

PLEUROPULMONARY PARAGONIMIASIS MIMICKING PULMONARY TUBERCULOSIS – A REPORT OF THREE CASES

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Abstract

Paragonimiasis is an important cause of pulmonary disease worldwide. Infection in humans mainly occurs by ingestion of raw or undercooked freshwater crabs or crayfishes. The disease is well known in endemic regions of Asian countries, where culturally based methods of food preparation foster human transmission. Three patients with clinical and radiological features compatible with pulmonary tuberculosis had been treated for tuberculosis without remedy despite an inability to demonstrate acid fast bacilli in sputum smears. All patients had history of ingestion of raw crabs and crayfishes. The confirmed diagnosis of pleuropulmonary paragonimiasis was made based on the demonstration of *Paragonimus* eggs in the sputum, and high absolute eosinophilia in their peripheral blood and pleural fluid. All the patients had been treated with praziquantel successfully.

Key words: *Paragonimiasis, Raw crabs, Raw crayfishes, Pleural effusion, Praziquantel*

Paragonimiasis is a food-borne parasitic disease commonly caused by infection with *Paragonimus westermani*, which is medically important trematode because the disease may be extremely chronic as the adult worms may survive for 20 years with an average of six years and infect an estimated 22 million people globally.¹ *Paragonimus*, the human lung fluke is an important cause of pulmonary disease worldwide. The disease is well known in endemic regions of Asian countries especially in Japan, Korea, the Phillipines, Thailand, Taiwan and China where culturally based methods of food preparation foster human transmission.² Furthermore, a high incidence of paragonimiasis was observed in some parts of Latin America and Africa. *P. westermani* was first discovered by Kerbert in 1878 in the lungs of Bengal tigers which was captured in India and died at a zoological garden in Amsterdam. The life cycle of *P. westermani* takes at least four months to complete and may be prolonged by winter hibernation of snails. The life cycle involves a definitive host: human; first intermediate host: snail; second intermediate host: crab, crayfish and the reservoir hosts: dogs, cats, tigers, leopards, wolves etc. Infection in humans is usually acquired by ingestion of raw or undercooked freshwater crabs or crayfishes containing encysted metacercariae or raw or undercooked pork could be another mode of infection as pig and wild boar could act as paratenic host.^{3,4}

Manipur with an area of 22,327 sq. km. is a small land-locked, 90% hilly state in India's north eastern region border with Myanmar. Mountainous areas with unpolluted water are

favourable for *Paragonimus* transmission.¹ The mountain streams of Manipur provide a rich source of fresh water crabs. In Manipur, crabs are eaten as fried or roasted, as cooked curry and sometimes as soup.

We report here three cases of pleuropulmonary paragonimiasis mimicking clinically and radiologically pulmonary tuberculosis. We believe this report will increase the awareness among clinicians and microbiologists.

Case Reports

Case 1

A 17 year old man presented with the chief complaints of cough, fever, dyspnoea, haemoptysis, poor appetite and weight loss of 1 ½ years duration. He gave a history of ingestion of raw crabs in September 2001. The limbs of crab was eaten in the raw mashed form and the body was crushed and eaten as pickle. After one month of ingestion of raw crabs in such different ways, the patient had started insidious cough, low grade fever for about three days, frank bouts of haemoptysis accompanied by night sweats, general malaise, pleuritic pain and viscous brown sputum with rusty smell. The patient was hospitalised.

Investigations showed no acid fast bacillus (AFB) by Ziehl-Neelsen stain in sputum. Sputum culture grew *Streptococcus* species; showed chest X-ray right pleural effusion with cavitation and fibrosis on right middle lobe. CT scan confirmed the above findings. Other systemic routine examinations were normal.

The patient was diagnosed as pulmonary tuberculosis with cavitation and treated with antituberculosis drugs continuously for one year. However, the treatment showed no improvement and the previous symptoms persisted. Then, the patient visited

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the microbiology laboratory, RIMS Hospital, Manipur, for necessary examinations and investigations.

Laboratory investigations: Microscopic examination (Fig. 1) of the rusty brown sputum revealed the presence of operculated, oval, yellowish coloured egg of *P. westermani* in the direct sputum smear (wet film), high absolute eosinophil count (24%) in the peripheral blood and raised erythrocyte sedimentation rate (50 mm/1st hr). The diagnosis was confirmed as pleuropulmonary paragonimiasis. He was treated with praziquantel at a dose of 25 mg / kg body weight three times a day for three days (with a 4 to 6 hours interval between doses) and responded well dramatically.

Case 2

A 15 year old man was hospitalised with a two month history of productive cough, dyspnoea, anorexia and weight loss. One month prior to hospital admission, he attended a function and ate different types of meat along with alcohol. He started having progressive dyspnoea, haemoptysis, productive cough and chest pain about a month after this incidence. He gave a dietary history of taking raw crabs and crayfishes since his childhood.

