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Roentgenological Findings on Pulmonary Paragonimiasis*

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=Abstract=

In order to determine the roentgenological characteristics of pulmonary paragonimiasis, chest roentgenograms of 76 patients with positive *Paragonimus* intradermal tests were studied.

The chest roentgenograms were of normal appearance in 50 cases or 65.5 per cent and abnormal in 26 cases or 35.5 per cent. Of the abnormal films, 19 cases had at least one cystic lesion and 7 cases were infiltrative appearance. The abnormal shadows were located more frequently in the right lung field than in the left, and involved in the all portions of the lungs except for rare apical involvement.

Key words: Chest roentgenogram, Pulmonary paragonimiasis, Cystic, Fibrotic, Infiltrative, Pleural effusion

Introduction

In a previous paper(Cho *et al.* 1995), a report was submitted concerning the prevalence of lung fluke among the residents of Kyongbuk Province, Korea.

The positive rate for *P. westermani* was relatively high being to be 7.4 per cent with a prevalence of 10.3 per cent in males and 4.4 per cent in females. However, the characteristic findings in chest X-rays of residents with paragonimiasis under study were not presented at that time. X-ray findings of pulmonary paragonimiasis cases have been reported in details by many investigators and various classifications of shadows have also been made. Iwasaki *et al* (1956) report-

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ed on 145 cases that nodular shadows, ring shadows and infiltrative shadows, in that order, were considered to be the typical findings for paragonimiasis. They also stressed that the moving phenomenon of the abnormal shadow in the chest X-ray was probably due to the migration of the worms.

Shigeyasu (1959) made statistical observations on chest X-rays and also reported in details as to the classification according to the lesions of each type of sex and age groups. Yun (1960) reported X-ray findings in eight cases of Korean children with paragonimiasis, Sadun & Buck (1960) in 140 cases of Korean adults, Kim (1964) in 510 cases, Noh *et al* (1988) in 36 cases, and Im *et al* (1988) in 47 cases, with special reference to differentiation from tuberculosis.

Seo & Joo (1990), utilizing the intradermal test, stool and sputa examinations, found a number of *P. westermani* eggs in the sputa of the residents in Ulchin county, Kyongbuk Province.

Cho *et al* (1995) conducted intradermal tests with 4,366 individuals in and around endemic areas of paragonimiasis in Kyongbuk Province, and to individuals positive in the intradermal test, stool and sputum examinations for *Paragonimus* eggs were added. Chest roentgenograms for pathologic typing of the lesions was made.

This paper deals with the roentgenological findings in some cases of pulmonary paragonimiasis.

Materials and Methods

Chest roentgenograms were available for this study on 76 cases whose *Paragonimus* intradermal tests were positives. Of them, *Paragonimus* eggs were positive in 18 cases in sputum; 3 cases in fecal specimens; and 9 cases in both sputum and fecal examinations. The number of films available in individual cases varied from one to three, the average being 1.01.

A roentgenographic pathologic typing of the lesions was made, based on the recognition of the following features and components as seen in all available films in each case : infiltrative, nodular, fibrotic and calcified. The other findings as appeared in the radiography such as pleural thickening, increased lung marking, pleural effusion, hilar enlargement, and streaked shadow were listed.

The pathologic lesions were localized by dividing the lung fields into horizontal thirds, giving the following divisions : upper, middle, and lower of both sides.

Single and multiple lesion occurrence was recorded.

Results

Of the 76 cases with pulmonary paragonimiasis on this study, 26 (34.5 %) had abnormal films. The roentgenological findings in abnormal films are presented in Table 1. Of the abnormal films, 12 (46.2 %) showed single lesions and 14 (54.8 %) multiple lesions.

Table 2 shows the types of roentgenologic lesions found in 76 cases with pulmonary Paragonimiasis. Of the 26 cases with abnormal films, 19 cases had at least one cystic lesion which was thought to be suggestive of pulmonary paragonimiasis, and 7 cases were infiltrative appearance. Pulmonary calcification occurred in 11 cases or 42.3 per cent.

