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# Recurrent Hemorrhage after Esophageal Variceal Ligation: What are the Predictive Factors?

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**Abstract** **Original Research Article**

Recurrent hemorrhage after esophageal variceal ligation (EVL) is a severe and potentially life-threatening complication of portal hypertension. Identifying predictive factors allows for the optimization of patient management, particularly for high-risk individuals, and enhances their follow-up care. The objective of our study is to analyze the prevalence and predictive factors of recurrent hemorrhage after esophageal variceal ligation. This is a prospective analytical study conducted over one year (May 2023 – May 2024), including patients with portal hypertension who underwent endoscopic ligation sessions. Our results showed that the average patient age was 55 years, with a male predominance. The main etiologies of portal hypertension were dominated by cirrhosis (80%), primarily post-viral (23%). Portal vein thrombosis was present in 15% of patients, while Budd-Chiari syndrome was identified in 5%. Ligation was performed as secondary prophylaxis in 92% of cases. Grade III esophageal varices were the most common initial endoscopic finding (85% of cases). Eradication was achieved in 46% of cases after an average of 2.6 sessions. The recurrence rate of hemorrhage was 18%, with a mean recurrence period of three weeks. Among these patients, 41% had Child-Pugh class B cirrhosis, and 58% were not receiving beta-blockers. Hemorrhage-related mortality was observed in three patients. A significant correlation was found between the risk of recurrence and factors such as age, beta-blocker use, and Child-Pugh and MELD scores.

**Keywords:** Upper Gastrointestinal Hemorrhage, Portal Hypertension, Endoscopic Elastic Band Ligation, Recurrent Hemorrhage, Predictive Factors.



## INTRODUCTION

Upper gastrointestinal hemorrhage due to the rupture of esophageal varices is a major complication of portal hypertension, posing a life-threatening risk. Endoscopic elastic band ligation is the treatment of choice to control bleeding and prevent recurrence [1]. However, despite its effectiveness, some patients develop recurrent hemorrhage, leading to a significant increase in morbidity and mortality [2]. Identifying predictive factors for this recurrence is crucial for optimizing patient management and tailoring surveillance for high-risk individuals. The objective of our study is to analyze the prevalence and predictive factors of recurrent hemorrhage after esophageal variceal ligation.

## MATERIALS AND METHODS

This is a prospective analytical study conducted in the Hepato-Gastroenterology Department of CHU Mohammed VI in Tangier over a one-year period, from May 2023 to May 2024. It includes patients with portal hypertension who underwent elastic band ligation of esophageal varices. Data were collected from medical records and analyzed using SPSS software version 21.0. Incomplete or unusable records were excluded from the study.

## RESULTS

During the study period, 61 patients were included. The mean age was 55 years (ranging from 18 to 87 years), with a male-to-female sex ratio of 1.25. The primary etiology of portal hypertension was hepatic cirrhosis, accounting for 80% of patients (n=49). The causes of cirrhosis were distributed as follows: post-viral in 23% of cases (n=14), primary biliary cirrhosis (PBC) in 3%, autoimmune cirrhosis in 2%, iron overload in 2%, and non-alcoholic steatohepatitis (NASH) in 2%. Portal vein thrombosis was observed in 15% of patients (n=9), and Budd-Chiari syndrome in 5% (n=3) (Figures 1 and 2).

The severity of hepatic cirrhosis was assessed using the Child-Pugh classification (a clinico-biological score). Among the patients who underwent ligation sessions, 80% had already been diagnosed with cirrhosis, with 54.5% classified as Child A, 39.5% as Child B, and 6.5% as Child C. Secondary prophylaxis for varices was the most common indication for ligation, representing 92% of cases. These patients had presented with hematemesis associated with melena in 88.5% of cases (n=54), while 3.3% (n=2) had isolated melena. The average number of hemorrhagic episodes was 1.67 (ranging from 1 to 7 episodes).

Initial endoscopic findings revealed grade III esophageal varices in 85% of patients (n=52) and grade II in 26% (n=16) (Figure 3). Portal hypertensive gastropathy (PHG) was observed in 64% of patients (n=39), and gastric varices were present in 44% of cases (n=27). A significant collapse of esophageal varices was noted by the third ligation session, with 34% of patients still presenting grade III varices (Figure 3). Ligation sessions were spaced one month apart, with endoscopic follow-up performed one month after the first ligation, then at three months, six months, and one year. Eradication of esophageal varices was confirmed when no further sessions were required. Treatment failure was defined as the occurrence of hemorrhage during follow-up (Figure 4). Esophageal variceal eradication was achieved in 46% of cases, with an average of 2.6 ligation sessions per patient before eradication. The mean number of elastic bands used per session was 5 ± 1.9. Four patients achieved eradication after a single session, 10 patients after two sessions, 7 patients after three sessions, 6 patients after four sessions, and one patient after six sessions. Additionally, 17 patients (28%) had contraindications to beta-blockers.

