

The prediction value of scoring systems in Mallory-Weiss syndrome patients

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Abstract

Mallory-Weiss syndrome (MWS) is a relatively less common cause of nonvariceal upper gastrointestinal bleeding. There is limited data on whether scoring systems could be used to predict the clinical outcomes in patients with bleeding due to MWS. The aim of our study is to evaluate whether the Glasgow-Blatchford score (GBS), AIMS65, and shocking index are effective in predicting the clinical outcomes of MWS.

One hundred twenty-eight patients from January 2010 to January 2017 with MWS in middle China were enrolled. Clinical features such as age, gender, causes of vomiting, endoscopic findings, GBS, AIMS65, and shocking index were recorded. The clinical outcomes including endoscopic treatment and transfusion were analyzed.

MWS accounted for 6.1% of nonvariceal upper gastrointestinal bleeding. Male-to-female ratio was 3.6:1 and median age was 51 years. Patients between 40 and 60 years were more commonly affected; 43.8% of MWS was caused by overdrinking followed by underlying gastric diseases (33.6%). However, for female patients alone, underlying gastric diseases were the leading cause (42.9%). The tears were usually single and most frequently located on the left lateral wall. In receiver-operating characteristic curve analyses, GBS system and shocking index were useful in predicting transfusion (0.856 vs 0.675). But for endoscopic intervention, these scoring systems are not helpful ($P > .05$).

Apart from drinking, underlying gastric disease is another important cause of MWS especially for female patients and should be paid more attention under endoscopy examination. GBS system and shocking index can be used to predict transfusion.

Abbreviations: AUC = area under the curve, AUROC = area under the receiver-operating characteristic curve, GBS = Glasgow-Blatchford score, MWS = Mallory-Weiss syndrome, NVUGIB = nonvariceal upper gastrointestinal bleeding, PPI = proton pump inhibitor.

Keywords: AIMS65, endoscopy, Glasgow-Blatchford score (GBS), Mallory-Weiss syndrome (MWS), shocking index, transfusion

1. Introduction

Mallory-Weiss syndrome (MWS) refers to nontransmural lacerations at the esophagogastric junction due to severe vomiting. It was first described by Mallory and Weiss in 1929.^[1] MWS has been reported to be the cause of upper gastrointestinal bleeding in approximately 3% to 5% of all cases.^[2–4] The performance spectrum of MWS is rather broad. Most of the time, MWS-related hemorrhage is a benign and self-limited process. Conservative medical treatment including resuscitation and proton pump inhibitor (PPI) treatment is effective enough or bleeding may even stop spontaneously. Yet, in

14% to 30% of MWS cases, conservative management is insufficient to resolve the problem and endoscopic therapy is needed.^[5] In rare cases, patients may even die due to MWS.^[6]

Although MWS is also an important cause for nonvariceal upper gastrointestinal bleeding (NVUGIB), there is limited study about MWS. As we all know, endoscopic manipulation developed a lot and early endoscopic intervention becomes more accessible than it used to be. Yet, rebleeding rate of MWS remains at 5% to 10% in the past decades.^[7–12] There are various scoring systems that have been devised to predict the clinical outcomes for patients as well as the need for hemostatic intervention.^[13,14] But, most of them focused on peptic ulcer bleeding because it is the most common cause of NVUGIB. Are the existing scoring systems effective in MWS?

In this retrospective study, we described the clinical characteristics of Chinese patients in our hospital with MWS and evaluated the efficiency of several scoring systems in predicting the clinical outcomes including transfusion and endoscopic intervention requirement.

2. Methods

2.1. Patients

From January 2010 to January 2017, 128 patients who were endoscopically diagnosed with MWS in our hospital in middle China were enrolled. Clinical characteristics including age, gender, causes of vomiting, presenting symptoms, comorbidities, drug-taking history, and drinking history were systematically

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Table 1
Scoring systems for gastrointestinal bleeding.

