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ORIGINAL RESEARCH

The impact of incidental endoscopic findings on PEG-related complications in critically ill patients

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ABSTRACT

Objective: This study investigated whether endoscopic abnormalities detected during percutaneous endoscopic gastrostomy placement are associated with complications in critically ill patients and whether these incidental findings predict adverse outcomes.

Materials and Methods: This retrospective cohort study included adult patients who underwent percutaneous endoscopic gastrostomy between January 2014 and January 2024 in the intensive care unit of a tertiary academic hospital. Demographic data, clinical features, endoscopic findings, biopsy results, and complications were recorded. Patients were grouped according to the presence or absence of complications, and statistical comparisons were performed.

Results: Eighty-seven critically ill patients were included. The median age was 69 years; 63.2% were male. Incidental endoscopic findings were observed in 39.1%, including esophagitis, gastritis, ulcers, and other mucosal abnormalities. Biopsies were obtained in 14.9% of patients and revealed chronic inflammation, intestinal metaplasia, or Helicobacter pylori. Complications occurred in 19.5%, with wound infection, bleeding, and leakage being most common. No statistically significant association was found between any endoscopic or histopathological findings and complication development.

Conclusion: Endoscopic and histopathological abnormalities were common but not predictive of complications. Percutaneous endoscopic gastrostomy can be safely performed without delay in the presence of mild to moderate mucosal changes. Systemic factors should guide risk assessment in critically ill patients.

Keywords: endoscopy, gastrointestinal, gastrostomy, percutaneous endoscopic, intensive care units

Introduction

Percutaneous endoscopic gastrostomy (PEG) is frequently employed in critically ill patients who are unable to maintain adequate oral intake due to neurological impairment, prolonged mechanical ventilation, or structural dysfunctions of the upper gastrointestinal tract. In the intensive care unit (ICU) setting, PEG serves as a reliable method to ensure safe and sustained enteral nutrition in patients requiring long-term feeding support (1).

Although PEG is considered a minimally invasive and generally safe procedure, it is not devoid of risks. Reported complication rates range from 4% to 30%, with major adverse events such as peritonitis, hemorrhage, and buried bumper syndrome occurring in a notable minority of patients (2,3). Additional retrospective analyses have shown that PEG can be safely performed in ICU patients, with complication rates comparable to those observed in general ward populations (4).

An underexplored aspect of PEG practice, particularly in ICU settings, is the presence and potential clinical relevance of incidental endoscopic findings discovered during PEG placement. These findings—

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such as esophagitis, erosions, ulcers, gastritis, bile reflux, or suspected neoplastic lesions—are not uncommon. One study reported incidental esophagitis in 14 patients, gastritis in 28, duodenal ulcers in 7, and gastric ulcers in 6 among those undergoing PEG placement, and speculated that such findings might sometimes warrant deferment of the procedure, although evidence remains limited (5). Another investigation focusing on neurologically impaired patients found a notable prevalence of mucosal abnormalities during endoscopic evaluation, including ulcers and esophagitis, highlighting the need for further research into their clinical significance (6).

This study aims to address these gaps by evaluating the incidence and types of PEG-related complications in ICU patients, examining the association between endoscopic findings and complication development, and analyzing baseline characteristics to identify potential risk factors. By providing a comprehensive and focused analysis in a critically ill population, this study provides novel insights that may guide future procedural strategies and improve outcomes in patients requiring long-term enteral nutrition.

Methods

Study design and setting

This was a retrospective, observational cohort study conducted in the intensive care unit of a tertiary care academic medical center. The study included adult patients who underwent PEG between January 2014 and January 2024. The institutional ethics committee approved the study protocol (Approval no: 2024000389)

Patient selection

Patients aged ≥18 years who underwent PEG during their ICU admission were eligible for inclusion. Patients with missing clinical or endoscopic data were excluded from the analysis. A total of 87 patients met the inclusion criteria and were included in the final analysis.

Data collection

Data were retrieved from the hospital's electronic medical records and included demographic characteristics such as age and sex, comorbid diseases, Charlson Comorbidity Index scores, ICU admission diagnoses, indications for PEG placement, and the timing of PEG insertion after ICU admission. Endoscopic findings and biopsy results during PEG placement were also recorded. PEG-related complications were identified based on clinical notes and procedure documentation.

Patients were categorized based on primary clinical indications into three groups: neurological, respiratory, and gastrointestinal. The neurological group included patients who underwent PEG due to stroke, traumatic brain injury, hypoxic-ischemic encephalopathy, prolonged disorders of consciousness, or neuromuscular diseases. The respiratory group comprised patients requiring prolonged mechanical ventilation, those with chronic respiratory failure (e.g., COPD), or patients with impaired oral intake associated with prolonged ventilatory support. Finally, the gastrointestinal group included patients presenting with swallowing dysfunction (dysphagia), structural esophageal or gastric disorders, or those requiring sustained nutritional support despite a functioning gastrointestinal system.

