TROPICAL AND SUBTROPICAL PARASITIC INFECTIONS OF THE CHEST: A GUIDE FOR RADIOLOGISTS

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PROTOZOA
MALARIA

• Transmitted by the bite of *Anopheles* mosquito.

• *Plasmodium vivax, P. falciparum, P. malariae* and *P. ovale* are responsible for the disease. *Falciparum* is the most deadly type of infection.

• Adult respiratory distress syndrome (ARDS) is the most common lung finding manifestation.

• Septal thickenings, pleural effusions and airspace consolidations are seen on HRCT and are consistent with noncardiogenic pulmonary edema. Cryptogenic organizing pneumonia (BOOP/COP) has been reported.

Murray PR et al. Medical microbiology. 4th ed. St Louis, Mo: Mosby, 2002
Rings of *P. falciparum* in a thick blood smear

CDC. [http://www.dpd.cdc.gov/DPDx/HTML/ImageLibrary/Malaria_il.htm](http://www.dpd.cdc.gov/DPDx/HTML/ImageLibrary/Malaria_il.htm) (with permission)
Malaria in a 38 year old man with fever, headaches and sore throat.

Chest HRCT showing diffuse septal thickening, sparse consolidations and right pleural effusion, consistent with ARDS.
Ingestion of mature *Entamoeba histolytica* cysts in fecally contaminated food, water or hands causes infection.

Approximately 1% of the world’s population is thought to be infected.

Most frequent in lower socioeconomic classes in tropical and subtropical climates.

Pleuropulmonary disease occurs in 6% to 40% of patients with amebic liver abscess.

Usually results from direct extension to the chest of a liver abscess. Aspiration or hematogenous dissemination are uncommon.

Lung consolidations, pleural effusions and pericarditis.
Pulmonary amebiasis. Chest radiograph and CT with IV contrast demonstrating an airspace consolidation in the RUL with cavitations.
PROTOZOA
TOXOPLASMOSIS

- Caused by *Toxoplasma gondii*. Cats are the primary carriers and humans get the infection by eating raw or undercooked meat, vegetables or milk products.

- The symptoms are flu-like syndrome, enlarged lymph nodes or myalgia. Pulmonary toxoplasmosis is more common in HIV patients.

- *Toxoplasma pneumonia* can manifest as interstitial pneumonia, diffuse alveolar damage or necrotizing pneumonia.

Dodds EM. Curr Opin Ophthalmol 2006; 17:557–561
Chest HRCT demonstrates consolidations in the right lung, bilateral patchy areas of ground glass opacities and septal thickenings.
PROTOZOA
TRYPANOSOMIASIS (CHAGAS)

• Caused by *Trypanosoma cruzi*, which is acquired through the bite of a triatomine insect.

• Major health problem in Latin America.

• The acute phase is usually asymptomatic, but can present with febrile illness with facial or palpebral edema ("Romanã sign") and acute myocarditis.

• A nodular lesion or furuncle, usually called chagoma, can appear at the site of inoculation.

• Chronic manifestations include cardiomyopathy, bundle branch blocks, complete atrioventricular block and ventricular aneurysms.

• Late GI compromise is due to damage to neurons of the myenteric plexus, with achalasia, megaesophagus and megacolon. Chronic Chagas disease and its complications can be fatal.

Prata A. Lancet Infect Dis 2001; 1(2):92-100
Chronic Chagas disease with megaesophagus and a left ventricular apical aneurysm
NEMATODES
ASCARIASIS

- Caused by ingestion of food or fluids contaminated with feces with *A. lumbricoides*.
- One of the most common parasitic infections, affecting 1.3 billion people worldwide.
- Signs and symptoms of Loeffler syndrome (cough, fever, expectoration and eosinophilia).
- Chest radiograph and CT: patchy acinar opacities, bilateral and migratory.

Ascaris (arrows) in the esophagus and pleural cavity. Iatrogenic perforation of the esophagus.
NEMATODES
STRONGYLOIDIASIS

- *Strongyloides stercoralis* larvae invade the lungs and small intestine through the skin from the soil.
- Continuous autoinfection can lead to a massive parasitic infestation (hyperinfection syndrome), especially in immunosuppressed patients.
- 35 million people are infected worldwide.
- Imaging findings include ill-defined, patchy, migratory airspace consolidation.

Chu E et al. Chest 1990; 97:1475-7
STRONGYLOIDIASIS

Life cycle

Longitudinal-section of larvae of *S. stercoralis* (H&E)

Patchy bilateral consolidations and ground glass opacities in a 42 year old man with AIDS and a massive infestation (hyperinfection syndrome) of Strongyloides stercoralis.
NEMATODES
DIROFILARIASIS

- Pulmonary dirofilariasis is common in dogs and is caused by the nematode *Dirofilaria immitis*.

- When dogs are bitten by infected mosquitoes, these suck the microfilarias out of the infected dogs and later transmit them to the human host.

- A solitary pulmonary nodule is the most common imaging finding. Multiple lung nodules (25%) or pleural effusion can be present.

Milanez de Campos JR et al. Chest 1997; 112: 729-733
Oshiro Y et al. JCAT 2004; 28 (6): 796-800
DIROFILARIAISIS

Cross-sections of *Dirofilaria sp.* stained with H&E.

