Intestinal obstruction in children due to Ascariasis: A tertiary health centre experience

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ABSTRACT

Background: Ascariasis is the infestation by the largest intestinal nematode of man, a common problem in the tropics attributed to poor hygienic and low socioeconomic conditions. The aim of this research is to analyse the presentation, diagnosis and management of bowel obstruction caused by Ascaris lumbricoides, with special emphasis on the role of conservative management. **Materials and Methods:** This is a single centre, two consultant based 5 year retrospective study of childhood intestinal obstruction due to worms. Diagnosis in the suspected patients was based on history of passage of worms per mouth or rectum and on x-ray and ultrasonography findings. Only the patients of intestinal obstruction with documented evidence of roundworm infestation were included in the study and were followed for one year. **Results:** One hundred and three children with intestinal obstruction due to Ascaris lumbricoides were treated in the past five years at our centre. Abdominal pain was the most common presentation seen in 96 children followed by vomiting in 77 children. 20 children had history of vomiting worms and another 43 had history of passing worms in stool. Abdominal tenderness was present in 50 children, 48 had abdominal distension of varying degree, 50 had abdominal mass due to worm bolus, and 16 had or developed abdominal guarding or rigidity. All the children were managed as for acute intestinal obstruction along with hypertonic saline enema. The aim of management was "to starve the worm and hydrate the patient". 87 patients (84.47%) responded favourably and were relieved of the obstruction by the conservative management, 16 children (15.53%) had abdominal guarding or rigidity and underwent emergency exploration. **Conclusion:** Roundworm obstruction should be considered in the differential diagnoses of all cases of intestinal obstruction in children. Clinical history and examination along with X-ray and ultrasonography are very helpful for diagnosis of this surgical emergency. Most cases of intestinal obstruction due to Ascaris can be managed conservatively; however emergency surgery is needed in patients with abdominal guarding and rigidity.

Key words: Hypertonic saline enema, intestinal obstruction, roundworms, ultrasonography

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INTRODUCTION

Ascariasis is a common problem in the tropics. Poor hygienic and low socioeconomic conditions have been the main factors incriminated. Common surgical problems[1,2] caused by Ascaris infestation include small intestinal obstruction, volvulus, intussusception and perforation usually involving the ileum. In our environment over 70% of children[1-5] are infested with Ascaris lumbricoides, the largest intestinal nematode of man. It is estimated that more than 1.5 billion people are infested globally with Ascaris lumbricoides, representing 25 percent of the world population.[6,7] Ascariasis causes about 10,00,000 new cases annually and 60,000 mortalities in a year the world over.[8,9] Although Ascariasis occurs at all ages, it is most common in children 2 to 10 years old[10] and prevalence decreases over the age of 15 years.

MATERIALS AND METHODS

This is a single centre, two consultant based, 5 year retrospective study of childhood intestinal obstruction due to roundworms. Only the patients of intestinal obstruction with documented evidence of roundworm infestation admitted and managed over the period of five years (January 2002- December 2007) in the department of paediatric surgery were included in the study and were followed for one year. Data were analysed retrospectively for age, gender, clinical features, management and outcome of management.

Diagnosis in the suspected patients was based on history of passage of worms per mouth or rectum and on x-ray and ultrasonography findings. All patients were examined by ultrasound scanning in both supine

and in left lateral position to increase the diagnostic efficacy.

Management aims to "starve the worms and hydrate the patient". All the patients were managed as for acute intestinal obstruction by keeping them nil by mouth, nasogastric aspiration, intravenous fluids and hypertonic saline enema twice daily. The hypertonic saline enema was used only for disentangling and expulsion of colonic worms and children were watched closely for any features of dehydration. No antihelmenthic drugs were given to the patient during the acute stage. However patients who had abdominal guarding or rigidity or those who developed them in due course were taken for emergency exploration.

Evaluation of other family members was carried out whenever the diagnosis was made because of the propensity of the infestation to cluster in families.

On follow-up, all the patients were given albendazole therapy two weeks after discharge from hospital and were evaluated at three months and at the end of one year to ensure that no ova were detectable in stool, either because of inadequate elimination of adult worms or because of re-infestation, and an extra dose of albendazole therapy was given to the positive cases.

