



## Review Article

# Repeated Esophagogastroduodenoscopy and Colonoscopy in the Diagnosis of Gastrointestinal Bleeding



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### Abstract

Esophagogastroduodenoscopy and colonoscopy play important roles in diagnosing gastrointestinal bleeding; however, they may sometimes fail to identify the source of the bleeding during the initial examination. In such cases, repeated endoscopic examination may be beneficial. Currently, no consensus exists on which patients would benefit from repeated examination. In this review, we discuss the role of repeated endoscopy and conclude that repeated esophagogastroduodenoscopy and colonoscopy can help improve detection rates. It is particularly valuable to repeat the procedure when the quality of the initial endoscopy is poor, the patient's condition deteriorates, or other examinations suggest that lesions are within the scope of endoscopy.

### Introduction

Gastrointestinal bleeding is a common and sometimes fatal condition. Based on the bleeding site, it is categorized into upper, middle (small intestine), or lower gastrointestinal (colorectal) bleeding.

The annual incidence of acute upper gastrointestinal bleeding is approximately 84–160 cases per 100,000 people, with a mortality rate of about 10%.<sup>1</sup> The most common cause of upper gastrointestinal bleeding is peptic ulcers, followed by variceal bleeding related to liver disease, mucosal erosions of the esophagus, stomach or duodenum, and gastrointestinal carcinomas.<sup>2</sup> Patients typically present with hematemesis and/or melena as the first symptoms, and may also experience abdominal pain or dizziness. Melena, in particular, is often associated with hemorrhagic shock.<sup>3–5</sup>

The incidence of lower gastrointestinal bleeding is around 20–33 cases per 100,000 people annually, with the incidence rate increasing with age and the presence of other gastrointestinal diseases.<sup>6–7</sup> Diverticula (26–49%) is the most common cause of hospitalization for lower gastrointestinal bleeding; other common causes include hemorrhoids, colorectal malignancy, and colitis.<sup>8</sup> Diverticular bleeding is usually painless, and patients may have a history of diverticular disease. Hemorrhoidal bleeding typically presents

as bright red blood stains at the site of contact with hemorrhoids. Bleeding from colitis often presents as acute bloody diarrhea.<sup>9</sup>

Gastrointestinal endoscopy plays a crucial role in diagnosing gastrointestinal bleeding, assessing the risk of further bleeding, and sometimes assisting in hemostasis.<sup>10</sup> Esophagogastroduodenoscopy (EGD) and colonoscopy are the primary diagnostic and treatment tools for upper and lower gastrointestinal bleeding; in most cases, they can identify the location and cause of the bleeding.<sup>11</sup> The initial diagnostic rate of upper gastrointestinal bleeding with EGD has been reported to be 90–95%; however, in approximately 10% of patients, a definitive diagnosis is not made during the first examination.<sup>12</sup> Colonoscopy has a diagnostic rate of 48–90%.<sup>13,14</sup> Therefore, the first endoscopic examination may not always identify the cause of bleeding. If no lesions are found during the initial endoscopy, repeat endoscopy should be considered in specific circumstances. However, there is no unified consensus on this issue at present, so we aimed to draw conclusions by combining existing clinical data, with the hope that our work will be helpful for future clinical practice.

### Role of repeated EGD and colonoscopy

Dieulafoy's disease involves an abnormal artery located near the mucosal surface, making exposure and bleeding more likely.<sup>15</sup> Injury to this artery can result in severe intermittent bleeding. During the quiescent stage, detection using gastrointestinal endoscopy can be challenging.<sup>15,16</sup> Bleeding vessels are detected in only 70% of cases of Dieulafoy lesions during the first endoscopy.<sup>17</sup> Therefore, repeated endoscopy can increase the likelihood of identifying intermittent lesions.

The experience of the endoscopist performing EGD and colonoscopy is crucial for detecting small lesions.<sup>18</sup> When encounter-

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ing small lesions, less experienced endoscopists are more likely to miss a diagnosis compared to their more experienced counterparts. In some cases of emergency gastrointestinal bleeding, the visual field during EGD and colonoscopy can be obscured by blood clots, food, or fecal material, and the patient may not be stable enough to complete the procedure, which increases the probability of a missed diagnosis. Additionally, colonic diverticular bleeding is the most common cause of lower gastrointestinal bleeding; however, the large surface area of the colon, residual stool and blood, intermittent bleeding, and the presence of numerous diverticula make diagnosis difficult.<sup>19</sup> Recognition rates for diverticular bleeding range from 6% to 42%.<sup>20</sup> Research suggests that cap attachment, the use of an endoscope with a water jet, good preparation for colonoscopy, and urgent CT imaging before colonoscopy can facilitate the identification of stigmata of recent hemorrhage.<sup>20</sup> These factors improve the accuracy of endoscopy and reduce the likelihood of missed lesions during the initial examination. Therefore, repeat endoscopy under better conditions can help identify missed lesions.

