International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Risk Factors and Management Outcomes of Post-Endoscopic Variceal Ligation Ulcer Bleeding: A Cross-Sectional Study from A Tertiary Care Center in Lucknow, India

Dr Mayank Rajput[1], Dr Pritam Das[2], Dr Jatin Prajapati[3]

[1]Assistant Professor, Department of Gastroenterology, Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Dehradun, Uttarakhand, India.

[2]Assistant Professor, Department of Medical Gastroenterology, Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.

[3]Senior Resident, Department of Community Medicine, World College of Medical Sciences and Research, Jhajjar, Haryana, India

OPEN ACCESS

Corresponding Author:

Dr Mayank Rajput
Assistant Professor, Department of Gastroenterology, Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Dehradun, Uttarakhand, India

Received: 01-03-2026
Accepted: 20-03-2026
Available online: 29-03-2026

ABSTRACT

Background: Endoscopic variceal ligation (EVL) is the standard endoscopic therapy for the prevention and treatment of esophageal variceal bleeding in patients with portal hypertension. Although EVL is considered safe and effective, post-EVL ulcer bleeding remains a clinically significant complication that may lead to morbidity and mortality. Identifying the risk factors and evaluating the management outcomes of post-EVL ulcer bleeding are essential for improving patient care.

Methods: A hospital-based cross-sectional observational study was conducted at a tertiary care hospital in Lucknow, Uttar Pradesh, India, between July 2024 and December 2025. A total of 73 patients who developed bleeding from post-EVL ulcers following endoscopic variceal ligation were included. Data regarding demographic characteristics, etiology of liver disease, clinical profile, laboratory parameters, and endoscopic findings were collected from hospital records. Management strategies and clinical outcomes were also assessed. Statistical analysis was performed using SPSS software, and associations between risk factors and bleeding outcomes were analyzed using Chi-square and logistic regression tests, with $p<0.05$ considered statistically significant.

Results: The mean age of the patients was 52.6 ±11.8 years, with males accounting for 69.9% of the study population. Alcohol-related cirrhosis (46.6%) was the most common etiology. Nearly half of the patients (45.2%) belonged to Child–Pugh class C. Large esophageal varices were present in 60.3% of patients, and 63% required four or more bands during EVL. Significant predictors of post-EVL ulcer bleeding included Child–Pugh class C ($p=0.018$), platelet count $<100\times10^9$/L ($p=0.011$), and application of ≥4 bands during EVL ($p=0.026$). Endoscopic therapy was the primary management modality. Rebleeding occurred in 15.1% of patients, and the overall in-hospital mortality rate was 8.2%.

Conclusion: Post-EVL ulcer bleeding is an important complication in patients undergoing endoscopic variceal ligation. Advanced liver disease, thrombocytopenia, and a higher number of bands applied during EVL were significant predictors of bleeding. Early recognition and timely endoscopic management are crucial for improving clinical outcomes and reducing morbidity and mortality.

Keywords*: Portal hypertension; Endoscopic variceal ligation; Post-EVL ulcer bleeding; Cirrhosis; Risk factors; Variceal hemorrhage.*

INTRODUCTION

Portal hypertension is one of the most important complications of chronic liver disease and cirrhosis and results from increased resistance to portal blood flow combined with increased portal venous inflow. The development of portosystemic collateral circulation leads to the formation of esophageal and gastric varices, which are prone to rupture and cause life-threatening upper gastrointestinal bleeding. Variceal hemorrhage remains a major cause of morbidity and mortality in patients with cirrhosis, with an estimated annual bleeding risk of 5–15% among individuals with esophageal varices. Despite improvements in pharmacological and endoscopic management, acute variceal bleeding continues to be associated with significant mortality, highlighting the need for effective preventive and therapeutic interventions [1].

Endoscopic variceal ligation (EVL) has become the preferred endoscopic therapy for the prevention and control of esophageal variceal bleeding. The procedure involves the placement of elastic rubber bands around the variceal columns during endoscopy, leading to mechanical strangulation of the varices followed by thrombosis and fibrosis. EVL has largely replaced endoscopic sclerotherapy because it is more effective in controlling bleeding and is associated with fewer complications and lower recurrence rates. Consequently, EVL is widely recommended for both primary prophylaxis in patients with high-risk varices and secondary prophylaxis after an episode of variceal hemorrhage [2].

