

A Method for Assessing the Severity of Ulcer Bleeding Combined with Various Forms of Coronary Artery Disease

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Abstract **Aim** of this study was to develop an integrated rating scale for predicting the severity of ulcerative gastroduodenal bleedings in combination with various forms of coronary artery disease. **Material and methods:** We accomplished this task by modifying and adapting Simplified Acute Physiology Score (SAPS) scale to the ulcerative gastroduodenal bleedings with coronary artery disease. Statistical analysis was carried out separately in groups of patients who had the development of severe course of ulcerative gastroduodenal bleedings with coronary artery disease (117 patients) and in the group of patients who had no development of severe course (131 patients) in the Department of Emergency Surgery and Emergency Cardiology of the Republican Research Centre of Emergency Medicine in 2019. **Results:** As a result of all our relevant calculations, the following indicators turned out to be prognostically significant and statistically reliable: age, systolic blood pressure, pulse for 1 minute, respiratory rate for 1 minute, consciousness, coagulation time, hemoglobin, platelet count, prothrombin, urea in the blood, blood hematocrit, blood loss, Algover index, Forrest hemostasis, myocardial ischemia, ejection fraction, stroke volume. **Conclusion:** Our proposed new integrated scale for predicting the severity category of ulcerative gastroduodenal bleedings with coronary artery disease has high sensitivity, specificity and is quite consistent with the requirements of practical emergency surgery.

Keywords Ulcerative gastroduodenal bleeding, Coronary artery disease, Emergency surgery

1. Introduction

One of the concomitant diseases against the background of which ulcerative gastroduodenal bleedings are particularly difficult is coronary artery disease (CAD). According to the modern version, CAD includes unstable angina, acute coronary syndrome (ACS) with and without ST elevation, as well as acute myocardial infarction [1-6].

It should be noted that CAD and ulcerative gastroduodenal bleedings (UGDB) even individually take first places in the structure of general morbidity and mortality. In cases of the combined development of these nosologies, the mutually additive effect of one pathological process on another is observed. It leads to high mortality, ranging from 37 to 70% with conservative and up to 90% with surgical treatments of such patients [7-14].

The providing effective emergency medical care to such patients involves assessing the severity of their general condition by predicting the severity of the existing combined

pathologies course and to determine an adequate and individualized treatment tactics on this basis [15-23].

However, clear criteria for assessing the severity of the combined course of UGDB and various forms of CAD have not been finally developed. Unfortunately, the criteria available in the literature are scattered and are mainly based on hemodynamic parameters; do not give the opportunity for a comprehensive, more holistic assessment of the condition of such patients.

Aim of this study was to develop an integrated rating scale for predicting the severity of ulcerative gastroduodenal bleedings in combination with various forms of coronary artery disease.

2. Material and Methods

We accomplished this task by modifying and adapting Simplified Acute Physiology Score (SAPS) SAPS scale to the UGDB with CAD. Retrospective studies were conducted to determine the prognostic significance and statistical significance of empirically selected anthropometric, clinical, instrumental and laboratory risk indicators for development and assessing the severity of UGDB with CAD. Statistical analysis was carried out separately in groups of patients who

had the development of severe course of ulcerative gastroduodenal bleedings with coronary artery disease (117 patients) and in the group of patients who had no development of severe course (131 patients) in the Department of Emergency Surgery and Emergency Cardiology of the Republican Research Centre of Emergency Medicine in 2019. The critical value of χ^2 was 3.84. The excess of the calculated indicators χ^2 of this critical value was evaluated by us as evidence of the statistical reliability of this indicator ($P < .$).

3. Results and Discussion

As a result of all our relevant calculations, the following indicators turned out to be prognostically significant and statistically reliable: age, systolic blood pressure, pulse for 1 minute, respiratory rate for 1 minute, consciousness, coagulation time, hemoglobin, platelet count, prothrombin, blood urea, blood hematocrit, blood loss, Algover index, Forrest hemostasis, myocardial ischemia, ejection fraction (EF), stroke volume (SV) (Tab. 1).

