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Does enteral nutrition through a percutaneous endoscopic gastrostomy, attenuate *Helicobacter pylori* colonization?: is it worth mentioning?

Ali Muhtaroglu[1], Ilker Sengul[1,2], Demet Sengul[3*], Tugrul Kesicioglu[1], Demet Seker[4], Muhammed Aydin[5], Ahmet Cumhur Dulger[6]

SUMMARY

OBJECTIVE: In patients who experience difficulties in oral feeding, alimentary intake can be supported by creating direct access into the stomach through a percutaneous endoscopic gastrostomy. The present study purposed to compare naïve and exchanged percutaneous endoscopic gastrostomy tubes in terms of *Helicobacter pylori* infection and other clinical characteristics.

METHODS: A total of 96 cases who underwent naïve or exchanged percutaneous endoscopic gastrostomy procedures with various indications were incorporated into the study. The patients' demographic data, such as age and gender, etiology of percutaneous endoscopic gastrostomy, anti-HBs status, *Helicobacter pylori* status, the presence of atrophy and intestinal metaplasia, biochemical parameters, and lipid profiles, had been analyzed. In addition, the anti-HCV and anti-HIV statuses had also been evaluated.

RESULTS: The most common indication for percutaneous endoscopic gastrostomy placement was dementia in 26 (27.08%) cases (p=0.033). The presence of *Helicobacter pylori* positivity was significantly lower in the exchange group compared to the naïve group (p=0.022). Total protein, albumin, and lymphocyte levels were significantly higher in the exchange group compared to the naïve group (both p=0.001), and the mean calcium, hemoglobin, and hematocrit levels were statistically significantly higher in the exchange group (p<0.001).

CONCLUSION: Preliminary outcomes of the present study revealed that enteral nutrition attenuates the incidence of *Helicobacter pylori* infection. Considering the acute-phase reactant, the significantly lower ferritin values in the exchange group suggest that there is no active inflammatory process in the patients and that immunity is sufficient.

KEYWORDS: Enteral nutrition. Gastrostomy. Immune system. *Helicobacter pylori*. Pathology.

INTRODUCTION

Patients who experience difficulties with oral feeding often require enteral or parenteral nutrition. In some cases, oral intake can even be dangerous in cases of obstructive or neurological conditions[1]. Enteral feeding has several advantages, including preserved enteral function, suppression of bacterial translocation, and reduced cost expenditure[2]. In these cases, alimentary intake can be supported by creating direct access into the stomach through a percutaneous endoscopic gastrostomy (PEG) application. On a case-by-case basis, recently published European Society of Gastrointestinal Endoscopy guidelines recommends enteral feeding through a PEG tube application in cases for whom enteral feeding is required for longer than 3–4 weeks[3-5]. The 3–4-week cutoff is arbitrary and has been chosen to avoid numerous adverse events associated with percutaneous access, such as infections.

Percutaneous endoscopic gastrostomy was performed for the first time on 12 pediatric and 19 adult patients by Gauderer et al. using a mushroom catheter[6]. Since then, multiple efforts have been made to improve the efficiency of the PEG procedure and reduce the rate of procedure-related complications. There has been a worldwide spread of this technique and an increase in indications for this medical approach. Of note, PEG allows the maintenance of normal physiological activities of the gastrointestinal tract and avoids long-term complications associated with intravenous nutritional support[7]. A gastric route through

[1]Giresun University, Faculty of Medicine, Department of General Surgery – Giresun, Turkey.
[2]Giresun University, Faculty of Medicine, Division of Endocrine Surgery – Giresun, Turkey.
[3]Giresun University, Faculty of Medicine, Department of Pathology – Giresun, Turkey.
[4]Giresun University, Faculty of Medicine, Department of Neurology – Giresun, Turkey.
[5]Giresun University, Faculty of Medicine, Department of Internal Medicine – Giresun, Turkey.
[6]Giresun University, Faculty of Medicine, Department of Gastroenterology – Giresun, Turkey.
*Corresponding author: demet.sengul.52@gmail.com
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a PEG tube is advantageous over a jejunal approach due to its better tolerance, ease of the procedure, and possibility of being performed in a bedside model[8]. Albumin and transferrin levels have been reported to improve after inserting a PEG tube in patients with dementia[9]. Park et al.[10] reported that weight gained by patients who underwent the PEG procedure were significantly higher than those who underwent the nasogastric intubation. Moreover, PEG was associated with a significantly faster time to start feeding.