Although EVL is generally considered safe and effective, several complications may occur following the procedure. Minor complications include transient chest discomfort, dysphagia, and superficial esophageal ulceration. More serious complications include esophageal strictures, recurrent variceal bleeding, and bleeding from post-ligation ulcers. Among these, post-EVL ulcer bleeding is a clinically significant complication that may lead to severe hemorrhage, hemodynamic instability, and increased mortality if not promptly recognized and managed [3].

The formation of post-EVL ulcers is a natural consequence of the band ligation process. After placement of the rubber band, the ligated variceal tissue undergoes ischemic necrosis due to interruption of blood flow. Over time, thrombosis develops within the varix, and the band typically sloughs off within 3–7 days, leaving behind a superficial ulcer at the ligation site. In most cases, these ulcers heal spontaneously within a few weeks. However, premature slippage of the band or incomplete thrombosis of the varix may expose underlying blood vessels within the ulcer base, resulting in significant bleeding [4].

Post-EVL ulcer bleeding is considered an uncommon but potentially life-threatening complication. The reported incidence varies widely in the literature, ranging from approximately 3.6% to 15% among patients undergoing EVL. Despite its relatively low frequency, the clinical significance of this complication is considerable because the associated mortality rate can be high, particularly in patients with advanced liver disease and poor hepatic reserve [5].

Several clinical and laboratory factors have been identified as potential predictors of post-EVL ulcer bleeding. Advanced liver disease is considered one of the most important risk factors. Patients with poor hepatic function, especially those classified as Child–Pugh class C or those with high Model for End-Stage Liver Disease (MELD) scores, are more likely to develop complications after EVL. Other reported risk factors include hepatocellular carcinoma, severe portal hypertension, anemia, thrombocytopenia, and prolonged prothrombin time, all of which may predispose patients to increased bleeding risk [6].

Endoscopic characteristics may also influence the risk of ulcer bleeding following EVL. Factors such as the size and grade of esophageal varices, the number of bands applied during the procedure, and the presence of high-risk stigmata such as red wale marks have been suggested to play a role. In addition, early detachment of the ligation band before complete thrombosis of the varix may increase the likelihood of bleeding from the ulcer base [7].

Clinically, post-EVL ulcer bleeding typically occurs several days after the procedure. Most studies have reported that bleeding episodes occur between 7 and 14 days following band ligation, corresponding to the period when the ligation band detaches and the ulcer base is exposed. Patients usually present with hematemesis or melena and may develop varying degrees of hemodynamic instability depending on the severity of bleeding. Early recognition and prompt endoscopic evaluation are therefore essential for effective management [8].

The management of post-EVL ulcer bleeding remains challenging because there are no universally accepted treatment guidelines. Various endoscopic techniques have been employed to control bleeding, including repeat band ligation, endoscopic sclerotherapy, injection therapy, and application of hemostatic clips. Pharmacological therapy with vasoactive agents such as terlipressin or octreotide, along with proton pump inhibitors and antibiotics, is commonly used as supportive treatment. In cases where bleeding cannot be controlled by endoscopic measures, rescue therapies such as balloon tamponade or transjugular intrahepatic portosystemic shunt (TIPS) may be required [5,9].

Despite the widespread use of EVL in the management of portal hypertension, the literature on post-EVL ulcer bleeding remains relatively limited, particularly from developing countries. Differences in patient characteristics, severity of liver

disease, and institutional management protocols may influence the incidence and outcomes of this complication. Therefore, further studies are necessary to better understand the risk factors and clinical outcomes associated with post-EVL ulcer bleeding in different healthcare settings [10].

In this context, the present study was conducted to evaluate the risk factors and management outcomes of post-EVL ulcer bleeding among patients treated at a tertiary care hospital in Lucknow, Uttar Pradesh, India. Identifying the clinical and endoscopic predictors of this complication may help improve risk stratification, guide clinical management, and ultimately reduce morbidity and mortality associated with post-EVL ulcer bleeding.

METHODOLOGY

Study Design: This study was a hospital-based cross-sectional observational study conducted to evaluate the risk factors and management outcomes of post-endoscopic variceal ligation (EVL) ulcer bleeding.

Study Setting: The study was carried out at a tertiary care teaching hospital in Lucknow, Uttar Pradesh, India, where endoscopic services are routinely provided for the management of portal hypertension and its complications.

Study Duration: The study was conducted over a 18 months period from July 2024 to December 2025.

Study Population: The study population consisted of patients with portal hypertension who underwent endoscopic variceal ligation (EVL) and subsequently developed bleeding from post-EVL ulcers during the study period.

