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Ascaris lumbricoides: The Unforeseen Diagnosis

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Infections from Ascaris lumbricoides have become very prevalent in lesser developed countries. These infections are believed to be a significant burden to the United States through its border with Mexico, and immigration from other countries, through increased travel and international adoptions (Cannans et al., 2013). Several cases of ascariasis have been found to cause cases in the United States, one being in Westerville, Ohio (Butts & Henderson, 2003). As early as 2011, the prevalence of ascariasis is estimated that the prevalence of A. lumbricoides is the highest in Latin America and the Caribbean, followed by South Asia (Stothard et al., 2011). The majority of these infections are caused by ingestion of contaminated food or water, and amongst the easiest ways of transmission is through children entering the United States who have not received treatment for ascariasis. It is essential in raising the standards of health and prevention of gastrointestinal symptoms.

**Epidemiology**

According to the Centers for Disease Control (CDC, 2014), the most common human helminthic infection worldwide is Ascaris lumbricoides, with the highest prevalence in both the tropical and subtropical regions, as well as areas with poor basic sanitation. A. lumbricoides has been identified in the water, soil, and food of the southeastern United States (CDC, 2013). A. lumbricoides has a worldwide distribution and is commonly found in poor and less developed regions (Hawari & Abu-El Dahab, 2014). It is important to note that the prevalence of A. lumbricoides is the highest in Latin America and the Caribbean, followed by South Asia (Stothard et al., 2011). The majority of these infections are caused by ingestion of contaminated food or water, and amongst the easiest ways of transmission is through children entering the United States who have not received treatment for ascariasis. It is essential in raising the standards of health and prevention of gastrointestinal symptoms.

**Epidemiology Continued**

According to the CDC (2014), the life cycle of A. lumbricoides begins with their eggs, which are mainly transmitted by the hand to mouth route through ingestion. Common routes of ingestion include food, water, and drinking water, and amongst children, fingers and toys are common reservoirs for transmission. The shell of the egg is waterlogged and exposed to air after ingestion of gastric acids and the egg will hatch into larva before it is swallowed and in the bile and alkaline ph of the small intestine. Larvae that have hatched in the bile will enter the liver via the portal vein and in the small wall of the intestine and will remain in the liver. The larvae will then migrate through the systemic system to the right side of the heart and end of the pulmonary system from the lungs. The larvae will then penetrate into the alveoli in the capillary beds. While in circulation, the larvae will have additional two cycles of molting. They will travel up the trachea to the pharynx where the host will swallow, and then will return into the host through the oral cavity. As early as 2011, the prevalence of A. lumbricoides is the highest in Latin America and the Caribbean, followed by South Asia (Stothard et al., 2011). The majority of these infections are caused by ingestion of contaminated food or water, and amongst the easiest ways of transmission is through children entering the United States who have not received treatment for ascariasis. It is essential in raising the standards of health and prevention of gastrointestinal symptoms.

**First Phase of A. lumbricoides**

A study completed by Staats et al. (2011), examined intestinal parasites, and found that 27% of the 1,042 stool samples of internationally adopted children were positive for A. lumbricoides. Current practice in the American Association for Pediatric Gastroenterology, in their most recent statement, is only one stool sample for exam, however, the study showed that a minimum of two stool samples should be collected and analyzed for all patients and the possibility of asymptomatic cases that are not reported to the United States, regards of gastroenteritis, enteritis, or appendicitis. Additional diagnostic of intestinal parasites can be identified by sample collected, that were not able to be diagnosed on stool samples one and two (Staats et al., 2011).

