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The AIMS65 Score Is a Useful Predictor of Mortality in Patients with Nonvariceal Upper Gastrointestinal Bleeding: Urgent Endoscopy in Patients with High AIMS65 Scores

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Background/Aims: To validate the AIMS65 score for predicting mortality of patients with nonvariceal upper gastrointestinal bleeding and to evaluate the effectiveness of urgent (<8 hours) endoscopic procedures in patients with high AIMS65 scores.

Methods: This was a 5-year single-center, retrospective study. Nonvariceal, upper gastrointestinal bleeding was assessed by using the AIM65 and Rockall scores. Scores for mortality were assessed by calculating the area under the receiver-operating characteristic curve (AUROC). Patients with high AIMS65 scores (≥ 2) were allocated to either the urgent or non-urgent endoscopic procedure group. In-hospital mortality, success of endoscopic procedure, recurrence of bleeding, admission period, and dose of transfusion were compared between groups.

Results: A total of 634 patients were analyzed. The AIMS65 score successfully predicted mortality (AUROC=0.943; 95% confidence interval [CI], 0.876 to 0.99) and was superior to the Rockall score (AUROC=0.856; 95% CI, 0.743 to 0.969) in predicting mortality. The group with high AIMS65 score included 200 patients. The urgent endoscopic procedure group had reduced hospitalization periods ($p < 0.05$)

Conclusions: AIMS65 score may be useful in predicting mortality in patients with nonvariceal upper gastrointestinal bleeding. Urgent endoscopic procedures in patients with high scores may be related to reduced hospitalization periods. **Clin Endosc 2015;48:522-527**

Key Words: Risk assessment; Gastrointestinal hemorrhage; Endoscopy

INTRODUCTION

Acute upper gastrointestinal (GI) bleeding is one of the most important and frequent diseases treated by gastroenterologists.¹⁻³ The development of endoscopic therapies and acid-suppressing agents (proton pump inhibitors) has reduced mortality and disease-associated morbidity, but upper GI

bleeding is still associated with high mortality rates, and the cost of treatment is high.³⁻⁹

Effective risk assessment for acute upper GI bleeding is important for building therapeutic plans. However, previous risk scales¹⁰⁻¹² (Rockall score and Glasgow-Blatchford score) for GI bleeding are complex and difficult to use, so clinicians often find it difficult to make rapid risk assessments. Recently, the AIMS65 score was introduced. This scoring system is composed of age, serum albumin level, systolic blood pressure, prothrombin time (international normalized ratio [INR]), and mental status. The AIMS65 scale is a simple and accurate risk assessment score that has been shown in some studies to predict in-hospital mortality, length of hospitalization, and treatment cost in patients with acute upper GI bleeding.¹³⁻¹⁶ An AIMS65 score of 2 has been indicated as a cut-off value for mortality risk.¹³ However, some studies have suggested that

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AIMS65 score was not suitable for validating upper GI bleeding. One of these studies included only peptic ulcer bleeding.¹⁷ Therefore, in this study, we aimed to evaluate the effectiveness of the AIMS65 score in predicting mortality among patients with nonvariceal upper GI bleeding, and to evaluate the effectiveness of urgent (<8 hours) endoscopic procedures in patients with high AIMS65 scores (≥ 2).

MATERIALS AND METHODS

Patients

We retrospectively assessed the medical records of patients who visited the emergency room (ER) for nonvariceal upper GI bleeding at Chungnam National University Hospital in Korea from March 2009 to March 2014. The study was reviewed and approved by the Institutional Review Board of Chungnam National University Hospital. Patients ≥ 18 years old who had visited the ER for any upper GI bleeding symptoms (melena, hematemesis, and/or hematochezia) were included in the study. Patients who did not undergo upper GI endoscopy, had lower GI bleeding, small bowel bleeding, variceal bleeding, cancer-associated bleeding, or post-procedural complications were excluded from the study. Patients with incomplete medical charts were also excluded.

Definitions

Data were collected for each patient by manually reviewing their medical chart. Data included age, sex, medication history and comorbidities, laboratory findings (serum albumin levels, INR, hemoglobin level), vital signs (systolic blood pressure, heart rate, mental status), and admission period (length of hospital stay). We reviewed endoscopic findings by using the full PACS (picture archiving communication system) system and classified findings as gastric ulcers (GUs), duodenal ulcers (DUs), Dieulafoy's lesions, Mallory-Weiss syndrome, esophageal ulcers, angiodysplasia, hemorrhagic gastritis, or hemorrhagic duodenitis.

As in previous studies,¹³ we classified the patients into two risk groups by using a cut-off AIMS65 score of 2: the high-risk group included patients with AIMS65 score ≥ 2 , while the low-risk group included patients with AIMS65 score of 0 or 1. Patients with high AIMS65 scores (≥ 2) were allocated into either the urgent or non-urgent endoscopic procedure group based on the interval between arrival and endoscopy (8 hours). Urgent endoscopy was defined as endoscopic examination performed within 8 hours of arrival at the emergency department.

