

# Efficacy of tranexamic acid combined with octreotide in acute upper gastrointestinal bleeding: A retrospective clinical controlled study of high-risk patients

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**Abstract: Background:** Acute upper gastrointestinal bleeding (AUGIB) is a critical clinical condition with high morbidity and mortality, necessitating effective therapeutic interventions. **Objectives:** This study retrospectively investigated the efficacy of tranexamic acid combined with octreotide (OCT) in patients with high risk of AUGIB. **Methods:** A total of 183 patients with UGIB were initially enrolled, and 170 eligible patients were finally included and divided into an OCT group (n=83) and a TXA + OCT group (n=87). The main indicators compared were: drug onset time, hemostasis time, upper gastrointestinal bleeding volume, blood routine, coagulation function and clinical effective rate; secondary indicators: clinical efficacy, visual analogue scale (VAS) and adverse reactions. **Results:** After treatment, the onset time, hemostasis time, bleeding volume, coagulation function indexes (PT, TT, APTT and Fib) and VAS in TXA group and OCT group were significantly lower than those in OCT group. The clinical effective rate and hemoglobin, red blood cell and platelet count in TXA group and OCT group were significantly higher than those in OCT group ( $P < 0.05$ ). There were no significant differences in the average blood transfusion volume, hospitalization time, rebleeding rate within 3 days, surgical intervention needs and mortality between the two groups ( $P > 0.05$ ), but the combined group had a slight advantage. In addition, combination therapy did not increase the incidence of adverse reactions. **Conclusion:** These findings provide valuable clinical evidence supporting the use of tranexamic acid in combination with octreotide for AUGIB.

**Keywords:** Acute upper gastrointestinal bleeding; Hemostasis; Octreotide; Tranexamic acid

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## INTRODUCTION

Acute upper gastrointestinal bleeding (AUGIB) is an acute bleeding lesion in the digestive tract (including esophagus, stomach, duodenum and biliary and pancreatic systems) above the Treitz ligament. It is a common cause of emergency department admissions. The clinical manifestations are hematemesis and melena. In severe cases, peripheral circulation failure and even shock can occur (Abrishami *et al.*, 2020; Wasserman *et al.*, 2024). There are many different causes of AUGIB, esophagitis, esophageal varices, peptic ulcer disease, duodenitis, Mallory-Weiss tear, etc. These causes vary from country to country, even in the same country. Peptic ulcer bleeding is the most common (40-50 %) and may be very serious in patients with esophageal varices (Akhtar *et al.*, 2023; Long

and Gottlieb, 2024). UGIB is a relatively common medical emergency, with a mortality rate of 2-16 %, of which 80 % -90 % of UGIB belongs to non-variceal UGIB (Akhtar *et al.*, 2023; Gupta and Gupta, 2022; L. Yang, 2022). Emergency endoscopy can significantly reduce the incidence and mortality of AUGIB by quickly locating the location and cause of bleeding and effectively managing bleeding activities and distinguishing high-risk and low-risk patients (Benedeto-Stojanov *et al.*, 2022). At present, the treatment of UGIB includes endoscopy, drugs (such as vasopressin, somatostatin and proton pump inhibitors, etc), angiography and surgical treatment. The core goal is to stop bleeding, stabilize hemodynamics and prevent rebleeding (Lee and Cho, 2024). Most patients can effectively control bleeding through drug therapy and endoscopic treatment and about 5% -15% of patients fail to stop bleeding under endoscopy and need interventional or surgical treatment (Yang, 2022).

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Octreotide (OCT), as a synthetic somatostatin analogue, has shown promise in patients with gastrointestinal bleeding, especially in reducing rebleeding rate and improving overall clinical outcomes (Papantoniou *et al.*, 2025; Peng and Chang, 2024; Yang *et al.*, 2025). Compared with natural somatostatin, the half-life of octreotide is significantly prolonged, which makes it have important application value in clinical treatment (Debnath and Cheriya, 2025; Mas *et al.*, 2022). In recent years, with the deepening of research, octreotide has shown new therapeutic potential in the treatment of UGIB. However, compared with traditional drugs such as pituitrin, octreotide also has certain limitations, such as high cost and limited route of administration.

Tranexamic Acid (TXA) is a synthetic anti-fibrinolytic drug that helps to reduce postoperative bleeding and traumatic bleeding (Grocott *et al.*, 2022; Prudovsky *et al.*, 2022). In view of its exact efficacy and good safety, the drug has been included in the WHO standard list of essential drugs and has been clinically recommended by several international authoritative guidelines (Lee *et al.*, 2021). Existing evidence shows that TXA has a significant hemostatic effect across a variety of surgical procedures, effectively minimizing intraoperative blood loss and substantially improving survival rates in obstetric and traumatic hemorrhage. In the clinical management of UGIB, the use of TXA has been shown to reduce mortality risk and the need for surgical intervention. However, some gastrointestinal bleeding studies have shown that TXA has not shown significant clinical benefits and TXA has not been listed as a blood routine treatment drug for gastrointestinal bleeding in clinical practice (Colomina *et al.*, 2022; Faraoni and Fenger-Eriksen, 2024; Lee *et al.*, 2021).

