

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

Esther-Lee Marcus, Ron Arnon, Arkadiy Sheynkman, Yehezkel G Caine, Chronic Ventilation Unit, Herzog Hospital POB 3900, Jerusalem 91035, Israel

Ron Arnon, Joseph Lysy, Department of Gastroenterology, Hadassah-Hebrew University Medical Center, PO Box 12000, Jerusalem 91120, Israel

Author contributions: Marcus EL, Arnon R, Sheynkman A, Caine YG and Lysy J were involved in diagnosis and research; Arnon R and Caine YG performed critical reviews; and Marcus EL and Lysy J wrote the paper.

Correspondence to: Esther-Lee Marcus, MD, Head, Chronic Ventilation Unit, Herzog Hospital, POB 3900, Jerusalem 91035, Israel. elm@zahav.net.il

Telephone: +972-50-8288188 Fax: +972-2-6536075

Received: June 4, 2010 Revised: August 22, 2010

Accepted: August 29, 2010

Published online: October 16, 2010

© 2010 Baishideng. All rights reserved.

Key words: Casein; Enteral feeding; Esophageal bezoar; Nasogastric tube

Peer reviewer: Shinji Nishiwaki, MD, PhD, Director, Department of Internal Medicine, Nishimino Kosei Hospital, Yoro-cho, Yoro-gun, Gifu 503-1394, Japan

Marcus EL, Arnon R, Sheynkman A, Caine YG, Lysy J. 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>

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 a bezoar from enteral feeding formula. The literature is reviewed and the pathogenesis, preventive measures and management are discussed.

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[®] (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 pressure 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, levothyroxine, 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 esophago-gastroduodenoscopy was performed in order to investigate the cause of esophageal obstruction. Just below 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 removed 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^[2,5,7-25] or an orogastric tube^[6]. 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 sucralfate or aluminum hydroxide antacids^[2,4,5,7-8,12-14,19-21], medications known to cause bezoars^[26]. 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*^[6], 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*^[6] 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^[11,12,15]). 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]. Douzinas *et al*^[30] 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^[2-3,7-10,12-14,16-22], as well as the other 14 cases reported in the literature^[23-25]. 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^[2,4,5], myasthenia gravis^[11], head injury^[22] and other brain insults. Partial gastrectomy has been reported in two cases^[3,14] 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.

Table 1 Reported cases of esophageal obstruction by enteral nutrition

Case No.	Authors	Year	Age	Gender	Formula	Duration of enteral nutrition (d)	Sucralfate and/or antacid	Mechanical ventilation	Underlying disease
1	Algozzine <i>et al</i> ^[2]	1983	79	M	Isocal [®]	37	+	+	Guillain-Barre syndrome
2	Myo <i>et al</i> ^[3]	1986	74	M	Osmolite [®]	6	-	+	S/P gastrectomy
3	Schulthess <i>et al</i> ^[4]	1986	69	F	Fresubin [®]	50	+	+	Guillain-Barre syndrome
4	Schulthess <i>et al</i> ^[4]	1986	20	M	Fresubin [®]	4	+	+	Multiple trauma
5	Schulthess <i>et al</i> ^[4]	1986	34	F	Fresubin [®]	2	+	+	Status epilepticus
6	Anderson <i>et al</i> ^[5]	1989	61	M	Osmolite [®] , TraumaCal [®] protein suppl	14	+	+	Guillain-Barre syndrome
7	Turner <i>et al</i> ^[6]	1991	52	M	Osmolite [®]	7	-	-	S/P cardiac operation
8	Carrougher and Barrilleaux ^[7]	1991	69	M	Osmolite [®]	15	+	+	Diabetes mellitus peripheral neuropathy
9	Rowbottom <i>et al</i> ^[8]	1993	65	M	Ensure Plus [®]	14	+	+	Adult respiratory distress syndrome, pneumonia
10	Krupp <i>et al</i> ^[9]	1995	74	M	Pulmocare [®]	12	-	+	Diabetes mellitus
11	Irgau and Fulda ^[10]	1995	81	F	Jevity [®] protein suppl	13	-	+	S/P cardiac arrest
12	Irgau and Fulda ^[10]	1995	77	F	TraumaCal [®] protein suppl	14	-	+	Hip fracture
13	Cremer and Gelfand ^[11]	1996	68	M	Osmolite [®]	14	-	-	Myasthenia gravis
14	García-Luna <i>et al</i> ^[12]	1997	40	M	Jevity [®]	73	+	+	Subarachnoid hemorrhage
15	García-Luna <i>et al</i> ^[12]	1997	61	M	Glucerna [®]	42	+	+	Brain hematoma
16	García-Luna <i>et al</i> ^[12]	1997	66	M	Jevity [®]	7	+	+	Burn
17	Razafimahefa <i>et al</i> ^[13]	1997	11	F	Sondalis Iso [®]	5	+	+	Encephalitis
18	Blasco Navalpotro <i>et al</i> ^[14]	1998	75	M	Precitene Standard [®]	16	+	+	S/P partial gastrectomy
19	Lentsch and Bumpous ^[15]	1999	77	M	Ensure [®] , Jevity [®]	7	-	-	Total laryngectomy
20	Lentsch and Bumpous ^[15]	1999	49	M	Osmolite [®]	10	-	-	Total laryngectomy
21	Iturrabde Yaniz <i>et al</i> ^[16]	1999	67	M	Formula not specified	26	-	+	Open heart surgery
22	Lartigue <i>et al</i> ^[17]	2001	51	M	Fresubin [®] HP 750 MC	20	-	+	Tetraplegia
23	Lartigue <i>et al</i> ^[17]	2001	85	F	Fresubin [®] HP 750 MCT	16	-	+	Diabetes mellitus polytrauma
24	Dhingra <i>et al</i> ^[18]	2001	77	F	Nutren 2 [®]	6	-	+	Coronary artery bypass graft
25	Gupta <i>et al</i> ^[19]	2001	77	M	Crucial [®]	28	+	+	S/P cardiac arrest, S/P abdominal operation due to diverticulitis
26	Oluguner <i>et al</i> ^[20]	2007	52	F	Osmolite [®]	3	+	+	Abdominal distention pneumonia
27	Rabec <i>et al</i> ^[21]	2008	82	F	Normoreal [®]	7	+	+	Restrictive lung disease
28	Forget and Hantson ^[22]	2008	18	M	Formula not specified	23	-	+	Head injury
29	Marcus <i>et al</i> (this article)	2010	80	F	Jevity [®] , Egg Plus [®]	370	-	+	Vascular dementia diabetes mellitus hypothyroidism

