Chest X-ray Findings and Some Clinical Aspects in Pulmonary Paragonimiasis*

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Not less than 200 cases have been diagnosed as pulmonary paragonimiasis since 1947 at the medical department of the National Taiwan University Hospital. Of those, definite diagnosis by positive ova from the sputum accompanied by fairly complete laboratory examinations by means of chest x-ray films, blood sedimentation rate, tuberculin test, sputum examination, white blood count with differential and eosinophilia in pleural fluids or in spinal fluids, if necessary, were worked up in 100 cases. Some of these patients were well followed up for as long as three years. Sputa were negative for acid-fast bacilli in all cases by repeated simple smears or cultures.

I. Chest X-ray Findings

Few studies have been published on the x-ray findings of pulmonary paragonimiasis and none is sufficient to justify conclusions. Moreover there is no agreement among these studies. Bercovitz reported that x-ray inspection of the lungs were disappointing and lipiodol installation showed no cavities. In a mass tuberculosis survey in Shinchu district, which is another endemic place of pulmonary paragonimiasis in Taiwan, Kusunoki et al. did not find any abnormality on miniature films of 98 persons in whom the parasite ova were discovered in the sputum. On the other hand, Ando and Yamada reported from rice-sized to bean-sized nodular shadows on the x-ray film study of experimental animals, Wang and Hsih described six cases of well-defined densities or isolated infiltrations which they thought to be characteristic for this condition. Yokogawa et al. also have called attention to the fact that they found circumscribed opacities in the majority of their nine cases.

In our series, we observed that the chest x-ray films of 88 out of 100 cases were more or less abnormal which will further be classified as follows.

1. Well-defined Nodules

In this category we include moderately or well-defined, considerably hard, but may be homogenously or irregular dense round or oval patches or nodules. We have seen this kind of nodules in 59 cases. Their sizes range from 0.5 to 4.0 cm. in diameter and may appear more than two in number on a single film (in 45 per cent) or combined with ill-defined opacities. The middle lung fields seem to be a slightly more favorite situation than the upper and lower fields (Table 2). These nodules are

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usually seen in chronic cases and do not disappear completely although
they may change their size and density (Case 3).

Nodules are the most frequent manifestation among the abnormal
findings in pulmonary paragonimiasis (Table 1). It is difficult to differ-
etiate these nodules from those of tuberculosis on a single x-ray film.
But on some occasions one may get a fairly strong impression that tuberc-
culosi is not likely especially when they are multiple and connected with
each other or situated in the lower lung field.

2. Ill-defined or Hazy Opacities

Ill-defined and soft hazy opacities, homogenous or irregular in their
densities may be observed. They are usually 2 to 4 cm. or more in diam-
ter, variable in shape and may be multiple in number. We observed this
kind of shadow in 29 cases. This kind of shadow may appear at any
stage of pulmonary paragonimiasis but especially in early newly dis-
covered cases and they are liable to disappear (Case 1) or decrease in
size with residual nodules remaining (Case 3) or reappear in other parts
of the lungs by follow-up studies. These shadows are due to the perifocal
unspecific inflammation or allergic reaction and are extremely difficult to
differentiate from tuberculous infiltration as well as nonspecific broncho-
pneumonia by single x-ray film inspection. With clinical symptoms we
might be able to predict the correct diagnosis even before the discovery
of the parasite ova in some of these cases when the x-ray shadows resemble
those of bronchopneumonia.

3. Pleurisy

Pleurisy with or without effusion was observed in 30 cases. Of these,
14 were on the right side, nine on the left and seven on both sides. It is
most frequently seen in the early stage when the larva likely penetrate the
diaphragm into the pleural spaces and consequently the ova still can not
be found in the sputum. Pleurisy may also occur if the “burrow” is situ-
ated too near the visceral pleura or the parasites actually lodge in the
pleural spaces. Differentiation from tuberculous pleurisy by x-ray film
can not be made. However one’s suspicion is aroused when it is bilateral
and/or accompanied by hazy opacities in the lower lung field, which are
uncommon in cases of tuberculous pleurisy.

