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Pre-endoscopic Intubation for Airway Protection in Patients Undergoing Evaluation for Hematemesis–Experience in a Tertiary Care Center

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Abstract

Background: Pre-endoscopic endotracheal intubation is frequently performed during hematemesis, with the assumption that it will prevent aspiration and other cardiopulmonary complications. However, current literature reveals limited studies showing this benefit. Furthermore, guidelines for identifying patients who would most benefit from pre-endoscopic intubation are lacking. We hypothesize that pre-endoscopic intubation as associated with increased cardiopulmonary complications. Our study aimed to compare the frequency of cardiopulmonary complications between patients presenting with hematemesis who underwent pre-endoscopic intubation versus those who did not.

Methods: A retrospective analysis of patients who underwent esophago-gastroduodenoscopy (EGD) for hematemesis between May 2015 and April 2018 was conducted. Patients were subdivided into those who underwent pre-endoscopic intubation and those who did not. The primary endpoint of "cardiopulmonary complications," was defined as the occurrence of pneumonia, pulmonary edema, pneumothorax, hypoxemia, sedation induced hypotension, shock or cardiac arrest within 72 hours after endoscopy or intubation. Number of units of red blood cells (RBC) transfused prior to endoscopy was used as a surrogate for acuity of bleed. Appropriateness of intubation was assessed by documented reason for intubation. Intubations due to witnessed hematemesis and solely from gastroenterology request were defined as inappropriate reasons for intubation.

Results: Of 300 distinct patient encounters undergoing endoscopy, 66 (22.0%) were intubated prior to the procedure. Witnessed hematemesis was the most common indication for intubation prior to endoscopy (47.0%). Patients who underwent pre-endoscopic intubation were associated with higher acuity of illness as evidenced by validated scoring systems (SAPSII/AIMS65). Median units of blood transfused in the intubated group vs. non-intubated group were 2 and 0 ($p<0.001$), respectively. Cardiopulmonary complications in the intubated group were more prevalent than in the non-intubated group (27.3% vs. 1.3% respectively; $p=<0.001$). After adjusting for differences in SAPSII, AIMS65, and pRBC, patients who were intubated had 15.36 (95% CI: 4.52-65.67) times the odds of having a complication than those who were not intubated ($p<0.001$). Furthermore, there were no significant differences in the proportion of complications in appropriate vs. inappropriate intubations (33.3% vs. 25.9%; $p=0.72$ by Fisher's exact test).

Conclusion: Our study demonstrates that pre-endoscopic intubation in the setting of hematemesis can be associated with increased cardiopulmonary complications. When controlling for potential confounders including severity score, bleeding risk score, and acuity of bleed, this finding persisted. We also note that patients who are intubated have similar risk of complications, regardless of reason for intubation. Thus, this suggests that intubations prior to endoscopy should be performed cautiously and only in specific scenarios.

Keywords: Gastrointestinal bleed • Hematemesis • Intubation • Endoscopy

Introduction

Upper gastrointestinal (GI) bleeding has been associated with significant morbidity and mortality [1]. Non-variceal upper GI bleeding mortality rates range from 3.5% to 10%, and as high as 12% in association with non-steroidal anti-inflammatory drug (NSAID) use. In the setting of variceal bleeding, mortality rates are even higher, reported between 15-20% [2]. Endoscopic intervention for upper GI bleeding has been associated with complication rates ranging from 0.01% to 0.5%, with cardiopulmonary adverse events being the most commonly reported [3]. Aspiration following endoscopic intervention for acute hematemesis is a concern, as these patients are subjected to intravenous sedation/analgesia which increases the risk of aspiration of gastric contents due to impairment of the gag reflex. A single center study reported aspiration pneumonia in up to 5% of patients undergoing endoscopy for upper GI bleeding [4]. For this reason, expert opinion may prefer endotracheal intubation prior to endoscopy with the intention of decreasing the incidence of aspiration. However, few studies suggest benefit from this practice. Additionally, intubation itself has been associated with respiratory complications independent of the indication [5-7]. Attempts to quantify the risk of aspiration during endoscopy have found clinically significant aspiration pneumonia to be uncommon [8,9]. However,

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despite these findings, pre-endoscopic intubation continues to be a common practice for patients presenting with acute upper GI bleeding. There are currently no predetermined criteria for selecting patients that would benefit from pre-endoscopic intubation.