A study by Zheng Lu *et al.* showed that second-look urgent endoscopy could benefit patients with esophageal variceal bleeding without increasing the complication rate. The benefits include clearly determining the cessation of bleeding, confirming the cause, and guiding the timing of diet reintroduction.<sup>21</sup> Repeated endoscopy has also revealed missed bleeding lesions in patients with “potentially small intestinal bleeding.” Diagnostic yields from repeated EGD range from 2% to 25%, and from repeated colonoscopy, they range from 6% to 23%.<sup>22</sup> In another study involving 290 patients from Italy, non-small intestinal bleeding was missed in 30.3% (88 patients) during the first EGD or colonoscopy.<sup>18</sup> Misdiagnosis of lesions may lead to life-threatening gastrointestinal bleeding. Therefore, repeated endoscopy is not a waste but rather an important tool for confirming the cause of gastrointestinal bleeding.

### Indications for repeated EGD and colonoscopy

The first endoscopy may not always be able to identify the source of bleeding. For patients with an unclear diagnosis after the initial gastrointestinal endoscopy, other examinations may be considered before proceeding with repeated EGD or colonoscopy. Push enteroscopy is an endoscopic method that uses modified colonoscopy equipment to examine and treat bleeding in the proximal small bowel. Because it does not require additional equipment or complex personnel training, it is an important tool for examining the small bowel in smaller medical centers where small bowel endoscopy is not available.<sup>23</sup> Capsule endoscopy (CE) is a gastrointestinal examination that uses a pill camera to capture images of the intestinal tract, and it has significant value in diagnosing small intestinal lesions. According to a study by Aoki T *et al.*, CE can be used as the next diagnostic test when colonoscopy cannot identify the source of bleeding in patients with acute episodic hematochezia. A Canadian guideline on capsule endoscopy states that CE should be performed as soon as possible in patients with significant gastrointestinal bleeding and negative EGD and colonoscopy results.<sup>24</sup> Computed tomography angiography is often used to determine the best timing for colonoscopy in patients with acute lower gastrointestinal bleeding.<sup>25</sup> It can pinpoint the source of arterial and venous gastrointestinal bleeding and suggest possible causes of the bleeding.<sup>26</sup> It is an excellent diagnostic tool for detecting and locating intestinal bleeding sites, with an overall sensitivity of 85.2% and specificity of 92.1.<sup>27</sup>

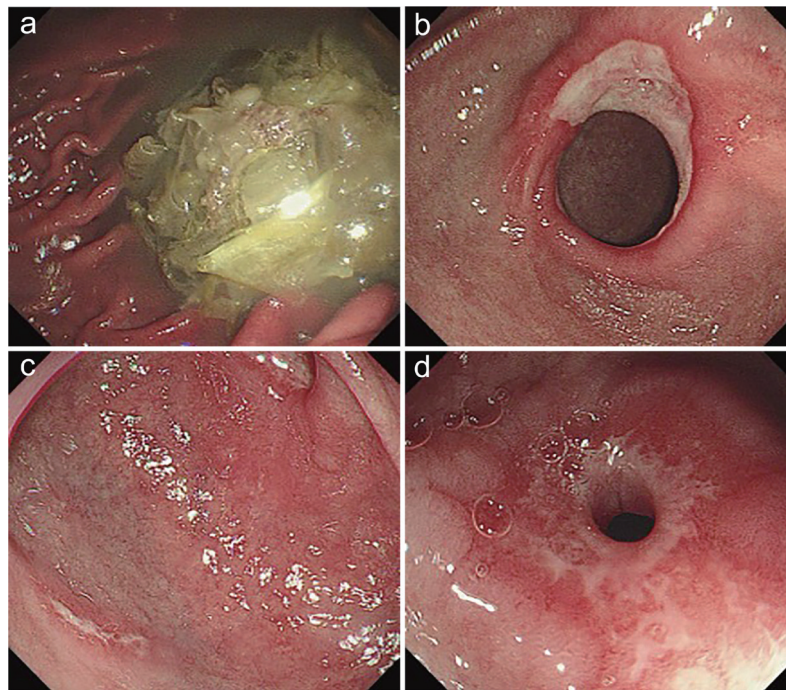
In addition, some studies outline situations in which repeated

endoscopy is recommended. Gerson *et al.* suggested that repeated endoscopy depends on the date of the patient’s previous examination, the quality of the examination, the adequacy of the intestinal preparation, and the presence of upper gastrointestinal bleeding.<sup>28</sup> According to Descamps *et al.*, factors such as a history of non-steroidal anti-inflammatory drug use (e.g., aspirin), occult bleeding, patient age, the experience of the operator, and the quality of the first endoscopy should be considered.<sup>29</sup>