4. Spontaneous Pneumothorax

We saw four cases with this condition. All were on the left side. Pleu-
risy with effusion and soft cloudy opacities in the lung parenchyma were

<table>
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<tr>
<th>TABLE I: ABNORMAL CHEST X-RAY FINDINGS IN 100 CASES OF PULMONARY PARAGONIMIASIS</th>
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</thead>
<tbody>
<tr>
<td>Abnormal Findings</td>
</tr>
<tr>
<td>Well-defined Nodules</td>
</tr>
<tr>
<td>Ill-defined Opacities</td>
</tr>
<tr>
<td>Pleurisy</td>
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<tr>
<td>Increases Lung Markings</td>
</tr>
<tr>
<td>Spontaneous Pneumothorax</td>
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<tr>
<td>Ring Shadows</td>
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<tr>
<td>Calcification</td>
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</tbody>
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combined in all instances. These conditions disappeared in a short time (Case 4). Penetration of visceral pleura by the larva when they gain access into the lung is the most probable etiology.

In addition to the above mentioned, increased lung markings and calcified lesions were seen in 34 and six cases respectively. They were not pathognostic though. Ring shadows indicative of suspected cavitation were only seen in two cases. No case with definite cavitation has been seen.

<table>
<thead>
<tr>
<th>Localization</th>
<th>Upper</th>
<th>Middle</th>
<th>Right</th>
<th>Lower</th>
<th>Upper</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodules</td>
<td>14</td>
<td>26</td>
<td>21</td>
<td>17</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Ill-defined Opa.</td>
<td>2</td>
<td>11</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Calcifications</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>38</td>
<td>29</td>
<td>22</td>
<td>26</td>
<td>17</td>
</tr>
</tbody>
</table>

II. Some Other Clinical Aspects

1. Blood Sedimentation Rate

Few references are available concerning this subject. One hour rate in 91 cases of our series at the first visit will be shown in Table 3.

<table>
<thead>
<tr>
<th>BSR</th>
<th>Number of Cases</th>
<th>Mean Value</th>
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<tbody>
<tr>
<td>6—10</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>11—20</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>21—50</td>
<td>25</td>
<td>26.0</td>
</tr>
<tr>
<td>51—</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>91</td>
<td></td>
</tr>
</tbody>
</table>

Blood sedimentation rate was variable and no definite correlation could be found with the type of x-ray shadow, severity of clinical symptoms and treatment. Because of its rather wide range, it is not too valuable in differential diagnosis.

2. White Blood Count

In 4 of our cases, there was leucocytosis of more than 10,000 in 26 cases (58 per cent) with the mean value of 12,000. Leucocytosis is apt to subside following treatment but no relationship could be found between leucocytosis and the extent of the x-ray findings or the clinical symptoms at the first consultation. The differential count was within normal limits except the esosinophils which was often markedly increased.

3. Eosinophilia

It is generally believed that there is slight eosinophilia in the peripheral blood, but Bercovitz\(^1\) reported the value of one per cent eosinophil from his 20 cases. We obtained an average of 13.6 per cent in 45 cases.

Eosinophils constituted more than 50 per cent of the white cells in
pleural fluid in 8 of our 10 cases who had such blood studies. This finding might be the only way to differentiate from tuberculous pleurisy with effusion in many instances at the time when the diagnosis is still obscure due to the negative result of parasite ova in the sputum.

More than 60 per cent eosinophilia with increase of cell count in the spinal fluid were obtained in two cases of cerebral manifestation. This finding is suggestive of cerebral manifestation of this malady and may be the key point to differentiate from other cerebral conditions.

4. **Subcutaneous creeping tumors**

In nine of 100 cases subcutaneous tumors were found. These were from green-pea to thumbtip in size and fairly firm in consistency. The subcutaneous connective tissue of the abdominal or the chest wall were the most frequent situations. Characteristic is that they may creep from one place to another and may disappear or reappear. The tumor may be single or multiple in number.