Research Methodology

An institutional review board approval was obtained for this study [HS-18-00030]. One thousand eight hundred ninety medical records of patients underwent inpatient Esophago Gastro Dodenoscopy (EGD) between May 2015 and November 2018 at Los Angeles County + University of Southern California Medical Center were reviewed. Patients included were aged 18 years or older who underwent EGD specifically for hematemesis. Hematemesis was identified by key words using either 'hematemesis' or 'coffee-ground emesis' documented in the medical record. Patients who presented with melena alone or for any other indication were excluded. Medical records with multiple encounters were randomly selected for a single encounter. Patients were subdivided into those who underwent pre-endoscopic endotracheal intubation and those who did not. Pre-endoscopic intubation was defined as endotracheal intubation performed prior to EGD, regardless of indication. Information was recorded into a database compiling demographics, admission hemoglobin (Hgb), mentation, time to endoscopy, platelets and international normalized prothrombin ratio (INR) on admission. The primary endpoint was a composite of "cardiopulmonary complications," defined as the occurrence of pneumonia, pulmonary edema, pneumothorax, hypoxemia, sedation induced hypotension, shock or cardiac arrest occurring within 72 hours of endoscopy or intubation. For the purposes of this study, pneumonia was defined as a new opacity on chest x-ray when compared to prior baseline on same admission, signs of systemic inflammatory response syndrome, and the completion of a full course of antibiotics (at least 5 days), suggesting that there was a strong concern for pneumonia. Pulmonary edema was defined as new oxygen requirement with chest x-ray findings consistent with pulmonary edema. Hypoxemia was defined as oxygen saturation < 92% or greater than 5% drop in SpO_2 from baseline. Sedation induced hypotension was defined as transient drop in blood pressure shortly after sedation that resolved with decreased sedation.

The reasons for intubation were assessed based on the recorded indication for intubation. The appropriateness of intubation was also assessed in this study. An intubation was determined to be appropriate if there was an intubation secondary to a standard indication, such as altered mental status, cardiac arrest, hypoxia, angioedema, or shock. Inappropriate reasons for intubation were defined as strictly for hematemesis of any volume or solely per gastroenterology request.

As volume of blood loss in the setting of upper GI bleeding is difficult to quantify and subjective, number of units of packed red blood cells (pRBC) transfused prior to endoscopy was used as a surrogate for acuity of bleed. Severity of GI bleeding was computed according to the AIMS65 score [10] and severity of illness was graded by the Simplified Acute Physiology Score (SAPSII) [11].

Another metric that was assessed during this study was the "time to endoscopy", which was effectively the time from presentation to endoscopy. We used this duration as a surrogate for urgency of bleed, as more urgent cases would have undergone endoscopy sooner.

Based on prior studies [12-15], an estimated sample size of 300 was calculated a priori to determine the ideal sample size for this study.

Descriptive statistics are reported as mean and standard deviation (SD) or median and interquartile range (IQR) and as frequencies within groups for continuous variables and categorical variables, respectively. Differences in patient characteristics and disease history by intubation status were tested by Student's t-test for normally distributed variables, Wilcoxon rank sum test for non-normally distributed variables, and x^2 test or Fisher's exact test for categorical variables, as appropriate. Normality was assessed graphically and by the Shapiro-Wilk test.

The association of intubation status with the primary composite complication outcome was analyzed using logistic regression. In order to reduce bias arising from the low complication rate in the data, Firth's penalized maximum likelihood approach was used. Univariate and multivariable models adjusting for potential confounders are reported and results are reported as odds ratios and penalized likelihood 95% confidence levels and p-values. SAPSII and AIMS65 were included in the adjusted model based on a priori criteria. Additional confounders were chosen based on the significance of their association with both intubation status and the complication outcome and were retained in the model if the intubation estimate was altered by at least 10%. Collinearity diagnostics were performed by calculating the tolerance and variance inflation factor (VIF) for each variable, where a VIF of 10 or greater indicates a high degree of intercorrelation.

Significance was evaluated using 0.05-level 2-sided tests. All statistical analyses were performed using SAS 9.4.

Results

A total of 1980 distinct patient-encounters were reviewed, with 300 that met the inclusion criteria and were included in the analysis. The study cohort was 74.3% male and the mean (SD) patient age was 52.3 (12.9) years. Of these, 66 patients (22.0%) underwent pre-endoscopic intubation. Patient demographics, baseline Hgb, time to endoscopy, mental status, baseline platelet count, SAPSII, AIMS65, and comorbidities for the entire cohort and by intubation group are listed.

