G-POEM in Belgium : a retrospective study

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Abstract

Gastroparesis is a condition with a growing incidence and few effective treatments. In recent years, GPOEM has demonstrated its superiority to other existing treatments.

We report here on our experience in which 34 patients underwent GPOEM, with 23 patients assessed for symptoms and quality of life before and after the procedure.

We measured an average clinical success rate of 73.92% and an excellent risk profile with only two minor complications. The procedure was very well accepted by patients as all would be willing to undergo it again.

Patients for whom GPOEM was successful saw a major improvement in their quality of life, which returned to normal, and, for those suffering from reflux, a significant reduction in their PPI treatment.

As for the patients for whom the procedure was not a success, we found that they were at high risk of somatization, so screening questionnaires should be considered pre-intervention to screen these patients and avoid unnecessary procedures. (Acta gastroenterol. belg., **2024,** 87, **469-477**).

Keywords: Gastroparesis, G-POEM, Lengh of procedure, somatization, predictive factors.

Introduction

Gastroparesis is a chronic gastric motility disorder characterized by delayed gastric emptying in the absence of mechanical obstruction. The most common symptoms include early satiety, bloating, nausea, vomiting, abdominal pain and weight loss which have a major impact on patients' quality of life and mental health but also on life expectancy (1-3).

The diagnosis of gastroparesis is considered when suggestive symptoms are present, alongside an upper gastrointestinal endoscopy (with biopsies) that shows no possible cause for these symptoms. A gastric emptying study, using one of the recognized methods (generally, a gastric emptying scintigraphy, the alternative being a C12 breath test or a wireless motility capsule), confirms delayed gastric emptying (4).

The symptomatic spectrum of gastroparesis can be standardized by the Gastroparesis Cardinal Symptom Index (GCSI), which includes nine different clinical criteria found in gastroparetic patients, grouped in three categories, and is assessed by severity (Figure 1).

The first category measures nausea and vomiting; the second, symptoms of fullness and early satiety; and the third, abdominal bloating and distension.

Typically, the score is expressed as an average of the three symptom subcategories, so that it ranges from 0 to a maximum of 5.

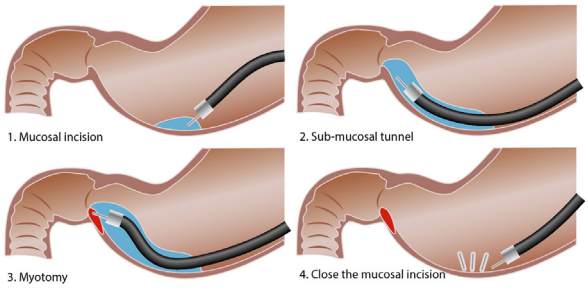

Fig. 1.

This score has shown be reliable and reproducible (5). It is not a diagnostic tool but it is useful to measure the severity of the disease and the post-treatment improvement.

Few epidemiological data are available for gastroparesis, but some studies have estimated its prevalence at 13.8/100,000 people in the UK (6), and 24.2/100,000 in the USA (7). Between 1997 and 2013, the number of hospitalizations for gastroparesis rose by 413%, and the associated costs by 1026% (8). These statistics are all the more alarming given that gastroparesis is an underdiagnosed condition (9), which suggests that a real epidemic is just around the corner.

This increase in prevalence may be linked to a better recognition and diagnosis of the disease itself and/or an increase in risk factors, such as diabetes associated with obesity or the increasing number of stomach and esophageal surgeries (10). Diabetic and surgical causes are in fact the two main causes of gastroparesis, while the other, very diverse causes, are grouped together under the term "idiopathic" (11).

The physiopathology of gastroparesis is complicated and not fully understood.

Pyloric dysfunction is believed to be the main reason for gastroparesis, induced by a lack of interstitial cell of Cajal, also resulting in impair fundic accommodation, antral hypomotility and gastric dysrythmia. This loss of Cajal cells could be mediated by autoimmune phenomena, potentially in response to certain viral infections (12).

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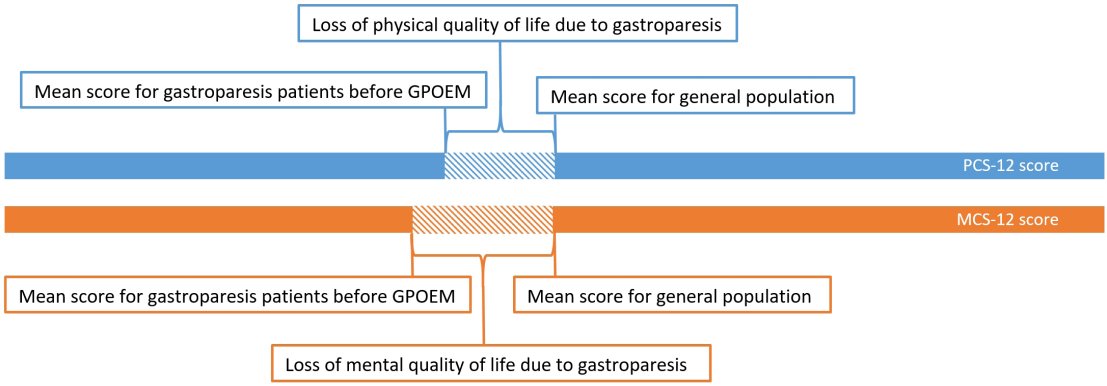

Fig. 2.