Sample Size: A total of 73 patients fulfilling the eligibility criteria and presenting with post-EVL ulcer bleeding during the study period were included in the study.

Inclusión Criteria

Patients were included in the study if they met the following criteria:

- Age ≥18 years
- Diagnosed case of portal hypertension with esophageal varices
- Underwent endoscopic variceal ligation
- Presence of upper gastrointestinal bleeding secondary to post-EVL ulcer confirmed on endoscopy

Exclusion Criteria

Patients were excluded if they had:

- Upper gastrointestinal bleeding due to causes other than post-EVL ulcer
- Gastric varices or other non-esophageal sources of bleeding
- Incomplete clinical or endoscopic records

Data Collection : Data were collected retrospectively from hospital medical records, endoscopy reports, and laboratory databases using a structured data collection proforma. The following variables were recorded:

Demographic variables: Age and gender.

Clinical variables: Etiology of liver disease, Child–Pugh classification, presence of ascites, and hepatic encephalopathy.

Laboratory parameters: Hemoglobin level, platelet count, international normalized ratio (INR), serum bilirubin, and serum albumin.

Endoscopic findings: Grade of esophageal varices, number of bands applied during EVL, presence of red wale signs, and associated portal hypertensive gastropathy.

Outcome variables: Time interval between EVL and bleeding, treatment modality used for bleeding control, requirement for intensive care unit (ICU) admission, occurrence of rebleeding, and in-hospital mortality.

Management Protocol: Patients presenting with post-EVL ulcer bleeding were managed according to the institutional protocol. Initial management included hemodynamic stabilization, intravenous fluids, and blood transfusion when indicated. Pharmacological therapy included administration of vasoactive agents such as terlipressin or octreotide, proton pump inhibitors, and prophylactic antibiotics. Endoscopic therapy was performed to control bleeding and included repeat endoscopic variceal ligation, endoscopic sclerotherapy, or application of hemostatic clips depending on the clinical situation. In cases where bleeding could not be controlled by endoscopic therapy, rescue interventions such as balloon tamponade or transjugular intrahepatic portosystemic shunt (TIPS) were considered.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using the Statistical Package for Social Sciences (SPSS) version 25. Continuous variables were expressed as mean ±standard deviation (SD), while categorical variables were presented as frequency and percentage. Association between potential risk factors and post-EVL ulcer bleeding was assessed using the Chi-square test or Fisher's exact test for categorical variables and Student's t-test for continuous variables where appropriate. Multivariate logistic regression analysis was performed to identify independent predictors of post-EVL ulcer bleeding. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Patient confidentiality was strictly maintained, and all data were analyzed anonymously without revealing patient identity.

RESULTS

A total of 73 patients with post-endoscopic variceal ligation (EVL) ulcer bleeding were included in the study conducted between July 2025 and December 2025 at a tertiary care hospital in Lucknow, Uttar Pradesh. The results describe the demographic profile, clinical characteristics, endoscopic findings, risk factors associated with bleeding, and management outcomes. The study population consisted predominantly of male patients (69.9%), with a mean age of 52.6 ±11.8 years. Most patients were in the 41–60 year age group (45.2%).(Table 1)

Table 1. Demographic Characteristics of Study Participants (n = 73)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	≤40	15	20.5
	41–60	33	45.2
	>60	25	34.3
Gender	Male	51	69.9
	Female	22	30.1
Mean Age (years)	52.6 ± 11.8		

Alcohol-related cirrhosis was the most common etiology (46.6%). Most patients had advanced liver disease, with Child–Pugh class C accounting for 45.2% of cases.(Table 2)

Table 2. Clinical and Laboratory Characteristics of Patients

Variable	Category	Frequency (n)	Percentage (%)
Etiology of liver disease	Alcohol-related cirrhosis	34	46.6
	Viral hepatitis	21	28.8
	NAFLD-related cirrhosis	10	13.7
	Others	8	10.9
Child–Pugh class	A	12	16.4
	B	28	38.4
	C	33	45.2
Ascites	Present	41	56.2
	Absent	32	43.8
Mean Hemoglobin (g/dL)	9.4 ± 1.6		
Mean Platelet count (×10⁹/L)	92 ± 34		
Mean INR	1.68 ± 0.42		

Large esophageal varices were the most common finding. Most procedures required **3–4 bands per session**.(Table 3)

Table 3. Endoscopic Findings Among Patients with Post-EVL Ulcer Bleeding

Variable	Category	Frequency (n)	Percentage (%)
Grade of esophageal varices	Grade II	29	39.7
	Grade III	44	60.3
Number of bands applied	≤3 bands	27	37.0
	≥4 bands	46	63.0
Red wale marks	Present	38	52.1
	Absent	35	47.9

Portal hypertensive gastropathy	Present	31	42.5
	Absent	42	57.5

Bleeding from post-EVL ulcers occurred at a mean interval of 9.2 ±3.6 days after the procedure.