Scoring system	Admission risk marker	Parameter	Score
GBS	BUN (mmol/L)	≥6.5 to <8.0	2
		≥8.0 to <10.0	3
		≥10.0 to <25.0	4
		≥25.0	6
	Hemoglobin (g/dL)	Men: ≥120 to <130	1
		Men: ≥100 to <120	3
		Men: <100	6
		Women: ≥100 to <120	1
	Systolic blood pressure (mm Hg)	Women: <100	6
		≥100 to <109	1
Other markers	≥90 to <100	2	
	<90	3	
	Heart rate ≥100 bpm	1	
	Melena	1	
AIMS65	Albumin (g/L)	Syncope	2
		Hepatic disease or cardiac failure	2
	INR	<30	1
	Mental status	>1.5	1
	Systolic blood pressure (mm Hg)	Altered	1
Shock index	Heart rate (bpm)/Systolic blood pressure (mm Hg)	≤90	1
		Age (yr) ≥65	1

BUN=blood urea nitrogen; GBS=Glasgow-Blatchford score; INR=international normalized ratio.

recorded. Glasgow-Blatchford score (GBS), shocking index, and AIMS65 were calculated for each patient as in Table 1. We retrospectively analyzed these data. This study was approved by the Ethics Committee of Tongji Medical College, and all the information of patients were kept private.

2.2. Classification

After basic life support measures, all the patients underwent endoscopy examination within 24 hours of admission. Endoscopic characteristics including endoscopic stigmata, number, site, length of lacerations, and number of clips were recorded. Diagnostic endoscopic findings of MWS were categorized according to the Forrest classification: Ia, spurting or pulsating; Ib, oozing; IIa, visible vessel; IIb, adherent clot; IIc, pigmented haematin; III, clean line ulcer or scar (Fig. 1). After endoscopic confirmation of the tearing, we choose different therapy methods according to the classification.

2.3. Treatment

After general anesthesia, the patient was positioned in the left lateral position under electrocardiogram monitoring. For patients with Forrest Ia, Ib, and IIa lacerations, endoscopic hemostasis with hemoclip devices was performed by well-trained doctors. For patients with Forrest IIb lacerations, hemoclips were used if visible vessel or deep lesion was found after flushing. Hemoclips were also used in Forrest IIb patients with high risks

