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Gastrostomies and clinical outcomes: a cohort of different enteral feeding techniques in advanced cancer palliative care

Abstract

Background: The study aimed to assess complications after gastrostomy (GTT) performance using different techniques and the impact on the survival of patients with advanced cancer in exclusive palliative care.
Patients and methods: Retrospective study with patients using gastrostomies, hospitalized in the oncology palliative care unit, where complications of the procedure were evaluated according to the period of occurrence and case severity.
Results: A total of 47 patients participated, being 83% male. Surgical gastrostomy was performed in 17%, radio intervention in 51.1%, and endoscopy in 31.9%. At the time of GTT indication, functional capacity by Karnofsky Performance Status (KPS) was different between groups and 87.5% of patients eligible for surgery had KPS $\geq$ 60%. On the date scheduled for GTT via surgery, only 50% of patients had KPS $\geq$ 60% and at that time no difference in KPS was observed between the types of intervention. The most frequent complications were abdominal pain and extravasation of the diet. There was no difference in terms of complications regarding the type of technique chosen; however, individuals who submitted to radio intervention had a greater 30-day survival. C-reactive protein (CRP) > 10 mg/dL, Modified Glasgow Prognostic Score (mGPS) $\geq$ 1, and the presence of comorbidities were independent predictors of poorer survival.
Conclusions: These findings are consistent with those reported in the literature regarding complications, regardless of the technique selected. Strategies should be designed to reduce the interval between the indication and the performance of the procedure, to preserve the functionality of those patients with a recognized limited survival, and to obtain better benefits from this intervention.

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Keywords: gastrostomy, complications, palliative care, enteral nutrition

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Introduction

Patients with advanced cancer experience an intense systemic inflammatory response, which plays an important role in disease progression and symptoms including pain, hyporexia, and dysphagia. The association of these symptoms with the inflammatory status and the tumor progression itself contributes to the fact that most patients with advanced cancer in exclusive palliative care have their nutritional status impaired and consequently have a shorter survival [1].

Exacerbated systemic inflammation, triggered by the disease and produced by the tumor itself, along with impaired nutritional status, which leads to decreased skeletal muscle mass, reduced physical and motor capacity, and increased fatigue, are factors that significantly impact overall function [2]. These factors have been recognized in the medical literature as valuable indicators in clinical practice [1, 3, 4]. Furthermore, prognostic evaluation can help mitigate the risks associated with ineffective and excessive cancer treatments [4].

Enteral nutritional therapy (ENT) is considered a therapeutic tool in cases where patients' oral ingestion is precluded due to mechanical reasons or when their intake capacity is below 60% for two weeks [5]. Enteral nutritional therapy's purpose is to restore or maintain the nutritional status or improve or prevent symptoms related to malnutrition such as weakness, nausea, depression, irritability, loss of concentration, and emotional effects [6]. However, this indication for patients with advanced cancer in palliative care is not simple and is not an isolated decision, requiring a reflection from a clinical and bioethical point of view, and is further considered a complex and controversial issue [7, 8].

In situations where patients require long-term ENT, gastrostomies (GTT) may be employed to provide nutritional support. Gastrostomy involves inserting a tube into the stomach through the abdominal wall, and this can be done surgically or through percutaneous endoscopy gastrostomy (PEG) or radiologically inserted gastrostomy (RIG).

GTT-related complications can be divided into early and late complications according to the time of occurrence, to distinguish potential problems associated with the performance of the procedure or the use of the tube. They can also be classified according to severity into minor and major complications [6]. There are only a few studies in the literature on nutritional therapy in advanced cancer patients who received palliative care and inconsistencies have been observed in the indication of enteral diet and in the procedure performed to establish the GTT (via endoscopy, surgery, or radio intervention). Thus, the objective of this study was to evaluate complications after performing GTT using different techniques for alternative feeding and the impact on the survival of patients with advanced cancer in exclusive palliative care.

Patients and methods

This was a descriptive, longitudinal, retrospective study with a quantitative approach, having as its field of application a hospital unit for exclusive oncological patients under palliative care, located in the city of Rio de Janeiro, Brazil.

In-patients aged 18 years or over, of both genders, diagnosed with advanced-stage malignant tumors, previously subjected to treatment, regardless of tumor location, and undergoing GTT placement for diet enteral infusion between January 2019 and December 2020 were included. Patients undergoing GTT placement for gastric decompression were excluded. Demographic information, diagnosis, metastases, comorbidities, functionality, inflammation and prognostic biomarkers, GTT indications, presence of tracheostomy, and post-procedure complications were retrieved from the medical records.