Advanced liver disease, thrombocytopenia, and a higher number of bands applied during EVL were significantly associated with post-EVL ulcer bleeding.(Table 4)

Table 4. Factors Associated with Post-EVL Ulcer Bleeding

Variable	Category	Bleeding (n=73)	p-value
Child–Pugh class	A/B	40	**0.018**
	C	33	
Platelet count	≥100 ×10⁹/L	21	**0.011**
	<100 ×10⁹/L	52	
Number of bands applied	≤3 bands	27	**0.026**
	≥4 bands	46	
Presence of red wale signs	Present	38	0.083
	Absent	35	

Child–Pugh class C, thrombocytopenia (<100 ×10⁹/L), and use of ≥4 bands during EVL were statistically significant risk factors for post-EVL ulcer bleeding.

Endoscopic therapy was the primary modality used to control bleeding in most patients.(Table 5)

Table 5. Management Strategies and Clinical Outcomes

Variable	Category	Frequency (n)	Percentage (%)
Endoscopic therapy used	Repeat EVL	29	39.7
	Endoscopic sclerotherapy	22	30.1
	Hemostatic clipping	12	16.4
	Balloon tamponade	6	8.2
	TIPS	4	5.5
ICU admission	Yes	18	24.7
	No	55	75.3
Rebleeding	Yes	11	15.1
	No	62	84.9
In-hospital mortality	Yes	6	8.2
	No	67	91.8

Endoscopic therapy successfully controlled bleeding in the majority of cases. Rebleeding occurred in 15.1% of patients, while the overall in-hospital mortality rate was 8.2%.

The findings of the present study suggest that advanced liver disease, thrombocytopenia, and a higher number of bands applied during EVL are significant predictors of post-EVL ulcer bleeding, while timely endoscopic intervention remains effective in controlling hemorrhage in most patients.

DISCUSSION

Endoscopic variceal ligation (EVL) is widely regarded as the standard endoscopic therapy for the prevention and control of esophageal variceal bleeding in patients with portal hypertension. Compared with endoscopic sclerotherapy, EVL has demonstrated superior efficacy with fewer complications and lower recurrence rates, making it the preferred treatment modality in most clinical settings [2]. However, despite its safety profile, EVL can be associated with complications, among which post-EVL ulcer bleeding remains a clinically significant and potentially life-threatening event [3].

In the present study, 73 patients with post-EVL ulcer bleeding were evaluated over a six-month period at a tertiary care hospital in Lucknow. The mean age of the study population was 52.6 ±11.8 years, and the majority of patients were males (69.9%). These findings are consistent with previous studies reporting a predominance of middle-aged male patients among

individuals with cirrhosis and portal hypertension [6,11]. The higher prevalence among males may reflect the greater burden of alcohol-related liver disease in this population.

Regarding the etiology of liver disease, alcohol-related cirrhosis (46.6%) was the most common underlying cause in our study, followed by viral hepatitis (28.8%). Similar findings have been reported in several studies from Asia where alcohol and viral hepatitis represent the leading causes of cirrhosis and portal hypertension [11,12]. The high proportion of alcohol-related cirrhosis may explain the relatively severe liver dysfunction observed in the study population.

Assessment of hepatic function revealed that 45.2% of patients belonged to Child–Pugh class C, while 38.4% were classified as Child–Pugh class B. This indicates that a substantial proportion of patients had advanced liver disease. Several previous studies have demonstrated that poor hepatic reserve is an important predictor of complications following EVL. Patients with Child–Pugh class C cirrhosis have been shown to have significantly higher rates of post-EVL ulcer bleeding compared with those with better hepatic function [5,6]. In the present study, Child–Pugh class C was significantly associated with ulcer bleeding ($p = 0.018$), further supporting the role of advanced liver disease as a major risk factor.