The recurrence rate of hemorrhage was 18% (n=12), with an average time to recurrence of three weeks. Among these patients, 41% were classified as Child B and required an average of three ligation sessions before eradication. Furthermore, 58% were not receiving beta-blockers. Hemorrhage-related mortality was observed in three patients (25% of recurrent cases). No significant correlation was found between the risk of recurrent hemorrhage and sex or the number of sessions required for esophageal variceal eradication. However, a significant correlation was identified with age, beta-blocker use, the Child-Pugh score, and the MELD score.

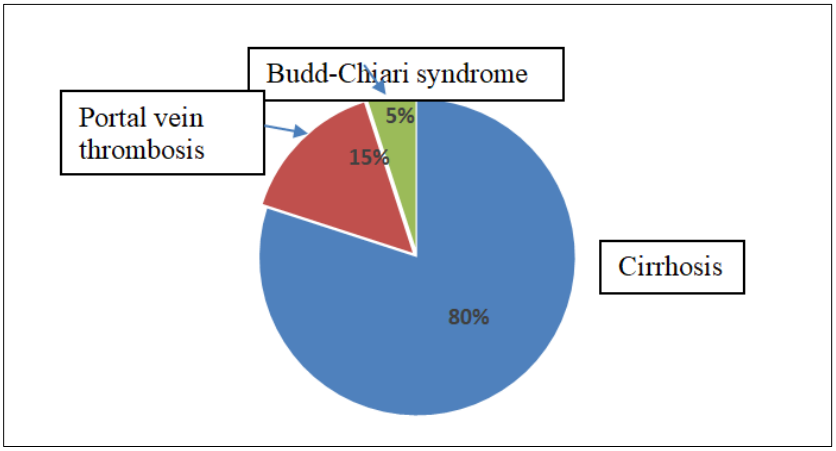


**Figure 1 : Distribution by Etiologies of Portal Hypertension**

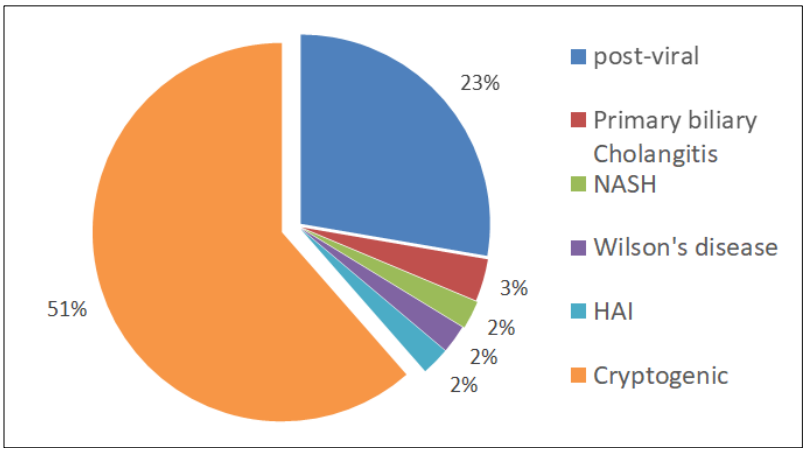


**Figure 2: Distribution by Etiologies of Cirrhosis**

**Figure 3 : Endoscopic view of grade III esophageal varices (persistent despite insufflation, confluent) with red signs in a cirrhotic patient monitored in our department**