Although the benefits of PEG have been reported, several controversies and major concerns still exist regarding this procedure[7]. Previously placed PEG tubes can dislodge or be inadvertently removed, blocked, or damaged. PEG tube replacement is not performed infrequently[11]. An endoscopic replacement is recommended as it becomes dislodged within a month after placement. However, bedside replacement is usually sufficient if the tube is dislodged after 4–6 weeks, when tract maturity is expected[12]. To the best of our knowledge, the remarkable effect of enteral nutrition fluid in comparing patients who underwent PEG replacement and those who underwent PEG for the first time was that it caused a decrease in *Helicobacter pylori* colonization.

METHODS

A total of 96 patients who underwent naïve or exchanged PEG procedures in our clinic with various indications between January 01 and December 31, 2021 had been included in the study. Patients were divided into two groups as naïve and exchanged PEG, and the results were compared between the two groups. In addition, the demographic data, such as age and gender, etiology of PEG, anti-HBs, anti-HCV, anti-HIV, *H. pylori* status, the presence of atrophy and intestinal metaplasia, biochemical parameters, and lipid profiles, had been reevaluated in cases.

Percutaneous endoscopic gastrostomy tube placement

The technique of PEG tube placement had been performed in line with the British Society of Gastroenterology (BSG) practice guidelines[13]. Briefly, PEG tube insertion using the pull technique had been performed under sterile conditions, and 2 g of ceftriaxone was administered intravenously as prophylaxis 30 min before the interventional procedure. The weight-adjusted midazolam and propofol were administered as sedation was required depending on the patient's condition. After a skin shave was performed, a 1-cm skin incision just before insertion of the PEG was performed with a positive transillumination in all patients. The PEG tube insertion was performed by using the PEG 24® Pull Method (Cook Medical, Bloomington, IN, USA), and the tube was fixed using an exterior retention plate without sutures after its insertion. The dressing was made three times a day for the first 7 days after the procedure, and water was given through the PEG tube 24 h after the tube placement. Initially, 100 mL of food was injected to ensure that there were no complications. If this was tolerated, an additional 50 mL of food was added to the previous volume as described by Jung et al.[3].

Percutaneous endoscopic gastrostomy exchange procedure

If the PEG tube is not dislodged completely but has been clogged or malfunctioning, the old tube needs to be exchanged. If resistance is felt during the attempted removal of the old tube by gentle traction, it is best to remove the tube after the endoscopic cutting of the internal mushroom cap and removal of the rest of the tube through external puling. A similar-diameter PEG tube as the old tube should be used as an exchange tube. The final step in PEG tube exchange is to confirm the placement. For this purpose, water-soluble contrast is placed through the exchanged tube, and a contrast-enhanced abdominal X-ray is obtained to confirm placement in the stomach[14].

Statistical analysis

Data obtained in this study were statistically analyzed using the SPSS version 25.0 (SPSS, Statistical Package for Social Sciences, IBM Inc., Armonk, USA) statistical software. The normal distribution of the variables was tested using the Kolmogorov-–Smirnov method. Normally distributed continuous variables were compared between the groups with the independent t-test and non-normally distributed variables with the Mann-–Whitney U test. Categorical variables were compared using the χ^2 test. Normally distributed continuous variables are expressed as mean±standard deviation and non-normally distributed variables are expressed as median (min–max) values. Categorical variables are given as a frequency (number, percentage), and p-values < 0.05 were considered statistically significant for the study.

RESULTS

A total of 96 patients who underwent placement or replacement (exchange) PEG procedures due to various etiologies in our clinic were included in the study. The patients were divided into two groups, namely, naïve and exchange. Patients with a PEG inserted before ≤1.5 months were considered to have naïve PEGs, while the others were included in the exchange

group. Accordingly, the naïve group consisted of 44 cases, and the exchange group consisted of 52 cases. The median PEG exchange duration was 9 months (min–max: 0.5–6). Of all patients, 37 (38.5%) were male and 59 (61.5%) were female.

The median age was found to be 83 years (min–max: 35–96) in the exchange and 79 years (min–max: 26–95) in the naïve. Of the patients in the exchange, 14 (26.9%) were male and 38 (73.1%) were female, while in the naïve, 23 (52.3%) were male and 21 (47.7%) were female. There was a statistically significant difference between the two groups in terms of gender (p=0.020), while no significant difference was observed in terms of age (p=0.179). The most common indication for PEG placement was dementia in 26 (27.08%) cases (p=0.033). The other etiologies are shown in Figure 1.

