Retinal Fluorescein Contrast Arrival Time of Young Patients with the Hepatosplenic Form of the Schistosomiasis Mansoni

Ana Catarina Delgado de Souza, Carlos Teixeira Brandt+, Liana Ventura, Fernando Oréfice

Hospital das Clínicas, Departamento de Cirurgia, CCS, Universidade Federal de Pernambuco, Av. Morais Rego s/nº, 500670-420 Recife, PE, Brasil

Schistosoma mansoni *is responsible for lesions that can alter the hemodinamic of the portal venous circulation, lung arterial and venous sistemic systems. Therefore, hemodinamic changes in the ocular circulation of mansonic schistosomotic patients with portal hypertension and hepatofugal venous blood flow is also probable. The purpose of this study was to determine the fluorescein contrast arrival time at the retina of young patients with the hepatosplenic form of schistosomiasis, clinically and surgically treated. The control group included 36 non schistosomotic patients, mean age of 17.3 years, and the case group was represented by 25 schistosomotic patients, mean age of 18.2 years, who were cared for at The University Hospital (Federal University of Pernambuco, Brazil), from 1990 to 2001. They underwent digital angiofluoresceinography and were evaluated for the contrast arrival time at the early retinal venous phase of the exam. Both groups were ophthalmologically examined at the same hospital (Altino Ventura Foundation, Recife, Brazil), using the same technique. There was retardation of the retinal contrast arrival time equal or more than 70 sec in the eyes of three schistosomotic patients (12%) and in none of the control group, however, the mean contrast arrival time between the two groups were not statistically different. These findings lend support to the hypothesis that there could be a delay of the eye venous blood flow drainage.*

Key words: *Schistosoma mansoni* - angiofluoresceinography - fluorescein contrast - eye - retina

The hepatosplenic form of schistosomiasis mansoni is associated to an increased morbi-mortality rate of this disease (Tonelli et al. 1987, Oréfice et al. 1988, Brandt et al. 1995, 2001). Pernambuco is one of the Brazilian states with a high mean prevalence – 23% in the general population (Pereira et al. 1993, Salomão 1995, Brandt et al. 1999, 2001).

Eggs, larvae or antigen-antibody immunocomplex deposits of the schistosoma can be found in any organ or body tissue, including the eye (Queiroz 1961, Moreno 1978, Neves et al. 1978, Lemos 1980, Oréfice et al. 1985, Pitella & Oréfice 1985, Tonelli et al.1987, Oréfice & Belfort 1987, Oréfice et al. 1988, Brandt et al. 1995, 2001, Salomão 1995). However, although schistosomiasis mansoni is endemic in Northeast Brazil, the ocular form is poorly studied in the Brazilian literature (Queiroz 1961, Neves et al. 1978, Lemos 1980, Pitella & Oréfice 1985, Oréfice & Belfort 1987, Oréfice et al. 1988).

The *S. mansoni* is responsible for liver lesions that can alter the hemodinamic of the portal venous circulation, lung arterial and venous sistemic systems (Lacerda et al. 1993, Brandt et al. 1999). Shistosomotic patients have similar hemodinamic behavior as cirrhotic patients. Both present with portal hypertension, esophageal varices and upper digestive bleeding. It was demonstrated that patients with hepatic cirrhosis showed decreased cerebral regional blood flow (Iwasa et al. 2000). As a consequence, it is likely to predict that ocular circulation also suffer from hemodinamic alterations in schistosomotic patients. Recently, it was observed tortuosity and enlargement of the retinal vessels, specially in the veins, of 28% of the patients with the hepatosplenic form of schistosomiasis mansoni treated clinical and surgically (Delgado et al. 2001).

The angiofluoresceinography, subsidiary exam to study the retinal, coroidal and optic nerve circulation, was first described in the 1960s. Using this exam it is possible not only to observe sequential phases of the retinal and coroidal contrast (fluorescein) perfusion, but also to make feasible the photographic documentation of these phases (Oréfice & Belfort 1987, Yamane 1990).

The purpose of this study was to determine the fluorescein contrast arrival time at the retina of young patients with the hepatosplenic form of schistosomiasis mansoni, clinically and surgically treated.

MATERIALS AND METHODS

A case-control study was done and the case group was represented by 25 young patients affected by the pure advanced form of the hepatosplenic schistosomiasis mansoni, who had undergone splenectomy, ligature of the left gastric vein and auto-implant of splenic tissue in a pouch of the major omentum, during the period of 1990 to 2001, with an average post-operative follow-up of five years. The schistosomiasis mansoni was clinically (with oxaminiquine ®) and surgically treated. The patients are regularly referred to pediatric surgeons at The Children General Surgical Service, University Hospital, Federal University of Pernambuco, Brazil.

