

# Asymptomatic Complete Transmural Gastric Migration of Polytetrafluoroethylene Mesh Seven Years After Mesh HiatoPlasty

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<b>Background</b>	A 90-year-old man was admitted to the hospital with a small bowel obstruction eight years after a hiatal hernia repair with expanded polytetrafluoroethylene (ePTFE) mesh reinforcement.
<b>Summary</b>	The patient underwent laparotomy for a small bowel obstruction. An adhesive obstruction with early focal ischemia was treated with an enterolysis and a short segmental resection. A fist-sized mobile, intraluminal mass was palpated in the stomach. A gastrotomy was performed, and the mass was extracted. Examination of the mass on the back table revealed an intact sheet of ePTFE mesh placed eight years ago to reinforce the hiatoPlasty. The patient's recovery was uneventful.
<b>Conclusion</b>	A case of ePTFE mesh erosion with complete transmural migration into the stomach seven years after mesh placement during a hiatal hernia repair is described. This case is unusual due to the delayed presentation, the paucity of symptoms, and an assumption that ePTFE mesh is not associated with gastrointestinal tract erosion.
<b>Key Words</b>	hernia mesh; hiatal hernia; expanded polytetrafluorethylene; ePTFE; mesh erosion; mesh migration; mesh complication

**DISCLOSURE STATEMENT:**

The authors have no conflicts of interest to disclose.

**FUNDING/SUPPORT:**

The authors have no relevant financial relationships or in-kind support to disclose.

**RECEIVED:** November 3, 2020

**REVISION RECEIVED:** November 29, 2020

**ACCEPTED FOR PUBLICATION:** March 4, 2021

**To Cite:** Arkfeld CK, Carlson MA. Asymptomatic Complete Transmural Gastric Migration of Polytetrafluoroethylene Mesh Seven Years After Mesh HiatoPlasty. *ACS Case Reviews in Surgery*. 2023;4(2):24-29.

## Case Description

A 90-year-old man was admitted to the hospital in 2015 with a five-hour history of abdominal pain, nausea, and small-volume emesis following an evening meal. He also had a three-month history of early satiety without associated nausea, vomiting, pain, or other gastrointestinal complaints. Eleven years prior to admission, the patient had an open low anterior resection for a large tubulovillous adenoma of the upper rectum. Seven years before admission, he underwent open repair of a large hiatal hernia with prosthetic reinforcement.

At the initial examination, the patient was alert, oriented, and complaining of severe abdominal pain. He was hypertensive with otherwise normal vital signs and a body mass index of 22. His abdomen was distended, tympanic, and diffusely tender. His laboratory tests included a white blood cell count of 14,400 per  $\mu\text{L}$ , a serum bicarbonate of 15 mEq/L, and a serum lactate of 6 mmol/L. Attempts at nasogastric tube placement were unsuccessful secondary to resistance during insertion. A computerized tomography (CT) scan obtained in the emergency department demonstrated (i) markedly dilated loops of small bowel with a transition point in the distal ileum, (ii) portal venous gas, (iii) a small ventral hernia containing a non-obstructed loop of colon, and (iv) a foreign body (possibly a bezoar) freely floating within the lumen of a distended, intraabdominal stomach (Figure 1).

The patient was given intravenous fluid and antibiotics, and then four hours after arrival, he underwent exploratory laparotomy. A small epigastric hernia sac was resected. The patient had dense, extensive intraabdominal adhesions, with obliteration of most of his peritoneal cavity. An enterolysis was performed, including the release of an obstructing band at the terminal ileum. Two short segments (proximal jejunum and ileum) of nonviable-appearing small intestine were resected, followed by stapled anastomoses.

The anesthetist's repeat attempt at nasogastric tube insertion during the operation was unsuccessful. The anterior stomach was dissected out, and a fist-sized mobile mass was palpated within the stomach (believed to be a bezoar identified on the CT). An 8 cm longitudinal gastrotomy was made over the mass, and a blackish, firm, irregular, but globular object was extruded from within the lumen of the stomach. It was not attached to any structure, and no

Figure 1. Preoperative CT. Published with Permission



A) Cross-sectional view, upper abdomen. Large arrow = free-floating mass within lumen of stomach. Small arrows = portal venous gas. (B) Sagittal view, left side. (C) Coronal view, anterior.

blood or tissue was associated with it. Upon examination and unfolding of the mass on the back table (Figure 2), it became apparent that this mass was a sheet of ePTFE mesh that had been placed seven years prior to reinforce the hiatoplasty. The mesh appeared to have a keyhole, or slot, likely positioned around the esophagus.