Karnofsky Performance Status (KPS) on the day of GTT indication and the day of the procedure was used to assess the functional capacity of patients, ranging from 0 to 100% with 10% increments between them; each increase describes the level at which patients can carry out their daily activities independently. For example, a score of 30% describes a poorly able patient with an indication for hospitalization [9]. The modified Glasgow Prognostic Score (mGPS) evaluated the inflammatory status, through serum albumin (< 3.5 g/dL) and C-reactive protein (CRP) (> 10 mg/dL) values, up to 15 days before the start of the ENT. The mGPS was classified as 2 if the albumin and CRP concentrations were < 3.5 mg/dL and > 10 mg/dL respectively; it was classified as 1 for albumin levels ≥ 3.5 mg/dL and CRP > 10 mg/dL; and mGPS was set at 0 if CRP was ≤ 10 mg/dL. Thus, the higher the mGPS the greater the inflammatory response [10]. When patients' serum CRP and albumin values were not available, those patients were excluded from the survey. These variables were analyzed in isolation with the same reference parameters [11].

Complications of GTTs were distributed according to the period of occurrence, that is, early complications, were those that occurred up to five days after the placement of the ancillary feeding route device, and late complications were those that occurred five days or greater after the procedure. Complications were classified according to severity as minor when they were mild and were transient and controllable by the implementation of simple measures. Minor complications include abdominal pain, ostium infection, incision dehiscence, catheter occlusion or displacement/disintegration, gastroparesis, fullness after feeding, and nausea or vomiting. More serious complications include severe symptoms, potentially dangerous complications, or conditions that require the cooperation of professionals outside the unit like peritonitis, external extravasation, massive hemorrhages, bronchial aspiration, pneumoperitoneum, septic shock, tube extrusion, severe local infection, and severe abdominal pain [6, 12].

Discharge or death outcome was assessed up to 90 days after the procedure. The calculated survival was set until death or cut-off, that is, patients who remained alive after 90 days of the procedure constituted the cut-off point. Data were analyzed using the IBM SPSS Statistics program, version 20. The Shapiro–Wilk test was performed to assess the distribution of variables. Descriptive analysis was presented in percentages for the categorical variables and as mean and standard deviation or median with interquartile range (IQR) for continuous variables.

The association between categorical variables was assessed using Fisher's exact test. Survival analysis was performed using the Kaplan–Meier curve and the log-rank test, used to compare survival curves according to the type of GTT. In addition, the Cox proportional hazards model was used to estimate fatal risk factors. All the analyses with $p \leq 0.20$ in the univariate analysis were included in the multivariate analysis. The final model was obtained through the backward procedure and considered statistically significant when $p < 0.05$.

This work was prepared in compliance with the Regulatory Guidelines and Norms for Human Research (CNS resolution 466/12) and approved by the Research Ethics Committee of the Institution (CAAE: 40143920.4.0000.5274).

Results

The sample consisted of 47 patients. Radiologically inserted gastrostomy was performed in 24 patients, PEG in 15, and surgically in 8. At the time GTT was indicated to the patients, 23 out of 47 individuals had KPS ≥ 60%, 20 had KPS between 40% and 50%, and 4 had KPS < 40%. However, on the day GTT was performed, there were 8 patients presenting KPS < 40%. The interval between GTT indication and procedure performance was 13 days (IQR: 6–21). The mGPS was calculated in 37 patients, among 24 had mGPS 0. The mean value of serum albumin observed in the sample was 3.49 ± 0.08 g/dL and the median CRP was 6.87 mg/dL (IQR: 3.87–14.29) (Table 1). The median 90-day survival of the sample was 54 (IQI: 17–90) days and, at the end of the follow-up period, 13 patients were alive.

