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Ascariasis

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Abstract

Ascaris lumbricoides is usually refer to a largest one of intestinal nematodes and the most common helminthic parasite that parasitizing humans and cause illness known as ascariasis. The disease is cosmopolitan worldwide and high prevalent throughout tropics and subtropics areas. Prevalence data suggests that 1 billion people are affected with ascariasis . Life cycle of *Ascaris lumbricoides* has no intermediate or reservoir hosts .life cycle consist of three stages they are egg, larvae and adult stage of which larvae and adult are pathogenic stages while the egg considered infective stage. The parasite transmitted mainly by oral –fecal route. Pathogenicity of *Ascaris lumbricoides* occurs due to absorption of nutrition from intestinal content of host or by mechanical blockage of intestinal lumen because of large size of worms also the migration of larval stage though the body of host cause many symptoms especially ascaris pneumonia . The best method for identification of parasite is visualized of eggs during exam the stool sample of patient microscopically also detection of adult stage from fecal or vomitus material . Ultrasound are also helpful in case of pancreatic ascariasis or hepatobiliary ascariasis , ascariasis can be treated by both mebendazole and lbendazole as good medications against *Ascaris lumbricoides* worm .

Key words:

Ascariasis, Ascaris lumbricoides, Parasite.

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Introduction

Ascariasis or round worm infection is a soil transmitted disease. Caused by helminthic parasite named *Ascaris lumbricoides* .Commonly called round worms of man.it is worldwide spread helminthic parasite of humans[1] .Many recent studies refer that more than one billion people are affected by *Ascaris lumbricoides*[2]. Prevalent rate of infection is higher in people lived in rural areas than in people lived in the urban. *Ascaris lumbricoides* considered the largest one of nematode infect humans[3]. The adult worm resides in small intestine where it sucks up their food from lumen of intestine and can developed to reach about 35 cm long and pencil lead in thickness [4] . The female worm larger than male .Socio economic condition, defecation of practice, sewage system, cultural variation relating to personal and food hygiene are principle factors associated with high prevalence rate of infection with round worm .most of ascariasis infection are a symptomatic but may occurs as severe complications in patient who tend to suffer from high worm burdens especially in children[5],[6] .

Calcification:

The scientific classification of *Ascaris lumbricoides* as the following [7]:

kingdom :Animalia

Subkingdom: Hielminthes

Phylum: Nematoda

Class : Chromadorea

Order: Ascardida

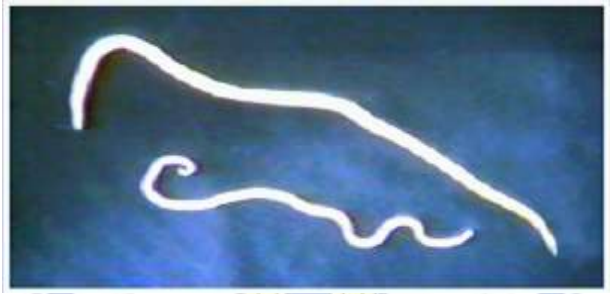
Family:Ascariddae

Genus :*Ascaris*

Species :lumbricoides

Morphology:

Adult worm: The adult worms has cylindrical shaped, the color is creamy to white. The length of female reach about thirty five centimeters . The female is longer than males, measuring about 15-30 cm in length and the body more slender than the body of female as in figure (1). The typical curved posterior end with two copulatory spicule . there are three lips on the anterior endof the worm. They have a complete elementary canal. Reproductive system re tubular. Female has two reproductive while male has a single reproductive tubule[8].



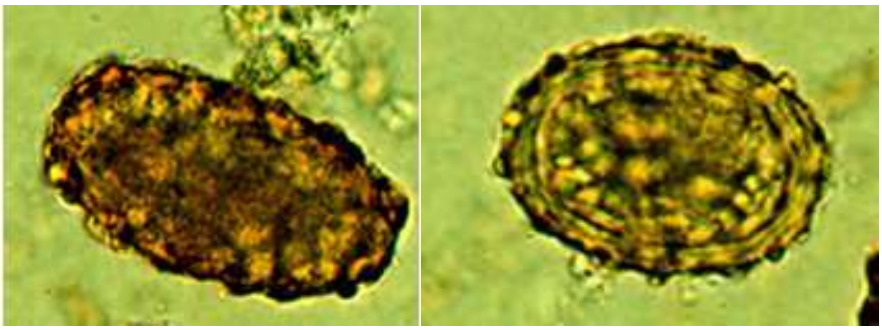
Figure(1) adult male and female of *Ascaris lumbricoides*

Eggs: There are three morphologic form of egg stage. They are: unfertilized , fertilized and decorticated eggs[9].