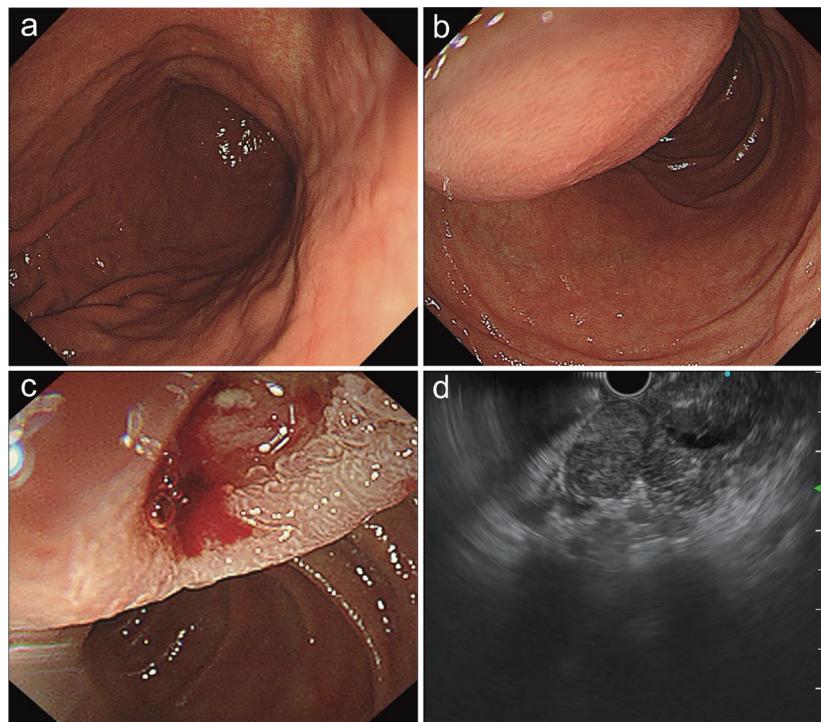
Rebleeding during treatment is common in patients with gastrointestinal bleeding. The guidelines of the European Society of Gastrointestinal Endoscopy do not recommend routine secondary endoscopy for the treatment of upper gastrointestinal bleeding due to causes other than varices. However, for patients with rebleeding after successful hemostasis during the first endoscopy, repeat upper gastrointestinal endoscopy is recommended.<sup>30</sup> An Asia-Pacific consensus on non-variceal upper gastrointestinal bleeding states that a second endoscopy within 24 h of cessation of the initial bleeding in patients with peptic ulcers can help detect and treat lesions with a high risk of rebleeding and reduce the probability of recurrent bleeding. However, the consensus also notes that this practice is not sufficiently beneficial for all patients.<sup>31</sup> A recent multicenter study suggested that successful initial hemostasis, the use of nonsteroidal anti-inflammatory drugs, and large blood transfusions were independent risk factors for rebleeding. Repeated endoscopy may benefit these patients.<sup>32</sup>

However, no unified consensus currently exists. After reviewing the literature and combining it with our clinical experience, we recommend repeat EGD and colonoscopy in the following situations:

