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***Observational Study*****Clinical characteristics of acute non-varicose upper gastrointestinal bleeding and the effect of endoscopic hemostasis**

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**Abstract****BACKGROUND**

Acute non-variceal upper gastrointestinal bleeding (ANUVUGIB) constitutes a prevalent emergency within Gastroenterology, encompassing 80%-90% of all gastrointestinal hemorrhage incidents. This condition is distinguished by its abrupt onset, swift progression, and notably elevated mortality rate.

**AIM**

This study aimed to gather clinical data from patients with acute non-varicose upper digestive hemorrhage (ANVUGIB) at our hospital in order to elucidate the clinical characteristics specific to our institution and analyze the therapeutic effectiveness of endoscopic hemostasis.

**METHODS**

We retrospectively retrieved records of 532 patients diagnosed with ANVUGIB through endoscopy at our hospital between March 2021 and March 2023, utilizing our medical record system. Data pertaining to general patient information, etiological factors, disease outcomes, and other relevant variables were meticulously collected and analyzed.

## RESULTS

Among the 532 patients diagnosed with ANVUGIB, the male-to-female ratio was 2.91:1, with a higher prevalence among males. Notably, 43.6% of patients presented with black stool as their primary complaint, while 27.4% had hematemesis as their initial symptom. Upon admission, 17% of patients exhibited both hematemesis and black stool, while most ANVUGIB patients primarily complained of overt gastrointestinal bleeding. Urgent blood routine examinations at admission revealed that 75.8% of patients had anemia, with 63.4% experiencing moderate to severe anemia, and 1.5% having extremely severe anemia (Hemoglobin < 30g/L). Regarding etiology, 53.2% of patients experienced bleeding without a definitive trigger, 24.2% had a history of using gastric mucosa-irritating medications, 24.2% developed bleeding after alcohol consumption, 2.8% attributed it to improper diet, 1.7% to emotional excitement, and 2.3% to fatigue preceding the bleeding episode. Drug-induced ANVUGIB was more prevalent in the elderly than middle-aged and young individuals, while bleeding due to alcohol consumption showed the opposite trend. Additionally, diet-related bleeding was more common among the young age group compared to the middle-aged group. Gastrointestinal endoscopy identified peptic ulcers as the most frequent cause of ANVUGIB (73.3%), followed by gastrointestinal malignancies (10.9%), acute gastric mucous lesions (9.8%), and androgenic upper gastrointestinal bleeding (1.5%) among inpatients with ANVUGIB. Out of the 532 patients with gastrointestinal bleeding, 68 underwent endoscopic hemostasis, resulting in an endoscopic treatment rate of 12.8%, with a high immediate hemostasis success rate of 94.1%.

## CONCLUSION

ANVUGIB patients exhibit diverse characteristics across different age groups, and endoscopic hemostatic treatments have demonstrated remarkable efficacy.

## INTRODUCTION

Non-variceal upper gastrointestinal bleeding (NVUGIB) is characterized as gastrointestinal (GI) hemorrhage that originates proximal to the ligament of Treitz in the duodenum. Acute non-variceal upper gastrointestinal bleeding (ANUVUGIB) represents a common emergency in the field of Gastroenterology, accounting for 80%-90% of all cases of gastrointestinal bleeding <sup>[1]</sup>. It is characterized by its sudden onset, rapid progression, and high mortality rate <sup>[2]</sup>. The primary cause of NVUGIB is typically gastroduodenal peptic ulcers, succeeded by gastroduodenal erosions. Other prevalent causes include peptic esophageal lesions (esophagitis or esophageal ulcers), vascular anomalies such as Dieulafoy lesions (a medical condition characterized by an abnormal, tortuous arteriole penetrating the gastrointestinal mucosa), and vascular ectasias like angiodysplasia (a minor vascular malformation in the gut). Additionally, Mallory-Weiss tears (mucosal lacerations at the gastroesophageal junction, often associated with recurrent vomiting, particularly following excessive alcohol consumption or a large meal) and, to a lesser extent, neoplastic lesions, are also notable causes of NVUGIB <sup>[6,19]</sup>. Significant advancements in medicine over the past two decades have influenced both the incidence and outcomes of Non-variceal Upper Gastrointestinal Bleeding (NVUGIB). On one hand, the introduction of potent acid-suppressing medications, recognition of *H. pylori* as a key etiological factor in peptic ulcers leading to targeted eradication therapy, advancements in diagnostic and therapeutic endoscopy, implementation of restrictive blood transfusion policies, and enhanced management of critically ill patients are pivotal factors that have decreased the risk of developing NVUGIB and improved its management and outcomes. On the other hand, certain risk factors are becoming increasingly prevalent. These include an aging population, which contributes to a higher prevalence of cardiovascular diseases and other comorbidities that escalate the mortality risk associated with NVUGIB, and the growing use of low-dose aspirin (LDA), non-steroidal anti-inflammatory drugs (NSAIDs), and other antiplatelet and anticoagulant agents <sup>[20-22]</sup>. The etiological landscape seems to be changing over time, but the overall incidence of hospitalizations remains high. During

