Prediction of clinical outcome in patients with nonvariceal gastrointestinal bleeding using Forrest classification and Rockall score

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Background
Predicting outcome of upper gastrointestinal bleeding has significant importance to reduce mortality, duration of hospital stay, and medical cost.
Objective
The aim was to investigate the predictive value of Forrest classification and Rockall score in assessing rebleeding rate and mortality rate in patients with nonvariceal gastrointestinal bleeding (NVUGIB).
Patients and methods
A total of 518 patients with NVUGIB from January 2013 to July 2017 were enrolled in this retrospective study. Logistic regression analysis was used to assess the association between these scores and clinical outcome.
Results
Forrest classification is significantly associated with rebleeding, whereas Rockall score is closely associated with mortality. The risks of rebleeding in patients with Forrest Ia-b [odds ratio (OR): 39.2; 95% confidence interval (CI):19.2–79.8], FIIa (OR: 29.7; 95% CI:13.5–65.4), and FIIb (OR: 6.5; 95% CI: 3.0–14.1) were significantly increasing compared with FIII. The risks of mortality in patients with Rockall score 4–6 (OR: 9.4; 4.1–21.6), 7–11 (OR: 101.5; 50.2–205.3), were significantly increasing compared with the group with Rockall score less than 4.
Conclusion
Forrest classification can be used as a predictor for rebleeding and Rockall score can be used as a predictor for mortality in patients with NVUGIB.

Keywords:
Forrest classification, nonvariceal upper gastrointestinal bleeding, Rockall score

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Introduction

Upper gastrointestinal bleeding (UGIB) is a common emergency, and it has an annual incidence of 50–150 per 100 000 adults with a mortality rate of 8–14% [1,2].

Although most UGIB (80–85%) cases stop spontaneously, the remaining patients continue bleeding or re-bleed, with high morbidity and mortality [3–5].

Therefore, predicting the outcome of UGIB has significant importance to reduce mortality, duration of hospital stay, and medical cost.

Several clinical scoring systems have been developed to predict clinical outcome including rebleeding, mortality need for intervention, and the length of hospital stay.

Forrest classification is a simple endoscopy-based classification of bleeding lesion [6]. It is closely associated with prognosis and helpful to guide appropriate medical treatment (need for endoscopic intervention).

The Forrest classification (at least stigmata of bleeding) is nowadays mostly used to identify patients at an increased risk for rebleeding and mortality [7,8].

Rockall *et al*. [9] developed a scoring system involving clinical and endoscopic criteria to predict risk of rebleeding and mortality.

Different studies indicated that this system is practical, accurate, and a quick tool in prediction of re-bleeding and mortality risk [10–12].

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However, some researchers reported that Rockall score was only suitable to predict the risk of death [7,13].

The purpose of our study was to investigate the predictive value of Forrest classification and Rockall score in assessing rebleeding rate and mortality rate in patients with nonvariceal gastrointestinal bleeding (NVUGIB).

Patients and methods

Study population

A total of 518 patients with NVUGIB between January 2013 and July 2017 were retrospectively included. Ethical consideration Ethical approval to conduct the study was sought from the Ministry of Public Health and Pyongyang Medical College Ethic Review Committee before the commencement of the study.

NVUGIB included bleeding owing to peptic ulcer, Mallory–Weiss syndrome, esophagitis, erosive gastritis, neoplasia, and vascular abnormalities.

Data were systematically collected and included demographics, medical history (presenting signs or symptoms), physical examination (blood pressure, heart rate), medication use (e.g. NSAID, proton pump inhibitors and anticoagulants), comorbidities, biochemical data (hemoglobin, platelet count, and creatinine), and endoscopic findings.

Forrest classification and Rockall score

All patients were categorized according to Forrest classification into FIa-b (active bleeding: spurting and oozing hemorrhages), IIa (visible vessel), IIb (adherent clot), IIc (flat pigmented spot), and III (clean base).

Patients were also stratified by Rockall scoring into three groups [14]:

(1) Low-risk group (Rockall score 0–3).
(2) Medium-risk group (Rockall score 4–6).
(3) High-risk group (Rockall score ≥7).

Study outcome

Study outcomes were rebleeding rate and all-cause mortality rate.

Rebleeding was defined as a new episode of bleeding during hospitalization after the initial bleeding has stopped, manifested as recurrence of hematemesis, fresh melena, hematochezia, or fresh blood in the nasogastric aspirate.

Mortality was defined as in-hospital death.

Statistical analysis

Statistical analysis was performed with SPSS version 16.0 (SPSS Inc., Chicago, Illinois, USA).

Logistic regression analyses were performed to assess the association between these scores and outcome (Forrest classification-rebleeding, Forrest classification-mortality, Rockall score-rebleeding, and Rockall score-mortality).