Timing of EGD ranged from one hour from presentation up to 48 hours after admission. Witnessed hematemesis was the most common indication given for intubation prior to endoscopy (53.0%), followed by requests by a gastroenterology consultant (30.3%), and encephalopathy (7.6%). The most common source of hematemesis was variceal hemorrhage followed by esophagitis. The most common complications in the intubated group were sedation induced hypotension (61.1%), pneumonia (16.7%), and death (11.1%). The 3 complications experienced in the non-intubated group were due to pneumonia (1; 33.3%) and hypoxia (2; 66.7%). One patient experienced pulseless electrical activity arrest following hematemesis and was intubated. One death from exsanguination occurred in the intubated group shortly after EGD; one of the patients required cricothyrotomy as a result of several unsuccessful attempts at endotracheal intubation.

Compared to patients who were not intubated, intubated patients were more likely to have altered AMS (24.2% vs. 2.6%; p<0.001), lower hemoglobin levels (mean [SD]: 8.2 [2.5] vs. 9.9 [3.3]; p<0.001), higher pRBC (median [IQR]: 2.0 [1.0-3.0] vs. 0 [0-1.0]; p<0.001), time to endoscopy (31.8% vs. 53.4%; p=0.002), lower plts (median [IQR]: 119.5 [90.0-199.5] vs. 157.5 [91.0-244.0]; p=0.049), and cirrhosis (66.7% vs. 30.8%; p<0.001). Intubated patients were also significantly more severe in their illness and bleeding risk (median [IQR] SAPSII and AIMS65 scores 28.0 [21.0-39.0] vs. 18.0 [13.0-24.0] and 2.0 [1.0-20] vs. 1.0 [0-1.0], respectively; both p<0.001).

Eighteen intubated patients (27.3%) and 3 non-intubated patients (1.3%) experienced a complication during their hospitalization (Figures 1 and 2). In an unadjusted model, intubation was associated with a significantly increased risk for complication (OR [95% CI]: 25.2 [8.6-98.5]; p<0.001). Potential confounders of this association included SAPSII, pRBC, AIMS65, hemoglobin, and AMS alteration. SAPSII and AIMS65 were included in the model based on a priori knowledge as well as their effect on the OR of intubation status. Additional logistic regression models revealed that the only additional confounder that changed the OR of intubation status by more than 10% was pRBC. After adjusting for SAPSII, AIMS65, and pRBC, the odds of complication for intubated patients was 15.4 (95% CI 4.5-65.6) times the

odds of complication for non-intubated patients, and this association maintained its significance at p<0.001.

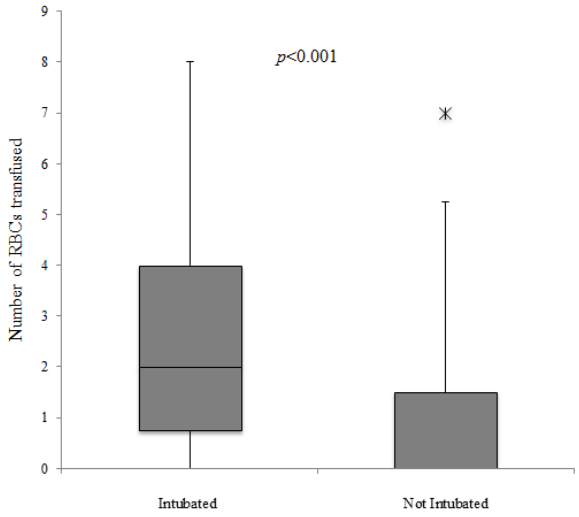

Figure 1. Eighteen intubated patients (27.3%) and 3 non-intubated patients (1.3%) experienced a complication during their hospitalization.

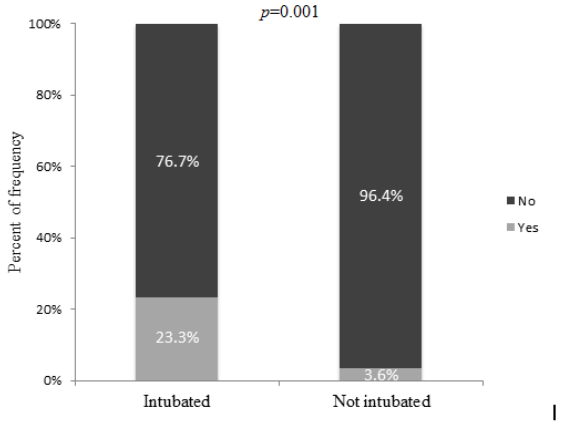

Figure 2. Percent of frequency between the Intubated and Non intubated.

In a subgroup analysis of the 66 patients who were intubated, 4 of 12 (33.3%) patients who were intubated appropriately experienced a complication while 14 of 54 (25.9%)patients intubated inappropriately experienced a complication; the differences were not statistically significant (Fisher's exact p=0.72).

