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ORIGINAL CONTRIBUTIONS

Peroral Endoscopic Myotomy Is Feasible and Safe in a Gastric Bypass Population

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Abstract

Background Obesity is public health problem of epidemic proportions. Esophageal dysmotility including achalasia is more commonly seen in an obese population. Standard therapy for achalasia can be complicated by hepatomegaly and a post-surgical anatomy in a pre- and post-bariatric population. Peroral endoscopic myotomy (POEM) has not been adequately studied in this population.

Methods A retrospective review of a prospectively collected database was completed. Patients who had undergone a Roux-en-y gastric bypass (RYGB) prior to or following a POEM were enrolled. Patient demographics, operative information and post-operative course data was collected.

Results Six patients underwent POEM prior to or after RYGB. There were no peri-operative complications with an average length of stay of 1.2 days. Five patients experienced a clinical success with excellent symptom resolution. The one failure was in the setting of type III achalasia, but did have objective evidence of lower esophageal sphincter (LES) relaxation post-operatively.

Conclusion POEM in the setting of bariatric surgery is safe and feasible. The potential increase in GERD following POEM is obviated by RYGB anatomy. In an obese individual, a staged POEM prior to or following a RYGB is an appropriate treatment algorithm for obese and achalasia.

Keywords POEM · Bariatric surgery · Achalasia

Introduction

Achalasia is a primary motor disorder of the esophagus characterized by dysmotility of the esophageal body and failure of lower esophageal sphincter relaxation. Several studies report a higher prevalence of esophageal dysmotility with obesity [1–3]. However, data is limited on the prevalence of achalasia in the morbidly obese, especially in those who have undergone bariatric surgery.

A Heller myotomy has traditionally been presented as the standard treatment for achalasia. Peroral endoscopic myotomy (POEM) has gained popularity due to its safety, efficacy, and decreased time for convalescence in the management of achalasia. In cases of recurrent achalasia, significant morbid obesity, or multiple medical comorbidities the POEM obviates the risks associated with accessing the structures of the foregut through standard minimally invasive techniques. Published reports on the safety and efficacy of the POEM in the obese population prior to or following a Roux-en-y gastric bypass (RYGB) are scarce. Herein is a series of patients who were diagnosed with achalasia prior to and following RYGB who underwent POEM.

Methods

Patients with a diagnosis of achalasia and a surgical history of a RYGB who also underwent POEM were identified after a retrospective review of prospectively collected database. The study obtained approval from the Institutional Research Board including a waiver of informed consent due to the retrospective nature of the study (IRB # 201611724). Patient demographics collected include age, sex, body mass index (BMI), and time to diagnosis of achalasia after the RYGB were recorded. Achalasia was diagnosed based on clinical symptoms and objective work-up comprising of high resolution esophageal manometry (HREM), esophagram and endoscopy. Achalasia subtypes were defined based on the most recent iteration of the Chicago Classification [4]. The Eckardt

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scoring system was used to define severity of symptoms associated with achalasia [5].

POEM was performed as previously described [6]. In each case, patients were treatment naive. Procedural details collected include myotomy location, length of myotomy, distance beyond the gastroesophageal junction (GEJ), and intraoperative blood loss. Post-operative complications were recorded and defined according to the Clavien Dindo classification scheme [7]. Post-procedure success was defined as symptom resolution with an Eckardt score less than or equal to three. Descriptive statistics were used in the analysis of the data.

Results

POEM was performed on six patients with achalasia prior to and following a RYGB. Patient characteristics are presented in Table 1. All of the patients presented with characteristic signs and symptoms of achalasia and were graded on severity using the Eckardt score (Table 3). Preoperative HREM was consistent with type I achalasia [1], type II achalasia [3], and type III achalasia [2].

In all cases, a posterior myotomy was completed with an average myotomy length of 12 cm (range 10–13 cm). The mean length of myotomy beyond the GEJ was 3.2 cm (range 2–5 cm). There were no intraoperative complications and blood loss was recorded as minimal in each case. The average length of stay was 1.2 days. Post-procedure, the mean Eckardt score decreased from 9.3 to 2.2 (Table 2). One patient with type III was a clinical failure with no significant change in her Eckardt score. An esophagram and endoscopy were completed and were significant for normal transit of barium bolus and a patulous GEJ. Another patient saw her Eckardt score decrease from 12 to 4. Additional work-up in was significant for Los Angelos Grade A esophagitis on endoscopy, a DeMeester score of 18.3 on 24 h pH testing (normal ≤ 14.72), and a decrease in her mean integrated relaxation pressure (IRP) from 36.9 pre-op to 10.6 post-op. This patient went on to have a RYGB 19 months later with good resolution of her symptoms related to poorly controlled GERD.

Discussion

Obesity affects more than one-third of society and is associated with an estimated annual cost of almost $150 billion in 2008 US dollars [8]. Morbid obesity is connected with a number of comorbid conditions including dyslipidemia, diabetes, and hypertension in addition to motility disorders of the esophagus such as achalasia [9–11]. First introduced by Dr. Mason in 1967, bariatric surgery is currently the most effective therapy for obesity and the related comorbid conditions [12, 13]. While the laparoscopic sleeve gastrectomy is performed in increasing numbers, the RYGB has been shown to result in a robust weight loss along with resolution of the metabolic complications of obesity including GERD [14].

