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ORIGINAL ARTICLE

Decompressive percutaneous endoscopic gastrostomy in advanced cancer patients with small-bowel obstruction is feasible and effective: a large prospective study

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Abstract
Purpose The purpose of this study was to evaluate patient-centered outcomes of decompressive percutaneous endoscopic gastrostomy (dPEG) in patients with malignant bowel obstruction due to advanced gynecological and gastroenteric malignancies.
Methods This is a prospective analysis of 158 consecutive patients with small-bowel obstruction from advanced gynecological and gastroenteric cancer who underwent PEG or percutaneous endoscopic jejunostomy (PEJ) positioning for decompressive purposes from 2002 to 2012. All of them had previous abdominal surgery and were unfit for any other surgical procedures. Symptom relief, procedural complications, and post dPEG palliation were assessed. Global Quality of Life (QoL) was evaluated in the last 2 years (25 consecutive patients) before and 7 days after dPEG placement using the Symptom Distress Scale (SDS).
Results *d*PEG was successfully performed in 142 out of 158 patients (89.8 %). Failure of tube placement occurred in 16 patients (10.1 %). In 8/142 (5.6 %) patients, dPEG was guided by abdominal ultrasound. In 3/142 patients, dPEG was CT-guided. In 14 (9.8 %) patients, who had previously undergone total or subtotal gastrectomy, decompressive percutaneous endoscopic jejunostomy (dPEJ) was performed. In 1/14 patients, dPEJ was CT-guided. Out of 142 patients, 110 (77.4 %) experienced relief from nausea and vomiting 2 days after PEG.

Out of 142 patients, 116 (81.6 %) were discharged. The median postoperative hospital stay was 9 days (range 3–60). Peristomal infection (14 %) and intermittent obstruction (8.4 %) were the most frequent complications associated with PEG. Median survival time was 57 days (range 4–472) after PEG placement.

Twenty-five patients had QoL properly evaluated with SDS score before and 7 days after dPEG. Sixteen patients (64 %) out of 25 exhibited an improvement of QoL ($p < 0.05$), 7 (28 %) patients exhibited a non-significant worsening of QoL ($p = 0.18$), and in 2 (8 %) patients, it remained unmodified.
Conclusions *dPEG* is feasible, effective, relieves nausea and vomiting in patients with unremitting small-bowel obstruction from advanced gynecological and gastroenteric cancer, and improves QoL.

Keywords Gastrostomy · Cancer · Gastrointestinal occlusion · Peritoneal carcinomatosis · Jejunostomy · Palliative treatment

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Introduction

Malignant bowel obstruction (MBO) is a frequent and distressing complication of advanced gynecological and gastroenteric cancer [1–4]. Resulting obstructive symptoms are nausea, vomiting, and abdominal distension pain. Prevalence of MBO ranges from 3 to 15 % of cancer patients. Primary cancers that most frequently cause MBO are ovarian (20–50 %), colorectal (10–29 %), gastric (6–19 %), pancreatic (6–13 %), bladder (3–10 %), endometrial (3–11 %), breast (2–3 %), and melanoma (3 %) [5–7]. To date, in patients with disseminated peritoneal carcinomatosis and small-bowel obstruction, gastrointestinal decompression through a nasogastric tube (NGT) is still the first-line procedure. However, long-term decompression with an NGT is associated with psychological distress and potential complications such as wing necrosis, laryngeal disorders, esophageal-gastric lesions, otitis media, and aspiration pneumonia.

In 1986, Malone et al. [8] reported the first case of percutaneous radiological gastrostomy (PRG) for a decompressive purpose. This technique was adopted and modified by Stellato and Gauderer [9] who described the first case of PEG for decompressive purpose in 1987. The benefit of decompressive percutaneous endoscopic gastrostomy (dPEG) tubes in MBO in advanced gynecological malignancies has been well established [10–14], although physical and psychological outcomes have not yet been evaluated.

The aim of this study is to examine, in a large single-center cohort of 158 successive patients with MBO and abdominal carcinomatosis from advanced gynecological and gastroenteric cancer, the efficacy and outcomes of dPEG. Relief from obstructive symptoms in patients with small-bowel obstruction due to advanced gynecological and gastrointestinal malignancies (and who were unfit for surgery) was assessed. Because palliative relief of these distressing symptoms is the main objective in care in terminal patients, Quality of Life (QoL) is an essential parameter (and a powerful issue in oncology) in assessing a patient's benefit given from a procedure like PEG.

