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Prophylactic pre-esophagogastroduodenoscopy tracheal intubation in patients with upper gastrointestinal bleeding

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ABSTRACT

The indications for endotracheal intubation (ETI) during an esophagogastroduodenoscopy (EGD) procedure remain unclear. This study performed a descriptive analysis of patients who underwent prophylactic tracheal intubation during or before an EGD to prevent pulmonary aspiration. We selected patients with an upper gastrointestinal bleed in an intensive care unit who underwent EGD between 2000 and 2013. Eighty-nine patients who underwent pre-EGD tracheal intubation were analyzed. The main outcomes in this study were pulmonary aspiration, length of stay, and mortality. The average age of patients undergoing pre-EGD intubation was 61 years. The incidence of pulmonary aspiration was 38% in patients who underwent pre-EGD tracheal intubation. The patients requiring tracheal intubation had a mortality rate of 22% during hospitalization. Other complications in pre-EGD ETI patients included myocardial infarction (9%), acute respiratory distress syndrome (10%), and pulmonary edema (7%). In conclusion, the incidence of pulmonary aspiration with pre-EGD tracheal intubation in our patients was high (38%). Cardiopulmonary complications including myocardial infarction, acute respiratory distress syndrome, and pulmonary edema were high in intubated patients.

KEYWORDS Endoscopy; endotracheal intubation; pulmonary aspiration; upper gastrointestinal bleeding

Patients with severe upper gastrointestinal bleeding (UGIB) who are hemodynamically unstable are usually managed in intensive care units (ICUs).[1] These patients may be tracheally intubated prophylactically before esophagogastroduodenoscopy (EGD) based on clinical evaluation by the treating physicians.[1,2] However, there are no clear guidelines for prophylactic pre-EGD endotracheal intubation (ETI) in these patients.[1–3] Pre-EGD ETI could maintain a secure airway and prevent pulmonary aspiration; however, existing studies show conflicting results in the prevention of aspiration or improvement in other outcomes.[2–4] Thus, we wanted to determine the incidence of pulmonary aspiration, length of stay, mortality, and outcomes in patients with pre-EGD tracheal intubation for UGIB.

METHODS

After obtaining approval from our institutional review board, we retrospectively reviewed the medical records from the years 2000 to 2013. Cases were selected based on inclusion criteria of being an adult (age >18 years) critical care patient admitted or transferred to the ICU who had acute UGIB (defined as suspected or witnessed bloody or coffee ground emesis; visible blood in the stomach during EGD was also included), in whom ETI was performed within 48 hours before or during EGD for acute UGIB with an indication of airway protection or shock or respiratory failure. In patients for whom no exact indication for intubation was identified, it was presumed to be for airway protection. EGD was performed by a gastroenterologist, and ETI was performed by an intensivist, anesthesiologist, or emergency department physician. Patients were excluded if ETI was performed for indications other than those mentioned in inclusion criteria (e.g., surgery, isolated exacerbation of chronic obstructive pulmonary disease), if EGD was performed for reasons other than acute UGIB, or if they were under the age of 18.

Indications for intubation were based on clinical evaluations by the intensivists or emergency center physicians.

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Table 1. Demographic characteristics of 69 patients who underwent pre-esophagogastroduodenoscopy intubation

Demographic and clinical variables	*N* (%) or median (range)
Age (years)	61 (38–84)
Female	46 (67%)
Habitual alcoholism	32 (46%)
Cirrhosis	28 (41%)
Nonmassive hematemesis	50 (72%)
Prior coronary artery disease	20 (29%)
Prior lung disease	19 (28%)
Number of transfusions	4 (2–50)
Esophageal varices	29 (43%)
Type of endotracheal intubation	
Elective	53 (77%)
Emergent	16 (23%)
Transjugular intrahepatic portosystemic stent shunting	9 (13%)
Hepatic encephalopathy	10 (15%)
Sepsis	18 (26%)
Disseminated intravascular coagulation	3 (4%)
Sengstaken-Blakemore tube	8 (12%)

Massive hematemesis was defined as >500 mL of bloody emesis; nonmassive hematemesis was defined as <500 mL. Toxic encephalopathy was defined as the change in mental status and the presence of either a blood alcohol level or a strong clinical suspicion that a medication contributed to the clinical presentation. Hepatic encephalopathy was defined as an abnormal mental status associated with a high ammonia level in a patient with known or suspected cirrhosis of the liver. The diagnosis of cirrhosis was based on radiology or histology reports.

