International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

Updates of Management of Acute Non-Variceal Upper Gastrointestinal Bleeding (ANVUGIB)

Review

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Abstract – Acute non-variceal upper gastrointestinal bleeding (ANVUGIB) is a frequent medical emergency in clinical practice. While the incidence has substantially reduced, the mortality costs have no longer gone through a comparable reduction in the ultimate few decades, accordingly imparting a substantial challenge. This editorial outlines the key motives and threat elements of ANVUGIB and explores the present day requirements and current updates in hazard evaluation scoring structures for predicting mortality and endoscopic remedies for accomplishing hemostasis. Since ANUVGIB predominantly influences the aged population, the effect of comorbidities may additionally be accountable for the negative outcomes. A thorough drug records is necessary due to the growing use of antiplatelet agents and anticoagulants in the elderly. Early chance stratification performs a fundamental function in identifying the line of administration and predicting mortality. Emerging scoring structures such as the ABC (age, blood tests, co-morbidities) rating exhibit promise in predicting mortality and guiding scientific decisions. While traditional endoscopic remedies stay cornerstone approaches, novel strategies like hemostatic powders and over-the-scope clips provide promising alternatives, in particular in instances refractory to usual modalities. By integrating validated scoring structures and leveraging novel therapeutic modalities, clinicians can decorate affected person care and mitigate the sizable morbidity and mortality related with ANVUGIB.

Key Words – Non-variceal upper gastrointestinal bleeding ; Upper gastrointestinal bleeding; Gastrointestinal bleeding; Risk stratification; Risk evaluation scores; Prognostication; Endoscopy; Esophagogastroduodenoscopy; Endoscopic hemostasis.

I. INTRODUCTION

Acute higher gastrointestinal bleeding (UGIB), described as any bleeding originating above the ligament of Treitz in the duodenum, is a medical emergency generally encountered in medical practice[1,2]. According to their etiology, upper gastrointestinal hemorrhage is similarly subdivided into variceal and non-variceal UGIB (NVUGIB). Acute non-variceal UGIB (ANVUGIB) has an annual incidence of 67 per 100,000 men and women and debts for 80% of all instances of UGIB[3,4]. A study that elucidated the medical traits of ANVUGIB by means of retrospectively inspecting affected person statistics from a tertiary-care health facility in China[5]. The excessive mortality quotes and the effectiveness of endoscopic hemostasis in the management of ANVUGIB in particular piqued our interest. Despite the advances in diagnostic and cure modalities, NVUGIB stays a frequent medical hassle owing to its surprising onset and speedy progression, occurrence of threat elements such as cardiovascular disease, growing use of blood thinning medicines (such as aspirin, anticoagulants, and antiplatelet agents) and non-steroidal anti-inflammatory capsules (NSAIDs), and excessive morbidity and mortality[6,7]. The present day hints endorse

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

esophagogastroduodenoscopy (EGD) as the manner of preference for each the prognosis and management of NVUGIB and transcatheter angiographic embolization or surgical operation in instances of refractory bleeding[8-11]. Various risk assessment scores, such as the Glasgow-Blatchford Score (GBS) and the Rockall score, are routinely used for hazard stratification in UGIB and may additionally have a position in predicting the chance of mortality due to re-bleeding[12]. Thus, hazard stratification and endoscopic interventions are key equipment in finding out the line of management and deciding morbidity and mortality. This review evaluates the modern demographics, etiologies, and risk elements related with ANVUGIB and highlights the fundamental function of early chance stratification in decreasing mortality and endoscopic remedies in reaching hemostasis. It additionally discusses the rising scoring structures and novel endoscopic applied sciences that exhibit promise in guiding medical selections and lowering mortality.

