Esophageal obstruction due to enteral feed bezoar: A case report and literature review

Esther-Lee Marcus, Ron Arnon, Arkadiy Sheynkman, Yehezkel G Caine, Joseph Lysy

Abstract
This paper describes a rare complication of enteral feeding, esophageal obstruction due to feeding formula bezoar, and reviews the published cases. An attempt to re-insert the nasogastric tube in a chronically ventilated 80-year-old female fed via a nasogastric tube with Jevity® failed. An esophagogastroduodenoscopy revealed an 18 cm-long concretion of the feeding formula, filling most of the esophageal lumen, which was removed endoscopically. Forty-two cases of feeding formula esophageal bezoars have been reported in the literature. The formation of feeding formula bezoars is triggered by acidic gastroesophageal reflux. The acidic pH in the esophagus causes clotting of the casein in the formula. Predisposing factors for bezoar formation are: mechanical ventilation, supine position, neurological diseases, diabetes mellitus, hypothyroidism, obesity and history of partial gastrectomy. Diagnosis and removal of the bezoar is done endoscopically. Feeding in a semi-recumbent position, administration of prokinetic agents and proton pump inhibitors may prevent this complication.

INTRODUCTION
Bezoars are retained concretions of indigestible foreign material that accumulate and conglomerate in the gastrointestinal tract, most commonly in the stomach. Rarely bezoars can be formed in the esophagus and cause esophageal obstruction[1]. Bezoars can be classified into four types based on their origin and components: phytobezoars, trichobezoars, lactobezoars and pharmacobezoars (medication bezoars). The use of enteral nutrition is growing. It is commonly used in critically-ill mechanically ventilated patients, as well as in patients who cannot maintain body weight by ordinary oral nutrition. Here we present an unusual case of esophageal obstruction due to enteral feed bezoar. A case report and literature review. World J Gastrointest Endosc 2010; 2(10): 352-356 Available from: URL: http://www.wjgnet.com/1948-5190/full/v2/i10/352.htm DOI: http://dx.doi.org/10.4253/wjge.v2.i10.352

CASE REPORT
The 80-year-old female had been hospitalized in a chronic ventilation unit in a long-term care facility for about a year. She was mechanically ventilated and fed via a nasogastric tube with Jevity®. An attempt to re-insert the nasogastric tube in the chronically ventilated 80-year-old female fed via a nasogastric tube with Jevity® failed. An esophagogastroduodenoscopy revealed an 18 cm-long concretion of the feeding formula, filling most of the esophageal lumen, which was removed endoscopically. Forty-two cases of feeding formula esophageal bezoars have been reported in the literature. The formation of feeding formula bezoars is triggered by acidic gastroesophageal reflux. The acidic pH in the esophagus causes clotting of the casein in the formula. Predisposing factors for bezoar formation are: mechanical ventilation, supine position, neurological diseases, diabetes mellitus, hypothyroidism, obesity and history of partial gastrectomy. Diagnosis and removal of the bezoar is done endoscopically. Feeding in a semi-recumbent position, administration of prokinetic agents and proton pump inhibitors may prevent this complication.
tube with Jevity® (Abbot Laboratory, Illinois) and Egg-Plus® (Primera Foods, Wisconsin) as a protein supplement. She suffered from advanced vascular dementia, chronic heart failure, diabetes mellitus, hypothyroidism and pres sure ulcers and was in a minimally conscious state. During her prolonged hospitalization she had recurrent ventilator-associated pneumonia and pressure ulcer infections. She was totally dependent on others for activities of daily living and was bed- and chair-bound. Her BMI was 31.2 kg/m². Her medications included furosemide, levo thyroxine, omeprazole, prednisone, carbidopa-levodopa, amiodarone and subcutaneous insulin. During routine replacement, the nasogastric tube was removed without difficulty. However, repeated attempts to reinsert it by an expert team of physicians and nurses failed and the patient was transferred to the emergency department of a general hospital. In the emergency department an esophageal-gastrodudenoscopy was performed in order to investigate the cause of esophageal obstruction. Just be low the upper esophageal sphincter a concretion of the feeding formula filled the esophageal lumen and prevented the continuation of the examination. The length of the mass was about 18 cm and it filled most of the esophageal lumen. The bezoar was fragmented, and re moved mainly by the oral route. The rest was pushed into the stomach. Because of abdominal bloating and distention the procedure was completed in two sessions. Marked atony of the esophagus was noticed during the examination.