The combination of octreotide and tranexamic acid shows a synergistic advantage in the treatment of UGIB, as octreotide reduces rebleeding risk and tranexamic acid enhances hemostasis via antifibrinolysis. However, clinical evidence remains insufficient. This study aims to clarify the efficacy and safety of this combination regimen in high-risk UGIB patients, thereby providing further support for its clinical application.

## MATERIALS AND METHODS

### Subjects

This study used a clinical retrospective analysis method to include 183 patients with UGIB who were admitted from May 2021 to November 2023. After preliminary screening, patients with specific diseases and an inability to communicate effectively were excluded according to the exclusion criteria. Finally, a total of 170 eligible patients were included in the study and divided into two groups: octreotide monotherapy group (OCT group, n = 83) and combination therapy group (TXA + OCT Group, n = 87).

In addition to conventional treatment, patients in the OCT group were only treated with octreotide, while patients in the TXA + OCT group were treated with tranexamic acid combined with octreotide. The information of AUGIB patients was collected according to the electronic medical record information of Baoding People's Hospital. The Primary indicators were compared: drug onset time, hemostasis time, upper gastrointestinal bleeding volume, blood routine, coagulation function and clinical effective rate; and secondary indicators: clinical outcome, visual analogue scale (VAS) and adverse reactions. The process design is shown in fig.1.

### **Inclusion and exclusion criteria (Abrishami *et al.*, 2020; Horibe *et al.*, 2018)**

**Inclusion criteria:** (1) Patients with UGIB according to the guidelines and combined with clinical features and endoscopic findings; (2) symptoms of hematemesis, black stool or tarry stool; (3) According to the guidelines and combined with clinical features, endoscopic findings and scoring system, the patients were comprehensively judged as high-risk patients; (4) 18 to 80 years old.

**Exclusion criteria:** (1) Patients with congestive heart failure; (2) Patients with end-stage renal disease who received hemodialysis; (3) pregnant or lactating women; (4) patients with acute coronary events; (5) Patients taking anticoagulants and patients with coagulation disorders; (6) Patients taking contraceptives, history of stroke, DVT and retinal vein or artery occlusion; (7) Patients with mental illness such as schizophrenia and acute manic episodes and unable to communicate normally.

### **Sample size calculation**

Reference to other literature, there were at least 40 patients in each group (Omoronyia *et al.*, 2025). In this study, the non-response rate was assumed to be 10% and the shedding rate was 10% (i.e.,  $r = 20\%$  or 0.2). Based on the two-sided test design, the significance level  $\alpha = 0.05$  and the test efficiency  $1 - \beta = 0.8$  ( $\beta = 0.2$ ). The calculated sample size was rounded to a minimum of 100 subjects (50 in each group). Finally, 170 subjects were included in this study, which exceeded the preset sample size requirement and provided more sufficient statistical guarantee for the research results.

### **Treatment and grouping**

According to the electronic medical records of Baoding People's Hospital, all patients received routine symptomatic treatment. On the basis of conventional treatment, patients treated with octreotide monotherapy were selected as the OCT group; patients treated with octreotide and tranexamic acid were treated as TXA + OCT group (Huang *et al.*, 2024; Zhu *et al.*, 2023).

### **Data collection**

Patient information was collected based on electronic cases,

including patient gender, age, BMI, smoking history, drinking history, causes and risk scores of UGIB, visual analogue scale (VAS) of pain and adverse reactions. Blood routine: hemoglobin level, red blood cell count, platelet count, coagulation function: prothrombin time (PT), thrombin time (TT), activated partial thromboplastin time (APTT), fibrinogen (FIB) and other information. The Rockall score (RS) is a widely used risk assessment tool for predicting mortality and rebleeding risk in patients with UGIB. A pre-endoscopic RS value of 3 or lower predicts a low risk of complications, while a post-endoscopic RS value of 8 or higher indicates a high risk of death. The Glasgow-Blatchford Score (GBS) is a validated risk assessment tool used to evaluate the severity and predict outcomes in patients with UGIB. A GBS greater than 6 indicates the need for blood transfusion and emergency hospitalization. AIMS65 is a clinical scoring system used to assess the risk of mortality, need for transfusion, and rebleeding in patients with UGIB and a score of  $\geq 2$  is a high risk. (Abraham *et al.*, 2025; Franco *et al.*, 2022). The calculation methods of RS, GBS and AIMS65 are shown in the previous literature (Stanley *et al.*, 2017). VAS was used to assess the degree of pain. The scale ranged from 0 to 10 points. The higher the score, the more severe the pain (Zhou *et al.*, 2024)

#### **Drug onset time, hemostasis time and upper gastrointestinal bleeding volume**

According to the electronic medical records of Baoding People's Hospital, the information on drug onset time, hemostasis time, and upper gastrointestinal bleeding volume was calculated (Zhu *et al.*, 2023). A positive fecal occult blood test indicates that the daily amount of bleeding in the digestive tract of the patient is  $\geq 5$  ml; black stool indicates that the amount of bleeding is 50-70 ml; haemorrhage indicates a storage volume of 250-300 ml, a decrease in hemoglobin of 1 g and a volume of about 400 ml.

