

Advanced Age and Anemia Predict Endoscopic Hemostasis Outcomes, Whereas Combination Therapy Shows a Trend Toward Reduced Mortality in Upper Gastrointestinal Bleeding: A Retrospective Cohort Study

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Abstract

BACKGROUND

Upper gastrointestinal bleeding (UGIB) remains a frequent acute gastroenterological emergency with morbidity and mortality. While various endoscopic hemostatic techniques are available, outcomes can vary significantly based on patient characteristics. Identifying predictors of treatment failure and mortality is crucial for optimizing clinical management and risk stratification in UGIB patients.

AIM

This study aimed to evaluate the factors influencing endoscopic hemostasis outcomes and mortality in patients with UGIB, focusing on advanced age, anemia, and hemostatic modalities.

METHODS

We retrospectively analyzed the records of 251 patients with UGIB who underwent therapeutic gastroscopy at the Liwan Campus of the Third Affiliated Hospital, Guangzhou Medical University between January 1, 2020, and December 31, 2024. Clinical data were collected, including etiology, demographic details, hemoglobin levels, hemostasis modality (endoscopic clips, thermal coagulation, combined method, drug spraying, or drug injection), and clinical outcomes (successful hemostasis, rebleeding, surgery/intervention referral, or death). Logistic regression analysis was performed to identify independent predictors of hemostatic success and mortality for the entire cohort and subgroups (non-variceal and variceal).

RESULTS

The cohort of 251 patients included 167 males (66.53%) and 84 females (33.47%). The most common etiology was peptic ulcer disease (167 cases, 66.53%), followed by esophagogastric varices (30 cases, 11.95%). Regarding outcomes, logistic regression revealed that age ≥ 80 years (adjusted OR = 0.35, 95% CI: 0.13–0.96, $p = 0.041$) and hemoglobin < 60 g/L (adjusted OR = 0.18, 95% CI: 0.07–0.45, $p < 0.001$) were independent negative predictors of successful hemostasis in all cases. In the non-variceal subgroup ($n = 221$), age ≥ 80 years (adjusted OR = 0.32, 95% CI: 0.11–0.94, $p = 0.038$) and hemoglobin < 60 g/L (adjusted OR = 0.19, 95% CI: 0.07–0.50, $p < 0.001$) remained significantly associated with hemostatic failure, while the choice of hemostatic method showed no significant impact on success rates ($p = 0.306$). For mortality, advanced age (≥ 80 years) was the only significant predictor in both the overall cohort (OR = 8.33, 95% CI: 2.23–31.11, $p = 0.002$) and non-variceal cases (OR = 0.10, 95% CI: 0.02–0.51, $p = 0.005$). In addition, different hemostatic methods were significantly associated with mortality in non-variceal cases. ($p = 0.031$) Furthermore, based on OR estimates, drug spraying was

associated with the highest estimated mortality risk, whereas combined method was associated with the lowest estimated risk. In variceal bleeding cases (n = 30), no significant associations were found between the analyzed variables and outcomes.

CONCLUSION

Advanced age (≥ 80 years) and severe anemia (Hb < 60 g/L) are independent risk factors for failed endoscopic hemostasis in UGIB, while advanced age is the primary predictor of mortality. In non-variceal bleeding, the specific hemostatic modality used did not significantly affect hemostasis success, but showed an association with mortality, with combined method showing a non-significant trend toward lower mortality. Whereas in variceal bleeding, outcomes were not significantly associated with the demographic or hematological factors studied.

Core tips

This single-center retrospective study investigated the predictors of outcomes in UGIB. Advanced age (≥ 80 years) and severe anemia (Hb < 60 g/L) were identified as independent risk factors for endoscopic hemostasis failure. In non-variceal bleeding, the selection of hemostatic modality significantly affects outcomes, with combined method showing a non-significant trend toward lower mortality. These findings support individualized care, with particular attention to anemia correction and optimized management for elderly patients to improve the success of endoscopic hemostasis.