the initial stages of this condition, patients frequently present symptoms such as hematemesis and melena, and in severe cases, peripheral circulatory failure may develop. In clinical practice, traditional medical treatments are often employed to manage ANUVUGIB, but their effectiveness in controlling acute active bleeding is frequently unsatisfactory. The advent of endoscopic techniques and innovative endoscopic accessories has significantly enhanced the efficiency of hemostasis [3-5].

This study entails a retrospective analysis involving the retrieval of medical records pertaining to 532 patients who received a diagnosis of ANUVUGIB through endoscopic examination at our hospital between March 2021 and March 2023. Data encompassing general patient information, etiological factors, and disease outcomes were systematically collected to gain insights into the clinical characteristics of ANUVUGIB within our hospital. Furthermore, the study aims to enhance the understanding of ANUVUGIB among our clinical practitioners and improve the standards of diagnosis and treatment. Additionally, the research assesses the efficacy of endoscopic hemostasis in patients who underwent this procedure.

## **MATERIALS AND METHODS**

### ***Case Collection***

A total of 532 patient cases diagnosed with ANVUGIB through endoscopic examinations at our hospital between March 2021 and March 2023 have been retrieved from the hospital's medical records system. General patient information, etiological factors, and disease outcomes were meticulously gathered and refined. Data from patients who underwent endoscopic hemostasis treatment were specifically chosen for evaluating the effectiveness of this therapeutic approach.

### ***Research Methods***

A retrospective analysis was undertaken on the case data, encompassing age, gender, chief complaint upon admission, hemoglobin levels, precipitating factors, etiology,

treatment outcomes, and the effectiveness of endoscopic treatment. Moreover, an additional analysis examined the interplay between precipitating factors, etiology, and age groups by categorizing patients into the following groups: the youth group (age < 40), middle-aged group (age < 60 but ≥40), and elderly group (age ≥ 60).

### ***Statistical Methods***

In this study, initial data collection was accomplished through Excel spreadsheets. All data underwent statistical analysis using SPSS 26.0 software. Frequency and percentage (%) were used to present count data, while measurement data were presented as means with standard deviations ( $\bar{X} \pm s$ ). The comparison of count data was performed using the Pearson chi-square test or the continuity correction test, with statistical significance set at  $P < 0.05$  to indicate significant differences.

## **RESULTS**

### ***General Situation***

A total of 532 patients diagnosed with ANVUGIB were gathered at our center between March 2021 and March 2023, presenting with symptoms such as hematemesis, melena, and other upper gastrointestinal bleeding (refer to Table 1). Among them, there were 396 males (74.44%) and 136 females (25.56%), resulting in a male-to-female ratio of 2.91:1. The age of the patients ranged from 18 to 94 years, with an average age of  $53.34 \pm 18.92$  years and an average hospital stay of  $7.6 \pm 4.56$  days.

### ***Chief Complaint and Hemoglobin Levels on Admission***

After collecting and analyzing the chief complaints of patients upon admission, it was observed that the majority of ANVUGIB patients presented with a primary complaint related to gastrointestinal bleeding. Among these patients, 232 cases (43.6%) reported melena as their primary complaint, representing the highest proportion. Additionally, 146 cases (27.4%) cited hematemesis as their primary complaint, while 90 cases (17.0%) reported both hematemesis and melena. Abdominal pain was the primary complaint in



32 cases (6.0%), while 32 cases (6.0%) had atypical complaints like dizziness and weakness, with ANVUGIB confirmed after further examination.

Urgent routine blood tests conducted upon admission revealed that 75.8% of the patients were anemic. Among them, 8 cases (1.5%) had severe anemia ( $Hb \leq 30g/L$ ), 58 cases (10.9%) had moderate anemia ( $Hb 30 \sim 60g/L$ ), 203 cases (38.2%) had mild to moderate anemia ( $Hb 60 \sim 90g/L$ ), 134 cases (25.2%) had mild anemia ( $Hb 90 \sim 120g/L$ ), and 129 cases (24.2%) did not exhibit anemia ( $Hb \geq 120g/L$ ).