Fertilized eggs: These eggs is typical broad oval in shape, brown in color, measuring about 40-70µm by 30 to 45 µm. The eggs has very thick shell and composed of chitin material, mammillated layer and fertilizing membrane appear brown when staind with bile stain as in figer(2). The content is undeveloped embryo. There is a prominent space found in the each pole of the shell[10].

unfertilized egg : The unfertilized egg is longer than fertilized egg .typically oblong in shape . measuring about 85- 90µm by 35 to 45 µm. The chitin and mammilated shell are thcker in fertilized eggs than those of the un fertilized without fertilizing membrane as in figure (2) [11].

Decorticated eggs: the fertilized eggs and unfertilized eggs some time lacking of their outer shell or mammelated shell and may be seen transparent without color[12].



Figure(2) A- unfertilized eggs B- fertilized egg

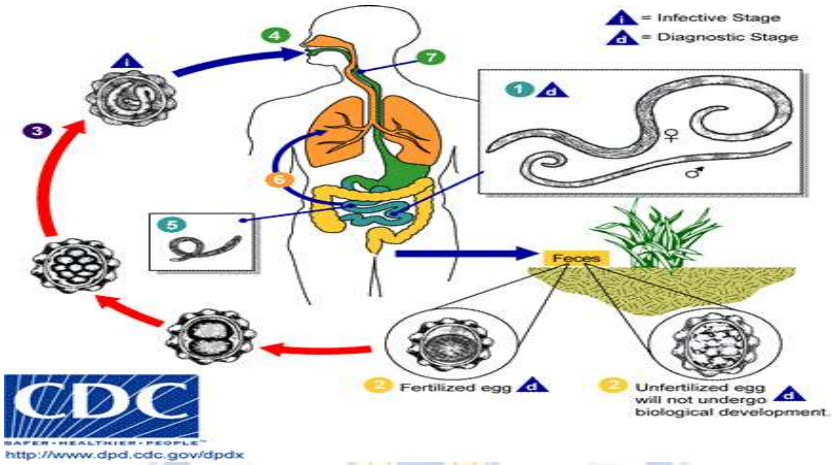
Transmission:

Ascaris lumbricoides is live in small intestine and Ascaris eggs shed with fecal material of infected individual some time infected human defecates outdoorslike as in aear bushes ,field or in ground in addition the fecal material of infected human may use as fertilizer in this case the eggs of Ascaris are deposited on the ground where they developed to mature embryomated egg as form of infection Ascaiasis is initiate when humans ingested eggs , this occurs usually via consumed food like as green row vegetables or fruit contaminated with mature egg of *Ascaris lumbricoides*. Transmission may occurs via inhalation of contaminated dust. The disease may be transmitted directly via contact with contaminated soil during hand to mouth[13],[14].

Life cycle:

The adult worm resides in the small intestine of humans, the nutrition of adult worm derives from contents of intestine, where the sexually mature female produced huge number of unembrionated eggs [15]. Adult female may lay about two hundred thousand of eggs daily, which are shed out through the stool of host. The fertilized eggs when passed are unembryonated and need development in outside environment about 3 weeks to reach mature under suitable condition [16] , motile embryo or larvae is developed inside the mature eggs. ingestion of egg during contaminated food or water or via contaminated hands, the egg is liberating the larval stage inside the lumen of small intestine [17]. These larvae invade the intestinal lining and reach the mesenteric blood and then enter the liver via portal blood stream and then migrate to the right heart and finally to the lungs where they enter to the small capillaries into the alveoli where they molt twice to

developed as larva four (L4) and stay about two weeks and then they are migrate, pass up the bronchi and trachea where they are swallowed, the larvae move into the lumen of small intestine and they develop to matuer male and female worm as in figure (3) [18]. The duration from the taken of infective ovaum to produce eggs by the adults females is approximately sixty to seventy five days [19] , [20] .