INTRODUCTION

Upper gastrointestinal bleeding (UGIB), defined as bleeding originating proximal to the ligament of Treitz, encompasses lesions of the esophagus, stomach, duodenum, and pancreatobiliary tree. It represents one of the most common acute gastroenterological emergencies, with a diverse etiologies ranging from peptic ulcer disease and esophagogastric variceal rupture to malignancies and acute hemorrhagic erosive gastritis.^{[1][2]} The clinical spectrum is broad; while some patients present with melena alone, others suffer from hematemesis or hemorrhagic shock, conditions which may be life-threatening^{[3][4]} Despite advances in critical care, the burden of UGIB remains substantial, with epidemiological studies reporting an annual incidence of 50–150 cases per 100,000 population and mortality rates varying between 2% and 10% depending on patient risk stratification and comorbidities.^{[5][6]}

Contemporary management of UGIB is grounded in a multidisciplinary strategy. Alongside endoscopic intervention, pharmacotherapy serves as a cornerstone, utilizing proton pump inhibitors for acid suppression in non-variceal bleeding and vasoactive agents (e.g., terlipressin, octreotide) for variceal hemorrhage.^[7] When primary endoscopic hemostasis fails, interventional radiology plays a pivotal rescue role, particularly via transjugular intrahepatic portosystemic shunt (TIPS) for refractory variceal bleeding or angiographic embolization for arterial sources. Surgery, owing to its invasive nature and

associated morbidity, is typically reserved as a definitive option when other modalities are ineffective or contraindicated.

Within this comprehensive framework, endoscopic hemostasis is established as the first-line intervention for UGIB due to its efficacy and minimally invasive profile.^[8] Nevertheless, clinical outcomes remain heterogeneous.^[9] The rebleeding rate following initial endoscopic treatment persists at approximately 10–15% in general practice, with notably higher rates of treatment failure and mortality observed in specific vulnerable populations, such as the elderly and those with severe anemia.^{[10][11]} These findings suggest that patient-specific physiological factors may be as critical as the hemostatic intervention itself in determining prognosis. To date, the bulk of literature has focused on the comparative efficacy of individual endoscopic techniques, such as clipping, sclerotherapy, electrocoagulation, combination therapies, and topical agents.^[3] However, the extent to which patient-related factors—rather than procedural choices—contribute to prognostic outcomes remains underexplored. Furthermore, the efficacy of various hemostatic modalities in conferring a survival benefits across different etiological subgroups, specifically non-variceal versus variceal hemorrhage, remains a subject of debate.

Therefore, this retrospective cohort study aimed to investigate the determinants associated with endoscopic hemostasis outcomes and mortality in patients with UGIB, specifically evaluating the impact of advanced age, anemia, and the choice of hemostatic modality. Identifying these independent predictors is essential for optimizing clinical decision-making and improving risk stratification.

METHODS

The Ethics Committee of the Third Affiliated Hospital, Guangzhou Medical University gave its approval for this study (Approval No.2025 – 126). General informed consent for participation and the use of de-identified clinical data for scientific research was obtained from all patients upon admission.

Study Population

We retrospectively reviewed the medical records of patients with UGIB who underwent therapeutic gastroscopy at the Liwan Campus of the Third Affiliated Hospital, Guangzhou Medical University between January 1, 2020, and December 31, 2024. The study inclusion criteria were: (1) confirmed diagnosis of UGIB; and (2) receipt of endoscopic hemostatic intervention during the index endoscopy. The exclusion criteria included: (1) patients undergoing repeat endoscopy solely for follow-up; (2) patients undergoing endoscopy for non-hemostatic reasons; and (3) inadequate clinical data. Initially, 273 patients were screened; 22 were excluded, and the remaining 251 patients were included in the final analysis.