The protocol study was approved by the Ethical Committee of the University. The patients and their parents, in case of under 18 year-old, were informed, in accessible language, that they were participating in a clinical research.

+Corresponding author. Fax: +55-81-3342-0830. E-mail: carlosbrandt@bol.com.br
Received 18 June 2002
Accepted 15 August 2002

Inclusion in the protocol was only done after the signature of the consent term.

Patients with severe renal insufficiency and any confirmed or suspected systemic disease such as tuberculosis, sarcoidosis, toxoplasmosis, besides others parasitosis, were excluded.

The control group consisted of non-schistosomotic patients pared for age. They underwent angiofluoresceinographic exam in the same hospital, and using the same technique. From a total of 5,854 patients of all ages that had undergone retinography or angiography, from February 1999 to September 2001, there were 282 patients aged between 9 and 21 year-old. From these, 36 underwent contrasted exam (angiography).

From the 25 patients of the schistosomotic group, 11 were males (44%) and 14 females (56%). The age varied from 12 to 22 years, with the mean age of 18.2 years standard deviation (*s*) of 2.9.

From the 36 patients of the control group, 23 were males (64%) and 13 were females (36%). The age varied from 10 to 20 years, with the mean age of 17.3 years and $s = 2.7$.

All patients underwent angiofluoresceinography at the Altino Ventura Foundation, Pernambuco, Brazil, and the exam was realized using the Imaginet RC 50 IA digital system, Topcon. All images were photodocumented and saved in a hard disc.

Initially the patients answered a questionnaire about allergy, cloroquine use, asthma, heart, hepatic and renal diseases. In case of any allergy problem, it would be given 5 ml of polaramine (syrup) and 5 ml of benadril (syrup) before injection of the contrast. In case of side effect, it would be injected, intravenously, corticoid solution (hydrocortisone® 500 mg).

The exam was performed with the patient in mydriasis. Injection of 2.5 ml of fluorescein was intravenously done in bolus. After 2 to 10 sec, a sequence of photographs was taken firstly at short intervals and than at longer intervals up to 10 to 15 min after the contrast injection. Approximately 16 photographs were taken for each patient, saved and printed.

The following time sequence of the fluoresceinographic exam was considered normal: first phase of contrast perfusion at the retina (phase of corio-capilar perfusion) started 10 to 12 sec after the contrast injection; arterial retinal phase 1 to 3 sec after the former; artery-venous phase 1 to 2 sec; and early venous phase after other 1 to 2 sec. As a result, the contrast arrival time at this early venous phase was considered normal between 13 to 20 sec after contrast injection (Oréfice & Belfort 1987, Yamane 1990). It was defined relative retardation of the contrast arrival time from arm-retina to the early venous phase between 21 and 70 sec and absolute retardation time equal or superior than 70 sec.

The quantitative results were expressed by their means and their Standard Error of the Mean (SEM). To verify the difference between means, it was used "t" Student test for non-related samples. Chi-square test was used to evaluate possible differences between frequencies. Statistic significance was established when $p < 0.05$, rejecting the null hypothesis.

RESULTS

From the 25 patients with schistosomiasis mansoni, five had relative retardation of contrast arrival time at early retinal venous phase. Three had absolute retardation (70, 73 and 76 sec).

Among the 36 patients of the non-schitosomotic control group seven had relative retardation of retinal contrast arrival time to early venous phase. None had absolute retardation. It was observed that in this group, the longer contrast arrival time at this early venous phase was 46 sec. It can be seen in Table I the probable etiology or reason for the angiofluoresceinographic exam indication and the relative retardation of the contrast arrival time in the eyes of the control group.

The mean contrast arrival time to the early retinal venous phase was not statistically different between the two groups. In the schistosomotic group it was 20 ± 4.4 sec and in the non-schistosomotic group it was 10.2 ± 1.7 sec ("t" = 1.05; $p > 0.05$) (Table II).

There was a trend of greater retardation of the retinal contrast arrival time at the early venous phase in the schistosomotic group, however, it did not reach statistical significance (Fig. 1).

TABLE I

Distribution of control group patients with relative retardation of retinal contrast arrival time

Probable etiology	Arrival time	Gender	Age (years)
Retinocoroiditis	46sec	M	17
DUSN	38 sec	M	19
Retinocoroiditis	31 sec	M	16
Diabetes juvenil	30 sec	M	19
Toxoplasmosis	30 sec	M	18
Optic way defects	30 sec	F	12
DUSN	22 sec	M	18

DUSN: diffuse unilateral subacute neuroretinitis

TABLE II

Distribution of retinal contrast arrival time at early venous phase in the schistosomotic group and the control group

Arrival time	Schistosomotic	Non-schistosomotic	Total
< or = 20 sec	17	29	46
21 to 70 sec	5	7	12
> or = 70 sec	3	-	3
Total	25	36	61

Chi-square for lineal trend = 2.856 ; p = 0.09102

DISCUSSION

The report of angiofluoresceinography in 25 young patients with the advanced hepatosplenic form of the schistosomiasis mansoni is original in the literature.