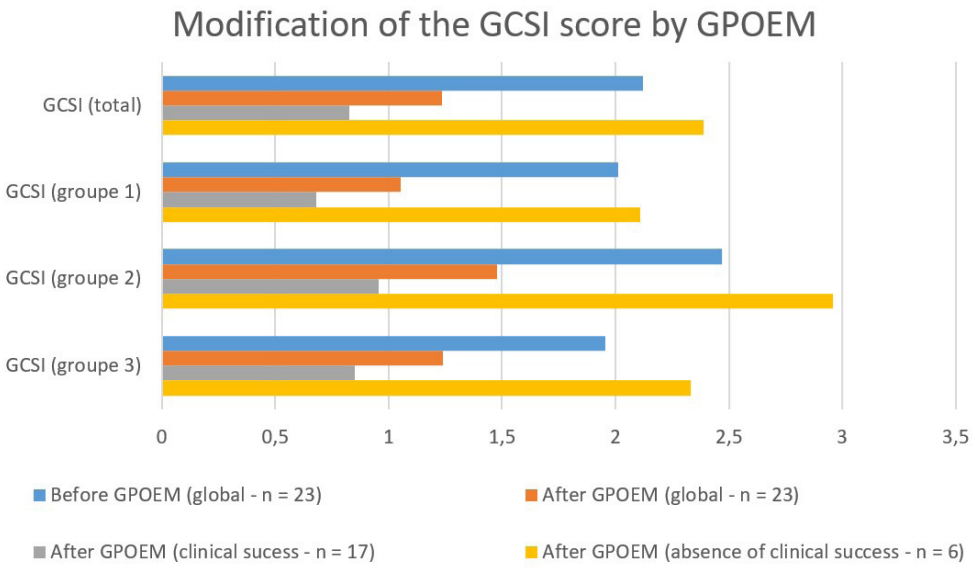

Fig. 3.

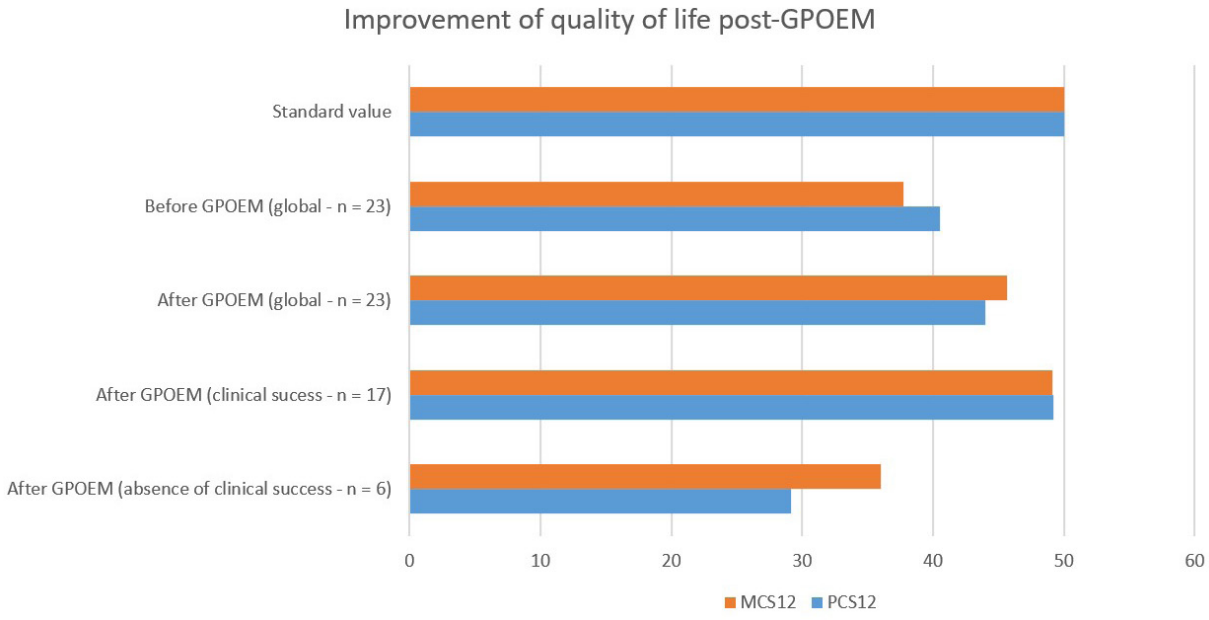

Fig. 4.

A deficiency in nitric oxide synthesis and release is also thought to be involved, responsible for inappropriate relaxation of the digestive smooth muscle (13).

Besides, parasympathetic dysfunction and vagus nerve injury are also considered as the underlying factors in pathogenesis of gastroparesis (14).

The variability of etiologies and underlying pathophysiological mechanisms makes the treatment of gastroparesis challenging. First-line therapies include dietary adaptations (low-fat and low-fiber diet, liquid or soft foods, meal splitting, etc.) and antiemetic or gastroprokinetic drugs. However, on the one hand, almost 30% of patients are not improved by these measures (15), and, on the other, the use of gastroprokinetics is limited by the occurrence of neurological and cardiac side effects, and by the loss of efficiency over time (16-19).

The poor efficacy of conservative methods has motivated the development of several surgical or interventional techniques, with mixed disillusioning results (20).

More recently, the POEM technique has been proposed for the treatment of gastroparesis, given its excellent success in motor disorders of the esophagus. Performed under general anesthetic, the technique involves incising the stomach mucosa approximately 5cm from the pylorus, then creating a submucosal tunnel to the pylorus, where a myotomy of the pylorus is performed. The incision is then closed with several hemostatic clips (figure 2).It was performed for the first time in humans in 2013 (21).

The excellent clinical success, and low complication rate, has since motivated the realization of the technique in many expert endoscopy centers around the world. We have therefore decided to report here on our experience in performing nearly 34 procedures over 3 years.