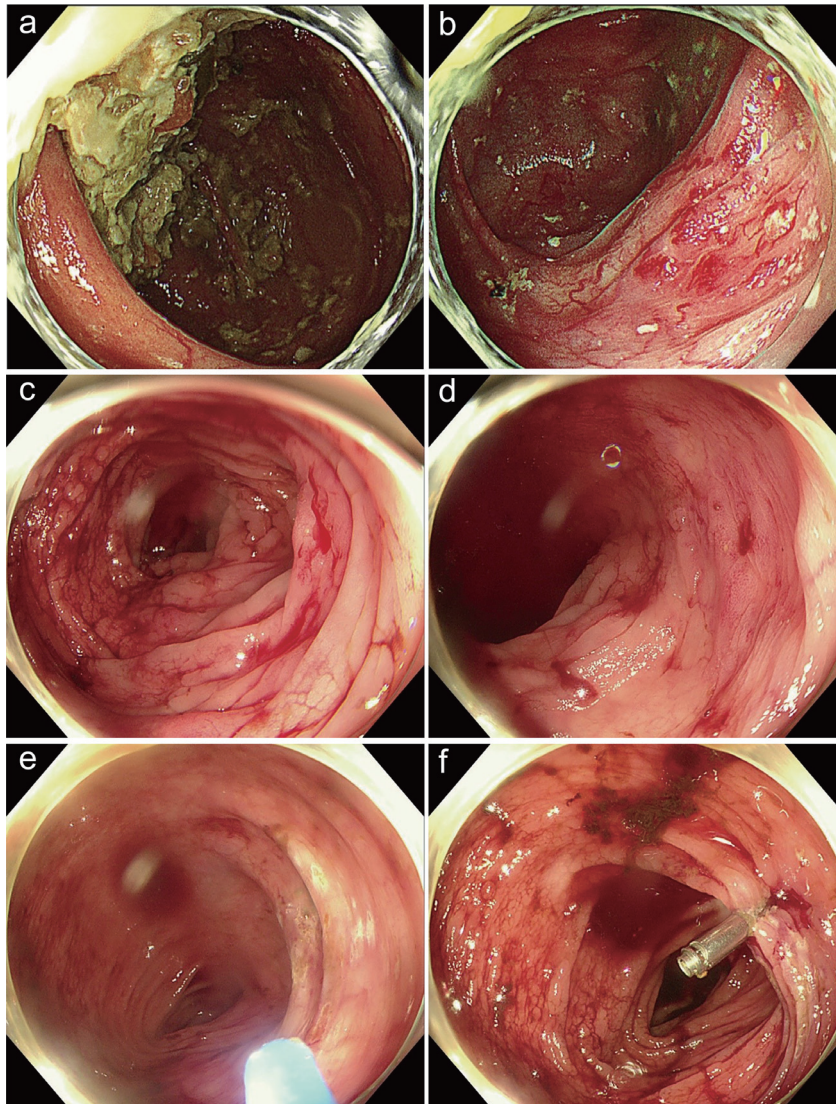
1. Poor or incomplete visual field during the first endoscopy (Fig. 1). When gastrointestinal bleeding affects the endoscopic field of view, blood clots should be fully washed off to ensure a clear view and avoid missing lesions.<sup>11</sup> If an adequate field of view is not obtained, repeat endoscopy can be performed after proper bowel preparation. Additionally, when the patient is unstable and cannot tolerate a complete endoscopic examination, a repeat endoscopy can be performed once vital signs are stabilized.
2. Examination during the first gastrointestinal endoscopy was incomplete (Fig. 2). Lower cecal intubation rates are associated with diminished detection rates, which may necessitate repeat colonoscopies or alternative testing.<sup>33</sup> A Korean study suggested visualizing the major duodenal papilla as a quality indicator for EGD.<sup>34</sup> Furthermore, due to the limited use of small intestinal endoscopy, EGD and colonoscopy should be used to examine parts of the small intestine in patients with gastrointestinal bleeding.
3. Recurrent bleeding, new symptoms, or aggravation of existing symptoms (Fig. 3). Studies strongly suggest that endoscopy should be repeated in patients with clinical evidence of recurrent bleeding.<sup>35</sup> In intermittent bleeding conditions such as Dieulafoy’s disease, if the bleeding temporarily stops during the first endoscopy, the lesions may not be identified. The development of new symptoms (e.g., hematemesis, hematochezia, or melena), or worsening of existing symptoms, such as progressive anemia, warrants repeat EGD and colonoscopy to identify potential lesions.
4. No lesions were detected on the first EGD and colonoscopy, but other tests suggest the lesions are within the scope of EGD and colonoscopy (Fig. 4). For patients with gastrointestinal bleeding, capsule endoscopy should be performed if no clear bleeding focus is found on EGD or colonoscopy.<sup>36</sup> Other examinations, such as CT, should also be performed to screen the small intestine. If these tests suggest the suspected lesions are within



**Fig. 1.** A second esophagogastroduodenoscopy (EGD) in a 70-year-old male with a four-month history of melena. The initial EGD performed at a local hospital revealed gastric retention but no suspicious lesions due to poor visualization. A repeated EGD at our hospital revealed: (a) gastric retention; (b) an ulcer at the pylorus after clearing retained food; (c) a second ulcer at the duodenal bulb; (d) a third ulcer and stricture at the junction between the duodenal bulb and the descending duodenum.



**Fig. 2.** A repeat esophagogastroduodenoscopy (EGD) in a 53-year-old male with a four-month history of intermittent melena. The initial EGD at a local hospital revealed a suspicious submucosal tumor near the duodenal papilla without exposure of the major duodenal papilla. A repeated EGD at our hospital revealed: (a) no bleeding lesion in the stomach; (b) a suspicious submucosal tumor at the duodenal papilla; (c) active bleeding at the major duodenal papilla; (d) a submucosal tumor at the ampulla.