Discussion

The main findings in this study are:

(a) Incidence of cardiopulmonary complications is higher in intubated patients compared to those who were not,

(b) This finding was preserved after multivariate analysis with cofounders which include severity of illness, risk of bleed, and encephalopathy, and

(c) That complications rates are similar in patients who were intubated appropriately and inappropriately.

Absolute indications for pre-endoscopic intubation are controversial, and vary in clinical practice in patients presenting with acute hematemesis. By convention, factors that influence the decision to intubate include volume of hematemesis, hemodynamic status, respiratory status, mental capacity, and extent of sedation required. This was consistent with our study, as patients selected for pre-endoscopic intubation were sicker as evidenced by higher SAPSII and AIMS65 scores (Figures 3 and 4).

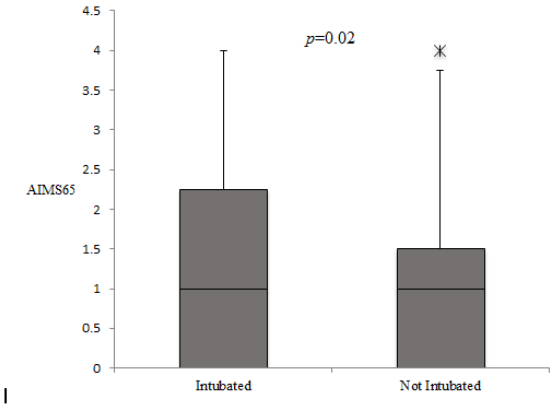

Figure 3. Pre-endoscopic Intubation and Non intubation for AIMS65.

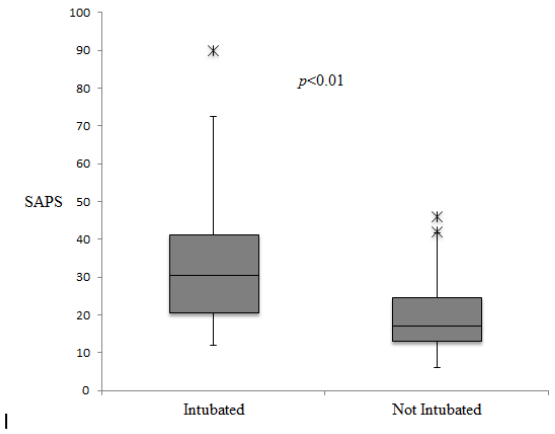

Figure 4. Pre-endoscopic Intubation and Non intubation for SAPSII.

While pre-endoscopic intubation is often proposed to decrease the risk of cardiopulmonary complications, namely aspiration pneumonia, our findings suggest that aggressive intubation may also lead to increased cardiopulmonary complications (27.3% in intubated group vs. 1.3% in non-intubated group). In fact, 3 of 66 (4.55%) intubated patients exhibited new radiographic infiltrate within 48 hours after endotracheal intubation, compared to only 1 of 234 (0.43%) patients who did not undergo the intervention. These findings further support findings in a recent meta-analysis of 367 patients, reporting 20 of 134 (15%) intubated patients who developed pneumonia following EGD vs. 5 of 95 (5%) for non-intubated patients [12]. Although our complication rates differ from prior studies, we used a more stringent definition of pneumonia. Our patients had to meet all three criteria of new infiltrate on CXR, signs of systemic inflammatory response, and full course of antibiotics. Thus, our findings are similar in that intubated patients exhibited a higher frequency of pneumonia compared to non-intubated patients. Endotracheal intubation itself carries risks of cardiopulmonary complications and should not be considered a benign procedure [13]. In fact, our study found that the leading cause of complications in the intubated group was due to sedation-induced hypotension. As this hypotension was iatrogenic, one may argue that this complication should not have happened if

the procedure was not necessary. However, this does not mean there are no clinical scenarios in which pre-endoscopic intubation would be reasonable. For example, pre-endoscopic endotracheal intubation has an important role in patients with a high risk of aspiration pneumonia, such as those with altered mentation.

Another interesting finding from this study was the stratification based on "appropriateness" of intubation. When the intubations were stratified based on appropriateness, we see that there is no difference in cardiopulmonary complications (33.3% in the appropriately intubated group vs. 25.9% in the inappropriately intubated group). Although the designation of appropriateness was arbitrary in this study, the results suggest that patients who are intubated strictly due to hematemesis or request by the gastroenterologist (which may be argued as "elective" intubations) have similar risk of cardiopulmonary complications compared to those who were intubated for routine indication.