RESULTS

One hundred and three patients with intestinal obstruction due to Ascaris lumbricoides were treated in the past five years at our centre. There were thirty-eight (36.89%) girls and sixty-five (63.11%) boys. Most of the children were in the 4 to 8 years age group, with peak occurrence at 5 to 6 years of age. Abdominal pain was the most common presentation in 96 (93.20%) children, followed by vomiting in 77 (74.76%). Twenty (19.43%) children had history of vomiting worms and another 43 (41.75%) had history of passing worms in stool. Twenty-two (20.36%) had fever, 30 (29.13%) had history of constipation and four (3.88%) had history of diarrhoea. Nine children (8.74%) had history of taking antihelmenthic drugs within one week of presentation to the hospital. Fifty (48.54%) children had abdominal tenderness, 14 (13.59%) of whom had abdominal guarding or rigidity at presentation and 2 (1.94%) developed them during the course of conservative management. 48 (46.60%) children had abdominal distension of varying degrees, 50 (48.54%) had abdominal mass due to bolus of worms, and six (5.83%) had features of dehydration. X-ray suggested the diagnosis in 54 patients (52.43%) and in 91 patients (88.35%) the diagnosis was confirmed on ultrasonography. Eighty-seven children (84.47%) responded favourably to conservative management and passed worms per rectally from third to fifth day onwards and did not require any surgical intervention. However during conservative management three children developed features of mild dehydration and electrolyte imbalance and were managed successfully.

All children who presented with abdominal guarding or rigidity and those who developed them subsequently were taken for emergency exploration (14 and two respectively). Of the 16 children who had emergency surgery, seven had bolus of worms, six had volvulus and gangrene of small bowel, two had ileal perforation [Figure 1] and one had appendicular perforation. Out of six patients with volvulus and gangrene, five were managed by resection and anastomosis and loop ileostomy was performed in the sixth case. Of the two children with ileal perforation one was managed by double layered repair and resection and anastomosis was performed for another. Appendectomy was performed for patient with appendicular perforation. One child with large bolus of worms and thinned out ileal wall required enterotomy for extraction of the worms. The remaining six children were managed by manual milking of the worms from the bowel [Figure 2].

Out of sixteen children who underwent surgery, two had wound infections, and one with ileostomy had peristomal excoriation but they all responded to conservative management. One of the children with volvulus and gangrene of small bowel managed by resection and anastomosis had leak from the anastomosis site; he underwent relaparotomy and ileal stoma was made but subsequently he developed septicaemia and died.

Ninety patients turned up for the 1st follow up visit at the end of three months of which 48 were positive for roundworm ova. Fifty-one turned up for the 2nd visit at the end of one year of which 32 were positive for roundworm ova. All positive cases were treated with an extra dose of albendazole. One patient, who did not turn up for follow up, presented at the end of 18 months with intestinal obstruction due to roundworms and was managed conservatively with good outcome.

DISCUSSION

Roundworm related intestinal obstruction is more common in children because of the smaller diameter of the lumen of the bowel and, often, an increased worm