On hospital admission, the patient looked ill with a temperature of 39°C and a regular pulse rate of 110 beats/min. BP was 140/85 mm Hg, and respiratory rate was 18 beats / min. Tubular breathing and rales were heard in the upper region of the right lung. The physical examination was otherwise normal.

Initial investigations revealed Hb, 8 gm%; WBC count, 16,000/cumm; neutrophils, 5%; lymphocytes, 28%; monocytes, 04%; eosinophils, 26% and erythrocyte sedimentation rate, 38 mm/1st hr (Westergreen).

Sputum examination for AFB, fungi, bacteria, malignant cells and *Entamoeba histolytica* were repeatedly negative. Culture findings for AFB were negative.

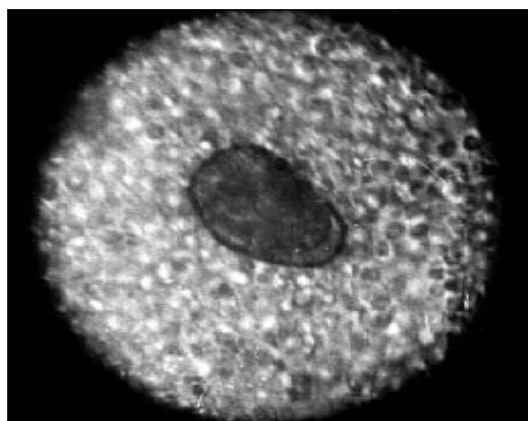


Figure 1: Photomicrograph showing operculated, oval yellowish coloured egg of *Paragonimus westermani*

A chest X-ray showed thin walled cavities, and a homogenous opacity in the right lower zone with obliteration of the right costo-phrenic angle, the apex of the opacity pointing towards the right axilla (Fig. 2) suggestive of right sided pleural effusion. CT scan confirmed the above finding. Ultrasound guided aspiration yielded about 450 mL of straw coloured fluid. Treatment with antituberculosis drugs did not improve the patient's condition. Then the patient came to our laboratory for further investigations.

Microscopic examination of the reddish coloured sputum revealed operculated, oval, yellowish coloured eggs of *P. westermani*. The eggs could be demonstrated on repeated smear examination.

Case 3

A 21 year old man was admitted to our institution for progressive dyspnoea with one month history of headache, fever, cough with scant haemoptysis, fatigue, pleuritic pain, anorexia, and weight loss. Two months prior to hospital admission, after ingesting three raw crabs, the patient had a three day selflimited watery diarrhoea. On hospital admission, the patient was cachectic with a temperature of 37°C. Respiratory rate was 30 beats/min, BP was 140/65 mmHg, and the pulse rate was 87 beats /min. There was dullness to percussion and absent breath sounds in the lower two-thirds of the chest bilaterally. The patient was found to be anaemic, clubbing without any lymphadenopathy, cyanosis and jaundice. He had a history of antituberculosis therapy for six months without improvement clinically.

Investigations revealed Hb, 9.5 gm%; WBC count, 9,000/cumm; eosinophil, 25% and erythrocyte sedimentation rate, 45 mm/1st hr (Westergreen).

The chest radiograph showed bilateral pleural effusion (Fig.3). CT confirmed the presence of effusion. Ultrasound guided thoracentesis on the right lung yielded about 200 ml of yellowish coloured fluid.

Laboratory analysis demonstrated the fluid to be exudative; pH 7.2; lactate dehydrogenase, 4,450 IU/L;

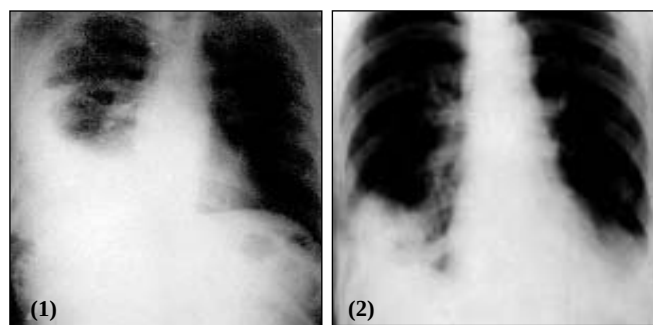


Figure 2: Chest radiograph (PA view) showing significant right sided pleural effusion

Figure 3: Chest radiograph (PA view) showing bilateral pleural effusion

glucose, 7 mg/dL; RBC count, 5,000/mL and WBC count, 2,700/mL. The differential of the WBC count measured 91% eosinophils. Pleural fluid for Gram stain and culture finding were negative. Based on the history of the raw crabs ingestion, the presence of operculated yellowish eggs in the sputum smears, the diagnosis was made and patient was treated with praziquantel, 25 mg/kg body weight thrice daily for three days and responded well. Interestingly, the right sided effusion did not recur after thoracocentesis and praziquantel treatment.

