

## CLINICAL AND EPIDEMIOLOGICAL ASPECTS OF ABDOMINAL ANGIOSTRONGYLIASIS IN SOUTHERN BRAZIL.

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### SUMMARY

Most of the cases of abdominal angiostrongyliasis in Brazil were reported from the southern States of São Paulo, Paraná, Santa Catarina and Rio Grande do Sul (RS). A study in 27 cases from RS revealed a distinct local epidemiology. Peasants were usually affected, either adults or children, from the mountainous areas in the north of the State. There was a seasonal increase in the number of cases, from late spring to autumn, that does not coincide with the rainy season. Besides the most common clinical features of abdominal pain, fever and eosinophilia in the leucogram, painful relapsing episodes were detected in some patients. The abdominal pain could be either localized or diffuse during the rapid evolution to a surgical abdominal condition, with a letality of 7.4%. The use of a serological test and the greater awareness of physicians working in endemic areas is expected to improve the recognition of uncomplicated and benign courses of the disease. This study confirms the known clinical manifestations of abdominal angiostrongyliasis and demonstrates the diversity of its epidemiology.

**KEY WORDS:** Abdominal angiostrongyliasis; *Angiostrongylus costaricensis*; Zoonosis; Nematode infections; Eosinophilic gastroenteritis.

### INTRODUCTION

Abdominal angiostrongyliasis is a nematode infection caused by *Angiostrongylus costaricensis* MORERA & CESPEDES, 1971. The disease, the parasite and its cycle were first described in Costa Rica. The worm lives inside the ileo-colic branches of the mesenteric artery of rodents. Man probably become infected by ingestion of food or water contaminated with third stage larvae, which may be present in the mucous secretions of veronicellid slugs, the most important intermediate host<sup>6,16</sup>.

The geographic range of the parasitosis includes most of the countries in the Americas, from the south of the United States to the north of Argentina<sup>7,17</sup> and a suspected case was reported from Zaire, Africa<sup>3</sup>. In Brazil, the occurrence of abdominal angiostrongyliasis has been reported since

1975, from Brasília and the southern States of São Paulo, Parana, Santa Catarina and Rio Grande do Sul (RS), comprising a total of 16 reported diagnosis until 1989<sup>1,2,4,5,14,15,20</sup>. Other 23 diagnoses were uncovered in a search in pathology laboratories in Rio Grande do Sul and have been the subject of a detailed comparative anatomopathological study, together with other 11 previously reported cases. The results led to the proposition of histopathological criteria for diagnosis of abdominal angiostrongyliasis<sup>10</sup>.

The description of clinical and epidemiological findings in those patients from Rio Grande do Sul is now presented, with a particular emphasis given to the distinct local epidemiology of abdominal angiostrongyliasis in southern Brazil.

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## MATERIAL AND METHODS

In Rio Grande de Sul - Brazil's southernmost State - the 22 out of 25 pathology laboratories' records were reviewed for the period from 1975 to 1984.

The screening criterion was the citation of "eosinophilia" or related keywords (eosinophilic, eosinophil) in the conclusions of the pathological reports from biopsies or surgical specimens from the gastrointestinal tract. From 654 cases, 27 had intense eosinophilia and were selected after examinations of new sections stained by Hematoxylin-Eosin. The 27 cases were classified into two groups according to the following criteria: Group 1 - identification of an intra-arterial nematode (thirteen confirmed diagnosis); Group 2 occurrence of intense eosinophilic inflammatory reaction, granuloma with eosinophilia and eosinophilic infiltration in the wall of blood or lymphatic vessels (fourteen suspected diagnosis).

The patients, their relatives and/or the physicians were interviewed and hospital records whenever available were reviewed. Four cases from the Group 1 had been previously reported in an anatomo-pathological study<sup>1</sup>.

Climatic data were obtained from the meteorological service of the Ministry of Agriculture (8. and 6. DISME) and from IPAGRO (Instituto de Pesquisas Agronômicas do RS).

## RESULTS

The results in the two Groups were very similar in all aspects we have studied. Almost all patients came from the highlands in the north of RS (Fig. 1). Eighty-two percent of the localities were higher than 300 m above the sea level, in mountainous areas covered by spots of residual subtropical forests. The annual mean values for climatic variables ranged from 1484 mm to 1832 mm for pluviometric precipitation, 69% to 83% for air humidity, and 12.6 to 17.7 Centigrades for air temperature.