Results

Clinical characteristics of the study population

Main clinical characteristics of the study population are shown in Table 1.

In total, 518 patients 43 (8.3%) patients were classified with Forrest Ia–b, 31 (6.0%) with Forrest FIIa, 145 (28.0%) with Forrest IIb, 53 (10.2%) with Forrest IIc, and 246 (47.5%) with Forrest III.

Table 1 Clinical characteristics of the study population (*n*=518)

Males [*n* (%)]	383 (73.9)
Age (mean±SD) (years)	49.2±14.9
Diagnosis [*n* (%)]	
Peptic ulcer disease	289 (55.8)
Gastroduodenal erosions	135 (26.1)
Malignancy	49 (9.5)
Mallory–Weiss tears	14 (2.7)
Esophagitis	11 (2.1)
Dieulafoy's lesion	5 (0.9)
Vascular abnormality	3 (0.6)
No lesion identified	12 (2.3)
Clinical symptoms [*n* (%)]	
Hematemesis	65 (12.5)
Melena	243 (46.9)
Hematemesis+melena	210 (40.5)
Use of NSAID [*n* (%)]	102 (19.7)
Previous history of ulcer [*n* (%)]	129 (24.9)
Comorbidities [*n* (%)]	
1–2	121 (23.4)
≧3	10 (1.9)
Liver disease	61 (11.8)
Cardiovascular disease	38 (7.3)
Renal failure	7 (1.4)
Diabetes	9 (1.7)
Cerebral disease	14 (2.7)
Lung disease	13 (2.5)
Hemodynamic instability [*n* (%)]	47 (9.1)
Hb (<70 g/l) [*n* (%)]	197 (38.0)
Patients with 1 or more blood transfusions [*n* (%)]	231 (44.6)
Patients receiving endoscopic intervention [*n* (%)]	12 (2.3)
Patients receiving surgery [*n* (%)]	33 (6.4)
Admission(median duration in days)	7.1±3.9
Rebleeding [*n* (%)]	69 (13.3)
Mortality [*n* (%)]	50 (9.7)

Hb, hemoglobin.

The Rockall score ranged from 0 to 10, with a mean (±SD) of 3.0 (±2.2).

A total of 314 (60.6%) patients had Rockall score less than 4 (low-risk group), whereas 167 (32.2%) and 37 (7.2%) patients had Rockall score 4–6 (medium-risk group) and greater than 6 (high-risk group), respectively.

A total of 69 (13.3%) patients had rebleeding and 50 (9.7%) patients died.

Overall, 31 (62.0%) patients died from non-GI bleeding-related causes.

Assessment of regression model

Results of logistic regression analysis are shown in Tables 2 and 3.

Forrest classification was strongly associated with rebleeding (P=0.005), whereas Rockall score was significantly associated with mortality (P=0.011).

Subgroup analysis between Forrest classification and rebleeding, as well as Rockall score and mortality

Rebleeding rates were highest for Forrest Ia–b (53.3%).

Forrest IIc and III showed lower rates for rebleeding (3.8 and 2.8%, respectively).

We found that patients with Forrest Ia were at very high risk [odds ratio (OR): 39.2; 95% confidence interval (CI) 19.2–79.8] for rebleeding compared with Forrest III.

Rebleeding risks were similarly increased for patients with Forrest IIa and IIb (OR: 29.7, 95% CI: 13.5–65.4, for Forrest IIa and OR: 6.5, 95% CI: 3.0–14.1, for Forrest IIb).

The association between Rockall score and mortality is shown in Table 4.

Mortality rate was highest for high-risk group (62.2%).

Mortality risk was significantly increased for medium-risk and high-risk group compared with low-risk group (OR: 9.4; 95% CI: 4.1–21.6 for medium-risk group and OR: 101.5; 95% CI: 50.2–205.3 for high-risk group).

Results of logistic regression analysis are shown in Table 2 and Figure 1. Subgroup analysis between forrest classification and rebleeding is shown in Table 3 and Figure 2. The association between Rockall score and mortality is shown in Table 4 and Figure 3.

Table 2 *P* value of logistic regression model

Models	*P* value
Forrest classification-rebleeding	0.005
Forrest classification-mortality	0.345
Rockall score-rebleeding	0.151
Rockall score-mortality	0.011

Table 3 Rebleeding rate according to Forrest classification

Classification	Rebleeding rate (%)	OR (95% CI)	*P* value
FIa-b	53.3 (24/45)	39.2 (19.2–79.8)	<0.01
FIIa	46.4 (13/28)	29.7 (13.5–65.4)	<0.01
FIIb	15.9 (23/145)	6.5 (3.0–14.1)	<0.01
FIIc	3.8 (2/53)	1.3 (0.3–6.6)	>0.05
FIII	2.8 (7/247)	1.0	–

odds ratio: compared to FIII. *P* compared to FIII. CI, confidence interval; OR, odds ratio.