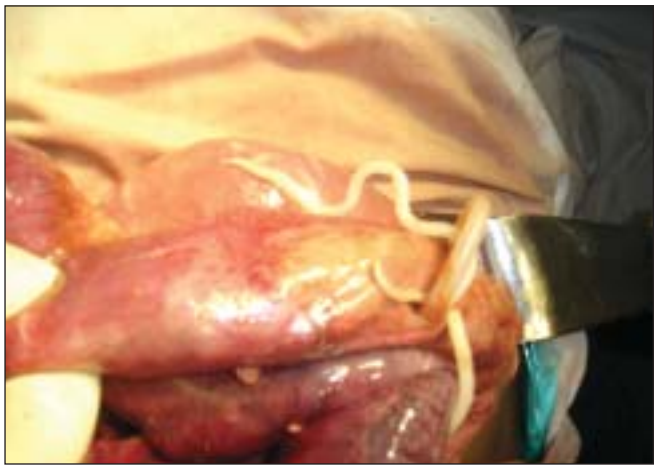


Figure 1: Round worm causing ileal perforation



Figure 2: Milking of small intestine to evacuate round worms

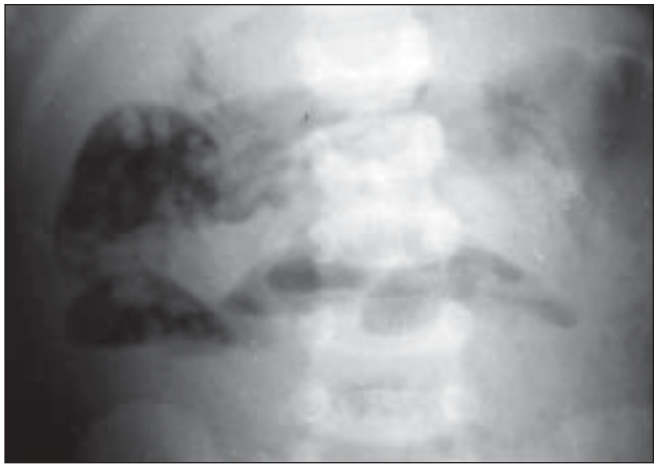


Figure 3: X-ray showing multiple air fluid level with cigar bundle appearance of round worms

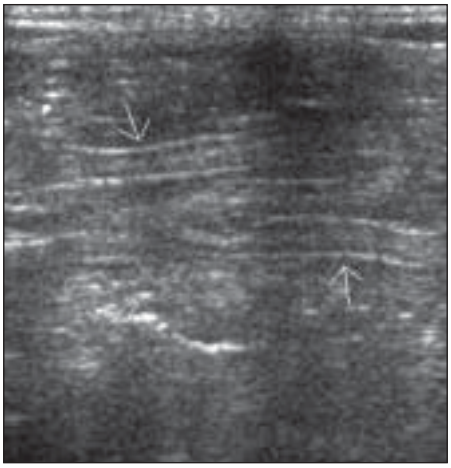


Figure 4: Ultrasound appearances of round worms

load. Transmission occurs mainly via ingestion of water or food contaminated with Ascaris lumbricoides eggs and occasionally via inhalation of contaminated dust. Children playing in contaminated soil may acquire the parasite from their hands and this can be the reason for greater incidence of this condition in boys as they are more exposed to outdoor activities; similar high incidence in male patients is also reported by other authors.[11] Transplacental migration[12] of larvae has also occasionally been reported. Adult worms do not multiply in the human host, so the number of adult worms per infested person relates to the degree of continued exposure to infectious eggs over time. In India, the prevalence of high-intensity Ascaris infection, in which there is a high worm burden, is 768 cases per 100,000 persons;[13] globally, there are an estimated 62 million persons[13] with high-intensity Ascaris lumbricoides infestation. Intestinal obstruction is an especially acute problem in the developing world.[13] The prevalence of Ascaris-related intestinal obstruction in India is 9.2 cases per 100,000 persons.[13] There are nearly 730,000 cases of Ascaris-induced bowel obstruction and 11,000 deaths annually worldwide.

The majority of infestations with Ascaris lumbricoides are asymptomatic. However, the burden of symptomatic disease worldwide is still relatively high because of the high prevalence of disease. Clinical disease[9,14] is largely restricted to individuals with a high worm load.[15] One review estimated the worm burden with intestinal obstruction to be >60 (and ten times higher in fatal cases).[16] When symptoms do occur, they relate either to the larval migration stage or to the adult worm intestinal stage.

Heavy infestations with Ascaris are frequently believed to result in abdominal discomfort, anorexia, nausea and diarrhoea. However, it has not been confirmed whether or not these non-specific symptoms can truly be attributed to Ascariasis.[17]

A mass of worms can obstruct the bowel lumen in heavy Ascaris infestation, leading to acute intestinal obstruction. The obstruction occurs most commonly at the ileocecal valve. Symptoms include colicky abdominal pain, vomiting and constipation. Vomitus may contain worms. Approximately 85 percent of obstructions occur in children between the ages of one and five years.[15] Sometimes an abdominal mass that changes in size and location on serial examinations[18] may be appreciated. Complications including volvulus,[19] ileocecal intussusception, gangrene, and intestinal perforation occasionally result.

