

Geophagia: A rare cause of Intestinal Obstruction

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Abstract

We report a 4-year-old male child, who presented with abdominal distension and absolute constipation for 4 days. The mother revealed that her child had been picking up sand and eating it for about a month prior to admission. The child was blind since birth and suffered from cerebral palsy and developmental retardation. Abdominal examination revealed a grossly distended abdomen, but no tenderness or guarding. The abdominal swelling had a doughy feel that was dull on percussion. Rectal digital examination revealed a solid sandy mass. Plain abdominal x-ray showed opacifications in both the large and small bowels. A diagnosis of intestinal obstruction due to geophagia was made. The patient was treated conservatively including rectal washouts. The obstruction was relieved and he started to pass normal stools on the 7th day.

We discuss this rare case of intestinal obstruction due to geophagia. We review this feeding abnormality. We describe our management including our novel and simple rectal washout technique. The problems that occurred during the course of the treatment and the role of multi-disciplinary approach are highlighted.

Keywords: Pica; Bezoar; Rectal impaction; Rectal washout.

The term Pica is derived from the Latin (Pica pica). This is a bird - also called magpie- that is famous for its indiscriminate eating habits. Pica is an eating disorder, defined as the persistent craving and the compulsive eating of non-nutritive substances for a period of at least one month, without an association of an aversion to food¹. To be considered abnormal, this behavior must not be part of a cultural or religious practice, or developmentally inappropriate. Subset forms of Pica include eating hair (trichophagia), ice (pagophagia), starch and talcum powder (amylophagia), as well as eating earth, soil, and clay (geophagia). The subsets are still expanding, including excessive eating of normal substances (tomatophagia)².

Pica may lead to the formation of ball masses in the stomach that may pass completely or partially into the small bowel. These balls are called bezoars. The term bezoar is derived from the Arabic *badzehr* or the Persian *padzhar*, meaning a counter poison or antidote³.

It is defined as an accumulation of indigestible exogenous matter in the stomach and intestine. Bezoars are named according to the substance forming their core, such as trichobezoar (hair), phytobezoar (leaves, seeds or vegetable fibres), geobezoar (sand), and so on. They usually form in the stomach where they may cause non-specific symptoms, such as epigastric pain, fullness and vomiting. However, when they migrate to or form within the small or large intestine, they can cause obstruction.

Geophagia (the deliberate consumption of earth, soil, or clay) is a form of pica that has been known since the dawn of history. Greek (Hippocrates), Roman, and Arab text books mentioned the disorder. Ibn Sina (980-1037), also known as Avicenna, made a detailed mention of geophagia including the way to cure it in children and pregnant women⁴.

In some areas of the world geophagia is culturally acceptable. However, in modern medical literature, it has been largely confined to some categories of people, such as pregnant women, children, psychiatric and mentally disabled patients.

The aetiology of pica and its subset geophagia is controversial. It is likely that there is more than one factor involved, including nutritional

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and psychological factors. One of the important and commonly studied factors is iron deficiency. It is still controversial whether geophagia is a cause or effect of iron deficiency anaemia. While some believe it is the cause of the iron deficiency since it is also found in non iron deficient individuals⁵, more recent studies showed that it is an effect that disappears once the deficiency is corrected^{6,7}. The prevalence of Geophagia is difficult to know because patients only seek medical attention when complications occur. Potential complications include parasitic and fungal infections, metabolic abnormalities, heavy metal poisoning, electrolyte and other elemental deficiencies.

Serious complications of geophagia have been described, such as acute abdomen, intestinal obstruction, and colonic perforation resulting in a high rate of morbidity and mortality from 'sandy' peritonitis⁸. Interestingly, geophagia and its complications are described in animals such as dogs, horses, elephants and others⁹.

A few and contrasting reports exist regarding the management of intestinal obstruction in cases caused by geophagia. These range from conservative regimes to bowel resection and anastomosis with different levels of success^{8,11,12}.

This case report highlights the importance of realizing and diagnosing this problem. It describes in details our conservative management including a novel technique of rectal washout without a need for general anaesthesia or sedation. The excellent result obtained from conservative treatment and avoidance of laparotomy emphasizes the importance of early diagnosis.

