Chest X-ray Findings in Systemic Lupus Erythematosus, Rheumatoid Arthritis and Behçet's Disease

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Review of the routine chest X-ray films in 14 cases of SLE, 14 cases of RA, 26 cases of RA, 26 cases of Behçet's disease and 33 normal controls revealed more frequent nodular changes in the pulmonary field and abnormal elevation of the diaphragm along with a definitely less distinct visualization of A3a and A8a in the pulmonary field in SLE than in other groups. Tracing A3a appeared to be useful for differentiation of SLE from RA, Behçet's disease and normal controls.

Key Words: Pulmonary field, Pulmonary arterial trees, A3a, A8a.

Systemic lupus erythematosus (SLE) is a prototype of connective tissue disorders, causing virtually any clinical manifestations including pericardiac-pleuro-pulmonary abnormalities. Attempts were made to analyze abnormal changes of the routine chest X-ray films in patients with SLE, in comparison with those with chronic rheumatoid arthritis (RA) or Behçet's disease. Visualizations of pulmonary arterial trees were classified into 5 grades, and then correlations of different grades to different disease entities were examined.

MATERIALS AND METHODS

Clinical diagnosis of SLE is determined according to the criteria of the American Rheumatism Association. RA is diagnosed in cases with positive rheumatoid factor in the serum and articular manifestations such as symmetric involvement of the joints of the elbows, hands, and feet with

tenderness and deformity associated with corresponding X-ray abnormalities. Behçet's disease was diagnosed in cases associated in cases associated with aphthous stomatitis, iritis or uveitis, and occasional if not always genital ulcers.

Routine chest X-ray films in 14 cases of SLE (3 males and 11 females with an age range from 16 to 56 years old), 14 cases of RA (4 males and 10 females, 25 to 55 y.o.), and 26 cases of Behçet's disease (23 males and 3 females, 25 to 50 y.o.) were analyzed regarding the presence and absence of pleural changes or pulmonary parenchymal manifestation throughout the clinical course, before and during treatment. X-ray films such as lateral view of the chest, bronchograms or angiograms were reviewed to exclude the possibilities of congenital anomaly or superimposed infections.

In each film, the maximal transverse diameters between the right and left

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Fig. 1. Transverse diameters of the pulmonary cone (a), cardiac silhouette (b) and thorax (c) were measured. The pulmonary arterial trees of A3a and A8a were traced (See for details in text).

pulmonary cone (a) and between the right auricular segment and the left ventricular segment (b), and the maximal transverse diameter of the thorax (c) were measured

as shown in Fig. 1. The ratio of a/c and the ratio of b/c were calculated to express the relative size of pulmonary artery arch (less than 0.25 as normal) and cardiac silhouette (less than 0.50 as normal), respectively.

In order to analyze vascularization in the pulmonary field, pulmonary arterial trees of both A. ventricularis (A3a) and A. lateralis of A. ventrobasalis (A8a) were traced on the films as schematically shown in Fig. 1. Visualization of A3a and A8a on the films were classified into 5 grades (unidentified, traceable to 1st, 2nd, 3rd and 4th branch). All these analytic data on the films in SLE, RA and Behçet groups were compared with data on normal films of 33 adult healthy persons ranging in age from 16 to 53 years old.

For statistical analysis, a Student's t test was used to determine the significance of differences between groups. Differences

Table 1. Incidence of abnormalities in the chest X-ray films of SLE, RA and Behçet's disease.

	SLE (14 cases)	RA (14 cases)	Behçet (26 cases)
Pulmonary field			
nodular	12 (86%)	3 (21%)	0 (0%)
ground-glass like	7 (50%)	6 (43%)	0 (0%)
pneumonia-like	4 (29%)	1 (7%)	1 (5%)
reticular	3 (21%)	1 (7%)	0 (0%)
reticulo-nodular	3 (21%)	1 (7%)	0 (0%)
atelectasis	1 (7%)	2 (4%)	0 (0%)
Pleura			
thickening or adhesion	4 (29%)	5 (36%)	7 (26%)
pleural effusion	3 (21%)	0 (0%)	1 (5%)
Heart & Pulmonary cone			
enlarged pulmonary cone	9 (64%)	7 (50%)	2 (10%)
enlarged cardiac silhouette	7 (50%)	5 (36%)	1 (5%)
pericarditis	1 (7%)	3 (21%)	0 (0%)
Diaphragm			
abnormal elevation	7 (50%)	0 (0%)	0 (0%)

Table 2. Grade of visualization of pulmonary artery trees of A3a and A8a among 5 groups.

	Number of films examined	Branch of A3a or A8a				
		Untraceable	1st	2nd	3rd	4th
<u>A3a</u>						
1. SLE $\bar{c}$ pulmonary changes	87	28 (32%)	23 (26%)	28 (32%)	9 (10%)	0 (0%)
2. SLE $\bar{s}$ pulmonary changes	20	0 (0%)	7 (35%)	10 (50%)	2 (10%)	1 (5%)
3. RA	22	1 (5%)	1 (5%)	7 (32%)	13 (59%)	0 (0%)
4. Behçet	44	0 (0%)	0 (0%)	6 (15%)	33 (73%)	5 (12%)
5. Normal	33	0 (0%)	0 (0%)	2 (6%)	22 (67%)	9 (27%)
<u>A8a</u>						
1. SLE $\bar{c}$ pulmonary changes	87	33 (38%)	31 (36%)	16 (18%)	6 (7%)	1 (1%)
2. SLE $\bar{s}$ pulmonary changes	20	0 (0%)	3 (15%)	20 (60%)	4 (20%)	1 (5%)
3. RA	22	2 (9%)	0 (0%)	8 (36%)	10 (46%)	2 (9%)
4. Behçet	44	0 (0%)	3 (4%)	4 (8%)	27 (63%)	10 (23%)
5. Normal	33	0 (0%)	0 (0%)	0 (0%)	17 (52%)	16 (48%)

with P greater than 0.05 were not considered significant.

