International Journal of Chemical and Biochemical Sciences
(ISSN 2226-9614)

Journal Home page: www.iscientific.org/Journal.html

Endoscopic Hemostasis in Ulcerative Gastroduodenal Bleeding

Nurlan Jaxymbaev[1], Talaybek Baysekeev[2], En Djun Choi[3], Orozali Kochorov[4], Kasymbek Mukanbaev[5], Alybek Turkmenov[2]*

[1]*Kyrgyz State Medical Institute of post-graduate training and continuous education named S. B. Daniyarov, 144a Bokonbaeva str., Bishkek, 720017, Kyrgyz Republic.*

[2]*Akhunbaev Kyrgyz State Medical Academy, 92 Akhunbaev str., Bishkek, 720020, Kyrgyz Republic.*

[3]*Royal Metropolitan University, 172 Moskoskaya str., Bishkek, 720010, Kyrgyz Republic.*

[4]*Kyrgyz-Russian Slavic University named after B. N. Yeltsin, 44 Kiyevskaya str., Bishkek, 720000, Kyrgyz Republic.*

[5]*National Center for Phthisiology, 90a Isa Akhunbaev str., Bishkek, 720075, Kyrgyz Republic.*

Abstract

Acute gastroduodenal bleeding is a life-threatening condition for patients which remains relatively understudied in Kazakhstan and Kyrgyzstan. This study aimed to analyze contemporary global literature on endohemostasis methods for treating peptic gastroduodenal bleeding. The authors analyzed various studies covering diverse endohemostasis methods using PubMed and Google Scholar electronic databases. Our search returned over 800 sources, from which the authors selected and included 67 relevant ones based on keywords, with 63 of them published within the last 5 years. Endohemostasis methods for treating peptic gastroduodenal bleeding remain important areas of research in medicine. However, more evidence-based, substantial, and scientifically justified studies are required. The review holds significance both theoretically and practically for medical practice in Kazakhstan and Kyrgyzstan.

Keywords: Peptic gastroduodenal bleeding, endohemostasis, gastrointestinal bleeding, hemostasis

Full length article **Corresponding Author*, e-mail: *ndzhaksymbayev@bk.ru*

1. Introduction

Acute gastroduodenal ulcerative bleeding is a life-threatening condition [1, 2, 3]. Upper gastrointestinal tract (GIT) bleeding (UGIB) refers to the bleeding above the Treitz ligament. With a prevalence of 50 to 100 cases per 100,000 population, this is a common pathology with an average age of 60-70 years. The mortality rate ranges from 3 to 14%, and for intensive care patients from 42 to 64%. In about 50% of cases, UGIB is the result of a peptic ulcer, such as a peptic ulcer of the stomach or duodenum. Other causes include bleeding from the esophagus or stomach tumors, Mallory-White syndrome, erosive gastritis or duodenitis, reflux esophagitis, angiodysplasia, and iatrogenic or post-traumatic changes. The probability of lower GIT bleeding (LGIB) outside the Treitz ligament, the prevalence of which is approximately 20-30 per 100,000 population, and the average age of the patients is 65-80 years, increases sharply with age. The mortality rate from it ranges from 2 to 5%. Etiologically, LGIB may be associated with causes such as diverticulitis, angiodysplasia, polyps, tumors, proctitis, or chronic inflammatory bowel disease [4].

Thus, the main cause of gastrointestinal bleeding is the bleeding from gastroduodenal ulcers [5]. According to an analysis of 4,474 patients from 212 hospitals in the United Kingdom as part of a nationwide audit, ulcerative GIT bleeding had worse outcomes than non-ulcerative bleeding [6]. According to meta-analysis, one in five patients with gastrointestinal bleeding develops shock or hemodynamic instability upon admission or during hospitalization [7]. Endoscopic hemostasis (EH) is sometimes the only method of local impact on the source of bleeding in case of intolerance to surgical intervention [8]. Devices used for EH in the GIT can be divided into injection (needles), thermal (multipolar/bipolar probes, hemostatic forceps, probe heater, argonoplasmic coagulation (APC), radiofrequency ablation and cryotherapy), mechanical (clamps (clips), stitching devices, banding devices, stents) and local devices (hemostatic sprays) [9]. According to the analysis of the results of EH in 770 patients with peptic ulcers, in case of recurrent bleeding, EH is an effective alternative to surgical intervention, especially in high-risk patients. Repeated EH significantly reduces mortality from 45 to 23% in case of repeated bleeding [10].

Nevertheless, despite the improvement of endoscopic and pharmacological therapy, bleeding continues or recurs in more than 10% of patients after initial EH [11] and is generally associated with a twofold increase in 30-day mortality [12]. The above speaks in favor of the relevance of the search for safer and more effective means of endohemostasis. Despite the urgency of the problem of endohemostasis in patients with peptic ulcer gastroduodenal bleeding, there are practically no well-written review articles on this topic in the literature published in Kazakhstan and Kyrgyzstan. The work aimed to characterize the current state of the global literature on current and promising methods of endohemostasis for peptic ulcer gastroduodenal bleeding.

2. Materials and methods

We analyzed studies on various means of endohemostasis based on the materials of PubMed and Google Scholar electronic databases. Over 800 sources were found, 67 of which were selected and included in the study, considering the keywords ("ulcerative gastroduodenal bleeding" and "endohemostasis"), of which 63 sources were published in the last 5 years.

3. Results and discussion

EH is sometimes the only method of local impact on the source of bleeding in case of intolerance to surgical intervention [8]. However, there are a small number of cases in which EH is impossible, despite the use of various methods of hemostasis. Predictors of difficulties in EH are Ia bleeding according to the Forrest classification, ulcers with a diameter of more than 2 cm, and hemodynamic shock [5]. Contraindications to endovascular therapy, such as contrast agent allergy, hyperthyroidism, pregnancy, sepsis, acute renal failure, and consumption coagulopathy, should be considered as relative contraindications, especially in acute threatening situations. Depending on the intensity of the bleeding, it is necessary to consider the possible advantages of surgical treatment [4]. Devices used for GIT EH can be divided into injection devices (needles), thermal devices (multipolar/bipolar probes, hemostatic forceps, probe heater, APC, radiofrequency ablation, and cryotherapy), mechanical devices (clamps, stitching devices, banding devices, stents), and local hemostasis devices (hemostatic sprays) [9].