The literature offers several studies about patients' outcomes after dPEG for malignant pathologies, but there are no articles about QoL (this has been investigated in patients undergoing PEG for nutritional purposes [15]).

Our goals were to estimate the feasibility, safety, and effectiveness of dPEG and its impact on QoL in patients with MBO.

Materials and methods

We collected data from September 2002 to September 2012. During this period, 158 consecutive patients with malignant small-bowel obstruction from abdominal-pelvic carcinomatosis and a life expectancy of more than 30 days underwent dPEG. All patients had intestinal obstruction diagnosed on a clinical and radiological basis (direct abdomen X-rays, abdominal ultrasound, and CT), were previously surgically treated, and were judged no longer eligible for further surgical treatment by a multidisciplinary team. For all patients, obstructive symptoms such as nausea, vomiting, and abdominal distension pain were reported from at least 24 h prior to the positioning of a nasogastric tube (NGT) that remained in situ for more than 5 days before PEG placement. All patients gave written informed consent as reported in clinical records.

dPEG procedures were performed with the patient lying in the supine position and sedated with midazolam 5 mg and fentanyl 0.1 mg, previous endovenous profilaxis with cefotaxime 2 g 1 h before the intervention. An Olympus Q165 video endoscope was transorally introduced. PEG was placed using the "pull" method [16]. When transillumination was not feasible, abdominal ultrasound or CT were used to find the appropriate site of PEG placement.

In 14 patients who had previously undergone total or subtotal gastrectomy for neoplastic gastric infiltration or peptic ulcer, a decompressive percutaneous endoscopic jejunostomy (dPEJ) was performed. Fifteen Fr catheters were used in 5 patients, while 20 Fr catheters were used in 9 patients.

After discharge, symptoms associated with disease progression were regularly checked, and pharmacological management of abdominal pain, nausea, and vomiting was verified.

In the last 2 years, we interviewed all consecutive patients before and 7 days after dPEG procedure for QoL assessment.

We used the Symptom Distress Scale (SDS) of McCorkle and Young (1978) [17], validated for Italian context by Peruselli and Paci (1993) [18]. The SDS is a self-report of a patient's current level of distress and assesses physical and psychological symptoms, as they are experienced by the patient, and their variation (due to the course of the disease or in association with specific medical or psychological interventions). The scale consists of 13 symptoms identified by patients as distressing (Fig. 1): nausea (frequency), nausea (intensity), fatigue, bowel pattern, concentration, appearance, appetite, insomnia, pain (frequency), pain (intensity), breathing, outlook, and cough. Some symptoms (e.g., fatigue, insomnia, and appetite) have been classified as somatopsychic ones, since they are easily affected by the organic and psychological components. Responses are given on a 5-point Likert scale ranging from 1 (no distress) to 5 (extreme distress). The 13 items can be summed to provide total symptom distress ranging from 13 to 65. Lower scores are associated with a better QoL.

The McNemar test was used to evaluate differences in QoL before and after dPEG, and $p \leq 0.05$ was chosen as the significance threshold.

Fig. 1 SDS of McCorkle and Young (1978) [22], validated for Italian context by Peruselli and Paci

SYMPTOMS	SCORE				
Pain Frequency	1	2	3	4	5
Pain Intensity	1	2	3	4	5
Nausea Frequency	1	2	3	4	5
Nausea Intensity	1	2	3	4	5
Appetite	1	2	3	4	5
Bowel Activity	1	2	3	4	5
Breathing	1	2	3	4	5
Cough	1	2	3	4	5
Fatigue	1	2	3	4	5
Insomnia	1	2	3	4	5
Concentration	1	2	3	4	5
Physical Appearance	1	2	3	4	5
Mental state	1	2	3	4	5

Results

dPEG was successfully performed in 142 (89.9 %) out of 158 patients. Table 1 summarizes the primary cancers. All patients had at least one previous gastrointestinal surgical procedure (19.7 % had one surgical procedure, 42.2 % had two, 28.1 % had three, 7.7 % had four, 2.1 % had five) (Table 2). In 16 (10.1 %) patients, it was impossible to identify the correct transillumination and/or insertion point of the needle because of excessive stomach migration and compression. In eight cases (5.6 %), because of a lack of transillumination, abdominal ultrasound was performed prior to dPEG placement. In three (2.1 %) patients (two had stomach dislocation, one had gastric tubulization), dPEG placement was CT-guided. In 40 (28.1 %) out of 142 patients, gastroesophageal lesions were encountered during PEG placement (16.1 % had esophagitis, 6.3 % gastric ulcers, 2.8 % duodenal ulcers, and 2.8 % neoplastic infiltration; Table 3).