1. ETIOLOGIES

Males are affected more in contrast to females, with the majority of patients being older than 65 years[13,14]. Peptic ulcer disease (PUD) is the most frequent reason of ANVUGIB, observed by means of upper gastrointestinal malignancy, Mallory-Weiss syndrome, and gastric angiodysplasia [4,13]. Significant developments in medicinal drug have triggered a reduction in ulcer-related bleeding over time due to the lowered incidence of PUD itself [13]. However, the mortality rates have now not modified much, owing to have an impact on of co-morbidities in an growing old population [2]. Cardiovascular disease (congestive coronary heart failure, ischemic heart disease) is the most well-known comorbidity encountered in such patients, accompanied by way of diabetes mellitus, chronic liver disease, and chronic kidney disease[13,14].Besides co-morbidities, there are different elements that extend the possibilities of mortality from NVUGIB. Particular interest ought to be paid to the patient's drug history. NSAIDs and aspirin (acetyl-salicylic acid) are diagnosed chance elements for growing the threat of bleeding from peptic ulcers and extreme erosive gastritis [15]. These tablets can reason NVUGIB through lowering prostaglandins in the gastric mucosa and growing the susceptibility to mucosal damage[16,17]. The use of anticoagulants and antiplatelet pills in getting older populace with more than one co-morbidities may also be related with an improved chance of bleeding in NVUGIB [17,18]. Helicobacter pylori (H. pylori) infection represents the single most frequent, which is in flip the main motive of NVUGIB[19]. H. pylori reputation have to be assessed in instances of NVUGIB due to PUD and reassessed after 4 weeks if the effects are negative[10]. Yin and Yu[17] described a hazard prediction mannequin and concluded six unbiased risk elements for NVUGIB by way of examining two years' well worth of medical information retrospectively [17].

2. RISK ASSESSMENT SCORES

Following profitable preliminary resuscitation, patients ought to be stratified as low- and high-risk the usage of risk assessment scoring systems to make certain fabulous affected person disposition. These scoring systems act as medical prediction guides and can be used to predict the line of therapy and mortality 8[20]. Getting well timed endoscopic hemostatic remedy is indispensable for enhancing the possibilities of survival, in particular in high-risk groups. Proper assessment of the patient's hemodynamic treatment and correct risk evaluation can lead to profitable treatments. This is why a proper environment efficient scoring device is wished to assist predict the prognosis and information fabulous management[21]. There are a range of scoring systems, every with distinctive goals, like assessing the kind of intervention, mortality, size of clinic stay, need for blood transfusions, etc. Some make use of solely medical records (pre-endoscopy scoring systems), whilst others require extra endoscopic findings (post endoscopy scoring systems) [22].

Some well-established pre-endoscopy scoring structures are the Glasgow-Blatchford Score (GBS), pre-endoscopic Rockall Score, and AIMS65 (albumin, international normalized ratio, intellectual status, systolic blood pressure, age ≥ 65 years) rating [23-25]. Initially developed to predict the need for intervention, the GBS has been observed to possess the absolute best accuracy in predicting the need for hospital-based intervention and mortality [26]. As such, hints endorse the use of GBS for hazard stratification in UGIB and state that patients with GBS ≤ 1 have a low threat of mortality and can be managed as an outpatient [10,11,27].The age, blood tests, co-morbidities (ABC) rating and international bleeding scoring (INBS) are newly-developed pre endoscopy scoring structures that can precisely predict the 30-day mortality in patients with NVUGIB [21,28]. The ABC scoring appeals as a medical tool in phrases of simplicity and ease of evaluation at the bedside and has the typical prognostic scores (which encompass scorings

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https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

like the GBS) in predicting mortality in patients with UGIB[29]. Studies have proven that the ABC scorings works higher on youthful patients in contrast to older patients[29]. The INBS is a novel prognostic scoring that is computed the usage of clinical records and biochemical results. It has been determined to be most efficient to the normal scoring structures in predicting mortality and can estimate the possibilities of re-bleeding, endoscopic hemostasis failure, and the period of hospitalization [21]. These scoring structures need validation from large-scale researches earlier than they can be integrated into medical practice. Since post-endoscopy scorings require endoscopy findings, it may also extend risk evaluation in setups the place endoscopy is the limiting issue in UGIB management. Early chance stratification lets in for early identification of high-risk patients , thereby making sure centered management of low- and high-risk patients[11,27]. Therefore, a lot of the focal point must be on pre-endoscopy scoring systems, which can be calculated quickly after affected person presentation. Pre-endoscopy scorings like the ABC score and INBS can be beneficial as rapid and superb tool in predicting the effects of ANVUGIB, shortening medical hospital stays, and guiding medical choices to minimize mortality by means of growing the possibilities of profitable endoscopic hemostasis.

