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ORIGINAL ARTICLE

DIOSPYROBEZOAR INDUCED SMALL BOWEL OBSTRUCTION IN CHILDREN

Zahur Hussain[1], Vikrant Singh[2], Suneel Mattoo[3], Ashufta Rasool[4], Barinder Kumar[5], Shadi Lal Kachroo[6]

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ABSTRACT: Phytobezoars are an unusual cause of small bowel obstruction (SBO). We report 14 patients presenting with episodes of small bowel obstruction from phytobezoars. 14 patients were admitted with SBO due to diospyrobezoar. 21.4% patients were females and majority belonged to rural areas. Majority were admitted to the hospital in November and December, when the fruit is highly consumed. Ileum was the commonest site for the location for phytobezoars (50%) followed by jejunum (28.6%). All patients underwent surgery including manual fragmentation and milking into cecum in 50% patients, enterotomy in 21.4% patients, resection anastomosis in 14.3% patients and resection with exteriorization of gut in 14.3% patients. Phytobezoars including diospyrobezoar should be considered as a rare but important cause of small bowel obstruction in children and in adults with known risk factors hailing from rural areas. Surgical treatment with manual fragmentation and milking of bezoar into cecum is effective in most cases.
KEYWORDS: Gastrointestinal phytobezoars, Diospyros lotus (Persimmon).

INTRODUCTION: Phytobezoar is a concretion composed of vegetable matter such as skin, seed and the fibre of fruit and vegetables.[1] Phytobezoars are the most common types of bezoars associated with small bowel obstruction with incidence ranging from 0.3 to 6% of all intestinal obstructions.[2-4] They have been known to exist in the stomach and intestines of animals for centuries but it was not until 1854 that Swain made the first post-mortem diagnosis of phytobezoar in humans.[5] The majority of series in the early twentieth century reported many gastric phytobezoars, presenting with dyspepsia, abdominal distension or gastrointestinal haemorrhage, but small bowel phytobezoars appeared to be uncommon (5%).[5,6] Previous gastric resection, gastrojejunostomy, pyloroplasty, ingestion of high-fiber foods, persimmon fruit ingestion, incomplete mastication habits, and autonomic neuropathies in patients with diabetes are predisposing factors for bezoar formation.[7] Persimmon (Diospyros) is the commonest cause of phytobezoar (Diospyrobezoar) formation reported in the literature.[5] Clinical picture depends on the amount consumed and also on the location of bezoar.

Gastric lavage, and endoscopic or surgical techniques, can be used in the treatment of gastrointestinal phytobezoars. L-cysteine, metoclopramide and cellulose, papain and cellulose, pineapple juice, normal saline solution, sodium bicarbonate, hydrochloric acid, pancrelipase, pancreatin, 1-2% zinc chloride, and coca cola have been used for the disintegration of the bezoar during gastric lavage.[8-12] Main surgical techniques include manual fragmentation and milking to cecum, enterotomy, and resection and anastomosis in complicated cases.[13]

Children are particularly at an increased risk due to unsupervised consumption of the fruit. Limited data exists regarding presentation and outcomes of patients with small bowel obstruction due to Diospyros with a few case reports published so far.

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The main aim of this study was to determine the clinical characteristics, treatment, complications and outcomes of various surgical procedures performed in paediatric patients presenting with small bowel obstruction due to Diospyros.

MATERIAL AND METHODS: In the present case series, the medical records of 14 patients, who had been admitted to the General Surgery Department in Government Medical College Hospital Jammu between 2008 and 2012, and underwent surgical intervention with a diagnosis of small bowel obstruction due to diospyrobezoar, were reviewed.

Demographic characteristics, predisposing factors, clinical and radiological findings, diagnostic and therapeutic methods were recorded from the patient records. Written informed consents was obtained from all patients.

RESULTS: During the study period, 14 patients were admitted with SBO due to diospyrobezoar with mean age of 7.8 years. Three (21.4%) patients were females and majority of patients (85.7%) belonged to rural areas.

Ten (71.4%) patients were admitted to the hospital in November and December, when the fruit is highly consumed and makes population vulnerable to development of SBO. The remaining 4 (28.6%) patients had a history of consumption of dried Diospyros and were admitted between March and June.

Acute abdominal pain, nausea and fecaloid vomiting were the chief complaints and reasons for hospital admission in all patients. Physical examinations revealed abdominal distension, rigidity, and rebound tenderness, indicating an acute mechanical bowel obstruction.

Plain abdominal radiographs in the standing position showed nonspecific signs such as dilated bowel loops and air-fluid levels. Initial diagnosis was based on the history, physical exam and clinical condition of patients and was subsequently confirmed by abdomen computed tomography in 2 patients (14.3%), and intraoperatively in 8 patients (57.14%).

Ileum was the most common site for the location for phytobezoars (50%) followed by jejunum (28.6%), duodenum (14.3%) and stomach (7.1%). Only 1(7.1%) patient had multiple ileal bezoars. No concurrent gastrobezoars were found in patients with small bowel bezoars.