Data Collection and Definitions

Clinical data documented included demographic characteristics (gender, age), etiology of bleeding, hemoglobin levels, endoscopic findings, hemostatic modality employed, and clinical outcomes.

For analysis, patients were categorized into three age groups: <60 years, 60–79 years, and ≥ 80 years. Anemia status was stratified by hemoglobin (Hb) levels into three groups for comparison based on the study thresholds: >90 g/L, 60–90 g/L, and < 60 g/L.

The primary outcome was endoscopic hemostasis success, defined as the absence of rebleeding. Rebleeding was defined as recurrent hemorrhage requiring repeated endoscopic intervention, surgery, interventional radiology, or resulting in death. Outcomes were classified as: (a) successful hemostasis; (b) rebleeding requiring repeated endoscopic intervention; (c) rebleeding requiring surgery or interventional radiology; and (d) death. For logistic regression, outcomes were grouped as: 1. Successful hemostasis (a) vs. Unsuccessful hemostasis (b, c, d); and 2. Survival (a, b, c) vs. Death (d).

Endoscopic Equipment and Materials

All procedures were performed using electronic gastroscopes (GIF-HQ290 and GIF-Q260J, Olympus, Tokyo, Japan). The hemostatic modalities utilized included:

•Sureclip

Rotatable clip with repeatable opening and closing (ROCC-D-260195-C, Micro-Tech, Nanjing, China).

•**Drug Injection:** the medication used for injection including (Lauromacrogol injection (10 mL:100 mg; Tianyu Pharmaceutical, Xian, China), Sclerotherapy), 3% Hypertonic saline solution, and epinephrine solution. (1:10,000); Endoscopic injection needles (IN02-25423239-J, Micro-Tech, Nanjing, China) delivering lauromacrogol or epinephrine-saline solution.

•Electrocoagulation

Disposable hemostatic forceps (FD-410LR, Olympus, Tokyo, Japan).

•Topical spraying

Ice-cold saline, 8% norepinephrine-saline, absorbable composite polysaccharide hemostatic powder (Xunning®) (Lianbo Bichao Medical Devices Co., Ltd., Chongqing, China; registration No. 20203140664), and sucralfate suspension (South China Pharmaceutical, Zhaoqing, China).

•Variceal ligation

Multi-band ligator (MBL-6-F, Wilson-Cook Medical, Winston-Salem, NC, USA).

•Tissue adhesive

Medical glue (α -octyl cyanoacrylate and α -butyl cyanoacrylate; Beijing Fuaile, Beijing, China).

Statistical Analysis

All data were analyzed using R software (version 4.3.3, R Foundation for Statistical Computing, Vienna, Austria). The glm function was used to conduct univariate and multivariate logistic regression analysis. The epiDisplay package was used to report odds ratios and their 95% confidence intervals. Variables with a likelihood ratio test P-value < 0.05 in the univariate analysis were entered into the multivariate model. Statistical significance was defined as P < 0.05. Analyses were conducted for the entire cohort and separately for non-variceal and variceal subgroups. Independent variables included in the model were gender, age, hemoglobin, cause of bleeding and hemostatic modalities. Hemoglobin and age were divided into three groups for analysis, and the differences between groups were examined using Wald's test.

RESULTS

Baseline Characteristics of the Study Population

The study cohort comprised 251 patients with UGIB, including 167 males (66.53%) and 84 females (33.47%). The age distribution was as follows: 85 patients (33.9%) were < 60 years, 115 patients (45.8%) were aged 60–79 years, and 51 patients (20.3%) were $\geq$ 80 years.

The most common etiology was peptic ulcer disease, observed in 167 cases (66.53%), followed by esophagogastric varices (30 cases, 11.95%), Mallory-Weiss tears (18 cases, 7.17%), Dieulafoy's lesions (17 cases, 6.77%), mucosal oozing (9 cases, 3.59%), esophagitis (5 cases, 1.99%), esophageal ulcers (3 cases, 1.20%), and tumors (2 cases, 0.80%) (Supplementary Table S1).

