Bolus obstruction by *Ascaris lumbricoides*

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Summary

Seventy-three cases of obstruction due to a bolus of *Ascaris* worms are reviewed. The diagnosis was made on the basis either of a characteristic palpable mass or a characteristic radiographic appearance. In 67 cases conservative treatment was successful. Six patients came to surgery, 5 because of deterioration. There were no deaths. The need for careful reassessment is stressed.

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Infestation with *Ascaris* occurs principally in underdeveloped countries with a humid climate, but in some areas of developed countries 8 - 25% of the children are infested.[1] Overall, probably 1 in 4 of the world's population is infested.[2] Two hundred thousand eggs are laid daily by each adult female worm.[2] The eggs resist freezing or drying and survive for several years. Under warm, moist, shady conditions the eggs develop into infective larvae which hatch when ingested. Children usually ingest the eggs present in soil contaminated with human faeces; the infestation rate in some areas may be as high as 70%.[3] The intestine may hold up to 5 000 worms.[3] The parasites deprive the patient of protein and vitamins,[1,4] and induce changes in the jejunal mucosa which lead to malabsorption. The larvae penetrate the intestinal wall and enter the portal circulation, passing through the liver into the lungs, where large-scale infestation may cause pneumonitis. They then pass up the bronchi to be swallowed again. They develop into adults in the jejunum and survive there for approximately 1 year.[4,5] In persistent infection eosinophilia is common, and IgE levels are greatly elevated, returning to normal after treatment.[4] The complication rate is 2 per 1 000 infested children per year,[1] being maximal when the worm burden exceeds 100.[2] Obstruction of the intestine by a bolus of worms, biliary ascariasis,[3,6] pancreatitis and acute appendicitis are the commonest complications necessitating surgical treatment. Penetration of the bowel with acute peritonitis or chronic granulomatous peritonitis is rare.[7] These complications of ascariasis carry a significant mortality.[3,8]

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Patients and methods

The records of 73 children with acutely symptomatic bolus obstruction admitted to the paediatric surgical wards of the Livingstone Hospital, Port Elizabeth, during the 4-year period 1973-1977 are reviewed. The diagnosis was made primarily on the basis of a palpable mass and characteristic radiographic features.

Fifty of the children were Coloured, and 23 Black. Males outnumbered females by 41 to 32. The maximal incidence was from 2 to 8 years, with a peak at 5 years. Colicky central abdominal pain (60 cases) and vomiting (65 cases) were the major symptoms. Worms had been vomited up by 19 children and had been passed *per rectum* by 8. Constipation was a significant symptom in 18 cases and diarrhoea in 15. Symptoms had been present for up to 7 days. Only 3 children had received a vermifuge before the onset of symptoms.

Many of the children were undernourished, but hydration was adequate in most. Pulse rate and temperature were not elevated on admission; if they rose, then surgery was indicated. The cardinal finding was a mass in the abdomen in 48 cases, with multiple masses in 16 of these. Tenderness was present in 24 patients and distension in 17.

Abdominal radiographs were available in 62 cases, of which 12 appeared normal. Forty-four showed features of *Ascaris* infesta-

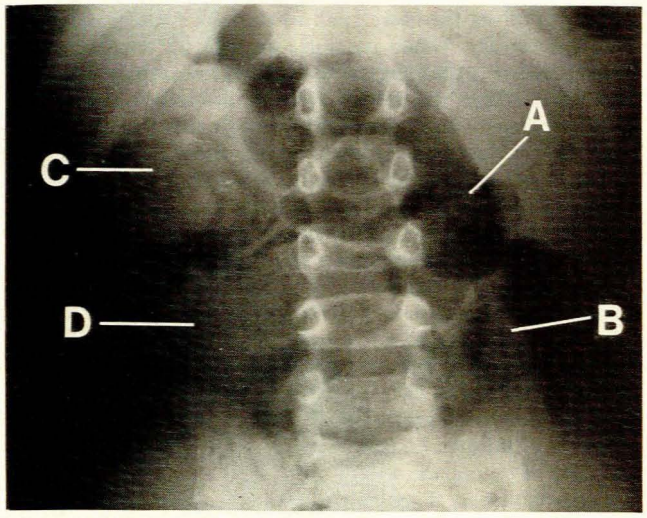

Fig. 1. Abdominal radiograph showing several worm boluses: A — a convoluted mass of worms outlined by gas; B — a bolus containing linear radiolucent shadows sandwiched between two gas shadows distorting the medial one; C — this bolus contains multiple linear radiolucent shadows. The gas bubble below this outlines several worms and is distorted by this bolus and another (D) which contains several fine radiolucent gas bubbles.

tion (Figs 1 and 2) and 5 showed a dilated small intestine and air/fluid levels. In 1 case the worms were detected on a subsequent barium meal. Seventy-nine per cent of plain abdominal radiographs were therefore abnormal and worms were seen in 70%.