### ***Precipitating factor of ANVUGIB***

Upon reviewing the admission records and the medical course, it was observed that 53.2% of the patients did not have an evident precipitating factor before experiencing the bleeding, while nearly half of the patients had relatively clear triggers preceding the bleeding episode. Among this group, there were 129 cases (24.2%) of patients who had used aspirin, NSAIDs, glucocorticoids, chemotherapy, and molecular targeted drugs known to stimulate and damage the gastric mucosa. Additionally, some patients were taking anticoagulant drugs like warfarin and rivaroxaban, which impacted their coagulation function. There were 84 cases (15.8%) of patients with a history of alcohol consumption before the bleeding occurred. Improper diet was a contributing factor in 15 cases (2.8%), emotional excitement was noted in 9 cases (1.7%), and physical exertion was a factor in 12 cases (2.3%). Given the relatively low frequency of physical exertion and emotional excitement as precipitating factors, these will be collectively referred to as psychological factors in the subsequent text.

### ***Relationship between Etiology of ANVUGIB and Age Groups***

Further stratifying the patients into three age groups: the youth group (age < 40), the middle-aged group (age < 60 but  $\geq 40$ ), and the elderly group (age  $\geq 60$ ), we found 139 cases in the youth group, 221 cases in the middle-aged group, and 172 cases in the elderly group. Among the 249 patients for whom bleeding triggers were recorded, there were 65 cases in the youth group, 103 cases in the middle-aged group, and 81 cases in

the elderly group. Statistical analysis revealed differences in ANVUGIB triggered by drugs and alcohol among patients in various age groups, while no significant differences were observed in ANVUGIB induced by dietary and psychological factors among patients in different age groups (refer to Table 2).

### *Various Causes of ANVUGIB*

Upon completion of gastrointestinal endoscopy, it was evident that peptic ulcer disease constituted the vast majority of ANVUGIB cases, accounting for 73.3% (390 cases). Gastrointestinal malignancies comprised 10.9% (58 cases), while acute gastric mucosal lesions represented 9.8% (52 cases). Other contributing factors included duodenal diseases, angiodysplasia, esophageal ulcers, and anastomotic ulcers, collectively amounting to 4.5% (24 cases). Iatrogenic upper gastrointestinal bleeding accounted for 1.5% (8 cases), encompassing post-ESD/EMR bleeding, post-EST bleeding at the duodenal papilla, and post-polypectomy bleeding in the upper gastrointestinal tract.

Among the 390 diagnosed cases of gastrointestinal ulcer bleeding, 213 were attributed to duodenal ulcers, 116 to gastric ulcers, and 53 to compound ulcers involving both gastric and duodenal ulcers. Given the relatively low theoretical frequency, variance analysis based on the age of onset was not conducted for UGIB patients caused by esophageal ulcers, anastomotic ulcers, duodenal diseases, upper gastrointestinal vascular malformations, and iatrogenic factors.

### *Relationship between Causes of ANVUGIB and Age of Onset*

A total of 532 patients with acute non-variceal upper gastrointestinal bleeding (ANVUGIB) underwent complete gastrointestinal endoscopy to determine the cause of bleeding. Among them, there were 139 cases in the young age group, 221 cases in the middle-aged group, and 172 cases in the elderly group. Statistical analysis revealed differences in the causes of gastrointestinal bleeding among the different age groups (refer to Table 3). Further pairwise comparisons using chi-square analysis showed that the comparison of bleeding caused by duodenal ulcers between the young and middle-



aged groups was not statistically significant ( $\chi^2=3.841$ ,  $P = 0.05$ ). However, the incidence rate in both the young and middle-aged groups was higher than that in the elderly group, with significant differences ( $P<0.05$ ).

The comparison of gastric ulcer bleeding between the middle-aged and elderly groups was not statistically significant ( $\chi^2=0.041$ ,  $P = 0.840$ ), but the incidence rate in both the middle-aged and elderly groups was higher than that in the young group, with significant differences ( $\chi^2=13.363$ ,  $p<0.001$ ,  $\chi^2=15.059$ ,  $p<0.001$ ). The incidence rate of compound ulcer bleeding showed no statistical significance between the young and middle-aged groups ( $\chi^2=1.043$ ,  $P = 0.307$ ), but it was higher than that in the elderly group, with significant differences ( $P<0.05$ ).