Endoscopic hemostasis protocol

Endoscopic hemostasis protocol

Gastroesophageal variceal hemorrhage secondary to cirrhotic portal hypertension, which hemostasis protocols is relatively fixed. Among the two options, esophageal variceal rupture is primarily treated with endoscopic variceal ligation (EVL) (Fig. 1A-B) Yet gastric fundal varices are primarily managed by endoscopic cyanoacrylate tissue adhesive injection (Fig. 1C-D) For non-variceal cases, they are classified according to the Forrest classification into Ia, Ib, IIa, IIb, IIc, and III.^[12] According to the guidelines, endoscopic intervention is recommended for the cases classified as Forrest IIb or higher.^[12] Guided by the reason of bleeding and the endoscopist's expertise, doctors could use Mechanical hemostasis (Endoscopic clipping, Fig. 1E-F), Drug spraying (Ice-cold saline, 8% norepinephrine-saline, hemostatic powders, and sucralfate suspension), Drug injection (1:10000 Epinephrine-saline, 3% hypertonic saline and sclerosing agents (Lauromacrogol with methylene blue as a chromogenic

reagent), Fig. 1G-H), Thermal coagulation (electrocoagulation, Fig. 1I-J) and combined method (e.g., thermal coagulation + injection, or endoscopic clipping + thermal coagulation, Fig. 1K-M).

Regarding hemostatic modalities, combination therapy was the most frequently used (78 cases, 31.08%), followed by endoscopic clips (75 cases, 29.88%), drug injection (36 cases, 14.34%), drug spraying (23 cases, 9.16%), electrocoagulation (20 cases, 7.97%), endoscopic band ligation (11 cases, 4.38%) and endoscopic tissue adhesive injection (8 cases, 3.19%).

Factors Associated with Successful Hemostasis

Overall Cohort

In the logistic regression analysis for the entire cohort, age and hemoglobin level were identified as independent predictors of hemostatic success (Table 1, Supplementary Table S2). Patients aged ≥ 80 years had a significantly lower likelihood of successful hemostasis compared with those aged < 60 years (adjusted OR = 0.18, 95% CI: 0.07–0.45, $p < 0.001$). Patients with hemoglobin < 60 g/L also showed significantly decreased hemostasis success (adjusted OR = 0.35, 95% CI: 0.13–0.96, $p = 0.041$). Sex and cause of bleeding (variceal/non-variceal) were not associated with hemostatic outcomes (all $p > 0.05$).

Table 1
Multivariate logistic regression of successful endoscopic hemostasis in all cases

Variable	Group	Univariate logistic regression		Multivariate logistic regression	
		P-value (Unadjusted)	OR(95% CI)	P- Value (Adjusted)	OR(95% CI)
Age	$< 60 = 1$	-	1.00(reference)	-	1.00(reference)
	$60 \sim 79=2$	0.501	1.39 (0.53, 3.68)	0.377	1.56 (0.58, 4.18)
	$\geq 80 = 3$	< 0.001	0.17 (0.07, 0.41)	< 0.001	0.18 (0.07, 0.45)
Hemoglobin	$> 90 = 1$	-	1.00(reference)	-	1.00(reference)
	$60 \sim 90=2$	0.536	0.74 (0.28, 1.93)	0.915	0.95 (0.34, 2.62)
	$< 60 = 3$	0.014	0.31 (0.12, 0.79)	0.041	0.35 (0.13, 0.96)
*Abbreviations: OR=Odds Ratio; CI=Confidence Interval.					

Non-variceal Cases

Among 221 patients with non-variceal bleeding, results were consistent with the overall cohort (Table 2, Supplementary Table S3). Advanced age (≥ 80 years) remained an independent negative predictor of successful hemostasis (adjusted OR = 0.32, 95% CI: 0.11–0.94, $p = 0.038$). Hemoglobin < 60 g/L was

also independently associated with failed hemostasis (adjusted OR = 0.19, 95% CI: 0.07–0.50, $p < 0.001$). Gender was not significantly associated with hemostasis outcome ($p = 0.147$).