#### **Clinical effectiveness rates**

According to the electronic medical records of Baoding People's Hospital, the total effective rate is calculated. Total effective rate = excellent rate + effective rate (Zhu *et al.*, 2023). *Excellent*: Hemostasis was successful within 24 hours after treatment. There was no evidence of active bleeding (stable blood pressure, heart rate  $< 90$  beats/min, yellow stool, gastroscopy confirmed that bleeding stopped), hemoglobin content was normal and blood urea nitrogen value was no longer increased. *Effective*: Hemostasis was successful within 24-72 hours after treatment and no active bleeding was found. *Invalid*: After 72 hours of treatment, there were still symptoms of bleeding, vomiting, blood or melena, unstable blood pressure, heart rate and pulse and hemoglobin content continued to decline or had a downward trend.

#### **Comparison of clinical outcomes**

According to the hospital electronic medical records, the

average blood transfusion volume, hospitalization time, rebleeding rate within 3 days, surgical intervention needs and mortality information were collected. Rebleeding was defined as hematemesis, hematochezia, a hemoglobin drop exceeding 2 g/dL, persistent melena, or fresh blood observed in the nasogastric tube after initial treatment (Abrishami *et al.*, 2020).

#### **Statistical analysis**

The data of this study were compared using SPSS 26 software using parametric or non-parametric test methods. The data following a normal distribution were presented as mean  $\pm$  SD, while categorical variables were expressed as counts n (%). Intergroup comparisons were performed using the chi-square test, with statistical significance set at  $P < 0.05$ .

## **RESULTS**

#### **Baseline characteristics**

There were no significant differences in gender, age, BMI, smoking and drinking history, causes of upper gastrointestinal bleeding and Rockall, Blatchford and AIMS65 scores between the two groups ( $P > 0.05$ ), indicating that the two groups of patients were comparable before treatment (Table 1).

#### **Onset time, hemostasis time and average bleeding volume**

Compared with OCT Group, the onset time (95 % CI: -2.332 to 4.261,  $t = 6.749$ ,  $P < 0.01$ ) and hemostasis time (95 % CI: 5.057 to 7.143,  $t = 11.547$ ,  $P < 0.01$ ) of TXA + OCT Group were significantly shortened and the amount of bleeding was also significantly reduced (95 % CI: 38.268 to 56.044,  $t = 10.474$ ,  $P < 0.01$ ). It is suggested that the combined drug regimen can quickly and effectively control bleeding and show a significant advantage over single drug therapy in clinical hemostatic treatment (Table 2).

#### **Blood routine**

After treatment, the Hb, RBC and platelet PLT of the two groups were significantly increased and the Hb, RBC and PLT of TXA + OCT Group were significantly higher than those of OCT Group ( $P < 0.05$ ). Hb and red blood cell count are higher than those before treatment, which usually indicates the response of bleeding improvement or effective treatment. The increase of platelet count also indicates the enhancement of hemostasis and coagulation function (Table 3).

#### **Coagulation function**

Coagulation function, including PT, TT, APTT and Fib levels, were significantly changed after treatment in both groups ( $P < 0.05$ ). Following treatment, the PT, TT, APTT and Fib levels in TXA + OCT Group were significantly lower than those in OCT Group ( $P < 0.001$ ).

