Safety of Percutaneous Endoscopic Gastrostomy Placement in Patients With SARS-CoV-2 Infection

Ayushi Shah[a], Zunirah Ahmed[b], Fadl Zeineddine[a], Eamonn M.M. Quigley[b, c]

Abstract

Background: Coronavirus disease 2019 (COVID-19) can lead to ventilator-dependent chronic respiratory failure and a need for tube feeding. Percutaneous endoscopic gastrostomy (PEG) placement provides more sustainable longer-term enteral access with fewer side effects compared to the long-term nasogastric tube placement. Bleeding is a recognized complication of PEG placement, and many COVID-19 patients are on antiplatelets/anticoagulants, yet minimal data exist on the safety of PEG tube placement in this context.

Methods: A retrospective chart review identified patients who underwent PEG placement between January 2020 and January 2021 at a single institution. Success was defined as PEG placement and use to provide enteral nutrition with no complications requiring removal within 4 weeks.

Results: Thirty-six patients with and 104 age- and sex-matched patients without COVID-19 infection were included. More COVID-19 patients were obese, on anticoagulants, had low serum albumin levels and had a tracheostomy in place. Of those patients, 8.3% with COVID-19 developed PEG-related complications compared to 16.3% without (P = 0.28). PEG success rates in patients with and without COVID-19 were similar at 97.2% and 92.3%, respectively (P = 0.44).

Conclusion: PEG tube placement is comparatively safe in COVID-19 patients who need long-term enteral access.

Keywords: Percutaneous endoscopic gastrostomy; COVID-19; Anticoagulants; Antiplatelets; Obesity; Complications; Nasoenteric tubes; Safety

Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was declared a global pandemic by WHO in March 2020 [1]. Intensive care unit (ICU)-level care is required for between 5% and 20% of patients hospitalized with coronavirus disease, with many patients requiring mechanical ventilation [2]. Enteral nutrition (EN) supports immune function, assists in diminishing the impact of the inflammatory catabolic state, and maintains gut barrier integrity in ventilator-dependent, critically ill patients [3]. In these patients, nutrition is initially provided via nasogastric (NG) or orogastric (OG) tubes. However, long-term use of these modalities is associated with various common to serious complications like sinusitis, sore throat, esophagitis and esophageal stricture, epistaxis, luminal perforation, pulmonary injury, aspiration, and intracranial placement [4].

Percutaneous endoscopic gastrostomy (PEG) provides an alternative for these patients. PEG is indicated for patients who require long-term enteral access over 30 days and have a functional gastrointestinal (GI) track but are unable to sustain adequate oral intake [5]. PEG tubes have fewer complications than NG feeding tubes [6], and PEG tube placements have also been associated with early hospital discharge and shorter hospital stay [7]. Nonetheless, there is a common perception that increased bleeding risk, together with the high morbidity and mortality associated with their underlying severe illness related to COVID-19 would lead to more complications with PEG placement in this patient population.

Minimal data exist on the safety and efficacy of PEG tube placement in patients with SARS-CoV-2 infection. This study assesses the safety of PEG tube placement in patients with SARS-CoV-2 infection compared to the control group.

Materials and Methods

This study was approved by the Institutional Review Board at Houston Methodist Hospital. This study was conducted in compliance with the ethical standards of the responsible institution on human subjects as well as with the Helsinki Declaration. We performed retrospective chart reviews and collected data on patients who underwent PEG tube placement between January 2020 and January 2021 at Houston Methodist Hospital. Convenience sampling was employed. Adult patients who had endoscopic PEG tube placement for the first time during