All patients underwent surgical intervention including manual fragmentation and milking into cecum in 7(50%) patients, enterotomy in 3(21.4%) patients, resection anastomosis in 2(14.3%) patients and resection with exteriorization of gut in 2(14.3%) patients.

Pathological examinations were performed. Macroscopically, the material was composed of plant fibres with the seed of Diospyros at the center. Microscopic examination revealed no cellular elements, but a material composed of plant fibre and food residue.

Postoperative complications included wound infection in 3(21.4%) patients, atelectasis in 1(7.1%) patient, intra abdominal collection in 1(7.1%) patient and small bowel fistula in 1(7.1%) patient.

Age group (years)	n=14	Percentage
1-5	2	14.3
5-8	4	28.6
8-13	8	57.1

Table 1

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Location	n=14	Percentage
Stomach	1	7.1
Duodenum	2	14.3
Jejunum	4	28.6
Ileum	6	42.9
Multiple	1	7.1

Table 2

Procedure	n=14	Percentage
Enterotomy	3	21.4
Manual Fragmentation and milking	7	50
Resection anastomosis	2	14.3
Resection with exteriorization of bowel	2	14.3

Table 3

DISCUSSION: Small bowel obstruction is a common surgical emergency encountered in childhood and ranks high in importance as an acute surgical catastrophe in infancy and early childhood.

Gastrointestinal bezoars are an important cause of small bowel obstruction and are classified according to their contents. Phytobezoars are the most common type of bezoars, formed by excessive consumption of herbal nutrients. Celery, grape, prune, Diospyros lotus and pineapple are the main nutrients responsible for phytobezoars. Such nutrients contain high amounts of indigestible fibers, such as cellulose, hemicellulose, lignin and fruit tannins. Trichobezoars, composed of hardened hair and hair-like fibers, are usually encountered in children with mental retardation and in adults with mental illness. Lactobezoar occurs in low birth weight infants fed with concentrated milk and formulas in the first week of life, pharmacobezoar occurs due the use of concentrated drug formulas (cholestyramine and kayexalate); and food bezoars occur due to the use of concentrated food formulas.[13]

Phytobezoars, though a rare cause of small bowel obstruction, are the most common types of bezoars associated with SBO and the reported incidence being 0.4 to 4% of all intestinal obstructions.[14] Persimmon is the commonest cause of phytobezoar formation reported in the literature. [15]

The origin of word "bezoar" derives either from the Arabic term "badzehr" or the Persian word "padzahr," which denote counterpoison or antidote. This word was applied to a greenish, hard concretion found in the fourth stomach of the Syrian goat. The stone was felt to prevent poisoning and came to Europe as the bezoar stone, which was highly prized for its medicinal properties.[5,6] Izumi et al.[16] proposed that the formation of persimmon bezoars was due to a soluble tannin termed 'Shibuol', which forms a coagulum when the astringent unripe fruit comes into contact with dilute hydrochloric acid in the stomach. This may explain why most phytobezoars encountered nowadays are in patients who have previously undergone peptic ulcer surgery.[17-21] By reducing acid secretion, interfering with the pyloric control of gastric emptying, or preventing mixing of food by either resection or bypass of the antrum, phytobezoars may be produced. By adding a pyloroplasty or

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gastrojejunostomy, a larger and less digested fruit bolus may be deposited into the duodenum or jejunum to form the nucleus of the phytobezoar.

Other risk factors include adhesions due to abdominal surgery, inadequate chewing, and excessive consumption of herbal nutrients including high amounts of indigestible fibers.[8,13] Furthermore, delayed gastric emptying, which results from diabetic neuropathy, hypothyroidism, and connective tissue diseases, forms a basis for the development of gastrointestinal phytobezoars[13] Chisholm et al. retrospectively examined 13 patients with phytobezoars, and found that all the patients had a history of persimmon consumption, whereas 11(84.6%) had a history of gastric surgery.[22] Krausz et al., in their retrospective study on 113 patients, showed that 106(93.8%) patients had undergone gastric surgery, whereas 103(91.1%) had a history of persimmon consumption.[21] In a study by Gökhan Ertuğrul et al, all 13 patients (100%) had a history of Diospyros lotus consumption, whereas four (30.7%) had a history of previous gastric surgery. Furthermore, four (30.7%) patients had diabetes mellitus and three (23%) had a history of using dental implants.[13] In the present study, all patients were children with no risk factor other than consuming unripe fruit.