Figure(3) life cycle of *Ascaris lumbricoides*

Epidemiology:

Ascaris lumbricoides is worldwide distribution.disease caused by Ascaris is named ascariasis .the disease is very common helminthic infection in the world especially in poor sanitation where people defecate directly on the soil or used the feces as fertilizer of ground[21]. The prevalence rate increase in undeveloped countries especially in the countryside. The regions that considered most suitable to harbor *Ascaris lumbricoides* is tropic and sub tropic areas such as Africa[22] , South America and parts of Asia . The parasite infection usually increased during rainy months. Simple life cycle of *Ascaris lumbricoides* facilitate the spread of infection as well as huge eggs production by single worm nearby two hundred thousand of eggs daily in addition the egg stage are very resistant to environment condition all these factors play a principle role and determined the prevalence rate of parasite infection.persons most at risk with ascaris infection are small aged who put their contaminated fingers in to their mouth. Individuals of all ages may affected where vegetables are contaminated with human feces[23], [24].

Pathogenesis:

There are two form in ascariasis ,first one the blood migration of the larvae. the migration of larval stage in the lungs result in pneumonia. The symptoms of the pneumonia are difficult breathing , cough , fever, blooddy sputum, asthma. Numerous numbers of larvae causes allergic symptom. High level of eosionophil cell is usually present[25]. These clinical feature is also called loeffler's syndrame. Complications caused by surface proteins or antigen of larvae that cause pulmonary infiltration, urticaria and then highly allergenic reaction and finally lead to asthma attack[26].

Second one the intestinal phase due to the adults. Few numbers of adult worms present in the lumen of intestinal tract generally produces no clinical symptoms, but may causes intermittent colic and abdominal pains, particularly in children. A heavyinfection with adultworm may results in malnutrition. Large size of adult worms can make mechanical blockage of the common bile duct or appendices canal also perforate the intestinal lining. Thus complications of disease , such as appendicitis, intestinal obstruction. Biliary ascariasis, perforation of the intestine, peritonitis and pancreatitis may occurs[27].

Diagnosis:

The simple and low cost diagnosis is microscopic examination of stool samples for identification of egg stage [28]. The eggs are easily found using this way due to a large number of the female oviposition thus this method is the best choice .W.B.C.s count : show high number of WBCs particularly eosinophil that refer to Eosinophilia , this occurs during migration of larval stage through the lungs .Imaging method like as computed tomography ct scan and x-ray done in case of heavily infection especially in infected children, mass of rowndworms may be observed in plain film of the patient's abdomen. In case of pancreatic ascariasis and biliary ascariasis can diagnosed by ultrasound exams[29]. May be observed one adult worm or numerous of worms as well as tumor-like changes A duodenoscope used to extract the adult worm out of the infected person . microscopic examination of sputum sample for identification larval stage is sometimes useful. Identification of adult worms by naked eye when they are found in stool or vomitus material of infected humans [30].

Host immune response:

Ascariasis can elicits macrophage, neutrophils and most importantly eosinophils. The body surface of Ascaris lumbricoides generally coated with immunoglobulin G (IgG) or immunoglobulin E (IgE) which lead to increase the production and release of immune cells particularly eosinophil on the surface of adult worm [31] .Immune response regulated by T helper lymphocytes. general concurrence is commonly Th2 immune response with production of greater levels of immunoglobuline E, eosinophil cells and mast cells. immune response of human against ascaris infection is characterized by distinguished antibodies and cellular response which are bring out as first line of defense against larval stage of *Ascaris lumbricoides* . ascariasis evoke the production and secretion of all isotype of antibodies[32, 33] .

Treatment:

Mebendazole and albendazole are considered the most common drug of choice for treatment ascaris infection. The infectious disease of America and world health organization recommend mebindazole is primary treatment of ascariasis. mebendazole can be administrated as single dose 50 mg or 100 mg for three days. Albendazole is givin as a single dose of 400 mg[34] .The patient may suffer from headache and leukopenia as a side effect of drug in case of treated with mebendazole or albendazole. The alternative choice for treatment ascariasis is piprazine citrate this medication is very effect and useful in case of biliary or intestinal obstruction because it serve as paralysis of the adult worm .piprazine can be prescribed as 3.5 gram for two days[35] . Other drug is pyrantel pamoate is used in case of pregnancy women infected with ascariasis as single dose of 11 milligram per kilogram .side effect of drug usually fever , gastrointestinal symptoms, headache and rush . The data of published studies reveal that use of pyrantel pamoate is very safe also is high effective treatment against Ascaris lumbricoides . Corticosteroids are the best choice for treated patient suffering from pulmonary ascariasis[36].