this time interval were included in the study; patients who underwent PEG placement surgically or via interventional radiology were excluded. During the procedure, the personnel wore personal protective equipment which included N95 mask, face shield, gloves and gown for COVID-19 patients and N95 mask, gloves and gown for non-COVID-19 patients. For all the patients, externally removable 20 Fr EndoVive Safety PEG (Boston Scientific, Marlborough, MA) was placed. We collected data on demographics, median duration of ICU stay, dosage and type of anticoagulants and antiplatelet therapy pre- and post-PEG placement, complications from the procedure during hospitalization, placement of a tracheostomy during hospitalization including the interval between PEG and tracheostomy placement, success of the PEG, death during or 1 month after hospitalization, American Society of Anesthesiology (ASA) grade, and other findings during the endoscopy. Success was defined as PEG placement and use to provide EN with no complications requiring removal over a 4-week period after placement. The association of categorical demographic variables with PEG tube placement in COVID-19 vs. non-COVID-19 patients was analyzed using a Chi-square test (2X2) or Fisher's exact test. Statistical significance was defined as $P < 0.05$. One-sided t-tests were used to analyze differences in continuous variables such as age and serum albumin. Microsoft Excel and SPSS were used for statistical analysis.

Results

We included 36 patients with (mean age 63.6 years; median age 64.5 years, 38.9% female) and 104 patients without COVID-19 infection (mean age 64.9 years, median age 67.5 years; 44.2% female) which were age- and gender-matched. Twenty-five patients were excluded because they had missing data, a PEG-J tube was placed, or they had the PEG tube placed initially by interventional radiology and exchanged endoscopically during the study period. Table 1 summarizes the main demographic and clinical characteristics of the participants. Of the patients with COVID-19, 41.6% had obesity (body mass index (BMI) > 30), compared to 22.1% of patients without COVID-19, with the difference being significant ($\chi^2(1, N = 140) = 5.16, P = 0.02$). A higher percentage of patients with COVID-19 were on either therapeutic or prophylactic anticoagulation at the time of PEG placement (86.1% vs. 51%), which was statistically significant ($\chi^2(1, N = 140) = 13.7, P < 0.05$) compared to the non-COVID-19 group. For COVID-19 patients, intravenous (IV) heparin was held 9 h prior to the procedure and resumed 11 h later and for the non-COVID-19 patients, on an average, IV heparin was held 12 h prior to the procedure and resumed 6 h thereafter. For both groups, apixaban was held for 24 h prior to the procedure (skipped one prior dose) and resumed 24 h post-procedure for patients with COVID-19 and on an average 48 h post-procedure for non-COVID-19. For both groups, the practice for therapeutic enoxaparin did not differ and was held 24 h (skipped one dose) prior to and resumed with the next scheduled dose after the procedure, usually within 6 - 8 h. Of patients with COVID-19, 38.8% were on antiplatelet therapies (including aspirin, clopidogrel, ticagrelor or both aspirin and clopidogrel), which was

similar to 25.9% of patients in the non-COVID-19 group ($\chi^2(1, N = 140) = 2.15, P = 0.14$). The mean duration of mechanical ventilation in COVID-19 patients was 33 days. A greater proportion of patients in the COVID-19 group had a tracheostomy than in the non-COVID-19 group (86% vs. 40.3%) ($\chi^2(1, N = 140) = 22.4, P < 0.05$). The average number of comorbidities was similar in patients with and without COVID-19 who underwent PEG placement ($P = 0.35$). Comorbidities noted included hypertension, diabetes, congestive heart failure, coronary artery disease, atrial fibrillation, chronic kidney disease, pulmonary embolism, deep vein thrombosis, dementia, stroke, seizure disorder, amyotrophic lateral sclerosis (ALS), and cancer. Serum albumin was significantly lower in the COVID-19 patients compared to the non-COVID-19 patients (2.4 vs. 2.77 g/dL) ($t(132) = 2.27, P = 0.024$). In the COVID-19 group, 8.3% of patients developed PEG-related complications, compared to 16.3% of patients without COVID-19; Fisher's exact test statistic value is 0.2829. The result is not significant at $P < 0.05$.

The success rates of PEG placement in patients with and without COVID-19 were similar at 97.2% and 92.3%, respectively; Fisher exact test statistic is 0.447, not significant at $P < 0.05$. PEGs that were removed due to complications within 28 days of placement were counted as unsuccessful. Of the 8/104 (7.6%) PEG tubes taken out in non-COVID-19 patients, two patients had developed leak and cellulitis at the PEG site; PEG was replaced at a new site 1 month later, five PEGs became clogged; one was replaced with a low-profile PEG, one was replaced due to persistent leakage. One PEG tube was taken out in the patients with COVID-19 due to a bleeding ulcer at the PEG site and placed at another site.