Table 1. Roentgenlogical findings in 26 cases with pulmonary paragonimiasis(1995)

Cases	Sex	Age (Year)	X-ray findings
Joo, S.K.	M	38	Multiple calcified nodular and streaky densities in the whole lung fields. Both hila are prominent, No pleural reaction can be identified.
Noh, D.Y.	M	9	Soft parenchymal infiltrations in the right upper lung field. Prominent both hila.
Kim, M.H.	M	9	Diffusely increased interstitial marking in both lower lung fields. Especially noted are partly calcified nodular densities in the left lower lung near the hemidiaphragmatic dome.
Park, D.S.	M	8	Dense pleural based mass lesion in along the left lower lateral chest wall with evidence of pleural thickening about lateral sulcus (C-P angle).
Chang, C.M.	F	8	Soft nodular density in the right lower lung.
Chu, Y.J.	M	9	Diffusely increased bronchovascular markings more in both lower lungs.
Kwon, K.H.	F	10	Soft nodular density in the right upper lung with diffusely increased interstitial marking in both upper lung fields.
Chung, C.S.	M	10	Fibro streaky density in the right upper lung.
Kim, S.K.	F	10	Pleural thickening about the right lateral sulcus.
Kim, S.H.	M	13	Soft nodular density in the lateral part of the right mid lung field. Prominent the left hilum with bronchovascular markings.
Kim, J.J.	M	13	Round and smooth pleural based soft tissue mass lesion in along the left lower lateral chest wall. Prominency of the left hilum. Increased bronchovascular marking in the right paracardiac region.
Ahn, Y.J.	M	13	Small round pleural based soft tissue mass lesion in along the left lower lateral chest wall near the costophrenic angle, Prominency of the right hilum.
Kim, K.M.	M	41	Pleural thickening with calcification about the right costo-phrenic angle.
Chu, C.S.	F	13	Round smooth soft tissue mass lesion in the right mid-lung suggestively based on the pleural plane. Diffusely increased interstitial markings in both lungs more on the left side.

Cases	Sex	Age (Year)	X-ray findings
Kim, J.R.	F	13	Soft parenchymal infiltrations in both parahilar regions along with suggestive calcified lymph nodes.
Joo, S.Y.	M	46	Nodular streaky infiltrates in the right paracardiac region.
Shim, S.K.	M	43	Pleural thickening in the right lower lung field with increased interstitial marking in the left parahilar area.
Moon, H.O.	F	29	Soft nodular density in the right upper lung field.
Chung, M.S.	M	36	Pleural thickening with calcification on both sides, more on the right side, Increased interstitial markings in the left parahilar region.
Kim, C.H.	M	49	Multiple nodular calcifications in the whole lung fields with hilar prominency on the left side.
Jheon, I.H.	M	59	Pleural thickening with calcifications in the right lower chest. Suggestive pleural effusion on the left.
Park, M.S.	F	22	Round smooth soft tissue mass lesion which appears to be based on pleural plane in the right lower lateral chest wall.
Baik, M.J.	M	61	Smooth and round mediastinal contour bulging on the right side suggestive of tortuous ascending aorta. Pleural calcification in the left lower chest.
Chang, D.B.	M	70	Pleural calcification with thickening on the right
Jheon, Y.T.	M	48	Suggestively calcified infiltrations in the left paracardiac area.
Im, J.S.	M	38	Calcified nodule in the left lower lung with hilar prominency.

Table 2. Types of roentgenologic findings in 76 cases with pulmonary paragonimiasis including 50 with normal chest films (1995)

Radiologic type of lesion	No. of patients	Per cent
Abnormal shadows	26	
Infiltrative	7	26.9
Nodular-cystic	8	30.8
Nodular-cystic with marked fibrosis	11	42.3
Pleural thickening	6	23.1
Increased lung marking	8	30.8
Pleural effusion	1	3.8
Hilar enlargement	9	34.6
Streaked shadow	3	11.5
Calcification	11	42.3
Normal films	50	
Not characteristic	50	

In 50 cases there was no characteristic pathologic lesions of this disease.

Table 3 reviews the reported roentgenologic changes of the pleura observed in pulmonary paragonimiasis. A marked variation in the rates of pleural effusion and other changes is apparent from investigators as apposed to the others.

Table 4 shows the locations of pathologic lesions of pulmonary paragonimiasis. The abnormal shadows are shown more frequently in the right lung fields than in the left fields.

Of the 47 lesions, 20 or 42.5 per cent involved in the lower lung fields, 31.9 per cent in the upper lung fields, and 25.5 per cent in the mid lung fields.