The distribution of cases was compared to the mean pluviometric precipitation and air temperature. The majority of the cases occurred in December and from March to June, while the rainy season is from June to October (Fig. 2).

Two thirds of the patients were peasants, both children and adults were affected (Fig. 3) and there was no significant difference in sex distribution (Group 1: 8 males (81%) and 5 females (39%); Group 2: 7 males and 7 females).

In both groups the ingestion of molluscs was denied and vegetables (lettuce, cabbage, carrot, broccolli) were always present in the diet.

The most important clinical features of the disease were abdominal pain, fever, anorexia, malaise, weight loss, nausea, vomits, constipation and palpable mass in the abdomen (Table). An acute surgical syndrome developed in 4 or less days in 45% (Group 1) and 75% (Group 2) of the patients (Fig. 4) and two of them had episodes of pain and abdominal distention for 5 and 6 months before the surgery. Eighty percent of the cases in both Groups had leucocytosis above 12.000 cells/100 ml and the eosinophils were always over 10% with exception of three patients (Fig. 5).

TABLE

Abdominal angiostrongyliasis in southern Brazil

Clinical Manifestations

	Group 1		Group 2	
	n	%	n*	%
Abdominal pain	13	100	11	85
Fever	10	77	6	46
Anorexia	8	61	5	38
Malaise	7	58	4	31
Weight loss	5	38	2	15
Vomits	5	38	2	15
Constipation	5	38	2	15
Nausea	4	31	2	15
Palpable abd. mass	4	31	1	8
Diarrhea	1	8	2	15

\* Data were not available in one case of group 2.

The radiological examination of the abdomen in only 8 patients revealed generalized distention and fluid levels. In two cases there were signs of enlargement of the intestinal wall, corresponding to the pseudo-neoplastic macroscopic pattern<sup>10</sup>.