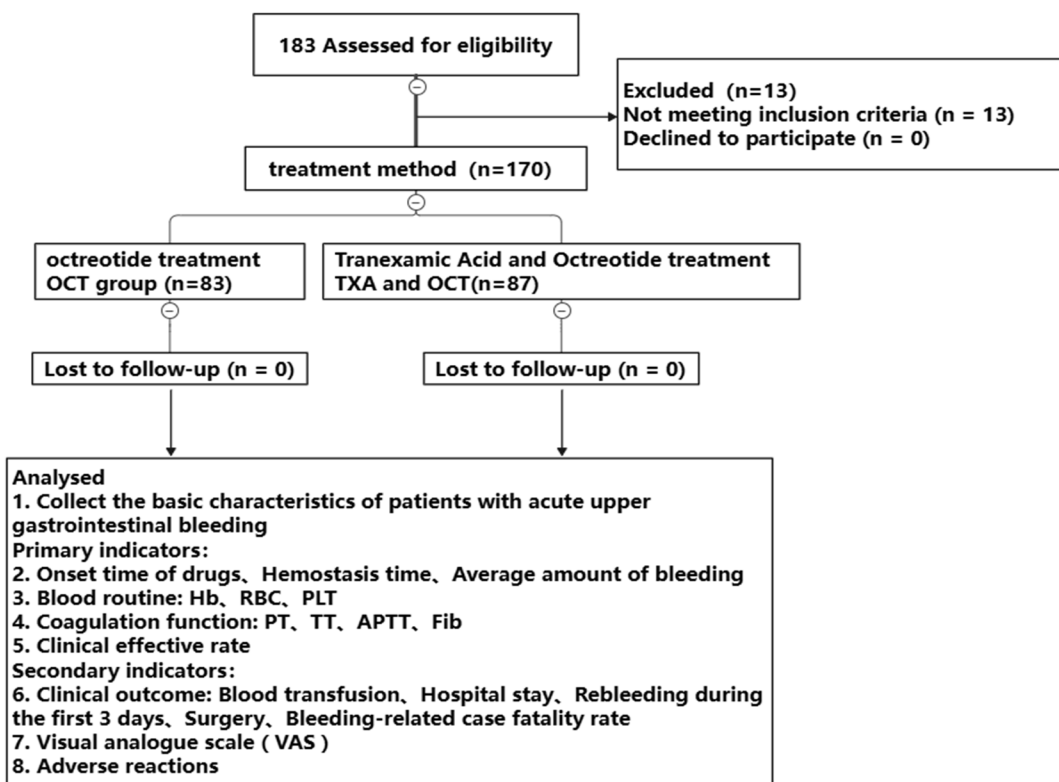


Fig. 1: Study flow diagram.

Table 1: Comparison of basic characteristics

| characteristics  | OCT group (n=83) | TXA + OCT group(n=87) | 95% CI          | $\chi^2/t$ | P     |
|--|------------------|-----------------------|-----------------|------------|-------|
| Gender   |                  |                       |                 |            |       |
| Male   | 43 (51.81)       | 46 (52.87)            | -               | 0.019      | 0.889 |
| Female   | 40 (48.19)       | 41 (47.13)            | -               |            |       |
| Age (years)  | 54.01±5.58       | 53.56±5.32            | -1.202 to 2.100 | 0.537      | 0.592 |
| BMI (kg/m <sup>2</sup> )   | 21.88±2.33       | 22.26±2.27            | -0.876 to 0.515 | -0.512     | 0.609 |
| Drinking wine  |                  |                       |                 |            |       |
| Yes  | 4 (4.82)         | 6 (6.90)              | -               | 0.331      | 0.565 |
| No   | 79 (95.18)       | 81 (93.10)            | -               |            |       |
| Smoking  |                  |                       |                 |            |       |
| Yes  | 11 (13.25)       | 14 (16.09)            | -               | 0.273      | 0.601 |
| No   | 79 (86.75)       | 81 (83.91)            | -               |            |       |
| Reason of AUGBI  |                  |                       |                 |            |       |
| GU/DU  | 45 (54.22)       | 48 (55.17)            |                 |            |       |
| Esophageal diseases  | 7 (8.43)         | 6 (6.90)              |                 |            |       |
| Upper gastrointestinal cancer  | 8 (9.64)         | 9 (10.34)             | -               | 0.81       | 0.975 |
| MWT  | 7 (8.43)         | 8 (9.20)              |                 |            |       |
| EG/ED  | 11 (13.25)       | 9 (10.34)             |                 |            |       |
| Other  | 5 (6.02)         | 7 (8.05)              |                 |            |       |
| Classification of patients based on Rockall, Blatchford, and AIMS65 scores |                  |                       |                 |            |       |
| Rockall score  | 6.90±2.18        | 6.84±2.23             | -0.603 to 0.733 | 0.191      | 0.849 |
| Blatchford score   | 11.88±3.95       | 12.13±3.98            | -1.449 to 0.955 | -0.405     | 0.686 |
| AIMS65 score   | 2.83±1.22        | 2.77±1.25             | -0.312 to 0.434 | 0.324      | 0.747 |

Note: BMI: Body Mass Index. GU/DU: Gastric ulcer/Duodenal ulcer, MWT: Mallory-Weiss tear, EG/ED: Erosive gastritis/Erosive duodenitis

**Table 2:** Comparison of onset time, hemostasis time and average amount of bleeding ( $x\pm s$ )

| Variables                       | OCT group (n=83) | TXA + OCT group (n=87) | 95% CI           | <i>t</i> | <i>P</i> |
|---------------------------------|------------------|------------------------|------------------|----------|----------|
| Onset time of drugs (h)         | 8.20±3.77        | 4.91±2.50              | -2.332 to 4.261  | 6.749    | <0.001   |
| Hemostasis time (h)             | 15.42±3.75       | 9.32±3.12              | 5.057 to 7.143   | 11.547   | <0.001   |
| Average amount of bleeding (mL) | 108.89±37.21     | 61.74±19.03            | 38.268 to 56.044 | 10.474   | <0.001   |