4. Injectable EH

Modern literature mentions the value of injectable EH in ulcerative GIT bleeding [13, 14]. Injections of diluted adrenaline and saline solution are usually included in the strategy of endoscopic treatment of ulcerative bleeding of the GIT. It is believed that the therapeutic mechanism of action of these injectable agents is due to their tamponade effect on the surrounding tissues and not the vasoactive properties of adrenaline. In a retrospective analysis of 605 patients, it was shown that combination therapy had a higher hemostatic efficacy than monotherapy with epinephrine injections in patients with visible blood vessel ulcers (FIIa). However, monotherapy with epinephrine injections was as effective as combination therapy for patients with bleeding ulcers [15]. According to the EH data of 132 patients with bleeding peptic ulcers of class Ia, Ib, and IIa according to Forrest, epinephrine injection retains an important role in the treatment of bleeding ulcers, but large volumes, up to 10-20 ml, are not associated with improved bleeding outcomes in individuals receiving combined endoscopic therapy [16]. Additional agents such as cyanoacrylate adhesives, thrombin, and fibrin are available [2]. In a study of 154 patients with high-risk refractory ulcerative bleeding with traditional endoscopic therapy, endoscopic intracellular cyanoacrylate injection was performed for the first time and its performance and safety were proven with a high frequency of successful hemostasis [17]. However, additional agents are not often used in the treatment [2].

5. Thermal EH

EH can be achieved by applying heat or cold to the bleeding site. Heat causes hemostasis, resulting in edema, protein coagulation, vasoconstriction, and indirect activation of the blood clotting cascade. For thermal coagulation of tissues, a temperature of approximately 70°C is required. Thermal devices used for GIT EH are traditionally divided into contact (bipolar/multipolar electrocoagulation, probe heater, and hemostatic forceps) and non-contact devices (APC) [9]. As for electrocoagulation methods, multipolar or bipolar approaches are preferably used, since they are safer and more economical. As for safety, multipolar electrocoagulation (MPEC) devices and bipolar cauterization devices provide power supply within a fixed circuit and stop working as soon as the temperature of the dried tissue reaches 100°C, thereby limiting the depth of tissue damage with rare cases of perforation. On the contrary, the heating sensors provide a constant temperature (250°C) for a specified time and do not stop working until a specified amount of energy is supplied. Thus, heating probes can cause unpredictable damage depth and lead to a higher perforation frequency, estimated to reach 3% of use cases. MPEC is also gaining popularity due to its ease of use; electric current is supplied locally, and there is no need to provide protective earthing to the patient, as is required in devices with heating probes. As for the cost of one device, the cost of currently available MPEC probes ranges from $230 to $335, while the cost of available heating probes exceeds $500 per probe [2].

In a study of 112 patients, higher efficiency of monopolar hemostatic forceps for gentle coagulation (MPGFGC) was noted in comparison with hemoclips (HC) in the treatment of UGIB associated with peptic ulcer disease. The initial success rate of hemostasis was 98.2% (55/56) in the MPGFGC group and 80.4% (45/56) in the HC group (P=0.004). Recurrent bleeding was detected in two patients in the MPGFGC group (3.6%) and in eight patients in the HC group (17.7%; P=0.04). The duration of endoscopic procedures (302±87.8 vs. 568±140.4 seconds) and the duration of hospital stay (3.50±1.03 vs. 4.37±1.86 days) were significantly shorter in the MPGFGC group. No adverse events (AEs) were observed in either group [18], and in a systematic review and meta-analysis, it was concluded that MPGFGC was superior to HCs, heating probes, and APC to achieve initial hemostasis and reduce recurrent bleeding in patients with ulcerative bleeding [19]. As for the APC, a retrospective analysis of 53 patients stated that EH with tumor bleeding in the GIT with APC did not significantly affect 30-day recurrent bleeding and mortality rates, regardless of the patient's state of health [20].

6. Mechanical EH

Clipping is a popular means of mechanical EH [21].

There are through-the-scope clips (TTSC) with different versions, in particular, a recent study compared five commercially available TTS clips (Instinct, Cook Medical; Resolution, Boston Scientific, Marlboro, Massachusetts, USA; DuraClip, ConMed, Largo, Florida, USA; SureClip, Micro-Tech, Ann Arbor, Michigan, USA; QuickClip Pro, Olympus, Center Valley, Pennsylvania, USA) [22]. However, the main disadvantage of TTSCs is their small size, which allows them to compress a limited amount of tissue necessary for the treatment of large vessels. More popular clips are OTSC (over-the-scope clips), which allow for greater and stronger mechanical compression of large areas of tissues with excellent results in achieving final hemostasis in complex cases [23-29]. OTSCs are also safe and effective in the pediatric population for acute ulcerative gastrointestinal bleeding, as described in a retrospective series of 10 observations [30]. In a prospective randomized study, it was said that endoscopic treatment with OTSC endoclips was superior to standard therapy (where combined EH was used with TTSC endoclips, thermal therapy, and dilute adrenaline injections) in patients with recurrent ulcerative bleeding. Persistent bleeding after hemostasis was observed in 14 patients (42.4%) in the standard therapy group and two patients (6.0%) in the OTSC group (P=.001). Repeated bleeding within 7 days occurred in five patients (16.1%) in the standard therapy group versus three patients (9.1%) in the OTSC group (P=.468). Further bleeding occurred in 19 patients (57.6%) in the standard therapy group and in five patients (15.2%) in the OTSC group (absolute difference 42.4%; 95% confidence interval 21.6-63.2; P=.001) During 30 days of follow-up, one patient in the standard therapy group (3.0%) and one patient in the OTSC group (3.0%) required surgical treatment (P=.999). Within 30 days after the procedure, two patients died in the standard therapy group (6.3%) and four patients died in the OTSC group (12.1%) (P=.672). No significant differences were found in other secondary endpoints [31].