Table 2
Multivariate logistic regression of successful endoscopic hemostasis in non-variceal cases

Variable	Group	Univariate logistic regression		Multivariate logistic regression	
		P-value	OR	P-value	OR
		(Unadjusted)	(95% CI)	(Adjusted)	(95% CI)
Age	< 60 = 1	-	1.00(reference)	-	1.00(reference)
	60 ~ 79=2	0.293	1.77 (0.61,5.13)	0.216	1.99 (0.67,5.9)
	>=80 = 3	< 0.001	0.18 (0.07,0.46)	< 0.001	0.19 (0.07,0.5)
Hemoglobin	> 90 = 1	-	1.00(reference)	-	1.00(reference)
	60 ~ 90=2	0.586	0.75 (0.27,2.11)	0.977	0.98 (0.32,3)
	< 60 = 3	0.016	0.29 (0.11,0.8)	0.038	0.32 (0.11,0.94)
*Abbreviations: OR=Odds Ratio; CI=Confidence Interval.					

Notably, endoscopic hemostasis protocol did not showed a significant difference in univariate analysis ($p = 0.306$ overall), but showed an association with success, with drug spraying associated with a lower success rate (OR = 0.29, 95% CI: 0.08–0.97, $p = 0.045$) when compared with endoscopic clips.

Variceal Cases

In the subgroup of 30 patients with variceal bleeding, no significant associations were observed between gender, age, hemoglobin levels, and hemostatic success (all $p > 0.05$) (Supplementary Table S4).

Factors Associated with Mortality

Overall Cohort

Mortality analysis of the entire cohort demonstrated that advanced age was the only significant predictor of mortality (Supplementary Table S5). Patients aged ≥ 80 years had a markedly higher risk of mortality (OR = 8.33, 95% CI: 2.23–31.11, $p = 0.002$). Gender, hemoglobin level, and bleeding etiology showed no significant association with mortality (all $p > 0.05$).

Non-Variceal Cases

In non-variceal cases, age ≥ 80 years remained strongly associated with higher mortality (OR = 0.10, 95% CI: 0.02–0.47, $p = 0.004$) (Supplementary Table S6). Hemoglobin < 60 g/L showed a borderline trend ($p = 0.070$).

Endoscopic hemostasis protocol was significantly associated with mortality ($p = 0.014$). In multivariate analysis (Table 3), compared with endoscopic clips, combined method showed a strong tendency toward lower mortality ($OR = 4.96$, 95% CI: 0.52–47.56, $p = 0.165$), while drug spraying and drug injection were associated with higher estimated risks ($OR = 0.27$, $p = 0.117$; $OR = 0.29$, $p = 0.090$, respectively).

Table 3
Multivariate logistic regression of mortality in non-variceal cases

Variable	Group	Univariate logistic regression		Multivariate logistic regression	
		P-value	OR	P- Value	OR
		(Unadjusted)	(95% CI)	(Adjusted)	(95% CI)
Age	< 60 = 1	-	1.00(reference)	-	1.00(reference)
	60 ~ 90=2	0.983	0.98 (0.16,6.02)	0.864	1.18 (0.19,7.46)
	>=80 = 3	0.004	0.1 (0.02,0.47)	0.005	0.1 (0.02,0.51)
Endoscopic hemotasis protocol	Endoscopic clips = 1	-	1.00(reference)	-	1.00(reference)
	Thermal coagulation = 2	0.923	1.12 (0.12,10.6)	0.956	0.94 (0.09,9.97)
	Combined method = 3	0.206	4.18 (0.46,38.32)	0.165	4.96 (0.52,47.56)
	Drug spraying = 4	0.078	0.26 (0.06,1.16)	0.117	0.27 (0.05,1.38)
	Drug injection = 5	0.065	0.28 (0.07,1.08)	0.09	0.29 (0.07,1.22)
*Abbreviations: OR=Odds Ratio; CI=Confidence Interval.					
*Outcome=Survival					

Variceal Cases

In the variceal bleeding subgroup ($n = 30$), none of the variables (gender, age, hemoglobin) were significantly associated with mortality (all $p > 0.05$) (Supplementary Table S7).