Two patients from the Group 1 developed

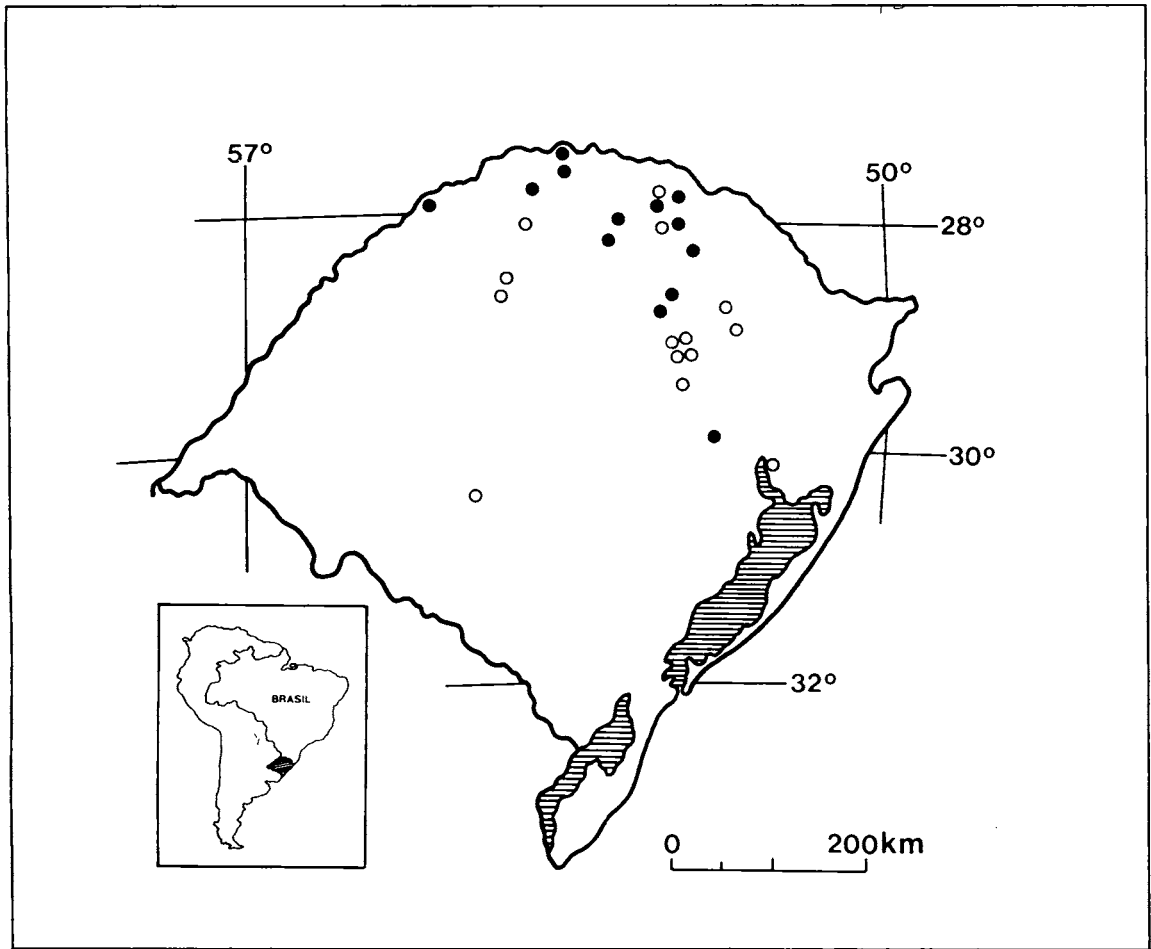


Fig. 1 - Geographical distribution of confirmed (●) and suspected (○) cases in the State of Rio Grande do Sul.

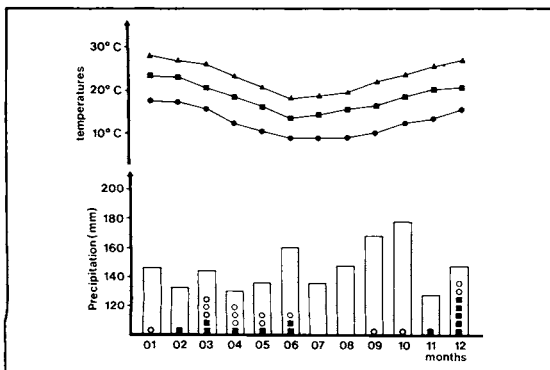


Fig. 2 - Monthly distribution of confirmed (■) and suspected (○) cases and mean monthly values for pluviometric precipitation (bars) and maximal (▲), mean (■) and minimal (●) air temperatures. (Source of meteorological data: 8. DISME Ministério da Agricultura, Porto Alegre, RS).

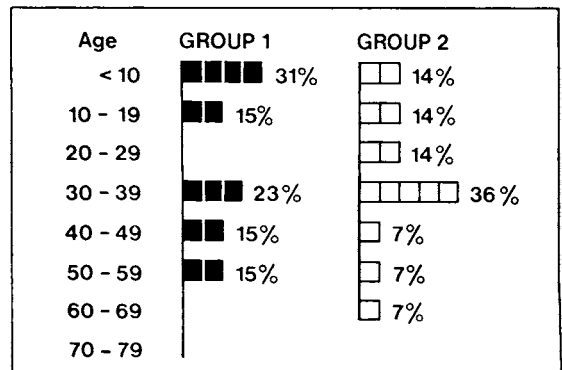


Fig. 3 - Age distribution of the cases.

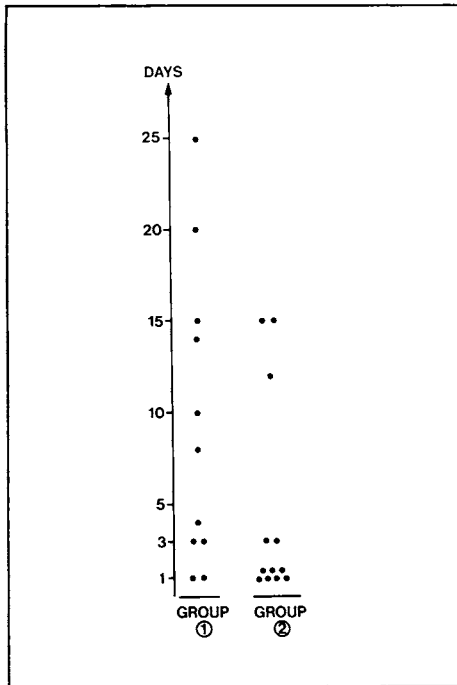


Fig. 4 - Duration of clinical disease before surgery (in 4 patients - two of each group - no data was available).