The main clinical symptoms are abdominal pain, epigastric distress, nausea and vomiting. In addition, sensation of fullness, dyspepsia, dysphagia, anorexia, weight loss, and gastrointestinal bleeding may be seen.[22-26] Decreased bowel sounds, rebound tenderness, rigidity, distension, diarrhoea, constipation, nausea and vomiting may be seen in complicated cases.[21]

Gastritis, ulcer, and gastric perforation may be seen. Small bowel phytobezoars usually occur due to the extension of gastric phytobezoars.[21,27] However, small intestinal phytobezoars may also be seen in patients with underlying diseases, such as diverticulitis, stricture, and tumor.[9,28-29] Small bowel obstructions due to phytobezoars usually occur in the terminal ileum and jejunum, which are the narrowest parts of the small intestine.[30] Chisholm et al identified phytobezoars in the stomach in two (12.5%), in the jejunum in four (25%), in the ileum in nine (56.2%), and in more than one region of the small intestine in two (12.5%) patients.[22] Krausz et al. detected phytobezoars in the stomach in 13(11.5%), in the small intestine and stomach in 20(17.6%), and in the small intestine in 80(70.7%) patients.[21] Gökhan Ertuğrul reported phytobezoars in the stomach alone in three (23%), in the jejunum and stomach in two (15.3%), in the jejunum alone in two (15.3%), and in the ileum alone in six (46.1%) patients.[13]

In the present study, phytobezoars were found in in the stomach in 1(7.1%) patient, duodenum in 2(14.3%), jejunum in 4(28.6%), and in the ileum alone in 7(50%) patients out of which 1(7.1%) patient had multiple ileal bezoars. No concurrent gastrobezoars were found in patients with small bowel bezoars in our study.

Upper gastrointestinal endoscopy and radiological imaging methods are used for the diagnosis of gastrointestinal phytobezoars. Plain abdominal radiographs may show dilated intestinal loops, air-fluid levels and thickened intestinal wall.[28] Barium radiography is contraindicated in patients with suspected complete obstruction and perforation. Phytobezoars may appear as an echogenic intraluminal mass and a remarkable posterior acoustic shadowing on abdominal ultrasound but it is operator dependent. A dilated small bowel loop with a well-defined, round-shaped, heterogeneous, intraluminal mass distally with air bubbles, is typical on abdominal computed tomography. In the present study, diagnosis was made by abdominal tomography only in 2(14.3%) patients preoperatively and in the rest, a diagnosis was made intraoperatively.

History of ingestion of persimmons could be obtained in all patients, either preoperatively or postoperatively.

Gastric lavage, and endoscopic or surgical techniques, can be used in the treatment of gastrointestinal phytobezoars. L-cysteine, metoclopramide and cellulose, papain and cellulose, pineapple juice, normal saline solution, sodium bicarbonate, hydrochloric acid, pancrelipase, pancreatin, 1-2% zinc chloride, and coca cola have been used for the disintegration of the bezoar during gastric lavage.[8,9, 10-12] Endoscopic disintegration requires normal pyloric function and absence of duodenal obstruction.[10] If the phytobezoar is not large in size, it can be removed using a basket catheter or by direct aspiration.[31]

Surgical therapy may be performed either by open or laparoscopic technique. Main surgical techniques include manual fragmentation and milking to cecum, gastrotomy, enterotomy, and resection and anastomosis in complicated cases. As the prevalence of concurrent gastric and small intestine phytobezoars is 17-21%, care should be given not to leave any residue during surgery.[32-33] Chisholm et al. performed endoscopic removal in one (6.2%), gastrotomy together with manual fragmentation and milking into cecum in one (6.2%), manual fragmentation and milking into cecum in nine (56.2%), enterotomy in four (25%), and small intestine resection and anastomosis in one (6.2%) patient.[22] In study conducted by Krausz et al, 14(12.3%) patients underwent gastrotomy, 62 patients (54.8%) underwent manual fragmentation and milking into cecum, 34 patients (30%) underwent enterotomy, and two patients (1.7%) underwent small intestine resection and anastomosis.[21] In study by Ertuğrul et al, three patients (23%) underwent gastrotomy, two patients (15.3%) underwent gastrotomy together with manual fragmentation and milking into cecum, five patients (38.4%) underwent enterotomy, and three patients (23%) underwent manual fragmentation and milking into cecum. [(13)]In the present study, seven patients (50%) underwent manual fragmentation and milking into cecum, three patients (21.4%) underwent enterotomy, and two patients (14.3%) each underwent resection anastomosis of gut and resection with exteriorization, respectively.

CONCLUSIONS: Phytobezoars including diospyrobezoar should be considered as a rare but important cause of small bowel obstruction in children and in adults with known risk factors hailing from rural areas. Surgical treatment with manual fragmentation and milking of bezoar into caecum is effective in most cases.

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AUTHORS:

1. Zahur Hussain
2. Vikrant Singh
3. Suneel Mattoo
4. Ashufta Rasool
5. Barinder Kumar
6. Shadi Lal Kachroo

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of General Surgery, Government Medical College, Jammu.
2. Assistant Professor, Department of General Surgery, Government Medical College, Jammu.
3. Post Graduate, Department of General Surgery, Government Medical College, Jammu.
4. Senior Resident, Department of General Surgery, Government Medical College, Jammu.
5. Senior Resident, Department of General Surgery, Government Medical College, Jammu.
6. Professor, Department of General Surgery, Government Medical College, Jammu.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Vikrant Singh,
264, Sector No. 6,
Channi Himmat, Jammu-180015,
Jammu & Kashmir.
E-mail: vikrant1118@rediffmail.com

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