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**EDITORIAL**

- 98 Computed tomography for the prediction of oesophageal variceal bleeding: A surrogate or complementary to the gold standard?  
*Fouad Y, Alborai M*
- 102 Precision in detecting colon lesions: A key to effective screening policy but will it improve overall outcomes?  
*Rabago LR, Delgado Galan M*
- 108 Future directions of noninvasive prediction of esophageal variceal bleeding: No worry about the present computed tomography inefficiency  
*Zhang YH, Hu B*
- 112 Anal pruritus: Don't look away  
*Albuquerque A*

**MINIREVIEWS**

- 117 Methods to increase the diagnostic efficiency of endoscopic ultrasound-guided fine-needle aspiration for solid pancreatic lesions: An updated review  
*Yang X, Liu ZM, Zhou X, Yang F, Ma WZ, Sun XZ, Sun SY, Ge N*
- 126 Human-artificial intelligence interaction in gastrointestinal endoscopy  
*Campion JR, O'Connor DB, Lahiff C*

**ORIGINAL ARTICLE****Retrospective Study**

- 136 Tumor size discrepancy between endoscopic and pathological evaluations in colorectal endoscopic submucosal dissection  
*Onda T, Goto O, Otsuka T, Hayasaka Y, Nakagome S, Habu T, Ishikawa Y, Kirita K, Koizumi E, Noda H, Higuchi K, Omori J, Akimoto N, Iwakiri K*
- 148 Impact of frailty on endoscopic retrograde cholangiopancreatography outcomes in nonagenarians: A United States national experience  
*Basida SD, Dahiya DS, Yousaf MN, Basida B, Pinnam BSM, Gangwani MK, Ali H, Singh S, Shah YR, Ahluwalia D, Shah MP, Chandan S, Sharma NR, Thakkar S*

**Observational Study**

- 157 Could near focus endoscopy, narrow-band imaging, and acetic acid improve the visualization of microscopic features of stomach mucosa?  
*Kurtcehajic A, Zerem E, Bokun T, Alibegovic E, Kunosic S, Hujdurovic A, Tursunovic A, Ljuca K*

**Prospective Study**

- 168** Using a novel hemostatic peptide solution to prevent bleeding after endoscopic submucosal dissection of a gastric tumor  
*Gomi K, Yamamoto Y, Yoshida E, Tohata M, Nagahama M*

**LETTER TO THE EDITOR**

- 175** Computed tomography for prediction of esophageal variceal bleeding  
*Elhendawy M, Elkalla F*

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## Computed tomography for prediction of esophageal variceal bleeding

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### Abstract

This letter to the editor relates to the study entitled “The role of computed tomography for the prediction of esophageal variceal bleeding: Current status and future perspectives”. Esophageal variceal bleeding (EVB) is one of the most common and severe complications related to portal hypertension (PH). Despite marked advances in its management during the last three decades, EVB is still associated with significant morbidity and mortality. The risk of first EVB is related to the severity of both PH and liver disease, and to the size and endoscopic appearance of esophageal varices. Indeed, hepatic venous pressure gradient (HVPG) and esophagogastroduodenoscopy (EGD) are currently recognized as the “gold standard” and the diagnostic reference standard for the prediction of EVB, respectively. However, HVPG is an invasive, expensive, and technically complex procedure, not widely available in clinical practice, whereas EGD is mainly limited by its invasive nature. In this scenario, computed tomography (CT) has been recently proposed as a promising modality for the non-invasive prediction of EVB. While CT serves solely as a diagnostic tool and cannot replace EGD or HVPG for delivering therapeutic and physiological information, it has the potential to enhance the prediction of EVB more effectively when combined with liver disease scores, HVPG, and EGD. However, to date, evidence concerning the role of CT in this setting is still lacking, therefore we aim to summarize and discuss the current evidence concerning the role of CT in predicting the risk of EVB.

**Key Words:** Esophageal variceal bleeding; Variceal upper gastrointestinal bleeding; Portal hypertension; Computed tomography; Computed tomography angiography

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**Core Tip:** Esophagogastroduodenoscopy is presently regarded as the established diagnostic standard for anticipating esophageal variceal bleeding (EVB) in individuals with cirrhosis. Computed tomography (CT) has recently surfaced as a potential non-invasive method for predicting EVB. However, comprehensive evidence on the role and efficacy of CT in this context is currently insufficient. Consequently, the study seeks to assess the existing evidence concerning the use of CT in predicting EVB.

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## TO THE EDITOR

We have perused with interest the review conducted by Martino *et al*[1], entitled "The role of computed tomography for the prediction of esophageal variceal bleeding: Current status and future perspectives ". This review study highlights the potential use of computed tomography (CT) as a hopeful technique for the non-invasive anticipation of esophageal variceal bleeding (EVB).