**Figure 2.** ePTFE mesh. Published with Permission



*Specimen was removed from stomach and then flattened out. Presumed keyhole for distal esophagus is evident in mesh's center.*

The nasogastric tube was then advanced into the body of the stomach, and the gastrotomy and midline incision was closed. The patient's postoperative course was prolonged secondary to confusion and pneumonia; he eventually recovered and was discharged to a short-term rehabilitation facility. A contrast study of the esophagus and stomach on postoperative day 8 demonstrated no evidence of obstruction at the gastroesophageal junction nor evidence of a leak; the anatomical configuration of the stomach appeared normal.

The subsequently-obtained operative note from seven years prior described a laparoscopic-converted-to-open mesh hiatoplasty (the index procedure) secondary to a frozen abdomen. The greater gastric curve was mobilized during this procedure, including transection of the short

gastric vessels. A hiatal hernia sac was reduced and excised. A primary posterior cruroplasty was performed with three interrupted 0-polyester sutures. The sutured cruroplasty was then reinforced with a sheet of ePTFE (Gore® Dual Mesh®) that was “placed around the esophagus and sutured to the diaphragm.” No description of the indication for mesh utilization nor further details of the mesh placement technique were given. A 60 Fr. esophageal bougie was then inserted by the anesthetist during this index procedure, but this perforated the stomach along the lesser curvature. This perforation was repaired with silk sutures, and then the injury site was covered with an anterior (Dor-type) fundoplication. A Stamm-type gastrostomy tube also was placed at the index procedure.

The patient expired at home two years after mesh removal at the age of 92. He was clinically well at a routine primary care visit one month before his death.

## Discussion

Since the 2000s, mesh use appears to have increased during the repair of hiatal hernias.<sup>1-4</sup> There have been both retrospective and prospective data that suggest that mesh utilization during hiatal hernia repair decreases hernia recurrence rate.<sup>5-10</sup> However, not all the data support mesh utilization,<sup>11,12</sup> and the prescribed indications for mesh hiatoplasty have varied. In addition, there has been a persistent concern about long-term mesh-related complications during the hiatus.<sup>13</sup> The present report described such a case, a relatively asymptomatic erosion and complete transmural migration into the stomach of a sheet of ePTFE that had been placed to reinforce a posterior cruroplasty seven years prior to presentation.

There have been at least 59 published cases of hiatal mesh erosion (Table 1). The incidence of hiatal mesh complications is difficult to determine secondary to an unknown total number of hiatoplasties in which mesh is used (i.e., the “denominator”). From a 2010 survey of SAGES members, the incidence of hiatal mesh erosion was estimated to be 0.2–0.5% for synthetic nonresorbable materials.<sup>2</sup> In the 59 cases of hiatal mesh erosion that were identified, most presented within the first two to three years after implantation, though the data in Table 1 incomplete. There were some late presentations (>3 years post-implantation); our case would fall in this group. For mesh erosions in which data were available, virtually all patients were symptomatic, most with dysphagia (Table 1), and virtually all patients underwent an intervention to remove the mesh, which sometimes involved an organ resection.

