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PATHCHAT

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Diagnosing schistosomiasis: An update

Introduction

Schistosomiasis, or bilharzia, is a common intravascular infection caused by the *Schistosoma* trematode worm. Bilharzia is endemic in sub-Saharan Africa where the majority of infections are caused by *S. haematobium* and *S. mansoni*. Important transmission sites in Africa are Lake Malawi and Lake Victoria and travellers are commonly infected when swimming there. In South Africa, schistosomiasis is endemic in the northeastern parts, including the North West, Limpopo, Mpumalanga, KwaZulu-Natal and the Eastern Cape. Infection is usually acquired through activities like swimming, bathing, fishing and washing clothes.

Schistosomiasis progresses through three phases: an acute phase, a chronic phase and an advanced phase, each with different clinical features. The phase of infection also impacts on the diagnostic tests used and their interpretation. Acute schistosomiasis (Katayama Syndrome) occurs in patients experiencing their first infection and presents with fever and eosinophilia, often with skin, abdominal and pulmonary symptoms. This is typically seen in travellers returning from schistosoma endemic countries. Chronic and advanced disease occurs due to chronic local inflammation to schistosoma eggs trapped in host tissues, which may lead to inflammation and obstructive disease of the urinary tract (*S. haematobium*); or intestinal disease, hepatosplenic inflammation and liver fibrosis (*S. mansoni*).

A diagnosis of schistosomiasis is based on an appropriate history, a physical examination, and appropriate laboratory and radiological investigations. A diagnosis requires prompt treatment, even if the patient is asymptomatic, as adult worms live for many years. Oral praziquantel is used to treat infections caused by all schistosome species.

Laboratory tests

Full blood count: A routine full blood count (FBC) may show an eosinophilia, which is frequently marked during the acute stage of the infection. Anaemia may also be seen due to chronic blood loss from the urinary or intestinal tract. Patients with hepatosplenic schistosomiasis may have a thrombocytopaenia secondary to splenic sequestration.

Urine dipstick: *S. haematobium* infections are usually associated with haematuria on dipstick testing.

Microscopy: Demonstration of parasite eggs in stool or urine is the gold standard test for diagnosing schistosomiasis and is required for species identification and determining the intensity of infection. However, the sensitivity may be low, especially with light infections, and it takes approximately six weeks for eggs to be detected after the initial infection. *S. haematobium* eggs are usually found in urine, but may also be present in stool. Urine should be collected between 10:00 and 14:00 when maximal egg excretion occurs.

Vigorous exercise prior to collection is thought to increase the yield of eggs in the urine. Eggs from *S. mansoni* and the other intestinal schistosoma species are found in stool. A diagnosis can also be made by demonstrating eggs in tissue biopsy specimens from the rectum, liver, bladder or cervix, depending on the site of infection.

Antibody tests: Schistosoma antibodies to soluble egg antigen can be detected by means of an enzyme-linked immunosorbent assay (ELISA). However, its application is limited as these antibodies will only appear after 4–6 weeks in response to the laying of eggs. The test is most useful for travellers from non-endemic countries who would not be expected to have prior exposure, or in patients with signs and symptoms of disease and a history of likely exposure. The presence of Immunoglobulin E (IgE) antibody is claimed to be a marker of chronic active disease, but with sensitivity limited at about 70%. Antibody tests cannot differentiate between old and new infections and have no place in monitoring the response to treatment. A negative antibody test is a useful tool to rule out infection in endemic populations, but it should be noted that a proportion of patients will not develop any antibody response in active infections. Finally, infections with non-human schistosomes, for example, avian schistosomes, may result in false positive antibody tests.

Antigen detection: Schistosoma antigens are present in the serum and urine of infected persons. Two antigens, referred to as circulating anodic antigens (CAA) and circulating cathodic antigens (CCA), can be detected in the laboratory. These assays detect gut-associated glycoproteins of adult worms, but have not been extensively evaluated and the sensitivity of these tests is variable, depending largely on the intensity of infection. Urine CCA has been shown to perform relatively well for *S. mansoni* infections with sensitivities exceeding those of stool microscopy. However, urine CCA is relatively insensitive for detecting *S. haematobium* infections. Reported specificities of urine CCA range from 50 to 75%. Studies have shown that circulating antigen tests can be used to monitor response to treatment, and a loss of detectable antigens indicates a likely cure of infection.

Polymerase chain reaction (PCR): Specific and highly sensitive polymerase chain reaction (PCR)-based tests have been developed for the detection of schistosoma DNA in urine, stool and serum, and have the advantage of being able to diagnose schistosomiasis in all stages of infection. PCR on urine (*S. haematobium* and *S. mansoni*) or stool (*S. mansoni*) has been shown to be a very sensitive and specific test for urinary and intestinal tract schistosomiasis. PCR on serum has recently been shown to be a very sensitive test for acute schistosomiasis with a reported sensitivity of more than 90% when compared to antibody tests and microscopy that have significantly lower sensitivities.

Key points

- Schistosomiasis should be suspected in those living in endemic countries and travellers to endemic countries who present with compatible signs and symptoms.
- There are limitations to all available laboratory tests and their results should be interpreted with an understanding of these limitations.
- The test and sample used should be based on the suspected phase of infection, site of infection and suspected schistosoma species.
- All of the above tests, including a new schistosoma species PCR, are available at Ampath laboratories.

References available on request.