The comparison of bleeding caused by upper gastrointestinal malignancies between the young and middle-aged groups was not statistically significant ( $\chi^2=3.600$ ,  $P = 0.773$ ), but it was significantly lower than that in the elderly group ( $P<0.05$ ). Among patients admitted with a diagnosis of acute gastric mucosal lesions, there was no statistical difference between the young and middle-aged groups ( $\chi^2=0.083$ ,  $P = 0.058$ ), but both were higher than those in the elderly group ( $P<0.05$ ).

Therefore, it can be concluded that acute gastric mucosal lesions, duodenal ulcers, and compound ulcers are more common in the middle-aged and young age groups, while gastric ulcers are more common in the middle-aged and elderly groups. The incidence rate of upper gastrointestinal malignancies is significantly higher in the elderly population compared to the middle-aged and young age groups.

### *Treatment and Outcome*

Out of the 532 patients with gastrointestinal bleeding, a total of 464 patients were diagnosed through endoscopy. These patients either received conservative drug therapy or were promptly referred to other departments for surgery or interventional treatment. Among them, 68 patients who were hemodynamically stable or stabilized after volume expansion underwent endoscopic hemostatic treatment, representing an endoscopic treatment rate of 12.8%. Of the 68 patients who underwent endoscopic

hemostasis during gastroscopy, four patients encountered challenges during the procedure for various reasons. Among these, three patients required embolization therapy for hemostasis, while one patient underwent surgical intervention for hemostasis. The remaining 64 bleeding patients achieved immediate hemostasis through endoscopic treatment, resulting in an immediate endoscopic hemostasis rate of 94.1%(refer to Table 4).

## **DISCUSSION**

Acute non-variceal upper gastrointestinal bleeding (ANVUGIB) represents a grave condition characterized by a high incidence, rebleeding rate, and mortality rate. It has consistently remained a subject of great concern for gastroenterologists and emergency physicians. This study undertook a retrospective analysis of patients diagnosed with ANVUGIB through endoscopic examinations conducted between March 2021 and March 2023 at our hospital. The findings revealed a significantly higher number of male patients compared to female patients, with a male-to-female ratio of 2.91:1. The age range of patients spanned from 18 to 94 years, with an average age of  $53.34 \pm 18.92$  years and an average hospital stay duration of  $7.6 \pm 4.56$  days. In line with previous studies conducted by Zhang Yanxia and Han Rong, gender emerged as one of the influencing factors for the occurrence of gastrointestinal bleeding [7,8]. Simplified statistics concerning admission complaints indicated that 43.6% of patients presented with melena as their primary complaint upon admission, while 27.4% presented with hematemesis. Additionally, 17% of patients exhibited both hematemesis and melena upon admission. The majority of ANVUGIB patients sought medical attention with clear complaints of gastrointestinal bleeding, underscoring the importance of vigilance for patients with atypical gastrointestinal bleeding complaints during the clinical assessment. Blood routine examination results at admission revealed that 75.8% of patients exhibited anemia, with 63.4% of them classified as having moderate or more severe anemia. A minority of patients (1.5%) presented with extremely severe anemia (Hemoglobin < 30g/L). The initial blood routine examination upon admission played a

crucial role in determining whether patients required immediate blood transfusion therapy. Patients with Hemoglobin levels below 70g/L were considered the primary candidates for transfusion therapy [4].

In recent years, there has been a notable surge in drug-related acute gastric mucosal lesions and bleeding, specifically associated with medications such as aspirin and heparin. This trend can be attributed to the aging population and the heightened prevalence of cardiovascular and cerebrovascular diseases among the elderly. Cai Ling *et al* conducted a study involving 253 patients with acute gastric mucosal lesions (AGML), where 153 cases (60.47%) were linked to NSAIDs and anticoagulant drugs. Notably, the incidence ratio between the first five years and the last five years exhibited statistical significance ( $P < 0.05$ ) [9]. In this investigation, upon categorizing the patients into different age groups, it was revealed that 53.2% of the patients experienced bleeding without any apparent triggers beforehand, while nearly half of the patients had identifiable triggers preceding the bleeding episode. Among this latter group, 24.2% of the patients were using aspirin, NSAIDs, corticosteroids, chemotherapy drugs, and molecularly targeted drugs known to stimulate and damage the gastric mucosa, along with patients taking anticoagulant medications like warfarin and rivaroxaban, which impact coagulation function. These individuals were primarily middle-aged and elderly, further reinforcing the aforementioned findings. Moreover, patients with a history of alcohol consumption accounted for 15.8% of cases before the onset of bleeding. Subsequent subgroup analysis indicated that the rise in the proportion of ANVUGIB in the younger age group was primarily linked to digestive ulcers and acute gastric mucosal lesions caused by alcohol consumption in this demographic.