**Table 3:** Comparison of blood routine ( $x\pm s$ )

| Blood routine           | Treatment status | OCT group (n=83) | TXA + OCT group (n=87) | 95% CI             | <i>t</i> | <i>P</i> |
|-------------------------|------------------|------------------|------------------------|--------------------|----------|----------|
| Hb (g/L)                | Baseline         | 94.90±11.70      | 95.42±11.99            | -4.111 to 3.067    | -0.287   | 0.775    |
|                         | After treatment  | 109.79±10.70*    | 126.67±17.28*          | -21.247 to -12.496 | -7.612   | <0.001   |
| RBC ( $10^{12}/L$ )     | Baseline         | 3.42±0.66        | 3.37±0.63              | -0.151 to 0.239    | 0.447    | 0.655    |
|                         | After treatment  | 4.67±0.80*       | 5.47±1.03*             | -1.085 to -0.524   | -5.663   | <0.001   |
| PLT ( $\times 10^9/L$ ) | Baseline         | 182.25±26.08     | 184.23±21.28           | -9.170 to 5.216    | -0.543   | 0.588    |
|                         | After treatment  | 213.98±21.77*    | 236.89±20.83*          | -29.360 to -16.458 | -7.011   | <0.001   |

Note: Compared with the Baseline, \*  $P < 0.05$ . Hb: Hemoglobin, RBC: Red blood cell, PLT: Platelet.

**Table 4:** Comparison of coagulation function ( $x\pm s$ )

| Variables | Treatment status | OCT group (n=83) | TXA + OCT group (n=87) | 95% CI          | <i>t</i> | <i>P</i> |
|-----------|------------------|------------------|------------------------|-----------------|----------|----------|
| PT (s)    | Baseline         | 13.88±1.58       | 13.97±1.41             | -0.549 to 0.356 | -0.421   | 0.674    |
|           | After treatment  | 11.48±1.26*      | 9.33±1.18*             | 1.771 to 2.511  | 11.424   | <0.001   |
| TT (s)    | Baseline         | 20.21±2.30       | 20.05±2.10             | -0.511 to 0.824 | 0.463    | 0.644    |
|           | After treatment  | 15.30±2.01*      | 12.67±2.06*            | 2.019 to 3.252  | 8.441    | <0.001   |
| APTT (s)  | Baseline         | 32.28±4.76       | 32.64±4.47             | -1.765 to 1.032 | 0.379    | 0.606    |
|           | After treatment  | 26.40±2.53*      | 22.52±2.04*            | 3.186 to 4.575  | 11.027   | <0.001   |
| Fib (g/L) | Baseline         | 3.98±0.38        | 4.02±0.57              | -0.194 to 0.101 | -0.618   | 0.538    |
|           | After treatment  | 2.72±0.52*       | 2.33±0.40*             | 0.246 to 0.525  | 5.455    | <0.001   |

Note: Compared with the Baseline, \*  $P < 0.05$ . PT: Prothrombin time, TT: Thrombin time, APTT: Activated partial thromboplastin time, Fib: Fibrinogen.

**Table 5:** Comparison of total effective rate ([n (%)])

| Variables            | OCT group (n=83) | TXA + OCT group (n=87) | $\chi^2$ | <i>P</i> |
|----------------------|------------------|------------------------|----------|----------|
| Excellent            | 26 (31.33)       | 51 (61.45)             | 10.766   | 0.001    |
| Effective            | 37 (44.58)       | 30 (36.14)             | 1.813    | 0.178    |
| Invalid              | 20 (24.10)       | 6 (7.23)               | 9.7      | 0.002    |
| Total effective rate | 63 (75.90)       | 81 (97.59)             | 9.7      | 0.002    |

**Table 6:** Comparison of clinical outcomes ( $x\pm s$ )

| Variables                           | OCT group (n=83) | TXA + OCT group (n=87) | 95% CI            | $\chi^2/t$ | <i>P</i> |
|-------------------------------------|------------------|------------------------|-------------------|------------|----------|
| Blood transfusion(ml)               | 48.19±104.02     | 33.33±87.16            | -14.147 to 43.866 | 1.011      | 0.313    |
| Hospital stay (day)                 | 4.04±1.08        | 3.77±10.5              | -0.056 to 0.588   | 1.629      | 0.105    |
| Rebleeding during the first 3 days  | 8 (9.64)         | 6 (6.90)               |                   | 0.423      | 0.516    |
| Surgery                             | 3 (3.61)         | 1 (1.15)               | -                 | 1.123      | 0.289    |
| Bleeding-related case fatality rate | 1 (1.20)         | 0 (0.00)               |                   | 1.054      | 0.305    |