Aims

The primary objective is to evaluate the practice of GPOEM as a treatment for gastroparesis, in terms of technical success and adverse events.

Adverse events were assessed according to American society of gastroenterology (ASGE) recommendations and classified according to the AGREE classification (23).

The technical success was defined as the ability to carry out the entire operation as required.

The secondary objective is to study the efficacy, which was defined as effective by an improvement in symptomatology, regardless of its degree, measured by the GCSI score; and the resulting improvement in quality of life, measured by the SF-12 quality of life score, itself subdivided into two categories: mental quality of life (MCS12) and physical quality of life (PCS12). These scores are calculated based on the responses to 12 questions covering different aspects of health, including physical functioning, role limitations due to physical health problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. The PCS12 range from 9,94 to 70,02; and the MCS12 range from 5,89 to 71,96, with 50 being considered the norm for both. It has the advantage of being easily achievable, and has proven its effectiveness in assessing quality of life in European patients (24).

Our aim is also to detect intraoperative and perioperative factors as potential predictors of success or adverse event.

Material and methods

This is a retrospective observational study. The endoscopy team of the University Hospital of Liège is performing this technique since 2021.

Population

The study included all patients treated with G-POEM between July 2020 and January 2024 at the University Hospital of Liège. These patients were diagnosed with gastroparesis following gastric emptying scintigraphy, with gastroscopy ruling out any organic cause for delayed gastric emptying.

No cut-off was imposed for the GCSI score. However, GPOEM was performed only in patients whose gastric emptying time was greater than 90 minutes and/or whose residual rate at 2 hours exceeded 35%.

All the patients have been previously treated with gastroprokinetics and/or neuromodulators and few could even have benefited from endoscopic or surgical treatment in the past.

All the patients included received the explanations and approved the procedure during a preoperative consultation.

After the procedure, all patients were re-evaluated through a follow-up consultation. Of the 34 patients, 23 agreed to take part in the study and complete the GCSI and SF-12 questionnaires, as well as answering questions about their personal medical history, their lifestyle, the efficacy of GPOEM on their symptoms and their willingness to repeat the procedure or not if the opportunity arose again.

Of the 11 remaining patients, 3 refused to answer the questionnaires, and the other 8 were lost to follow-up. They were included in the study solely on the assessment of the procedure's safety and on the technical success.

Regarding the population studied, the follow-up consultation occurred at varying intervals, with an average delay of 17 months in the population studied (min. 2 months-max 39 months).

Endoscopic procedure

Two expert endoscopists, already experienced in esophageal POEMs, carried out all our GPOEMs.

GPOEM was carried out under general anesthesia with endotracheal intubation and in "volume-control" ventilatory mode. A high-resolution endoscope, equipped with a cap at its distal end, was used, and CO_2 was utilized for insufflation.

A hybrid knife (Olympus TriangleTipKnife J) capable of both dissection and injection was employed. Submucosal injection was done using modified liquid gelatin mixed with indigo carmine (Geloplasma®).

The mucosal incision was made approximately 5cm from the pylorus, on the side of the greater curvature of the stomach, keeping the endoscope in a neutral position.

A submucosal tunnel is created by progressively dissecting the submucosa up to the pylorus. After confirming the integrity of the mucosa, a full myotomy of the pylorus was performed. In some cases, the incision edges were coagulated. The gastric mucosal incision was then closed with mucosal clips.

Antibiotic prophylaxis was used systematically for all patients.

The use of antibiotic prophylaxis was systematic.

Methodological approach

This is a retrospective observational study. The subjects were recruited from databases of patients who had a G-POEM at the UHC of Liège over a defined period of 3 years. On the basis of the patient's computerized medical record, an analysis was performed and addressed the following parameters:

– Pre-operative data : Sex, age at time of procedure, duration of gastric half-emptying, residual radiotracer level at 2 h on gastric emptying scan, BMI at time of procedure, maximum BMI reached in lifetime, presence of diabetes, history of surgery suspected of damaging vagus nerve, history of autoimmune disease, history of neuromuscular disease, history of psychiatric disease, history of connective tissue disease, medications potentially responsible for gastroparesis, long-term psychotropic medications, smoking habits, previous gastroprokinetic treatment, previous interventional treatment, duration since first symptoms, duration since diagnosis, pre-procedure GCSI, pre-procedure SF-12, daily dose of PPI, (if applicable), presence of constipation.

– Operative data : Duration of procedure, prophylactic antibiotic therapy

– Peri and post-operative data : Length of hospital stay, complications according to the AGREE classification, infectious complication, need for pain medication on day 1.

– Follow-up data : Duration since procedure, post-procedure GCSI, post-procedure SF-12, daily dose of PPI, presence of constipation, weight gain

Statistical analysis

The results are expressed as means, standard deviations (± SD), quartiles (median, Q1, Q3), extremes values (minimum, maximum) for quantitative variables and as frequency tables for qualitative variables.

For statistical tests, some parameters were log-transformed to normalize their distribution. The parameters were compared between the two groups by the paired Student t test (or Kruskal-Wallis test) for quantitative variables and by Fisher's exact test for qualitative variables. The change in GCSI score between preoperative and postoperative medical consultation was analyzed by the paired Student t test.

The correlation between two continuous variables was measured by the Pearson correlation coefficient.

To consider a possible effect attributable to the medical center, the outcome was studied as a function of center and explanatory variable by linear regression.

When the outcome was binary, logistic regression (univariate and bivariate) was used instead, and the odds ratio and its 95% confidence interval were reported.

Results were considered significant at the 5% uncertainty level ($p<0.05$).

Calculations were performed using SAS version 9.4.