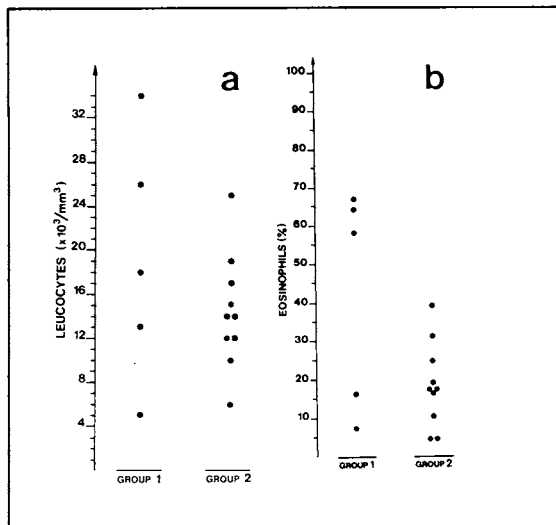


Fig. 5 - Number of leucocytes (a) and percentage of eosinophils (b) in the leucogram (in 9 patients in group 1 and in 3 patients in group 2, no data was available).

peritonitis, had extensive intestinal resection and died 43 and 60 days after the initial surgical treatment, with septicemia. All the other patients recovered after surgery.

## DISCUSSION

The intense eosinophilic infiltration throughout the intestinal wall, the granulomas with eosinophilia and the eosinophilic arteritis proposed as peculiar to this parasitosis in previous studies were taken here as the criteria to classify the patients<sup>1, 2, 6</sup>. The validity of these criteria was confirmed by a histopathological comparative study including the present series of patients<sup>10</sup>. The similarity in the epidemiological and clinical data, between the two groups is another indication that this classification is appropriate. Also, *Angiostrongylus costaricensis* was recovered from the slug *Phyllocaulis variegatus* and two wild rodents of the genus *Oryzomys*: *O. nigripes* and *O. ratticeps* captured near the houses of patients diagnosed according to the proposed criteria<sup>8, 9</sup>.

The patients from both groups came from the mountainous region in the north of RS, with much vegetation and humidity, explored by peasants of Italian and German origin, rather than from the northern plateau or from the plains ("pampa") in the south, where extensive cattle raising and big crop farms predominate. Such environmental conditions and human activities in the northern parts of RS would be most favorable for the completion of the cycle and for the transmission to man. This is a first distinctive feature from what is known about abdominal angiostrongyliasis in Costa Rica, where the disease is found throughout the territory, from the sea level to the highest lands<sup>17</sup>. Also, both definitive and intermediate hosts of *A. costaricensis* in Central America do not occur in southern Brazil, where *Oryzomys nigripes* and the slug *Phyllocaulis variegatus* were found infected<sup>8, 9</sup>.

Comparing the monthly distribution of cases and the pluviometric precipitation values, it was found that they do not occur coincidentally with the rainy season, as reported in Central America<sup>13</sup>. It is known that the activity of slugs diminishes during the winter and that the expansion of their number and activity takes place in the spring. Otherwise, it was demonstrated that cold inhibits the development of infective third stage larvae from *Angiostrongylus cantonensis* and this could also happen to *A. costaricensis*<sup>12</sup>. These facts could explain the apparent seasonality of abdominal angiostrongyliasis in southern Brazil, where there is a well defined and cold winter, especially at the highlands where the endemic area was identified.

While in Central America, abdominal

angiostrongyliasis could be considered a pediatric disease, in the present study only 31% of the patients was younger than 10 years. This distinct age distribution can not be attributed to sample bias, since almost all pathology laboratories that receive material from general hospitals throughout the State of RS were reviewed.

Patients that did not come from rural areas were living in small towns, usually with a vegetable-garden at home. Fruits were usually consumed peeled, what makes them a less probable source of infection than raw vegetables, always present in the diet. Although food habits do not include slugs, somewhere they are used as fishing bait, what could represent a possibility for contamination of hands or instruments. The ingestion of slugs by small children is known to occur and could have been the way of infection in some young patients in the present series<sup>17</sup>.

The abdominal pain, localized or diffuse, was the main symptom in the acute surgical syndrome which usually developed in a mean time of 9.5 days (Group 1) and 4.6 days (Group 2). The small number of cases prevents any interpretation about temporal difference in the evolution observed between both groups. No clinical manifestation of ectopic location, such as in the liver or in the spermatic artery was detected<sup>18,19</sup>.