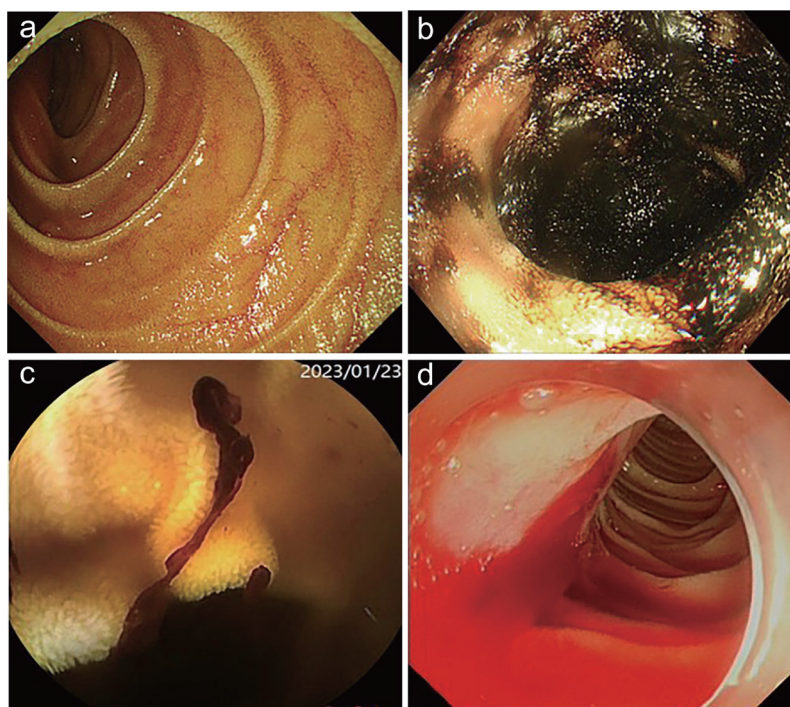
**Fig. 3. Colonoscopy and repeat colonoscopy for an 80-year-old female with a two-week history of intermittent hematochezia, with no suspicious lesion found on esophagogastroduodenoscopy (EGD).** Findings included: (a) no bleeding lesion up to the ileocecum; (b) telangiectasis in the transverse colon with no active bleeding; (c,d) recurrent hematochezia, with emergent colonoscopy showing active bleeding from the telangiectasis in the transverse colon; (e,f) treatment with electrocoagulation and endoclips, resulting in no further hematochezia.

reach of EGD and colonoscopy, repeat gastrointestinal endoscopy should be considered.

#### Reducing repeat EGD and colonoscopy: Where do we start?

Repeated endoscopy undoubtedly increases the inconvenience for patients. Therefore, reducing the likelihood of repeated endoscopy in patients with gastrointestinal bleeding is worthwhile. Choosing an appropriate examination time is crucial for diagnosing the condition. In general, patients with unstable upper gastrointestinal bleeding should be examined immediately after their condition stabilizes, while other patients should be examined within 24 h of admission.<sup>37</sup> For lower gastrointestinal bleeding, guidelines recommend that patients with high-risk clinical features and persistent bleeding undergo colonoscopy as early as possible, ideally within 24 h of presentation.<sup>38</sup> A poor-quality initial endoscopy increases

the likelihood of repeated examinations; therefore, ensuring the quality of the endoscopy is critical. If conditions allow for a complete examination, sufficient time and adequate intestinal preparation are essential measures to ensure examination quality.<sup>33,39,40</sup> Notably, the necessity of bowel preparation before colonoscopy is still debated.<sup>41</sup> Guidelines do not recommend colonoscopy without bowel preparation in cases of acute lower gastrointestinal bleeding. In emergency colonoscopy without preparation, cecal intubation rates are low (55–70%), and the risk of perforation increases due to a poor visual field.<sup>38</sup> However, Mizuki A *et al.* showed that colonoscopy performed within 12 h of admission had a higher rate of detection of recent bleeding signs in diverticular disease of the colon compared to examinations performed 12 h later.<sup>42</sup> Chaudhry V *et al.* also indicate that an unprepared colonoscopy can be performed safely within 24 h, suggesting that the information obtained from the amount and distribution of blood in the colon can



**Fig. 4.** A repeat EGD for an 83-year-old male with a 40-day history of intermittent melena. The initial EGD at a local hospital did not reveal a suspicious lesion. The repeat EGD findings included: (a) no bleeding lesion in the distal part of the descending duodenum; (b) black feces in the terminal ileum; (c) capsule endoscopy showing active bleeding in the duodenum; (d) active bleeding in the duodenum.

help locate the lesion.<sup>43</sup> The answer to this question requires further research in the future.

### Limitations and strengths

Limitations include a lack of high-quality studies related to this review topic (i.e., minimal RCTs). Strengths include the clinical importance of this inpatient gastrointestinal-related topic, as the discussion and review will be helpful in guiding patient care and inspiring ideas for further research.