The primary outcome was pulmonary aspiration, defined as a new infiltrate or opacity on chest x-ray within 48 hours after EGD. Aspiration documented during intubation by an intensivist was also included. If a prior aspiration within 48 hours of the EGD was suspected or witnessed, increasing clinical symptoms or infiltrate or hypoxemia were recorded to establish this diagnosis. Seven secondary outcomes were also analyzed: (1) myocardial infarction, defined according to the third universal definition of myocardial infarction within 12 hours after EGD[5]; (2) pneumonia, defined as the appearance of a new infiltrate with a fever and/or leukocytosis after ETI with clinical diagnosis by an intensivist (if a pre-existent pneumonia was present prior to EGD, an increasing infiltrate or a change in clinical status after EGD was recorded); (3) acute respiratory distress syndrome (ARDS), with clinical documentation by an intensivist included based on the consensus definition of ARDS within 48 hours after EGD[6]; (4) cardiogenic pulmonary edema, defined as new lung infiltrates with systolic or diastolic dysfunction evidenced by echocardiography or elevated brain natriuretic peptide (250 ng/dL) or elevated pulmonary capillary wedge pressure (>18 mm Hg), with clinical documentation of pulmonary edema included; (5) sepsis, the presence of systemic inflammatory response syndrome with a suspected or confirmed source of infection as defined by the International Sepsis Definitions Conference[7]; (6) mortality, all-cause mortality during hospitalization; and (7) hospital days, ICU days, and total hospital days.

RESULTS

We identified 788 patients who had a UGIB and required an EGD in an ICU. Of these, 192 underwent ETI. Twenty-two patients were excluded due to inadequate documentation, and 81 were excluded either because the ETI was performed for other indications or because of the timing of ETI (>48 hours before or after endoscopy). Twenty patients underwent post-EGD ETI (within 48 hours after EGD). Sixty-nine patients satisfied the inclusion and exclusion criteria and were included in the study. Most intubations were elective (77%). Multiple physicians performed these procedures, and there was no standardized protocol for intubation.

Table 2. Outcomes in 69 patients who underwent pre-esophagogastroduodenoscopy intubation

Outcome	*N* (%) or median (range)
Myocardial infarction	6 (9%)
Pulmonary aspiration	26 (38%)
ARDS	6 (9%)
Pulmonary edema	5 (7%)
Hospital LOS (days): Median (range)	10 (2, 61)
ICU LOS (days): Median (range)	6 (1, 60)
Mortality during hospitalization	15 (22%)

ARDS indicates acute respiratory distress syndrome; ICU, intensive care unit; LOS, length of stay.

Demographic and clinical variables of the intubated patients are reported in *Table 1*. The average age of patients undergoing pre-EGD intubation was 61 years. Clinical characteristics of patients with ETI included cirrhosis (41%), alcoholism (46%), massive hematemesis (25%), lung disease (28%), varices (43%), sepsis (26%), and placement of a Sengstaken-Blakemore tube (12%).

Of the 69 patients undergoing pre-EGD ETI, 26 (38%) met our criteria for pulmonary aspiration. This was higher than a previously reported frequency of pulmonary aspiration with pre-EGD ETI (~17%).[3] Pre-EGD ETI was associated with several complications, including myocardial infarction (9%), ARDS (9%), and pulmonary edema (7%). The median length of hospital stay, including ICU stay, was 10 days, and the mortality rate was 22% *(Table 2)*.

We also performed a post hoc comparison of pre-EGD ETI patients ($n = 69$) and post-EGD ETI patients ($n = 20$) *(Table 3)*. Pulmonary aspiration (40% vs 38%), ARDS (20% vs 9%), hospital length of stay (15.5 days vs 10.0 days), and hospital mortality (45% vs 22%) were higher in post-EGD ETI patients than in pre-EGD ETI patients. The difference in mortality rate was statistically significant ($P = 0.049$) *(Table 3)*.

DISCUSSION

Our study demonstrates that pulmonary aspiration occurs frequently in patients with UGIB undergoing pre-EGD ETI. The length of stay and mortality were also high in the pre-EGD ETI patients. The exact cause of the increased risk of pulmonary aspiration in pre-EGD intubated patients is unclear, but it may be related to the inherent risk of intubation in patients with vomiting and poor visualization of the upper airway.[8–11] Given the high incidence of pulmonary aspiration in the intubated group, we investigated whether the timing of intubation affected the outcome. Compared to post-EGD ETI patients, pre-EGD ETI patients had less frequent pulmonary aspiration and ARDS and a shorter length of stay; however, these differences were not statistically significant. The post-EGD patients had a higher mortality rate, which might reflect more comorbidity.