The clinical suspicion of abdominal angiostrongyliasis should not be discarded even if the number of eosinophils in the leucogram is within normal limits. This may be a transitory situation in the dynamic kinetics of this cell in transit through the blood.

The disease may develop in a very acute course and there are indications that clinical manifestations may end as abruptly as they began. The observation of two patients with relapsing episodes of abdominal pain for many months and the experience of physicians in the endemic area, indicate the possibility of a great number of patients with oligosymptomatic and uncomplicated disease.

The difference in letality from the present series (7.4% - 2/27 patients) and that from Costa Rica (1.3% - 2/116 patients)<sup>13</sup> may be attributed to the inclusion in the latter, of many uncomplicated cases.

The growing awareness of the medical personnel and the use of serological tests for diagnosis

and for seroepidemiology will result in a better knowledge about the infection by *Angiostrongylus costaricensis* in Brazil.

While the clinical data from many reports in the literature were confirmed, this study produced evidences for a distinct and local epidemiology of abdominal angiostrongyliasis in southern Brazil: it is not only a pediatric disease, there is a sazonalidade with an apparent lower transmission during the winter and a focal geographical distribution. In RS, local dynamics of transmission are probably operative in adjacent areas with a different species of the predominant mollusc acting as source of infection and this fact may represent critical changes in the intensity of transmission and in the required profilatic measures.

The diversity of epidemiological features is to be expected in a zoonosis that occurs in many different environmental conditions, from the south of the United States to the sub-tropical areas in South America, with distinct rodents and molluscs involved in the cycle. In the description of a parasitic disease like abdominal angiostrongyliasis, besides the focus on the features that are common to most areas, special attention should be paid to the diversity of its epidemiology, because it is the result of a most interesting and important biological strategy for survival: the parasite's ability for adaptation.

The demonstration of diversity in the epidemiology of abdominal angiostrongyliasis stresses the importance of performing studies at whatever area the disease is detected.

## RESUMO

### Aspectos clínicos e epidemiológicos da angiostrongilíase abdominal no sul do Brasil.

A maioria dos 16 casos de angiostrongilíase abdominal publicados no Brasil até 1989, eram originários dos Estados de São Paulo, Paraná, Santa Catarina e Rio Grande do Sul (RS). Um estudo clínico e epidemiológico em 27 casos no RS revelou aspectos distintos do que é conhecido sobre a ocorrência da doença na Costa Rica: tanto adultos quanto crianças são acometidos, provenientes de áreas serranas do norte do Estado e há uma aparente sazonalidade, não relacionada às chuvas e sim aos meses mais quentes do ano. Além de confirmar o quadro clínico-laboratorial descrito na literatura (dor abdominal, febre e eosinofilia), o estudo salienta a ocorrência de episódios

recorrentes de dor abdominal com remissão espontânea e de outras formas pouco sintomáticas, possivelmente as formas mais comuns de manifestações da doença. Foi observada uma letalidade de 7,4%. Com o alerta aos médicos, especialmente da área endêmica, e o uso de teste sorológico, espera-se um aumento do número de diagnósticos de angiostrongilíase abdominal e conseqüente aprimoramento do conhecimento sobre esta zoonose no Brasil.