Bleeding from esophageal varices (EV) is a potentially life-threatening complication associated with clinically significant portal hypertension (PH), representing a noteworthy economic and health concern[2]. Hence, it is crucial to conduct upper endoscopy screening for esophagogastric varices in patients exhibiting clinically significant PH [hepatic venous pressure gradient (HVPG) higher than 10 mmHg] and liver stiffness exceeding 25 kPa. Patients with varices at high-risk of bleeding should undergo primary prophylaxis through nonselective beta-blocker medication or variceal band ligation. For those experiencing variceal bleeding, an upper endoscopy should be conducted within 12 h following resuscitation and hemodynamic stabilization. If the patients' condition is unstable, endoscopy should be performed at the earliest opportunity[3].

PH is a significant complication of liver cirrhosis, leading to EV. Even in the presence of clinical and/or imaging indicators of PH, the definitive diagnostic method for EV remains esophagogastroduodenoscopy (EGD), considered the gold standard. EGD serves the primary purpose of diagnosing and risk-stratifying varices by evaluating their size and identifying high-risk stigmata, whereas the HVPG is employed to assess the severity of PH[2].

Due to endoscopy being regarded as an invasive method for evaluating varices, as well as the accompanying patient discomfort and high cost, other alternative tests have been evaluated over time[4,5].

The Baveno VII guidelines do not advise upper endoscopy as a screening method for EV in patients with liver stiffness below 20 kPa, platelet counts exceeding  $150 \times 10^9/L$  and spleen stiffness measurement  $\leq 40$  kPa[6].

Due to the ineffectiveness of the non-invasive Baveno VII criteria in screening for varices in patients with portosinusoidal vascular disorders, it is necessary to perform endoscopy for diagnosis. The endoscopic screening frequency should adhere to the guidelines established for liver cirrhosis[6].

### **We would like to draw attention to several aspects concerning this study**

The authors analyzed a number of retrospective studies and single center studies incorporating small numbers of patients, which could influence the completeness and precision of the findings. The studies analyzed were not uniform regarding the manner of research, comparison factors, grading classifications of the varices, and Child scores posing a potential bias of the study cohort that could affect the validity of the review.

Secondly, this review did not include studies that focused solely on assessing the presence of EV or those comparing CT findings with the endoscopic grading of EV.

The percentage of patients with decompensated cirrhosis remains uncertain in the studies under review. As non-invasive measures are predominantly employed for patients with compensated cirrhosis, clarification on this aspect is needed.

The primary cause of liver cirrhosis in this review is predominantly attributed to alcohol, with no comparison to other etiologies such as viral hepatitis. This limitation has the potential to limit the generalizability of the review findings to various populations and settings. Additionally, the possible effect of antiviral treatment on cirrhosis and varices has been not studied.

CT is a diagnostic modality that can detect maximal EV diameter, paraumbilical and coronary vein diameters, and ascitic fluid presence. However, it is incapable of detecting variceal risk signs.

There exists a time gap between the occurrence of bleeding and the execution of CT scans. During this interval, patients may experience improvement, leading to the potential for CT results to be misleading.

Another constraint in the study involves incorporating patients who are receiving pharmacological prophylaxis for EVB either primary or secondary with no mention of comparison or statistics in correlation with the bleeding varices, even though it is well established that these drugs alter the hemodynamics and therefore would affect the CT findings.

There are no data about correlation between other shunts, and the size and risky signs of bleeding varices as these shunts may decrease intravariceal pressure.

Moreover, none of the included studies compare CT-measured liver volume and liver function in correlation with variceal bleeding.

Furthermore, the bleeding and non-bleeding groups in the reviewed studies significantly differ regarding model for end-stage liver disease score and Child-Pugh class, both of which may affect liver function, coagulation profile of the patient, pathogenesis of varices formation and bleeding liability. All these strong limitation factors have not been studied.

CT may prove valuable in identifying patients at an elevated risk of variceal bleeding, but should not be intended to replace endoscopy.

We concur with the authors' viewpoint, emphasizing the importance of investigating the role of CT in predicting EVB. This entails measuring various EV indicators and collateral veins. We advocate for large-scale, multicenter prospective controlled trials integrating liver disease scores and simultaneous performance of endoscopy and/or HVPG conducted concurrently without significant delays and with adequate follow-up. Furthermore, the results ought to be categorized according to liver disease scores, endoscopic scores, and the etiology of cirrhosis. This comprehensive approach is essential for generating high-quality evidence to validate and advance our understanding.

Utilizing CT findings of portal-systemic collaterals can help identify their impact on PH and their association with variceal bleeding. This is particularly relevant because these collaterals are influenced by the etiology of cirrhosis and exhibit variability among patients. They can manifest either as single entities or a combination of multiple collaterals, each having distinct effects on PH and its association with variceal bleeding.

To bolster the credibility of the study's conclusion, we suggest conducting a larger-scale investigation, among patients with diverse etiologies and various forms of cirrhosis. Such a study would contribute to enhancing the applicability and practicality of clinical practice, providing a more precise assessment of patients' conditions.

CT can be used as a screening strategy together with other noninvasive methods, to alleviate the burden on endoscopy units and optimize the utilization of healthcare resources, all the while minimizing the potential risks and discomfort for patients. Finally, we recognize and appreciate the efforts and contributions of the authors and recommend further prospective validation.

## FOOTNOTES

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