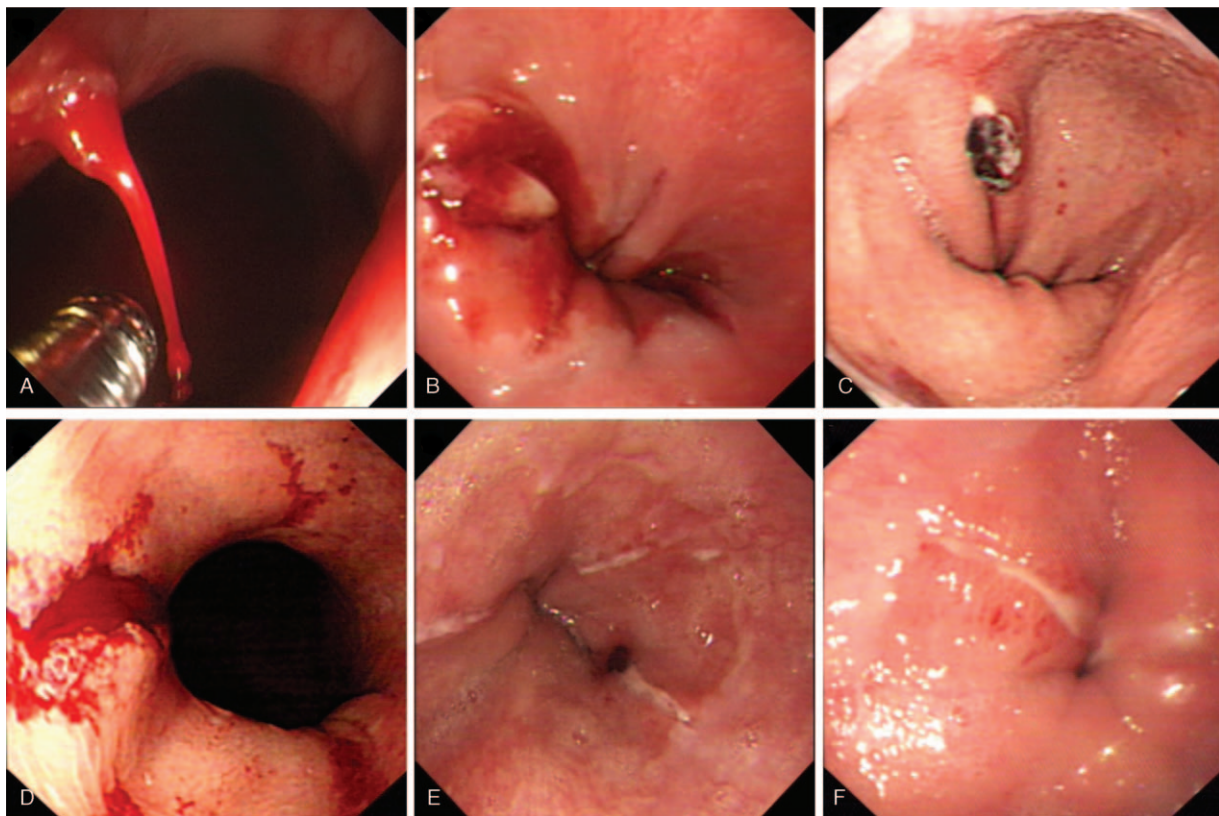


Figure 1. The Forrest classification for endoscopic findings of MWS. Ia, spurting or pulsating (A); Ib, oozing (B); IIa, visible vessel (C); IIb, adherent clot (D); IIc, pigmented haematin (E); III, clean line ulcer or scar (F). MWS=Mallory-Weiss syndrome.

Table 2
Clinical and endoscopic characteristics of 128 patients with Mallory-Weiss syndrome.

Characteristics	n (%)
Gender: Male (%)	100 (78.1)
Age (yr)	51 (range 1–81)
<20	7 (5.5)
20–39	28 (21.9)
40–59	55 (43.0)
60–79	35 (27.3)
≥80	3 (2.3)
Causes of vomiting	
Heavy drinking	56 (43.8)
Acute gastroenteritis	9 (7.0)
Upper gastrointestinal diseases	43 (33.6)
Peptic ulcer	32 (25.0)
Gastric cancer	7 (5.5)
Dieulafoy disease	4 (3.1)
Belching during endoscopy	10 (7.8)
Other causes	6 (4.7)
Unknown causes	4 (3.1)
Hematemesis	44 (34.4)
Hematochezia	35 (27.3)
No. of lacerations	
Single	86 (67.2)
2–3 lacerations	33 (25.8)
≥4 lacerations	9 (7.0)
Site of lacerations	
Anterior wall	35 (27.3)
Posterior wall	49 (38.3)
Left lateral wall	68 (53.1)
Right lateral wall	62 (48.4)
Number of clips	3 (range 2–16)
Transfusion	19 (14.8)
Aspirin	16 (12.5)
Warfarin	2 (1.6)
Long-term drinking	39 (30.5)

such as transfusion, advanced age, aspirin or warfarin history, etc. Metal clips were placed directly on the tearing site along with the surrounding tissues. Once hemostasis was achieved, the bleeding site was observed for at least 1 minute. Primary hemostasis was defined as endoscopically verified cessation of bleeding during this time after hemoclip placement in the first endoscopic session. Rebleeding referred to 1 or more signs of ongoing hemorrhage, including coffee ground material in vomit, hematemesis, hematochezia, vital signs instability, and a decrease of hemoglobin level by more than 20 g/L within 24 to 72 hours

after successful primary hemostasis.^[10] A second endoscopic examination was performed immediately when recurrent bleeding was suspected. If tears were found with hemorrhage at the esophagogastric junction, recurrent bleeding was confirmed and endoscopic hemostasis with hemoclip was performed once again. Patients underwent emergency surgery when retreatment was unsuccessful. After endoscopy, all patients were treated with PPI and made to fast for at least 24 hours.