Table 1. Clinical and pathological characteristics of patients on enteral nutrition by gastrostomy with advanced cancer in palliative care

Variables	N [%]
Gender	
Male	39 (83)
Female	8 (17)
Age	
< 60 years	24 (51.1)
≥ 60 years	23 (48.9)
Comorbidities	
No	28 (59.6)
Yes	19 (40.4)
Prophylactic antibiotic therapy	
No	41 (87.2)
Yes	6 (12.8)
Tumor location	
Head and neck	39 (83)
Others (gastrointestinal tract, neuro, gynecological)	8 (17)
mGPS n = 37	
mGPS 0	24 (64.9)
mGPS 1 or 2	13 (35.1)
Albumin	
Albumin ≥ 3.5 g/dL	25 (53.0)
Albumin < 3.5 g/dL	22 (47.0)
CRP (n = 37)	
CRP ≤ 10.0 mg/dL	24 (64.9)
CRP > 10.0 mg/dL	13 (35.1)
Tracheostomy	
No	25 (53.2)
Yes	22 (46.8)
Motives for gastrostomy	
Total dysphagia	22 (46.8)
Partial dysphagia	23 (48.9)
Lowering of the level of consciousness	2 (4.3)
Type of gastrostomy tube	
RIG	24 (51.1)
PEG	15 (31.9)
Surgical	8 (17)

Table 1. cd. Clinical and pathological characteristics of patients on enteral nutrition by gastrostomy with advanced cancer in palliative care

Variables	N [%]
KPS on the day of the indication of gastrostomy	
60%	23(48.9)
40–50%	20 (42.6)
< 40%	4 (8.5)
KPS on the day of gastrostomy	
60%	19 (40.4)
40–50%	20 (42.6)
< 40%	8 (17)
Complications*	
No	27 (57.4)
Yes	20 (42.6)

KPS — Karnofsky Performance Status; PEG — percutaneous endoscopic gastrostomy; RIG — radiologically inserted gastrostomy
* Some patients had more than one complication

In 27 individuals complications after the procedure did not develop. Among the 20 patients who had complications, some patients had more than one type of complication: 10 early complications were found, and 11 late complications were experienced. The frequency of complications was also classified in terms of severity, with 15 being mild and 13 being severe.

Concerning early complications, the frequency of abdominal pain, requiring analgesia or opioids, was 23.7%, followed by dietary extravasation with 19% frequency. In addition, ostium infection, nausea, and catheter displacement occurred in 9.5% of the patients. Finally, severe abdominal pain, vomiting, pneumoperitoneum, gastroparesis, catheter fullness, and occlusion had a 4.8% frequency each (Figure 1).

Among the late complications (Figure 2), the most frequent was extravasation of the diet (36.8%), followed by abdominal pain (15.8%), ostium infection, nausea, and vomiting (10.5% each), and dehiscence, gastroparesis, and hemorrhage (5.3% each). Regarding minor complications (Figure 3), abdominal pain was the most frequent (32%), followed by ostium infection (16%), nausea and vomiting (12%, each), and catheter displacement and gastroparesis (8%, each). Catheter occlusion, dehiscence, and fullness were less frequent (4% each). Finally, among the major complications (Figure 4), extravasation stands out as the most frequent complication (76.9%), followed by hemorrhage, pneumoperitoneum, and severe abdominal pain (7.7% each). Catheter disintegration, peritonitis, bronchial aspiration, septic shock, severe local infection, and tube extrusion were not seen in any patient.

The clinical outcomes of patients who underwent GTT with a 90-day follow-up are presented in Table 2 After the initial 30 days, 68.1% (n = 32) of patients who underwent the procedure survived. At the 60-day mark, this percentage decreased to 46.8% (n = 22), and at 90 days, it further declined to 27.6% (n = 13). In the first 30 days following the procedure, the RIG group had a death rate of 12.5% (n = 3), which was significantly different from other groups (p = 0.01), though it is impossible to assert that any type of gastrostomy had an impact on survival in this study. When considering complications (early, late, minor, and major), no significant differences were observed in relation to the technique employed. In summary, although there were no notable differences in complications based on the type of GTT used, there was a significant difference in survival rates at the 30-day mark among the different groups about the technique adopted.