Case Report

The surgical team was asked to see a male child of 4 years in the paediatric emergency room. The child was brought by his mother complaining of absolute constipation and abdominal distension for 4 days. There was no history of vomiting. The mother, despite being not the world best historian, managed to tell about her child abnormal eating habit. He apparently had been picking soil and sand at

their house, using his feet and hands, and eating it for one month prior to admission. He also scratched and picked clay from the wall of his room. The child was blind in both eyes since birth, but his other senses were intact and had no problem using his arms and hands. The patient passed urine in decreasing amounts over the previous few months, but there was no history of dysuria or haematuria. There was no past history of hospitalization, but the patient attended ophthalmology and paediatrics outpatient clinics for his blindness and development delay.

His mother's obstetric history revealed 3 stillbirths and 5 normal deliveries. She had fever and jaundice in the first trimester, and premature rupture of the membranes in the 3rd trimester of her pregnancy with this child.

General examination revealed an obviously distressed child who is in pain. He was pulling on his penis from time to time.

The child showed a global delay in developmental milestones. His length (48 cm) and weight (7Kgm) were below the 3rd percentile. He suffered a total body involvement cerebral palsy. His vital signs were: pulse 120/minute, respiratory rate: 42/minute, and axillary temperature 37.8⁰ C. Examination of the head and neck revealed an absent left eye (anophthalmia), and underdeveloped right eye (microphthalmia). The conjunctiva was pale. He had oral thrush but no cervical lymphadenopathy. Chest and heart examination was unremarkable.

Fig. 1 The Child on Admission (Note abdominal distension and penile irritation)



Abdominal examination revealed a grossly distended abdomen with everted umbilicus

(Figure1). There was no evidence of hernias, or hepatosplenomegaly. The abdominal swelling/mass had a doughy feel to it, and was dull on percussion. Rectal digital examination with the little finger revealed a solid sandy mass and his dipper was soiled with sand.

Plain abdominal x-ray (Figure 2) showed global opacifications of the gastrointestinal tract involving the stomach, the small and large intestine, rectum and anal canal. The opacification looked like a radio-opaque contrast study of the bowel, but on a closer look, it had a 'ground glass' or 'sandy' appearance.

Abdominal ultrasound showed bilateral hydronephrosis and hydroureters, distended urinary bladder, both kidneys are hypoechogenic and hydronephrotic with loss of cortical medullary differentiation, the size was normal, no calculi seen. Picture was suggestive of urinary output obstruction, chronic renal disease or chronic infection.

Initial blood investigations showed microcytic anaemia, leukocytosis, thrombocytosis, and hypocalcaemia (Table1).

Fig. 2 Plain Abdominal X-ray on admission showing 'Sand and pebbles-appearance' filling the gastrointestinal tract down to the rectum and anal canal mimicking a contrast study



Table 1 Blood investigations on admission

Blood Test	Patient's Value	Reference range
Haemoglobin	8.0- 6.6 gm/dl (day1&2)	10-13
White Blood Cells	14.3 x 10 ⁶ /L	3-10
Red Blood Cells	4.2 x 10 ⁶ /L	4.2-6.9
Platelets	586 x 10 ⁶ /L	150-350
Haematocrit	25%	30-40%
MCV	59.4 fl	76-100
MCH	15.7 pg	27-32
MCHC	26.4g/dl	32-36
Urea	54 mg/dl	10-50
Creatinine	1.3 mg/dl	0.5-1.4
Sodium N ⁺	133 mmol/L	130-148
Potassium K ⁺	3.9 mmol/L	3.5-5.0
Calcium Ca ⁺⁺	7.7 mmol/L	8.5-10.5

His urea was a bit higher than normal, and creatinine levels were on the high side of normal.

A diagnosis of intestinal obstruction due to geophagia was made. This was further complicated by features of microcytic hypochromic anaemia and obstructive uropathy in a child with congenital problems.