Recently, Caldeira *et al*^[25] 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*^[21] reported a

case in which the presentation was difficulty in weaning a mechanically ventilated patient due to tracheal 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 mass endoscopically. Esophageal perforation is a rare complication of the procedure^[6]. Irgau and Fulda^[10] reported using an effervescent liquid (Coca Cola) to soften the mass. Gupta *et al*^[19] after unsuccessful endoscopic management of the bezoar dissolved it using pancreatic

enzyme extract, and Katsanos *et al.*^{24]} 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.

REFERENCES

- 1 **Sanders MK.** Bezoars: from mystical charms to medical and nutritional management. *Pract Gastroenterol* 2004; **28**: 37-50 Available from: URL: <http://www.healthsystem.virginia.edu/internet/digestive-health/nutritionarticles/practicalgastro1.04.pdf>. Accessed on May 24, 2010
- 2 **Algozzine GJ,** Hill G, Scoggins WG, Marr MA. Sucralfate bezoar. *N Engl J Med* 1983; **309**: 1387
- 3 **Myo A,** Nichols P, Rosin M, Bryant GD, Peterson LM. An unusual oesophageal obstruction during nasogastric feeding. *Br Med J (Clin Res Ed)* 1986; **293**: 596-597
- 4 **Schulthess HK,** Valli C, Escher F, Asper R, Häcki WH. [Esophageal obstruction in tube feeding: a result of protein precipitation caused by antacids?] *Schweiz Med Wochenschr* 1986; **116**: 960-962
- 5 **Anderson W,** Weatherstone G, Veal C. Esophageal medication bezoar in a patient receiving enteral feedings and sucralfate. *Am J Gastroenterol* 1989; **84**: 205-206
- 6 **Turner JS,** Fyfe AR, Kaplan DK, Wardlaw AJ. Oesophageal obstruction during nasogastric feeding. *Intensive Care Med* 1991; **17**: 302-303
- 7 **Carrougher JG,** Barrilleaux CN. Esophageal bezoars: the sucralith. *Crit Care Med* 1991; **19**: 837-839
- 8 **Rowbottom SJ,** Wilson J, Samuel L, Grant IS. Total oesophageal obstruction in association with combined enteral feed and sucralfate therapy. *Anaesth Intensive Care* 1993; **21**: 372-374
- 9 **Krupp KB,** Johns P, Troncoso V. Esophageal bezoar formation in a tube-fed patient receiving sucralfate and antacid therapy: a case report. *Gastroenterol Nurs* 1995; **18**: 46-48
- 10 **Irgau I,** Fulda GJ. Esophageal obstruction secondary to concretions of tube-feeding formula. *Crit Care Med* 1995; **23**: 208-210
- 11 **Cremer SA,** Gelfand DW. Esophageal bezoar resulting from enteral feedings. *JPEN* 1996; **20**: 371-373
- 12 **García-Luna PP,** García E, Pereira JL, Garrido M, Parejo J, Migens V, Serrano P, Romero H, Gómez-Cía T, Murillo F. Esophageal obstruction by solidification of the enteral feed: a complication to be prevented. *Intensive Care Med* 1997; **23**: 790-792
- 13 **Razafimahefa H,** Mouterde O, Devaux AM. [Esophageal