ICU admission diagnoses were categorized into ten predefined clinical groups reflecting the primary reason for ICU admission: respiratory, cardiovascular, neurological, trauma without surgery, PACU, sepsis/infection, metabolic/endocrine disturbances, renal indications, gastrointestinal causes, and toxicological causes.

Definitions

PEG-related complications were defined as any clinically documented event attributable to the PEG procedure, including wound infection, bleeding,

peristomal leakage, buried bumper syndrome, and fistula formation. Incidental endoscopic findings were defined as any unexpected mucosal or structural abnormality identified during PEG placement, not previously known or suspected.

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics for Mac, version 28.0 (IBM Corp., Armonk, NY, USA) and Python (v3.10). Continuous variables were expressed as median and interquartile range (IQR) due to non-normal distribution, which was assessed using the Shapiro–Wilk test and visual inspection. Categorical variables were presented as numbers and percentages (n [%]).

Comparisons between patients with and without PEG-related complications were made using the Mann–Whitney U test for continuous variables and either the Chi-square test or Fisher's exact test for categorical variables, as appropriate. A two-tailed p-value <0.05 was considered statistically significant.

Results

A total of 87 patients who underwent PEG during their ICU stay were included in the analysis. The median age of the cohort was 69 years [IQR: 58–79], and 55 patients (63.2%) were male. The most frequently observed chronic conditions among all patients were atherosclerotic cardiovascular disease in 17 patients (19.5%), diabetes mellitus without end-organ damage in 12 (13.8%), dementia in 11 (12.6%), chronic pulmonary disease in 8 (9.2%), and prior stroke in 6 (6.9%). The median Charlson Comorbidity Index was 4 [IQR: 2–6], indicating a moderately comorbid population. The median time to PEG insertion after ICU admission was 20 days [IQR: 14–30].

The most common reasons for ICU admission were postoperative care in 40 patients (46.0%), neurologic conditions in 11 (12.6%), sepsis and infection in 11 (12.6%), and cardiovascular causes in 6 (6.9%). Neurological dysfunction was the leading indication for PEG placement, observed in 61 patients (70.1%), followed by respiratory failure in 21 (24.1%) and gastrointestinal causes in 5 (8.7%).

PEG-related complications were observed in 17 patients (19.5%). The most frequently encountered complications were wound infection in 9 patients (10.3%), bleeding in 8 (9.2%), and peristomal leakage in 8 (9.2%). Less common complications included buried bumper syndrome in 2 patients (2.3%) and fistula formation in 1 (1.1%). Patients were categorized into two groups based on the presence or absence of complications, and their baseline characteristics were compared. No statistically significant differences were found between the two groups in terms of age, sex, CCI score, PEG indication, or ICU admission reason, indicating that the groups were comparable at baseline. A detailed comparison of demographic and clinical characteristics between groups is provided in Table 1.

Endoscopic evaluation revealed incidental findings in 34 patients (39.1%) during PEG placement. Esophageal abnormalities were observed in 13 patients (14.9%), including esophagitis in 9 (10.3%), tumor-like lesions in 2 (2.3%), and tracheoesophageal fistula in 1 (1.1%). Gastric findings were present in 28 patients (32.2%) and included erosions in 11 (12.6%), pangastritis in 10 (11.5%), gastric ulcers in 5 (5.7%), LES laxity in 4 (4.6%), bile reflux in 1 (1.1%), and an intragastric balloon in 1 (1.1%).

When compared between patients with and without PEG-related complications, none of the individual endoscopic findings showed a statistically significant association with complication development ($p>0.05$ for all). Notably, pangastritis and mucosal erosions appeared numerically more frequent in the complication group; however, these differences did not reach statistical significance. A detailed comparison of endoscopic findings and complication status is provided in Table 2.

Endoscopic biopsy was performed in 13 patients (14.9%) during PEG placement. Of these, 11 patients

Table 1. Baseline Demographic and Clinical Characteristics of Patients by PEG-Related Complication Status.

