung	0	0	3	50

Table 2.
CT scans in the examined patients in comparative aspect

Indicators		RA (n-5)		SLE (n-5)	
		absolute	relative (%)	absolute	relative (%)
Thickening of the peribronchovasal interstitium		5	100	2	100
bronchiectasis	traction	3	66	0	0
	«varicose»	3	66	0	0
	undefined	0	0	5	100
Irregular ventilation of lung tissue with the presence of "air traps"	undefined	4	66	0	0
	defined	1	33	0	0
The "interface" symptom	undefined	0	0	5	100
	defined	5	100		
Thin-walled air cysts	undefined	0	0	5	100

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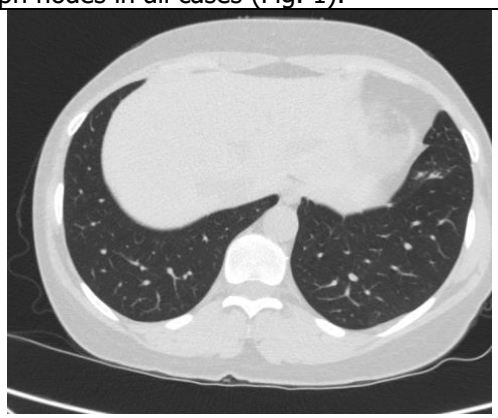
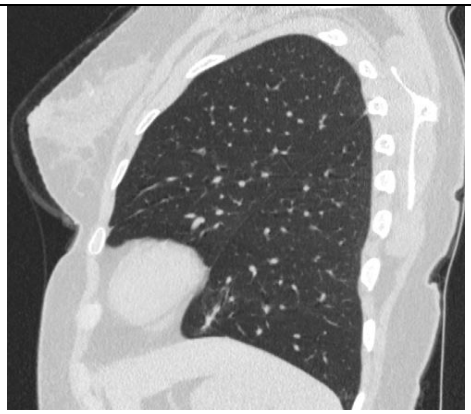
	defined	5	100	0	0
Pleural effusion	on both sides	3	33	1	50
	on one side	1	33	0	0
	undefined	1	33	1	1
Lymphadenopathy	intrathoracic l/n	4	66	2	100
	axillary group	1	33	2	100

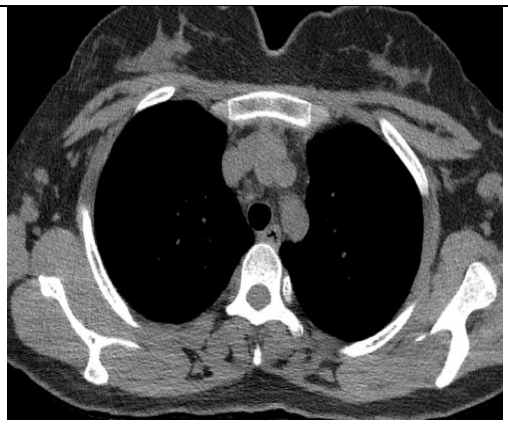
In addition to reticular changes, the following features were detected in SLE patients: thickening of peribronchovasal interstitium (100%), pleural effusion on both sides in one patient and enlargement of intrathoracic and axillary lymph nodes in all cases (Fig. 1).



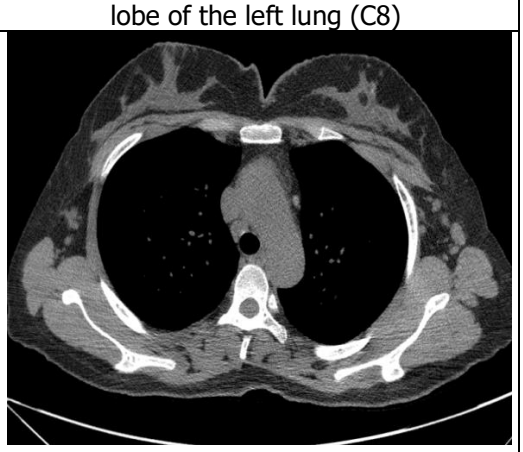
a. axial HRCT image; thickened bronchovascular interstitium in the lower lobe of the left lung



b. sagittal HRCT image: thickened bronchovascular interstitium in the lower lobe of the left lung (C8)



c. axial HRCT image: intrathoracic lymphadenopathy



d. axial HRCT image: lymphadenopathy of axillary l/n group

Fig. 1. a,b,c,d - Axial (a, c,d) and sagittal (b) HRCT images of patient B, 34 years old, with SLE, history of 3 years

Thickening of peribrochovasal interstitium was determined in all patients with RA and in two patients with SLE. Three patients with RA (66%) had bronchiectasis, both traction and varicose (Table 2). One patient with RA had uneven ventilation of lung tissue in the form of "air traps" (Figure 2).