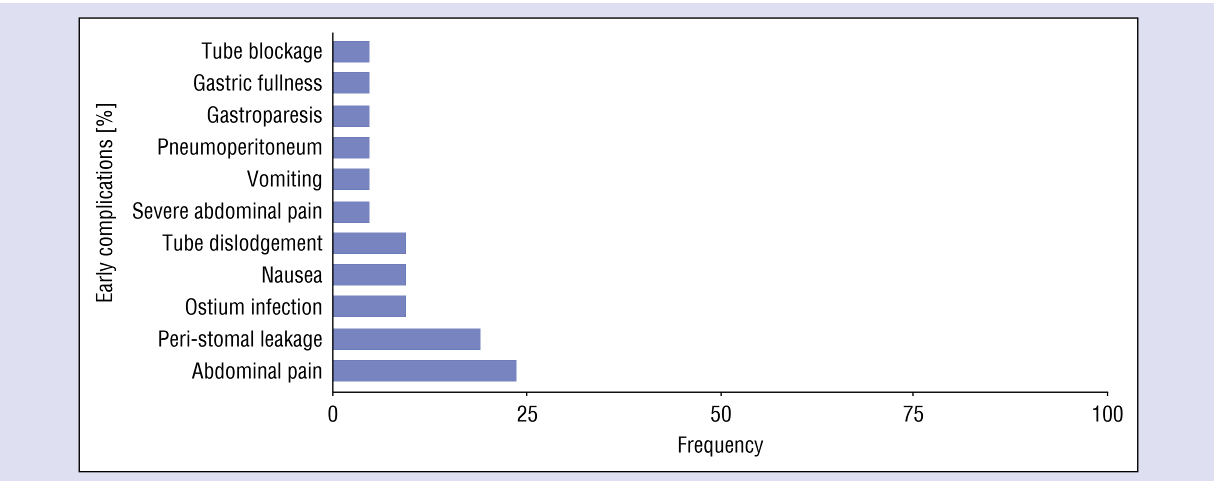

Figure 1. Frequency of early complications

Regarding functional capacity at the time of GTT indication and on the day of GTT performance, there was a significant difference ($p = 0.01$) in KPS at the time of indication between the different techniques (Table 3). The Cox univariate regression model suggested as independent predictors of lower survival: CRP values > 10 mg/dL, mGPS ≥ 1, and the presence of comorbidities (Table 4).

Discussion

The present study evaluated the complications after performing GTT in advanced cancer patients using different techniques such as RIG, surgical, or PEG. The laparoscopic technique was introduced in the early 1990s [13]. The PEG method was first described in 1980 by Gauderer and Ponsky, and the RIG method in 1981 by Preshaw, the last two being associated with low complication rates [14]. When compared to surgical placement, PEG is normally faster and cheaper and does not require general anesthesia. However, the surgical technique is still a method used in cases where there is a need, such as in total obstruction of the esophagus [15]. The main findings showed that there was no significant difference in terms of complications in relation to the type of GTT performed.