For patients with Forrest IIc and III lacerations, only conservative treatments were used including fasting (48 to 72 hours), bed rest, antiemetic treatment (metoclopramide, 10 mg, intramuscular injection), use of PPI, or blood transfusion (hemoglobin level was less than 70 g/L). Aspirin or warfarin should be temporarily stopped if previously used. The underlying gastric diseases were treated individually.

2.4. Statistical analysis

Results are expressed as median and range. The Mann-Whitney U test was used as a nonparametric test. Pearson Chi-square test was used to evaluate whether or not an observed frequency distribution differs from 2 groups. The area under the receiver-operating characteristic curve was calculated for scoring system and clinical outcome, with binomial intervals. The area under the receiver-operating characteristic curves was tested for equality by means of the Delong 2 test. *P* value <.05 was considered significant.

3. Results

3.1. Clinical and endoscopic characteristics

From January 2010 to January 2017, a total of 2106 inpatients presented with NVUGIB in our hospital; 128 (6.1%) of them were diagnosed with MWS. Their clinical and endoscopic characteristics are outlined in Table 2. There were 100 men and 28 women. The male-to-female ratio was 3.6:1. The youngest patient was 1 year old whereas the oldest was 81 years old. Median age for all the patients was 51 years. There was no significant difference in median age between male and female (*P* = .089). Those between 40 and 60 years were more commonly affected than any other age groups. They accounted for 46.1% (59/128) of all the cases. As showing in Table 3, drinking was the most common causative factor (43.8%) for retching and vomiting in all the cases, followed by underlying gastric diseases (33.6%), endoscopy operation (7.8%), acute gastroenteritis (7.0%), other causes (including taking traditional Chinese

Table 3
Causes for Mallory-Weiss syndrome.

Causative factors	Male (n=100)		Female (n=28)		All cases (n=128)	
	n	%	n	%	n	%
Drinking	51	51.0	5	17.9*	56	43.8
Gastric diseases [§]	31	31.0	12	42.9*	43	33.6
Endoscopy operation	7	7.0	3	10.7	10	7.8
Acute gastroenteritis	6	6.0	3	10.7	9	7.0
Other causes [#]	2	2.0	2	7.1	4	3.1
Unknown reasons	3	3.0	3	10.7	6	4.7

[§] Gastric diseases include peptic ulcer, gastric cancer and Dieulafoy disease with complications such as bleeding or obstruction.

[#] Other causes include taking traditional Chinese medicine or intracranial disease.

* *P* < .05.

Table 4
Forrest classification and clinical outcome of Mallory-Weiss syndrome.

Type	Manifestation	n	%	Treatment	Rebleeding
Ia	Spurting or pulsating	3	2.3	Hemoclips	1
Ib	Oozing	17	13.2	Hemoclips	0
Ila	Visible vessel	7	5.5	Hemoclips	0
Ilb	Adherent clot	16	12.5	Hemoclips/conservative	0
Ilc	Pigmented hematin	27	21.1	Conservative	0
III	Clean line ulcer or scar	58	45.3	Conservative	0

medicine or intracranial disease) (3.1%), and unknown reasons (4.7%). However, for female patients alone, underlying gastric diseases ranked first (42.9%). The difference is statistically significant ($P=.036$). Besides, in this study, single laceration was the most common forms (67.2%) and lacerations were more frequently located in the left lateral wall of esophagus and cardia (53.1%). Most of the lacerations measure between 0.5 and 2 cm. Among patients with MWS, 12.5% used aspirin and 1.6% used warfarin regularly. Meanwhile, long-term drinking history was found in 30.5% of the patients; 19 patients (14.8%) received transfusion.