Fourteen (9.8 %) patients with previous gastric surgical procedures underwent PEJ for decompressive purpose, of which nine (64.3 %) had undergone partial gastrectomy and five (35.7 %) total gastrectomy. In one case, PEJ was CT-guided. In all 14 patients, PEJ placement provided relief from nausea and vomiting. All patients were on total parenteral nutrition (TPN) after dPEG or dPEJ tube placement.

After 2 days, obstructive symptoms were re-assessed. Out of 142 patients, 110 (77.4 %) experienced complete relief from nausea and vomiting and were able to resume oral liquids and small amounts of soft food intake for a median of 57 days with self-reported satisfaction. Twelve patients (8.4 %) had only nausea, while 20 (14 %) had persistent vomiting. In these 20 patients, somatostatin analogues were used with partial relief from vomiting: in 12 patients, octreotide was administered with doses up to 0.6 mcg until death and 8 patients were treated with lanreotide until death.

The median hospital stay was 9 days (range 3–60 days). Median survival time was 57 days (range 4–472 days) after dPEG placement. All deaths were related to underlying disease. Twenty-six (18.3 %) out of 142 deaths occurred during the hospital stay because of disease progression. Out of 142 patients, 116 (81.6 %) were discharged and continued end-stage palliation at home without further need of an NGT.

dPEG-associated complications were encountered in 41 (28.8 %) out of 142 patients. Peristomal infection (14 %) and intermittent catheter obstruction (8.4 %) were the most frequent. Peristomal infection was successfully treated with

Table 1 Primary cancers in patients with successful dPEG or dPEJ placement

Disease	No. of patients (%)
Colon carcinoma	13 (9.1)
Gastric carcinoma	7 (4.9)
Gallbladder carcinoma	2 (1.4)
Breast carcinoma	2 (1.4)
Pancreas carcinoma	2 (1.4)
Ovarian carcinoma	96 (67.6)
Portio carcinoma	6 (4.2)
Endometrial carcinoma	8 (5.6)
Uterine sarcoma	6 (4.2)
Total	142

Table 2 Number of surgical procedures in 142 cancer patients prior to dPEG or dPEJ placement

No. of surgical procedures	No. of patients (%)
0	0
1	28 (19.7)
2	60 (42.2)
3	40 (28.1)
4	11 (7.7)
5	3 (2.1)

Table 3 Gastroesophageal lesions highlighted in the endoscopic examination during dPEG

Lesions	No. of patients (%)
Gastric ulcers	9 (6.3)
Duodenal ulcers	4 (2.8)
Neoplastic infiltrations	4 (2.8)
Esophagitis	23 (16.1)
Total	40 (28.1)

local antibiotic medication. Other complications observed were loss of gastric juices from ostomy (1.4 %), gastric bleeding (2.1 %) related to disease progression, dPEG displacement (2.1 %), and one catheter failure at 24 h caused by excessive stretching with immediate resumption of catheter drainage after appropriate positioning within the stomach (Table 4).

Fourteen (9.8 %) out of 142 patients underwent salvage chemotherapy after PEG placement, which showed to be effective in four patients with gastrointestinal neoplastic disease.

In regard to the global QoL, 25 patients had a SDS score properly evaluated (Fig. 2). Sixteen (64 %) improved (41 vs 32.6, pre- and post-PEG median scores, respectively, $p<0.01$), two (8 %) at a further assessment showed the same scores as at baseline, and seven (28 %) had non-significant worsening (30.85 vs 36.14, $p=0.18$) of QoL. Of the 16 patients who showed an improvement in the QoL, nine reported an improvement of symptoms at physical (19.6 vs 14.75, $p<0.01$), psychological (10.1 vs 7.3, $p<0.05$), and somatopsychic levels (11.25 vs 9.2, $p<0.05$). Regarding diet tolerance, all were able to resume oral liquid and small amounts of soft food intake. Of the remaining seven patients, one reported improvement at the physical level, three at the psychological level, and three at the somatopsychic level. The worsening of global QoL was determined by the persistence of the physical symptoms (14.57 vs 20, $p<0.05$) while psychological and somatopsychic levels remained stable.