Prevention:

Prevention of reinfection poses a substantial problem since this parasite is abundant in soil therefore good sanitation is necessary to prevent contamination of soil with fecal material[37] .the avoidance using human feces as fertilizer. Contaminated soil should be treatment although it is not highly advised mass treatments of children with mebendazole as single doses or albendazole helps reduce transmission in population[38]. Hygienic habits like as cleaning of hands before meals, health education, proper disposal of feces and personal hygiene practical is very necessary factors for eliminate the ascaris infection and good measure to breaking the cycle of parasite[39,40].

Conclusions

As the considerably spread helminthic parasite illness , *Ascaris lumbricoides* is fundamental for healthiness of humans especially in developing countries .Although the wide range of effectiveness on the validity of human host, *Ascaris lumbricoides* persist negligent as parasitic infection infect high numbers of humans . The prevalence and insistence related to control planning for eradication the parasite especially clean the source of drinking water still restricted, improvement in waste management and sanitation lead to reduction of prevalence of disease . further future studies of the technique and methods of resistance against roundworm infection and programs for good control measure should be taken to eradicate the ascariasis infection are required.

Conflict of interests.

There are non-conflicts of interest.

References:

[1] M.S. Chan, The global burden of intestinal nematode infections efiftyyears on, Parasitol. Today 13 (1997) 438e443.
[2] P.J. Hotez, P.J. Brindley, J.M. Bethony, C.H. King, E.J. Pearce, J. Jacobson,Helminth infections: the great neglected tropical diseases, J. Clin. Invest.118 (2008) 1311e1321.
[3] D.W.T. Crompton, How much human helminthiasis is there in the world? J. Parasitol. 85(1999) 397e403.
[4] A. Roepstorff, O. Nilsson, A. Oksanen, B. Gjerde, S.H. Richter,E. O¨rtenberg, .Christensson, K.B. Martinsson, P.C. Bartlett, P. Nansen,ntestinal parasites in swine in the Nordic countries: prevalence andgeographical distribution, Vet. Parasitol. 76 (1998) 305e319.
[5] E. Miguel, M. Kremer, Worms: identifying impacts on education andhealth in the presence of treatment externalities, Econometrica 72 (2004)159e217.
[6] P. O'Lorcain, C.V. Holland, The public health importance of Ascaris lumbricoides, Parasitology 121 (2000) S51eS71.
[7] D.W.T. Crompton, Ascaris and ascariasis, Adv. Parasitol. 48 (2001)285e375.
[8]D.A.P. Bundy, Population ecology of intestinal helminthes infections inhuman communities, Philos. Trans. R. Soc. Lond. B. Biol. Sci. 321(1988) 405e420.
[9] P.L. Geenen, J. Bresciani, J. Boes, A. Pedersen, L. Eriksen, H.P. Fager-holm, P. Nansen,The morphogenesis of Ascaris suum to the infectivethird-stage larvae within the egg, J. Parasitol. 85 (1999) 616e622.
[10] B. Sinniah, Daily egg production of Ascaris lumbricoides: the distribution of eggs in the faeces and the variability of egg counts, Parasitology 84 (1982) 167e175.
[11]D.B. Elkins, M. Haswell-Elkins, R.M. Anderson, The importance of hostage and sex to patterns of reinfection with Ascaris lumbricoidesfollowing mass anthelminthic treatment in a South Indian fishingcommunity, Parasitology 96 (1988) 171e184.