Although it would have been interesting to stratify the patients who were intubated strictly for hematemesis based on the volume of hematemesis for risk stratification, it was not possible to quantify the amount of hematemesis accurately for this study. This study is also limited by its retrospective design. Nonetheless, the number of patients provided enough power to arrive at the stated conclusions. As previously stated, it is difficult to quantify the actual amount of blood lost from hematemesis, and therefore a surrogate was used in our study (e.g., number of pRBC transfused). Based on these data alone, it is difficult to determine if pneumonia resulted from aspiration of blood or from the intubation itself, or was even pre-existing [14-16]. Chest imaging prior to endoscopy was not available in most cases, which excluded patients within our study to be diagnosed with pneumonia as there was no prior chest x-ray without infiltrate. With that being said, a prospective study designed to analyze such a clinical question would be unethical, as one study arm would need to be randomized to not undergo endotracheal intubation.

Conclusion

In conclusion, intubation prior to endoscopy can be associated with an increased risk of complications as compared to patients who do not undergo intubation. Our study was able to complete our initial objective of assessing the frequency of complications for patients who receive pre-endoscopic intubation. Further studies are needed to assess the findings in subgroup analysis within this study, and to help develop appropriate guidelines when selecting patients presenting with hematemesis for pre-endoscopic intubation.

References

1. Targownik, Luis and Nabalamba. "Trends in management and outcomes of acute nonvariceal upper gastrointestinal bleeding: 1993-2003". *Clin Gastroenterol Hepatol* (4) 2006: 1459-1466.
2. Garcia-Tsao, Guadalupe, SanyalArun, Grace Norman and Carey Willam, et al. "Prevention and management of gastroesophageal varices and variceal hemorrhage in cirrhosis". *Hepatology* (46) 2007: 922-938.
3. Benmenachem, Tamir, Decker Anton, Early Dayna and Jerry Evans, et al. "Adverse events of upper GI endoscopy". *Gastrointest Endosc* (76) 2012: 707-718.
4. Kawanishi, Koki, Kato Jun, Toda Nobuo and Mari Yamagami, et al. "Risk Factors for Aspiration Pneumonia After Endoscopic Hemostasis". *Dig Dis Sci* (61) 2016: 835-840.
5. Adriani, Jan, Naraghi Mewar and Ward Mari."Complications of endotracheal intubation". *South Med J* (81) 1988: 739-744.
6. Stauffer, Joul, Olson Dews and Petty Tin. "Complications and consequences of endotracheal intubation and tracheotomy. A prospective study of 150 critically ill adult patients". *Am J Med* (70) 1981: 65-76.
7. Sue, Richard and Susanto Irawan."Long-term complications of artificial airways". *Clin Chest Med* (24) 2003: 457-471.
8. Thomson, Andrew, Tye-din Jouls and Tonga Sam. "Aspiration in the context of upper gastrointestinal endoscopy". *Can J Gastroenterol* (21) 2007: 223-225.
9. Sharma, Virender, Nguyen Cuong, Crowell Michael and Lieberman David, et al. "A national study of cardiopulmonary unplanned events after GI endoscopy". *Gastrointest Endosc* (66) 2007: 27-34.
10. Saltzman, Jhon, Tabak Ying, Hyett Brain and Sun Xiaowu,et al."A simple risk score accurately predicts in-hospital mortality, length of stay, and cost in acute upper GI bleeding". *Gastrointest Endosc* (74) 2011: 1215-1224.
11. Le Gall, James, Lemshow Sam and Saulnier Freik. "A new Simplified Acute Physiology Score (SAPS II) based on a European/North American multicenter study". *JAMA* (270) 1993: 2957-2963.
12. Almashhrawi, Ashraf, Rahman Rubayat and Jersak Samuel. "Prophylactic tracheal intubation for upper GI bleeding: A meta analysis". *World J Metaanal* (3) 2015: 4-10.
13. Hamelberg, White, Welch Crewel, Siddall James and Jacoby Jame. "Complications of endotracheal intubation". *JAMA* (168) 1958: 1959-1962.
14. Rello, Jell, Diaz Edwen, Roque Moark and Vallés Joul. "Risk factors developing pneumonia within 48 hours of intubation". *Am J Respir Crit Care Med* (159) 1999: 1742-1746.
15. Hayat, Umar, Lee Peter, Ullah Hamid and Sarvepalli Shashank, et al. "Association of prophylactic endotracheal intubation in critically ill patients with upper GI bleeding and cardiopulmonary unplanned events". *Gastrointest Endosc* (86) 2017: 500-509.e1.
16. Driver, Brain, Klein Lauren, Schick Alexandra and Prekker Matthew, et al. "The occurrence of aspiration pneumonia after emergency endotracheal intubation". *Am J Emerg Med* (36) 2018: 193-196.

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