**Life Cycle**

According to the CDC (2014), the life cycle of the A. lumbricoides begins with their eggs, which are mainly transmitted by the hand to mouth route through ingestion. Common routes of ingestion include food, water, and drinking water, and amongst children, fingers and toys are common reservoirs for transmission. The shell of the egg is waterlogged and exposed to air after ingestion of gastric acids and the egg will hatch into larva before it is swallowed and in the bile and alkaline ph of the small intestine. Larvae that have hatched in the bile will enter the liver via the portal vein and in the small wall of the intestine and will remain in the liver. The larvae will then migrate through the systemic system to the right side of the heart and end of the pulmonary system from the lungs. The larvae will then penetrate into the alveoli in the capillary beds. While in circulation, the larvae will have additional two cycles of molting. They will travel up the trachea to the pharynx where the host will swallow, and then will return into the host through the oral cavity. As early as 2011, the prevalence of A. lumbricoides is the highest in Latin America and the Caribbean, followed by South Asia (Stothard et al., 2011). The majority of these infections are caused by ingestion of contaminated food or water, and amongst the easiest ways of transmission is through children entering the United States who have not received treatment for ascariasis. It is essential in raising the standards of health and prevention of gastrointestinal symptoms.

**First Phase of A. lumbricoides Continued**

During the first phase which targets the pulmonary system, A. lumbricoides can cause multiple mechanisms such as, a hypersensitive reaction to the antigens that are produced by A. lumbricoides larvae, as well as a non-specific inflammatory reaction to the larvae. A. lumbricoides larvae can also cause clinical symptoms like ascariasis, enteritis, and appendicitis. Patients may present with complications - symptoms such as dyspepsia, dysphagia, and cardiovascular and clinical symptoms like ascariasis, enteritis, and appendicitis. The lifecycle of A. lumbricoides can be divided into three phases of disease, which can occur simultaneously or one after the other. The second phase, is the intestinal phase, and the third phase is the occurrence phase. (Batts and Henderson, 2013)

**Second Phase of A. lumbricoides**

The second phase of the intestinal parasite, which results from the migration of A. lumbricoides through organs, entanglement of masses of worms and penetration of the intestinal wall, can cause complications of the abdomen, nausea and diarrhea. The patient may notice the worms in their stool or emerging external openings (CDC, 2014). The presence of A. lumbricoides in the biliary tree can present in multiple ways, one being the right upper quadrant pain that is associated with nausea, vomiting, and abdominal pain. This pain is caused by the obstruction of the bile duct, which is also referred to as the right or the back side that is associated with nausea, vomiting, and abdominal pain. This pain can also be caused by liver palpation, symptoms similar to those of cholecystitis on exam. Patients may present with right upper quadrant pain, high fever and jaundice, which symptoms are similar to that of a gallstone. A. lumbricoides can also cause ascariasis obstruction or pulmonary pneumonia, depending on the type of larval migration. Patients may present with symptoms of pancreatitis, with epigastric pain radiating to the back, nausea and vomiting. Patients may also present with eosinophilia in the blood. A thoracic computed tomography is a microscopic examination of a direct fecal smear can reveal eggs or ova at a later stage. A. lumbricoides can also be diagnosed by abdominal ultrasonography, revealing the presence of a sometimes mobile A. lumbricoides, CT scan and nuclear magnetic resonance imaging can also be used (Gallen, Sabater and Ouri, 2010). A. lumbricoides can be identified as a curved esophageal structure with active movement on real time imaging (Riggin, Brewer, Turner, & Mullens, 2010).

**Third Phase of A. lumbricoides**

Patients presenting with A. lumbricoides are generally asymptomatic, or can present with gastrointestinal symptoms that correlate directly with the larval migration. These complaints may represent an early disease or the onset of complications that may correlate directly with the larval migration. These complaints may represent an early disease or the onset of complications that may result in severe complications if not treated. A. lumbricoides can cause gastrointestinal symptoms like nausea and vomiting, as well as liver, biliary, and pancreatic symptoms can occur, such as cough, dyspepsia, dysphagia, hepatomegaly, esophagitis, pulmonary symptoms, and pneumonitis as known to A. lumbricoides larvae (CDC, 2014). Less common complications are respiratory compromise, intussusception, reactive arthritis, and lung abscesses.

**A. lumbricoides**

The lifecycle of Ascaris lumbricoides can be divided into three phases: the pre-infection phase, the infection phase, and the postpartum phase. The first stage is the intestinal phase, and the third stage is the infection phase. (Batts and Henderson, 2013)