Discussion

We assessed predictive value of Forrest classification and Rockall score in predicting rebleeding and mortality of NVUGIB.

First, we studied association between Forrest classification and outcomes.

Several previous studies have shown that Forrest classification strongly correlated with rebleeding, and it was helpful to select clinical and endoscopic methods of treatment [7,15].

It was also reported that Forrest classification had association with mortality [8].

However, Giese *et al*. [13] reported that 'high-risk' Forrest score had no correlation with any clinical outcomes.

In our study, Forrest classification was strongly associated with rebleeding in patients with NVUGIB (P=0.0005).

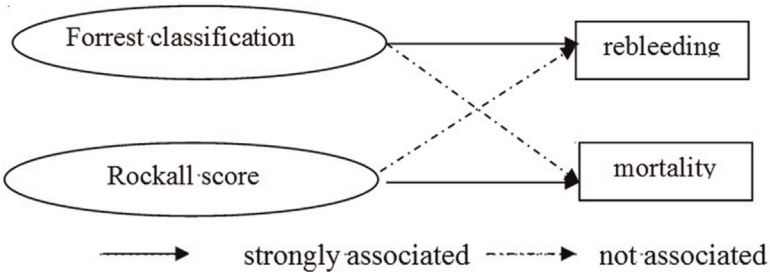
Our results are similar with other studies, and Forrest classification can be used as a predictor of rebleeding not only in peptic ulcer bleeding but also in other NVUGIB [7,15].

Table 4 Mortality rate according to Rockall score

Groups	Mortality rate (%)	OR (95% CI)	*P* value
High risk	62.2 (23/37)	101.5 (50.2–205.3)	<0.01
Medium risk	13.2 (22/167)	9.4 (4.1–21.6)	<0.01
Low risk	1.6 (5/314)	1.0	–

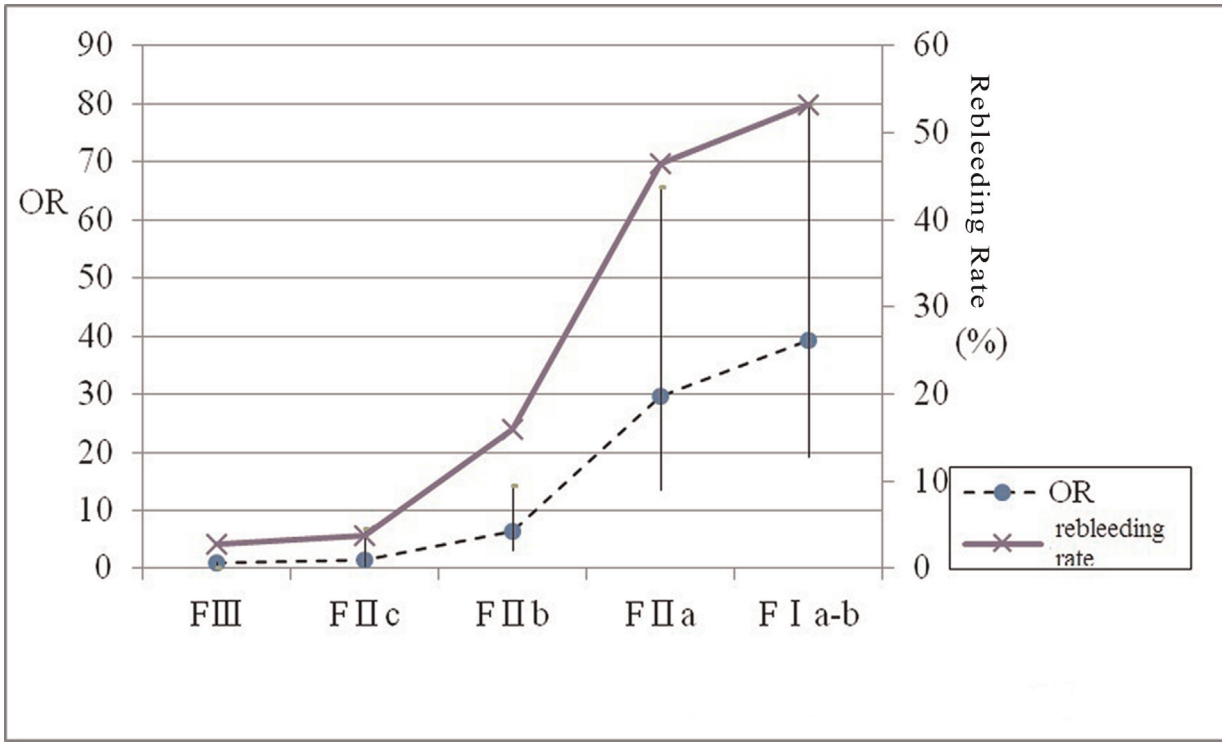
odds ratio: compared to low-risk group. *P* compared to low-risk group. CI, confidence interval; OR, odds ratio.