Discussion

Characteristic findings in chest X-rays of cases with paragonimiasis have been reported in details by many investigators and various classifications of shadows have also

Table 3. Reported roentgenologic changes of the pleura observed in pulmonary paragonimiasis

Source	No. of cases	Pleurisy with effusion and emphyema		Other pleural reaction		Group tested
		No.	%	No.	%	
Miller & Walker (1955)	227	15	6.6	62	17.3	Korean prisoners of war
Chien Mu-Han (1955)	61	7	11.5	36	59.0	-
Geher (1957)	Not stated	-	10.0	-	-	General population
Graumann *et al* (1957)	311	45	4.5	199	64.0	Hospitalized and Outpatients
Sadun & Buck (1960)	140	19	13.6	-	-	-
Noh *et al* (1988)	36	4	13.0	18	56.0	Hospitalized patients
Im *et al* (1988)	47	17	36.0	6	13.0	Hospitalized patients
Present study (1995)	26	1	3.8	6	23.1	General population

Table 4. Locations of 47 lesions in 26 patients with pulmonary paragonimiasis(1995)

Location		No. of lesion	Per cent
Right	upper	10	21.3
	middle	8	17.0
	lower	8	17.0
Left	upper	5	10.6
	middle	4	8.5
	lower	12	25.5

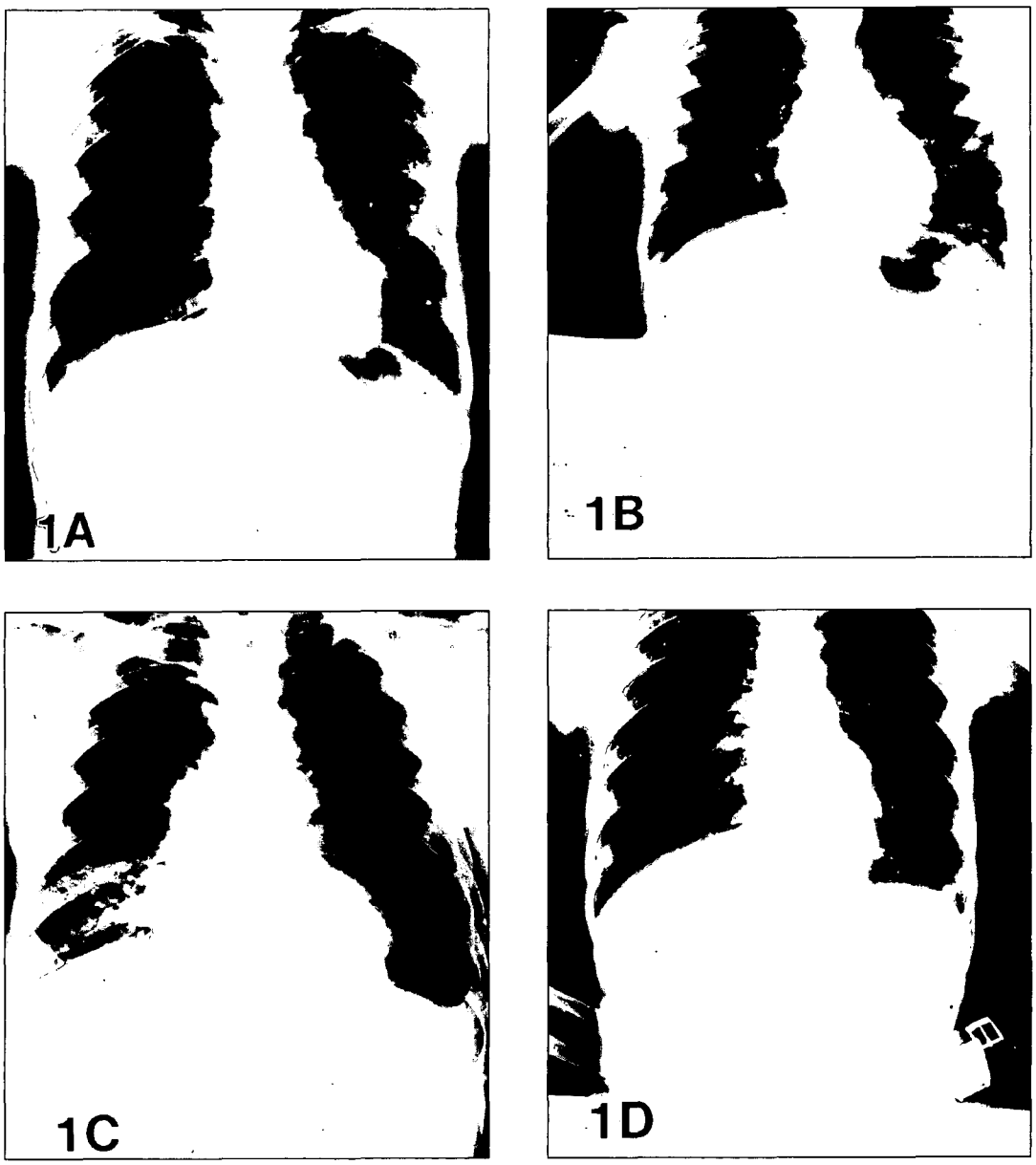

Fig. 1. Roentgenograms of Lung in Paragonimiasis.

