CASUISTRY

Vesical schistosomiasis with terminal hematuria in sub-Saharan patients

J. Pereira\textsuperscript{a}, E. Calleja\textsuperscript{b}, C. Marne\textsuperscript{a,*}, A. Borque\textsuperscript{c}

\textsuperscript{a} Servicio de Microbiología, Hospital Universitario Miguel Servet, Zaragoza, Spain
\textsuperscript{b} Servicio de Cirugía Pediátrica, Hospital Universitario Miguel Servet, Zaragoza, Spain
\textsuperscript{c} Servicio de Urología, Hospital Universitario Miguel Servet, Zaragoza, Spain

KEYWORDS
Vesical schistosomiasis; Macroscopic hematuria; Schistosoma haematobium; Praziquantel

Abstract

Objectives: To know the characteristics of vesical schistosomiasis caused by schistosoma haematobium in immigrant patients.

Materials and methods: The retrospective study of 41 cases microbologically diagnosed in our hospital over the last 16 years is presented. Data were collected on origin, age, presentation form, diagnostic tests and treatment.

Results: All were African patients whose ages ranged from 4 to 32 years and who had terminal macroscopic hematuria. Most of the patients (85%) were men. In all of the cases, diagnosis was by a urinary microbiological study and in one case, cystoscopy with a biopsy of a typical vesical lesion. Terminal hematuria is the most representative clinical sign. They were treated with praziquantel.

Conclusions: The epidemiology and intermittent terminal hematuria in African patients should lead to the suspicion of vesical schistosomiasis as the first diagnostic option. Urinary microbiological study is a rapid, non-invasive test with high diagnostic yield that would avoid performing invasive studies. Its simple treatment assures high level of compliance and consequent efficacy.

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PALABRAS CLAVE
Esquistosomiasis vesical; Hematuria macroscópica; Schistosoma haematobium; Praziquantel

Resumen

Objetivos: Conocer las características de la esquistosomiasis vesical por Schistosoma haematobium en pacientes subsaharianos.

Material y métodos: Se presenta el estudio retrospectivo de 41 casos diagnosticados microbólogicamente en nuestro hospital en los últimos 16 años, recogiendo datos de origen, edad, forma de presentación, pruebas diagnósticas y tratamiento.

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\textsuperscript{*} Corresponding author.
E-mail address: carmartra@gmail.com (C. Marne).

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Results: Todos eran pacientes africanos con edades comprendidas entre 4 y 32 años y presentaban hematuria macroscópica terminal. La mayoría (85%) eran varones. Se diagnosticaron con estudio microbiológico de orina en todos los casos y en uno de biopsia por cistoscopía de una lesión típica vesical. La hematuria terminal es el signo clínico más representativo. Se trataron con praziquantel.

Conclusions: La epidemiología y la hematuria terminal intermitente en pacientes africanos debe hacer sospechar esquistosomiasis vesical como primera opción diagnóstica. El estudio microbiológico de orina es una prueba rápida, no invasiva y con alta rentabilidad diagnóstica que evitaría la realización de exploraciones invasivas. Su sencillo tratamiento asegura un alto nivel de cumplimiento y consecuente eficacia.

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Introduction

Bladder schistosomiasis is caused by the trematode helminth Schistosoma haematobium. It is an infectious disease of important prevalence in sub-Saharan Africa, the Maghreb, the Nile Valley in Egypt and Sudan, and the Arabian Peninsula.1-5 It is acquired in usual activities (farming, fishing, bathing, etc.) related to polluted fresh water with larval forms. Due to immigration and travel, schistosomiasis has increased in Europe in recent years, cases diagnosed and treated becoming increasingly frequent.6 Macroscopic terminal hematuria with or without voiding syndrome is the most representative clinical sign of the disease, and it must be borne in mind with patients from endemic areas.7 Given a well-known disease but very little prevalent in our environment, such as bladder schistosomiasis, and a potentially affected and even native immigrant population through tourist trips, we present our experience in its management over the last 16 years. Our series of 41 diagnoses, to the best of our knowledge, is the most comprehensive collected in our country. We describe our experience and a review of the disease with a practical approach as a guide in its suspicion, diagnosis, and treatment.

Materials and methods

Between 1996 and 2012, a total of 489 urine samples from 272 patients were processed in our hospital for schistosome research, with about a third of Pediatrics. We present a retrospective study of 41 patients treated in our hospital over a period of 16 years, with microbiological finding of S. haematobium eggs in urine or bladder biopsy (Fig. 1). For this, medical records were reviewed, collecting the following variables: sex, age, geographic origin, signs and symptoms, complementary tests (blood count, ultrasound, cystoscopy), concomitant parasitism (feces and blood) and treatment.