3.2. Classification and clinical outcome

According to Forrest classification, the number of patients with Forrest Ia, Ib, Ila, Ilb, and III was 2.3%, 13.2%, 5.5%, 12.5%, 21.1%, and 45.3%, respectively (Table 4). All the cases with Forrest IIc and III (66.4%) received conservative medical treatment. The patients with Forrest Ia, Ib, and Ila and partial patients with Ilb underwent endoscopic treatment. Only 1 patient

Table 5
AUROC of scoring systems for predicting transfusion.

Test result variable (s)	Area	95% Confidence interval	P value
GBS	0.856	0.762–0.950	.038
Shocking index	0.682	0.577–0.787	.049
AIMS65	0.675	0.509–0.842	.085

AUROC=area under the receiver-operating characteristic curve; GBS=Glasgow-Blatchford score.

bled again due to recurrent MWS within 24 to 72 hours after endoscopic intervention. This patient was a 64-year-old man without drinking history. He presented with hematemesis due to immediate diet after endoscopic biopsy at the esophagogastric junction. After an emergency endoscopy examination, he was diagnosed with MWS and the endoscopic stigmata beside the biopsy site belonged to Forrest Ia. Primary endoscopic hemostasis with hemoclip was failed. So hemoclippping was performed again during the second endoscopy. During the 2 months following up, there was no recurrent bleeding. There is a patient who died during his hospitalization. He was diagnosed with Forrest Ia MWS at the first endoscopy and treated with hemoclips. One day later, he presented with melena and underwent endoscopy again. Yet, no signs of bleeding were found in esophagus, stomach, or duodenum. Colonoscopy was also performed without any meaningful findings. Finally, he died because of suspected underlying intestinal bleeding.

3.3. GBS, shocking index, and AIMS65 in predicting clinical outcomes

As showed in Table 5 and Figure 2, GBS showed a highest area under the curve (AUC) of 0.856 (95% confidence interval, CI,

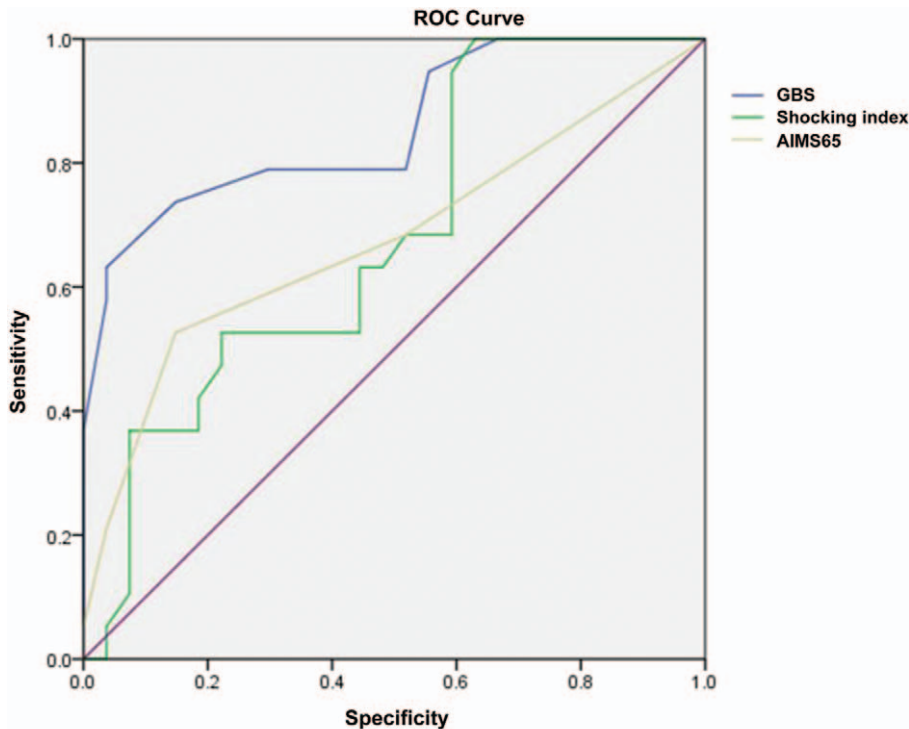


Figure 2. ROC curves for the prediction of transfusion in patients with MWS. MWS=Mallory-Weiss syndrome; ROC=receiver-operating characteristic.