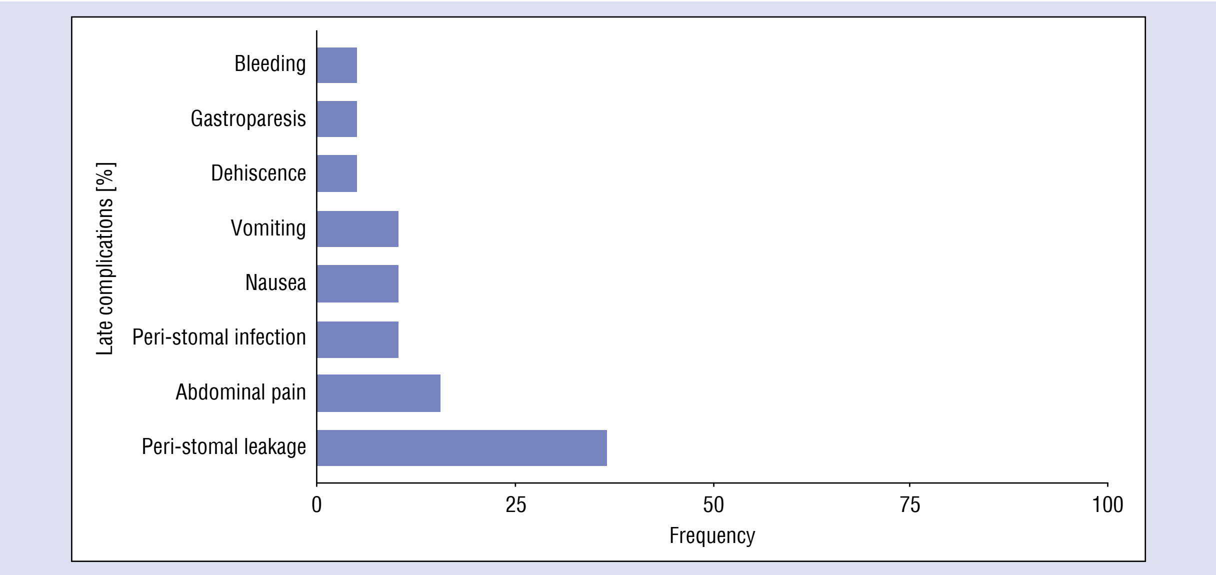

Figure 2. Frequency of late complications

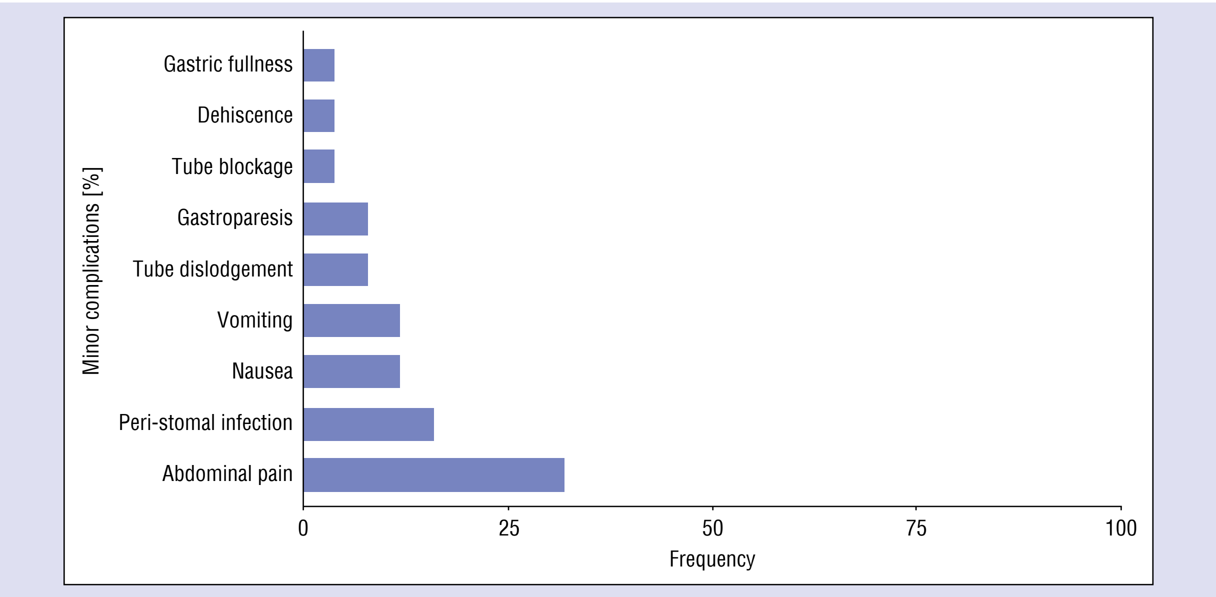

Figure 3. Frequency of minor complications

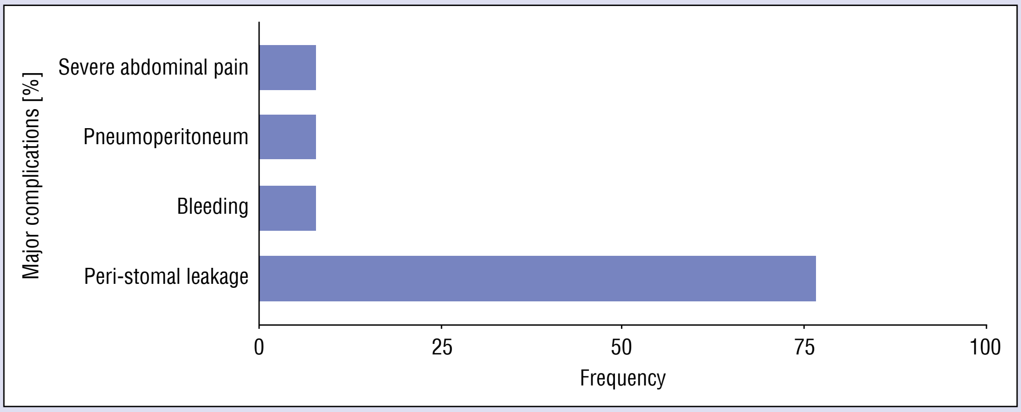

Figure 4. Frequency of major complications

Table 2. Clinical outcomes (discharge or death and complications after gastrostomy)