3. ENDOSCOPIC INTERVENTIONS

After preliminary resuscitation and hemodynamic stabilization, patients with UGIB must endure endoscopy within 24 h of admission. Endoscopy is the technique of preference for the prognosis and management of ANVUGIB [8-11]. Current hints advise early endoscopy (within 24 h) in each high- and low-risk patients considering early endoscopies end result in early discharges, decreased size of hospital stay, and improved outcomes [2]. However, the most useful timing of endoscopy in high-risk patients stays controversial. While some researchers determined no sizable distinction in mortality costs between urgent and early endoscopies, different researches pronounced a reduction in hospital stay and mortality after urgent endoscopies in patients with ANVUGIB[30,31]. The development of endoscopic remedy has reduced the hospitalization cost and mortality of UGIB over the remaining decade[32]. Therapeutic upper gastrointestinal endoscopy by EGD has been superb in reaching hemostasis [9,15]. Traditionally, endoscopic treatment options attaining hemostasis have been categorised into three categories: Injection remedy (involving injection of epinephrine, sclerosant, and thrombin), thermal remedy (with contact or non-contact probes inflicting electrocoagulation), and mechanical remedy (with clips, loops, and ligation) [15]. These modalities structure the mainstay of preferred endoscopic management. However, the development of more recent endoscopic tools has the manageable to enhance results in instances the place traditional treatments fail to attain hemostasis [15].

Several new hemostatic methods have emerged over the previous decade[15], which have been summarized in Table (1) .These novel strategies have various approaches, ranging from upgrading cutting-edge strategies to growing new technologies. Some of them have been included into the cutting-edge suggestions and are advocated as rescue or salvage therapies, whilst others need to be viewed when traditional interventions have failed [9]. For instance, hemostatic powders (non-absorbable mineral powders) can attain instant hemostasis by means of forming an adhesive mechanical barrier on contact with water and may also be regarded in ANVUGIB due to malignancy[9,20,27]. Current hints advocate over-the-scope clips (large-caliber clips that permit full circumferential tissue closure of massive lesions) in pick NVUGIB instances (especially instances of recurrent and persistent bleeding) the place general endoscopic modalities fail to cease the bleeding [9,20,27]. Over-the-scope clipping structures are quickly gaining prominence as viable first-line endoscopic treatments since they may be proven to outperform fashionable endoscopic modalities in reducing the bleeding risk and mortality in high-chance cases of NVUGIB[15,20]. Those improvements have the capacity to plug the loopholes of traditional cures, however they are not without their fair share of boundaries [15,20]. Similarly big-scale studies are needed to become aware of their indications and validate their consequences on morbidity and mortality before they can be completely incorporated into clinical practice.

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

Table 1 Summary of emerging endoscopic modalities for the management of non-variceal upper gastrointestinal bleeding

Modality type	Endoscopic modalities	Mechanism of action
1-Injection	Endoscopic ultrasound-guided Angio therapy	Controls variceal bleeding by deploying coils and injecting cyanoacrylate glue directly into targeted vessels, and confirming the thrombosis in real time with Doppler
2-Thermal	Coagulation grasper	A combination mechanical and thermal hemostasis device that delivers targeted monopolar (Coagrasper) coagulation at the precise site of bleeding
3-Radiofrequency ablation		High-frequency alternating electrical current delivered to local tissue *via* radiofrequency electrode, causing thermal coagulative necrosis of the targeted tissue
4-Cryotherapy		Induces cell necrosis through cycles of controlled local freezing and thawing of the tissue
5-Endoscopic laser coagulation		Instantaneous hemostatic effect due to alterations in structural proteins in the vessel wall causing vessel shrinkage
6-Topical Hemospray (TC-325)		hemostatic Non-absorbable mineral powder that forms an adhesive mechanical barrier upon contact with water powder)
7-Endo Clot (polysaccharide)		Absorbable modified plant-based polymer that forms a protective gel matrix and concentrates hemostatic powder) coagulation factors upon contact with water
8-Oxidized regenerated cellulose		Absorbable plant-based polymer that provides a matrix for clot formation and enhances platelet activation and adhesion
9-Ankaferd Blood Stopper		Standardized mixture of plant extracts that induces formation of an encapsulated protein network which provides focal points for vital erythrocyte aggregation
10-Mechanical	Over-the-scope clip system	Large caliber clips made of metal alloy nitinol with shape-memory effect that stops bleeding by exerting constant circumferential compression force on the bleeding site
11-Endoscopic suturing device		Excludes peptic ulcer from the intra-gastric acidic environment to prevent rebleeding
12-Endoscopic band ligation		Complete obliteration of varices by causing mechanical strangulation with rubber bands

4. TRADITIONAL TREATMENT PLANS

4.1 TTS CLIPS

TTS clips were used for hemostasis given that 1975[33]. Synthetic by using 5 key players (Olympus, Boston scientific, prepare dinner medical, ConMed, and Micro-Tech), those clips are available in numerous sizes ranging from 8 mm, 11 mm, 12 mm, 16 mm, to 22 mm in establishing width [34,35]. they're all designed to fit through the standard 2.8 mm biopsy channel of an endoscope or colonoscope, and some provide bidirectional rotation competencies [34,35].