The primary outcome was in-hospital mortality, defined as any death occurring during hospitalization. The secondary

outcomes were success of endoscopic hemostasis, recurrence of bleeding, admission period (length of stay), and dose of packed red blood cells used for transfusion. Success of endoscopic hemostasis was defined as acquisition of a stable lesion without active bleeding, following therapeutic endoscopic intervention. Recurrence of bleeding was defined as secondary bleeding from the first identified lesion, and was confirmed by performing follow-up endoscopy.

Statistical analyses

Categorical data were expressed as mean \pm standard deviation. The chi-square test or Fisher exact test were used to evaluate categorical variables. Student *t*-test was used to evaluate continuous variables. To assess the prediction of mortality, an area under the receiver-operating characteristic curve (AUROC) was calculated for each score. Primary and secondary outcomes between the groups were compared by using the chi-square test and *t*-test. A $p < 0.05$ was considered statistically significant.

RESULTS

During the 5 years of the study, 1,128 patients visited the ER for upper GI bleeding. Of these, 252 had nonvariceal upper GI bleeding, 172 had variceal bleeding, 53 had cancer-associated bleeding, and 17 had procedure-associated bleeding. In total, 634 patients were selected for evaluation. Of these, 200 patients were included in the high-risk group and 434 in the low-risk group. Among the high-risk group, 157 patients were included in the urgent endoscopic procedure group and 43

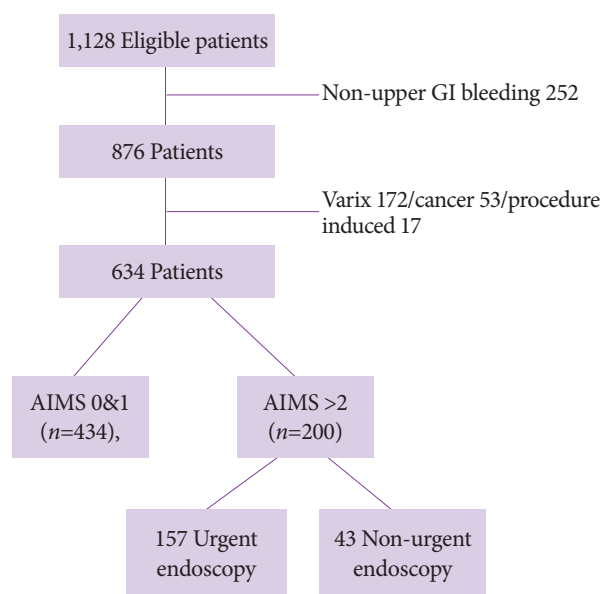


Fig. 1. Study design and enrollment of patients. GI, gastrointestinal.

Table 1. Characteristics of Patients Presenting at the Emergency Room with Nonvariceal Upper Gastrointestinal Bleeding between March 2009 and March 2014

Characteristic	Total (n=634)	Urgent (n=157)	Non-urgent (n=43)	p-value
Age, yr ^{a)}	65.7±38.4	72.7±10.9	72.1±12.2	0.31
Male sex	469 (73.9)	108 (68.7)	29 (67.4)	0.85
Comorbidity				-
Cardiac	203 (32.0)	57 (36.3)	21 (48.8)	
Pulmonary	5 (0.7)	3 (1.9)	0	
Renal	34 (5.3)	10 (6.3)	2 (4.7)	
Metabolic	31 (4.8)	3 (1.9)	2 (4.7)	
Neurologic	122 (19.2)	47 (29.9)	6 (13.9)	
Malignancy	12 (1.8)	3 (1.9)	0	
None	182 (28.7)	19 (12.1)	9 (20.9)	
2 or more	45 (7.0)	15 (9.5)	3 (6.9)	
Medication				-
None	386 (60.8)	78 (49.7)	25 (58.1)	
NSAIDs	27 (4.3)	6 (3.8)	0	
Warfarin	46 (7.3)	31 (19.7)	7 (16.2)	
Antiplatelet	173 (27.3)	42 (26.7)	11 (25.6)	

Values are presented as mean±SD or number (%).

NSAID, nonsteroidal anti-inflammatory drug.

^{a)}AIMS65 score component.