Further research conducted among different age groups has revealed variations in the etiology of gastrointestinal bleeding. When comparing bleeding caused by duodenal ulcers between the young and middle-aged groups, no statistically significant difference was observed ( $\chi^2 = 3.841$ ,  $P = 0.05$ ). However, the incidence rates were higher in both the young and middle-aged groups when compared to the elderly group, and these differences were statistically significant ( $P < 0.05$ ). Similarly, when examining gastric

ulcer bleeding between the middle-aged and elderly groups, no statistical significance was found ( $\chi^2=0.041$ ,  $P = 0.840$ ). Nevertheless, the incidence rates of gastric ulcer bleeding were notably higher in both the middle-aged and elderly groups in comparison to the young group, and these disparities were statistically significant ( $\chi^2=13.363$ ,  $p<0.001$ ,  $\chi^2=15.059$ ,  $p<0.001$ ). The incidence rate of combined ulcer bleeding displayed no statistical significance between the young and middle-aged groups ( $\chi^2=1.043$ ,  $P = 0.307$ ), but it was significantly elevated in both of these groups when compared to the elderly group, with statistically significant differences ( $P<0.05$ ). Furthermore, when comparing patients with upper gastrointestinal malignant tumors causing bleeding between the young and middle-aged groups, no statistical significance was observed ( $\chi^2=3.600$ ,  $P = 0.773$ ). However, both of these groups exhibited significantly lower incidence rates when compared to the elderly group, with statistically significant differences ( $P<0.05$ ). In conclusion, it can be deduced that acute gastric mucosal lesions, duodenal ulcers, and combined ulcers are more prevalent in the middle-aged and young groups, while gastric ulcers are more common in the middle-aged and elderly groups. Additionally, the incidence rate of upper gastrointestinal malignant tumors is notably higher among the elderly population as compared to the middle-aged and young groups.

Furthermore, as endoscopic technology continues to advance and the number of endoscopic procedures performed rises, iatrogenic gastrointestinal bleeding has been increasingly identified as a notable complication during and after surgeries. In this retrospective analysis, iatrogenic upper gastrointestinal bleeding constituted 1.5% of cases (8 instances), encompassing post-ESD/EMR bleeding, bleeding following EST procedures in the duodenal papilla, and post-endoscopic polypectomy bleeding in the upper gastrointestinal tract. A comprehensive literature review disclosed noteworthy discrepancies in the incidence of intraoperative and postoperative bleeding associated with ESD/EMR across different medical centers [10-13]. This analysis suggests that the substantial variations in occurrence rates might be attributed to various factors, such as differing definitions of bleeding complications employed by different physicians, the

extent of submucosal dissection, and the extent of electrocoagulation applied to the wound surface after dissection.

Several prior studies <sup>[14-18]</sup> have affirmed the therapeutic efficacy of gastrointestinal endoscopy in the management of Acute Non-Variceal Upper Gastrointestinal Bleeding (ANVUGIB). It has been shown to significantly enhance treatment outcomes, reduce the treatment duration, and improve hemoglobin levels. In this particular investigation, conducted among a cohort of 532 patients with gastrointestinal bleeding, a total of 68 patients underwent endoscopic hemostatic procedures, representing a utilization rate of 12.8% for endoscopic treatment. The indications for endoscopic treatment predominantly included pulsatile bleeding, oozing, exposure of blood vessels, and the identification of the primary bleeding site following the removal of blood clots due to various etiologies. Among the 68 patients who underwent endoscopic hemostasis *via* gastroscopy, four cases encountered challenges in achieving hemostasis through endoscopy due to various factors. Within this subgroup, three patients underwent embolization therapy to achieve hemostasis, while one patient required surgical intervention for hemostasis. Among the remaining 64 patients experiencing bleeding, immediate hemostasis was successfully achieved through endoscopic treatment, resulting in an impressive immediate endoscopic hemostasis rate of 94.1%. These results underscore the effectiveness of endoscopic hemostatic treatment for upper gastrointestinal bleeding. However, it is crucial to remain vigilant against the possibility of rebleeding.

## **CONCLUSION**

In summary, this retrospective study examined the data of patients diagnosed with ANVUGIB through endoscopic examination at our hospital. It highlighted the distinct characteristics among ANVUGIB patients of different age groups. While this study was conducted at a single center, it's noteworthy that the age and gender distribution of the patients in this study closely mirrored those reported in previous multicenter studies conducted in China. Furthermore, the study analyzed the therapeutic impact of

endoscopic hemostatic treatment, indicating that it is indeed effective in managing ANVUGIB, enhancing treatment outcomes, and warranting broader application.



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