### Conclusions

Repeated endoscopic examinations are highly beneficial in identifying missed lesions and can significantly improve the diagnostic rate of gastrointestinal bleeding. However, no consensus exists on the indications for repeated EGD and colonoscopy. We suggest that repeated endoscopy has greater value in patients under the following circumstances: when the first endoscopy had a poor visual field; when there was an incomplete examination during the first gastrointestinal endoscopy; in cases of recurrent bleeding, new symptoms, or worsening of existing symptoms; and when the first EGD and colonoscopy did not reveal bleeding lesions but other examinations suggesting that the suspected lesions are within the scope of EGD and colonoscopy. In the future, more studies are required to identify suitable indications for repeated endoscopy to achieve greater benefits in clinical settings.

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### Conflict of interest

Prof. Yuyong Tan has been an editorial board member of *Journal of Translational Gastroenterology* since May 2023. The authors declare that there is no other conflict of interests.

### Author contributions

Writing and editing the manuscript, reviewing the literature (TL), writing - review & editing, visualization (LH), project administration, visualization, editing (YT), concept and outline of the manuscript (DL, YT). Contributed to study concept and design (DL and YT), acquisition of the data (YT), drafting of the manuscript (TL), critical revision of the manuscript (LH, TL, YT), supervision (DL, YT).

### References

- [1] Rațiu I, Lupușoru R, Popescu A, Sporea I, Goldiș A, Dănilă M, *et al*. Acute gastrointestinal bleeding: A comparison between variceal and nonvariceal gastrointestinal bleeding. *Medicine (Baltimore)* 2022; 101(45):e31543. doi:10.1097/MD.00000000000031543, PMID:36397398.
- [2] Kavitt RT, Gralnek IM. Ideal strategy for nonvariceal upper gastrointestinal bleeding. *Curr Opin Gastroenterol* 2024;40(5):342–347. doi:10.1097/MOG.0000000000001043, PMID:38967918.
- [3] Raj A, Kaeley N, Prasad H, Patnaik I, Bahurupi Y, Joshi S, *et al*. Prospective observational study on clinical and epidemiological profile of adult patients presenting to the emergency department