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4.2 THERMAL REMEDY

Thermal remedy is some other choice for treating GI bleeding. This magnificence remedy includes APC, a non-touch tool which uses argon gas to deal with superficial vascular lesions along with angiodysplasias or gastric antral vascular ectasia, as well as touch tools such as bipolar electrocoagulation [e.g., Gold Probe™ Catheter] and monopolar electrocoagulation (e.g., hemostatic forceps and snare tip soft coagulation) [36,37]. Both bipolar and monopolar electrocoagulation tools generate heat to cauterize vessels and follow direct pressure to the bleeding site [36,37].

4.3 INJECTION THERAPY

Different conventional treatments encompass injection therapies, including epinephrine for vasoconstriction, sclerosing agents for nearby thrombosis (e.g., ethanol), and tissue adhesives for tissue bonding and sealing (e.g., thrombin and cyanoacrylate) [36,37]. Epinephrine is the most commonly used agent on this class, normally diluted to one:10000 or 1:20000 and injected in 0.5 to 2 mL aliquots to the ulcer base. It's far mixed with bipolar electrocoagulation or TTS clips, as combination remedy has been tested to be superior to epinephrine monotherapy at stopping recurrent bleeding (relative risk (RR) 0.34, 95% confidence interval (CI) 0.23-0.50)[38].The recent 2021 American College of Gastroenterology (ACG) guideline on upper GI bleeding strongly recommends bipolar electrocoagulation or injection of absolute ethanol for patients with ulcers and conditionally helps monopolar coagulation, APC, or TTS clips for remedy of bleeding because of ulcers. Advantages include ease of access, abundance of safety facts, and low cost. however, disadvantages can include danger of rebleeding in particular with monotherapies like epinephrine and ability perforation with contact remedy[39].

4.4 OTS CLIPS

Over the past two decades , every other sort of clip has been developed, known as OTS clips. In evaluation to the conventional TTS clips, OTS clips can treat larger fibrotic ulcers and facilitate full-thickness wall closure in instances of leaks, perforations, and fistulas [40]. Whilst the European and Japanese gastroenterology societies suggest OTS clips as a primary-line remedy for GI bleeding, American gastroenterology societies currently position it as a second line hemostatic remedy as of the writing of this review[37]. The 2021 ACG guideline recommends the usage of OTS clips for recurrent ulcer bleeding after previously a success endoscopic hemostasis, while the 2020 American Gastroenterological association guideline suggest its use in pick patients wherein traditional techniques fall short [37].Presently, two OTS clip systems are approved via America Food and Drug administration (FDA): The OTSC® machine , and the Padlock Clip® [40]. Both structures involve deploying a large nitinol magnetic resonance imaging-biocompatible clip the usage of a transparent applicator cap connected to the distal cease of the endoscope even as making use of suction in a technique just like variceal banding[40,41].

OTSC, FDA-approved inside the USA in 2010, is used for repairing perforations < 20 mm, and reaching hemostasis from mucosal/submucosal defects < 3 cm, arteries < 2 mm, polyps < 1.5 cm in diameter, diverticula, or bleeding ulcers in each the upper GI tract and the decrease GI tract [42]. It's miles a bear-claw-formed clip with 3 prongs available in 4 sizes: a 10 mm diameter package for pediatric endoscope or slender passage (i.e. via stents), an 11 mm and 12 mm diameter kit for grownup endoscopes, and a 14 mm diameter package for colonoscopes[42,43]. It comes with 2 cap depths: A 3 mm cap for smaller or skinny tissue location, and a deeper 6 mm cap for good sized defects. The last spikes range in line with intended use: kind “a” (atraumatic) has blunt enamel for tender tissue, type “t” (therapeutic) has spiked.