It was considered absolute retardation of retinal contrast arrival at the early venous phase, time equal or greater than 70 sec. This time is longer than the upper limit of the normality range, to be justified by wrong technique or non-cooperative patient (Oréfice & Belfort 1987, Yamane 1990).

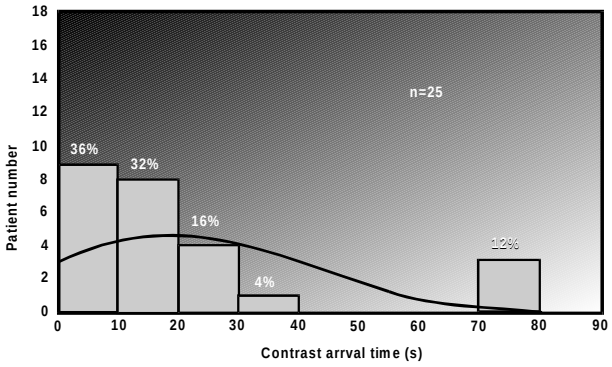

Fig. 1: the distribution curve of the retinal contrast arrival time frequency at the early venous phase of patients with schistosomosis mansoni.

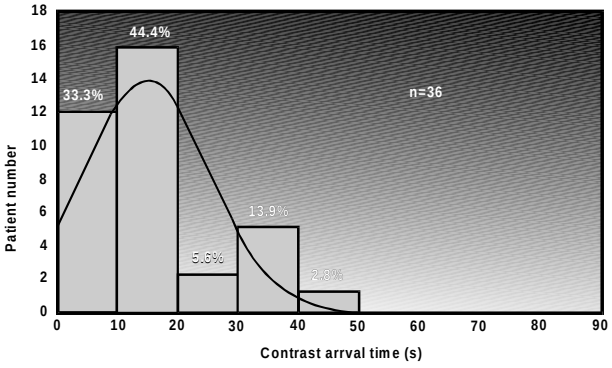

Fig. 2: the distribution curve of the contrast arrival time frequency at the early venous phase of patients without schistosomosis mansoni.

The absence of previous study about the retinal contrast arrival time in young patients with the advanced hepatosplenic form of the schistosomiasis was a limitation for the sample size of this study. Furthermore, the small number of patients who undergo angiography aged between 10 and 21 years is limited. It is important to realize that from 5,854 exams done at the Altino Ventura Foundation, only 36 could be included in these criteria, also limiting the size of the control group. Even accepting these limitations, the results should be considered relevant because the peculiarities observed and the original aspect of the information.

The retinal contrast arrival time retardation in the schistosomotic patients, although not statistically significant when compared with control group, suggests delayed arterial blood flow of retina. The possible explanation could be an increased capillary pressure due to delayed venous drainage of this organ into the systemic circulation. The basis for this hypothesis could be that in cases of hepatic disease associated with portal hypertension, as in the hepatosplenic form of the schistosomiasis, reversion of the normal blood flow can occur, from hepatopetal to hepatofugal. This reverse flow in the left gastric vein, which occur in these patients, can alter the pressure in the azigo system and potentially could retard the venous drainage of the crania-facial structures (Lacerda et al. 1993, Iwasa et al. 2000), including the eye. This rationale may be the reason for the tortuosity and enlargement of the retinal vessels, specially the veins (Delgado et al. 2001) in patients with the advanced form of schistosomiasis mansoni. The retardation of the cerebral blood flow, in cirrhotic patients with portal hypertension, evaluated through scintigraphy using technetium 99, corroborates this hypothesis (Iwasa et al. 2000). This hemodynamic change in the retinal blood circulation may, in the long term follow-up, produces further damage to this eye structure. Similarly, an additional support for this hypothesis is the fact that young patients with hepatosplenic schistosomiasis mansoni present with a significant deficit of the genital development, high prevalence of varicocele, reduction of the testicular volume and deficit of spermatozoid production as a result of hemodinamic consequences of portal hypertension which increases the venous pressure of all systems, including the spermatic vein, directly or not connected to the portal circulation (Albuquerque et al. 2000, 2001).

The hemodinamic alterations, as the retardation of retinal contrast arrival time equal or greater than 70 sec in the angiofluoresceinographic exam, in patients with the advanced hepatosplenic form of schistosomiasis mansoni, not described previously in the literature, open new perspectives for future investigations.