Variables	RIG	PEG	Surgical	p-value
Death in 30 days				0.01
No	21 (87.5)	7 (46.7)	4 (50)	
Yes	3 (12.5)	8 (53.3)	4 (50)	
Death in 60 days				0.9
No	12 (50.0)	7 (46.7)	3 (37.5)	
Yes	12 (50.0)	8 (53.3)	5 (62.5)	
Death in 90 days				0.6
No	8 (33.3)	4 (26.7)	1 (25.5)	
Yes	16 (66.7)	11 (73.3)	7 (87.5)	
Early complications				0.2
No	18 (75.0)	14 (93.3)	5 (62.5)	
Yes	6 (25.0)	1 (6.7)	3 (37.5)	
Late complications				0.6
No	19 (79.2)	12 (80.0)	5 (62.5)	
Yes	5 (20.8)	3 (20.0)	3 (37.5)	
Minor complications				0.3
No	16 (66.7)	12 (80)	4 (50)	
Yes	8 (33.3)	3 (20)	4 (50)	
Major complications				0.3
No	18 (75)	12 (80)	4 (50)	
Yes	6 (25)	3 (20)	4 (50)	

KPS — Karnofsky Performance Status; PEG — percutaneous endoscopic gastrostomy; RIG — radiologically inserted gastrostomy

In the present study, 20 patients (42.6%) evolved with complications, which is consistent with a study by Rustom et al. [15] who compared techniques via PEG (n = 40), surgical (n = 10), and RIG (n = 28) in 78 patients with head and neck malignancies and showed that 36 (46%) developed complications, among which 23% (n = 18) had early and 22% late complications. However, in terms of severity, they found more minor complications (41%; n = 32) than in the present sample, and fewer major complications (5%; n = 4). Among the smallest complications, the authors highlighted superficial cellulitis, catheter displacement, and peristomal leakage. Concerning the major complications, patients evolved with peritonitis

Table 3. Functional capacity at indication and on the day of the GTT procedure

Variables	RIG	PEG	Surgical	p-value
KPS on the day of the indication of gastrostomy				0.01
≥ 60%	11 (45.8)	5 (33.3)	7 (87.5)	
40–50%	13 (54.2)	6 (40)	1 (12.5)	
< 40%	0 (0)	4 (26.7)	0 (0)	
KPS on the day of gastrostomy				0.2
≥ 60%	12 (50)	3 (20)	4 (50)	
40–50%	10 (41.7)	7 (46.7)	3 (37.5)	
< 40%	2 (8.3)	5 (33.3)	1 (12.5)	

KPS — Karnofsky Performance Status; PEG — percutaneous endoscopic gastrostomy; RIG — radiologically inserted gastrostomy

Table 4. Cox's regression model for survival of patients who underwent gastrostomy

	Univariate (n = 47)		Multivariate (n = 37)	
Variables	HR (95% CI)	p-value	HR (95% CI)	p-value
Head and neck tumor	0.486 (0.21–1.12)	0.1		
Comorbidity	2.54 (1.27–5.06)	0.01	3.50 (1.55–7.90)	0.00
mGPS ≥ 1 (n = 37)	2.89 (1.34–6.24)	0.01	3.50 (1.55–7.90)	0.00
Albumin < 3.5 g/dL	1.79 (0.91–3.53)	0.1		
CRP >10 mg/dL (n = 37)	2.89 (1.33–6.24)	0.01	2.60 (1.10–6.13)	0.03
KPS ≤ 40	2.85 (1.09–7.45)	0.3		
Early complications	1.25 (0.56–2.78)	0.6		
Late complications	1.23 (0.55–2.75)	0.6		
Minor complications	1.30 (0.67–2.78)	0.4		
Major complications	1.97 (0.94–4.10)	0.1		
Age ≥ 60	1.14 (0.58–2.24)	0.7		
Type of Gastrostomy				
PEG	1.49 (0.69–3.22)	0.3		
Surgical	1.99 (0.81–4.87)	0.1		

CI — confidence interval; CRP — C-reactive protein; HR — hazard ratio; KPS — Karnofsky Performance Status; mGPS — Modified Glasgow Prognostic Score; PEG — percutaneous endoscopic gastrostomy; a covariate linearly dependent on CRP

and bronchopneumonia. The three methods led to similar results in the number of minor complications and patients' treatment consisted of prophylactic antibiotic therapy [15]. In the present findings, there were no complications such as peritonitis or bronchopneumonia.