Laboratory parameters in our study revealed a mean hemoglobin level of 9.4 ±1.6 g/dL and a mean platelet count of 92 ± 34 $\times 10^9$/L, reflecting the presence of anemia and thrombocytopenia in a considerable proportion of patients. Thrombocytopenia is a common finding in portal hypertension due to hypersplenism and reduced thrombopoietin production. Several investigators have suggested that thrombocytopenia may increase the risk of bleeding from post-EVL ulcers due to impaired hemostasis [6,13]. In the present study, platelet counts below 100 $\times 10^9$/L were significantly associated with post-EVL ulcer bleeding ($p = 0.011$), which is consistent with previous observations.

Endoscopic findings in our study showed that 60.3% of patients had grade III esophageal varices, indicating that most patients had large varices requiring aggressive endoscopic treatment. Large varices are known to have a higher risk of rupture and are more frequently associated with severe portal hypertension [1]. In addition, 63% of patients required four or more bands during EVL, and the number of bands applied was significantly associated with bleeding risk ($p = 0.026$). Similar findings have been reported in earlier studies suggesting that the application of multiple bands may increase mucosal injury and predispose patients to ulcer formation and subsequent bleeding [7,12].

The presence of red wale signs was observed in 52.1% of patients in our study. Although these endoscopic stigmata are well recognized markers of increased variceal bleeding risk, their association with post-EVL ulcer bleeding was not statistically significant in our analysis ($p = 0.083$). Previous studies have produced mixed results regarding the predictive value of red wale signs for post-banding ulcer bleeding [7,13]. This suggests that while these signs may indicate severe portal hypertension, they may not independently predict ulcer-related bleeding after EVL.
The timing of bleeding following EVL is an important clinical consideration. In the present study, the mean interval between EVL and bleeding was 9.2 ±3.6 days, which is consistent with previous reports indicating that most episodes of post-EVL ulcer bleeding occur between 7 and 14 days after the procedure [8]. This period corresponds to the time when the ligation band sloughs off and the ulcer base becomes exposed before complete healing occurs. Consequently, close monitoring of patients during this period is essential to facilitate early detection and management of bleeding.

With respect to management, endoscopic therapy was the primary treatment modality in the majority of patients in the present study. Repeat EVL was performed in 39.7% of cases, followed by endoscopic sclerotherapy (30.1%) and hemostatic clipping (16.4%). Endoscopic interventions remain the cornerstone of treatment for post-EVL ulcer bleeding because they allow direct visualization and targeted control of bleeding sources [5]. Previous studies have also demonstrated the effectiveness of endoscopic therapy in achieving hemostasis in most patients with post-banding ulcer bleeding [11].

Despite effective endoscopic management, rebleeding occurred in 15.1% of patients in the present study. This rate is comparable to those reported in earlier studies, where rebleeding rates ranged from approximately 10% to 20% [5,13]. Rebleeding may occur due to incomplete hemostasis, severe portal hypertension, or progressive liver dysfunction.

The overall in-hospital mortality rate in the present study was 8.2%, which is lower than the mortality rates reported in some earlier studies where mortality associated with post-EVL ulcer bleeding ranged from 20% to 60% [5]. The relatively lower mortality observed in our study may be attributed to early diagnosis, prompt endoscopic intervention, and improved supportive care including vasoactive therapy and intensive monitoring. Recent studies have also suggested that advances in endoscopic techniques and critical care management have contributed to improved survival outcomes in patients with variceal bleeding [12].

The findings of the present study therefore highlight several important clinical predictors of post-EVL ulcer bleeding, including advanced liver disease, thrombocytopenia, and the use of multiple ligation bands during the procedure.

Identification of these risk factors may help clinicians stratify patients according to bleeding risk and implement preventive measures such as closer follow-up and optimization of coagulation status.

However, the study has certain limitations that should be considered while interpreting the findings. First, the study was conducted at a single tertiary care center, which may limit the generalizability of the results. Second, the relatively small sample size and cross-sectional design restrict the ability to establish causal relationships between risk factors and bleeding events. Nevertheless, the study provides valuable clinical insights into the characteristics and management outcomes of post-EVL ulcer bleeding in a real-world tertiary care setting.

CONCLUSION

Post-endoscopic variceal ligation ulcer bleeding is an uncommon but clinically significant complication in patients undergoing EVL for portal hypertension. The present study demonstrated that advanced liver disease, particularly Child–Pugh class C cirrhosis, thrombocytopenia, and the application of multiple ligation bands were significant predictors of post-EVL ulcer bleeding. Most bleeding episodes occurred within the first two weeks following the procedure, highlighting the importance of close monitoring during this period. Endoscopic therapy remained the primary and effective modality for achieving hemostasis in the majority of cases. Although rebleeding occurred in a small proportion of patients, the overall mortality rate in this study was relatively low, suggesting that prompt recognition and timely management can significantly improve patient outcomes. Identification of high-risk patients may help clinicians implement preventive strategies and optimize post-procedural surveillance. Further multicenter studies with larger sample sizes are needed to develop standardized risk prediction models and management protocols for post-EVL ulcer bleeding.