RESULTS

Table 1 shows the incidences of abnormal pericardiac-pleuro-pulmonary shadows in the chest films, among SLE, RA and Behçet's groups. In SLE patients, nodular changes in the pulmonary field and abnormal elevation of the diaphragm were found more frequently than in RA or Behçet's group ($p < 0.05$, respectively). Nodular changes, ground-glass like density, enlarged pulmonary cone and cardiac silhouette were more frequently seen in SLE and RA than in Behçet group ($p < 0.005$, respectively).

Fig. 2 shows representative chest films of two cases with SLE. In Case M.M. 20 y.o., female, ground-glass shadows in the pulmonary field, marked pleural effusion and untraceable A3a and A8a were noted on April 2, 1977 prior to therapy (Fig. 2A), in contrast to disappeared ground-glass shadows, decreased effusion and improved visualization of A3a to 2nd branch and A8a to 1st branch on July 25, 1977 under prednisolone therapy (Fig. 2B). In Case T.A. 18 y.o. female, there were improvements between 2 chest films of June 9,

1975 prior to therapy (Fig. 2C) and of July 14, 1975 under prednisolone therapy (Fig. 2D), including normalization of cardiac silhouette, disappearance of nodular shadows in the pulmonary field, and improved visualization of A3a from 1st to 2nd branch and A8a from untraceable state to 2nd branch.

Table 2 shows different grades of pulmonary arterial trees of A3a and A8a, in the review of chest films among 5 groups including 2 SLE groups with and without abnormal pulmonary shadows, RA and Behçet's groups and normal controls. Among SLE, A3a and A8a were frequently untraceable or visible up to 1st branch in cases with abnormal pulmonary shadows, compared to cases with no pulmonary abnormality ($p < 0.005$). This suggests that abnormal pulmonary shadows possibly interfered tracing the visualization of arterial trees in the background of pulmonary field. Secondly, only 1st and 2nd branch of A3a were traceable in SLE group without abnormal pulmonary shadows, compared to other group of RA and Behçet groups and normal controls. This indicates that tracing of A3a may be useful to differentiate SLE group from RA group ($p < 0.05$) and Behçet's group ($p <$

Fig. 2. (A) Ground-glass shadows, pleural effusion and untraceable A3a and A8a in Case M.M. with SLE, which improved in 3 months (B) under therapy. (C) Nodular shadows, increased cardiac silhouette and poorly traceable A3a and A8a in Case T.A. with SLE, which improved in a month (D) under therapy. Arrows indicate A3a and A8a.

0.005). Regarding A8a, SLE without abnormal pulmonary shadows were significantly different from Behçet's group and normal controls ($p < 0.005$), but not from RA group. Less distinct visualizations of A3a and A8a in RA was also significantly different from Behçet's group and normal control ($p < 0.05$). There was no difference between Behçet's group and normal control.

DISCUSSION

Pleural involvements with effusions are found more frequently (50%) in patients with SLE than in other connective tissue

disease¹³. Diffuse interstitial pulmonary disease with fibrosis is noted in more than 75% of patients with scleroderma^{2,33} but less commonly in SLE and RA. Pulmonary parenchymal disease was found in 20% of patients with SLE but diffuse interstitial lung disease in a much smaller percentage³³. The term lupus pneumonitis based on both micronodular and infiltrative findings in the X-ray films, is thought to represent a pulmonary vasculitis, but its exact nature is somewhat obscure⁴².

Pulmonary vasculitis may depend on various factors such as fibrosis, hyaline thickening, elastic degeneration of pulmo-

nary arterioles, cell infiltrations and deposition of soluble immune complexes⁵⁾. Study of lung biopsies in SLE and in RA showed the presence of immunoglobulins deposited in the pulmonary capillaries, arterioles, alveolar walls and adjacent nodules⁵⁾. Various X-ray abnormalities are more frequently seen in SLE than in RA or Behcet group, as shown in Table 1. In fact, the pathohistology of the lung in SLE varies tremendously. The lungs in SLE includes not only vasculitis, but interstitial edema, alveolitis, alveolar epithelial hyperplasia, fibrosis, cystic honey comb changes, interstitial infiltrates and pleural thickening^{3,5,6)}.

As to visualizations of pulmonary arterial trees in the chest films, it is assumed that tracings of A3a and A8a are less well visualized when there occurred inflammatory and fibrotic changes in the lung. There is little information on the chest angiography in SLE, because serious manifestations or complications in SLE patients make such procedure quite risky. Since it is practically important to follow up these abnormalities of X-ray films for the managements of patients with connective tissue diseases, a grading of the visualization of A3a and A8a in the routine chest X-ray

film was attempted as shown in Table 2. The results suggested a distinct difference between patients with SLE on one hand and those with RA or Behcet's disease and normal controls on the other. Semiquantitative study of the chest X-ray findings may provide a simple, reliable and useful method to study the lung involvement in connective tissue diseases.

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