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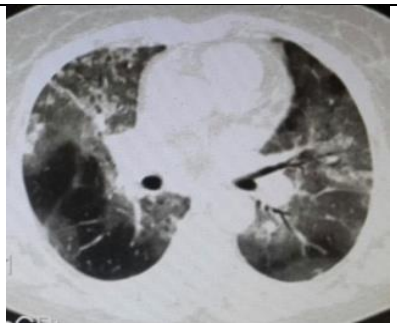
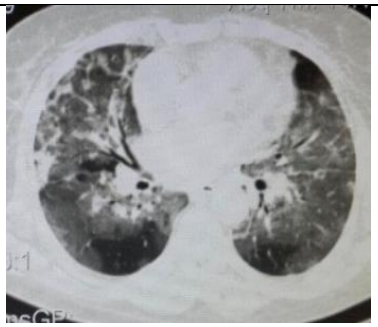
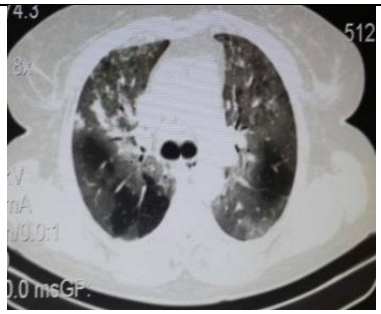
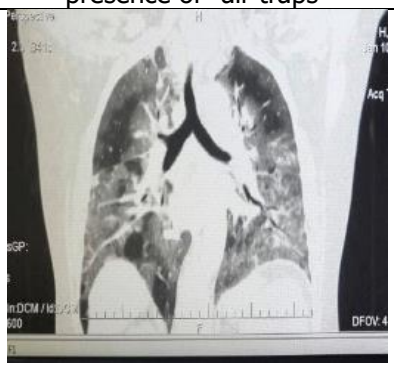
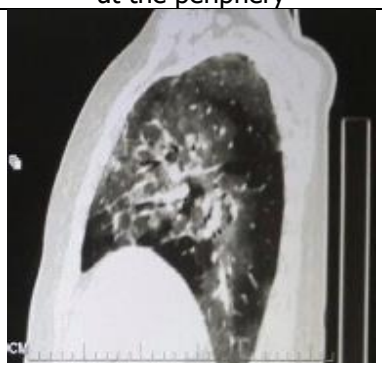
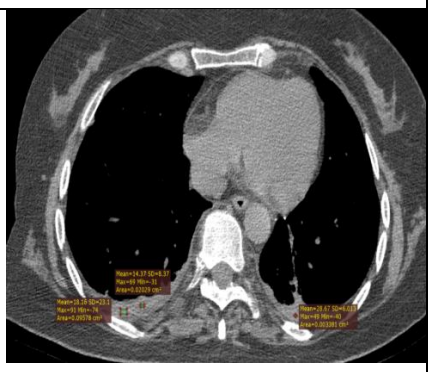
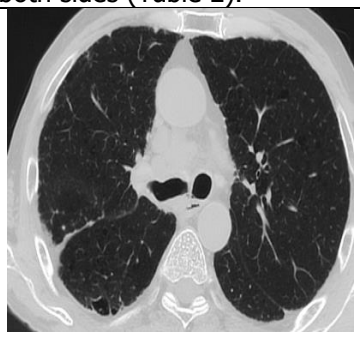
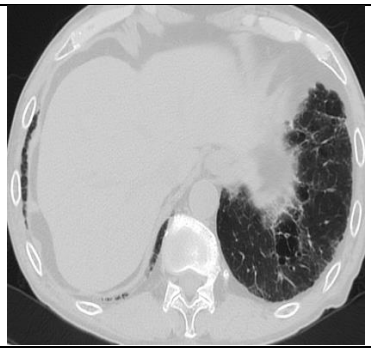
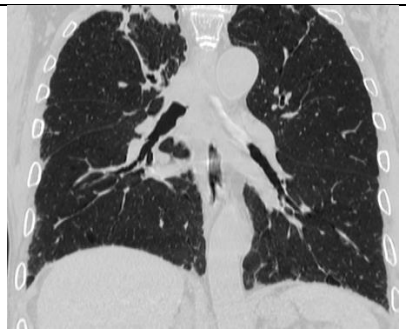
		