DIROFILARIASIS

Chest HRCT shows multiple pulmonary nodules scattered bilaterally, some of them with a ground-glass halo.
NEMATODES
CYSTICERCOSIS

• Common parasitic disease in Latin America, acquired by ingestion of ova of *Taenia solium*.

• Disseminated cysticercosis mainly involves the CNS and occasionally striated muscles and subcutaneous tissue. Subcutaneous cysticercosis presents as small, movable, painless nodules, usually in the arms or chest.

• CT scan: cystic lesions, commonly with a hyperdense central nodule, which represents the parasite head, called the scolex.

• Pulmonary involvement is very similar to other parasitic infections. If association of chest wall and cardiac muscles lesions is seen, cysticercosis should be the first diagnosis considered.

The life cycle of Cysticercosis involves the following stages:

1. Embryonated eggs ingested by the human host.
2. Embryonated eggs and/or gravid proglottids ingested by pigs.
3. Oncospheres hatch, penetrate the intestinal wall, and circulate to musculature.
4. Humans infected by ingesting raw or undercooked infected meat.
5. Scolex attaches to the intestine.
6. Adults in small intestine.
7. Eggs or gravid proglottids in feces and passed into the environment.
8. Oncospheres develop into cysticerci in pig muscle.
9. Cysticerci may develop in any organ, being more common in subcutaneous tissues as well as in the brain and eyes.

Larval *Taenia solium* cyst stained with H&E.

Disseminated cysticercosis, with multiple hypoattenuating nodules on the chest wall muscles, brain, cardiac muscle and lungs.
NEMATODES
TOXOCARIASIS

• Toxocariasis is worldwide distributed. Humans can be accidental hosts.

• Human toxocariasis is caused by the larvae of *Toxocara canis* or *Toxocara cati*. In humans, the larvae do not develop into adult worms, but migrate through host tissues. Therefore, the disease is also called visceral larva migrans.

• The larvae induce an eosinophilic inflammation in tissues.

• The most common clinical features of the disease in humans are peripheral eosinophilia, abdominal pain, hepatosplenomegaly, fever, and hypergammaglobulinemia

The patient was treated with antibiotics, with no improvement. A chest CT was performed after 14 days, showing multiple randomic pulmonary nodules. A pulmonary biopsy confirmed the diagnosis of toxocariasis.
NEMATODES SYNGAMOSIS

- Infection caused by *Syngamus trachea* or *Syngamus laryngeus*, nematodes found in tropical mammals and birds and, very rarely, in humans.

- The main symptoms are chronic nonproductive cough, asthma-like symptoms and hemoptysis.

- Imaging studies may be normal or depict findings consistent with pneumonitis. Bronchoscopy is the diagnostic modality of choice for diagnosis and treatment, with removal of the worms.

45 yo male, chicken raiser. Presented with dry cough, with no improvement after treatment.

A fibrous bronchoscopy was performed and two syngamus were removed from the trachea.
**CESTODES HYDATIDIDOSIS**

- *Echinococcus granulosus, E multilocularis* and *E. vogeli* can cause echinococcosis in humans. The lung is the second most common site of disease, after the liver.

- *E. granulosus* causes unilocular cystic echinococcosis. Thoracic involvement may occur via a transdiaphragmatic route or by means of hematogenous spread.

- Imaging studies show cystic lesions, solitary (60%) or multiple, predominantly in the lower lobes. In transdiaphragmatic dissemination, findings include pleural effusion, diaphragm elevation, pulmonary consolidation, laminar atelectasis, pleural cysts and empyema.

Chest topogram and CT show multiple cystic lesions in the liver and spleen, with thoracic involvement via a transdiaphragmatic route.
The most frequent etiologic agent is *Paragonimus westermani*. The disease is acquired by ingesting raw or undercooked infected crabs or crayfish or by drinking contaminated water.

Endemic areas: southeast Asia, Latin America and Africa.

The main imaging findings are areas of consolidation, nodules and fluid or air-filled cysts.

PARAGONIMIASIS

Chest CT demonstrate multiple pulmonary nodules and cysts, some of them containing fluid.
TREMATODES
SCHISTOSOMIASIS

- Schistosomiasis is a major helminthic infection, with estimated 200 million people infected.

- The earliest pulmonary manifestations are of a Loeffler-like syndrome, with foci of consolidation changing at short time intervals. The acute phase is usually asymptomatic, but lung nodules may be seen, sometimes with halo sign. In the chronic phase, liver fibrosis, pulmonary hypertension, thrombi and cor pulmonale can be present.

Eggs of *S. mansoni* in unstained wet mounts.
Schistosomiasis

A. CT scan demonstrating multiple esophageal varices.
B-C. Another patient with scattered lung opacities, some of them with an inverted halo sign.
Schistosomiasis. Enlarged pulmonary arteries, with pulmonary hypertension and arterial thrombi.
CONCLUSIONS

• Tropical and subtropical parasitic diseases are very common worldwide and will probably become more frequent due to increasing globalization and changes in natural ecosystem and climate.

• As chest is frequently involved, knowledge about chest parasitic diseases is crucial for their prompt recognition and appropriate treatment.

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