**Figure 4: Endoscopic Elastic Band Ligation of an Esophageal Varix**

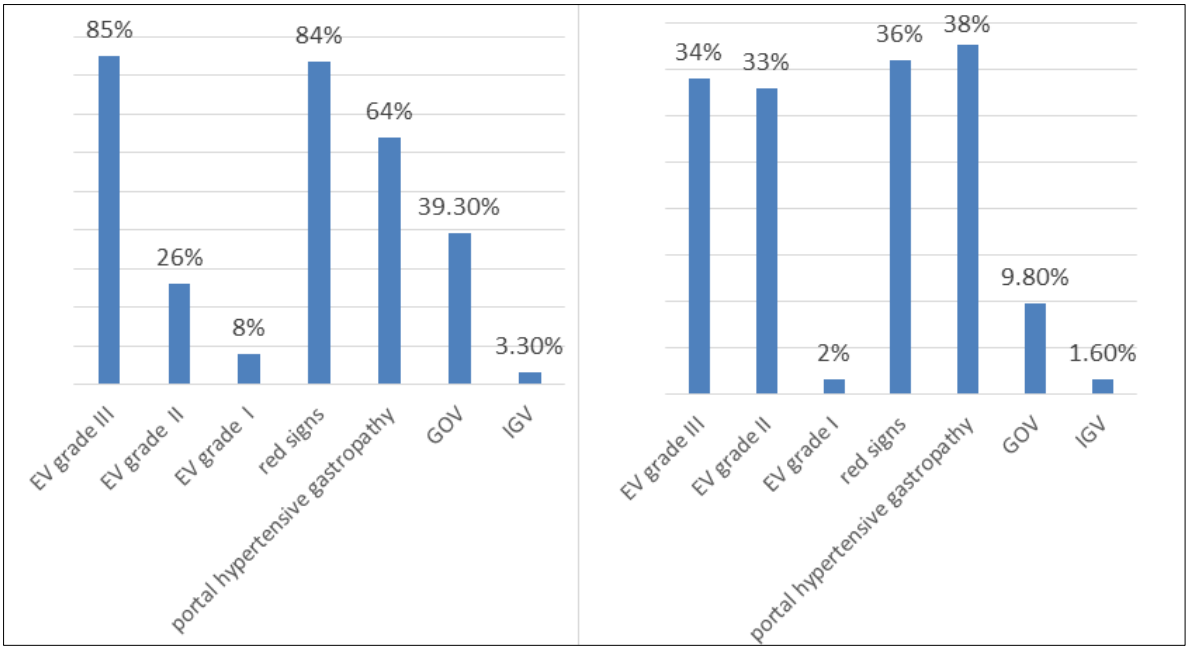


**Figure 5: Endoscopic appearance during the first ligation session (left) and the third session (right)**

## DISCUSSION

Variceal hemorrhage affects approximately 30% of cirrhotic patients throughout their lifetime. Several factors influence the risk of bleeding, including variceal size, portal pressure, and the severity of the underlying liver disease. Although endoscopic treatment is effective in controlling these hemorrhages, the risk of recurrence remains high, ranging between 20% and 50%. The mortality associated with these hemorrhagic episodes largely depends on the severity of liver disease. In patients classified as Child A, the risk of death during a first hemorrhagic episode is estimated at 5%, whereas it reaches 50% in those at Child C stage. The overall mortality rate of patients presenting with variceal hemorrhage is approximately 14%. However, the administration of antibiotics for five days after the bleeding episode may help reduce this mortality rate [3]. The factors associated with hemorrhagic recurrence remain partially elucidated. Numerous studies have explored the factors influencing recurrence after endoscopic ligation, including clinical, biological, endoscopic, and therapeutic factors. Moreover, recent recommendations from expert societies, such as those issued by the Baveno VII Consensus Conference, have provided clearer guidelines on the monitoring and management of high-risk patients.

In our sample, the primary etiology of portal hypertension was hepatic cirrhosis in 80% of cases, which aligns with the literature data, where cirrhosis is the leading cause of esophageal varices related to portal hypertension [4]. Viral hepatitis was the predominant etiology in our cohort, similar to findings from studies conducted in North African countries [5-7], while alcoholic liver disease remains the major cause in Western populations [8].

Endoscopic criteria play a key role in predicting recurrence risk. In our study, 85% of patients had grade III varices with red signs. These results are consistent with those of De Franchis *et al*., who evaluated 560 patients and identified large varices and red signs as significant risk factors for recurrence [4]. Incomplete or ineffective ligation may leave residual varices prone to rupture. Beyond endoscopic factors, several studies have highlighted the role of clinical and biological factors in post-ligation hemorrhagic recurrence. Advanced cirrhosis (Child-Pugh B or C), persistent severe portal hypertension, previous hemorrhagic recurrence, and non-adherence to beta-blocker therapy are poor prognostic factors [9, 10]. In our study, 41% of Child B patients experienced post-ligation hemorrhagic recurrence. Moreover, certain biological parameters have been identified as predictive markers of bleeding risk. Severe thrombocytopenia (<50,000 platelets/mm³) and low serum albumin levels (<30 g/dL) are associated with an increased risk of hemorrhagic recurrence [11].