The diagnosis was kept in mind in all cases of intestinal obstruction in paediatric age group and was based on history of passage of worms in vomitus or stool[20,21] along with X-ray and ultrasonographic features of roundworm and intestinal obstruction. In heavily infested children, large collections of worms may be visualised on plain film of the abdomen as radiolucent areas[22] or with a cigar bundle appearance [Figure 3]. Occasionally the mass of worms created contrasts against the gas in the bowel, typically producing a "whirlpool" effect.[23] Radiographs also showed features of associated intestinal obstruction like abdominal distension, dilated bowel loops and multiple air fluid levels and free gas under diaphragm in cases with intestinal perforation.

Ultrasonography [Figure 4] of the abdomen has been advocated as a quick, safe, non-invasive and relatively inexpensive modality for suspected intestinal Ascariasis and various appearances of roundworms have been described like a thick echogenic strip with a central anechoic tube or multiple long, linear, parallel echogenic strips without acoustic shadowing.[24-28] Other characteristic findings were visualisation of single worm, bundles of worms, or a pseudo tumour-like (helmenthinoma)[29] appearances. Some times individual body segments of worms were visible as multiple pairs of curvilinear echogenic lines, and on prolonged scanning, the worms showed curling movements. The alimentary canal of the worm was seen either as a single central echogenic line in collapsed state or as two parallel hypoechoic bands with a hypoechoic centre in distended state also described as a "winding highway" or "parallel lines".[24-26] When examined transaxially, the individual worm resembled a target with its circular, echogenic body wall and its central dot-like alimentary canal.

The aim of our management "to starve the worms and hydrate the patient" is based on the fact that roundworms are dependent on the partially digested nutrients in the small intestine for survival. So by keeping the patients nil by mouth we are indirectly starving the worms which promotes their movement and disentanglement. The hydration part of the management emphasises the need for proper fluid therapy so as to avoid any untoward complication during the conservative therapy.

The hypertonic saline enema[30] causes irritation and promotes disentangling and expulsion of colonic worms, however during its use children should be watched closely for any features of dehydration.

We did not use any antihelmenthic agent during the course of conservative management as they alter the motility of the worms and hamper their clearance and may lead to serious complications like intussusceptions, volvulus, haemorrhagic or necrotic bowel and even perforation.[21,31]

Re-infestation occurs frequently; more than 80 percent of individuals in some endemic areas become re-infested within six months.[15] The overall incidence of obstruction is approximately 1 in 500 children.[15] In endemic areas, it has been shown that between 5 and 35 percent of all cases of bowel obstruction are due to ascariasis.[15] Multiple worms frequently remain in the intestines for several years without causing disease. There are 4 major factors that result in Ascaris-related intestinal obstruction.:[23]

1. Multiple worms can form a large bolus, resulting in mechanical obstruction of the bowel lumen. This is the most frequent cause of Ascaris- related bowel obstruction.
2. The worm bolus may serve as a lead point in intussusception or a pivot in small bowel volvulus.
3. Ascaris worms may inhabit the ileocecal valve, where roundworm secretion of neurotoxins prompts small-bowel contraction. This action, coupled with high worm burden in the ileocecal valve, can obstruct the intestine.
4. A host inflammatory reaction to worm-derived haemolysins, endocrinolysins, and anaphylatoxins can be severe enough to obstruct the gut lumen.

Bowel perforation is thought to follow ischemia from pressure by the mass of worms in the ileum. This view was however questioned by Efem[5] who postulated that except in confined spaces like the appendix, Meckel's diverticulum and the biliary tree, the intestine is capable of immense dilatation to accommodate up to 5000 worms without symptoms. Typhoid perforations,

non-specific ulcers and anastomotic suture lines are thought to provide exits for the worm.

Various other authors[32,33] have performed similar studies involving paediatric patients and examined the use of conservative versus surgical management of intestinal obstruction due to Ascariasis and reported a high success rate with conservative therapy. Unlike the other mechanical causes of intestinal obstruction most cases of acute intestinal obstruction due to Ascariasis can be managed conservatively.

At the time of discharge and in follow up children and their parents were advised regarding use of toilet facilities, safe excreta disposal, protection of food from dirt and soil, thorough washing of raw food materials, hand washing, and common-sense sanitary measures.