Table 1. — **Overview clinical characteristics**

Symptom subscale	Symptom	None	Very mild	Mild	Mod	Severe	Very severe
Nausea/ vomiting	Nausea	0	1	2	3	4	5
	Retching	0	1	2	3	4	5
	Vomiting	0	1	2	3	4	5
Fullness/ early satiety	Stomach fullness	0	1	2	3	4	5
	Not able to finish meal	0	1	2	3	4	5
	Fullness after eating	0	1	2	3	4	5
	Loss of appetite	0	1	2	3	4	5
Bloating/ distention	Bloating	0	1	2	3	4	5
	Belly visibly larger	0	1	2	3	4	5

Table 2. —**The sub-score of each catégory**

	Idiopathic gastroparesis (n = 13)	Post-chirurgical gastroparesis (n = 8)	Diabetic gastroparesis (n = 2)	All aetiologies combined (n = 23)
Mean sub-category 1 (nausea and vomiting)	1,86 ± 1,52	2,20 ± 1,39	2,16 ± 1,18	2,01 ± 1,
Mean sub-category 2 (fullness and early satiety)	2,38 ± 1,15	2,56 ± 1,25	2,62 ± 0,88	2,46 ± 1,39
Mean sub-category 3 (bloating and distention)	2,69 ± 2,07	1,25 ± 1,03	2,75 ± 1,06	1,95 ± 1,72
Mean GCSI global	2,13 ± 0,97	2 ± 0,70	2,51 ± 0,33	2,12 ± 0,97

Table. 3. — **Overview of AE and DAE**

Grading		Definition
No adverse event		**A telephone contact with the general practitioner, outpatient clinic, or endoscopy service without any intervention or extended observation of the patient after the procedure, <3 hours, without any intervention**
Grade I		**Adverse events with any deviation of the standard postprocedural course, without the need for pharmacologic treatment or endoscopic, radiologic, or surgical interventions : presentation at the emergency ward, without any intervention or hospital admission (<24 hours), without any intervention or allowed therapeutic regimens are drugs as antiemetics, antipyretics, analgesics, and electrolytes or allowed diagnostic tests: radiology and laboratory tests**
Grade II		**Adverse events requiring pharmacologic treatment with drugs other than those allowed for grade I adverse events (ie, antibiotics, antithrombotics, etc) or blood or blood product transfusions or hospital admission for more than 24 hours**
Grade III		**Adverse events requiring endoscopic, radiologic, or surgical intervention**
	Grade IIIa	**Endoscopic or radiologic intervention**
	Grade IIIb	**Surgical intervention**
Grade IV		**Adverse events requiring intensive care unit/critical care unit admission**
	Grade IVa	**Single-organ dysfunction (including dialysis)**
	Grade IVb	**Multiorgan dysfunction**
Grade V		**Death of the patient**

Results

Population

Among the 34 patients who benefited from a GPOEM, only 23 completed pre- and post-operative questionnaires to assess the effectiveness of the procedure.

The gender distribution was nearly equal with 52,94% women and 47.05% men. The average age was 48.35 years (min. 18-max. 79). The mean body mass index (BMI) was 23,26 ± 4,12.

In the group of 23 patients studied for efficacy, women were predominant 65,21% women and 34,78% men). The average age was 50,17 ± 13,60 (min. 18-max. 75).

In this population, the mean BMI was 23,07 ± 4,39. Even if the BMI at the time of the operation was usually between 20 and 25, most of the patients have been overweight in the past, with 33% having been overweight (BMI ≥ 25) and 33% obese (BMI ≥ 30).

The main cause of gastroparesis was idiopathic (56.51% of patients), followed by post-surgical (34.72%) and diabetic (8.68%) causes.

Patients with post-surgical gastroparesis were significantly (p value = 0,039) older (mean age 59,62 years) than those with idiopathic or diabetic gastroparesis (mean ages 45,69 and 41,5 years respectively).

The average residual rate at 2 hours was 55% ± 13%, and the average gastric half-empty time was 147 ± 62,54 minutes. There was no significant difference between the etiological subgroups.

The mean total GCSI score was 2,12 ± 0,97 pre-procedure. It was higher in diabetics patients (2,51 ± 0,33). 13 patients (8 idiopathic and 5 post-chirurgical) had a GCSI of between 1 and 2; and 2 patients had a GCSI of less than 1.

The mean score for the sub-categories was 2,01 ± 1,42 for group 1 symptoms (nausea and vomiting); 2.46 ± 1,39 for group 2 symptoms (fullness and early satiety); and 1,95 ± 1,72 for group 3 symptoms (bloating and distension).

There was no significant difference between the causes of gastroparesis and the subcategories of symptoms, except for group 3 symptoms, which were lower in patients with post-surgical gastroparesis.

In terms of quality of life, before the procedure, the mean PCS12 score was 40,53 ± 10,74 and the mean MCS12 score was 37,75 ± 10,79.

Patients suffering from idiopathic gastroparesis, a significantly greater loss of mental quality of life than the others with a MCS12 calculated at 35,58 ± 11,95, while it is 40,07 ± 10,26 for the other causes.

Among our patients, 30,43% had a history of psychiatric illness (17.36% depression and 13.02% anorexia). These were mainly (71,42%) patients suffering from idiopathic gastroparesis.

34,72% of patients had been taking antidepressants for more than 3 months, but 100% of patients taking antidepressants suffered from idiopathic gastroparesis.

43,40% of patients were active smokers or had a significant smoking history (more than 10 pack-years) with no significant predominance of one group over the other.

All patients had received one or more lines of previous drug treatment for gastroparesis.

Only one patient had undergone previous interventional management.