DISCUSSION

UGIB remains a common and potentially life-threatening gastroenterological emergency. In this retrospective cohort study, we analyzed the outcomes of 251 patients to identify independent predictors of endoscopic hemostasis failure and mortality.

Regarding the etiology of UGIB, peptic ulcer disease was the most common cause (167 cases, 66.53%), followed by esophagogastric varices (30 cases, 11.95%). This is consistent with the results of previous studies.^[13]

Consistent with established epidemiological trends, our cohort demonstrated a distinct male predominance, with a male-to-female ratio of approximately 2:1, in line with previous reports.^[14] This disparity is likely attributable to lifestyle factors more prevalent in men, such as smoking and alcohol consumption, which are known risk factors for UGIB etiologies like peptic ulcer disease.^[15] However, univariate logistic regression confirmed that biological sex was not an independent predictor of either hemostatic success or mortality, suggesting that while men are more susceptible to UGIB, gender does not inherently dictate the prognosis once the bleeding event occurs.

One of the significant findings of this study is the identification of severe anemia, defined as Hb < 60 g/L, was an independent negative predictor of successful hemostasis in both the overall cohort and the non-variceal subgroup. In the overall cohort, patients with Hb < 60 g/L had a significantly lower rate of hemostatic success (adjusted OR = 0.18, 95% CI: 0.07–0.45, $p < 0.001$). In contrast, moderate anemia, defined as Hb 60–90 g/L, showed no independent effect in multivariate models. Furthermore, anemia was not directly associated with increased mortality in our analysis. This suggests that anemia primarily impacts the technical success of hemostasis—possibly by impairing coagulation cascade efficiency or mucosal healing—rather than being the direct cause of death.^[16] Nevertheless, optimizing hemoglobin levels prior to intervention remains a clinically sound strategy to improve the likelihood of initial hemostatic success.^{[17][18][19][20]}

Advanced age (≥ 80 years) emerged as the strongest and most consistent predictor of adverse outcomes in our study. Patients aged 80 years or older had a significantly lower likelihood of successful hemostasis and a significantly higher risk of mortality compared with younger patients. This trend persisted robustly in the non-variceal subgroup. These findings corroborate other studies highlighting the “U-shaped” or linear increase in risk associated with geriatric populations, where physiological reserves are diminished, and comorbidities are more prevalent.^[21] The elderly are particularly vulnerable to the hemodynamic stress of acute bleeding. Our results underscore the urgent need for specialized management protocols for octogenarians with UGIB, involving early risk stratification, meticulous hemodynamic support, and potentially lower thresholds for intensive care admission to mitigate the elevated risk of rebleeding and death.^{[22][23][24][25]}

Regarding therapeutic interventions, our analysis revealed that the specific choice of endoscopic hemostatic modality did not significantly affect hemostatic success but was significantly associated with mortality in non-variceal bleeding cases. This suggests that while multiple methods may achieve comparable short-term bleeding control, differences may emerge in longer-term clinical outcomes. However, in multivariate analysis, no individual method reached statistical significance, although combination therapy showed a trend toward lower mortality risk, while drug spraying and drug injection were associated with higher estimated risks. The results are consistent with the guidelines^{[8][9][26]}. It is

recommended to prefer using endoscopic clips for hemostasis or thermal coagulation for hemostasis. Moreover, drug injection or drug spraying should be used in combination with endoscopic clips for hemostasis or thermal coagulation, rather than being used alone. One possible explanation is that combined method may provide more durable hemostasis and reduce rebleeding-related mortality in high-risk patients. However, this finding should be interpreted cautiously, as treatment selection may have been influenced by age, bleeding characteristics, economic condition or physician preference, introducing potential confounding by indication.^{[27][28]} From a practical perspective, these results suggest that while several methods may be appropriate for initial bleeding control, combined method may represent a promising strategy in non-variceal cases, while actual choice should still be individualized based on bleeding characteristics, patient condition, operator expertise, and resource availability.