Mass treatments with single dose mebendazole or albendazole for all school-age children every three to four months have been used in some communities. This serves the dual function of treating the children and reducing the overall worm burden in the community. Indeed, mass community therapy has been shown to reduce Ascaris burden and transmission. Although it has a greater effect on the intensity of infestation than on the overall prevalence,[34-37] this approach has been shown to be cost-effective.[38] Because re-infestation occurs so frequently, shorter intervals between treatments have been found to be preferable. Targeted treatment helps control the morbidity of infestation but does not have a substantial effect on transmission.[29,39,40]

In conclusion, roundworm obstruction should be the differential diagnosis of all cases of intestinal obstruction in children. Proper history with leading questions regarding passage of worms in vomitus and stool and history of intake of any antihelmenthic drug in recent past along with careful clinical examination looking specifically for abdominal guarding and rigidity are essential for the proper diagnosis and management of this condition. X-ray and ultrasonography are very helpful for diagnosis of this surgical emergency. Uncomplicated cases of intestinal obstruction due to Ascaris can be managed conservatively; however surgery is needed in patients with complications.

REFERENCES

1. Otu AA. Tropical surgical abdominal emergencies: Acute intestinal obstruction. Afr J Med Med Sci 1991;20:83-8.
2. Archibong AE, Ndoma-Egba R, Asindi AA. Intestinal obstruction in south-eastern Nigerian children. East Afr Med J 1994;71:286-9.
3. Wani NA, Shah OJ, Wani MA. Surgical complications of abdominal ascariasis. Postgrad Doctor Afr 2002;24:38-40.
4. Hassan AW. Intestinal obstruction due to ascariasis. Niger J Surg Sci 1993;3:91-3.
5. Efem EE. Ascaris lumbricoides and intestinal perforation. Br J Surg 1987;74:683-4.
6. Embil J, Pereira L, White F, Garner J, Manuel F. Prevalence of ascaris lumbricoides infection in a small Nova Scotian community. Am J Trop Med Hyg 1984;33:595-8.
7. Crompton D. How much human helminthiasis is there in the world? J Parasitol 1999;85:397-403.
8. Drake L, Bundy D. Multiple helmet infections in children: Impact and control. Parasitological 2001;122:73-81.
9. Cooper PJ, Chico ME, Sandoval C, Espinel I, Guevara A, Kennedy MW, *et al*. Human infection with Ascaris lumbricoides is associated with a polarized cytokine response. J Infect Dis 2000;182:1207-13.
10. Haswell-Elkins M, Elkins D, Anderson RM. The influence of individual, social group and household factors on the distribution of Ascaris lumbricoides within a community and implications for control strategies. Parasitology 1989;98:125-34.
11. Gangopadhyay AN, Upadhyaya VD, Gupta DK, Sharma SP, Kumar V. Conservative treatment for round worm intestinal obstruction. Indian J Pediatr 2007;74:1085-7.
12. Chu WG, Chen PM, Huang CC, Hsu CT. Neonatal ascariasis. J Pediatr 1972;81:783-5.
13. Murray CL, Lopez AD. Global health statistics: A compendium of incidence, prevalence and mortality estimates for over 200 conditions. Vol II. Boston: Harvard University Press; 1996. p. 394-405.
14. Somoro MA, Kantar J. Non-operative management of intestinal obstruction due to ascaris lumbricoides. J Cull Physicians Surge Pak 2003;13:86-9.
15. Khuroo MS. Ascariasis. Gastroenterol Clin North Am 1996;25:553-77.
16. De Silva NR, Guyatt HL, Bundy DA. Worm burden in intestinal obstruction caused by Ascaris lumbricoides. Trop Med Int Health 1997;2:189-90.
17. Availabel from: http://www.stanford.edu/class/humbio103/ParaSites2005/Ascaris/JLora_ParaSite.htm#Intestinal#Intestinal.
18. Tietze PE, Tietze PH. The roundworm, Ascaris lumbricoides. Prim Care 1991;18:25-41.
19. Montiel-Jarquín A, Carrillo-Ríos C, Flores-Flores J. Ascaridiasis vesicular asociada a hepatitis aguda: Manejo conservador. Cir Ciruj 2003;71:314-8.
20. Dávila GC, Trujillo HB, Vásquez C. Prevalencía de parasitosis intestinales en niños de zonas urbanas del estado de Colima, México. Vol. Med Hosp. Infanta Mes 2001;58:234-9.
21. Vasquez Tsuji O, Gutierrez Castrellon P, Yamazaki Nakashimada MA, Arredondo Suarez JC, Campos Riveral T, Martinez Barbosa I. Anthelmintics as a risk factor in intestinal obstruction by Ascaris lumbricoides in children. Bol Chil Parasitol 2000;55:3-7.
22. Mahmood T, Mansoor N, Quraishy S, Ilyas M, Hussain S. Ultrasonographic appearance of Ascaris lumbricoides in the small bowel. J Ultrasound Med 2001;20:269-74.
23. Vilamizar E, Mendez M, Bonilla E, Varon H, de Onatra S. Ascaris lumbricoides infestation as a cause of intestinal obstruction in children: Experience with 87 cases. J Pediatr Surg 1996;31:201-5.
24. Hoffmann H, Kawooya M, Esterre P, Ravaolimalala-Thomas AK, Roux-Seitz HM, Doehring VE. *In vivo* and *in vitro* studies of the sonographic detection of Ascaris lumbricoides. Pediatr Radiol 1997;27:226-9.
25. Peck RJ. Ultrasonography of intestinal Ascaris. J Clin Ultrasound 1990;18:741-3.
26. Brazilai M, Khamaysi N. Sonographical imaging of Ascaris lumbricoides. Harefuah 1996;131:247-8.
27. Khuroo MS, Zargar SA, Mahajan R, Bhat RL, Javid G. Sonographic appearances in biliary ascariasis. Gastroenterology 1987;93:267-72.