**Table 7:** Comparison of VAS ( $\bar{x}\pm s$ )

| Variables | Treatment status | OCT group (n=83) | TXA + OCT group (n=87) | 95% CI          | t      | P      |
|-----------|------------------|------------------|------------------------|-----------------|--------|--------|
| VAS       | Baseline         | 6.08±1.46        | 6.21±1.59              | -0.584 to 0.339 | -0.524 | 0.601  |
|           | After treatment  | 1.48±0.92*       | 0.93±0.91*             | 0.274 to 0.827  | 3.929  | <0.001 |

Note: Compared with the Baseline, \*  $P < 0.05$ .

**Table 8:** Comparison of Side effects [n(%)]

| Variables                          | OCT group (n=83) | TXA and OCT group (n=87) | $\chi^2$ | P     |
|------------------------------------|------------------|--------------------------|----------|-------|
| Nausea and vomiting                | 4 (4.82)         | 2 (2.30)                 | 0.793    | 0.373 |
| Stomach pain abdominal distension  | 1 (1.20)         | 1 (1.15)                 | 0.001    | 0.973 |
| Headache                           | 0 (0.00)         | 1 (1.15)                 | 0.96     | 0.327 |
| Chest tightness heart palpitations | 3 (3.61)         | 1 (1.15)                 | 1.123    | 0.289 |
| Elevated blood pressure            | 2 (2.41)         | 2 (2.30)                 | 0.002    | 0.962 |
| Allergic reaction                  | 1 (1.20)         | 0 (0.00)                 | 1.054    | 0.305 |
| Other                              | 2 (2.41)         | 3 (3.45)                 | 0.161    | 0.689 |

The decrease of Fib level indicates the decrease of coagulation material consumption, the shortening of PT reflects the recovery of exogenous coagulation pathway function, the shortening of TT indicates the improvement of fibrinogen function or quantity and the shortening of APTT indicates the enhancement of endogenous coagulation pathway function. The clinical manifestations of these multi-index synergistic improvement usually indicate the overall improvement of coagulation function (Table 4).

#### Clinical effective rates

After treatment, the TXA + OCT combination therapy demonstrated a significantly higher total effective rate (97.59%) compared to OCT monotherapy (75.90%) ( $P < 0.05$ ). These findings indicate that the combined use of TXA + OCT may provide superior hemostatic efficacy over OCT alone in managing patients at high risk of AUGIB (Table 5).

#### Comparison of clinical outcomes

As shown in table 6, OCT Group had 16 patients, with an average loss of  $48.19 \pm 104.02$  ml ; in TXA + OCT Group, 13 patients received blood transfusion, with an average of  $33.33 \pm 87.16$  ml ; the average hospitalization time of the two groups was  $4.04 \pm 1.08$  days and  $3.77 \pm 10.5$  days respectively. About 9.64 % of OCT Group patients and 6.90 % of TXA + OCT Group patients had early rebleeding within the first 3 days after admission. The bleeding of 3 patients in OCT Group and 6.90 % of 1 patient in TXA + OCT Group was uncontrolled and the surgical treatment was finally performed. One death occurred in OCT Group (1.20 %). There was no death in TXA + OCT Group.

#### VAS score

After treatment, the pain symptoms of the two groups were significantly improved compared with those before treatment. The VAS of TXA + OCT Group decreased to  $1.48 \pm 0.92$ , which was significantly lower than  $0.93 \pm 0.91$

of the single OCT treatment group ( $t = 3.929$ ,  $P < 0.001$ ). This suggests that the combined treatment regimen shows a more significant therapeutic advantage in relieving pain in patients (Table 7).

#### Adverse effects

There was no significant difference in adverse reactions such as stomach pain, abdominal distension, headache, chest tightness, palpitation, elevated blood pressure and allergic reactions between TXA + OCT Group and OCT Group ( $P > 0.05$ ). This important finding suggests that increasing the combination of drugs on the basis of existing treatment regimens does not significantly increase the risk of adverse drug reactions in patients and confirms the clinical feasibility of the combined treatment strategy from a safety perspective (Table 8).