When the clinical features of the patients were examined, the presence of *H. pylori* positivity was significantly lower in the exchange compared to the naïve (p=0.022). Clinical features of the patients are given in Table 1. Among laboratory parameters, glucose was significantly lower in the exchange group (p=0.05). Similarly, ferritin levels were statistically significantly lower in the exchange compared to the naïve (p=0.001). The exchange group's lymphocyte count was significantly higher (p=0.001) (Table 2). Total protein and albumin levels were statistically significantly higher in the exchange compared to the naïve (both, p=0.001). The mean calcium, hemoglobin, and hematocrit levels were statistically significantly higher in the exchange (for all, p<0.001). The PNI value calculated as [albumin (g/dL)×10+lymphocyte (×10⁹/mL)×0.005] was also statistically significantly higher in the exchange compared to the naïve (p<0.001).

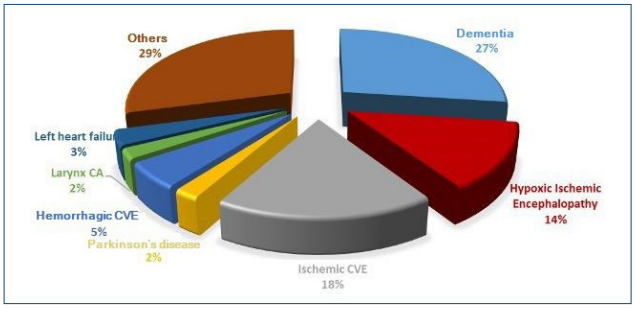

Figure 1. Etiologies of the percutaneous endoscopic gastrostomy application.

Table 1. Clinicopathological features of the cases.

Variable		Exchange	Naïve	p
		n (%)	n (%)	
Anti-HBs	Positive	10 (29.4)	8 (44.4)	0.437
	Negative	24 (70.6)	10 (55.6)	
Helicobacter pylori	Positive	1 (2.6)	10 (19.2)	0.022
	Negative	37 (97.4)	42 (80.8)	
Atrophy	Yes	3 (6.4)	5 (11.6)	0.472
	No	44 (93.6)	38 (88.4)	
Intestinal metaplasia	Yes	6 (12.8)	3 (7)	0.489
	No	41 (87.2)	40 (93)	

DISCUSSION

Nutritional support is essential in patients who have a limited capacity to maintain their normal body weight through a normal diet[7]. Enteral nutrition is indicated for patients who have a functional gastrointestinal tract and whose oral nutritional intake is insufficient to meet the estimated nutritional needs[15]. The placement of a PEG tube is one of the most commonly used methods to provide enteral feeding. PEG is usually indicated when a period of inadequate nutritional intake exceeding 2–4 weeks is expected, such as in patients with malignancies (mainly head and neck) or neurological diseases (e.g., cerebrovascular stroke and brain hemorrhage)[2]. Since its introduction, PEG has become a very well-established endoscopic procedure for the enteral feeding of patients.

In the present study, we evaluated the efficacy of the enteral feeding system by comparing naïve and exchanged PEGs. Our results indicated that enteral feeding was maintained through the PEG system. No evidence-based guidelines regarding the replacement of PEG tubes have been reported. Our study's median PEG exchange duration was 9 months (0.5–6). Similarly, in a study by Bouchiba et al.[16] the median follow-up was found to be 8.9 months. In our study, the median age was found to be 83 years (35–96) in the PEG exchange group, while Jung et al.[2] reported the mean age of 77 years.

Helicobacter pylori is a gram-negative, microaerophilic, spiral-shaped, and active bacteria that possess the ability to colonize in gastric mucosa, causing histopathological alterations in some cases, such as persistent inflammation, even peptic ulcus, chronic active gastritis, mucosa-associated lymphoid tissue lymphoma, and gastric adenocarcinoma. *H. pylori* remains one of the most common bacterial infections in humans. It has been suggested that *H. pylori* infection may influence intake and caloric homeostasis[17-22]. It has been reported that the bacterial content of the gut and the presence of relevant antigens influence the rate of recovery of host pathophysiology induced by chronic *H. pylori* infection[23]. Histopathologically, a high ratio of gastric mucosa abnormalities, chronic active gastritis, and reactive gastropathy have been reported in cases with *H. pylori* colonization[21,24].