[12] M. Haswell-Elkins, D.B. Elkins, R.M. Anderson, The influence of indi-vidual, social group and household factors on the distribution of Ascarislumbricoides, Parasitology 98 (1989) 125e134.
[13]C. Michaud, J. Bethony, R. Correa-Oliveira, X. Shuhua, A. Fenwick,L. Savioli, Helminth infections: soil-transmitted helminth infectionand schistosomiasis, in: D.T. Jamison, J.G. Breman, A.R. Measham,
[14] T.S. Thein-Hlaing, Epidemiology and transmission dynamics of Ascarislumbricoides in Okpo village, rural Burma, Trans. R. Soc. Trop. Med.Hyg. 78 (1984) 497e504.
[15] K.D. Murrell, L. Eriksen, P. Nansen, H.C. Slotved, T. Rasmussen,Ascaris suum: a revision of its early migratory path and implications forhuman ascariasis, J. Parasitol. 83 (1997) 255e260. [16] L.S. Olsen, G.W. Kelley, H.G. Sen, Longevity and egg-production of Ascaris suum, Trans. Am. Microsc. Soc. 77 (1958) 380e383.
[17] D.W.T. Crompton, M.C. Nesheim, Nutritional impact of intestinal helminthiasis during the human life cycle, Annu. Rev. Nutr. 22 (2002)35e59.
[18] T.J.C. Anderson, Ascaris infections in humans from North America:molecular evidence for cross-infection, Parasitology 110 (1995) 215e219.
[19] N.A. Croll, E. Ghadirian, Wormy persons: contributions to the nature and patterns of overdispersion with Ascaris lumbricoides,Ancylostomaduodenale,Necator americanus and Trichuris trichiura, Trop. Geogr.Med. 33 (1981) 241e248.
[20] N.R. de Silva, S. Brooker, P.J. Hotez, A. Montresor, D. Engels, L. Savioli,Soil-transmitted helminth infections: updating the global picture,Trends Parasitol. 19 (2003) 547e551.
[21] C.V. Holland, S.O. Asaolu, D.W.T. Crompton, R.C. Stoddart,R. MacDonald, .E.A.Torimiro, The epidemiology of Ascaris lumbricoidesand other soil-transmittedhelminths in primary school childrenfrom Ile-Ife,Nigeria, Parasitology 99 (1989) 275e285.
[22] D.A.P. Bundy, U.J. Blumenthal, Human behaviour and the epidemiology of helminth infections: the role of behaviour in exposure to infection, in:C.J. Barnard, J.M. Behnke (Eds.), Parasitism and Human Behaviour,Taylor and Francis, London, 1990, pp. 264e289.
[23] D.B. Elkins, M. Haswell-Elkins, R.M. Anderson, The epidemiology and control of intestinal helminths in the Pulicat lake region of southern India.I. Study design and pre- and post-treatment observations on Ascaris lumbricoides infection, Trans. R. Soc. Trop. Med. Hyg. 80 (1986) 774e792.
[24] W. Peng, K. Yuan, X. Zhou, M. Hu, Y.G.A. EL-Osta, R.B. Gasser,Molecular epidemiological investigation of Ascaris genotypes in Chinabased on single-strand conformation polymorphism analysis of ribosomal DNA, Electrophoresis 24 (2003) 2308e2315.
[25] B. Sinniah, K. Subramaniam, Factors influencing the egg production of Ascaris umbricoides: relationship to weight, length and diameter of worms, J. Helminthol. 65 (2009) 141e147.
[26] A. Sakakibara, K. Baba, S. Niwa, T. Yagi, H. Wakayama, K. Yoshida,T. Kobayashi, T. Yokoi, K. Hara, M. Itoh, Visceral larva migrans dueto Ascaris suum which presented with eosinophilic pneumonia andmultiple intra-hepatic lesions with severe eosinophil infiltration, Intern.Med. 41 (2002) 574e579.
[27] E.S. Cooper, C.A.M. Whyte-Alleng, J.S. Finzi-Smith, T.T. MacDonald,Intestinal nematode infections in children: the pathophysiological pricepaid, Parasitology 104 (1992) 91e103.
[28] P.J. Hotez, D.A.P. Bundy, K. Beegle, S. Brooker, L. Drake, N.R. de Silva,A. Montresor, D. Engels, M. Jukes, L. Chitsulo, J. Chow, R. Laxminarayan,636 C. Dold, C.V. Holland / Microbes and Infection 13 (2011) 632e637