Figs 1 and 2 show worms outlined against intestinal gas, either singly or in large numbers.[9] They appeared longitudinally, obliquely, in transverse section or as conglomerate coiled masses. Air trapped within the worm bolus assumed irregular shapes — often elongated, and multiple fine bubbles produced a soap-bubble effect. Some of the gas was within the worm intestine, and this too appeared as long narrow radiolucencies or fine bubbles. On the erect film a mass of worms sometimes intruded into fluid levels as an irregular hump.

Treatment was initially conservative. Oral intake was stopped and intravenous fluids administered. Nasogastric decompression was instituted when distension or vomiting was present. Analgesics and antispasmodics were administered as required. A vermifuge was withheld until the signs and symptoms of obstruction had resolved.

In 67 cases the condition resolved with conservative treatment, and 51 of these patients passed worms in the ward following a vermifuge. The remainder were discharged immediately after administration of the vermifuge. There were no further episodes of obstruction following the administration of the vermifuge. A further dose was administered 6 weeks later to deal with any worms which might have been in the larval phase at the time of admission.

Surgical intervention was undertaken in 6 cases (in 1 inadvertently on a misdiagnosis of appendicitis). The indications included the passage of offensive stools, rectal bleeding, pyrexia, tachycardia, increasing distension, and peritoneal irritation — all ominous signs. In 1 case the deterioration was due to concomitant hepatic ascariasis. In 2 cases gangrene had supervened and resection was necessary, and in 1 case doubtful areas were oversewn. In 1 case, enterotomy with removal of worms was performed; the child developed endotoxic shock, and was fortunate to survive this and subsequent treatment for adhesion obstruction. In 2 children the worm bolus was milked into the caecum. There were no deaths in this series.

Discussion

A clinical diagnosis of bolus obstruction can be made in almost all cases. A history of worm infestation is suggestive, but a firm diagnosis should be based either on the presence of a typical mass or on the radiographic features. The presence of eosinophilia is of little value in the group of patients at risk because there is usually a high incidence of other parasites in these cases.[3]

Wong[10] suggested that the worm mass might be confused with an intussusception and, in addition, that worms can initiate an intussusception by stimulating the bowel. Intussusception does occur in children in this age group and, as would be expected, some of these have worms in the upper jejunum. The presence of worms even on the radiograph should not upset a clinical diagnosis of intussusception.

Worm masses can be distinguished from intussusception on clinical grounds. Multiple tubular masses are almost invariably due to worms. An intussusception follows the line of the colon, lying across the upper abdomen or vertically down the left side, while worm masses lie in the small intestine, frequently occupying the right iliac fossa or the central or lower abdomen, or lying transversely in the left iliac fossa. An intussusception feels smooth and may harden as the intestine contracts. A mass of worms has a characteristic granular surface. A worm mass in the lower abdomen can be pushed onto a finger in the rectum and the