Finally, the variceal bleeding subgroup (n = 30) presented a challenge due to the limited sample size, which restricted the statistical power to detect significant associations. While female patients in this subgroup showed a trend toward higher hemostatic success, this did not reach statistical significance. The heterogeneity of variceal bleeding management and the small number of cases likely contributed to the lack of definitive predictors in this subset.^[29] Consequently, large-scale prospective studies are warranted to validate these findings specifically in the variceal population.^{[30][31]}

CONCLUSION

In conclusion, this retrospective cohort study identified advanced age (≥ 80 years) and severe anemia (Hb < 60 g/L) as independent risk factors for failed endoscopic hemostasis in patients with UGIB, while advanced age is the only significant predictor of mortality. In non-variceal bleeding, the specific endoscopic hemostatic modality chosen was significantly associated with patient survival, with combination therapy showing a non-significant trend toward lower mortality. These findings suggest that optimizing patient-specific physiological factors, while carefully selecting appropriate hemostatic strategies, may both be critical to improving clinical outcomes in UGIB patients.

Declarations

Author contributions: Ru-jing Zhang, Shan-wen Tan and Li Zhang participated in the conception and design of the study; Ru-jing Zhang and Yangda Song were responsible for the acquisition, analysis, or interpretation of data; Ru-jing Zhang, Shan-wen Tan, Xuan Zhou, Shan-ping Wang and Li Zhang wrote the manuscript; Ru-jing Zhang, Shan-wen Tan, Yangda Song, Shan-ping Wang, Li Zhang accessed and verified the study data. All authors critically reviewed the manuscript, provided final approval for publication and agreed to be accountable for all aspects of the work.

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AVAILABILITY OF DATA AND MATERIALS

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Ethics Committee of the Third Affiliated Hospital, Guangzhou Medical University gave its approval for this study (Approval No.2025-126). General informed consent for participation and the use of de-identified clinical data for scientific research was obtained from all patients upon admission.

CONSENT FOR PUBLICATION

The authors received general consent forms from all patients who took part in the study, and have them on file in case they are requested by the editor.

COMPETING INTERESTS

The authors declare no conflicts of interest.