	Total	Complication		P-Value
		Yes	No	
General Patient Characteristics				
Age (years), median [IQR]	69 [58-79]	70 [62-80]	68 [56–77]	0.406
Male sex, n (%)	55 (63.2%)	14 (25.5%)	41 (74.5%)	0.522
CCI, median [IQR]	4 [2-6]	5 [3–7]	4 [2–5]	0.346
PEG insertion day, median [IQR]	20 [14–30]	20 [13–35]	20.5 [14–27]	0.944
ICU Admission Indication, n (%)				
Post-operative	40 (46.0%)	14 (35.0%)	26 (65.0%)	0.291
Sepsis/Infection	12 (13.8%)	3 (25.0%)	9 (75.0%)	
Multi-trauma	11 (12.6%)	3 (27.3%)	8 (72.7%)	
Neurological	11 (12.6%)	4 (36.4%)	7 (63.6%)	
Cardiovascular	6 (6.9%)	0 (0.0%)	6 (100%)	
Respiratory	5 (5.7%)	0 (0.0%)	5 (100%)	
Toxicological	1 (1.1%)	0 (0.0%)	1 (100%)	
Metabolic/Endocrine	1 (1.1%)	1 (100%)	0 (0.0%)	
PEG Indication, n (%)				
Neurological	61 (70.1%)	15 (24.6%)	46 (75.4%)	0.423
Respiratory	21 (24.1%)	8 (38.1%)	13 (61.9%)	
Gastrointestinal	5 (8.7%)	2 (40%)	3 (60%)	

Values are presented as median [IQR] for continuous variables and number (%) for categorical variables. Percentages in the "Total" column are calculated out of the total cohort (n=87), while percentages in the "Complication (Yes)" and "Complication (No)" columns are calculated within each row. P-values were calculated using the Mann–Whitney U test for continuous variables and the Chi-square test for categorical variables, as appropriate.
CCI, Charlson Comorbidity Index; ICU, Intensive Care Unit; PEG, Percutaneous Endoscopic Gastrostomy.

Table 2. Comparison of Incidental Endoscopic Findings Between Patients With and Without PEG-Related Complications.

	Total	Complication		P-Value
		Yes	No	
Incidental Finding, n (%)	34 (39.1%)	11 (32.4%)	23 (67.6%)	0.550
Esophageal Finding, n (%)	13 (14.9%)	6 (46.2%)	7 (53.8%)	0.132
Esophagitis	9 (10.3%)	4 (44.4%)	5 (55.6%)	0.271
Tracheoesophageal fistula	1 (1.1%)	0 (0.0%)	1 (100.0%)	1.000
Tumor-like Lession, n (%)	2 (2.3%)	1 (50%)	1 (50%)	0.495
Ulcer, n (%)	1 (1.1%)	1 (100%)	0 (0.0%)	0.287
Gastric Finding, n (%)	28 (32.2%)	8 (28.6%)	20 (71.4%)	0.981
Erosion	11 (12.6%)	4 (36.4%)	7 (63.6%)	0.550
Pangastritis	10 (11.5%)	5 (50.0%)	5 (50.0%)	0.114
Ulcer	5 (5.7%)	2 (40.0%)	3 (60.0%)	0.566
LES Laxity	4 (4.6%)	1 (25.0%)	3 (75.0%)	1.000
Bile Reflux	1 (1.1%)	0 (0.0%)	1 (100.0%)	1.000
Intragastric Balloon	1 (1.1%)	0 (0.0%)	1 (100.0%)	1.000

Values are presented as number (%). Percentages in the "Total" column are calculated out of the total cohort (n=87), while percentages in the "Complication (Yes)" and "Complication (No)" *columns are calculated within each row. P-values were calculated using the Chi-square or Fisher's exact test, as appropriate.*
LES, Lower Esophageal Sphincter.

Table 3. Histopathologic Findings in Patients Who Underwent Endoscopic Biopsy During PEG Placement.

	Total	Complication		P-Value
		Yes	No	
Biopsy Taken, n (%)	13 (14.9%)	2 (15.4%)	11 (84.6%)	0.249
Histologically Normal	1 (1.1%)	0 (0.0%)	1 (100.0%)	1.000
Chronic Inflammation	11 (12.6%)	2 (18.2%)	9 (81.8%)	0.408
Intestinal Metaplasia	3 (3.4%)	1 (33.3%)	2 (66.7%)	0.858
Helicobacter Pylori Positive	5 (5.7%)	2 (40.0%)	3 (60.0%)	0.566

Values are presented as number (%). Percentages in the "Total" column are based on the total cohort (n=87), while percentages in the "Complication (Yes)" and "Complication (No)" columns are calculated within each row. P-values were calculated using Fisher's exact test.

(12.6%) had findings of chronic inflammation, 3 (3.4%) had intestinal metaplasia, and 5 (5.7%) tested positive for *Helicobacter pylori*. Only one patient had a histologically normal biopsy result.

When compared according to complication status, none of the histopathologic findings showed a statistically significant difference between patients with and without PEG-related complications ($p>0.05$ for all comparisons). A summary of the biopsy results and complication distribution is shown in Table 3.