All our patients were on proton pump inhibitors (PPI) with a mean dose of 56,95 ± 29,45mg.

The mean time between onset of symptoms and GPOEM was 5,04 ± 4,16 years. This delay was significantly shorter in post-surgical gastroparesis.

The mean time from diagnosis of gastroparesis to GPOEM was 3,17 ± 3,41 years. Once again, it was shortest in post-surgical gastroparesis.

Endoscopic procedure

The technical success is 100%.

The mean duration time was 32,52 minutes ± 9,86 minutes.

The mean duration of hospitalization was 1,13 ± 0,34 days.

Adverse event

Only two patients suffered minor complications. Both grade II according to the AGREE classification. The first suffered pain which required stage 1 and 2 analgesics, and which persisted for 3 days, necessitating prolonged hospitalization.

The second patient suffered an asymptomatic centimetric pneumothorax, which resolved spontaneously, requiring 48 hours' in-patient monitoring.

No infectious complications were observed.

Follow up

The mean duration of follow-up was 11,82 ± 10,62 months.

The mean post-procedure GCSI score was 1,23 ± 0,98, representing a decrease of 0,91 ± 1,06 (41,83%) compared with the initial GCSI score. In terms of subcategories, the mean score for category 1 was 1,05 ± 1,11 (a decrease of 47,57%); for category 2 it was 1,47 ± 1,49 (a decrease of 40,08%); and for category 3 it was 1,23 ± 1,26 (a decrease of 36,66%).

For patients who experienced clinical success following GPOEM (n = 17), the total GCSI score decreased by 1,38 ± 0,72 (61,99%). Group 1 symptoms decreased by 65.47%, group 2 by 61.76%, and group 3 by 58.57%.

In contrast, patients who did not experience clinical improvement (n = 6), saw their total GCSI score increase by 0,41 ± 0,64 (21%) after the procedure. Group 1 symptoms remained stable, but group 2 symptoms increased by 24.56%, and group 3 symptoms by 40%.

In terms of quality of life, GPOEM led to an improvement in the PCS12 score by 3.43 ± 5.72, which represents an 8.47% increase, and in the MCS12 score by 7.92 ± 9.68, a 21% increase. A marked difference was noted between patients who responded positively to GPOEM and those who did not. In the successful group (n = 17), the PCS12 score improved by 10.43%, while the MCS12 score increased by 27.95%, nearly reaching normal levels. Conversely, in the unsuccessful group (n = 6), there was no significant improvement or a deterioration in quality of life scores.

Following the GPOEM, we also notice a reduction in daily PPI doses at 41,74 ± 24,06mg (- 26,70% compared to initial dose), but, once again, this reduction is essentially confined to the success group.

Overall, 73,92% of patients are satisfied of the procedure. Nevertheless, even if they're not satisfied, 100% of patients say they'd like to do it again, to try out all the possibilities for improvement.

Discussion

Primary endpoint

Technical success

The technical success of GPOEM is excellent, with a success rate of 100%.

The procedure is also notably fast, with an average completion time of 32.52 minutes and a short hospital stay averaging 1.13 days.

The duration of our examinations is shorter than that reported in the literature, since the average reported duration is between 40 and 120 minutes, but this can be explained by our team's extensive experience in esophageal POEMs and the utilization of an hybrid knife (15).

We found no relationship between procedure duration and operator experience in GPOEMs.

However, we observed a significant difference in procedure duration between patients for whom GPOEM was clinically successful (with a longer average duration) and those for whom it failed (with a shorter average duration). The average procedure time was 33 minutes for the successful group versus 24.5 minutes for the unsuccessful group (p = 0.0048).

Adverse event

We encountered only two minor complications, neither of which affected the long-term health of the patients.

The worsening of gastroparesis symptoms following GPOEM seems to be the natural progression of the disease rather than a consequence of the operation itself. Moreover, the symptoms worsened gradually, and no

patient reported a sudden exacerbation of their symptoms post-GPOEM, which supports this hypothesis.

Seconday endpoint

GPOEM effectiveness

Clinical aspect:

Given that gastroparesis is a functional disorder responsible for a loss of quality of life for the patient due to uncontrolled clinical symptoms, and because our complication rate is very low, we did not impose a minimum value for the GCSI score for patients to be eligible for GPOEM. Moreover, an important proportion of patients undergoing surgery had debilitating symptoms of refractory reflux, a factor not considered in GCSI.

This explain why 11 patients had a GCSI of between 1 and 2, and 2 patients had a GCSI of less than 1. This contrast with most other studies, where a GCSI score below 2 is considered an exclusion criterion for endoscopic treatment.

For this reason, we did not define a specific decrease in GCSI score as the threshold for determining GPOEM success. We considered the procedure effective as long as it led to a significant subjective improvement in symptoms, as reflected by the GCSI score, regardless of the quantitative value of that improvement.

Additionally, we did not see the need to monitor gastric emptying scintigraphy after GPOEM, since it has been demonstrated that there is no correlation between qualitative improvement in symptoms and quantitative improvement in gastric emptying time (25,26) and that it is a costly and irradiating examination.

According to these criteria, our success rate is similar than that reported in other studies for the duration we studied (27) with a clinical success rate of 73,92% and an average improvement in the GCSI score of 59,69% for these patients.

The improvement was greatest in sub-scale 2, then sub-scale 1 and finally sub-scale 3, but there was no significant difference between the different sub-scales.

There was also a significant reduction in the daily dosage of PPIs (-26,70%, p = 0,0020) in all patients for whom the procedure was successful, reflecting a reduction in gastroesophageal reflux symptoms.