Table 4 Complications associated with dPEG

Complications	No. of patients (%)
PEG dislodging/repositioning	3 (2.1)
Gastric bleeding	3 (2.1)
Intermittent obstruction	12 (8.4)
Peristomal infection	20 (14.08)
Loss of gastric juices from ostomy	2 (1.4)
Catheter failure	1
Total	41 (28.8)

Discussion

MBO is a common and distressing outcome in patients with gastrointestinal or gynecological cancer. Palliative management of end-stage malignant intestinal obstruction remains controversial. The primary goal in patients with end-stage malignant disease is the relief of obstructive symptoms by providing the highest level of comfort possible and improving QoL. To date, in patients with disseminated peritoneal carcinomatosis and small-bowel obstruction, gastrointestinal decompression through an NGT is still the first-line procedure. However, a long-term NGT is not well tolerated and causes severe complications. Surgical management of intestinal obstruction in patients with advanced ovarian cancer who have received adjunctive chemotherapy and/or radiation therapy and have a poor performance status is associated with high morbidity and mortality [19, 20]. dPEG represents a safe and effective alternative treatment to an NGT in improving symptoms of small-bowel obstruction. The success rate of dPEG placement has been reported to be 86 to 100 %, achieving adequate control of symptoms in 84 to 100 % of the patients, even in cases presenting peritoneal carcinomatosis, ascites, or gastric infiltration [2, 9–13, 21]. Previous studies have evaluated the feasibility and outcomes of dPEG, but our study evaluates the largest number of patients so far, focusing on symptomatological relief as the outcome.

Our study showed a high rate of successful dPEG placement (89.8 %), which is in line with previous studies (84–100 %). In eight (5.6 %) patients, because of a lack of transillumination, PEG was guided by abdominal transcutaneous ultrasound imaging at the time of endoscopy, which allowed for rapid localization of an appropriate area for dPEG placement. In three patients (two with stomach dislocation, one with gastric tubulization), dPEG was guided by CT. Fourteen (9.8 %) patients with previous gastric surgical procedures underwent dPEJ. In one patient, PEJ was CT-guided because of a lack of transillumination. PEG placement was unsuccessful in 16 (10.1 %) patients because of the absence of appropriate puncture site. Obstructive symptoms were relieved by dPEG or PEJ in 110 (77.4 %) patients out of 142, allowing oral intake of liquids and soft foods. In 20 (14 %) out of 142 patients, persistent obstructive symptoms (nausea and vomiting) were partially relieved with the use of somatostatin analogues (in 12/20 octreotide and in 8/20 lanreotide), which inhibit the release and activity of gastrointestinal hormones. The efficacy of octreotide and lanreotide in relieving partial bowel obstruction has already been demonstrated in literature [22–25]. The costs of somatostatin analogues are elevated and the cost/benefit ratio of this treatment has not yet been assessed. Therefore, we suggest the use of somatostatin analogues only in unremitting obstructive symptoms after PEG placement. The most frequent complications observed were peristomal infection (14 %) and intermittent catheter