For the microbiological study, we used urine from the last urination stream collected in a sterile container without preservatives. Direct visualization was conducted under an optical microscope of the urine sediment previously concentrated by centrifugation (1500–2000 rpm for 5 min).6

Results

Of the 272 patients with suspected bladder schistosomiasis and urine processed for parasites, 41 (15.1%) were positive aged between 4 and 32. They were 27 (66%) adults and 14 (34%) children (Fig. 2). The distribution by sex was 36 males (85%) and 5 females (15%). Most were from sub-Saharan Africa. The distribution by country of origin was: 21 patients from Gambia, 7 from Mali, 4 from Equatorial Guinea, 2 from Mauritania, and 5 from Senegal, Mozambique, Ghana, Zambia, and Zimbabwe, respectively. 2 were born in Spain with ancestry from Mali and Senegal. Of the 13 patients reviewed in pediatric age, 100% of the cases were males aged between 4 and 14 years and 8 of them were older than 10.

The clinical sign common in all cases was terminal macroscopic hematuria, accompanied in some by fever with urinary symptoms or abdominal pain. The hemogram showed eosinophilia in 20 patients and anemia in 2 of them.

Figure 1 S. haematobium egg showing the characteristic terminal spur (phase-contrast vision ×400).
Vesical schistosomiasis in sub-Saharan patients

![Figure 2](image1) Distribution of the number of patients with suspected and microbiological confirmation of schistosomiasis.

The ultrasound was pathological in 19 patients, objectifying bladder wall thickening and in one of them hyperchoic image suggestive of pseudotumor. In the latter patient, cystoscopy was performed for the biopsy taking, later diagnosing bladder schistosomiasis in the pathological and microbiological studies.

Concomitant parasitism was a common finding in our patients; 4 cases had gastrointestinal parasitism due to *Schistosoma mansoni*, *Strongyloides stercoralis*, *Giardia lamblia*, and *Blastocystis hominis*. Hematological coparation due to malaria due to *Plasmodium falciparum* occurred in 4 cases and because of filariasis due to * Mansonella perstans* in one case.

As a treatment, they received 40 mg/kg praziquantel as a single dose or divided into 2 doses in 24 h. Microbiological control was performed after 15–20 days in 19 patients which was positive in 6 of them. None had a second control. One patient had a second episode at 5 years, after a trip to Gambia, his country of origin.

**Discussion**

Bladder Schistosomiasis is an endemic parasitic disease in some parts of Africa and the Middle East. In our country, until recently, it was an exceptional disease. Currently, it has increased due to immigration. Family reunification from their countries of origin has given rise to pediatric cases more recently; in fact, 50% of pediatric cases at our center were diagnosed in the last 5 years studied (Fig. 3). There are several species of schistosome parasites of man, *S. mansoni*, *S. japonicum*, *S. intercalatum* and *S. mekongi*, causing hepato-intestinal disease, and *S. haematobium*, which causes urinary disease process, although, occasionally, *S. mansoni* eggs can be found in urine.

Cercariae larvae of *S. haematobium* surviving in the water penetrate through human skin, passing rapidly to the bloodstream migrating to the liver, where they mature into adult worms and end up accumulating in the bladder venous plexuses, where they deposit their eggs (Fig. 1). Inside the eggs, the miracidium larva develops, ciliated embryo that with its movement causes the eggs to move progressively toward the bladder and the ureters. The eggs excreted in urine release the miracidium larva into the water, which penetrates the intermediate host, a freshwater snail, where it is transformed into sporocyst that multiplies and gives rise to many cercariae larvae, repeating the cycle.

The presence of eggs in the bladder wall leads to the first sign, macroscopic hematuria that appears discontinuously and at the end of urination. If it evolves to chronic phase, it can lead to complications such as bladder fibrosis, ureteral stenosis, hydronephrosis, and, finally, kidney failure due to the accumulation of eggs in the bladder wall.

4 phases can be distinguished in the clinical picture of bladder schistosomiasis:

1) Shortly after coming into contact with polluted water, cutaneous manifestations occur such as itching and redness.
2) 4–8 weeks later, there is a phase of toxemia which coincides with the first egg laying. This phase may be asymptomatic or present the so-called Katayama syndrome, consisting of fever, joint pain, rash, headache, abdominal pain, hepatosplenomegaly, eosinophilia, and dysentery. This picture of acute schistosomiasis is uncommon in inhabitants of endemic areas and it can be especially severe in tourists.
3) Weeks, months, or even years later, when the disease is established, urinary symptoms such as terminal, intermittent, and recurrent hematuria occur, which is usually the reason for the consultation. The hematuria may be accompanied by non-specific urinary symptoms, urinary frequency, or suprapubic pain with urination. The diagnosis at this stage is carried out by observing eggs of *S. haematobium* in urine.
4) In the last phase, in untreated patients, the sequelae of the disease may occur due to the inflammatory reaction in the bladder wall, obstructive uropathies, vesicogenital granulomas, and even bladder cancer which is up to 31% more frequent in these patients, with 60% being squamous cell carcinomas.
S. haematobium can also affect the genital tract (urethritis, epididymitis, salpingitis). Genital involvement is more common in women than in men, being one of the most common causes of female infertility in Africa. Other less common clinical manifestations are: intestinal infection, recurrent abdominal pain, appendicitis, malnutrition, and iron losses, and in children, bladder pseudotumor has been described. The diagnosis is based on epidemiological data, on ultrasound findings, on the existence of macroscopic hematuria, and on the presence of S. haematobium eggs in urine. The ultrasound is the imaging technique of choice because of its non-invasive nature, rapid implementation, and low cost. The typical ultrasound finding is thickening of the bladder wall and papillary images due to infiltration of the wall by S. haematobium eggs. Cystoscopy demonstrates the potential decrease in bladder capacity or the appearance of filling defects, injuries that should be evaluated by cystoscopy in case of suspected bladder tumor with biopsies thereof.

The definitive diagnosis is visualization of S. haematobium eggs in urine. They are only detected from the maturation of the adult worms, from 5 to 13 weeks after the initial infection. Taking and processing of the sample is important. No preservatives or refrigeration must be used. The recommended sample is urine from the last stream of urination, since the hematuria makes the eggs stay trapped between the blood and mucus in the terminal portion of the urine. As the presence of eggs in urine depends on circadian variables, it is preferable to pick it up at noon due to the maximum concentration of eggs in this time slot. It is advisable to previously make a moderate effort like going up and down stairs for further elimination of eggs in urine. Since in chronic schistosomiasis the presence of eggs may be limited, in these cases, it is recommended to process multiple samples. There are different ways to concentrate the urine, by means of membrane filtration or by centrifugation. The latter is the most used.

Serological diagnosis has not proved useful due to the slow host immune response, the persistence of high titers despite successful treatment, and the cross-reactions with other parasitic infections.

The treatment of choice today is praziquantel orally at a single dose of 40 mg/kg or divided into 2 doses in 24 h. Given the persistence of the disease, we can perform another cycle of treatment with praziquantel. The alternative is oral metrifonate at doses of 7.5–10 mg/kg/day in 3 doses at 2 intervals of 2 weeks. Treated patients must keep microbiological follow-up of egg excretion for one year. Eggs can be removed for weeks or months, so the feasibility thereof should be observed by movement of the miracidium larva inside the egg. The follow-up of these patients is especially difficult, due to their linguistic, social, and cultural characteristics. Surgery is reserved for the treatment of the sequelae.

The treatment campaigns of schistosomiasis control programs in endemic areas have limitations. They do not prevent reinfections, since within 6–8 months, prevalence returns to the initial values. Despite having no evidence of the existence of praziquantel-resistant schistosomes, we have observed a decrease in susceptibility to this drug. This makes the prophylaxis a costly and impractical strategy due to the risk of occurrence of resistance. Improving knowledge of the immune response in animal models and in humans presents the development of vaccines with a promising future.

The fight against schistosomiasis is especially difficult. Water projects of building artificial ponds and irrigation channels facilitate the spread of the snail, intermediate host, which, along with the migration of population into wilderness areas, contributes to the spread of this disease. The use of molluscicide chemicals is expensive, of high toxicity and low effectiveness. The most successful programs have been those that avoid contact with polluted water and its use for household use, providing drinking water supply and health care. The sequencing of the genome of S. haematobium opens a promising future in the knowledge of its ecology, epidemiology, pathogenesis, and host-parasite interaction.

**Conclusion**

Due to the increase in the population from endemic areas, the epidemiology and intermittent terminal hematuria in African patients, with a history of recent trip to their country, we should suspect bladder schistosomiasis as the first diagnostic option. Therefore, given suspicion thereof, we must dismiss it with the microbiological study of urine of the last voiding stream collected at noon. As it is a rapid, non-invasive test, and with high diagnostic yield, it can avoid undertaking more invasive and more expensive examinations. The recent decline in seen and diagnosed cases observed in recent years may be due to socioeconomic factors, such as the partial return to their country of origin due to labor difficulties or because of not attending the health center due to the implementation of drug copayment (Fig. 2). This paper aims to raise awareness of this disease in our healthcare setting.

**Conflict of interest**

The authors declare that they have no conflict of interest.

**References**