However, according to a retrospective analysis of 95 patients, no significant difference was found in the frequency of preventing recurrent bleeding (95.6% vs. 91.8%, p=0.678), hospital days (3 days vs. 4 days; p=0.215) and hospitalization costs (US$ 108,000 vs. US$ 240,000, p=0.215) in the OTSC group compared to the combination therapy group (TTSC with epinephrine injection). Nevertheless, the average time of the OTSC procedure was shorter than with combined therapy (11 min vs. 20 min; p<0.001) [32]. Moreover, according to the multicenter international randomized controlled trial (RCT) on patients with peptic ulcers of Forest IIa class or higher with a size of ≥1.5 cm, routine use of OTSC as a primary hemostasis agent for extensive bleeding peptic ulcers is not associated with a significant reduction in recurrent bleeding after 30 days [33]. Nevertheless, as for the costs of hospitalization, according to the prospective STING RCT, complex treatment with OTSC endoclips is cost-effective for recurrent bleeding from peptic ulcer disease [34]. Another, but less common EH means is endoscopic ligation (EL). Dieulafoy lesions (DL) are abnormally large arterial lesions that do not decrease in size as they exit the submucosa to the surface of the mucous membrane. Endoscopic treatment is one of the foundations of the therapy of actively bleeding DLs. According to a meta-analysis of 75 patients, EL is an effective procedure for the treatment of gastrointestinal bleeding secondary to DLs. In this meta-analysis, the success rate of primary hemostasis with EL in bleeding DLs was 0.96 [95% confidence interval (CI): 0.88-0.99]. The frequency of bleeding recurrence in patients treated with EL was 0.06 (95% CI: 0.02-0.15) [35]. We also note the method of endoscopic suturing (ES) for ulcerative GIT bleeding [36, 37]. An international series of observations of 10 patients has shown that ES is a safe and effective method of achieving EH. ES should be considered a life-saving endoscopic therapy when primary EH does not allow for bleeding control or when bleeding recurs after successful bleeding control. In this series, the primary result was the rate of immediate hemostasis and the frequency of early recurrent bleeding (within 72 hours). Secondary outcomes included technical success, delayed recurrent bleeding (>72 hours), and frequency of AEs. Nine (90%) previously had unsuccessful EH, on average 1.4±0.7 (range 1-3) of previous endoscopic sessions. Forrest's classification was Ib in five patients (50%), IIa in three (30%), IIb in one (10%), and IIc in one (10%). The average suturing time was 13.4±5.6 (in the range from 3.5 to 20) minutes. Technical success equaled 100%. The frequency of immediate hemostasis was 100%, and the frequency of early recurrent bleeding was 0%. The average number of stitches was 1.5 (range from 1 to 4). No AEs were observed. Delayed recurrent bleeding was not observed in any case after an average of 11 months (range from 2 to 56) after ES [38].

In a prospective analysis of 38 patients, it was concluded that special endoscopic pouch sutures were safe and effective in the treatment of patients with a high risk of ulcerative bleeding. All patients had a high risk of developing stomach ulcers larger than 1 cm, including Forrest Ia (n=4, 10.5%), Forrest Ib (n=13, 34.2%), and Forrest IIa (n=21, 55.3%). Endoscopic pouch sutures were applied to all patients. The clinical success rate reached 89.5%. Three patients had repeated bleeding within seven days, and they underwent surgery or arterial embolization, after which the bleeding stopped in all patients. One patient died of a myocardial infarction. All other patients were monitored for 30 days without bleeding [39].

7. Local EH

Mechanical and thermal EH types are effective, especially when the source of bleeding is localized, and the endoscopist can effectively direct focal therapy. However, with hard-to-reach and diffuse bleeding, achieving hemostasis using the above-mentioned devices can be a difficult task. The literature emphasizes the role of special hemostatic sprays and special powders in ulcerative GIT bleeding [40-44]. In a retrospective review of a total of 56 patients, UI-EWD hemostatic spray had a high probability of immediate successful hemostasis as monotherapy and showed promising results in terms of preventing recurrent bleeding. The success rate of immediate hemostasis was 96.4% (54/56), and the frequency of recurrent bleeding after 30 days among patients who achieved immediate hemostasis was 3.7% (2/54). No side effects occurred [45]. The use of the Hemospray hemostatic spray should be carried out by experienced endoscopists, which is especially true in a cohort of seriously ill patients since although the use of Hemospray is technically feasible, it is associated with a high risk of recurrent bleeding in seriously ill patients [46]. Another promising hemostatic spray is the Endoclot, the role of which was noted in the analysis of the results of 43 patients: the

percentage of hemostasis was 90.4% (in 19 of 21 patients) [47]. As for the comparative indicators of Hemospray and Endoclot, it is stated that they show equivalent results within 72 hours and 30 days [48]. A prospective multicenter RCT states the equivalent effectiveness of polysaccharide hemostatic powder (PHP) in comparison with traditional endoscopic methods of treatment (which included the use of electrocoagulation or hemoclips after injection of diluted adrenaline) of bleeding from a peptic ulcer. Two hundred and sixteen patients were divided into two groups: 105 in the PHP group and 111 in the control group. Initial hemostasis was achieved in 92 out of 105 patients (87.6%) in the PHP group and 96 out of 111 patients (86.5%) in the control group. Recurrent bleeding did not differ between the two groups. In subgroup analysis, the frequency of initial hemostasis disorders in the control group was 13.6% in Forrest IIa cases; however, there were no initial hemostasis disorders in the PHP group (P=0.023). Large ulcer size (≥15 mm) and chronic kidney disease requiring dialysis were independent risk factors for recurrent bleeding after 30 days. No side effects associated with the use of PHP were detected [41].

Some studies mention the role of hemostatic spray TC-325 [49, 50]. According to a multicenter data registry of 202 patients from 14 centers in the UK, France, Germany, and the USA, the use of TC-325 hemostatic spray was accompanied by high rates of immediate hemostasis in bleeding peptic ulcers. Immediate hemostasis was achieved in 178/202 patients (88%), 26/154 (17%) after repeated bleeding, 21/175 (12%) died within 7 days, and 38/175 (22%) died within 30 days (all-cause mortality). Combination therapy with hemostatic spray with other endoscopic methods was accompanied by lower 30-day mortality (16%, P<0.05) compared with monotherapy or restorative therapy. In all classifications of Forrest's peptic ulcer disease, high rates of immediate hemostasis were observed [51]. In a multicenter study involving 17 centers and 105 patients, TC-325 hemostatic spray provided high rates of immediate hemostasis with comparable rates of recurrent bleeding after treatment of tumor-related bleeding from the GIT [52]. The economic analysis concluded that hemostatic spray TC-325 increased the effectiveness of traditional hemostasis and was less expensive in most groups of patients with ulcerative gastrointestinal bleeding. In this analysis, four possible treatment strategies were taken into account: only traditional therapy (T), only hemostatic spray (H), traditional therapy supplemented with hemostatic spray, if necessary (T+H), or hemostatic spray supplemented with traditional therapy, if necessary (H+T). For all patients, T+H was more effective (97% managed to avoid repeated bleeding) and less expensive (the average cost per patient was $9,150) than all other approaches. The second most cost-effective approach was H+T (5.57% less effective and $635 more expensive per patient). Sensitivity analysis has shown that T+H, followed by the H+T strategy, remains more cost-effective than only H or T, with variation of all probabilistic assumptions in acceptable ranges. The analysis of the subgroups showed that the inclusion of H (especially separately) was the least adapted for the treatment of ulcers and was more cost-effective in the treatment of lesions with a low risk of delayed recurrent bleeding [53]. The role of the Doppler endoscopic probe (DEP) is noted in the structure of the means of local endohemostasis. In RCTs of patients with severe ulcerative bleeding from the GIT, it was shown that EH under the control of DEP significantly reduced the frequency of repeated bleeding within 30 days compared with standard hemostasis under visual control [54]. According to meta-analysis, DEP improves the visual prognosis of recurrent bleeding in gastrointestinal ulcerative bleeding, while treatment with DEP leads to a decrease in total recurrent bleeding, mortality associated with bleeding, and the need for surgical intervention [55]. Self-assembling peptide (SSP), which is becoming increasingly available in the United States is considered another relevant and promising tool from the point of view of the importance of improving visualization when using hemospreys. When applied to the affected area, this gel forms an extracellular matrix-type structure that provides hemostasis. A systematic review and meta-analysis of 7 studies involving 427 patients showed that the use of SSP was a safe and effective treatment method. Moreover, this method provides an additional advantage in the form of improved visualization compared to new methods based on spraying. It was shown that SSP was technically successful in all 427 patients. The calculated total rate of successful hemostasis was 93.1% (95% CI 84.7-97.0, I2=73.6), and the frequency of recurrent bleeding was 8.9% (95% CI 5.3-14.4, I2=55.8). The total indicators of hemostasis during SSP monotherapy and combination therapy were similar. There were no side effects associated with SSP [56].