REFERENCES

Albuquerque CDC, Brandt CT, Brandt FT 2001. Desenvolvimento puberal em jovens poradores de esquistossomose mansônica na forma hepatoesplênica. *Acta Cir Bras 17* (Suppl. 1): 60.

Albuquerque CDC, Brandt CT, Brandt FT, Ávila L, Sá HP 2000. Varicocele em jovens portadores de esquistossomose na forma hepatoesplênica cirúrgica. *An Fac Med Univ Fed Pernamb 45*: 18-20.

Brandt CT, Braga MVM, Melo KL, Sá HP, Carvalheira R 2001. Surgical hepatosplenic mansonic schistosomiasis in adolescents: repercussions of the post-treatment schistosomotic burden on the hepatic functional reserve. *Mem Inst Oswaldo Cruz 96*: 113-115.

Brandt CT, Maciel DT, Azevêdo FAZ 1995. Esquistossomose mansônica hepatoesplênica em crianças: desenvolvimento pondo-estatural após tratamento cirúrgico. *An Fac Med Univ Fed Pernamb 40*: 56-60.

Brandt CT, Maciel DT, Frei Caneca AO 1999. Esplenose associado ao tratamento cirúrgico da hipertensão porta esquistossomótica na criança: avaliação de dez anos. *An Fac Med Univ Fed Pernamb 44*: 15-20.

Delgado AC, Brandt CT, Ventura L, Oréfice F 2001. Achados oftalmológicos em pacientes jovens submetidos a esplenectomia, ligadura da veia gástrica esquerda e autoimplante de tecido esplênico em jovens portadores de estágio avançado da esquistossomose mansônica. *An Fac Med Univ Fed Pernamb 46*: 89-94.

Iwasa M, Matsumura K, Kaito M, Ikoma J, Kobayashi Y, Nakagawa N 2000. Decrease of regional cerebral blood flow in liver cirrhosis. *Eur J Gastroenterol Hepatol 12*: 1001-1006.

Lacerda CM, Ramos H, Raia S, Kelner S 1993. Fisiopatologia da HP esquistossomótica e efeito da esplenectomia com ligadura de varizes de esôfago. *Acta Cir Bras 8*: 113-117.

Lemos E 1980. Alterações retinianas na esquistossomose hepatoesplênica. *Rev Bras Oftalmol 24*: 123-128.

Moreno RC 1978. Sobre algunas lesiones oculares en la schistosomíasis mansoni. *Arch Ven Soc Otorrino Laringol Oftalmol Neurol 1*: 158-175.

Neves J, Pedroso ERP, Oréfice F 1978. Esquistossomose pulmonar. III: forma crônica extensa com hipertensão pulmonar e na vigência de hipertensão portal associada à provável coroidite e retinite esquistossomótica. *Arq Bras Oftalmol 41*: 215-220.

Oréfice F, Belfort RJ 1987. *Helmintíasis: Esquistossomose Ocular*, Roca, São Paulo, p. 233-234.

Oréfice F, Belfort JR 1987. *Angiografia Fluoresceínica nas Uveítes*, Roca, São Paulo, p. 107-116.

Oréfice F, Pittella JEH, Simal CJR, Coscarelli G 1988. Uveíte esquistossomótica: alterações fundoscópicas, achados histológicos do ovo do *S. mansoni*, abordagem da etiologia e tratamento. *Arq Bras Oftalmol 51*: 123-134.

Oréfice F, Simal CJR, Pittella JEH 1985. Schistosomotic chorioiditis I: fundoscopic changes and differential diagnosis. *Br J Ophthalmol 69*: 294-299.

Pereira G, Santos RP, Alexandre Neto J, Azevedo AP, Carvalheira AE 1993. Formas graves da esquistossomose mansônica: dados de internação hospitalar em PE. *An Fac Med Univ Fed Pernamb 38*: 12-18.

Pittella JEH, Oréfice F .1985. Schistosomotic choroiditis II: report of the first case. *Br J Ophthalmol 69*: 300-302.

Queiroz JM 1961. Aspectos experimentais e clínicos das manifestações oculares da esquistossomose mansoni. *Oftal Ibero Am 22*: 115-178.

Salomão MRI 1995. *Alterações Coriorretinianas em Indivíduos de Área Hiperendêmica de Esquistossomose,* PhD Thesis, Faculdade de Medicina, UFMG, 103 pp.

Tonelli E, Andrade GMC, Martins MA 1987. Esquistossomose mansoni. In E Tonelli, *Doenças Infecciosas na Infância*, Medsi, Rio de Janeiro, p. 817-832.

Yamane R 1990. *Semiologia Ocular: Angiografia Fluoresceínica*, Cultura Médica, São Paulo, p. 212-228.