Overall, although various mucosal and histopathologic abnormalities were identified during PEG placement, none were independently associated with an increased risk of PEG-related complications. These findings suggest that the presence of incidental or histopathologic abnormalities alone may not be sufficient to predict the occurrence of complications in critically ill patients undergoing PEG.

Discussion

In this retrospective cohort study, we evaluated the association between incidental endoscopic findings during PEG placement and the subsequent development of PEG-related complications in critically ill patients. Among the 87 patients included, incidental findings were observed in 39.1% during endoscopic evaluation. However, none of these findings, nor histopathological abnormalities demonstrated a statistically significant association with the development of PEG-related complications.

PEG is a commonly performed procedure to ensure long-term enteral nutrition in critically ill or neurologically impaired patients. Despite its benefits, PEG is associated with complications such as wound infection, bleeding, leakage, and buried bumper syndrome, with reported rates ranging between 10% and 35% (7,8).

During PEG placement, incidental endoscopic findings—such as esophagitis, gastritis, and ulcers—are frequently encountered across various patient populations. Among neurologically impaired patients specifically, a significant proportion have been found to exhibit incidental mucosal abnormalities during endoscopic evaluation (6). However, the clinical relevance of these findings regarding PEG-related complications remains unclear. In our study, although nearly 40% of patients had endoscopic or histopathologic abnormalities, these were not statistically associated with increased complications. This observation is consistent with other studies suggesting that mucosal lesions observed during PEG are often benign and do not necessitate deferral of the procedure (4,6).

Interestingly, systemic inflammatory status may be a more accurate predictor of complications than local mucosal pathology. For example, the C-reactive protein to albumin ratio (CAR) has been shown to correlate with both early mortality and complication risk following PEG placement (9). Additionally, studies have emphasized that peristomal infections following PEG are more strongly associated with systemic

patient factors such as frailty and immune compromise, rather than localized mucosal abnormalities identified during the procedure (10). These observations support the notion that mild to moderate mucosal changes do not independently predict adverse outcomes, particularly when acid suppression therapy is routinely administered in ICU settings.

Our study is distinct from previous works in several key ways. Most existing literature on PEG placement has focused on general patient populations or specific surgical settings, with limited attention paid to critically ill patients in ICUs. The ICU population presents unique challenges, including severe comorbidities, altered physiology, and higher risk of complications. Furthermore, while incidental endoscopic findings such as esophagitis, gastritis, and ulcers are frequently observed during PEG placement, their clinical relevance in the ICU context remains largely unexplored. Our study specifically addresses this gap by evaluating the impact of these incidental findings on the development of PEG-related complications in critically ill ICU patients, a population that is often underrepresented in existing studies. Additionally, while previous studies have focused on PEG complications in general or surgical ICU settings, our research uniquely combines the exploration of incidental endoscopic findings with detailed analyses of baseline patient characteristics and complication outcomes. This approach allows us to provide a more comprehensive understanding of the role of endoscopic findings in predicting post-PEG complications, which has been inadequately addressed in prior literature. Taken together, these findings suggest that although incidental endoscopic abnormalities are prevalent among critically ill patients undergoing PEG, they do not independently predict procedural complications. Routine detection of such findings should prompt clinical awareness but does not necessarily mandate postponement or alteration of PEG placement strategies.

Our study's strengths include the simultaneous analysis of endoscopic and histopathologic data and a focus on a critically ill ICU population. However, limitations such as retrospective design, small sample size, and lack of long-term follow-up restrict broader generalizability. Moreover, uniform administration of PPIs may have diminished the potential impact of local lesions on complications.

Clinically, our findings suggest that routine endoscopic abnormalities—unless suggestive of severe pathology—should not delay PEG. Biopsies performed for incidental lesions may still have long-term prognostic value (e.g., for *H. pylori* or metaplasia), but their relevance to immediate post-procedural safety appears limited. Future prospective, multicenter studies with larger samples are needed to refine risk stratification protocols and validate these observations.

Conclusion

Incidental endoscopic and histopathologic findings are common during PEG placement in critically ill patients but do not independently increase the risk of complications. PEG can be safely performed without deferral in the presence of mild to moderate mucosal abnormalities, while systemic factors should remain the primary focus for risk assessment.

Ethical approval

This study has been approved by the Ondokuz Mayıs University Clinical Research Ethics Committee (approval date: 10.09.2024, number: 2024000389). Informed consent was not obtained due to the retrospective design of the study.

Author contribution

Study conception and design: ÖYÇ, NÜA; data collection: Mİ, TSA; analysis and interpretation of results: ÖYÇ, NÜA, FÜ, TSA; draft manuscript preparation: ÖYÇ, NÜA, Mİ, FÜ. The author(s) reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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