- with suspected upper gastrointestinal bleed. *BMC Emerg Med* 2023;23(1):107. doi:10.1186/s12873-023-00885-9, PMID:37726688.
- [4] Jairath V, Martel M, Logan RF, Barkun AN. Why do mortality rates for nonvariceal upper gastrointestinal bleeding differ around the world? A systematic review of cohort studies. *Can J Gastroenterol* 2012;26(8):537–543. doi:10.1155/2012/862905, PMID:22891179.
  - [5] Sung JJ, Tsoi KK, Ma TK, Yung MY, Lau JY, Chiu PW. Causes of mortality in patients with peptic ulcer bleeding: a prospective cohort study of 10,428 cases. *Am J Gastroenterol* 2010;105(1):84–89. doi:10.1038/ajg.2009.507, PMID:19755976.
  - [6] Matkovic Z, Zildzic M. Colonoscopic Evaluation of Lower Gastrointestinal Bleeding (LGIB): Practical Approach. *Med Arch* 2021;75(4):274–279. doi:10.5455/medarh.2021.75.274-279, PMID:34759447.
  - [7] Adegboyea T, Rivadeneira D. Lower GI Bleeding: An Update on Incidences and Causes. *Clin Colon Rectal Surg* 2020;33(1):28–34. doi:10.1055/s-0039-1695035, PMID:31915423.
  - [8] Xiao X, Palihati S, Zhou M, Zeng Y, Yang JL. Lower Gastrointestinal Bleeding: Current State of Diagnosis and Treatment and Interpretation of the Clinical Guidelines. *Sichuan Da Xue Xue Bao Yi Xue Ban* 2022;53(3):367–374. doi:10.12182/20220560207, PMID:35642140.
  - [9] Hawks MK, Svarverud JE. Acute Lower Gastrointestinal Bleeding: Evaluation and Management. *Am Fam Physician* 2020;101(4):206–212. PMID:32053333.
  - [10] Sung JJY, Laine L, Kuipers EJ, Barkun AN. Towards personalised management for non-variceal upper gastrointestinal bleeding. *Gut* 2021;70(5):818–824. doi:10.1136/gutjnl-2020-323846, PMID:33649044.
  - [11] Cappell MS, Friedel D. Acute nonvariceal upper gastrointestinal bleeding: endoscopic diagnosis and therapy. *Med Clin North Am* 2008;92(3):511–550. doi:10.1016/j.mcna.2008.01.001, PMID:18387375.
  - [12] Chak A, Cooper GS, Lloyd LE, Kolz CS, Barnhart BA, Wong RC. Effectiveness of endoscopy in patients admitted to the intensive care unit with upper GI hemorrhage. *Gastrointest Endosc* 2001;53(1):6–13. doi:10.1067/mge.2001.108965, PMID:11154481.
  - [13] Strate LL, Syngal S. Timing of colonoscopy: impact on length of hospital stay in patients with acute lower intestinal bleeding. *Am J Gastroenterol* 2003;98(2):317–322. doi:10.1111/j.1572-0241.2003.07232.x, PMID:12591048.
  - [14] Davila RE, Rajan E, Adler DG, Egan J, Hirota WK, Leighton JA, *et al*. ASGE Guideline: the role of endoscopy in the patient with lower-GI bleeding. *Gastrointest Endosc* 2005;62(5):656–660. doi:10.1016/j.gie.2005.07.032, PMID:16246674.
  - [15] Schmulewitz N, Baillie J. Dieulafoy lesions: A review of 6 years of experience at a tertiary referral center. *Am J Gastroenterol* 2001;96(6):1688–1694. doi:10.1111/j.1572-0241.2001.03922.x, PMID:11419815.
  - [16] Tee HP, Kaffes AJ. Non-small-bowel lesions encountered during double-balloon enteroscopy performed for obscure gastrointestinal bleeding. *World J Gastroenterol* 2010;16(15):1885–1889. doi:10.3748/wjg.v16.i15.1885, PMID:20397267.
  - [17] Kusnik A, Mostafa MR, Sharma RP, Chodos A. Dieulafoy Lesion: Scope it until you find it. *Cureus* 2023;15(3):e36097. doi:10.7759/cureus.36097, PMID:37065413.
  - [18] Innocenti T, Dragoni G, Roselli J, Macri G, Mello T, Milani S, *et al*. Non-small-bowel lesions identification by capsule endoscopy: A single centre retrospective study. *Clin Res Hepatol Gastroenterol* 2021;45(1):101409. doi:10.1016/j.clinre.2020.03.011, PMID:32245690.
  - [19] Strate LL, Naumann CR. The role of colonoscopy and radiological procedures in the management of acute lower intestinal bleeding. *Clin Gastroenterol Hepatol* 2010;8(4):333–343, quiz e44doi:10.1016/j.cgh.2009.12.017, PMID:20036757.
  - [20] Yamada A, Niikura R, Yoshida S, Hirata Y, Koike K. Endoscopic management of colonic diverticular bleeding. *Dig Endosc* 2015;27(7):720–725. doi:10.1111/den.12534, PMID:26258405.
  - [21] Lu Z, Sun X, Zhang W, Jin B, Han J, Wang Y, *et al*. Second urgent endoscopy within 48-hour benefits cirrhosis patients with acute esophageal variceal bleeding. *Medicine (Baltimore)* 2020;99(11):e19485. doi:10.1097/MD.00000000000019485, PMID:32176084.
  - [22] Gerson LB, Fidler JL, Cave DR, Leighton JA. ACG Clinical Guideline: Diagnosis and Management of Small Bowel Bleeding. *Am J Gastroenterol* 2015;110(9):1265–1287. doi:10.1038/ajg.2015.246, PMID:26303132.
  - [23] Akerman PA, Cantero D. Spiral enteroscopy and push enteroscopy. *Gastrointest Endosc Clin N Am* 2009;19(3):357–69. doi:10.1016/j.giec.2009.04.001, PMID:19647645.