Despite the frequent use of pre-EGD ETI in ICU patients, the lack of conclusive guidelines and conflicting studies on the efficacy of ETI make this decision difficult in patients with severe UGIB. A review of previous publications revealed conflicting results. Koch et al concluded that in patients with variceal hemorrhage, elective ETI was associated with a substantial risk of aspiration pneumonia.[3] However, this study included variceal hemorrhage patients, had a small sample size (42 patients and 20 controls), and had a time effect; specifically, fewer pre-EGD ETIs were performed before 1997 compared to after 1997 due to the presence of new faculty. Hayat et al reviewed 144 patients undergoing pre-EGD ETI and found an increase in cardiopulmonary events, such as pneumonia, septic shock, and

Table 3. Outcomes in patients who underwent pre-esophagogastroduodenoscopy intubation compared to postesophagogastroduodenoscopy intubation

Outcome	Pre-EGD-ETI ($N = 69$)	Post-EGD-ETI ($N = 20$)	*P* value
Myocardial infarction	6 (9%)	2 (10%)	1.00
Pulmonary aspiration	26 (38%)	8 (40%)	0.92
ARDS	6 (9%)	4 (20%)	0.22
Pulmonary edema	5 (7%)	4 (20%)	0.11
Hospital LOS (days): Median (range)	10 (2, 61)	15.5 (2, 127)	0.056
ICU LOS (days): Median (range)	6 (1, 60)	9.5 (2, 103)	0.14
Mortality during hospitalization	15 (22%)	9 (45%)	0.049

ARDS indicates acute respiratory distress syndrome; ICU, intensive care unit; LOS, length of stay; post-EGD ETI, postesophagogastroduodenoscopy intubation defined by intubation >48 hours after EGD; pre-EGD-ETI, pre-esophagogastroduodenoscopy intubation.

hemorrhagic/hypovolemic shock.[12] Hayat et al found no difference between mortality among pre-EGD ETI and nonintubated patients (10%). Rudolph et al suggested that the use of ETI for airway protection did not affect the incidence of pneumonia or cardiopulmonary events during a study with inclusion dates of 1988 to 1992.[4] This study focused on the frequency of pneumonia rather than on pulmonary aspiration and was limited by a small number of intubated patients (3 in 1988 and 18 in 1992).[4] Rehman et al concluded that cardiopulmonary events were unaffected by pre-EGD ETI.[13] They included patients between the years 2002 and 2006 and had a moderate sample size of 49 patients. Pulmonary aspiration occurred equally in pre-EGD ETI patients and nonintubated patients (10 vs 9 patients).

All studies indicate that pre-EGD patients have a relatively high incidence of pulmonary aspiration associated with prophylactic ETI. Several studies have shown a strong correlation between alcohol consumption and liver cirrhosis and the incidence of pulmonary aspiration.[14–16] Thus, screening patients for alcoholism and liver cirrhosis might identify patients at high risk for aspiration. There are no large randomized studies on the use of pre-EGD ETI.[1,2,4] Conditions under which an ETI would be indicated are unclear, but ongoing hematemesis, poor respiratory status, encephalopathy, and an uncooperative patient are potential indications.[1]

Our study has limitations. We depended on information recorded in the medical records by multiple providers. Our sample size was small because the lack of adequate electronic records before 2002 reduced the study population. The patients who were intubated could have been more critically ill, which might have altered any direct causal association between benefits or hazards associated with ETI. We did not use risk stratification scores, like APACHE II (Acute Physiology and Chronic Health Evaluation), to classify these patients due to lack of documentation in the electronic health records. The diagnosis of aspiration in a critically ill patient can be difficult. Other causes of new pulmonary infiltrates include atelectasis, pneumonia, and pulmonary emboli, which could lead to the misclassification of patients. As a single-center study, its external validity is limited. Finally, the clinical expertise of gastroenterologists, intensivists, and emergency room physicians could influence outcomes and potentially could limit our conclusions.

In conclusion, there was a high incidence of pulmonary aspiration (38%) and mortality (22%) in the 69 patients who underwent prophylactic intubation between the years 2000 to 2013. Our results match the reported cardiopulmonary complications and mortality associated with pre-EGD ETI. A large randomized prospective trial could provide the information needed to develop a potential scoring tool for the use of ETI in patients requiring an urgent EGD.

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