Figure 1



Results of logistic regression analysis.

Figure 2



Rebleedig rate and odds ratio according to Forrest classification.

The risks of rebleeding in patients with Forrest Ia–b (OR: 39.2; 95% CI: 19.2–79.8), FIIa (OR: 29.7; 95% CI:13.5–65.4), and FIIb (OR: 6.5; 95% CI: 3.0–14.1) were significantly increasing compared with FIII ($P<0.01$).

It suggested that patients with Forrest Ia–b and IIa–b should receive aggressive clinical intervention, including endoscopic therapy and the use of (intravenous) proton-pump inhibitor (PPI).

Forrest classification was not correlated with mortality, which was in contrast to the literature ($P=0.345$) [8]. An explanation for this could be that nonbleeding-related cause (62.0%) was high in our study.

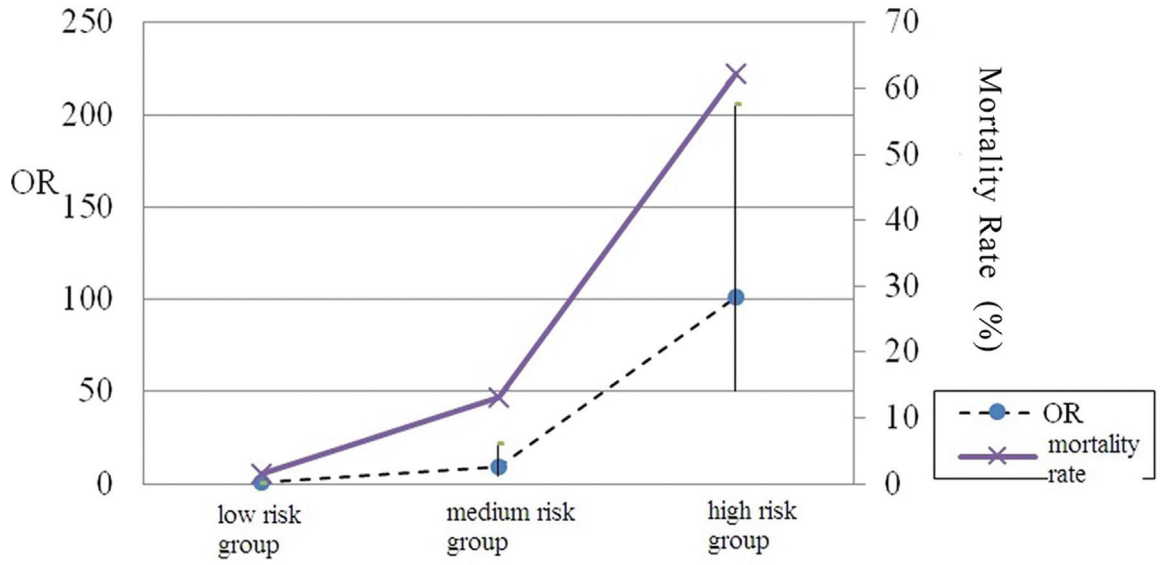
Other reason for this is owing to significant improvement of treatment for bleeding patients (endoscopic intervention and PPI therapy).

We also evaluated predictive value of Rockall score in predicting clinical outcome of NVUGIB.

Given that many of the risk factors for rebleeding are identical to those for mortality and that rebleeding itself is independently predictive of death, the Rockall score may also be used to estimate rebleeding risk.

In one previous study, it was reported that rebleeding was also strongly associated with increased Rockall scores.

Figure 3



Mortality rate and odds ratio according to Rockall score.

However, prediction of rebleeding by Rockall score was statistically unsatisfactory [16].

One study analyzed 951 Dutch patients with acute UGIB [16,17]. The Rockall score performed well in predicting mortality but less well in predicting rebleeding.

In another study, Rockall score was strongly associated with mortality not rebleeding in 221 patients with severe peptic ulcer bleeding [7].

We found that Rockall score was only a predictor of death (P=0.011).

Especially mortality was highest in patients with Rockall score greater than or equal to 7.(OR: 101.5; 95% CI: 50.2–205.3).

It suggests that patients with Rockall score greater than or equal to 7 should receive not only bleeding-related therapy but also treatment for their comorbidities.

Rockall score is derived from several factors, including age, shock, comorbidity, diagnosis, and stigmata of recent hemorrhage.

Comorbidity (0–3 points) is the most important factor among them.

Thus, Rockall score is predictive of mortality more than rebleeding.

In conclusion, Forrest classification can be used as a predictor for rebleeding and Rockall score can be used as a predictor for mortality in patients with NVUGIB.

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Conflicts of interest

There are no conflicts of interest.

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