Another study that assessed 760 procedures performed by PEG or RIG in adults, whose most common indications were head and neck malignancies, followed by stroke and amyotrophic lateral sclerosis, found tube-associated complications, both early complications (PEG: 2.7% *vs.* RIG: 26.4%) and late complications (PEG: 8.6% *vs.* RIG: 31.5%); they were less frequent in patients who underwent PEG [16]. The present study showed early complication rates similar to those found by Strijbos et al. [16] via RIG (25%) and higher via PEG (6.7%), and lower rates of late complications via RIG (20.8%) and higher via PEG (20%).

In the present sample, regarding early and late complications, abdominal pain and extravasation of the diet through the GTT ostium were the most prevalent. The occurrence of abdominal pain is understandable due to manipulation and the very location of the procedure. A review that evaluated the indications, care, and complications of PEG described that such extravasation can be explained by the loss of stoma compression that occurs a few days after the GTT is performed and may be associated with a larger than expected incision or also by the delay in the production of granulation tissue in the area, especially in immunosuppressed, malnourished or diabetic patients. The extravasation can also occur as a result of excessively high volumes of diet or even through its administration at a very fast rate [17].

Regarding severity, minor, and major complications, no difference was observed in the present study in relation to the type of GTT. The rate of complications (major and minor) of PEG varies from 0.4% to 22.5% of cases, with minor complications being three times more frequent, and of RIG from 13 to 43% [18, 19]. In the present study, the authors observed similar results comparing the two methods (PEG and RIG): major complications (RIG: 46.1% *vs.* PEG: 23.1%) and minor complications (RIG: 53.3% *vs.* PEG: 20%). Complications were more prevalent in the RIG group.

One of the minor complications observed in this study was ostium infection in 16% of the cases, corroborating the work by Villalba et al. [17] who found rates of stoma infection in the placement via PEG between 5% and 25%. Regarding major complications, extravasation was the most prevalent. In the group that underwent PEG, major complications were seen in 20% of the individuals, which confirms the results of Villalba et al. study [17] in which PEG was a safe technique, with no higher rates of major complications than 22%. On the other hand, another study that evaluated the indications and complications of GTT by PEG in 142 patients with advanced head and neck malignancy identified 17% of minor complications and 7% of major complications [20], rates lower than those found in the present study.

Regarding functional capacity, measured by KPS, at the time of GTT indication, most patients (87.5%) with an indication for the surgical procedure had KPS $\geq$ 60%, and there was a significant difference between the groups ($p < 0.01$), indicating that individuals with better functionality had more favorable conditions to undergo a more invasive surgical procedure. On the day scheduled for GTT, this difference in functional capacity was no longer observed between the types of intervention, which suggests that the time interval between the indication and the performance of the procedure may be sufficient for the decline of functionality, which constitutes one of the main signs of prognosis for palliative care. The KPS, a numerical scale created in 1948 by Karnofsky and Burchena to measure the degree of patient activity and dependence on medical care, has been widely used for the general assessment of cancer patients and is used to quantify the status of individuals concerning the degree of independence to perform daily activities and self-care. The method ranges from 100 to 10, with 100 representing no limitation and 10, imminent risk of death [21].

In terms of mGPS, 35.1% of patients had mGPS greater than or equal to 1, and 64.9% had mGPS 0. There was no difference between the samples concerning the type of GTT. However, the patients who had a better prognosis for the indication of ancillary food route procedure were the majority. GTT is the best option for long-term enteral nutrition [22], so it is important to have resources that help in determining the prognosis and, thus, guide a timely indication, especially in the case of patients with a recognized limited life expectancy. Although no association was seen between mGPS and type of GTT, there was a correlation between lower survival rate and mGPS $\geq$ 1, CRP > 10, and the presence of comorbidities (Table 4). A meta-analysis that examined the role of the systemic inflammatory response in predicting outcomes in patients with advanced inoperable cancer, assessed isolated markers such as albumin and CRP in addition to EPG and considered those as independent prognostic values across all tumor types and locations [11]. The importance of individualizing each case and observing the isolated and aggregated parameters for adequate decision-making is highlighted.