5. COMMON STRATIGIES OF ENDOSCOPIC HEMOSTASIS

Use of OTSC clip for a duodenal ulcer. here, an OTSC clip is used to efficiently treat gastrointestinal bleeding from a Forrest IIa duodenal bulb ulcer. Teeth for tough/fibrotic tissue, and type “gc” has longer pointed teeth for gastric perforation/fistula closure[42,43]. Additional utility aids (along with the OTSC Anchor and OTSC dual Grasper) may be advanced via the working channel of the endoscope to help approximate tissues after full-thickness resection prior to OTSC deployment [42].The other FDA-authorized OTS clip is the Padlock Clip, authorized in 2012 for the same makes use of as the Ovesco OTSC[44]. Although it became briefly recalled in 2019, it has been lower back available on the market in view that 2020[45]. Unlike the undergo-claw shape of the OTSC clip, the Padlock machine has a hexagonal superstar-formed clip layout with six internal prongs that permits for a

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

circumferential grip on tissues [44,46]. It comes in 2 forms The Padlock Clip Defect Closure system has tip diameters starting from 9.5 mm to 11 mm with a set chamber depth of 1 cm for endoscopes, whilst the seasoned choose closure device has tip diameters ranging from 11.3 to 14 mm with variable depth (8-20 mm) for colonoscopes[46]. Not like the OTSC system, the linking cable to install the clip runs outside the scope in preference to inside the tool channel [44,46]. Moreover, even as OTSC has a specialized cutter system (Ovesco dispose of machine) to take away the clip if it gets caught, the Padlock Clip cannot be eliminated once positioned [47]. There are presently no human trials evaluating the different varieties of OTS clips. In a look at comparing the OTSC and Padlock Clip in a model the usage of a porcine stomach, the OTSC turned into stated to have a fulfilment rate of 100% (11/11 techniques) and the Padlock had a 0% achievement rate (0/11 processes)[48].

Each OTS clip systems come with blessings, which include the capability to grasp large amounts of tissue or fibrotic ulcers, and imparting sizeable compressive forces. In a meta-analysis with the aid of Faggen et al [49] on 11 research evaluating the OTS clip with fashionable endoscopic remedies for non-variceal upper GI bleeding, the previous confirmed lower rates of rebleeding at 30 days (RR 0.58; 95%CI: 0.41-0.92), though there had been no differences in mortality (RR 0.69; 95%CI: 0.38-1.23). A similar meta-evaluation of 10 studies became accomplished by Bapaye et al [50], which discovered that OTS had lower 7-day (RR 0.41; 95%CI: 0.240.68) and 30-day rebleeding risk (RR 0.46; 95%CI: 0.31-0.65), shorter process time by using 6.63 mins (95%CI: 2.58-10.67), however no difference in mortality (RR 0.55; 95%CI: 0.24-1.24). With regards to efficacy as a primary remedy and rescue intervention, a meta-evaluation of 16 studies determined similar number one hemostasis rates (93 % vs 91%) for use as a number one and rescue remedy, respectively. however, there has been a decreased hazard of re-bleeding in patients handled with OTS clips as number one remedy vs rescue (RR = 0.52, 95%CI: 0.31-0.89) [51]. Likewise, a meta-analysis by Zhong et al [52] searching at 16 research found that OTS clips had high technical (95.7% success rate) and clinical (84.2% success rate) achievement.

However, OTS clips also include limitations. challenges include wanting to cast off the endoscope to attach the applicator cap and reintubate the affected person previous to deployment, trouble positioning the clip on a goal lesion, issue navigating it through strictures and areas of stenosis, and difficulty appearing different hemostasis manoeuvres with bleeding persists following deployment. Additional damaging events include unintentional deployment, clip dislodgement, mucosal harm, gastric and jejunal stenosis, secondary perforations, maceration of the perforated site, and tissue necrosis [53]. the overall adverse event rate became 1.8% in a retrospective take a look at via Kobara et al[54] related to 58 patients. but, in some other retrospective study of 30 patients through Mercky et al[55], OTS clips had been related to an adverse rate of 13.3%.

5.1 HEMOSTATIC AGENTS

Topical hemostatic agents provide an alternative strategy for dealing with non-variceal upper GI bleeding, presenting a noncontact, non-thermal, non-traumatic application, awesome from hemoclips or thermocoagulation [40]. Due to the fact directed focused on isn't vital, their ease of application makes them appropriate for eventualities in which bleeding is diffuse and challenging to localize, inclusive of ulcers, anastomosis , tumors , or iatrogenic lesions secondary to endoscopic submucosal dissection (ESD), endoscopic mucosal resection (EMR), and polypectomy. The 2021 ACG guideline recommends hemostatic powders as a temporizing measure to prevent bleeding in cases where traditional modalities fall quick of accomplishing hemostasis, bridging the distance to extra definitive remedies like trans arterial embolization or surgery[56].