**DISCUSSION**

An extensive search of the literature revealed 42 other cases of esophageal obstruction in patients enterically-fed via a nasogastric tube [2-7,10,12-14,16-25] or an orogastric tube [26]. The 29 cases (age range 11-85 years) in which details were reported are presented in Table 1. In 15 out of the 29 cases the patients received either sulfate or aluminum hydroxide antacids [2-7,8,12-14,19-21], medications known to cause bezoars [28]. Those medications probably contributed to the formation of the bezoar. In the 27 patients in whom the feeding formula was mentioned, the various formulas contained casein [2,15,17-21]. The pathogenesis of bezoar formation following enteral nutrition is triggered by acidic gastroesophageal reflux. The acidic pH in the esophagus causes the casein in the enteric formula to clot, thus forming a bezoar [3]. In an in vitro study by Turner et al [28], Osmolite® (which has a pH of 6.5) that was acidified to a pH of less than 5 was solidified within 5 min. The same phenomenon occurred when other enteral formulas containing casein were exposed to an acidic environment. In contrast, formulas containing peptides of dried skim milk as the protein constituent did not solidify even in pH below 1. Similar findings have been reported by Marcuard and Perkins [27] and by Hofstetter and Allen [28]. Therefore Turner et al [28] suggest that in patients at high risk for this complication it may be advisable to use a formula without casein and to administer acid-lowering medications. The formula in this case (Jevity®) contains casein (Jevity® was the formula in four other cases reported [11,12,13,14]). Note that in the current case this complication occurred despite the fact that the patient was treated with omeprazole. Nasogastric intubation increases the risk of gastroesophageal reflux [29]. Douzinias et al [29] reported that the degree of gastroesophageal reflux correlates with the duration of nasogastric tube in situ in mechanically ventilated patients. The presence of a nasogastric tube is an important cause of reflux since it may induce relaxation of the lower esophageal sphincter. Also, nasogastric tubes cause mechanical irritation and interfere with normal esophageal motility and sphincter function. In addition, the supine position contributes to the increased incidence of gastroesophageal reflux in patients with mechanical ventilation [31]. An extensive search of the literature did not reveal any report of esophageal obstruction due to enteral feeding in patients fed via a percutaneous gastrostomy. This may be due to difficulty in the diagnosis of such cases, since obstruction in those patients may be asymptomatic. In addition, some studies suggest that percutaneous gastrostomy lowers the risk of gastroesophageal reflux in comparison to nasogastric tube [30,31]. The duration of enteral nutrition prior to the diagnosis of bezoar ranged from 2 d to 370 d.

Twenty-five patients out of the 29 cases reported in detail (including our own case) were mechanically ventilated [2-5,7,10,12-14,16-25], as well as the other 14 cases reported in the literature [21-25]. Gastroesophageal reflux, a risk factor for this complication, is common among critically-ill mechanically ventilated patients [32]. Analgetic and sedative drugs administered to mechanically ventilated patients may contribute to esophageal dysmotility and bezoar formation. Many critically ill mechanically ventilated patients are in the supine position, increasing the risk of gastroesophageal reflux especially when fed via a nasogastric tube.

The current case, as well as three other reported cases, suffered from diabetes mellitus [7,9,17]. Gastroesophageal reflux is a frequent complication of diabetes. Wang et al [33] reported that 40% of patients with diabetes type 2 showed symptoms of gastroesophageal reflux. Overweight and obesity are risk factors for gastroesophageal reflux [34]. Obesity has been associated with increased intra-abdominal pressure, impaired gastric emptying, decreased lower esophageal sphincter pressure and increased frequency of transient sphincter relaxation, thus leading to increased esophageal acid exposure [34]. The BMI of our patient was 31.2 kg/m². The BMI of the other cases reported in the literature is not disclosed. Our patient also suffered from hypothyroidism, which can affect esophageal peristalsis [35].

Underlying neurological diseases that may cause altered esophageal motility have been reported in many of the cases: Guillain-Barre syndrome [24-26], myasthenia gravis [37], head injury [38] and other brain insults. Partial gastrectomy has been reported in two cases [9,14] as yet another possible predisposing factor for gastroesophageal reflux. In some cases, such as the current one, several risk factors for bezoar formation are present.
Recently, Caldeira et al. published a retrospective study of all cases of esophageal bezoar due to enteral feed diagnosed over a period of 3 years in an intensive care unit at a single center in Portugal. During that period nine of 1003 patients (0.9%) who were fed enterally, were diagnosed with bezoar. Mean age of the patients was 66 years (range 33–89), mean duration of enteral nutrition was 12 d and the feeding formula was Infusamat fm5® (Braun). All patients were mechanically ventilated. Seven patients presented risk factors for esophageal reflux such as a history of gastrectomy, achalasia or hiatal hernia.

### Diagnosis

Presenting symptoms of esophageal bezoar due to enteral feeding include regurgitation of the feeding formula, difficulty in removing or reinserting a feeding tube and recurrent aspiration pneumonia. Rabec et al. reported a case in which the presentation was difficulty in weaning a mechanically ventilated patient due to trachal compression by an esophageal bezoar. Gastrografin swallow can demonstrate a mass obstructing the esophagus. The definitive diagnosis of esophageal bezoar is done endoscopically, where the extent of obstruction and the nature of the obstructive mass are determined.