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### REFERENCES

- AGOSTINI, A.A.; MARCOLAN, A.M.; LISOT, DEXHEIMER, A. & CAMARGO, R.R. - Angiostrongilíase abdominal. Estudo anátomo-patológico de quatro casos observados no Rio Grande do Sul, Brasil. *Mem. Inst. Oswaldo Cruz*, 79: 443-445, 1984.
- AYALA, M.A.R. - Angiostrongiloidose abdominal nos estados do Paraná e Santa Catarina: apresentação de cinco casos e revisão da literatura. *Mem. Inst. Oswaldo Cruz*, 82: 29-36, 1987.
- BAIRD, J.K.; NEAFIE, R.C.; LANOIE, L. & CONNOR, D.H. - Abdominal angiostrongyliasis in an african man: case study. *Amer. J. trop. Med. Hyg.*, 37: 353-356, 1987.
- BARBOSA, H.; RAICK, A.N.; MAGALHÃES, A.V. & OTERO, P.M.F. - Angiostrongiloidose abdominal. *Rev. Ass. méd. bras.*, 26: 178-180, 1980.
- CAMPOS, R.; MARIGO, C. & CABEÇA, M. - Terceiro caso brasileiro de parasitismo humano por *Morerastrongylus costaricensis* (Morera & Cespedes, 1971). In: CONGRESSO DA SOCIEDADE BRASILEIRA DE MEDICINA TROPICAL, 13., Brasília, 1977. Resumos, p. 186.
- CEPESDES, R.; SALAS, J.; MEKBEL, S.; TROPER, L.; MULLNER, F. & MORERA, P. - Granulomas entericos y linfaticos con intensa eosinofilia tisular producidos por un strongilídeo (*Strongylata*) I - Patologia. *Acta. méd. costarric.*, 10: 235-255, 1967.
- DEMO, O.J. & PESSAT, O.A.N. - Angiostrongilosis abdominal. Primer caso observado en Argentina. *Prensa méd. argentin.*, 73: 732-738, 1986.
- GRAEFF-TEIXEIRA, C.; THOME, J.W.; PINTO, S.C.C.; CAMILLO-COURA, L. & LENZI, H.L. - *Phyllocaulis variegatus* - an intermediate host of *Angiostrongylus costaricensis* in south Brazil. *Mem. Inst. Oswaldo Cruz*, 84: 65-68, 1989.
- GRAEFF-TEIXEIRA, C.; AVILA-PIRES, F.D.; MACHADO, R.C.C.; CAMILLO-COURA, L. & LENZI, H.L. - Identificação de roedores silvestres como hospedeiros do *Angiostrongylus costaricensis*. *Rev. Inst. Med. trop. S. Paulo*, 32: 147-150, 1990.
- GRAEFF-TEIXEIRA, C.; CAMILLO-COURA, L. & LENZI, H.L. - Histopathological criteria for diagnosis of abdominal angiostrongyliasis. (Aceito para publicação *Parasit. Res.*, 1991).
- IABUKI, K. & MONTENEGRO, M.R. - Apendicite por *Angiostrongylus costaricensis*: apresentação de um caso. *Rev. Inst. Med. trop. S. Paulo*, 21: 33-36, 1979.
- ISHII, A.I. - Effects of temperature on the larval development of *Angiostrongylus cantonensis* in the intermediate host, *Biomphalaria glabrata*. *Parasit. Res.*, 70: 375-379, 1984.
- LORIA-CORTES, R. & LOBO-SANAHUJA, J.F. - Clinical abdominal angiostrongyliasis. A study of 116 children with intestinal eosinophilic granuloma caused by *Angiostrongylus costaricensis*. *Amer. J. trop. Med. Hyg.*, 29: 538-544, 1980.
- LUZZI, C.A. & NEWMANN, M. - Angiostrongilíase abdominal apresentação de dois casos. *Arq. catarin. Med.*, 18: 41-44, 1989.
- MAGALHÃES, A.V.; ANDRADE, G.E.; KOH, I.H.J.; SOARES, M.C.; ALVES, E.; TUBINO, P.; SANTOS, F.A.M. & RAICK, A.N. - Novo caso de angiostrongilose abdominal. *Rev. Inst. Med. trop. S. Paulo*, 24: 252-256, 1982.
- MORERA, P. - Life history and redescription of *Angiostrongylus costaricensis* Morera and Cespedes, 1971. *Amer. J. trop. Med. Hyg.*, 22: 613-621, 1973.
- MORERA, P. - Angiostrongilíase abdominal - um problema de saúde pública? *Rev. Soc. bras. Med. trop.*, 21: 45-47, 1988.
- MORERA, P.; PEREZ, F.; MORA, F. & CASTRO, L. - Visceral larva migrans - like syndrome caused by *Angiostrongylus costaricensis*. *Amer. J. trop. Med. Hyg.*, 31: 67-70, 1982.
- RUIZ, P.J. & MORERA, P. - Spermatic artery obstruction caused by *Angiostrongylus costaricensis* Morera & Cespedes, 1971. *Amer. J. trop. Med. Hyg.*, 32: 1458-1459, 1983.
- ZILLOTTO Jr., A.; KUNZLE, J.E.; FERNANDES, L.A.R.; PRATES-CAMPOS, J.C. & BRITTO-COSTA, R. - Angiostrongilíase abdominal. Apresentação de um provável caso. *Rev. Inst. Med. trop. S. Paulo*, 17: 312-318, 1975.

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