[29] T.J.C. Anderson, M.E. Romero-Abal, J. Jaenike, Genetic structure andepidemiology of Ascaris populations: patterns of host affiliation in Guatemala, Parasitology 107 (1993) 319e334.
[30] A. Roepstorff, P. Nansen, The Epidemiology, Diagnosis and Control of Helminth Parasites of Swine, A FAO Handbook, FAO, Rome, Italy, 1998.
[31] M.W. Kennedy, F. Qureshi, Stage-specific secreted antigens of the parasitic larval stages of the nematode Ascaris, Immunology 58 (1986)515e522.
[32] V.M. Arean, C.A. Crandall, The effect of immunization on the fate ofinjected second stage Ascaris lumbricoides larvae in the rabbit, Am. J.Trop. Med. Hyg. 11 (1962) 369e379.
[33] J. Pe´rez, P.M. Garcia, E. Mozos, M.J. Bautista, L. Carrasco, Immuno-histochemical characterization of hepatic lesions associated withmigrating larvae of Ascaris suum in pigs, J. Comp. Pathol. 124 (2001)200e206.
[34] WHO, Preventative Chemotherapy in Human Helminthiases: Coordi-nated Use of Anthelminthic Drugs in Control Interventions: a Manual forHealth Professionals and Programme Managers, World Health Organi-sation, Geneva, 2006.
[35] H.J.W. Sturrock, P.W. Gething, A.C.A. Clements, S. Brooker, Optimal survey designs for targeting chemotherapy against soil-transmittedhelminths: effect of spatial heterogeneity and cost-efficiency of sampling,Am. J. Trop. Med. Hyg. 82 (2010) 1079e1087.
[36] V. Hadju, L.S. Stephenson, K. Abadi, H.O. Mohammed, D.D. Bowman,R.S. Parker, Improvements in appetite and growth in helminth-infectedschoolboys three and seven weeks after a single dose of pyrantel pamoate, Parasitology 113 (1996) 497e504.
[37] L.K. Kightlinger, J.R. Seed, M.B. Kightlinger, Ascaris lumbricoidesintensity in relation to environmental, socioeconomic, and behavioraldeterminants of exposure to infection in children from southeastMadagascar, J. Parasitol. 84 (1998) 480e484.
[38] M. Albonico, A. Montresor, D.W.T. Crompton, L. Savioli, H.M. David,Intervention for the control of soil-transmitted helminthiasis in thecommunity, Adv. Parasitol. 61 (2006) 311e348.
[39] M. Albonico, D.W.T. Crompton, L. Savioli, Control strategies for humanintestinal nematode infections, Adv. Parasitol. 42 (1999) 278e341
[40]G. Alleyne, M. Claeson, D.B. Evans, P. Jha, A. Mills, P. Musgrove (Eds.),Disease Control Priorities in Developing Countries, World Bank Group, Washington, 2006, pp. 467e478.

الخلاصة

يشير مصطلح الصفر الخراطيني الى اكبر الطفيليات المدورة المعوية والشائعة والتي تتطفل في امعاء الانسان وتسبب ما يدعى بداء الصفر الخراطيني. المرض شائع الانتشار عالميا وينتشر بصورة واسعة في المناطق الاستوائية وشبة الاستوائية. تشير البيانات الى اصابة بليون انسان بداء الصفر الخراطيني. لا تحتاج دورة حياة الطفيلي الى مضيف وسطي او مضيف خازن. تتكون دورة الحياة من ثلاث مراحل وهي البيضة واليرقة والدودة البالغة حيث تعتبر اليرقة والدودة البالغة مرحلتان ممرضتان بينما تعتبر البيضة الطور المعدي للطفيلي. ينتقل الطفيلي بطريقة البراز/الفم. تشمل امراضية الصفر الخراطيني امتصاص المواد الغذائية من المحتويات المعوية للمضيف او بواسطة الانسداد الميكانيكي للقناة المعوية نظرا لكبر حجم الطفيلي بالإضافة الى هجرة اليرقات خلال جسم المضيف مسببة علامات مرافقة لهذه الهجرة خاصة الالتهاب الرئوي الخراطيني. افضل طريقة لتشخيص الطفيلي هي رؤية البيوض عن طريق فحص نماذج البراز للمصابين بواسطة المجهر وكذلك رؤية الطفيلي البالغ في نماذج البراز. يعد التصوير الشعاعي طريقة ناجحة لتشخيص الصفر الخراطيني البنكرياسي او الصفر الخراطيني في الكبد وتفرعات المرارة. افضل الادوية في معالجة الصفر الخراطيني هي الميبندازول والالبندازول.

الكلمات الدالة: داء الصفر الخراطيني، الصفر الخراطيني، الطفيلي.