Achalasia is a rare disease with an incidence of approximately 1 per 100,000 individuals [15]. In addition to being a rare entity, the diagnosis of achalasia can be challenging as presenting signs and symptoms can be non-specific. Dysphagia is the most frequently reported symptom, followed by regurgitation, heartburn, and chest pain [16]. Heartburn, experienced by 40–50% of patients with achalasia, is often attributed to GERD and patients are treated with proton pump inhibitors with a consequent delay in diagnosis [17]. The Eckardt score is a validated grading system used for the evaluation of symptoms of achalasia (Table 3) [5]. Achalasia is classified into three types based on the results of a high resolution manometry [18]. All subtypes of achalasia are unified by the presence of ineffective lower esophageal sphincter relaxation. Type I is characterized by a complete lack of peristalsis. Type II has evidence of panesophageal pressurization. Type III, or spastic achalasia, has preserved peristalsis with $\geq$ 20% premature contractions. This cataloging is important in that post-treatment outcomes can be stratified based on the

Table 1 Patient characteristics including temporal relationship between Roux-en-y gastric bypass (RYGB) and peroral endoscopic myotomy

Case number	Age	Gender	Body mass index	Achalasia	Follow-up (months)	Prior to RYGB?
1	28	F	39.1	2	4	No (7 years after)
2	32	F	28.5	2	12	No (6 years after)
3	66	F	23.8	3	12	No (18 years after)
4	56	F	42.41	3	6	No (2 years after)
5	37	F	55.3	2	15	Yes (12 months prior to RYGB)
6	29	F	46.1	1	20	Yes (19 months prior to RYGB)

Table 2 Pre- and post-peroral endoscopic myotomy (POEM) Eckardt scores

Case	Pre-/post-POEM Eckardt score									
	Chest pain		Dysphagia		Regurgitation		Weight Loss		Eckardt Score	
1	2	0	2	0	2	0	3	0	9	0
2	2	0	2	0	2	0	3	0	9	0
3	2	2	2	2	2	3	0	0	6	7
4	3	0	3	0	3	0	0	0	9	0
5	2	1	3	1	3	0	3	0	11	2
6	3	1	3	1	3	2	3	0	12	4

presenting subtype with type III achalasia most likely to have residual complaints following treatment. Most published literature focuses on the laparoscopic Heller myotomy (LHM) as the standard treatment for achalasia in patients [19, 20]. In 2010, Inoue et al. published the initial results of POEM in 17 patients with achalasia [6]. POEM has continued to expand as centers continue to incorporate it in the treatment algorithm for achalasia. Inoue et al. most recently published a series of 500 patients with successful long-term outcomes of up to 3 years after the procedure with excellent, durable symptom resolution [21].

Obesity affects several aspects of esophageal function, including motility and LES resting pressures [1, 2, 22, 23]. Esophageal dysmotility after weight loss surgery is likely to be encountered more frequently as the practice of bariatric surgery expands in line with the obesity epidemic. Patients with achalasia often alter their diets to consume foods which minimize the disease burden, negating low calorie diets and the subsequent classic weight loss expected with food avoidance. Given this fact, the incidence of achalasia in pre- and post-RYGB is likely to increase in the future bringing into question what treatment provides for the best symptom resolution. Despite several recent publications reporting the efficacy of POEM in achalasia management, the role of POEM in patients prior to and following bariatric surgery is not well established. The LHM and POEM appear to achieve comparable symptomatic improvement rates [24]. However, a surgical myotomy can be challenging in patients with concomitant obesity due to associated hepatomegaly and difficulty accessing the mediastinum during myotomy creation. Further, prior hiatal manipulation following a RYGB can make a second foregut operation more complicated. POEM ameliorates both of these issues due to the peroral approach. This technique avoids post-bypass adhesions and complex mediastinal dissection while also allowing for flexibility in terms of the length and location of the myotomy. Further, the concerns of GERD following POEM are largely alleviated by the anti-reflux characteristics of the RYGB anatomy.

Two recent reports describe one patient each with a successful outcome after a POEM for achalasia after a gastric bypass [25, 26]. This series, the largest to date, adds to the available data. Five patients experienced a significant improvement in the Eckardt scores after the POEM, while one with type III achalasia had normal post-procedure objective testing despite no change in the Eckardt score. These findings are concordant with existing data on subtypes of achalasia and their response to an intervention. Pandolfino and colleagues found that type II achalasia patients were significantly more likely to respond to LHM or pneumatic dilatation, as compared to type I and type III [27]. Similarly, Salvador and colleagues evaluated patients who underwent LHM and found that treatment failure rates were significantly different among the subtypes of achalasia: type I, 14.6%; type II, 4.7%; and type III, 30.4% ($P < 0.001$) [28]. The results in this cohort are consistent with these results and should not be interpreted as a failure of POEM in a post-RYGB population.

There are obvious limitations to this cohort of patients. Namely, this is a rather small "n." With that said, achalasia is considered an orphan disease and it would be difficult to enroll large numbers of patients who suffer from both this disorder as well as obesity. Additionally, follow-up data was restricted to the Eckardt score and, while this is a validated scoring system, it is not a particularly sensitive tool for the assessment of LES function or adequacy of the myotomy.

Table 3 Components of Eckardt score for classification of severity of achalasia symptoms

Score	Weight loss (kilograms)	Dysphagia	Chest pain	Regurgitation
0	None	None	None	None
1	< 5	Occasional	Occasional	Occasional
2	5–10	Daily	Daily	Daily
3	> 10	Each meal	Each meal	Each meal

Conclusion

This series illustrates that, with appropriate expectations, the POEM can be a safe, effective and practical minimally invasive alternative for patients with achalasia prior to and following RYGB.

Compliance with Ethical Standards The study obtained approval from the Institutional Research Board including a waiver of informed consent due to the retrospective nature of the study (IRB # 201611724).

Conflict of Interest The authors declare that they have no conflict of interest.

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