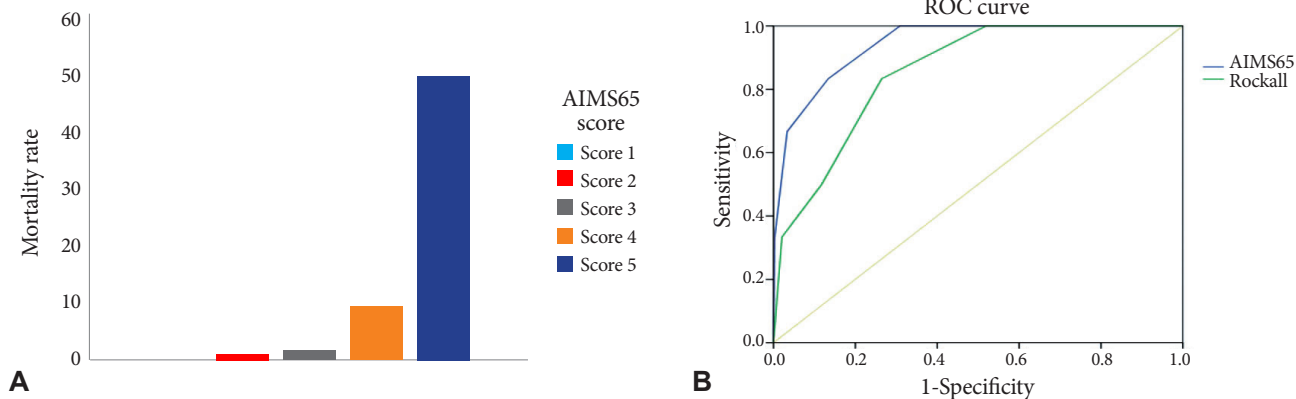


Fig. 2. Mortality according to (A) AIMS65 score and (B) receiver-operating characteristic curve (AUROC) with Rockall score.

patients were included in the non-urgent group (Fig. 1).

Patient characteristics

The average age of the entire cohort was 65.7 years, and the population was predominantly male (73.9%). Cardiac disease was the most common comorbidity (32%). In terms of patient medication history, none was the most common (60.8%) and antiplatelet was the second most common (27.3%) (Table 1).

Table 2 shows the vital signs and laboratory findings. GU (51.4% to 58.1% across the cohorts) was the most common and DU (18.6% to 28.7%) was the second most common endoscopic finding. There were no differences in vital signs,

comorbidities, laboratory findings, and endoscopic findings between the urgent and non-urgent endoscopic procedure groups (Tables 1, 2).

AIMS65 score and mortality rate of patients with nonvariceal upper GI bleeding

The overall mortality rate was 0.94%. Mortality rates increased with higher AIMS65 scores. No deaths occurred among patients with AIMS65 scores of 0 and 1. For patients with AIMS65 scores of 2, 3, 4, and 5, mortality rates were 0.9%, 1.5%, 9.5%, and 50.0%, respectively. The AUROC for the AIMS65 score predicting mortality was 0.943 (95% confidence

Table 2. Vital Signs and Laboratory Findings of Patients Who Presented with Nonvariceal Upper Gastrointestinal Bleeding in the Emergency Room between March 2009 and March 2014

Variable	Total (n=634)	Urgent (n=157)	Non-urgent (n=43)	p-value
Systolic blood pressure, mm Hg ^{a)}	122.7±82.2	101.8±24.9	95.8±27.8	0.17
Heart rate, min	89.7±20.2	90.1±23.8	90.6±17.5	0.89
Body temperature, °C	36.7±4.6	37.6±8.7	35.8±3.06	0.19
Mental state ^{a)}				0.48
Alert	550 (86.7)	98 (62.4)	24 (55.8)	
Nonalert	84 (13.3)	59 (37.6)	19 (44.2)	
Albumin, mg/dL ^{a)}	3.3±0.6	2.8±0.56	2.8±0.44	0.98
Hemoglobin, g/dL	9.6±3.3	8.1±2.41	8.5±2.45	0.34
Prothrombin time, INR ^{a)}	1.5±4.1	2.3±8.08	2.2±2.79	0.97
Lesion				-
Gastric ulcer	326 (51.4)	88 (56.0)	25 (58.1)	
Duodenal ulcer	182 (28.7)	40 (25.4)	8 (18.6)	
Mallory-Weiss lesion	63 (9.9)	13 (8.2)	4 (9.3)	
Esophageal ulcer	9 (1.4)	7 (4.4)	1 (2.3)	
AGML	9 (1.4)	0	0	
Dieulafoy's lesion	9 (1.4)	1 (0.6)	0	
Angiodysplasia	19 (2.9)	5 (3.4)	3 (6.9)	
Gastritis	10 (1.5)	2 (1.2)	2 (4.7)	
Duodenitis	7 (1.1)	1 (0.6)	0	

Values are presented as mean±SD or number (%).

INR, international normalized ratio; AGML, acute gastric mucosal lesion.

^{a)}AIMS65 score component.