Discussion

Paragonimus westermani infection is generally known as a food borne parasitic disease of young people. Humans are infected by eating raw or undercooked freshwater crabs or crayfishes containing encysted metacercariae or raw or undercooked pork could be another mode of infection as pig and wild boar could act as paratenic host.^{3,4} Another possible mode of transmission is the accidental transfer of metacercariae through handling of infected crabs during preparation of food. In Manipur, crabs are eaten fried or roasted, as cooked curry and sometimes as soup. To prepare soup, crabs are chopped and crushed by grinder or hand pounding and strained through a muslin cloth or other suitable strainer. The crab juice is then cooked in a little oil with garlic, onion and other spices till it becomes pasty in consistency. This method of preparation kills *Paragonimus* metacercariae, however, transfer of metacercariae to the mouth from fingers, utensils, and other appliances used during processing is a possible means of acquiring infection..

The incubation period of paragonimiasis is highly variable but in humans, as early as 2-30 days or as long as to several months. The prepatent period or first appearance of eggs in the sputum, however, is 8-10 weeks. In our cases, the symptoms began within two months following ingestion of raw or undercooked crabs/crayfishes. Non-specific symptoms, e.g., diarrhoea, abdominal and chest pain, allergic reactions, fever and chills may be present during the migration phase. Once the worms establish, the most common symptoms are cough and haemoptysis which may be accompanied by night sweats and general malaise. Severe infections might progress to pleurisy, persistent rales, clubbed fingers and pneumothorax. Chest radiographic findings are normal in 10 to 20% of infected persons and findings in others include infiltrate, cavitation, fibrosis, effusion or pleural thickening.⁵

The main differential diagnosis of caviting lung infiltrates include pyogenic abscess from a variety of bacterial organisms, pulmonary tuberculosis, nocardiosis, fungal infections, and parasitic diseases of the lungs. A study done in Japan by Nakamura-Uchiyama *et al* revealed that nodular lesions in the lungs of middle aged people are often suspected to be lung cancer by clinicians. In paragonimiasis endemic areas in Japan, and other developed countries, therefore, caution is required to differentiate between lung cancer and paragonimiasis.⁶ The haemoptysis of *Paragonimus* requires

parasitological and bacteriological differentiation from that of the more prevalent tuberculosis in co-endemic areas. In general, however, the clinical presentation is frequently indistinguishable from pulmonary tuberculosis, and the diagnosis is often confused, leading to improper and inadequate chemotherapy.^{2,7} Differential diagnosis of pulmonary paragonimiasis should, therefore, include lung cancer, tuberculosis, nocardiosis and fungal infection.

The clinical relevance of this parasitic infection is often underestimated. Clinical suspicion of the disease will arise from a thorough history of raw freshwater crabs or crayfish ingestion, clinical signs and sputum containing operculated eggs. Diagnosis of paragonimiasis can be established readily in most patients by identifying the typical operculated eggs, the most sensitive and reliable diagnostic sign in the sputum, stools, or pleural fluids but during the migratory phase, diagnosis poses a problem since no eggs are passed. However, in our cases, eggs were found in the sputum samples but no eggs were detected in pleural fluids. Marked eosinophilia was detected in peripheral blood of all cases, however, in the pleural fluids, eosinophilia was detected in case 3. No malignant cells were found in all cases. According to Minh *et al*, the presence of pleural effusion is one of the clinical manifestations of *P. westermani*.⁸ In our cases also, unilateral pleural effusion (cases 1 and 2) and bilateral (case 3) were detected. Alternatively, if the clinical history is suspicious and eggs laden sputum cannot be demonstrated, the humoral immune response, which is considered supplementary tool, can be quantified through enzyme immunoassay (EIA).⁹ This test however, cannot differentiate between current and past infection. Praziquantel at 25 mg/kg body weight three times daily for three consecutive days is the drug of choice for paragonimiasis and is an effective treatment in > 90% of cases.¹⁰

To conclude, paragonimiasis and tuberculosis must be differentiated, though chest X-ray appearance alone does not make the distinction. In such situation, pleuropulmonary paragonimiasis should be ruled out by repeated sputum and pleural fluid examinations for the eggs of *P. westermani* by well experienced microbiologists before initiating antituberculosis therapy.

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ANNOUNCEMENT

A Hands-on training workshop on “Laboratory Diagnosis of Leptospirosis” will be conducted at WHO Collaborative Centre for Diagnosis, Research, Reference and Training in Leptospirosis Regional Medical research Centre (ICMR) Port Blair, Andaman and Nicobar Islands during August 2005.

The workshop will include lectures, demonstrations and practicals including molecular techniques.

Applications on plain paper duly recommended by the head of the respective Institutes should reach to the Director, Regional Medical Research Centre (ICMR) Post Bag No. 13 Port Blair, Andaman and Nicobar Islands (Ph.No. 03192-51158, 51164, 51043, E-mail: pblicmr@sancharnet.in) latest by 30th May 2005.

No TA/DA will be provided to participants. However, local accommodation will be provided to the participants during training period and there is no course fee for training. The preference would be given to young scientists/microbiologists/technologists.