## DISCUSSION

AUGIB is a common clinical emergency caused by a variety of causes such as peptic ulcer disease, which occurs in the esophagus, stomach or duodenum and other parts of the digestive tract bleeding. (Antunes *et al.*, 2025). UGIB accounts for up to 75 % of acute gastrointestinal bleeding and its hospitalization rate is 6 times that of lower gastrointestinal bleeding and the mortality rate is significantly increased (Long and Gottlieb, 2024). AUGIB is a common acute and severe disease of the digestive system. Its high-risk cases are often accompanied by recurrent bleeding and significantly increased mortality, posing a serious threat to the prognosis of patients. Risk assessment can help identify high-risk patients and provide evidence for clinical decision-making such as hospitalization indications, timing of endoscopic intervention and blood transfusion strategies (Barkun *et al.*, 2019; Orpen-Palmer and Stanley, 2023). At present, the clinical treatment drugs include proton pump inhibitors, somatostatin and its analogues (octreotide), etc. The hemostatic auxiliary drug tranexamic acid has shown a

clear effect in traumatic hemorrhage and postpartum hemorrhage, but its value in UGIB treatment is still controversial (Franchini *et al.*, 2024; Khedr *et al.*, 2022). In this study, objective indicators such as drug onset time, hemostasis time, bleeding volume change, blood routine index, coagulation function parameter, clinical effective rate and clinical outcome were retrospectively analyzed and evaluated. Combined with VAS and adverse reactions, the hemostatic effect was comprehensively evaluated to provide medical basis for optimizing the treatment plan of high-risk patients with AUGIB.

The drug ultimately controls the amount of bleeding by optimizing the onset and hemostasis time, which is a key indicator for evaluating the hemostatic effect. For acute bleeding (such as trauma, surgical bleeding), the rapid onset of drugs can reduce blood loss and reduce the risk of shock. The reduction of blood loss is the core indicator of hemostatic effect, which directly reflects the effectiveness of drugs or interventions. In this study, the onset time of the combination was faster than that of octreotide and the hemostasis time was shorter. Studies have shown that octreotide can quickly play a hemostatic role in upper gastrointestinal bleeding caused by various causes and show a high clinical efficiency (Abrishami *et al.*, 2020; Zhou *et al.*, 2024; Zhu *et al.*, 2023). In addition, tranexamic acid also showed significant efficacy in reducing blood loss (Ortuanya *et al.*, 2024; Park *et al.*, 2025). This provides a theoretical basis for the combination of the two drugs in the treatment of bleeding in high-risk patients with AUGIB. However, evidence regarding the combined effect of these two therapies remains limited. Therefore, well-designed prospective randomized controlled trials are warranted to robustly validate the efficacy and safety of this combination regimen.

Hemoglobin, red blood cell count and platelet count are the key indicators in blood routine examination. It has been reported in the literature that TXA and OCT alone or in combination can effectively increase hemoglobin levels and red blood cell counts in the treatment of bleeding caused by various diseases (Houghton *et al.*, 2019; Ibrahim *et al.*, 2025; Lei *et al.*, 2022; Morales Santias *et al.*, 2020; Ortuanya *et al.*, 2024; Hart *et al.*, 2023; Yan *et al.*, 2021) which provides a theoretical basis for improving related indicators observed in this study. However, some studies have pointed out that octreotide has limited effect on the improvement of hemoglobin level in the treatment of hemorrhage caused by gastrointestinal vascular malformation (Correa *et al.*, 2024). This conclusion differs from the results of this study, which may be due to heterogeneity in patients' bleeding causes or to selection bias in the research sample.

In terms of coagulation function, APTT, PT, TT and FIB are important parameters for evaluating coagulation status. Previous studies have shown that octreotide monotherapy

can shorten APTT, PT and TT and reduce FIB levels (M. Yang *et al.*, 2025; Zhou *et al.*, 2024). In this study, the effect of TXA combined with OCT treatment group was more significant than that of OCT monotherapy group in shortening PT, TT and APTT, suggesting that the combination of drugs can promote faster recovery of coagulation function, echoing the existing evidence. However, some studies have reported that in patients with bleeding caused by different causes, APTT, PT, TT and FIB did not change significantly after treatment with tranexamic acid (Hao *et al.*, 2024; Hao *et al.*, 2023; Yan *et al.*, 2021). This finding is inconsistent with the results of this study, which may be due to different causes and locations of bleeding or related to the choice of postoperative detection time points.

Blood transfusion volume, length of hospital stay and rebleeding can be used as key clinical indicators to evaluate the effectiveness of initial treatment, predict the prognosis of patients and guide follow-up treatment strategies (such as upgraded treatment or discharge follow-up). Studies have shown that octreotide combined with other drugs has multiple advantages in the clinical application of liver cirrhosis with gastrointestinal bleeding, including significantly shortening the length of hospital stay, reducing the need for blood transfusion, improving the overall treatment efficiency and reducing the VAS pain score (Wang *et al.*, 2019). Tranexamic acid monotherapy in the treatment of upper gastrointestinal bleeding also showed reduced incidence of rebleeding, reduced blood transfusion requirements and shortened blood transfusion time (Lee *et al.*, 2021). Although the results of this study showed that there was no significant difference between the two groups in terms of average blood transfusion volume, hospital stay, 3-day rebleeding rate, surgical intervention needs and total mortality. However, the combined treatment group still showed a trend toward improvement in clinical efficacy indicators. This phenomenon may be related to the outstanding performance of octreotide monotherapy in the treatment of high-risk patients with AUGIB, which significantly reduces the need for blood transfusion, effectively shortens the length of hospital stay and shows excellent results in preventing early rebleeding. These advantages may weaken the potential synergistic effect of combined therapy to some extent.