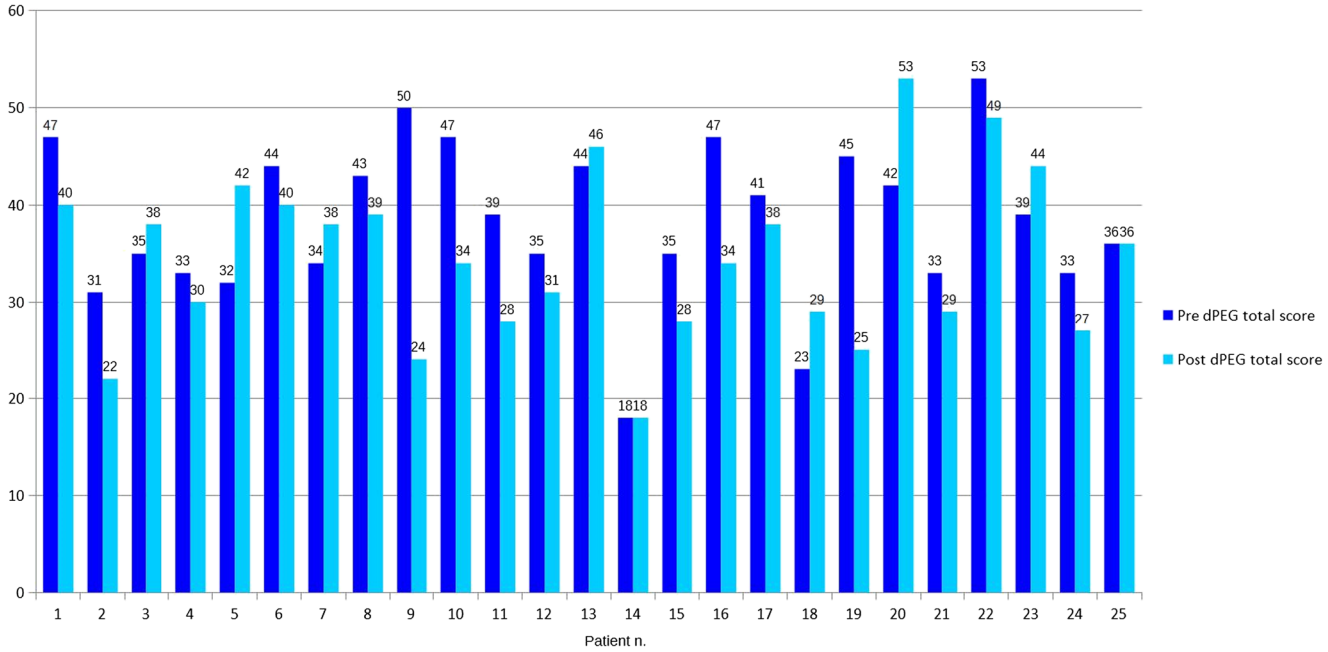

Fig. 2 Pre- and post-dPEG SDS total scores

obstruction (8.4 %). Maintenance of PEG is easily performed by the patient with the help of an adequately trained family member. It consists in the daily washing of the gastrostomy catheter using 10 to 20 cc of saline solution or water, which is sufficient to prevent catheter obstruction, emptying collection bags of drained fluid from the stomach, and periodic cleaning of peristomal skin.

Some previous studies [26–28] have indicated that ascites, abdominal tumor masses, advanced carcinomatosis, or prior surgical gastrointestinal procedures are absolute contraindications to dPEG or dPEJ. In our experience, dPEG is safe and feasible in patients with these kinds of pathologies. The failure rate of insertion is low; however, insertion improves with experience and the possible use of supporting techniques [29–31]. Out of 142 patients, 126 (88.7 %) were discharged and continued end-stage palliation at home, while 9.8 % could undergo salvage chemotherapy.

In our study, dPEG has shown to be a safe and effective procedure for relieving nausea and vomiting and to eliminate the need for an NGT. However, dPEG is contraindicated when patients suffer from a progressive deterioration of performance status and present life expectancies shorter than 30 days. In this setting, pharmacological treatment (hyoscine butylbromide, haloperidol, morphine, octreotide, or lanreotide) with or without nasogastric intubation should be the elective palliative management.

A group of experts from the European Association of Palliative Care (EAPC) have endorsed recommendations for management of bowel obstruction in end-stage cancer. It was concluded that surgery should not be undertaken routinely in patients with poor prognostic criteria, such as intra-abdominal carcinomatosis, poor performance status, and massive ascites. An NGT should be used only as a temporary measure. Medical measures such as analgesics, antiemetics, and antisecretories should be used alone or in combination to relieve symptoms. A venting gastrostomy should be considered if drugs fail to reduce vomiting to an acceptable level [32]. In our experience, dPEG is effective in relieving obstructive symptoms, is well tolerated by patients, and has acceptable complication rates. Furthermore, dPEG has proven to be effective in symptom relief. In persistent obstructive symptoms after dPEG placement, somatostatin analogues were used with partial efficacy.

Our study shows that a consecutive group of 25 patients with intestinal occlusion from peritoneal carcinosis who underwent dPEG experienced a significant improvement of their global QoL on physical, psychological, and somatopsychic levels measured by the SDS of McCorkle and Young. The SDS was one of the first scales developed to measure the symptom distress defined as the degree of discomfort reported by the patient in relation to his/her perception of the symptoms experienced. Improvement of QoL was observed in 16 (64 %) out of 25 patients. The non-significant worsening of global QoL in 7 (28 %) patients was determined mainly by the persistence of the physical symptoms. In two (8 %) patients, QoL remained unchanged. Data show that dPEG affects the physical and, less specifically, the psychological symptoms. In addition to these fundamental issues regarding QoL, it is noteworthy that dPEG may allow palliative chemotherapy in selected cases (14/129

[(10.8 %)]) patients in our case study. In this kind of patient, who can have a rapidly worsening condition due to underlying pathologies, these are very encouraging data.

We propose that dPEG should be considered at an earlier stage in patients with recurrence of malignant carcinomatosis (which results in severely distressing gastrointestinal complications) for better success rate and outcomes.

In conclusion, our study is the largest in the literature on this topic and demonstrates that dPEG is effective in relieving symptoms of MBO in advanced gynecological and gastrointestinal cancer patients with prior surgical procedures and multiple chemotherapy treatments. dPEG also is effective in improving QoL.

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