Quality of life aspect

Gastroparesis is associated with significant psychological distress and poor quality of life (28) and the impact of diabetes gastroparesis on quality of life is estimated to be comparable to active inflammatory bowel disease or rheumatoid arthritis (29).

It is uncertain whether there are differences in quality of life between the different etiologies of gastroparesis.

In our series, we found that, before GPOEM, physical quality of life is poorer in diabetic gastroparesis, whereas mental quality of life is poorer in idiopathic gastroparesis.

These differences persisted with the intervention, since after GPOEM considered clinically effective, the physical quality of life of patients suffering from idiopathic or post-surgical gastroparesis returned to normal (mean PCS12 50,83 ± 8,02), whereas that of diabetic patients remained lower (mean PCS12 42,49 ± 18,78). This difference could be explained by the existence of diabetic disease rather than by the persistence of gastroparesis symptoms.

The same applies to mental quality of life, which remains lower in patients suffering from idiopathic gastroparesis (MCS12 45,43 ± 8,72) despite clinically effective GPOEM, whereas it returns to normal in patients suffering from post-surgical or diabetic gastroparesis (MCS12 52,41 ± 10,12).

This could be explained by the prevalence of psychopathological problems in patients suffering from gastroparesis, which has been confirmed in terms of depression, anxiety and somatisation (28).

The improvement in quality of life was also positively correlated with the improvement in the GCSI score.

Potential predictor factor of success

In terms of our population, consistent with other studies (30–33), we found no association between the clinical success of GPOEM and patient gender or BMI, contrary to the study published by Abdelfatah et al (34).

Again, unlike to what is reported by Abdelfatah (34), the presence of psychiatric medications was not a predictor of clinical failure in our study. Nevertheless, the presence of a psychiatric history was significantly associated with an increased risk of failure of the procedure (p = 0,038).

In our opinion, more than psychiatric treatment, it is therefore the history of psychiatric illness, even if cured, that should be investigated.

For the scintigraphy parameters, we did not observe any relationship between the retention rate at 2 hours on scintigraphy or the gastric half-emptying time and the clinical efficacity of the GPOEM.

Nor did we find evidence that a longer delay between symptom onset and GPOEM was a predictor of GPOEM failure, contrary to what was reported by Abdelfatah (34).

On the other hand, a longer delay between the diagnosis of gastroparesis (made by gastric emptying scintigraphy) and the performance of GPOEM was associated with a higher rate of clinical success (p = 0,061).

This could possibly be explained by the fact that ensuring the persistence of symptoms over time before performing GPOEM avoids performing the latter on patients who may be suffering from functional dyspepsia rather than gastroparesis.

For the symptoms, neither the total GCSI value nor the values of the various sub-scores were predictive of success contrary to what has already been reported by certain authors (35). Nevertheless, the higher the GCSI score, the greater the improvement.

However, a low GCSI score is not a predictor of failure and both symptomatic and quality of life improvements are significant following GPOEM, independently of the initial GCSI score. Furthermore, the statistically significant reduction in PPI doses suggests that refractory reflux in gastroparesis could be a valid indication for G-POEM. A modified GCSI score, taking reflux into account, could be introduced in the future so as not to prevent these patients from benefiting from a therapy that seems particularly effective in this indication.

A surprising feature of our data, which, to our knowledge, has never been described, is the significant discrepancy between loss of physical quality of life and loss of mental quality of life in GPOEM non-responders.

In fact, the vast majority of our patients have a loss of quality of life that is primarily mental, and only a few patients have a loss of quality of life that is predominantly physical, despite having relatively identical symptoms both overall and in terms of sub-categories.

It is precisely these patients, who have physical difficulties in daily life because of their digestive symptoms, who do not respond to GPOEM. This could possibly be linked to greater somatisation or visceral hypersensitivity, which would have to be proven, or because some patients considered to be gastroparesis suffer in fact from functional dyspepsia, which is frequently associated with a high degree of somatisation.

The introduction of questionnaires assessing the degree of somatisation, such as the PHQ15 or SSD12 questionnaires, which have proven their effectiveness in detection of somatoform disorders (36), and carried out systematically during the development of a suspected gastroparesis, could make it possible to identify these patients who are at high risk of failure of the procedure.

Another important factor is the correlation shown between the length of the procedure and the success of GPOEM: in our series, failures have a significantly shorter intervention time.

The duration of procedures has already been studied in several recent meta-analysies (22,27,31,32,37,38). However, this causal link may never have been demonstrated because of the large number of operators, each with their own working speed.

Even if our number of procedures is low compared with other series, all our procedures were carried out by the two same operators, with the same equipment, under the same working conditions. this difference in duration could be explained by the absence of submucosal fibrosis and/or pyloric hypertrophy in certain patients, who may have functional dyspepsia rather than gastroparesis, since fibrosis is only found in the latter, and who therefore do not benefit from GPOEM.

Another possibility is that most cohorts include a large proportion of diabetic gastroparesis, whereas this is rare in our series. It has been shown that fibrosis is mainly present in patients with idiopathic gastroparesis (39,40), which could mean longer procedures for these patients, and contrast thenceforth with the length of procedures for patients who are more likely to have functional dyspepsia than gastroparesis.

Loss of efficiency over time

Abdelfatah et al reported a loss of efficacy over time in 2020 (34). We did not observe this in our series. Although some patients reported an improvement in their symptoms in the days following the procedure before a recurrence, all our patients were assessed at least 2 months after the procedure, so transient symptomatic improvements were not taken into account.

When patients did improve their symptoms at two months, they seemed to maintain this improvement over time: we found no significant correlation between symptomatic improvement and the time elapsed since the procedure.