Currently, 3 FDA-authorised single-use hemostatic powders are to be had : TC-325 ; Endo Clot® Polysaccharide Hemostatic system (PHS) ; UI-EWD [40,57]. All contain a 220 cm transport catheter via the operating channel of an end-viewing endoscope, related to a powder dispenser and a transport device. at the bleeding site, the powders shape a transient mechanical barrier that sloughs off within 1-3 days [40,57].TC-325 (Hemospray), FDA-permitted in 2018 for each non-variceal upper and lower GI bleeding, uses sodium bentonite, a natural aluminum phyllosilicate clay, to absorb water on contact with blood[58,59]. It has two versions: HEMO-7 compatible with a 2.8t mm endoscope accessory channel, and HEMO-10 well matched with a 3.7 mm channel[58, 59]. Contraindications encompass patients with a GI fistula and those at excessive chance of or suspected of having a GI perforation, as each canister of TC-325 can add 3 L of extra extent to the GI tract, posing a possibility of overdistension [58]. At the same time , preceding concerns approximately bowel obstruction, allergic reactions, and embolization have no longer been located clinically [58]. A maximum of 3 devices in line with patient is suggested at a time. The shelf life is 3 years [58,59]. One predicament is the

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

risk of early activation of the powder and catheter clogging if moisture comes in touch with the catheter in advance[59]. This could be prevented via preflushing the working channel with air prior to catheter insertion and deploying the spray from a distance of 1-2 cm away in 1- to 2-second bursts. additionally, efficacy in nonbleeding lesions is restrained, as the powder on the whole adheres to blood. Washing the lesion site or cleaning the lens post-spray is likewise not encouraged, as it can wash away the powder[57,58,60].

Endo Clot PHS, FDA-accepted in 2021, is a spray composed of absorbable modified polymers derived from plant starch[61,62]. it's far accredited for the same meant use as Hemospray but with a reduced scope of activity, because it excludes Forrest Ia (spurting) ulcers[62]. just like TC-325, the polymers provoke a dehydration procedure, ensuing in a high concentration of platelets, red blood cells, and coagulation proteins at the bleeding site. This paperwork a gel adhesive matrix that promotes the physiologic clotting cascade[61,62]. The matrix is conveniently dissolved via saline irrigation and is degraded through amylase and glucoamylase, and removed through stool within 24 hours[61]. Contraindications include starch sensitivity, with different barriers just like TC-325. The shelf life is 3 years. Endo Clot is likewise to be had in 180 cm catheter length[61,62].UI-EWD , FDA-approved due to the fact that 2022, is a twig that consists of succinic anhydride and oxidized dextran derived from microbial extraction [63,64]. At the same time as sharing the equal intended use as Hemospray, it isn't permitted for decrease GI bleeding[36]. Not like Endo Clot and TC-325, Nexpowder may be utilized in non-bleeding sites, as the 2 compounds inside the spray crosslink to shape a highly adhesive, extraordinary blue hydrogel inside the presence of any moisture[63]. Moreover, unlike Endo Clot or TC-325, UI-EWD makes use of a battery-powered system, getting rid of the need for CO2-pressurized air compressors, thereby enhancing endoscopic visibility and decreasing the threat of the catheter clogging [63]. Contraindications include patients with galactose intolerance, Lapp lactase deficiency, or glucose-galactose malabsorption because of the presence of lactose within the powder[61,62]. Additionally, the spray can't be utilized in patients with allergic reaction to brilliant blue FCF dye, bowel obstruction, GI fistulas, or suspected/excessive-chance GI perforation. The shelf life is 15 months[63,64].

Lately, a hemostatic gel has additionally received popularity of non-variceal GI bleeding, except Forrest 1a ulcers. PuraStat® , FDA-accredited for the reason that 2021, is a sterile gel composed of an artificial repeating 16-amino acid (acetyl-[arginyl-alanyl-aspartyl-alanyl]4-amide tetrahydrochloride) oligopeptide suspended in sterile water[65,66]. when exposed to blood, a pH-triggered transformation induces the peptide to self-bring together into a scaffold fiber shape that mimics the human extracellular matrix, growing an obvious adhesive floor . it is packaged in a 5-mL prefilled syringe containing 1, 3, or 5 mL of gel (2.5% peptide content material) [66]. Like all hemostatic sprays, PuraStat is brought to the intended site through a delivery catheter inserted into the running channel. Other than number one non-variceal GI bleeding, it is also accredited for hemostasis of mild and moderate bleeding post ESD or EMR, as an accessory, bridge, prophylactic, or rescue remedy for intraprocedural venous bleeding or prophylactic therapy.