Table 6
AUROC of scoring systems for predicting endoscopic intervention requirement.

Test result variable (s)	Area	95% Confidence interval	P value
GBS	0.694	0.541–0.848	.078
Shocking index	0.644	0.483–0.804	.085
AIMS65	0.612	0.446–0.779	.082

AUROC = area under the receiver-operating characteristic curve; GBS = Glasgow-Blatchford score.

0.762–0.950) in predicting transfusion. It is followed by shocking index with an AUC of 0.675 (95% CI 0.577–0.787). The AIMS65 results with an AUC of 0.523 (95% CI 0.509–0.842) were not found to be statistically significant for the estimation of transfusion ($P > .05$).

The AUCs for each scoring system in predicting the need of endoscopic intervention are shown in Table 6 and Figure 3. GBS showed an AUC of 0.694 (95% CI 0.541–0.848). The shocking index showed a slightly lower AUC of 0.644 (95% CI 0.483–0.804). For AIMS65, AUC is 0.612 (95% CI 0.446–0.779). Yet, all these results were found to be statistically insignificant.

4. Discussion

MWS is most frequently induced by repeated episodes of retching and vomiting. Binge drinking has always been assumed as the major cause of retching and vomiting.^[15,16] Yet, we found that the association of MWS with alcohol consumption was present in only 17.9% of Chinese female patients in our study. Underlying gastric diseases, which include peptic ulcer, gastric cancer, and Dieulafoy disease with complications such as bleeding or obstruction, predisposed 12 female patients (42.9%) to vomiting.

Besides, underlying gastric disease was the second most important cause (31.0%) of vomiting in males. These results suggested that underlying gastric disease is another important cause of vomiting especially for Chinese female MWS patients. Therefore, when a patient with bleeding MWS is sent to the hospital, physicians should perform the endoscopic examination with care in case the patient suffers from underlying gastric diseases at the same time. If there are lots of gastric contents interfering with thorough inspection of stomach and duodenum, a second endoscopic examination should be performed to exclude the possibly underlying gastric diseases at a later stage. In the earlier reports, hiatal hernia is common in MWS patients whereas in this retrospective clinical study conducted in middle China, none of the patients had hiatal hernia.^[17]

Many studies reported that MWS accounts for 3% to 15% of all the NVUGIB cases.^[10,18–21] The incidence (6.1%) in this series is consistent with the previous reports and proves that MWS is a relatively less common reason of NVUGIB. However, the mortality of MWS in high-risk patients with bleeding is similar to that of peptic ulcer bleeding.^[22] Most of the existing conclusions about NVUGIB mainly focus on peptic ulcer bleeding. Studies concentrating on MWS are rare. The GBS and AIMS65 system is designed to assess the likelihood that a patient with an acute NVUGIB will need to have a blood transfusion or endoscopic intervention.^[23,24] Besides, shocking index is recognized as relatively simple scoring system to predict NVUGIB prognosis.^[25–27] Whether these scoring systems work in MWS needs to be explored.