Nine out of 36 (25%) patients with COVID-19 died during the index hospitalization or in a long-term acute care or skilled nursing facility after discharge. Of these, five patients passed away after transitioning to hospice for prolonged respiratory failure and failure to wean from the ventilator, one had superimposed aspergillus pneumonia, one had a tracheostomy dislodgement in long-term acute with ensuing anoxic brain injury and two passed away in the ICU from respiratory acidosis secondary to respiratory failure.

Sixteen out of 104 (15%) died in the non-COVID-19 group during the index hospitalization or in a long-term acute care or skilled nursing facility after discharge. Causes of death included respiratory failure from ALS (n = 7), intracranial hemorrhage (n = 5), GI bleed (n = 1), cardiac arrest from hypothermia and adrenal insufficiency (n = 1). Two died in hospice with progressive dementia (n = 2).

The median number of days in the ICU for patients with COVID-19 was 39 days and subsequently, about 58.3% (21/36) of these patients moved to a long-term acute care facility. For the non-COVID-19 patients, 60/104 (57.6%) patients were in the ICU when PEG was placed and 44/104 (42.3%) were in a hospital ward. Of these, 44/104 (42.3%) were discharged to long-term acute care facility.

Discussion

COVID-19 has been associated with higher incidences of co-

Table 1. Demographic and Clinical Characteristics of Participants

	COVID-19 (N = 36)	Non-COVID-19 (N = 104)	P-value
Age, mean ± SD	63.69 ± 4.78	64.95 ± 2.7	0.32
Gender			0.21
Male	22 (61.1%)	54 (51.9%)	
Female	14 (38.9%)	50 (48.1%)	
Body mass index			0.0229
> 30	15 (41.6%)	23 (22.1%)	
< 30	21 (58.4%)	81 (77.9%)	
Healthy: 18.5 to < 25	7 (19.4%)	42 (40.3%)	
Overweight: 25.0 to < 30	9 (25%)	24 (23%)	
Underweight: < 18.5	5 (13.8%)	15 (14.4%)	
Anticoagulation			0.000207
None	5 (13.8%)	51 (49%)	
On therapeutic or prophylactic anticoagulation	31 (86.1%)	53 (51%)	
Prophylactic enoxaparin or heparin	12 (33.3%)	33 (31.7%)	
IV heparin	14 (38.8%)	9 (8.6%)	
Apixaban	2 (5.5%)	7 (6.7%)	
Warfarin	0	0	
Therapeutic enoxaparin	3 (8.3%)	2 (1.9%)	
Bivalirudin	0	1	
Rivaroxaban	0	1	
Antiplatelets			0.14
None	22 (61.1%)	77 (74%)	
On antiplatelet therapy	14 (38.8%)	27 (25.9%	
Aspirin	13	22	
Clopidogrel	1	3	
Ticagrelor	0	1	
Aspirin and clopidogrel	0	1	
Number of comorbidities per patient	2.25 ± 0.44	2.36 ± 0.32	0.35
Tracheostomy	31 (86%)	42 (40.3%)	0.000001
Indication for PEG tube			
Prolonged tube feeding (> 2 weeks) while on mechanical ventilation due to acute respiratory failure requiring tracheostomy	32 (88%)	9 (8.6%)	
Dysphagia secondary to neurological conditions which include ischemic and hemorrhagic stroke, refractory recurrent seizures, neuromuscular diseases (amyotrophic lateral sclerosis, myasthenia gravis) or severe cognitive impairment from dementia	4 (11.1%)	93 (89.4%)	
Oropharyngeal or esophageal cancer	0	2 (1.9%)	
Serum albumin	2.4 g/dL	2.77 g/dL	0.02
ASA grade			0.054
3	12 (33.3%)	52(50%)	
4	24 (66.6%)	48(46.1%)	
Complication rate	3 (8.3%)	17 (16.3%)	0.28
Melena	1	0	
Bleeding ulcer under PEG	1	2	