8. Prediction and prevention of recurrence of ulcerative GIT bleeding

Ulcerative GIT bleeding represents a significant clinical and economic burden, and recurrent bleeding is one of the most important predictors of morbidity and mortality. Identification of patients who are likely to have recurrent bleeding is an essential component of the effective management of patients with bleeding peptic ulcers [57-63]. Special scoring scales, such as the Rockall scale, are of great importance. In the analysis of 368 patients, it was said that patients with Rockall scores ≥6 were at risk of prolonged recurrent bleeding from peptic ulcer disease. The risk can be independently increased by the presence of activated partial thromboplastin time increased by more than 1.5 times, the American Society of Anesthesiologists class ≥III and gastric ulcer in patients with Rockall scores ≥6 [64]. In a prospective study, the prognostic indicators of the main outcomes in 243 cancer patients were compared, according to which the AIMS65 index (area under the curve [AUC] 0.85) showed the best results in predicting admission to the intensive care unit, while the Glasgow-Blatchford index was the best in predicting blood transfusion (AUC 0.82) and the low-risk group (AUC 0.92). All indicators did not allow for predicting hemostatic therapy and repeated bleeding. The new indicator was higher (AUC 0.74) when predicting hemostatic therapy. The AIMS65 index (AUC 0.84) was the best predictor of in-hospital mortality [65]. According to the results of the analysis of 512 patients, the AIMS65 scoring scale was comparable to the Glasgow-Blatchford score (GBS) or Rockall scoring systems when predicting mortality, recurrent bleeding, or admission to the intensive care unit. Since AIMS65 is a much simpler and easily calculated scoring system compared to others, researchers recommended using AIMS65 in everyday practice [66].

In modern literature, the role of machine programs based on artificial intelligence (AI) in predicting the risk of

recurrence of ulcerative GIT bleeding, as well as the main outcomes associated with this recurrence, is noted. Based on the results of the analysis of a retrospective cohort of 22,854 patients, an IPU-ML machine program was built to predict recurrent ulcerative bleeding. The IPU-ML model, based on six parameters (age, baseline hemoglobin level, and the presence of gastric ulcers, gastrointestinal diseases, malignant neoplasms, and infections), identified patients with recurrent bleeding within 1 year with an area under the receiver performance curve (AUROC) equal to 0.648. When setting the threshold value of IPU-ML equal to 0.20, 27.5% of patients were classified as patients with a high risk of recurrent bleeding with a sensitivity of 41.4%, specificity of 74.6%, and a negative prognostic value of 91.1%. In the validation cohort, the IPU-ML machine program identified patients with recurrent ulcerative bleeding for 1 year with an AUROC of 0.775 and an overall accuracy of 84.3% [67].

9. Conclusions

EH methods in ulcerative gastroduodenal bleeding remain an urgent problem of modern medicine. These methods are controversial, and therefore, more evidence-based, weighty, and scientifically based studies are required. This review has theoretical and practical significance for such republics as Kazakhstan and Kyrgyzstan.

References

[1] I. Rácz. (2023). Az akut gastroduodenalis fekélyvérzés gyógyszeres és endoszkópos kezelésének újabb szempontjai [Recent aspects of pharmaceutical and endoscopic treatment of acute gastroduodenal ulcer bleeding]. Orvosi Hetilap. 164(23): 883-890. (in Hungarian) https://doi.org/10.1556/650.2023.32808

[2] A. Kichler, & S. Jang. (2019). Endoscopic hemostasis for non-variceal upper gastrointestinal bleeding: New frontiers. Clinical Endoscopy. 52(5): 401-406. https://doi.org/10.5946/ce.2018.103

[3] A.V. Poznyak, M.B. Ekta, V.N. Sukhorukov, M. Popov, & A.V. Grechko (2024). The Benefits of Selected Nutritional Compounds Towards Atherosclerosis Management. OnLine Journal of Biological Sciences, 24(1): 48-63. https://doi.org/10.3844/ojbsci.2024.48.63

[4] A. M. Augustin, F. Fluck, Th. Bley, & R. Kickuth. (2019). Endovascular therapy of gastrointestinal bleeding. Rofo. 191(12): 1073-1082. https://doi.org/10.1055/a-0891-1116

[5] S. Tanabe. (2022). Endoscopic hemostasis for nonvariceal upper gastrointestinal bleeding. Digestive Endoscopy. 34(S2): 61-63. https://doi.org/10.1111/den.14165

[6] M. S. L. Sey, S. B. Mohammed, M. Brahmania, S. Singh, B. C. Kahan, & V. Jairath. (2019). Comparative outcomes in patients with ulcer- vs non-ulcer-related acute upper gastrointestinal bleeding in the United Kingdom: A nationwide cohort of 4474 patients. Alimentary Pharmacology and Therapeutics. 49(5): 537-545. https://doi.org/10.1111/apt.15092

[7] M. Obeidat, B. Teutsch, A. Rancz, E. Tari, K. Márta, D. S. Veres, N. Hosszúfalusi, E. Mihály, P. Hegyi, & B. Erőss. (2023). One in four patients with gastrointestinal bleeding develops shock or hemodynamic instability: A systematic review and meta-analysis. World Journal of Gastroenterology. 29(28): 4466-4480. https://doi.org/10.3748/wjg.v29.i28.4466

[8] Kh. A. Akilov, N. T. Urmanov, M. A. Khoshimov, & A. B. Eshmuradov. (2020). Endoscopic hemostasis at gastroduodenal bleeding of ulcer etiology in children. American Journal of Medicine and Medical Sciences. 10(11): 914-918.