In this study, we showed that both GBS system and shocking index were able to predict the need of transfusion. GBS system is more accurate than shocking index. But, as GBS system is much more complicated than shocking index, shocking index could be

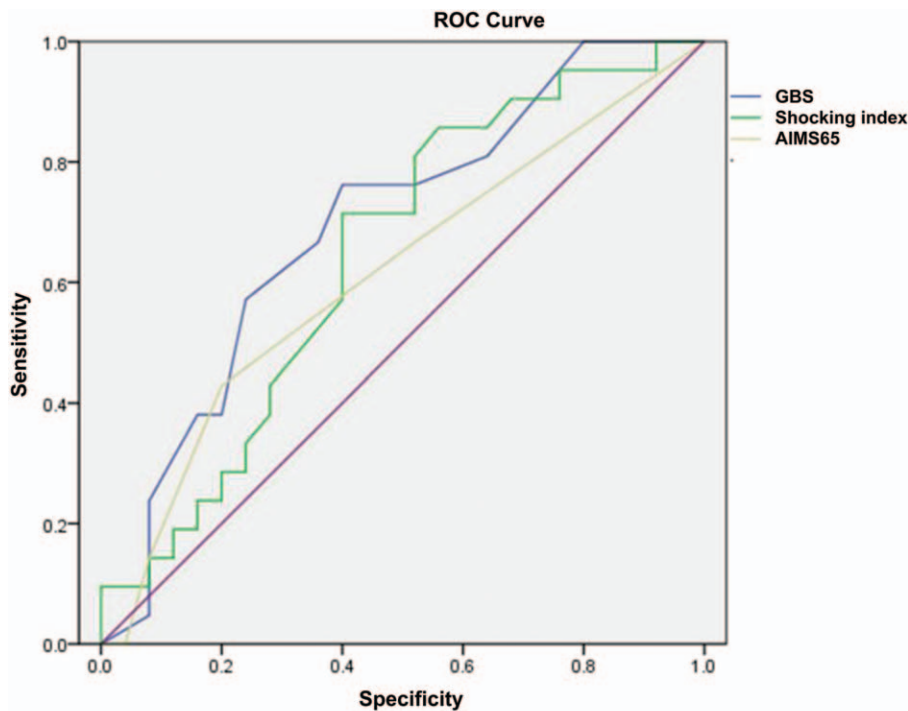


Figure 3. ROC curves for the prediction of endoscopic intervention requirement in patients with MWS. MWS = Mallory-Weiss syndrome; ROC = receiver-operating characteristic.

a good indicator for predicting transfusion quickly. On the other hand, when these scoring systems were used to predict the need for endoscopic intervention, GBS showed a highest AUC, followed by shocking index. AIMS65 system showed a lowest AUC. But, none of them were found to be statistically significant. In a word, GBS system and AIMS65 system is not good at predicting the need for endoscopic intervention in MWS patients. This result is inconsistently with those NVUGIB studies before. The fact that MWS is always caused by overdrinking and other diseases, such as peptic ulcer, Dieulafoy disease or gastric cancer may be a possible reason. In some patients, scores of GBS and AIMS65 may be high on account of the underlying gastric diseases instead of the severity of MWS. Thus, GBS system and AIMS65 may not be suitable for MWS caused by underlying gastric diseases. However, there was only 1 patient who rebelled in these 128 MWS patients according to our treatment plan guided by Forrest classification. It is suggested that the Forrest classification is helpful for the evaluation of endoscopic intervention requirement in MWS patients rather than above scoring systems.

There are still some limitations in this study. As MWS is a relatively less common event with relatively rare complications, we enrolled in total 128 patients with MWS from January 2010 to January 2017. This sample size is relatively larger compared with the previous reports about MWS.^[7,8,12] However, it is still small when compared with those studies about peptic ulcer. Besides, number of patients who have Forrest Ia to IIb ulcers is just 53 (41.4%) and only 1 patient had rebleeding due to recurrent MWS. It may result in the lack of statistical reliability. Conducting the study in multicenter can be helpful to enroll more patients and drive statistically more important results.

5. Conclusion

In summary, we described the clinical and endoscopic characteristics of 128 Chinese patients with MWS in this retrospective study. Besides, we verified if the classical scoring systems could be used in clinical outcome prediction. Except drinking, underlying gastric disease is another important cause of MWS especially for female patients and should be paid more attention under endoscopy examination. GBS system and shocking index can be used to predict transfusion but not be helpful for endoscopic intervention prediction.

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