Our main urgent objective was to relieve the intestinal obstruction. A trial of conservative treatment was planned. This consisted of nothing by mouth, nasogastric tube and suction, intravenous fluids and broad spectrum antibiotics, in addition to antifungal agent for his oral thrush. A urinary catheter was introduced smoothly to monitor the urine

output. It drained 500 mls of normal colour urine in the first hour. A urine specimen was examined and was normal.

A regimen for rectal wash out was designed (Figure 3).

Fig.3a The assembled Fig.3b Rectal irrigation apparatus



This was carried out by our doctors once a day. The rectal wash out succeeded in evacuating sand and small pebbles (Figure 4).

Fig. 4 Sand and small pebbles retrieved by rectal washout



The patient's mother took the liberty to feed her child after 24 hours, without doctors' orders, but as no complications ensued, we sanctioned the feeding but allowed only fluids and light diet. The rectal washout started to have visible effects on abdominal diameter and child's comfort after 2-3 days from its use. A plain abdominal x-ray on day 6 showed marked improvement, with free stomach and upper bowel. The sand concretions confined to the left colon and rectum (Figure 5).

Fig. 5: Plain Abdominal x-ray after 6 days of conservative treatment



The child's abdomen looked still distended around the umbilicus (Figure 6).

The patient started to pass normal stools from the 10th day onwards and his abdomen looked and felt normal (Figure 7).

An abdominal x-ray on the 14th day showed complete evacuation of sand from the gastrointestinal tract (Figure 8).

Fig. 6 The child after 6 days: note the abdominal distension



Fig. 7 Day 10: Normal abdominal contour



Fig.8 : Plain abdominal film on day 15 showing complete evacuation of sand and pebbles



Further investigation of his anaemia during this admission showed serum iron of 39 ug/dl (50-170), total iron binding capacity of 491 ng/ml (250-425), and serum ferritin of (included iron study (**Table2**). This proved the presence of chronic iron deficiency. Hence the patient was prescribed therapeutic doses of oral iron (5-6 mg/Kg/day) in the form of ferrous sulfate, plus folic acid and multivitamins. During the course of treatment, however, the patient developed bilateral lower limb oedema, and we were baffled whether the cause was fluid overload, the patient being suffering from bilateral renal problems. A clinical systemic review of the cardiovascular system was unremarkable. Investigations including a chest x-ray, renal and liver functions were also normal. Blood investigations, unexpectedly, showed decreasing haemoglobin at 5 gm/dl. Packed cell transfusion of 105 mls was done (3mls/Kg/1g deficit). His feet oedema disappeared promptly and completely.

The patient was discharged in a good condition after successful treatment of his bowel obstruction. He was transferred from the surgical to the paediatric ward and thereafter to the department of paediatric urology at another health facility to deal with his urinary system problem.

Discussion

Pica and geophagia, as defined above, are not uncommon in our culture. Its prevalence is unknown, as patients only present when complications occur. It is, therefore, important that doctors are aware of the problem and the morbidity and mortality associated with it. Intestinal obstruction, per se, is one of the common presentations at casualty, accounting for up to 20% of emergency surgical admissions. Geophagia, however, as a cause of intestinal obstruction remains rare and only a handful of case reports describe it in the English literature^{8, 11-14}.

The diagnosis is mainly dependent on taking a good history. In a child this depends on the awareness of his parents, usually the mother. The diagnosis can be confirmed simply by a plain abdominal x-ray that shows opacifications in the bowel similar to a contrast (barium) study, with the exception that there would be no history of such examination in the near past. In addition, sand usually shows a characteristic ground glass appearance. We propose that the term 'Sandy appearance' is a better descriptive term in such cases.

Reports on the surgical complications of geophagia and their management are few, and variable. The management depended on the type of geophagia such as sand or stones, and so on. It also depended on the clinical presentation of the patients and whether they had soft abdomen or signs of peritonitis. Conservative management¹¹, manual evacuation of stones under sedation¹², and bowel resection and anastomosis⁸ were all mentioned. These reports are not only few, but also contrasting and with different levels of success, morbidity, and mortality.