5.2 USE OF NEXPOWDER FOR TUMOR BLEEDING

Application of Nexpowder to stop diffuse bleeding from gastric adenocarcinoma to prevent post procedure bleeding, and for rectal mucositis[65]. Unlike hemostatic powder, PuraStat have to be carried out as near as possible to the bleeding site for the duration of application to form a mechanical barrier. It must additionally be stored in a refrigerator (from 2 to 8 °C). The gel is metabolized by means of enzymes into constituent amino acids over 30 days[65,66].Different powders-Ankaferd Blood Stopper (Ankaferd health products, Istanbul, Turkey) and CEGP-003 (CGBio, Seong-Nam, Republic of Korea)-have been described for use in non-variceal upper GI bleeding, however aren't yet accepted through the FDA. The previous accommodates a standardized mixture of 5 herbs (urtica dioica, vitis vinifera, glycyrrhiza glabra, alpinia officinarum, and thymus vulgaris) [67,68]. This plant-based totally agent stimulates the formation of an encapsulated protein network containing fibrinogen, total protein, albumin, and globin, attracting erythrocytes and selling platelets aggregation [67,68]. The latter, CEGP-003, is a powder together with hydroxyethylcellulose and epidermal growth factor [69]. Hydroxyethylcellulose, upon touch with water, forms an adhesive gel that acts as a barrier, at the same time as the epidermal increase factor turns on the synthesis of hyaluronan and aquaporin-three, both promoting wound recovery. Up to now, a single-blinded, potential randomized study of 72 patients has been completed to evaluate the efficacy and safety of CEGP-003 in patients with peptic ulcers bleeding[69]. The study found that CEPG-003 had an preliminary hemostasis rate of 100% compared to epinephrine (89.2%), with rebleeding taking place in three out of 35 and 1 out of 37 patients

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 47 No. 1 October 2024, pp. 322-334

within the CEPG-003 and epinephrine companies, respectively (P = 0.35)[69].A meta-analysis looking at 59 research (46 on Hemospray, 4 on PuraStat, 5 on Endo Clot, 3 on Nexpowder, 1 on CEGP003) located that the cumulative rates of instant hemostasis were 93% and ordinary rebleeding charge changed into 18% inside one week[70]. Adverse events occurred in 2%, along with 3 cases of perforations amongst 2111 patients. whether or not used as monotherapy, mixture therapy, or rescue therapy, hemostatic powders offer endoscopists with another method of accomplishing hemostasis.

5.3 TTS DOPPLER PROBE

The endoscopic doppler probe (EDP) is an adjunctive device that can be used for threat stratification in GI bleeding and steering of hemostasis [37,40]. Presently, the VTI Selectable intensity Doppler system stands as the only FDA-permitted tool for endoscopic use. It contains of a portable 1.18 kg AC-powered base unit related to a single-use 2.5 mm diameter doppler probe emitting a 20-MHz pulsed-wave ultrasound beam [71]. The probe comes in lengths of 165 cm or 245 cm, and may be used with widespread diagnostic or therapeutic forward-viewing endoscopes, in addition to side-viewing duodenoscopes and colonoscopes[71].To use it, a lubricated doppler probe is exceeded down the accent channel of an endoscope or colonoscope. it's far then carried out to the lesion of interest in a tangential orientation to become aware of blood flow. The probe is moved in various guidelines to acoustically map the direction of blood flow and manual endoscopic hemostasis. depending on the lesion, the scanning depth can be adjusted: Shallow (0-1.5 mm) for untreated peptic ulcers or those treated with Endo clips, thermal coagulation, or combination of injection with thermal remedy; mid (0-4 mm) for varices, untreated gastric ulcers with adherent clot, or ulcers treated with injection (because of existence of subsurface fluid bleb). Arterial go with the flow typically gives as a spiking, excessive-pitched sound, at the same time as venous blood drift affords as a continuous low-pitch rumble[71,72].