Limitations

The main limitations of our study are its retrospective nature (preventing us from retrieving missing data) and the relatively small sample of patients. In addition, there may be a selection bias in that patients in whom GPOEM would not have been effective would have been less inclined to take part in the study.

Another limitation of our study is the fact that our scintigraphies do not evaluate the gastric residue at 4 hours, unlike the majority of other studies. However, our results are similar to those of other series, which leads us to believe that it is not necessary to have this data to select patients requiring a GPOEM.

References

1. YU D, RAMSEY FV, NORTON WF, NORTON N, SCHNECK S, GAETANO T, *et al*. The Burdens, Concerns, and Quality of Life of Patients with Gastroparesis. Dig Dis Sci. avr 2017;62(4):879-93.
2. LACY BE, CROWELL MD, MATHIS C, BAUER D, HEINBERG LJ. Gastroparesis: Quality of Life and Health Care Utilization. J Clin Gastroenterol. janv 2018;52(1):20-4.
3. PARKMAN HP, WILSON LA, HASLER WL, MCCALLUM RW, SAROSIEK I, KOCH KL, *et al*. Abdominal Pain in Patients with Gastroparesis: Associations with Gastroparesis Symptoms, Etiology of Gastroparesis, Gastric Emptying, Somatization, and Quality of Life. Dig Dis Sci. août 2019;64(8):2242-55.
4. CAMILLERI M, KUO B, NGUYEN L, VAUGHN VM, PETREY J, GREER K, *et al*. ACG Clinical Guideline: Gastroparesis. Am J Gastroenterol. 1 août 2022;117(8):1197-220.
5. REVICKI DA, RENTZ AM, DUBOIS D, KAHRILAS P, STANGHELLINI V, TALLEY NJ, *et al*. Development and validation of a patient-assessed gastroparesis symptom severity measure: the Gastroparesis Cardinal Symptom Index. Aliment Pharmacol Ther. 1 juill 2003;18(1):141-50.
6. YE Y, JIANG B, MANNE S, MOSES PL, ALMANSA C, BENNETT D, *et al*. Epidemiology and outcomes of gastroparesis, as documented in general practice records, in the United Kingdom. Gut. avr 2021;70(4):644-53.
7. JUNG HK, CHOUNG RS, LOCKE GR, SCHLECK CD, ZINSMEISTER AR, SZARKA LA, *et al*. The incidence, prevalence, and outcomes of patients with gastroparesis in Olmsted County, Minnesota, from 1996 to 2006. Gastroenterology. avr 2009;136(4):1225-33.
8. WADHWA V, MEHTA D, JOBANPUTRA Y, LOPEZ R, THOTA PN, SANAKA MR. Healthcare utilization and costs associated with gastroparesis. World J Gastroenterol. 28 juin 2017;23(24):4428-36.
9. REY E, CHOUNG RS, SCHLECK CD, ZINSMEISTER AR, TALLEY NJ, LOCKE GR. Prevalence of hidden gastroparesis in the community: the gastroparesis « iceberg ». J Neurogastroenterol Motil. janv 2012;18(1):34-42.