Case A. Multiple calcified nodular and streaky densities in the whole lung fields. Both hila are prominent. No pleural reaction can be identified.

Case B. Diffusely increased interstitial marking in both lower lungfields. Especially noted are partly calcified nodular densities in the left lower lung near the hemidiaphragmatic dome.

Case C. Pleural thickening with calcification in the right lower chest. Suggestive pleural effusion on the left.

Case D. Round smooth soft tissue mass lesion in the right midlung suggestively based on the pleural plane. Diffusely increased interstitial markings in both lungs more on the left side.

been made. Miller & Walker (1955) studied 227 patients with paragonimiasis from a roentgenographic standpoint in an attempt to delineate the roentgen features of this disease and reported that a characteristic cystic lesion was occurred with sufficient frequency (63%), and specificity to indicate that its presence was at least suggestive of pulmonary paragonimiasis.

Kim (1964) made roentgenological studies of 610 patients and reported that round or oval infiltrative shadows with a considerably clear outline were found in 70 per cent of the total cases, and next nodular shadows in 48.2 per cent and ring shadows in 44.7 per cent, respectively.

As shown in Table 2, besides the typical roentgenographic lesions which are seen characteristically in pulmonary paragonimiasis, abnormal changes due to pleural reactions are so frequently present that they may provide an important clue in the differential diagnosis of pulmonary paragonimiasis in a large number of individuals studied, especially when pleural reactions are present on both sides. Such consideration was also recognized by Miller and Walker (1955), Ch'ien (1955), Geher (1957), Graumann *et al* (1957), Sadun & Buck (1960), and Kim (1964).

As indicated in Table 3, roentgenologic changes in the pleura were observed by many investigators in a large percentage of individuals studied. Since almost all of our cases had active pulmonary paragonimiasis and passed *Paragonimus* eggs in the sputum and/or in the stools, the exclusively fibrotic or calcified stage was not expected. In fact, most of the 26 cases with paragonimiasis in our study were of the nodular-cystic type (Table 2.).

In the study of lung field involvement and roentgenographic lesions in patients with paragonimiasis, Ch'ien (1955) described a typical pattern of pulmonary changes due to paragonimiasis from the very early active stages to the late and residual stages after the parasites had died and disease had disappeared clinically.

Geher (1957) described three radiologic types which vary according to the localization and spread of the lesions such as basal, infraclavicular and disseminated types. The disseminated type is a combination of the infraclavicular and basal types, in which nodular shadows and patches of various densities are found in both lungs simulating changes caused by tuberculosis.

Diaconita & Goldis (1964) reported that tomographic and bronchographic examinations are indispensable for the clinical diagnosis of pulmonary paragonimiasis, and also ascertained that abnormal shadows were found in the middle, upper and lower parts of the lungs, but were rarely seen in the apex.

Kim (1964), using partly tomography and partly high voltage radiography, observed the distribution of pathological shadows and found that the shadows were located more frequently in the right lung field than in the left, in the lower lung field being found in 34.3 per cent of the total cases, followed by in the middle field with 34.1 per cent, in the upper field with 31.3 per cent, and in the apices with only 3.3 per cent. Approximately the same relative trends in less involvement in the upper lung field than in lower field

were observed in the results of Kim (1964) and those of present survey (1995); that is, this is distinctly different from that of pulmonary tuberculosis, and seems to be a significant indication in making differential diagnosis radiographically.

Sadun & Buck (1961) reported that the roentgenographic picture of pulmonary tuberculosis appeared to have a apico-caudal progression, whereas that of pulmonary paragonimiasis usually tended to be caudo-apical. This caudo-apical progression may be apparent since Miller & Walker (1955) observed that although the apex was usually free of lesions, all portions of the lungs in a vertical plane were equally involved.

The results of this study generally indicate, first, that abnormal shadows are seen more frequently in the right lung field than in the left lung, second, that the abnormal shadows are found in the middle, upper, lower parts of the lungs, but are rarely seen in the apex, and, third, that a case has a 73.1 per cent probability of showing cyst formation.

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