[9] ASGE technology committee; M. A. Parsi, A. R. Schulman, H. R. Aslanian, M. S. Bhutani, K. Krishnan, D. R. Lichtenstein, J. Melson, U. Navaneethan, R. Pannala, A. Sethi, G. Trikudanathan, A. J. Trindade, R. R. Watson, J. T. Maple, ASGE Technology Committee Chair. (2019). Devices for endoscopic hemostasis of nonvariceal GI bleeding (with videos). VideoGIE. 4(7): 285-299. https://doi.org/10.1016/j.vgie.2019.02.004

[10] N. V. Lebedev, A. E. Klimov, & V. A. Petukhov. (2016). Repeated endoscopic hemostasis as an alternative to surgical treatment of patients with gastroduodenal ulcerative bleeding. Khirurgiia. 6: 52-56. (in Russian) https://doi.org/10.17116/hirurgia2016652-56

[11] A. Roy, M. Kim, R. Hawes, & S. Varadarajulu. (2017). The clinical and cost implications of failed endoscopic hemostasis in gastroduodenal ulcer bleeding. United European Gastroenterology Journal. 5(3): 359-364. https://doi.org/10.1177/2050640616663570

[12] S. B. Laursen, A. J. Stanley, L. Laine, & O. B. Schaffalitzky de Muckadell. (2022). Rebleeding in peptic ulcer bleeding - A nationwide cohort study of 19,537 patients. Scandinavian Journal of Gastroenterology. 57(12): 1423-1429. https://doi.org/10.1080/00365521.2022.2098050

[13] O. Belei, L. Olariu, M. Puiu, C. Jinca, C. Dehelean, T. Marcovici, & O. Marginean. (2018). Continuous esomeprazole infusion versus bolus administration and second look endoscopy for the prevention of rebleeding in children with a peptic ulcer. Revista Española Enfermedades Digestivas. 110(6): 352-357. https://doi.org/10.17235/reed.2018.4864/2017

[14] T. Akay, & M. Leblebici. (2021). Comparison of high and low-dose epinephrine & endoclip application in peptic ulcer bleeding: A case series analysis observational study. Medicine. 100(52): e28480. https://doi.org/10.1097/MD.0000000000028480

[15] J. Wang, S. He, G. Shang, N. Lv, X. Shu, & Z. Zhu. (2023). Epinephrine injection monotherapy shows similar hemostatic efficacy to epinephrine injection combined therapy in high-risk patients (Forrest Ib) with bleeding ulcers. Surgical Endoscopy. 37(9): 6954-6963. https://doi.org/10.1007/s00464-023-10152-4

[16] S. Saffo, & A. Nagar. (2022). Impact of epinephrine volume on further bleeding due to high-risk peptic ulcer disease in the combination therapy era. World Journal of Gastrointestinal Pharmacology and

Therapeutics. 13(5): 67-76. https://doi.org/10.4292/wjgpt.v13.i5.67

[17] H. Mou, C. Zou, G. Shi, S. Wu, R. Xie, X. Liu, J. Yang, & B. Tuo. (2023). Endoscopic cyanoacrylate injection therapy for refractory high-risk peptic ulcer bleeding by conventional endoscopic therapy. Scandinavian Journal of Gastroenterology. 58(4): 331-338. https://doi.org/10.1080/00365521.2022.2132535

[18] B. Toka, A. T. Eminler, C. Karacaer, M. I. Uslan, A. S. Koksal, & E. Parlak. (2019). Comparison of monopolar hemostatic forceps with soft coagulation versus hemoclip for peptic ulcer bleeding: A randomized trial (with video). Gastrointestinal Endoscopy. 89(4): 792-802. https://doi.org/10.1016/j.gie.2018.10.011

[19] F. Kamal, M. A. Khan, R. Tariq, M. K. Ismail, C. Tombazzi, & C. W. Howden. (2020). Systematic review and meta-analysis: Monopolar hemostatic forceps with soft coagulation in the treatment of peptic ulcer bleeding. European Journal of Gastroenterology & Hepatology. 32(6): 678-685. https://doi.org/10.1097/MEG.0000000000001738

[20] B. C. Martins, S. Wodak, C. C. Gusmon, A. V. Safatle-Ribeiro, F. S. Kawaguti, E. R. Baba, C. M. Pennacchi, M. S. Lima, U. Ribeiro Jr, & F. Maluf-Filho. (2016). Argon plasma coagulation for the endoscopic treatment of gastrointestinal tumor bleeding: A retrospective comparison with a non-treated historical cohort. United European Gastroenterology Journal. 4(1): 49-54. https://doi.org/10.1177/2050640615590303

[21] P. Wander, D. Castaneda, L. D'Souza, S. Singh, S. Serouya, A. I. Velazquez, R. Mamun, R. Voaklander, P. Benias, & D. L. Carr-Locke. (2018). Single center experience of a new endoscopic clip in managing nonvariceal upper gastrointestinal bleeding. Journal of Clinical Gastroenterology. 52(4): 307-312. https://doi.org/10.1097/MCG.0000000000000785

[22] T. J. Wang, H. Aihara, A. C. Thompson, A. R. Schulman, C. C. Thompson, & M. Ryou. (2019). Choosing the right through-the-scope clip: A rigorous comparison of rotatability, whip, open/close precision, and closure strength (with videos). Gastrointestinal Endoscopy. 89(1): 77-86. https://doi.org/10.1016/j.gie.2018.07.025

[23] A. E. Faggen, F. Kamal, W. Lee-Smith, M. A. Khan, S. Sharma, A. Acharya, Z. Ahmed, U. Farooq, A. Bayudan, R. McLean, P. Avila, S. C. Dai, C. A. Munroe, & A. Kouanda. (2023). Over-the-scope clips versus standard endoscopic treatment for first line therapy of non-variceal upper gastrointestinal bleeding: Systematic review and meta-analysis. Digestive Diseases and Sciences. 68(6): 2518-2530. https://doi.org/10.1007/s10620-023-07888-3

[24] G. Galloro, A. Zullo, G. Luglio, A. Chini, D. A. Telesca, R. Maione, M. Pollastro, G. D. De Palma, & R. Manta. (2022). Endoscopic clipping in non-variceal upper gastrointestinal bleeding treatment. Clinical Endoscopy. 55(3): 339-346. https://doi.org/10.5946/ce.2021.249