**Table 1.** Summary of Reports Describing Erosion of Hiatal Prosthetic Material in Adults.

No.	Year	Reference	Cases (N)	Symptoms	Interval (mo)	Mesh Material	Intervention	Comments
1	1996	Casabella <sup>24</sup>	1	NS	NS	NS	Esophageal resection	Mentioned in manuscript discussion only
2	1998	Carlson <sup>6</sup>	1	None	29	PPE	Esophagectomy	Minor fundal erosion; resection because of concurrent esophageal cancer
3	2000	Arendt <sup>25</sup>	1	Dysphagia	108	Teflon pledgets	Endoscopic removal	Associated fistula, resolved with medical care after Teflon removed
4	2000	Baladas <sup>26</sup>	1	Heartburn & dysphagia	1.5	Teflon pledgets	Laparotomy, Teflon removal and repair of fistula	Early occurrence; complicated postoperative course, recovered
5	2000	Coluccio <sup>27</sup>	1	Dysphagia & weight loss	2	PTFE	Esophageal resection	Early occurrence
6	2005	Zilberstein <sup>28</sup>	1	Dysphagia	16	Dacron	Laparoscopic removal	Later endoscopic dilatation for stricture
7	2006	Hergueta-Delgado <sup>29</sup>	1	Dysphagia	NS	PTFE	None	Fundal erosion; left in situ & monitored endoscopically
8	2008	Griffith <sup>30</sup>	2	Dysphagia	NS	PTFE	Stent (1); endoscopic removal (1)	Case series
9	2008	Rumstadt <sup>31</sup>	1	Pain	10	Ti-PPE	Endoscopic removal	Complete transmural migration into stomach
10	2008	Tatum <sup>32</sup>	1	Pain & dysphagia	36	PTFE	Gastrectomy	Complete transmural migration into stomach
11	2009	Hazebroek <sup>33</sup>	1	Dysphagia	4	PTFE	Gastrotomy & removal	CruraSoft <sup>TM</sup> Patch; removed by gastrotomy
12	2009	Soricelli <sup>5</sup>	1	NS	NS	PPE	Laparoscopic removal	Brief mention in a large series
13	2009	Stadlhuber <sup>13</sup>	17	Dysphagia (N = 13); Pain (N = 6); Reflux (4)	NS	PPE (N = 5); PTFE (N = 11); Biol (N = 1)	Esophagectomy (5); gastrectomy (3); excision (3); repair & fundus (2); diversion (1); none (3)	Cases compiled from multiple surgeons
14	2010	Frantides <sup>2</sup>	24	NS	NS	PPE (N = 15); PTFE (N = 6); NS (N = 3)	NS	SAGES survey data
15	2011	Carpelan-Holmström <sup>34</sup>	1	Dysphagia & weight loss	24	PTFE	Distal esophagectomy	CruraSoft <sup>TM</sup> Patch; passed per rectum
16	2013	Nandipati <sup>35</sup>	3	NS	NS	NS	Esophageal resection	Drawn from a larger series of 26 patient with mesh complications
17	2018	Berg <sup>36</sup>	1	Pain	NS	Unknown	Endoscopic removal	Complete transmural migration into stomach
		Total cases of mesh erosion	59					

Specimen was removed from stomach and then flattened out. Presumed keyhole for distal esophagus is evident in mesh's center.

The case presented in this report was unusual in that the patient was relatively asymptomatic, aside from some early satiety at the time of his presentation for an apparently unrelated adhesive small bowel obstruction. Considering that this sheet of ePTFE migrated from the peritoneal cavity completely into the stomach, this was fairly remarkable. It is unclear how long the patient had a gastric mesh bezoar during his enterolysis. In addition, it is unknown

whether the lesser curvature perforation that was incurred and repaired during the index mesh hiatoplasty seven years prior to presentation predisposed the patient to the subsequent erosion, nor whether the apparent circumferential application of the hiatal mesh (i.e., around the esophagus, as suggested by the keyhole configuration of the mesh in Figure 2) was a predisposing factor.

Polypropylene or polyester mesh erosion into the gastrointestinal tract after ventral hernia repair is a well-described phenomenon.<sup>14-17</sup> PTFE hernia mesh had been considered relatively safe regarding erosion and fistula formation.<sup>16</sup> However, PTFE erosion into the gastrointestinal tract after repair of ventral hernia<sup>18,19</sup> and hiatal hernia (Table 1) is now known to occur. Erosion of biologic mesh into the gastrointestinal tract may occur at a lower incidence compared to erosions with synthetic nonresorbable mesh (Table 1), but accurate denominator data are unavailable. Regarding synthetic nonresorbable mesh materials (i.e., polytetrafluoroethylene, polypropylene, polyester), assuming all types are prone to gastrointestinal erosion may be reasonable. The risk of erosion with newer synthetic resorbable mesh materials is unclear, as adequate follow-up is unavailable.

Of note, the above erosive mesh complications at the hiatus are reminiscent of complications associated with the placement of the Angelchik prosthesis to treat reflux disease, which was noted in the 1980s.<sup>20-23</sup> The potential hazards of hiatal prosthesis placement appear to have persisted into the modern era, though the precise risk is difficult to quantify.

## Conclusion

This case represents a delayed, relatively asymptomatic erosive complication after ePTFE reinforcement of a hiatoplasty. Although mesh utilization during hiatal hernioplasty has been debated in the surgical literature, many repairs continue to be performed.

## Lessons Learned

Long-term follow-up of all mesh hiatoplasties is recommended, with the knowledge that a mesh-related complication can occur years after implantation.

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