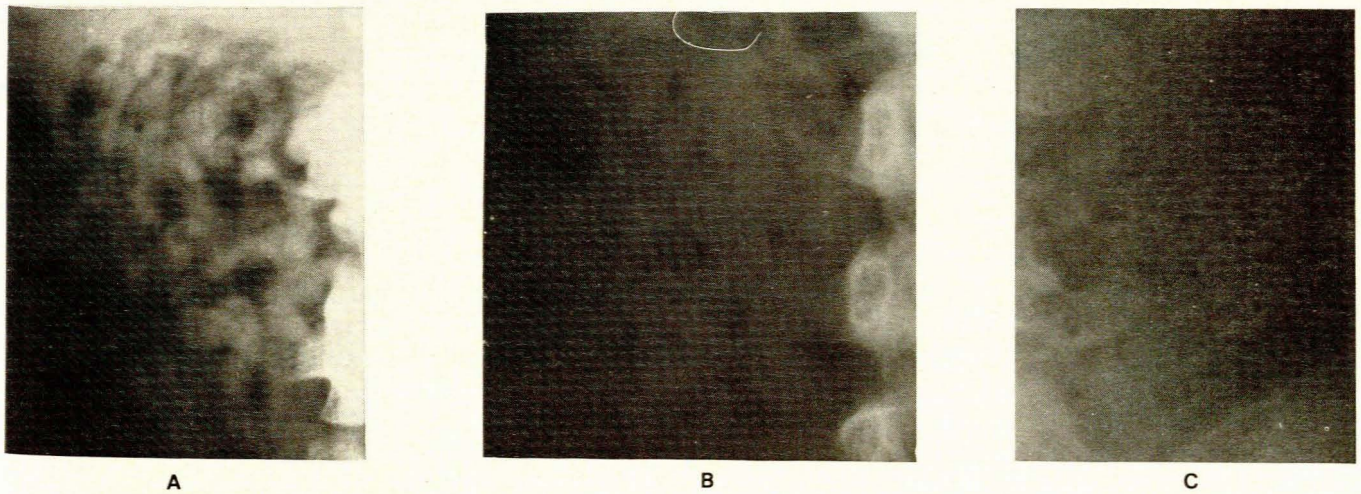

Fig. 2. Radiological structure of the worm bolus. A conglomerate mass of worms is defined in (A). Irregular gas shadows (B) and curled linear shadows (C) are due to gas trapped within the bolus. The long coiled shadow in (A) as well as some of the shadows in (C) may be caused by gas within the worms themselves.

individual worms felt. A bolus of worms seen in the same area on the abdominal radiograph provides further support for the diagnosis. If doubt exists, a contrast enema may be useful, but in endemic areas this is seldom necessary.

Distension and tenderness may mask the mass. If present, they should subside rapidly with conservative measures. Increasing distension, rigidity, rebound tenderness, tachycardia, pyrexia, offensive stools or melaena, all suggest that bowel viability is impaired or that an alternative diagnosis should be considered. Laparotomy is then indicated.

Plain radiographs of the abdomen are of great value in diagnosis particularly when a mass is not palpable (Figs 1 and 2).[9] The features of a worm bolus may be mimicked by faeces in the colon but because the obstruction is usually incomplete, gas within the colon permits the distinction to be made anatomically. Complete intestinal obstruction indicates firm impaction suggesting intestinal damage and is cause for concern.

We have shown that linear radiolucencies due to gas within the worm intestine are present in the radiographs of 64% of children with ascariasis but without obstruction, and the mere presence of isolated worms on the radiograph should not upset an alternative diagnosis.[9] A positive radiological diagnosis depends on the demonstration of a worm bolus as a conglomerate mass of shadows within the small intestine.

The condition resolves with conservative measures in over 90% of cases, but in the remainder clinical deterioration necessitates operation. We have withheld anthelmintics in the belief that paralysis of the worms prevents resolution and increases the risks of gangrene.[3]

At operation, the bowel, usually the lower ileum, is tightly contracted around the worm bolus. The bolus is seldom large enough to cause vascular impairment, but mucosal sloughing, a fibrinous serosal reaction, and areas of full-thickness gangrene are found. These are caused by substances released by the worms and for this reason surgery should not be delayed when the clinical features give cause for concern. Most authors report volvulus of loops of bowel laden with worms. We have not encountered this.

At operation, the worms can often be milked into the caecum to relieve the obstruction. In the occasional case where there is risk of rupturing the bowel, and when there is gangrene, resection is necessary. When possible, we milk all worms into the bowel adjacent to the gangrenous area and resect this area as well. In 1 case, where the worms were so numerous that a large segment of small intestine would have required resection, mobilization of several inches of intestine permitted the distally transected bowel to be held in a surgeon's splash bowl while the worms were milked out. The proximal end was then divided without contamination. Enterotomy with removal of worms results in serious contamination and should not be performed.

Penetration of anastomoses by worms is considered a distinct hazard. We have not encountered this, perhaps because bowel resection in this age group is not frequently performed in our hospital. If, when resecting for bolus obstruction, we were unable to completely clear the bowel of worms we passed a tube up to the duodenojejunal flexure and injected piperazine as the tube was withdrawn hoping to paralyze the parasites. A further oral dose of piperazine was given as soon as intestinal function was re-established. The value of these steps is unproved, however, and piperazine has been replaced by newer anthelmintics.

Bolus obstruction has been associated with a significant mortality.[3] The results in this series were achieved by a high degree of diagnostic awareness and by frequent and careful reassessment.

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