[25] J. Bapaye, S. Chandan, L. Y. Naing, A. Shehadah, S. Deliwala, V. Bhalla, D. Chathuranga, & P. I. Okolo 3rd. (2022). Safety and efficacy of over-the-scope clips versus standard therapy for high-risk nonvariceal upper GI bleeding: Systematic review and meta-analysis. Gastrointestinal Endoscopy. 96(5): 712-720.e7. https://doi.org/10.1016/j.gie.2022.06.032

[26] A. Kuellmer, T. Mangold, D. Bettinger, M. Schiemer, J. Mueller, A. Wannhoff, K. Caca, E. Wedi, T. Kleemann, R. Thimme, & A. Schmidt. (2023). Reduced mortality for over-the-scope clips (OTSC) versus surgery for refractory peptic ulcer bleeding: a retrospective study. Surgical Endoscopy. 37(3): 1854-1862. https://doi.org/10.1007/s00464-022-09679-9

[27] M. Hollenbach, A. Decker, A. Schmidt, O. Möschler, C. Jung, T. Blasberg, A. A. H. Seif, K. Vu Trung, A. Hoffmeister, J. Hochberger, V. Ellenrieder, & E. Wedi. (2023). Comparison between traumatic and atraumatic over-the-scope clips in patients with duodenal ulcer bleeding: a retrospective analysis with propensity score-based matching. Gastrointestinal Endoscopy. 98(1): 51-58.e2. https://doi.org/10.1016/j.gie.2023.01.051

[28] D. Villaescusa Arenas, E. Rodríguez de Santiago, M. Á. Rodríguez Gandía, S. Parejo Carbonell, B. Peñas García, A. Guerrero García, J. R. Foruny Olcina, A. García García de Paredes, J. Á. González Martín, E. Vázquez-Sequeiros, & A. Albillos. (2023). Over-the-scope-clip (OTSC®) as a rescue treatment for gastrointestinal bleeding secondary to peptic ulcer disease. Revista Española Enfermedades Digestivas. 115(2): 70-74. https://doi.org/10.17235/reed.2022.8722/2022

[29] J. Y. W. Lau, R. Li, C. H. Tan, X. J. Sun, H. J. Song, L. Li, F. Ji, B. J. Wang, D. T. Shi, W. K. Leung, I. Hartley, A. Moss, K. Y. Y. Yu, B. Y. Suen, P. Li, & F. K. L. Chan. (2023). Comparison of over-the-scope clips to standard endoscopic treatment as the initial treatment in patients with bleeding from a nonvariceal upper gastrointestinal cause: A randomized controlled trial. Annals of Internal Medicine. 176(4): 455-462. https://doi.org/10.7326/M22-1783

[30] P. Tran, J. Carroll, B. A. Barth, N. Channabasappa, & D. M. Troendle. (2018). Over the scope clips for treatment of acute nonvariceal gastrointestinal bleeding in children are safe and effective. Journal of Pediatric Gastroenterology and Nutrition. 67(4): 458-463. https://doi.org/10.1097/MPG.0000000000002067

[31] A. Schmidt, S. Gölder, M. Goetz, A. Meining, J. Lau, S. von Delius, M. Escher, A. Hoffmann, R. Wiest, H. Messmann, T. Kratt, B. Walter, D. Bettinger, & K. Caca. (2018). Over-the-scope clips are more effective than standard endoscopic therapy for patients with recurrent bleeding of peptic ulcers. Gastroenterology. 155(3): 674-686.e6. https://doi.org/10.1053/j.gastro.2018.05.037

[32] C. Robles-Medranda, R. Oleas, J. Alcívar-Vásquez, M. Puga-Tejada, J. Baquerizo-Burgos, & H. Pitanga-Lukashok. (2021). Over-the-scope clip

system as a first-line therapy for high-risk bleeding peptic ulcers: a retrospective study. Surgical Endoscopy. 35(5): 2198-2205. https://doi.org/10.1007/s00464-020-07625-1

[33] S. Chan, R. Pittayanon, H. P. Wang, J. H. Chen, A. Y. B. Teoh, Y. T. Kuo, R. S. Y. Tang, H. C. Yip, S. K. K. Ng, S. Wong, J. W. Y. Mak, H. Chan, L. Lau, R. N. Liu, M. Wong, R. Rerknimitr, E. K. Ng, & P. W. Y. Chiu. (2023). Use of over-the-scope clip (OTSC) versus standard therapy for the prevention of rebleeding in large peptic ulcers (size ≥1.5 cm): An open-labelled, multicentre international randomised controlled trial. Gut. 72(4): 638-643. https://doi.org/10.1136/gutjnl-2022-327007

[34] A. Kuellmer, J. Behn, B. Meier, A. Wannhoff, D. Bettinger, R. Thimme, K. Caca, & A. Schmidt. (2019). Over-the-scope clips are cost-effective in recurrent peptic ulcer bleeding. United European Gastroenterology Journal. 7(9): 1226-1233. https://doi.org/10.1177/2050640619871754

[35] M. Barakat, A. Hamed, A. Shady, M. Homsi, & S. Eskaros. (2018). Endoscopic band ligation versus endoscopic hemoclip placement for Dieulafoy's lesion: a meta-analysis. European Journal of Gastroenterology & Hepatology. 30(9): 995-996. https://doi.org/10.1097/MEG.0000000000001179

[36] N. T. Chuang, A. Agarwal, & R. Kim. (2020). Successful hemostasis with endoscopic suturing of recurrent duodenal ulcer bleeding after failed initial endoscopic therapy and embolization. ACG Case Reports Journal. 7(2): e00275. https://doi.org/10.14309/crj.0000000000000275

[37] M. Andreone, B. Megna, N. McDonald, D. Sunjaya, B. Hanson, & M. Bilal. (2023). Use of endoscopic suturing for the treatment of malignant gastric ulcer-related hemorrhage. ACG Case Reports Journal. 10(5): e01047. https://doi.org/10.14309/crj.0000000000001047

[38] A. Agarwal, P. Benias, O. I. Brewer Gutierrez, V. Wong, Y. Hanada, J. Yang, V. Villgran, V. Kumbhari, A. Kalloo, M. A. Khashab, P. Chiu, & S. Ngamruengphong. (2018). Endoscopic suturing for management of peptic ulcer-related upper gastrointestinal bleeding: a preliminary experience. Endoscopy International Open. 6(12): E1439-E1444. https://doi.org/10.1055/a-0749-0011

[39] J. Hu, M. Jiang, H. Liu, H. Zhou, & Y. Wang. (2023). Application of endoscopic purse-string sutures in high-risk peptic ulcer hemorrhage: preliminary experience of 38 cases. Scandinavian Journal of Gastroenterology. 58(2): 216-221. https://doi.org/10.1080/00365521.2022.2116291