- bezoar in a child treated with sucralfate]. *Arch Pediatr* 1997; **4**: 659-661
- 14 **Blasco Navalpotro MA,** Zaragoza Crespo R, Málaga López A, Alfonso Moreno V. [Esophageal bezoar: an exceptional complication of enteral nutrition]. *Rev Clin Esp* 1998; **198**: 487-488
- 15 **Lentsch EJ,** Bumpous JM. Early postoperative esophageal obstruction caused by enteral feeding concretions in patients who have undergone laryngectomy. *Otolaryngol Head Neck Surg* 1999; **120**: 617-618
- 16 **Iturrabde Yaniz I,** Osés Munarriz I, Roldan Ramirez J, Loinaz Bordonabe M, Barado Hualde J, Zozaya Urmeneta JM. Esophageal obstruction by a bezoar resulting from enteral feeding. *Med Intensiva* 2000; **24**: 81-84
- 17 **Lartigue C,** Karayan J, Beau P, Kaffy F. [Esophageal bezoar resulting from nasogastric enteral feeding in an intensive care unit]. *Ann Fr Anesth Reanim* 2001; **20**: 374-377
- 18 **Dhingra VK,** Greenwood JK, Fenwick JC. Esophageal complications of feeding tubes in the critically ill. *Internet J Emerg Intensive Care Med* 2001; **5**(2) Available from: URL: <http://www.ispub.com/ostia/index.php?xmlFilePath=journals/ijeicm/vol5n2/feed.xml>. Accessed on April 20, 2010
- 19 **Gupta R,** Share M, Pineau BC. Dissolution of an esophageal bezoar with pancreatic enzyme extract. *Gastrointest Endosc* 2001; **54**: 96-99
- 20 **Oluguner C,** Akan M, Koca U, Karaege G, Günerli A. A rare complication of enteral nutrition: esophageal obstruction. *Dokuz Eylül Üniversitesi Tıp Fakültesi Dergisi* 2007; **21**: 56-61
- 21 **Rabec C,** Kabeya KN, Bonniaud P, Jouve JL, Baudouin N, Favrolt N, Camus C, Camus P. [Difficult weaning due to tracheal compression by an esophageal bezoar]. *Rev Mal Respir* 2008; **25**: 333-337
- 22 **Forget P,** Hantson P. Esophageal bezoar. *CJEM* 2008; **10**: 574
- 23 **Díaz de la Lastra E,** Trapero M, Cantero J, Monasterio F. Esophageal obstruction in critically ill patients: a potential severe complication of enteral nutrition. *Endoscopy* 2005; **37**: 786
- 24 **Katsanos KH,** Koulouras V, Nakos G, Tsianos EV. Successful management of full-length obstructing esophageal bezoars in an intensive care unit. *Intensive Care Med* 2010; **36**: 1280-1281
- 25 **Caldeira A,** Casanova P, Sousa R, Martins P, Banhudo A, Pimentel J. [Enteric nutrition and esophageal impactation: what relationship]. *Acta Med Port* 2010; **23**: 183-190
- 26 **Taylor JR,** Streetman DS, Castle SS. Medication bezoars: a literature review and report of a case. *Ann Pharmacother* 1998; **32**: 940-946
- 27 **Marcuard SP,** Perkins AM. Clogging of feeding tubes. *JPEN* 1988; **12**: 403-405
- 28 **Hofstetter J,** Allen LV Jr. Causes of non-medication-induced nasogastric tube occlusion. *Am J Hosp Pharm* 1992; **49**: 603-607
- 29 **Ibáñez J,** Peñafiel A, Raurich JM, Marse P, Jordá R, Mata F. Gastroesophageal reflux in intubated patients receiving enteral nutrition: effect of supine and semirecumbent positions. *JPEN* 1992; **16**: 419-422
- 30 **Douzinis EE,** Tsapalos A, Dimitrakopoulos A, Diamanti-Kandarakis E, Rapidis AD, Roussos C. Effect of percutaneous endoscopic gastrostomy on gastro-esophageal reflux in mechanically-ventilated patients. *World J Gastroenterol* 2006; **12**: 114-118
- 31 **Douzinis EE,** Andrianakis I, Livaditi O, Bakos D, Flevari K, Goutas N, Vlachodimitropoulos D, Tasoulis MK, Betrosian AP. Reasons of PEG failure to eliminate gastroesophageal reflux in mechanically ventilated patients. *World J Gastroenterol* 2009; **15**: 5455-5460
- 32 **Mutlu GM,** Mutlu EA, Factor P. GI complications in patients receiving mechanical ventilation. *Chest* 2001; **119**: 1222-1241
- 33 **Wang X,** Pitchumoni CS, Chandrarana K, Shah N. Increased prevalence of symptoms of gastroesophageal reflux diseases in type 2 diabetics with neuropathy. *World J Gastroenterol* 2008; **14**: 709-712

- 34 **Hampel H**, Abraham NS, El-Serag HB. Meta-analysis: obesity and the risk for gastroesophageal reflux disease and its complications. *Ann Intern Med* 2005; **143**: 199-211
- 35 **Daher R**, Yazbeck T, Jaoude JB, Abboud B. Consequences of dysthyroidism on the digestive tract and viscera. *World J Gastroenterol* 2009; **15**: 2834-2838

S- Editor Zhang HN **L- Editor** Hughes D **E- Editor** Liu N