Predictors of Percutaneous Endoscopic Gastrostomy Placement in Acute Ischemic Stroke

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Background: Dysphagia is a common complication of stroke and can have a lasting impact on morbidity and mortality; yet there are no standards to guide dysphagia management in stroke patients. We assessed predictors of percutaneous endoscopic gastrostomy (PEG) placement in an ischemic stroke cohort and sought to determine the utility of an objective scale in predicting PEG placement in a high-risk sub-set. *Methods:* Consecutive cases of ischemic stroke were retrospectively, identified and demographic and clinical variables were collected. Penetration-Aspiration (PAS) scores (1-2 normal; 3-5 penetration; 6-8 aspiration) were calculated for patients undergoing Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Modified Barium Swallowing Studies (MBSS). Multiple logistic regression analysis was used to assess predictors of PEG placement. *Results*: Among 724 patients, 131 underwent PEG placement. In univariate analysis of the overall cohort, sex, age, insured payer status, arrival National Institute of Health Stroke Scale (NIHSS), NIHSS level of consciousness severity, NIHSS dysarthria severity, diabetes mellitus, and prior International Conference for Harmonization (ICH) were all significantly associated with PEG placement. Among 197 high-risk patients undergoing FEES or MBSS, the multivariate logistic regression analysis showed that PAS scores 6-8 versus 1-2 (odds ratio [OR] 13.2; 95% confidence interval [CI] 4.58, 38.2), PAS score 3-5 versus 1.2 (OR 33.8; 95% CI 11.6, 98.3), Hispanic race (OR, 5.73; 95% CI 1.82, 18.0), male sex (OR, 2.59; 95% CI 1.05, 6.34), and arrival NIHSS (OR, 1.11; 95% CI 1.05, 1.18) were associated with PEG placement. *Conclusions*: Use of an objective dysphagia scale simplified the prediction model among acute ischemic stroke patients undergoing instrumental assessments of dysphagia with FEES or MBSS. Male sex and Hispanic race were also significantly associated with PEG placement in this analysis. These findings support the need for rigorously designed prospective studies to assess biological and social factors that influence PEG placement and to determine, how to best evaluate and manage patients with dysphagia.

Key Words: Dysphagia—ischemic stroke—percutaneous endoscopic gastrostomy tube—rehabilitation—penetration aspiration scale—recovery—swallow.
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Introduction

Dysphagia is common after acute stroke. It is associated with dehydration, malnutrition, and aspiration pneumonia, and leads to increased morbidity and mortality.[1,2] Percutaneous endoscopic gastrostomy (PEG) tubes are routinely placed in stroke patients with dysphagia. Although this surgical procedure is commonly performed, it is not without complications and the long-term benefit to patients is unclear.[3,4] There is substantial variability in PEG placement rates across institutions likely related to the lack of standard tools to guide practitioners as to which patient would have the greatest benefit from PEG tube placement.[5]

Several studies have been performed at single institutions seeking to identify factors associated with an increased likelihood of PEG placement in ischemic stroke patients.[6-10] In these studies, several factors including stroke severity, age, race, dysarthria, and infarct location were variably associated with increased odds of PEG placement. Additionally, a study using the Nationwide Inpatient Sample (NIS), which examined PEG placement practices in ischemic stroke patients revealed that among 332,907 ischemic stroke hospitalizations, 8.8 % of patients underwent PEG tube placement.[5] In this study, the rate of PEG placement ranged from 0%-26% between hospitals. The factors associated with increased odds of PEG placement in the NIS study included insurance status, race, patient age and hospital characteristics, such as privately owned versus state owned. While some of the variables associated with PEG placement in the NIS study and other studies are biologically plausible causes of severe dysphagia, many others are not. These findings suggest that objective measures are not routinely used to determine which patients should undergo PEG placement for dysphagia and aspiration risk.

In this study, we first sought to determine whether the clinical and social variables that have been associated with PEG placement in prior studies of ischemic stroke patients were similarly associated with PEG placement at our institution. Second, we sought to assess whether the use of an objective score of dysphagia, assessed by using an instrumental assessment of swallow (IAS) study would be a strong and independent predictor of PEG placement among patients with risk for aspiration, according to a bedside swallow. We hypothesized that inclusion of a dysphagia severity score in the prediction model would simplify the model by accounting for the degree to which dysphagia accounts for PEG placement.

Methods

Using our inpatient stroke registry, we retrospectively identified acute ischemic stroke (AIS) patients treated at our institution from June 2014 to April 2015. Patients were included, if they were 18 years or older and admitted to our Comprehensive Stroke Center following an AIS. Exclusion criteria were death or transfer to hospice within 72 hours of admission, PEG placement prior to hospitalization, or primary management outside of the stroke team care pathway (off service strokes on cardiology or other medicine services). Demographic and clinical variables including age, gender, race, marital status, insurance status, medical history (diabetes mellitus (DM), hypertension, lung disease, atrial fibrillation, prior stroke or intracerebral hemorrhage-ICH, dementia, and tobacco use), National Institutes of Health Stroke Scale (NIHSS) on admission, NIHSS sub-scores (level of consciousness, facial palsy, dysarthria, and aphasia), Glasgow coma score (GCS) on admission, discharge disposition, and length of stay were collected for all patients. We reviewed charts to minimize missing data and to abstract additional relevant information including stroke side, stroke circulation, dysphagia screen results, and details of PEG placement. Speech language pathologists (SLP) retrospectively completed case report forms for dysphagia-related data including results of the Fiberoptic Endoscopic Evaluation of Swallowing (FEES) and Modified Barium Swallowing Studies (MBSS) and Penetration Aspiration scores (PAS). This study was approved by the Institutional Review Board of the UT McGovern Medical School.

Dysphagia Evaluation

As per our institutional policy, all patients presenting with stroke symptoms undergo a dysphagia screen by emergency department or stroke unit nursing staff, according to a standardized protocol that includes a checklist of clinical symptoms as well as a swallow test with water. The initial dysphagia screen is implemented early after presentation, so that patients can take necessary oral medications and are not unnecessarily kept Nothing By Mouth for prolonged periods of time. Stroke patients are also routinely evaluated by (SLP). SLP therapists use several clinical indicators to evaluate for concerns of pharyngeal dysphagia including vocal quality, strength of cough and throat clearing after swallowing. Depending on the patient's performance on the bedside swallow evaluation, they may be referred for an (IAS) evaluation, either with a FEES or MBSS.

The FEES and MBSS can be used to calculate a dysphagia severity score based on the (PAS). The PAS is one of the most widely used scales to quantify dysphagia in studies involving stroke and non-stroke patients.[11,12] The scale was designed to measure a variety of factors including, depth of penetration of food products as well as the patient's ability to expel products that have come in contact with the vocal folds in an attempt to assess the severity of dysphagia. It has been shown to have an inter-rater reliability of 57%-75% (kappa coefficient 0.35-0.88) and intra-judge reliability of 74% (kappa coefficient 0.42-0.91) for individual scores. The score is determined by the depth at which food materials of