In the present study, *H. pylori* positivity was significantly lower in the exchange compared to the naïve (p=0.022). In

Table 2. Laboratory parameters of the cases.

Variable	Exchange		Naïve		p
	n	Median [min–max]	n	Median [min–max]	
Glucose	52	106 [80–266]	44	118 [83–380]	0.005
AST	52	22.5 [9–67]	44	23 [7–167]	0.342
ALT	52	14 [3–76]	44	18 [5–257]	0.053
ALP	42	80.5 [16–217]	23	88 [54–416]	0.38
GGT	43	23 [2–197]	31	26 [6–268]	0.507
Urea	52	43.5 [16–203]	44	54 [13–269]	0.27
Creatinine	52	0.64 [0.24–2.6]	44	0.615 [0.15–7.29]	0.724
Uric acid	34	4.23 [1.4–9.9]	33	3.92 [1.41–13.65]	0.985
WBC	52	7.565 [4.14–20.95]	44	7.81 [4.52–19.88]	0.492
Lymphocyte	42	1.765 [0.63–4.22]	44	1.34 [0.33–2.67]	0.001
Ferritin	37	143 [12.6–2000]	28	607.55 [9.2–2000]	0.001
TSH	36	1.255 [0.01–6.97]	18	1.835 [0.2–25]	0.283
FT4	37	1.35 [0.9–12.1]	18	1.215 [0.28–1.94]	0.074
PT	51	9.99 [7.81–22.1]	44	9.87 [8.08–20.6]	0.979
HbA1c	23	5.48 [4.69–7.95]	11	5.3 [4.71–10.08]	0.821

addition, *H. pylori* prevalence varies concerning ethnicity and geographic regions worldwide[19,21]. Lee et al.[24] reported that *H. pylori* positivity was detected in 48.3, 67.4, and 77.9% of Americans, Korean, and Japanese, respectively. They also stated the antrum location dominancy. In the study conducted in December 2018, Sengul and Sengul[19,21] reported 55.2% overall positivity of *H. pylori* with the antrum dominancy, 57.9%, in our studied city region. Their reported positivity was between the positivity of American and Korean-Japan groups with the frequent location of the antrum, concerning the corpus.

Several markers are used to evaluate nutritional status in the enteral feeding system through a PEG. In the present study, glucose and ferritin levels were significantly lower in the exchange group ($p<0.05$). The lymphocyte count was significantly higher in the exchange group ($p=0.001$). Similarly, in a study by Jung et al.[2] lymphocyte count was higher in the post-PEG group compared to the pre-PEG group.

In the present study, total protein and albumin levels were statistically significantly higher in the exchange group versus the naïve group ($p=0.001$). Total protein was also significantly higher in the post-PEG group in the Jung et al.[2] study. The mean calcium, hemoglobin, and hematocrit levels were statistically significantly higher in the exchange group (for all, $p<0.001$). The PNI value was also significantly higher in the exchange group than in the naïve group ($p<0.001$). However, since this is the first study in the literature comparing naïve and exchange PEGs, we could not compare our findings exactly.

Study limitations

The main limitations of the current study include its retrospective nature and the relatively small number of patients. In addition, we could not measure pre-PEG values. However, given the lack of a similar study in the literature, we believe that our findings will serve as a guide for future, more comprehensive studies.

CONCLUSION

Our findings indicate that dementia was the most common etiology for PEG placement, enteral feeding was maintained, and this decreased the incidence of *H. pylori* infection. Total protein, glucose, albumin, and lymphocyte counts were statistically higher, while ferritin levels were significantly lower in the PEG exchange group, showing that enteral feeding was maintained and continued to provide nutritional support through PEG. To the best of our knowledge, this is the first study in the English literature stating that enteral nutrition through PEG might lead to attenuating *H. pylori* colonization. However, further comprehensive prospective studies are needed to confirm our findings. .

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AUTHORS' CONTRIBUTIONS

AM: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft. **IS:** Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **DS:** Investigation, Methodology, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **TK:** Investigation, Resources, Validation, Visualization. **DS:** Project administration, Resources, Validation, Visualization. **MA:** Data curation, Formal Analysis, Resources, Validation, Visualization. **ACD:** Conceptualization, Investigation, Methodology, Project administration, Resources, Validation, Visualization.

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