Table 3. Primary and Secondary Outcomes of Patients with High AIMS65 Scores in the Early and Late Endoscopic Procedure Groups

Outcome	Urgent (n=157)	Non-urgent (n=43)	p-value
Mortality	6 (3.8)	0	0.23
Success of endoscopic hemostasis	153 (97.4)	42 (97.6)	0.41
Re-bleeding	37 (23.5)	7 (16.2)	0.10
Admission period	6.9±3.5	8.5±3.9	0.02
Blood transfusion	3.2±2.9	3.1±1.8	0.77

Values are presented as number (%) or mean±SD.

interval [CI], 0.876 to 0.99), whereas for the Rockall score it was 0.873 (95% CI, 0.743 to 0.969). The AIMS65 score was superior to the Rockall score for predicting mortality (Fig. 2).

Urgent endoscopic procedure in the high-risk group

There were no significant differences in mortality rate, blood transfusion dose, success of endoscopic hemostasis, or recurrence of bleeding between the urgent and non-urgent groups. However, admission periods were significantly reduced in the urgent group compared to the non-urgent group ($p=0.02$) (Table 3).

DISCUSSION

Despite developments in endoscopic treatment and proton pump inhibitors, upper GI hemorrhage is still commonly encountered in emergency medical practice.¹⁻³ AIMS65 score consists of five factors, including: albumin level <3.0 mg/dL, INR >1.5, altered mental status, systolic blood pressure ≤90 mm Hg, and age >65 years.¹³ It is simple and easy to apply in ERs, and can be helpful in making rapid decisions. Some studies suggest that the AIMS65 score can accurately predict in-hospital mortality, length of stay, and cost of treatment in cases of acute upper GI bleeding,¹³⁻¹⁶ but a different investiga-

tion raised questions about the effectiveness of AIMS65 score in predicting outcomes in peptic ulcer disease.¹⁷

In this study, AIMS65 score was more useful in predicting mortality in nonvariceal upper GI bleeding patients compared to Rockall score. In addition, urgent endoscopic procedures (<8 hours) was associated with reduced hospitalization periods for patients in the high-risk group but had no effect on mortality, primary hemostasis, re-bleeding, or blood transfusion.

Two previous studies that confirmed the applicability of AIMS65 in acute upper GI bleeding patients, included bleeding of variceal and nonvariceal origin,^{13,14} and recent studies that did not assess the effectiveness of AIMS65 scores¹⁷ included only peptic ulcers in their study designs. In medical practice, variceal bleeding is independent from nonvariceal upper GI bleeding due to its specific treatment options (endoscopic variceal ligation, Sengstaken-Blakemore tube, etc.). Diagnoses related to advanced liver cirrhosis and peptic ulcers cannot be differentiated before endoscopy. To evaluate rapid and prognosis-compatible risk scoring in ERs, we excluded only variceal bleeding and included other hemorrhagic lesions in the upper GI system, in addition to peptic ulcers.

High-risk patients (AIMS65 ≥ 2) have higher INRs, which can be associated with warfarin use in older patients (>65 years). In our study, patients in the high-risk group were more likely to have a history of warfarin use and underlying neurologic disease. Warfarin-associated GI bleeding can be fatal, and some studies suggest that: older age (>75 years), bleeding history, severe renal disease, hypertension, and anemia may be risk factors for bleeding.^{18,19} To consider poor outcomes in patients with high AIMS65 scores, warfarin use and age-associated upper GI bleeding require more attention and careful monitoring.

Low albumin level and higher INR of the high-risk group may have been associated with chronic liver disease. Although we excluded variceal bleeding, the high-risk group had poor outcomes. Peptic ulcers are rarely the cause of GI hemorrhage in patients with chronic liver disease,^{20,21} but once bleeding occurs, clinicians should monitor the possibility of nonvariceal upper GI bleeding in patients with chronic liver disease.

There are limited studies for endoscopy timing <12 hours. Because the regular working hours of most physicians are about 8 hours, we chose 8 hours as the cut-off point. In our study, urgent endoscopy (<8 hours) was related to reduced length of hospital stay. Although vacations or holidays could influence admission periods, our endoscopy room and GI medical team is available year-round, so this confounding effect is minimal. Urgent endoscopic treatment can be considered cost-effective for patients with high AIMS65 scores.

There are some limitations to this study. First, this was a retrospective, single center study, which can be a confounding

factor. Second, we enrolled only patients who underwent gastroduodenoscopy, so unstable patients who could not undergo endoscopy were excluded. Third, although we excluded patients with variceal bleeding, the high-risk group may include more patients with chronic liver disease and cerebrovascular accident, which could therefore be a confounding factor.

In conclusion, the AIMS65 score may be useful for predicting outcomes in patients with upper GI bleeding. Urgent endoscopic treatment for high-risk patients can be useful to decrease admission periods. However, further studies are necessary to validate the role of the AIMS65 score in nonvariceal upper GI bleeding and its usefulness in identifying high-risk patients who require early endoscopic treatment.

Conflicts of Interest

The authors have no financial conflicts of interest.

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