28. Anand R, Narula M, Gupta A. Images: Biliary ascariasis. Indian J Radiol Imaging 1999;9:23.
29. Malde HM, Chadha D. Roundworm obstruction: sonographic diagnosis. Abdom Imaging 1993;18:274-6.
30. Mukhopadhyay B, Saha S, Maiti S, Mitra D, Banerjee TJ, Jha M, *et al*. Clinical appraisal of Ascaris lumbricoides, with special reference to surgical complications. Pediatr Surg Int 2001;17:403-5.
31. Rodriguez-Garcia AJ, Belmares-Taboada J, Hernandez-Sierra JF. Ascaris lumbricoides-caused risk factors for intestinal occlusion and subocclusion. Cir Cir 2004;72:37-40.
32. Ochoa B. Surgical complications of ascariasis. World J Surg 1991;15:222-7.
33. Upadhyaya VD, Gangopadhyaya AN, Pandey A, Gupta DK, Upadhyaya A. Round worm intestinal obstruction: A single center study. Int J Surg 2007;12:7.
34. Hall A, Anwar KS, Tomkins AM. Intensity of reinfection with Ascaris lumbricoides and its implications for parasite control. Lancet 1992;339:1253-7.
35. Asaolu SO, Holland CV, Crompton DW. Community control of Ascaris lumbricoides in rural Oyo State, Nigeria: Mass, targeted and selective treatment with levamisole. Parasitology 1991;103:291-8.
36. Thein-Hlaing, Than-Saw, Myat-Lay-Kyin. The impact of three-monthly age targetted chemotherapy on Ascaris lumbricoides infection. Trans R Soc Trop Med Hyg 1991;85:519-22.
37. Thein-Hlaing, Than-Saw, Myat-Lay-Kyin. Control of ascariasis through age targeted chemotherapy: Impact of 6-monthly chemotherapeutic regimens. Bull World Health Organ 1990;68:747-53.
38. Holland CV, O'Shea E, Asaolu SO, Turley O, Crompton DW. A cost-effectiveness analysis of anthelminthic intervention for community control of soil-transmitted helminth Infection: Levamisole and Ascaris lumbricoides. J Parasitol 1996;82:527-30.
39. Anderson RM, Medley GF. Community control of helminth infections of man by mass and selective chemotherapy. Parasitology 1985;90:629-60.
40. Holland CV, Asaolu SO, Crompton DW, Whitehead RR, Coombs I. Targeted antihelmenthic treatment of school children: Effect of frequency of application on the intensity of Ascaris lumbricoides infection in children from rural Nigerian villages. Parasitology 1996;113:87-95.

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