Conservative management was successful in this case. The decision was taken as the

patient had a soft non-tender abdomen. The conservative treatment consisted of a regime of nil by mouth, intravenous fluids, broad spectrum antibiotics, using metronidazole infusion and a cephalosporin. The antibiotics were used in anticipation of any complications: from translocation of bacteria to perforation. The absence of vomiting was noted and welcomed. It is also notable that oral feeding was started after just one day by his mother and went without complications. The main stay of our conservative treatment, however, was the rectal wash out. As we never had an experience of such cases, we had to review the literature and consult with a paediatric surgery unit, who suggested doing a rectal wash out. No information on the precise technique, however, was obtainable from any source. We had to improvise and design our own technique. Eventually we used a simple and cheap system for the rectal washout consisting of 2 infant nasogastric tubes. The smaller one-size 5French- was connected to a saline bag and introduced into the rectum. This was used for the irrigation of the rectum. Another larger nasogastric tube (size 8F) was also introduced inside the rectum for the efflux, which is allowed to drain freely into a bowel (Figures 3, 4). This wash was done once a day, using 500mls of saline that was made to flow slowly. We were cautious not to induce perforation or anal irritation and hence we made sure to moisten the anal area with a local anaesthetic gel (xylocaine) before and after each wash.

The cause-effect relationship of geophagia and iron deficiency anaemia is controversial as mentioned above⁵⁻⁷. One ferrokinetic study indicated that in some children with geophagia, there was ineffective erythropoiesis (in the presence of a normal bone marrow), and increased splenic sequestration of red blood cells¹⁵. Another in vitro ecological study showed that black earth (ingested by pregnant ladies in some parts of Africa) absorbed iron, and potassium, but released calcium when immersed in iron-enrich Ringers lactate solution¹⁶. This ingested earth may, therefore, cause chelation of iron and other important elements, such as

zinc¹⁵ rendering them unavailable for the gut mucosa. Zinc is a cofactor for the enzyme aminolevulinic acid dehydrogenase (ALAD) that is essential in haem synthesis during erythropoiesis.

This child definitely suffered from chronic iron deficiency anaemia as was proved by his blood investigations. During his stay in the surgical department he was treated by oral iron and multivitamins. This was, apparently not enough, and his haemoglobin unexpectedly decreased further and he developed bilateral feet oedema. The iron deficiency and oedema was only corrected by transfusion with packed cells. This case report may, therefore, support the view that there is a problem of iron absorption from the GIT in children with geophagia, and suggests that their treatment, at least initially – if anemia is severe- should not depend on oral therapy but on blood (or packed cells) transfusion.

Whether geophagia is a cause or effect of iron deficiency will continue to raise discussion. We propose that a vicious circle is created whereby mild iron deficiency anaemia may induce intuitive geophagia, which in turn worsens the iron deficiency by interfering with the absorption of iron and zinc and other important substances for erythropoiesis.

Other investigations such as serum folate, zinc, and other elements of the blood were not done due to either the inavailability or the cost of such tests, especially if they had to be repeated. It is worth mentioning that, this is a common problem that faces both patients and doctors practicing in low income countries. Credit goes to some of the doctors who donate their effort and money for the sake of their patients.

In a better set up this patient could have a genetic mapping done, since he could be harbouring some kind of syndrome other than that described by Prasad¹⁷. The child didn't have all the components of the 'geophagia syndrome' described by Prasad, especially hepatosplenomegaly, and his iron deficiency was not corrected readily by oral iron. A multidisciplinary approach is important involving psychiatrists and social service, community medicine, in addition to the

paediatric team, in order to prevent the recurrence of this condition and to survey the family and the community where this child has come from.

Conclusion

Geophagia is a rare but important cause of intestinal obstruction. Awareness of the problem is essential for early diagnosis and successful treatment. Diagnosis is based on good history and a plain abdominal X-ray. Conservative treatment with rectal washout is safe and gives good results in patients with no symptoms and signs of peritonitis. Treatment of the iron deficiency anaemia associated with geophagia is more efficiently done parenterally rather than orally. We propose that geophagia is both an effect and a cause of iron deficiency, thus a vicious circle is created. Geophagia can be the whole mark of a group of syndromes in a patient that warrants multidisciplinary medical and social team-cooperation for prevention and cure.

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