a. axial HRCT image: irregular ventilation of lung tissue with the presence of "air traps"	b. axial HRCT image: "air traps" areas of alveolar consolidation at the periphery	c. axial HRCT image: thickening of the bronchovascular interstitium
		
d.coronal HRCT image: thickening of bronchovascular interstitium, air-containing cysts	e. sag. HRCT image: "air traps", thickening of bronchovascular interstitium, "interface" symptom	f. axial HRCT image, mediastinal window: effusion in the pleural cavity on both sides

Fig. 3. a,b,c,d,e,f - HRCT images of patient A., 54 years old, with RA

All patients with RA had thin-walled air bullae and the "interface" symptom (irregularity of the bronchovascular interstitium contour, barely visible short lines perpendicular to the interface between the air pulmonary parenchyma and bronchi and vessels) (Figure 3). Pleural effusion was detected in two patients with RA, one on one side and the other on both sides (Table 2).

		
a. axial HRCT image: on both sides asymmetrically reticular changes in the periphery	b. axial HRCT image: air-containing cysts in the left lung	c. coronal HRCT image: thickening of peribronchovasal interstitium

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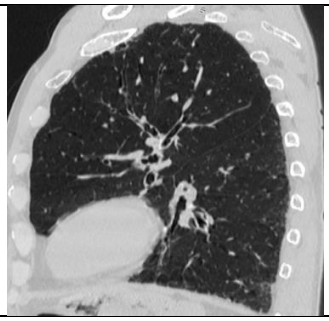	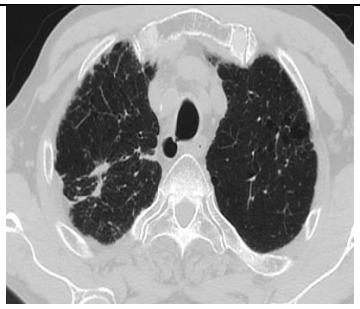	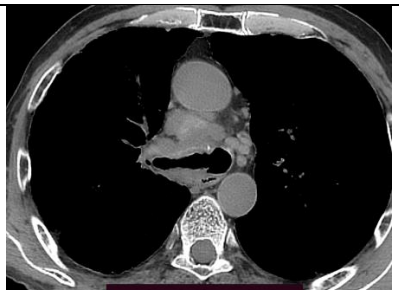
d. sag. HRCT image: thickening of peribronchovasal interstitium, traction bronchiectasis	e. axial HRCT image: asymmetrical areas of fibrosis in both lungs	f. axial HRCT image: lymphadenopathy of intrathoracic lymph nodes

Fig. 4. a,b,c,d,e,f - HRCT images of patient A., 51 years old, with RA

CONCLUSIONS.

1. Thus, in patients with rheumatoid arthritis interstitial changes according to CTVR may correspond to common interstitial pneumonia (CIP), which clinically and radiologically corresponds to idiopathic pulmonary fibrosis of the lungs. In addition, patients with rheumatoid arthritis may also have interstitial changes in the type of nonspecific interstitial pneumonia (NSPI). NSPI is more favorable, because there are no gross fibrotic changes in the interstitium like "honeycomb lung", which is very often characteristic of NSPI.
2. The following CT signs are characteristic of SLE patients: central and peripheral interstitial thickening, bronchiectasis, "interface" symptom, air cysts, pleural effusion, enlargement of intrathoracic and axillary l/u. These changes may correspond to nonspecific interstitial pneumonia and lymphocytic interstitial pneumonia.
3. CT signs of usual interstitial pneumonia are the following signs: asymmetric changes in the lungs - one lung may have areas of normal and altered lung tissue (reticular changes, thickening of peribronchovasal interstitium with the presence of traction and varicose dilated bronchiectasis, etc.).
4. CT signs of nonspecific interstitial pneumonia are symmetric and homogeneous changes in the lungs. In one lung the pathologic process is distributed symmetrically, evenly.
5. Lymphocytic interstitial pneumonia is characterized by the following CT signs: thin-walled cystic cavities, infiltration of peribronchovascular interstitium (more often bilateral, rarely limited).

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