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Figures

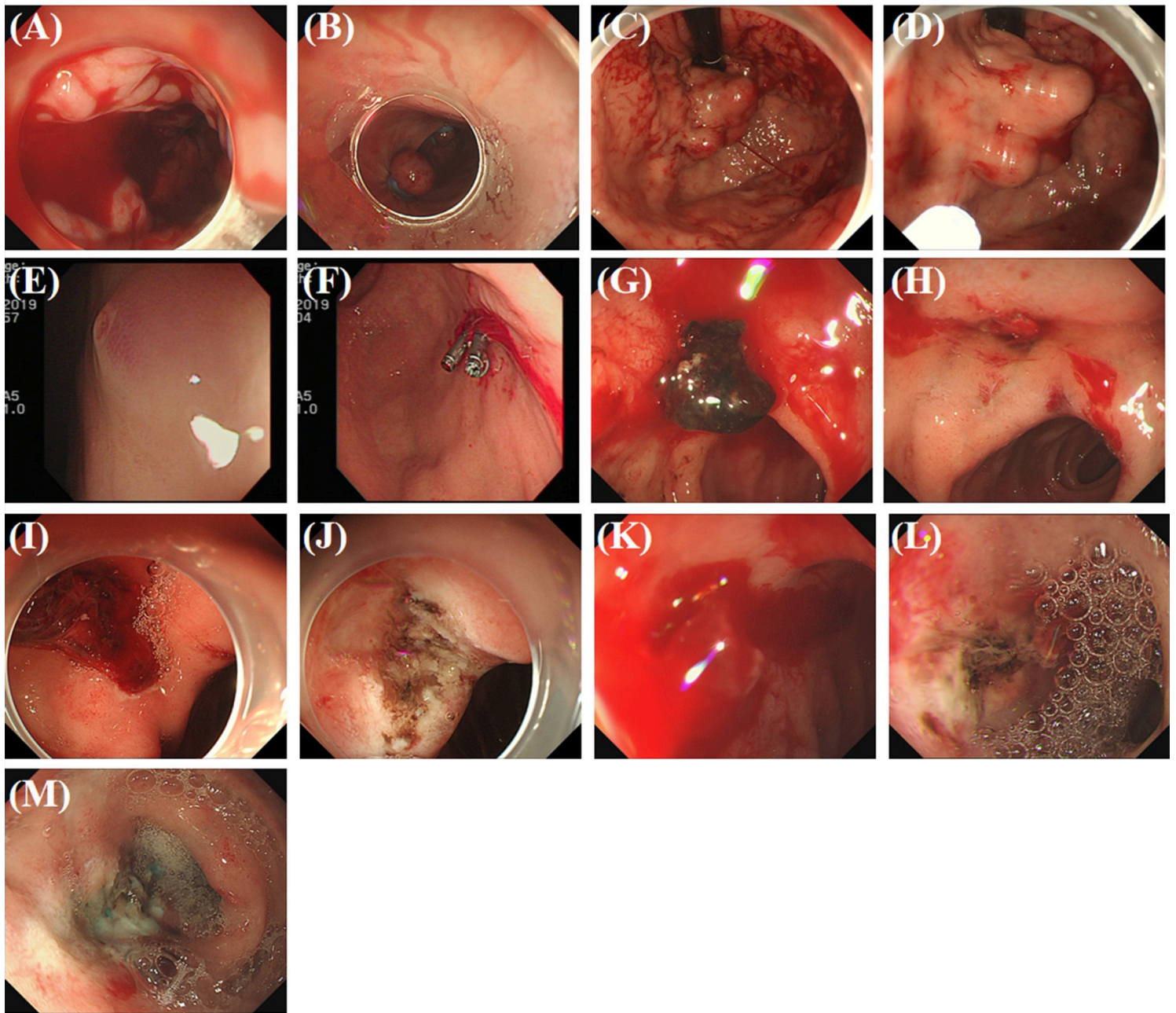


Figure 1

Endoscopic hemostatic techniques for upper gastrointestinal bleeding.

(A) Esophageal varices with active spurting hemorrhage.

(B) Successful hemostasis was achieved after endoscopic variceal ligation (EVL).

(C) Gastric fundal varices with active jet bleeding.

(D) Successful hemostasis was achieved after endoscopic tissue adhesive injection.

(E) Dieulafoy's lesion on the posterior wall of the gastric antrum.

- (F) Successful hemostasis was achieved after endoscopic clipping.
- (G) Duodenal bulb ulcer with an adherent blood clot.
- (H) Successful hemostasis was achieved after 3% hypertonic saline irrigation and sclerosing agents injection(lauromacrogol).
- (I) Anterior duodenal bulb ulcer with active oozing.
- (J) Successful hemostasis was achieved after thermal coagulation(thermocoagulation)
- (K) Anterior duodenal bulb ulcer with pulsatile arterial bleeding.
- (L) Near-successful hemostasis was achieved after thermal coagulation (electrocoagulation).
- (M) Adjunctive injection of lauromacrogol into the ulcer base for definitive hemostasis.

Supplementary Files

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