Table 1. The reliability and likelihood of the development of UGDB with CAD severe course in the presence of the studied factors (n=248)

Analyzed facto	Total amount	Criteria		χ^2	Score
		Light course of UGDB with CAD (n=117)	Severe course of UGDB with CAD (n=131)		
Age, (years)	248				
46-55		31	57	7.82	1
56-65		24	57	14.86	2
66-75		17	62	31.05	3
Consciousness	248				
clear		32	56	6.40	1
stun, stupor		22	59	19.34	2
coma		19	60	24.88	3
Systolic blood pressure, (mmHg)	248				
70-82 or 90-105		29	59	11.07	1
55-69 or 106-120		23	58	17.03	2
<55 or >120		20	59	22.23	3
Pulse, (per 1 min)	248				
100-119 or 141-150		30	58	9.37	1
70-99 or 151-169		25	56	12.85	2
<70 or >170		18	61	27.68	3
Respiratory rate, (per 1min)	248				
25-34 or 49-55		28	60	12.91	1
15-24 or 56-60		21	60	21.80	2
<15 or >60		16	63	33.72	3
Hemoglobin, (mg/l)	248				
85 - 141;		27	61	14.89	1
60 - 85;		20	61	24.41	2
<60		15	64	36.97	3
Platelets, (thousands)	248				
160-130		28	60	12.93	1
130-100		24	58	17.53	2
<100		18	61	27.68	3
Blood hematocrit, (%)	248				
> 35.0		32	56	6.40	1
> 25.0		22	59	19.34	2
< 25.0		19	60	24.88	3
Prothrombin index, (%)	248				
80-50		31	57	7.82	1
50-30		24	57	14.86	2
<30		17	62	31.05	3
Blood fibrinogen "A", (mmol/l)	248				
4.0-3.5		30	58	9.37	1
3.5-3.0		20	61	24.41	2
< 3.0		18	61	27.38	3

Analyzed facto	Total amount	Criteria		χ^2	Score
		Light course of UGDB with CAD (n=117)	Severe course of UGDB with CAD (n=131)		
Blood urea, (mmol / l) 7.0-28.0 28.0- 35.0 >35.0	248	28 24 20	60 58 59	12.91 15.88 22.23	1 2 3
Algover index 1.0-1.5 1.5-2.0 >2.0	248	32 21 16	56 60 63	6.40 21.80 33.72	1 2 3
Forrest hemostasis F 2C F 2B F 2A	248	29 22 15	59 59 64	11.07 19.34 36.97	1 2 3
Blood loss volume, (ml) Up to 500.0 500.0-1000.0 >1000.0	248	31 19 16	57 62 63	7.82 27.16 33.72	1 2 3
The degree of myocardial changes myocardial ischemia myocardial damage myocardial necrosis	248	28 21 16	60 60 63	12.91 21.80 33.72	1 2 3
Ejection fraction (EF) index, (%) 50-60 35-50 <35	248	27 21 15	61 60 64	14.89 21.80 35.44	1 2 3
Stroke volume (SV) index, (ml) do 60.0 40.0-60.0 <40.0	248	32 21 16	56 60 63	6.40 21.80 33.72	1 2 3