  - [24] Enns RA, Hookey L, Armstrong D, Bernstein CN, Heitman SJ, Teshima C, *et al*. Clinical Practice Guidelines for the Use of Video Capsule Endoscopy. *Gastroenterology* 2017;152(3):497–514. doi:10.1053/j.gastro.2016.12.032, PMID:28063287.
  - [25] Schwab SJ, Hlatky MA, Pieper KS, Davidson CJ, Morris KG, Skelton TN, *et al*. Contrast nephrotoxicity: a randomized controlled trial of a nonionic and an ionic radiographic contrast agent. *N Engl J Med* 1989;320(3):149–153. doi:10.1056/NEJM198901193200304, PMID:2643042.
  - [26] Foley PT, Ganeshan A, Anthony S, Uberoi R. Multi-detector CT angiography for lower gastrointestinal bleeding: Can it select patients for endovascular intervention? *J Med Imaging Radiat Oncol* 2010;54(1):9–16. doi:10.1111/j.1754-9485.2010.02131.x, PMID:20377709.
  - [27] García-Blázquez V, Vicente-Bártulos A, Olavarria-Delgado A, Plana MN, van der Winden D, Zamora J, *et al*. Accuracy of CT angiography in the diagnosis of acute gastrointestinal bleeding: systematic review and meta-analysis. *Eur Radiol* 2013;23(5):1181–1190. doi:10.1007/s00330-012-2721-x, PMID:23192375.
  - [28] Gerson LB. Small Bowel Bleeding: Updated Algorithm and Outcomes. *Gastrointest Endosc Clin N Am* 2017;27(1):171–180. doi:10.1016/j.giec.2016.08.010, PMID:27908516.
  - [29] Descamps C, Schmit A, Van Gossum A. “Missed” upper gastrointestinal tract lesions may explain “occult” bleeding. *Endoscopy* 1999;31(6):452–455. doi:10.1055/s-1999-151, PMID:10494684.
  - [30] Gralnek IM, Dumonceau JM, Kuipers EJ, Lanás A, Sanders DS, Kurien M, *et al*. Diagnosis and management of nonvariceal upper gastrointestinal hemorrhage: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. *Endoscopy* 2015;47(10):a1–46. doi:10.1055/s-0034-1393172, PMID:26417980.
  - [31] Sung JJ, Chiu PW, Chan FKL, Lau JY, Goh KL, Ho LH, *et al*. Asia-Pacific working group consensus on non-variceal upper gastrointestinal bleeding: an update 2018. *Gut* 2018;67(10):1757–1768. doi:10.1136/gutjnl-2018-316276, PMID:29691276.
  - [32] Park SJ, Park H, Lee YC, Choi CH, Jeon TJ, Park JC, *et al*. Effect of scheduled second-look endoscopy on peptic ulcer bleeding: a prospective randomized multicenter trial. *Gastrointest Endosc* 2018;87(2):457–465. doi:10.1016/j.gie.2017.07.024, PMID:28735835.
  - [33] Keswani RN, Crockett SD, Calderwood AH. AGA Clinical Practice Update on Strategies to Improve Quality of Screening and Surveillance Colonoscopy: Expert Review. *Gastroenterology* 2021;161(2):701–711. doi:10.1053/j.gastro.2021.05.041, PMID:34334168.
  - [34] Park JM, Lim CH, Cho YK, Lee BI, Cho YS, Song HJ, *et al*. The effect of photo-documentation of the ampulla on neoplasm detection rate during esophagogastroduodenoscopy. *Endoscopy* 2019;51(2):115–124. doi:10.1055/a-0662-5523, PMID:30184610.
  - [35] Laine L, Jensen DM. Management of patients with ulcer bleeding. *Am J Gastroenterol* 2012;107(3):345–360. doi:10.1038/ajg.2011.480, PMID:22310222.
  - [36] Patel A, Vedantam D, Poman DS, Motwani L, Asif N. Obscure Gastrointestinal Bleeding and Capsule Endoscopy: A Win-Win Situation or Not? *Cureus* 2022;14(7):e27137. doi:10.7759/cureus.27137, PMID:36017285.
  - [37] Kurien M, Lobo AJ. Acute upper gastrointestinal bleeding. *Clin Med (Lond)* 2015;15(5):481–485. doi:10.7861/clinmedicine.15-5-481, PMID:26430191.
  - [38] Strate LL, Gralnek IM. ACG Clinical Guideline: Management of Patients With Acute Lower Gastrointestinal Bleeding. *Am J Gastroenterol* 2016;111(5):755. doi:10.1038/ajg.2016.155, PMID:27151132.
  - [39] Johnson DA, Barkun AN, Cohen LB, Dominitz JA, Kaltenbach T, Martel M, *et al*. Optimizing adequacy of bowel cleansing for colonoscopy: recommendations from the US Multi-Society Task Force on Colorectal Cancer. *Am J Gastroenterol* 2014;109(10):1528–1545. doi:10.1038/ajg.2014.272, PMID:25223578.
  - [40] Kaminski MF, Regula J, Kraszewska E, Polkowski M, Wojciechowska U, Didkowska J, *et al*. Quality indicators for colonoscopy and the risk of interval cancer. *N Engl J Med* 2010;362(19):1795–1803. doi:10.1056/

- NEJMoa0907667, PMID:20463339.
- [41] Mizuki A, Tatemichi M, Nagata H. Management of Diverticular Hemorrhage: Catching That Culprit Diverticulum Red-Handed!. *Inflamm Intest Dis* 2018;3(2):100–106. doi:10.1159/000490387, PMID:30733954.
- [42] Mizuki A, Tatemichi M, Nakazawa A, Tsukada N, Nagata H, Kanai T. Identification of diverticular bleeding needs early colonoscopy rather than preparation. *Endosc Int Open* 2022;10(1):E50–E55. doi:10.1055/a-1630-6175, PMID:35047334.
- [43] Chaudhry V, Hyser MJ, Gracias VH, Gau FC. Colonoscopy: the initial test for acute lower gastrointestinal bleeding. *Am Surg* 1998;64(8):723–728. PMID:9697900.