EDP may be specifically beneficial within the evaluation of lesions with doubtful visible bleeding stigmata, which include gastric or duodenal ulcers that can either be labelled as Forrest 2b (adherent clot) or Forrest 2c (flat pigmented spot) relying on the endoscopist. while the previous is treated per current guidelines, the latter is traditionally no longer handled endoscopically [72]. Initial studies have additionally tested the usage of doppler explore for the analysis and remedy of gastric varices, Dieulafoy's lesion, diverticular bleeding, and post-ESD ulcers[73].Research records EDP as a promising tool for threat stratifying lesions at excessive risk of rebleeding and for steering hemostatic therapy. advantages consist of ease of use without requiring EUS schooling, actual-time evaluation of vasculature with the capacity to distinguish between arterial and venous flow, and the capability to estimate depth of subsurface blood vessels. limitations consist of variability among endoscopists in Doppler signal interpretation and the ability presence of fake artefactual alerts (e.g., transmitted cardiac pulsations within the fundus of the stomach).

5.4 ENDOSCOPIC-ULTRASOUND

EUS is awesome from TTS doppler probes in that it makes use of radial or linear array echoendoscopes to delineate the anatomy and subsurface blood vessels. whilst both use doppler technology to assess blood waft, the TTS doppler probe does so through the endoscopic doppler probe. The VTI Selectable intensity Doppler system (created by Vascular era, Inc., Nashua, New Hampshire) includes. A: A single-use 2.five mm diameter doppler probe; B: A portable AC-powered base unit. picture courtesy of Vascular technology, integrated. citation: Vascular technology, integrated. photo of VTI's Endoscopic Doppler device and Probe. While EUS applies doppler go with the flow to visualise the blood vessels liable for GI bleeding. With EUS guidance, needles are used to goal blood vessel or lesions responsible for bleeding. Polidocanol, cyanoacrylate, polidocanol, embolization coils, thrombin, or ethanol are then injected for hemostasis[74]. EUS has been suggested to be an powerful technique for directing hemostasis in patients with refractory GI bleeding from ulcers, Dieulafoy's lesions, pancreatic pseudoaneurysms, and GI stromal tumors[75].These days, a potential observational single-center take a look at by means of Uribarri-González et al[76] looked at the usefulness of EUS-guided remedy in patients with non-variceal GI bleeding refractory to 2 traditional endoscopic cures. Of the 14 patients covered, 9 had Dieulafoy's lesions, and 5 had submucosal tumors. 6 patients (78%) had a scarcity of re-bleeding after EUS remedy. Benefits of this adjunctive approach include its ability to visualize small blood vessels no longer seen with radiologic or endoscopic exam, carry out EUS-guided Angio therapy, and investigate for procedural success actual-time by looking for cessation of blood flow. Risks include the need for training in endosonography, cost, lack of efficacy and safety records, limited portability and availability of EUS systems, as well as technical problems inclusive of imaging artifacts from retained intraluminal blood [74].

II. CONCLUSION

ANVUGIB is a common place clinical emergency that has a high mortality rate notwithstanding its declining prevalence. As the general public of patients are elderly, the increasing burden of comorbidities and the superiority of chance factors within the geriatric population increase the chance of terrible results in high-risk groups. The growing use of drugs including NSAIDs, antiplatelet agents, and anticoagulants (mainly in the elderly populace) underscores the importance of acquiring a thorough drug history. Early risk stratification with tested scoring systems is the key to determining the line of control. Newly advanced ratings (just like the ABC score and INBS), which can be advanced to the conventional scores in predicting effects, must be incorporated into clinical hints after acquiring correct-great evidence. Upper gastrointestinal endoscopies have each diagnostic and therapeutic programs and ought to be completed within 24 h of patient admission. Novel improvements in endoscopic remedies like hemostatic powder and over-the-scope clips have the capability to grow to be first-line remedies in instances in which standard endoscopic therapeutic procedures are useless. Clinicians should be privy to the recent advances in threat stratification and endoscopic interventions in order to make informed choices about focused management for low- and high-risk patients. with the aid of integrating validated scoring systems and leveraging cutting-edge therapeutic modalities, clinicians can beautify patient care and mitigate the widespread morbidity and mortality related to this essential condition. emerging strategies which includes OTS clips, hemostatic retailers, TTS doppler, and EUS display promise in decreasing rebleeding costs and enhancing basic patient consequences. In addition randomized, controlled trials and cost-analyses may be helpful in delineating their specific roles in hemostasis for future clinical applications.

CONFLICT OF INTERIST

All authors declare no conflicts of interest.

AUTHOR CONTRIBUTION

Authors have equally participated and shared every item of the work.

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