Table 1. Demographic and Clinical Characteristics of Participants   - *(continued)*

	COVID-19 (N = 36)	Non-COVID-19 (N = 104)	P-value
Ileus	1	0	
Clogged	0	7	
Hematemesis	0	1	
Dislodged	0	4	
Skin granuloma	0	1	
Cellulitis	0	2	
Success of PEG tube			0.44
Successful	35 (97.2%)	96 (92.3%)	
Removed/exchanged due to a complication within 28 days of placement	1 (2.8%)	8 (7.7%)	

COVID-19: coronavirus disease 2019; SD: standard deviation; PEG: percutaneous endoscopic gastrostomy; IV: intravenous; ASA: American Society of Anesthesiology.

agulopathy and thrombotic events, so anticoagulants have an important role in the management algorithm [8]. Furthermore, patients with COVID-19 have a high incidence of cardiovascular comorbidity [9] and are commonly on antiplatelet agents in addition to anticoagulation. PEG tube placement is considered a high bleeding risk (> 1.5%) procedure [10], so the current clinical practice is to stop anticoagulation/antiplatelets prior to the procedure. In our patient population, there was variability in the management of therapeutic anticoagulation, dictated by the clinical team and was influenced by such factors as history of or being at high risk for thromboembolic events and prior instances of bleeding during that hospitalization. One patient who reported melena after PEG placement in the COVID-19 group, had a pre-existing duodenal ulcer that was the source of bleeding after PEG placement. A patient with hematemesis in the non-COVID-19 group was found to have LA grade B esophagitis and was also on ticagrelor, of which only a single prior dose had been held which may have been the reason for bleeding after PEG placement. There was no significant difference in PEG-related complications between age- and gender-matched patients with and without COVID-19. In patients with COVID-19, PEG tubes were placed in ventilator-dependent critically ill patients with respiratory failure who were expected to recover. PEG placement was performed at least 3 weeks following admission and the initial positive test for COVID-19. Many of the patients were severely ill as evidenced by the median duration of ICU stay in the COVID-19 patients being around 33 days and that more than half were discharged to a long-term acute care facility. Serum albumin is a well-known marker of risk of PEG placement. Lower serum albumin levels in the COVID-19 patients compared to non-COVID-19 could be reflective of prolonged ICU stay and secondary to viral illness. The overall success rate of PEG placement was similar in both groups.

Obesity has been associated with severe COVID-19 infection in many studies [11]. Our study emphasizes the same finding, as many of the critically ill patients were obese. PEG tube placements in obese patients can be technically challenging due to insufficient transillumination and the inability to approximate the abdominal and gastric wall in our study, so

obese patients did not develop PEG-related complications. This resonates with the existing data that PEG placement is safe in obese patients [12, 13] and not a relative contraindication, as it was once considered.

This is, to our knowledge, the first study to assess the safety of PEG tube placement in patients with SARS-CoV-2 infection. Our study was limited by being a single-center study with a relatively small sample size. Multicenter prospective studies are needed to determine the generalizability of our results and to establish specific guidelines on enteral feeding in patients with COVID-19.

Despite high BMI and high rates of anticoagulant and antiplatelet therapies, PEG placement in patients with COVID-19 at Houston Methodist Hospital was successful, and complication rates did not differ from those in age- and gender-matched patients without COVID-19. PEG tube placement offered a safe and effective means of providing longer-term access for EN in these COVID-19 patients. Prospective validation in multicenter studies is needed.

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Financial Disclosure

Conflict of Interest

All authors declare they have no conflict of interest.

Informed Consent

Not applicable.

Author Contributions

Ayushi Shah contributed to data collection, analysis, manuscript writing and review of final draft of manuscript. Zunirah Ahmed contributed to the conceptualization, data collection, manuscript writing and review of final draft of manuscript. Fadl Zeineddine contributed to data collection and analysis. Eamonn MM Quigley contributed to conceptualization, supervision, manuscript writing and review of final draft of manuscript.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

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