Table 2. Modified severity category prediction scale of UGDB with CAD

Parameter	Analyzed sign	Points and their corresponding numerical values of indicators						
		3	2	1	0	1	2	3
X1	Age, years				<45	46-55	56-65	66-75
X2	Consciousness				clear	stun	sopor	coma
X3	Pulse, (per min)	< 40	40-54	55-69	70-109	110-139	140-179	> 179
X4	Systolic blood pressure, (mmHg)	<40	40-54	55-79	80-149	150-179	180-189	>189
X5	Respiratory rate (per 1 min)	< 6	6-9	10-11	12-24	25-34	35-49	> 49
X6	Hemoglobin, (mg/l)				141-150	85 - 141	60 - 85	< 60
X7	Platelets, (thousands)				260-250	250-180	180-140	< 140
X8	Blood hematocrit, (%)	> 60	60-54	54-45	45-42	42-35	35-25	< 25
X9	Prothrombin index, (%)				100-80	80-50	50-30	< 30
X10	Blood fibrinogen "A", (mmol/l)					4.0-3.5	3.5-3.0	< 3.0
X11	Blood urea, (mmol / l)			<3.49	3.50-7.4	7.50-28.9	29-35.9	36-54.9
X12	Algover index				1.0	1.0-1.5	1.5-2.0	>2.0
X13	Forrest hemostasis					F 2C	F 2B	F 2A
X14	Blood loss volume, (ml)					≤ 500.0	500.1-1000.0	>1000.0
X15	The degree of myocardial changes					ischemia	damage	Necrosis
X16	Ejection fraction (EF) index, (%)					50-60	35-50	<35
X17	Stroke volume (SV) index, (ml)					> 60.0	40.0-60.0	< 40.0

After highlighting the above pointed indices, we had to establish the rules for predicting the severity category of the UGDB with CAD course at the presence of a specific indicator. Each indicator was assigned a prognostic score of 1 to 3, depending on the degree of its severity and on the degree of its reliability (value χ^2). We strictly adhered to the rule that the greater was the severity and, accordingly, the value of χ^2 , the higher score was received by one or another indicator. As a result, we obtained a new modified integrated forecast scale for the severity category of the course of UGDB with CAD which is given in Table. 2.

Subsequently, the points were summed up. Based on the sum of the points we have developed gradations for predicting the severity category of UGDB with CAD course from 17.0 to 26.8 points (light), from 26.9 to 35.7 (moderate), from 35.8 to 51.0 (severe). Prospective studies on identifying

the effectiveness of this scale allowed us to conclude that there was more than 80% coincidence of the preliminary determination of the severity category and the final diagnosis in 62 examined patients. This served as the primary basis for the assumption of the reliability and adequacy of the integrated predicting scale proposed by us.

For the further conformity of the severity category of UGDB with CAD according to our integrated scale to the principles of evidence-based medicine, we calculated their "sensitivity" and "specificity". The term "sensitivity" refers to the proportion of patients with the severity of the disease in whom the diagnostic test is positive, and "specificity" refers to the proportion of patients with the severity of the disease in whom the diagnostic test is negative (according to R. Fletcher "Clinical Epidemiology"). The obtained results are given in Tab. 3.

Table 3. Indicators of "sensitivity" and "specificity" of the prognosis scale for the category of severity of UGDB with CAD in patients of the main group

Conformity of estimation scale results and outcomes	Light		Moderate		Severe	
	Yes	No	Yes	No	Yes	No
Positive (conformity)	a= 52	b=11	a=53	b=11	a=51	b=12
Negative (nonconformity)	c=10	d=4	c=9	d=3	c=11	d=5
Sensitivity (Se) = $a/(a+c)$	83.9%		85.5%		82.2%	
Specificity (Sp) = $b/(b+d)$	73.3%		78.6%		70.6%	
Overall accuracy (Ac) = $(a+b)/(a+c+b+d)$	81.8%		84.2%		79.7%	

We have received the rationalization certificate No. 00114 dated by January 11, 2020 from the Tashkent Institute of Post Education Doctors for the developed integrated scale of predicting the category of severity of the course of UGDB with CAD.

4. Conclusions

Thus, conducting retrospective studies to determine the prognostic significance and statistical significance of empirically selected anthropometric, clinical, instrumental and laboratory indicators allowed us to develop an integrated scale for predicting the category of severity of the UGDB course in combination with various forms of CAD.

Our proposed new integrated scale for predicting the category of severity of the course of UGDB in combination with various forms of CAD has high sensitivity, specificity and fully complies with the requirements of practical emergency surgery.

Its widespread use will make it possible to objectify the assessment of the severity of UGDB in combination with various forms of CAD, which accordingly will lead to improved treatment results in these patients.

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