**Case 1:** S. T. C., a 43 year old male, visited our out patient department on June 19, 1948 with the complaints of cough, and chest pain for about one month and bloody sputum for two days. No fever elevation was noticed. He had a history of eating undercooked crabs two months prior. Physical examination showed the signs of bilateral pleural effusion which was proved by aspiration. This was a serous exudate but negative for
acid-fast bacilli both by smear and culture. Worthwhile is that eosinophilic leucocytes constitute more than 80 per cent of the cell elements of the effusion. There were 10,100 white blood cells with differential of 16 per cent eosinophils. Blood sedimentation rate was 52 (one hour). Chest x-ray film showed evidence of bilateral pleural effusion with an ill-defined density in the left middle lung field (Fig. 1A). Repeated sputum examination for acid-fast bacilli and ova of paragonimus westermani had been negative until July 27, when the latter were found in the bloody sputum. Chest x-ray film on August 29 revealed clearing of the pleural effusion bilaterally and condensation of the previous cloudy opacity in the left middle lung field (Fig. 1B).

Case 2: C. S. C., a 26-year-old male, was admitted in August 1948, complaining of severe cough and bloody sputum for two weeks. He had taken raw crabs in several occasions since 1946. In August 1947 he suffered from chest pain with bloody sputum, thereafter he had recurrent hemoptysis and had been treated as pulmonary tuberculosis. Once, he noticed a finger tip sized tumor in the abdominal wall but not much attention was paid because it disappeared in a few days. Physical examination on admission revealed no abnormal physical sign in the chest or the abdomen. The tuberculin test was positive, the blood sedimentation rate was 45 (1 hour). No fever was noted. There was no abnormal finding in his blood count except 8 per cent eosinophilia. A chest x-ray film taken on August 7 (Fig. 2A) revealed an ill-defined opacity, irregular in its homogeneity, throughout the right upper lung field, resembling that of tuberculous infiltration. Well defined nodules also were evident in the left lower lung field. Ova of distoma were found from the sputum but acid-fast bacilli were not demonstrated by 70 smears and 20 cultures. Following the combined therapy of emetine and aktisol, his symptoms were greatly improved although the ova did not disappear completely. A chest x-ray film on September 24 showed almost complete clearing of the abnormal density in the right upper lobe (Fig. 2B). He was discharged on December 11.

Case 3: K. S. C., a medical student, aged 27, was found to have an ill-defined cloudy opacity in the right middle lung field mesially in December 1949 (Fig. 3A). In the summer of that year, he recalled eating undercooked crabs followed by chocolate-colored sputum in which the ova of paragonimus westermani were found by himself. Sputa were negative both by smear and culture. White blood count and red blood sedimentation rate were within normal limits. On January 12, 1950 a follow-up x-ray film study revealed that the previous cloudy density had decreased in size and appeared to be a well defined nodule (Fig. 3b). He is now a resident of our hospital and a follow-up study in December 1951 showed further minimization of the nodule.

Case 4: C. W., a male, aged 34, visited our outpatient department on January 21, 1948 with the complaints of chest pain and intense cough. A chest x-ray film taken nine days prior was normal. In view of reduced resonance with diminished breath sound over the left lower chest, another film was ordered on January 30, which showed left spontaneous pneumothorax with pleural effusion and a soft density in the left midlung field (Fig. 4A). The fluid was yellowish clear, positive for Rivalta test and negative for acid-fast bacilli by culture. Left pulmonary tuberculosis with spontaneous seropneumothorax had been the diagnosis until white blood count was done a few days later with the result of 14,900 leucocytes and 16 per cent eosinophilia. The
follow-up roentgenological examination on February 16 revealed complete clearing of the seropneumothorax as well as the parenchymal infiltration (Fig. 4B). Thereafter he developed right sided pleurisy with effusion (eosinophilia in it) in March and finally was admitted to the medical ward on May 1, for a complete work up of his disease. During his hospitalization, eosinophilia in peripheral blood ranged from 28 to 55 per cent. Acid-fast bacilli were not demonstrated by 50 smears and 15 cultures. A diagnosis of pulmonary paragonimiasis had only been suspected until the discovery of the parasite ova in bloody sputum on September 21.

SUMMARY AND CONCLUSION

1. Chest x-ray films and some other clinical figures have been studied in 100 cases of proved pulmonary paragonimiasis.

2. Contrary to the previous general belief, x-ray findings of pulmonary paragonimiasis may reveal one or several kinds of abnormalities; namely well-defined nodules, ill-defined transient opacities, pleurisy, spontaneous pneumothorax and ring shadows, provided they are well followed up from the onset of disease.