[40] J. J. Y. Sung, S. Moreea, H. Dhaliwal, D. C. Moffatt, K. Ragunath, T. Ponich, A. N. Barkun, E. J. Kuipers, R. Bailey, F. Donnellan, D. Wagner, K. Sanborn, & J. Lau. (2022). Use of topical mineral powder as monotherapy for treatment of active peptic ulcer bleeding. Gastrointestinal Endoscopy. 96(1): 28-35.e1. https://doi.org/10.1016/j.gie.2022.01.020

[41] D. H. Jung, C. H. Park, S. I. Choi, H. R. Kim, M. Lee, H. S. Moon, & J. C. Park. (2023). Comparison of a polysaccharide hemostatic powder and conventional therapy for peptic ulcer bleeding. Clinical Gastroenterology and Hepatology. 21(11): 2844-2853.e5. https://doi.org/10.1016/j.cgh.2023.02.031

[42] D. Alzoubaidi, M. Hussein, R. Rusu, D. Napier, S. Dixon, J. W. Rey, C. Steinheber, S. Jameie-Oskooei, M. Dahan, B. Hayee, S. Gulati, E. Despott, A. Murino, S. Subramaniam, S. Moreea, P. Boger, M. Hu, P. Duarte, J. Dunn, I. Mainie, J. McGoran, D. Graham, J. Anderson, P. Bhandari, M. Goetz, R. Kiesslich, E. Coron, L. Lovat, & R. Haidry. (2020). Outcomes from an international multicenter registry of patients with acute gastrointestinal bleeding undergoing endoscopic treatment with Hemospray. Digestive Endoscopy. 32(1): 96-105. https://doi.org/10.1111/den.13502

[43] S. X. Jiang, D. Chahal, N. Ali-Mohamad, C. Kastrup, & F. Donnellan. (2022). Hemostatic powders for gastrointestinal bleeding: A review of old, new, and emerging agents in a rapidly advancing field. Endoscopy International Open. 10(8): E1136-E1146. https://doi.org/10.1055/a-1836-8962

[44] A. Facciorusso, M. Bertini, M. Bertoni, N. Tartaglia, M. Pacilli, G. Pavone, A. Ambrosi, & R. Sacco. (2021). Efficacy of hemostatic powders in lower gastrointestinal bleeding: Clinical series and literature review. Digestive and Liver Disease. 53(10): 1327-1333. https://doi.org/10.1016/j.dld.2021.05.026

[45] J. S. Park, H. K. Kim, Y. W. Shin, K. S. Kwon, & D. H. Lee. (2019). Novel hemostatic adhesive powder for nonvariceal upper gastrointestinal bleeding. Endoscopy International Open. 7(12): E1763-E1767. https://doi.org/10.1055/a-0982-3194

[46] A. Becq, C. Houdeville, M. L. Tran Minh, N. Steuer, D. Danan, M. A. Guillaumot, E. Abou Ali, M. Barret, A. Amiot, N. Carbonell, P. Marteau, U. Chaput, X. Dray, M. Camus; the Parisian On-call Endoscopy Team (POET). (2020). Experience with the use of a hemostatic powder in 152 patients undergoing urgent endoscopy for gastrointestinal bleeding. Clinics and Research in Hepatology and Gastroenterology. 45(5): 101558. https://doi.org/10.1016/j.clinre.2020.10.003

[47] A. F. Hagel, M. Raithel, P. Hempen, G. Preclik, W. Dauth, M. F. Neurath, J. Gschossman, P. C. Konturek, & H. Albrecht. (2020). Multicenter analysis of endoclot as hemostatic powder in different endoscopic settings of the upper gastrointestinal tract. Journal of Physiology and Pharmacology. 71(5): 657-664. https://doi.org/10.26402/jpp.2020.5.06

[48] F. Vitali, A. Naegel, R. Atreya, S. Zopf, C. Neufert, J. Siebler, M. F. Neurath, & T. Rath. (2019). Comparison of Hemospray® and Endoclot™ for the treatment of gastrointestinal bleeding. World Journal of Gastroenterology. 25(13): 1592-1602. https://doi.org/10.3748/wjg.v25.i13.1592

[49] D. Chahal, J. G. H. Lee, N. Ali-Mohamad, & F. Donnellan. (2020). High rate of re-bleeding after application of Hemospray for upper and lower gastrointestinal bleeds. Digestive and Liver Disease.

52(7): 768-772. https://doi.org/10.1016/j.dld.2020.01.009

[50] J. Y. W. Lau, R. Pittayanon, A. Kwek, R. S. Tang, H. Chan, R. Rerknimitr, J. Lee, T. L. Ang, B. Y. Suen, Y. Y. Yu, F. K. L. Chan, & J. J. Y. Sung. (2022). Comparison of a hemostatic powder and standard treatment in the control of active bleeding from upper nonvariceal lesions: A multicenter, noninferiority, randomized trial. Annals of Internal Medicine. 175(2): 171-178. https://doi.org/10.7326/M21-0975

[51] M. Hussein, D. Alzoubaidi, M. F. Lopez, M. Weaver, J. Ortiz-Fernandez-Sordo, P. Bassett, J. W. Rey, B. H. Hayee, E. Despott, A. Murino, S. Moreea, P. Boger, J. Dunn, I. Mainie, D. Graham, D. K. Mullady, D. S. Early, K. Ragunath, J. T. Anderson, P. Bhandari, M. Goetz, R. Kiesslich, E. Coron, L. B. Lovat, & R. Haidry. (2021). Hemostatic spray powder TC-325 in the primary endoscopic treatment of peptic ulcer-related bleeding: multicenter international registry. Endoscopy. 53(1): 36-43. https://doi.org/10.1055/a-1186-5360

[52] M. Hussein, D. Alzoubaidi, M. O'Donnell, A. de la Serna, P. Bassett, I. Varbobitis, T. Hengehold, J. Ortiz Fernandez-Sordo, J. W. Rey, B. Hayee, E. J. Despott, A. Murino, D. Graham, M. Latorre, S. Moreea, P. Boger, J. Dunn, I. Mainie, D. Mullady, D. Early, K. Ragunath, J. Anderson, P. Bhandari, M. Goetz, R. Kiesslich, E. Coron, E. Rodriguez de Santiago, T. Gonda, S. A. Gross, L. B. Lovat, & R. Haidry. (2021). Hemostatic powder TC-325 treatment of malignancy-related upper gastrointestinal bleeds: International registry outcomes. Journal of Gastroenterology and Hepatology. 36(11): 3027-3032. https://doi.org/10.1111/jgh.15579