### Treatment

Removal of the bezoar caused by nutrition formula is often a difficult task and may take many hours in several sessions. It is done by fragmentation of the obstructive mass are determined. Esophageal perforation is a rare complication of the procedure. Irrigation and fulguration reported using an effervescent liquid (Coca Cola) to soften the mass. Gupta et al. after unsuccessful endoscopic management of the bezoar dissolved it using pancreatic

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### Table 1 Reported cases of esophageal obstruction by enteral feed

| Case No. | Authors | Year | Age | Gender | Formula | Duration of enteral nutrition (d) | Sucralfate and/or antacid | Mechanical ventilation | Underlying disease |
|----------|---------|------|-----|--------|---------|----------------------------------|--------------------------|-----------------------|---------------------|
| 1        | Algozine et al. | 1983 | 79  | M      | Isocal® | 37 | + | + | Guillain-Barre syndrome |
| 2        | Myo et al. | 1986 | 74  | M      | Osmolite® | 6 | - | + | S/P gastrectomy |
| 3        | Schultess et al. | 1986 | 69  | F      | Fresubin® | 50 | + | + | Guillain-Barre syndrome |
| 4        | Schultess et al. | 1986 | 20  | M      | Fresubin® | 4 | + | + | Multiple trauma |
| 5        | Schultess et al. | 1986 | 34  | F      | Fresubin® | 2 | + | + | Status epilepticus |
| 6        | Anderson et al. | 1989 | 61  | M      | Osmolite®, TraumaCal® | 14 | + | + | Guillain-Barre syndrome |
| 7        | Turner et al. | 1991 | 52  | M      | Osmolite® | 7 | - | - | S/P cardiac operation |
| 8        | Carrougher and Barrilleaux | 1991 | 69  | M      | Osmolite® | 15 | + | + | Diabetes mellitus |
| 9        | RowBOTTOM et al. | 1993 | 65  | M      | Ensure Plus® | 14 | + | + | Adult respiratory distress syndrome, pneumonia |
| 10       | Krupp et al. | 1995 | 74  | M      | Pulmocare® | 12 | - | + | Diabetes mellitus |
| 11       | Irgau and Fulda | 1995 | 81  | F      | Jevity® protein suppl | 13 | - | F | S/P cardiac arrest |
| 12       | Irgau and Fulda | 1995 | 77  | F      | TraumaCal® protein suppl | 14 | - | + | Hip fracture |
| 13       | Cremer and Gelderman | 1996 | 68  | M      | Osmolite® | 14 | - | - | Myasthenia gravis |
| 14       | Garcia-Luna et al. | 1997 | 40  | M      | Jevity® | 73 | + | + | Subarachnoid hemorrhage |
| 15       | Garcia-Luna et al. | 1997 | 61  | M      | Glucerna® | 42 | + | + | Brain hematoma |
| 16       | Garcia-Luna et al. | 1997 | 66  | M      | Jevity® | 7 | + | + | Burn |
| 17       | Razafimahae et al. | 1997 | 11  | F      | Jomalwal Isol® | 5 | + | + | Encaphilitis |
| 18       | Blanco Navalpoto et al. | 1998 | 75  | M      | Precitone Standard® | 16 | + | + | S/P partial gastrectomy |
| 19       | Lentsch and Bumpous | 1999 | 77  | M      | Ensure®, Jevity® | 7 | - | - | Total laryngectomy |
| 20       | Lentsch and Bumpous | 1999 | 49  | M      | Osmolite® | 10 | - | - | Total laryngectomy |
| 21       | Iturrabe Yanez et al. | 1999 | 67  | M      | Formula not specified | 26 | - | + | Open heart surgery |
| 22       | Lartigue et al. | 2001 | 51  | M      | Fresubin® HP 750 MC | 20 | + | + | Tetraplegia |
| 23       | Lartigue et al. | 2001 | 85  | F      | Fresubin® HP 750 MCT | 16 | - | + | Diabetes mellitus |
| 24       | Dhingra et al. | 2001 | 77  | F      | Nutren 2® | 6 | - | + | Coronary artery bypass graft |
| 25       | Gupta et al. | 2001 | 77  | M      | Crucial® | 28 | + | + | S/P cardiac arrest, S/P abdominal operation due to diverticulitis |
| 26       | Olugunmi et al. | 2007 | 52  | F      | Osmolite® | 3 | + | + | Abdominal distention pneumonia |
| 27       | Rabec et al. | 2008 | 82  | F      | Normoreal® | 7 | + | + | Restrictive lung disease |
| 28       | Forget and Hantson | 2008 | 18  | M      | Formula not specified | 23 | - | + | Head injury |
| 29       | Marcus et al. (this article) | 2010 | 80  | F      | Jevity®, Egg Plus® | 370 | - | + | Vascular dementia, diabetes mellitus, hypothyroidism |
enzyme extract, and Katsanos et al[20] reported using N-acetylcysteine and Gastrografin spray in difficult cases to liquefy and to remove enteral feed bezoars.

Prevention

Although a rare complication, physicians should implement measures to prevent this complication. In patients who are fed enterally, one should identify the patients at risk for gastroesophageal reflux and implement measures to decrease this risk, such as elevating the head of the bed, feeding in the semi-recumbent position and consideration of administration of prokinetic agents and/or proton pump inhibitors. Other measures may include performing lavage of the esophagus while gradually removing the nasogastric tube in patients who have suffered from this complication, and replacing the feeding formula with a casein-free solution.

In conclusion, a case of esophageal bezoar from feeding formula is described. Comprehensive literature review disclosed the main predisposing factors. The approach and the management of this complication are discussed.

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