According to the literature, complications occur mainly in the elderly, in individuals with pathologies, malnourished and with a history of bronchospasm or infection [17], low weight, advanced cancer, and neurological disorders which are predictors of complications [23]. Cachexia is a significant contributor to morbidity and mortality, particularly in the field of oncology. It affects more than 50% of cancer patients, with the prevalence increasing to around 80% when the cancer involves the head-neck region or the gastrointestinal tract [24]. Patients starting on Home Artificial Nutrition (HAN) in the pre-cachexia stage had a mean survival time of 28.7 $\pm$ 35.9 weeks. In comparison, patients in the cachexia stage had a mean survival time of 17.1 $\pm$ 20.3 weeks, while patients in refractory cachexia had a mean survival time of 11.9 $\pm$ 13.8 weeks [24]. In the present findings, there was a correlation between a lower survival rate and mGPS $\geq$ 1, CRP > 10, and the presence of comorbidities, which suggests a worse inflammatory state. It is noteworthy that most patients who arrive at the exclusive palliative care unit already have an impaired nutritional status, with cachexia or refractory cachexia, which contributes to reduced survival.

A study that analyzed complications after PEG in patients with head and neck cancer, esophageal cancer, neurological diseases, and others, comparing the mortality of patients with cancer and with neurological disorders, reported a significantly higher proportion of neurological patients who died within 24 weeks than cancer patients (60.0% *vs.* 27.7%, respectively, p = 0.00, n = 100). The 30-day mortality in patients with malignancy was much lower than in patients with neurological disorders (4.6% *vs.* 14.3%, respectively); however, this was not statistically significant due to the small number of patients in each time interval [23].

Regarding the outcome, a 30-day mortality rate of 53.3% was found in the PEG group, 12.5% in the RIG group, and 50% in the surgery group. These rates are not in line with the results reported by Strijbos et al. [16], who found mortality at 30 days of 10.7% in the PEG technique and 5.1% in the RIG technique. In the work of these authors, stroke was associated with higher 30-day mortality and major complications did not differ in connection with the type of technique.

The present findings showed that there was no significant difference in complications in relation to the type of GTT performed, but a difference in survival rates at the 30-day mark. While it may seem contradictory it's important to note that complications and survival are separate outcomes that can be influenced by different factors.

The lack of significant difference in complications could suggest that the occurrence and severity of complications were similar across the different techniques of GTT used. This indicates that the potential risks and challenges associated with the procedures themselves were comparable. On the other hand, the difference in 30-day survival rates could be attributed to various factors unrelated to the occurrence of complications. Factors such as patient characteristics, underlying health conditions, and disease progression can all contribute to differences in survival outcomes. It's possible that these factors played a more prominent role in influencing survival within the initial 30-day period than the occurrence of complications.

A limitation of the study is the fact that it was carried out in a single center; in addition, the type of study (retrospective), the relatively small sample size, and the collection of secondary data are also limitations. However, aspects related to the use of ancillary feeding routes were presented with different GTT techniques. More studies with this population are required to confirm these findings.

Conclusions

In the findings regarding complications, there was no difference concerning the type of technique selected; although individuals undergoing RIG had a significant difference in 30-day survival, it is not possible to assert that there was an impact on survival due to the limited number of patients. There was an association between CRP > 10 mg/dL, mGPS ≥ 1, and the presence of comorbidities after GTT, with lower survival. Because of the reduction of the KPS, it is necessary to devise strategies to reduce the time interval between the indication and the performance of the procedure so that patients with limited life expectancy can benefit from this type of intervention.

As far as it was possible to verify, no study reviewed complications in cancer patients in exclusive palliative care, which characterizes the originality of the present work and the contribution of this research. This observational study aimed to describe the subject, recognizing that Brazil ranks 79th in terms of palliative care [25], it is evident that more comprehensive studies of the topic are needed. The decision to perform a GTT should be considered carefully and is as important as evaluating clinical and laboratory parameters to consider whether the procedure will improve the individual's quality of life, the main objective of palliative care.

Article information and declarations

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Data availability statement

The datasets generated and analyzed which support the conclusion of this study are included in this paper.

Ethics statement

This work was prepared in compliance with the Regulatory Guidelines and Norms for Human Research (CNS resolution 466/12) and approved by the Instituto Nacional de Câncer Research Ethics Committee (CAAE: 40143920.4.0000.5274). This manuscript does not contain any person's data in any form.

Author contributions

Study design and planning were developed by TMS, BDW, RSS, and MFC. Data collection and analysis were performed by TMS, BDW, and RSS. The interpretation, writing, and critical review of the content was the responsibility of the four authors. All authors read and approved the final manuscript.

Conflict of interest

The authors declare that they do not have conflicting interests.

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Supplementary material

None.

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