[53] A. N. Barkun, V. Adam, Y. Lu, Y. I. Chen, & M. Martel. (2018). Using hemospray improves the cost-effectiveness ratio in the management of upper gastrointestinal nonvariceal bleeding. Journal of Clinical Gastroenterology. 52(1): 36-44. https://doi.org/10.1097/MCG.0000000000000709

[54] D. M. Jensen, T. O. G. Kovacs, G. V. Ohning, K. Ghassemi, G. A. Machicado, G. S. Dulai, A. Sedarat, R. Jutabha, & J. Gornbein. (2017). Doppler endoscopic probe monitoring of blood flow improves risk stratification and outcomes of patients with severe nonvariceal upper gastrointestinal hemorrhage. Gastroenterology. 152(6): 1310-1318.e1. https://doi.org/10.1053/j.gastro.2017.01.042

[55] N. Chapelle, M. Martel, M. Bardou, M. Almadi, & A. N. Barkun. (2023). Role of the endoscopic Doppler probe in nonvariceal upper gastrointestinal bleeding: Systematic review and meta-analysis. Digestive Endoscopy. 35(1): 4-18. https://doi.org/10.1111/den.14356

[56] B. S. Dhindsa, K. M. Tun, K. J. Scholten, S. Deliwala, Y. Naga, A. Dhaliwal, D. Ramai, S. M. Saghir, D. S. Dahiya, S. Chandan, S. Singh, & D. G. Adler. (2023). New alternative? Self-assembling peptide in gastrointestinal bleeding: A systematic review and meta-analysis. Digestive Diseases and Sciences. 68(9): 3694-3701. https://doi.org/10.1007/s10620-023-08009-w

[57] S. Parveen, A. H. Shah, S. A. Zargar, G. M. Gulzar, J. S. Sodhi, M. A. Khan, N. A. Syed, & N. A. Dar. (2023). Predictors of rebleeding in non-variceal upper gastrointestinal bleeding of peptic ulcer etiology in Kashmiri population. Cureus. 15(1): e33953. https://doi.org/10.7759/cureus.33953

[58] N. Ito, K. Funasaka, T. Fujiyoshi, K. Nishida, Y. Satta, K. Furukawa, N. Kakushima, S. Furune, E. Ishikawa, Y. Mizutani, T. Sawada, K. Maeda, T. Ishikawa, T. Yamamura, E. Ohno, M. Nakamura, R. Miyahara, Y. Sasaki, J. I. Haruta, M. Fujishiro, & H. Kawashima. (2023). Risk factors for rebleeding in gastroduodenal ulcers. Irish Journal of Medical Science. https://doi.org/10.1007/s11845-023-03450-2

[59] S. H. Kim, H. S. Moon, S. W. Choi, S. H. Kang, J. K. Sung, & H. Y. Jeong. (2023). Comparison and validation of the Japanese score and other scoring systems in patients with peptic ulcer bleeding: A retrospective study. Medicine. 102(34): e34986. https://doi.org/10.1097/MD.0000000000034986

[60] R. Pittayanon, B. Y. Suen, N. Kongtub, Y. K., Tse, R. Rerknimitr, & J. Y. W. Lau. (2022). Scheduled second-look endoscopy after endoscopic hemostasis to patients with high risk bleeding peptic ulcers: A randomized controlled trial. Surgical Endoscopy. 36(9): 6497-6506. https://doi.org/10.1007/s00464-021-09004-w

[61] V. Quentin, A. J. Remy, G. Macaigne, R. Leblanc-Boubchir, J. P. Arpurt, M. Prieto, C. Koudougou, L. Tsakiris, D. Grasset, R.-L. Vitte, D. Cuen, J. Verlynde, K. Elriz, M.-P. Ripault, F. Ehrhard, M. Baconnier, S. Herrmann, N. Talbodec, Y.-H. Lam, K. Bideau, L. Costes, F. Skinazi, I. Touze, D. Heresbach, P. Lahmek, S. Nahon, Members of the Association Nationale des Hépato-gastroentérologues des Hôpitaux Généraux (ANGH) SANGHRIA Study Group. (2021). Prognostic factors associated with upper gastrointestinal bleeding based on the French multicenter SANGHRIA trial. Endoscopy International Open. 9(10): E1504-E1511. https://doi.org/10.1055/a-1508-5871

[62] A. C. Tatlıparmak, Ö. Dikme, Ö. Dikme, & H. Topaçoğlu. (2022). Cancer, platelet distribution width, and total protein levels as predictors of rebleeding in upper gastrointestinal bleeding. PeerJ. 10: e14061. https://doi.org/10.7717/peerj.14061

[63] S. M. Bitar, & M. Moussa. (2022). The risk factors for the recurrent upper gastrointestinal hemorrhage among acute peptic ulcer disease patients in Syria: A prospective cohort study. Annals of Medicine & Surgery. 74: 103252. https://doi.org/10.1016/j.amsu.2022.103252

[64] E. H. Yang, H. C. Cheng, C. T. Wu, W. Y. Chen, M. Y. Lin, & B. S. Sheu. (2018). Peptic ulcer bleeding patients with Rockall scores ≥6 are at risk of long-term ulcer rebleeding: A 3.5-year prospective longitudinal study. Journal of Gastroenterology and

Hepatology. 33(1): 156-163. https://doi.org/10.1111/jgh.13822

[65] M. C. Franco, S. Jang, B. D. C. Martins, T. Stevens, V. Jairath, R. Lopez, J. J. Vargo, A. Barkun, & F. Maluf-Filho. (2022). Risk stratification in cancer patients with acute upper gastrointestinal bleeding: Comparison of Glasgow-Blatchford, Rockall and AIMS65, and development of a new scoring system. Clinical Endoscopy. 55(2): 240-247. https://doi.org/10.5946/ce.2021.115

[66] M. S. Kim, J. Choi, & W. C. Shin. (2019). AIMS65 scoring system is comparable to Glasgow-Blatchford score or Rockall score for prediction of clinical outcomes for non-variceal upper gastrointestinal bleeding. BMC Gastroenterology. 19(1): 136. https://doi.org/10.1186/s12876-019-1051-8

[67] G. L. Wong, A. J. Ma, H. Deng, J. Y. Ching, V. W. Wong, Y. K. Tse, T. C. Yip, L. H. Lau, H. H. Liu, C. M. Leung, S. W. Tsang, C. W. Chan, J. Y. Lau, P. C. Yuen, & F. K. Chan. (2019). Machine learning model to predict recurrent ulcer bleeding in patients with history of idiopathic gastroduodenal ulcer bleeding. Alimentary Pharmacology and Therapeutics. 49(7): 912-918. https://doi.org/10.1111/apt.15145