10. WANG YR, FISHER RS, PARKMAN HP. Gastroparesis-related hospitalizations in the United States: trends, characteristics, and outcomes, 1995-2004. Am J Gastroenterol. févr 2008;103(2):313-22.
11. WASEEM S, MOSHIREE B, DRAGANOV PV. Gastroparesis: current diagnostic challenges and management considerations. World J Gastroenterol. 7 janv 2009;15(1):25-37.
12. OH JH, PASRICHA PJ. Recent advances in the pathophysiology and treatment of gastroparesis. J Neurogastroenterol Motil. janv 2013;19(1):18-24.
13. GRONEBERG D, VOUSSEN B, FRIEBE A. Integrative Control of Gastrointestinal Motility by Nitric Oxide. Curr Med Chem. 2016;23(24):2715-35.
14. PARKMAN HP, HASLER WL, FISHER RS, American Gastroenterological Association. American Gastroenterological Association technical review on the diagnosis and treatment of gastroparesis. Gastroenterology. nov 2004;127(5):1592-622.
15. MEKAROONKAMOL P, SHAH R, CAI Q. Outcomes of per oral endoscopic pyloromyotomy in gastroparesis worldwide. World J Gastroenterol. 28 févr 2019;25(8):909-22.
16. SHAKHATREH M, JEHANGIR A, MALIK Z, PARKMAN HP. Metoclopramide for the treatment of diabetic gastroparesis. Expert Rev Gastroenterol Hepatol. août 2019;13(8):711-21.
17. SONG BG, LEE YC, MIN YW, KIM K, LEE H, SON HJ, *et al*. Risk of domperidone induced severe ventricular arrhythmia. Sci Rep. 22 juill 2020;10(1):12158.
18. LACY BE, PARKMAN HP, CAMILLERI M. Chronic nausea and vomiting: evaluation and treatment. Am J Gastroenterol. mai 2018;113(5):647-59.
19. RAO AS, CAMILLERI M. Review article: metoclopramide and tardive dyskinesia. Aliment Pharmacol Ther. janv 2010;31(1):11-9.
20. JONES MP, MAGANTI K. A systematic review of surgical therapy for gastroparesis. Am J Gastroenterol. oct 2003;98(10):2122-9.
21. KHASHAB MA, STEIN E, CLARKE JO, SAXENA P, KUMBHARI V, CHANDER ROLAND B, *et al*. Gastric peroral endoscopic myotomy for refractory gastroparesis: first human endoscopic pyloromyotomy (with video). Gastrointest Endosc. nov 2013;78(5):764-8.
22. YAN J, TAN Y, ZHOU B, ZHANG S, WANG X, LIU D. Gastric per-oral endoscopic myotomy (G-POEM) is a promising treatment for refractory gastroparesis: a systematic review and meta-analysis. Rev Esp Enferm Dig. mars 2020;112(3):219-28.
23. NASS KJ, ZWAGER LW, VAN DER VLUGT M, DEKKER E, BOSSUYT PMM, RAVINDRAN S, *et al*. Novel classification for adverse events in GI endoscopy: the AGREE classification. Gastrointest Endosc. juin 2022;95(6):1078-1085.e8.
24. GANDEK B, WARE JE, AARONSON NK, APOLONE G, BJORNER JB, BRAZIER JE, *et al*. Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: results from the IQOLA Project. International Quality of Life Assessment. J Clin Epidemiol. nov 1998;51(11):1171-8.
25. MALIK Z, KATARIA R, MODAYIL R, EHRLICH AC, SCHEY R, PARKMAN HP, *et al*. Gastric Per Oral Endoscopic Myotomy (G-POEM) for the Treatment of Refractory Gastroparesis: Early Experience. Dig Dis Sci. sept 2018;63(9):2405-12.
26. JANSSEN P, HARRIS MS, JONES M, MASAOKA T, FARRÉ R, TÖRNBLOM H, *et al*. The relation between symptom improvement and gastric emptying in the treatment of diabetic and idiopathic gastroparesis. Am J Gastroenterol. sept 2013;108(9):1382-91.
27. STOJILKOVIC T, STAUDINGER K, DENNIS J. A Systematic Review of the Long-Term Clinical Success of Gastric Peroral Endoscopic Myotomy for Refractory Gastroparesis. Cureus. mai 2023;15(5):e39709.
28. WOODHOUSE S, HEBBARD G, KNOWLES SR. Psychological controversies in gastroparesis: A systematic review. World J Gastroenterol. 21 févr 2017;23(7):1298-309.
29. BHARUCHA AE, KUDVA YC, PRICHARD DO. Diabetic Gastroparesis. Endocr Rev. 1 oct 2019;40(5):1318-52.
30. GONZALEZ JM, BENEZECH A, VITTON V, BARTHET M. G-POEM with antro-pyloromyotomy for the treatment of refractory gastroparesis: mid-term follow-up and factors predicting outcome. Aliment Pharmacol Ther. août 2017;46(3):364-70.
31. UEMURA KL, CHAVES D, BERNARDO WM, UEMURA RS, DE MOURA DTH, DE MOURA EGH. Peroral endoscopic pyloromyotomy for gastroparesis: a systematic review and meta-analysis. Endosc Int Open. juill 2020;8(7):E911-23.
32. MOHAN BP, CHANDAN S, JHA LK, KHAN SR, KOTAGIRI R, KASSAB LL, *et al*. Clinical efficacy of gastric per-oral endoscopic myotomy (G-POEM) in the treatment of refractory gastroparesis and predictors of outcomes: a systematic review and meta-analysis using surgical pyloroplasty as a comparator group. Surg Endosc. 1 août 2020;34(8):3352-67.
33. VOSOUGHI K, ICHKHANIAN Y, BENIAS P, MILLER L, AADAM AA, TRIGGS JR, *et al*. Gastric per-oral endoscopic myotomy (G-POEM) for refractory gastroparesis: results from an international prospective trial. Gut. janv 2022;71(1):25-33.
34. ABDELFATAH MM, NOLL A, KAPIL N, SHAH R, LI L, NUSTAS R, *et al*. Long-term Outcome of Gastric Per-Oral Endoscopic Pyloromyotomy in Treatment of Gastroparesis. Clin Gastroenterol Hepatol Off Clin Pract J Am Gastroenterol Assoc. avr 2021;19(4):816-24.
35. RAGI O, JACQUES J, BRANCHE J, LEBLANC S, VANBIERVLIET G, LEGROS R, *et al*. One-year results of gastric peroral endoscopic myotomy for refractory gastroparesis: a French multicenter study. Endoscopy. mai 2021;53(5):480-90.
36. TOUSSAINT A, HÜSING P, KOHLMANN S, LÖWE B. Detecting DSM-5 somatic symptom disorder: criterion validity of the Patient Health Questionnaire-15 (PHQ-15) and the Somatic Symptom Scale-8 (SSS-8) in combination with the Somatic Symptom Disorder - B Criteria Scale (SSD-12). Psychol Med. janv 2020;50(2):324-33.
37. AZIZ M, GANGWANI MK, HAGHBIN H, DAHIYA DS, SOHAIL AH, KAMAL F, *et al*. Gastric peroral endoscopic myotomy versus surgical pyloromyotomy/pyloroplasty for refractory gastroparesis: systematic review and meta-analysis. Endosc Int Open. avr 2023;11(4):E322-9.
38. SPADACCINI M, MASELLI R, CHANDRASEKAR VT, ANDERLONI A, CARRARA S, GALTIERI PA, *et al*. Gastric peroral endoscopic pyloromyotomy for refractory gastroparesis: a systematic review of early outcomes with pooled analysis. Gastrointest Endosc. avr 2020;91(4):746-752.e5.
39. FAUSSONE-PELLEGRINI MS, GROVER M, PASRICHA PJ, BERNARD CE, LURKEN MS, SMYRK TC, *et al*. Ultrastructural differences between diabetic and idiopathic gastroparesis. J Cell Mol Med. juill 2012;16(7):1573-81.
40. GOTFRIED J, SCHEY R. Understanding the Differences Between Gastroparesis and Gastroparesis-Like Syndrome: Filling a GaPing Hole? Dig Dis Sci. 1 oct 2017;62(10):2615-7.