DECLARATIONS

Ethics Approval and Consent to Participate: The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Patient confidentiality was strictly maintained, and all data were analyzed anonymously.

Availability of Data and Materials: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests: The authors declare that they have no competing interests.

Funding: The study did not receive any specific funding from public, commercial, or not-for-profit funding agencies.

Authors 'Contributions: All authors contributed to the conception and design of the study. Data collection, analysis, and interpretation were performed collaboratively. All authors contributed to manuscript preparation and approved the final version of the manuscript.

REFERENCES

1. Garcia-Tsao G, Abraldes JG, Berzigotti A, Bosch J. Portal hypertensive bleeding in cirrhosis: Risk stratification, diagnosis, and management: 2016 practice guidance by the American Association for the study of liver diseases. Hepatology. 2017 Jan;65(1):310-35.
2. Xu L, Ji F, Xu QW, Zhang MQ. Risk factors for predicting early variceal rebleeding after endoscopic variceal ligation. World journal of gastroenterology: WJG. 2011 Jul 28;17(28):3347.
3. Sinclair M, Vaughan R, Angus PW, Gow PJ, Parker F, Hey P, Efthymiou M. Risk factors for band-induced ulcer bleeding after prophylactic and therapeutic endoscopic variceal band ligation. European journal of gastroenterology & hepatology. 2015 Aug 1;27(8):928-32.
4. Cho E, Jun CH, Cho SB, Park CH, Kim HS, Choi SK, Rew JS. Endoscopic variceal ligation-induced ulcer bleeding: What are the risk factors and treatment strategies?. Medicine. 2017 Jun 1;96(24):e7157.
5. Vanbiervliet G, Giudicelli-Bornard S, Piche T, et al. Predictive factors of bleeding related to post-banding ulcer following endoscopic variceal ligation in cirrhotic patients: a case-control study. *Aliment Pharmacol Ther*. 2010;32(2):225-232.
6. Jamwal KD, Maiwall R, Sharma MK, Kumar G, Sarin SK. Case control study of post-endoscopic variceal ligation bleeding ulcers in severe liver disease: outcomes and management. Journal of Clinical and Translational Hepatology. 2019 Mar 10;7(1):32.
7. Ryu H, Kim TU, Yoon KT, Hong YM. Predicting the risk of early bleeding following endoscopic variceal ligation in cirrhotic patients with computed tomography. BMC gastroenterology. 2023 Nov 24;23(1):410.
8. Petrasch F, Grothaus J, Mössner J, Schiefke I, Hoffmeister A. Differences in bleeding behavior after endoscopic band ligation: a retrospective analysis. *BMC Gastroenterol*. 2010;10:5.
9. de Franchis R; Baveno VI Faculty. Expanding consensus in portal hypertension: Report of the Baveno VI Consensus Workshop: Stratifying risk and individualizing care for portal hypertension. *J Hepatol*. 2015;63(3):743-752.

10. Giri S, Sundaram S, Jearth V, Bhrugumalla S. Predictors of early bleeding after endoscopic variceal ligation for esophageal varices: a systematic review and meta-analysis. Clinical and Experimental Hepatology. 2022 Dec 28;8(4):267-77.
11. Kim BK, Fung J, Yuen MF, Kim SU. Clinical application of liver stiffness measurement using transient elastography in chronic liver disease from longitudinal perspectives. World journal of gastroenterology: WJG. 2013 Mar 28;19(12):1890.
12. Albillos A, Bañares R, Hernández-Gea V; Grupo Español de Consenso en Hipertensión Portal. Portal hypertension: recommendations for diagnosis and treatment. Consensus document sponsored by the Spanish Association for the Study of the Liver (AEEH) and the Biomedical Research Network Center for Liver and Digestive Diseases (CIBERehd). *Rev Esp Enferm Dig*. 2025;117(1):14-57.
13. de Franchis R, Bosch J, Garcia-Tsao G, Reiberger T, Ripoll C; Baveno VII Faculty. Baveno VII - Renewing consensus in portal hypertension. *J Hepatol*. 2022;76(4):959-974.