After a first bleeding episode, the recurrence risk is estimated at 60% within 1 to 2 years if left untreated, with a mortality rate reaching 33% [12]. Preventing recurrence relies on a combined strategy involving elastic band ligation and non-selective beta-blockers (NSBBs), which is the gold-standard treatment [1-13]. However, in cases of failure of this well-conducted secondary prophylaxis, transjugular intrahepatic portosystemic shunt (TIPS) remains the preferred therapeutic option. A randomized trial demonstrated that using a covered TIPS significantly reduced the recurrence rate compared to standard dual prophylaxis, although its impact on overall survival was not significant [14, 15]. In our study, esophageal variceal eradication was achieved in 46% of patients after an average of 2.6 ligation sessions. These results are comparable to those reported by Garcia-Tsao *et al*., who followed 200 patients and observed an eradication rate ranging from 40% to 60% after multiple ligation sessions [1]. Similarly, a study by N. Afredj *et al*., conducted on 158 patients, reported an eradication rate of 93% after an average of 3.16 sessions, with a recurrence rate of 10.8% [16]. Another Moroccan study on 56 patients undergoing secondary prophylaxis reported an eradication rate of 34%, with an average of 2.52 ± 1.65 sessions per patient. The total number of sessions ranged from 1 to 6, and 50% of patients achieved complete variceal eradication within 7 weeks. This relatively low rate was attributed to limited healthcare access and a high rate of lost-to-follow-up patients [5].

In our study, the hemorrhagic recurrence rate was 18%, with an average recurrence period of 3 weeks. Comparatively, a meta-analysis by Thabut *et al*., including 1,235 patients from 12 studies, reported a recurrence rate ranging from 15% to 30%, depending on the therapeutic strategy used [17]. Another study reported a recurrence rate of 24.4% [15]. Furthermore, a study by Villanueva *et al*., involving 420 patients, demonstrated that adding NSBBs to ligation reduced recurrence rates to 22%, compared to 36% in patients treated with ligation alone. These findings confirm the benefit of a combined therapeutic approach to optimize recurrence prevention [18]. A significant correlation was observed in our study between hemorrhagic recurrence risk and several factors, including age, absence of beta-blocker therapy, Child-Pugh score, and MELD score. A meta-analysis by Berzigotti *et al*., involving 950 patients, demonstrated that the absence of NSBB therapy and an advanced Child-Pugh score were major predictive factors for hemorrhagic recurrence [19]. Additionally, a recent study by Bosch *et al*., reported a 30% reduction in recurrence rates in patients receiving NSBB therapy in addition to endoscopic ligation, compared to those treated with ligation alone [20].

The management of post-ligation hemorrhagic recurrences follows the recommendations of expert societies, notably the Baveno VII Consensus, which advocates for a combined approach associating elastic band ligation and NSBB therapy (e.g., carvedilol) to reduce portal pressure below 12 mmHg, significantly

lowering recurrence risk [4]. However, poor adherence to therapy or under-dosing of NSBBs increases recurrence risk. According to the EASL (European Association for the Study of the Liver) guidelines, regular evaluation of high-risk patients and adjusting pharmacological treatment is essential, particularly for Child-Pugh B or C patients, where liver transplantation should be considered if bleeding risk persists [21]. Furthermore, post-ligation follow-up must be rigorous, with regular endoscopic monitoring to assess variceal eradication or the need for additional sessions. The SFED (French Society of Digestive Endoscopy) recommends close endoscopic follow-up (every 3 to 6 weeks) until complete variceal eradication and suggests using non-invasive tests, such as liver elastography, to evaluate long-term recurrence risk [22].

## CONCLUSION

Recurrent hemorrhage after esophageal variceal ligation remains a major challenge in gastroenterology. Identifying predictive factors allows for optimized patient management and the adoption of a personalized therapeutic strategy. In our study, the hemorrhagic recurrence rate was 18%, with an average recurrence time of 3 weeks. A significant correlation was observed with age, the absence of beta-blocker therapy, and the severity of cirrhosis. Integrating combined strategies, including ligation and non-selective beta-blockers (NSBBs), along with rigorous follow-up, appears to be the most effective approach to reducing recurrence risk and improving the prognosis of high-risk patients.

**Conflicts of Interest:** The authors declare no conflicts of interest.

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