3. It is difficult to differentiate these abnormalities from those of tuberculosis or bronchopneumonia by x-ray films alone with some exceptional cases in which the impression from the findings as a whole is definitely unlike that of tuberculosis.

4. The incidence of pleurisy with or without effusion is high and it is often the first manifestation. High percentage of eosinophils in the pleural effusion has its diagnostic value to differentiate from tuberculous pleurisy.

5. Slight leucocytosis with differential count of considerable eosinophilia in peripheral blood are rather common.

6. The mean value of blood sedimentation rate in this disease is slightly increased. It has a such a wide range it is not valuable in diagnosis.

7. Eosinophilia in the cerebrospinal fluid may be the key point to differentiate the cerebral complication of this disease from other cerebral conditions.

8. Subcutaneous creeping tumors, if present, are strongly suggestive of this disease in Taiwan.
RESUMEN

1. Se han estudiado las películas roentgenográficas y otros aspectos clínicos en 100 casos de paragonimiasis demostrada en el pulmón.

2. Contrariamente a la creencia general, los hallazgos a los rayos X en la paragonimiasis pulmonar, pueden revelar varias clases de anormalidades; como son nódulos bien definidos, opacidades transitorias mal definidas, pleuresia, neumotórax-espontáneos e imágenes anulares, siempre que se busquen desde el principio de la enfermedad.

3. Es difícil diferenciar estas anormalidades de las de la bronconeumonía o de la tuberculosis sólo por los rayos X, salvo algunos casos en los que la impresión de los hallazgos, es definidamente disimilar de la tuberculosis.

4. La frecuencia de la pleuresia con o sin derrame, esalta y a menudo es la primera manifestación. Un elevado porcentaje de eosinófilos en el líquido pleural, tiene valor diagnóstico para diferenciar de la pleuresia tuberculosa.

5. Es común encontrar ligera leucocitosis con una cuenta diferencial mostrando considerable eosinofilia en la sangre periférica.

6. La sedimentación globular está ligeramente aumentada.

7. La eosinofilia en el líquido cerebroespinal, puede dar la clave para diferenciar la complicación cerebral de esta enfermedad, de otras afecciones cerebrales.

8. Los tumores subcutáneos movedizos, cuando se encuentran, son fuertemente sugestivos de esta enfermedad en Taiwan.

RESUME

1. Les auteurs ont étudié les radiographies pulmonaires et quelques caractères cliniques concernant cent cas de distomatose pulmonaire avérée.

2. À l'opposé de l'opinion généralement admise jusqu'à présent, les constatations radiologiques dans la distomatose pulmonaire peuvent mettre en évidence un ou plusieurs caractères anormaux; nodules bien délimités, infiltrats labiles, pleurésie, pneumothorax spontané, et ombres annulaires. Es altérations apparaissent à condition que la maladie soit suivie depuis son extrême début.

3. Dans l'ensemble, on ne peut que difficilement différencier ces aspects radiologiques de ceux qui appartiennent habituellement à une tuberculose ou aux pneumopathies aigues. Ce n'est que dans quelques cas exceptionnels que l'aspect apparaît nettement différent de celui de la tuberculose.

4. Une réaction pleurale avec ou sans épanchement est fréquente et réalise souvent la première manifestation de la maladie. L'importance de l'éosinophilie du liquide pleural a une grande valeur diagnostique et permet de le différencier de celui de la pleurésie tuberculeuse.

5. Dans le sang périphérique, l'existence d'une leucocytose peu élevée avec une éosinophilie considérable est assez commune.

6. La vitesse de sédimentation sanguine est, dans cette affection, légère-
ment augmentée. Toutefois, cette augmentation n'atteint pas de proportions suffisantes pour prendre une valeur au point de vue du diagnostic.

7. L'existence d'éosinophilie dans le liquide céphalo-rachidien peut permettre de différencier les complications cérébrales d'autres affections touchant l'encéphale.

8. L'existence de tumeurs sous-cutanées mobiles, si on peut les constater, est tout à fait suggestive de cette affection.

REFERENCES