Studies have shown that more than 50% of patients with upper gastrointestinal bleeding caused by OCT cirrhosis (Zhu *et al.*, 2023). In this study, the total effective rate of the combined treatment group was significantly improved and the total effective rate was higher than that of previous studies, which may be due to the synergistic effect of the combined treatment plan. In addition, there was no significant increase in adverse reactions with the combination, suggesting that the combination therapy is well tolerated while improving efficacy. VAS can

effectively reflect the postoperative pain intensity of patients and has positive significance for evaluating postoperative recovery (Robinson *et al.*, 2024). In this study, the degree of pain relief in the combined treatment group was better than that in the single drug treatment group. The results were consistent with the relevant research conclusions of OCT combined with other drugs (Wang *et al.*, 2019), which further confirmed the advantages of combined medication in relieving pain. Although the preliminary data provide basic support for the effectiveness and safety of combination therapy, its clinical value still needs to be further evaluated using more comprehensive efficacy indicators and long-term follow-up results.

#### **Meaning and innovation**

This study provides a new clinical basis for the efficacy and safety of tranexamic acid combined with octreotide in patients with high risk of acute upper gastrointestinal bleeding. The results showed that the combined treatment of tranexamic acid and octreotide not only acted quickly but also effectively controlled bleeding and improved hemostasis. It also significantly improved the effective rate of treatment and effectively alleviated the pain symptoms of patients, which opened up a new treatment path for the clinical management of patients with high risk of AUGIB. Although the application of this combination therapy in patients with high risk of acute upper gastrointestinal bleeding is still in the exploratory stage, this study provides an important reference for clinical decision-making of patients with high risk of AUGIB and also lays a theoretical foundation for expanding the application of this combination therapy in other hemorrhagic diseases.

#### **Limitation**

This study confirmed that tranexamic acid combined with octreotide has significant clinical efficacy in the treatment of high-risk patients with AUGIB. However, it must be objectively recognized that there are still several important limitations in the current study that need to be clarified. First of all, multiple key clinical parameters of the combination regimen are not yet clear, including the best time for preventive use, the selection criteria for specific populations, the precise grasp of drug dosage and the optimal selection of administration timing. These need to be further verified by a rigorously designed large-sample prospective study. Secondly, the safety issues that may be brought about by the combination of drugs, such as drug interactions, adverse reaction superposition effects, etc., also require more systematic quantitative evaluation. To generate more robust medical evidence, multi-center, randomized controlled clinical trials are urgently required, and high-quality meta-analyses should be conducted on this basis. Only through rigorous methodological verification, good repeatability and peer-reviewed research results, valuable references for clinical practice can be truly provided, thereby facilitating the accumulation of medical

knowledge and the advancement of diagnostic and therapeutic levels.

#### **CONCLUSION**

In summary, tranexamic acid and octreotide combined with high-risk patients with acute upper gastrointestinal bleeding have significant clinical value. The combined regimen can not only quickly take effect, effectively control bleeding and improve the success rate of hemostasis, but also significantly improve clinical symptoms while maintaining good safety. Despite the limitations of this study in many aspects, this finding provides new medical evidence for the clinical treatment of patients with high risk of AUGIB. The follow-up study should explore the mechanism of combined treatment through rigorous methodological verification and systematically evaluate its long-term efficacy and safety, in order to further improve the diagnosis and treatment of AUGIB and improve the treatment effect and quality of life of patients.

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None

#### **Authors' contributions**

Yuqian Zhao, Zhao Yang: Conceived and designed the research and analyzed data. Drafted and revised the manuscript critically for important intellectual content; Wei Song, Musong Li, Na Guan, Chenyi Zhao, Bing Liu, Fang Yuan: Contributed to the acquisition, analysis and interpretation of data. Provided substantial intellectual input during the drafting and revision of the manuscript; Jianru Jia: Participated in the conception and design of the study. Played a key role in data interpretation and manuscript preparation.

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#### **Data availability statement**

The data supporting the findings of this study can be obtained from the corresponding author upon request.

#### **Ethical approval**

The design and implementation of this study strictly follow the ethical guidelines for medical research established by the World Medical Association's 'Helsinki Declaration' (latest revision), with prior approval obtained from Baoding People's Hospital institutional review board (No. 2023-107). This study was performed in adherence with the STROBE guidelines. See Supplementary file for the STROBE checklist.

#### **Consent to participate**

Before the implementation of the study, each participant signed the informed consent form.

**Conflict of interest**

The authors affirm that they do not have any financial conflicts of interest.

**Supplementary data**

<https://www.pjps.pk/uploads/2026/04/SUP1775801048.pdf>

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