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The Possibility of Using the BISAP Scale for Predicting the Development of Severe Acute Pancreatitis

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Purpose. To study the possibilities of using the BISAP scale for predicting the development of severe acute pancreatitis.

Materials and methods. The study included 243 patients with acute pancreatitis who were hospitalized in the emergency surgery department of the Samarkand branch of the Republican Scientific Center for Emergency Medical Aid, for the period from 2017 to 2020.

BISAP scores were calculated for all cases within 24 hours of the date of contact. The diagnostic effectiveness of the scale was assessed by the area under the ROC-curve.

Results. Statistical analysis of the data obtained showed that the Sensitivity (Sensitivity) of the BISAP scale for early diagnosis of severe acute pancreatitis is 0.417, and the Specificity is 0.957. Further, the positive predictive value (PPV - Positive Prevalence Value) was calculated, which was 0.625, and the negative predictive value (NPV - Negative Prevalence Value), which was 0.947. The area under the ROC curve for assessing the BISAP scale in predicting the development of severe acute pancreatitis was 0.790.

Conclusions. The BISAP score is a simple way to predict the development of severe acute pancreatitis within the first 24 hours after a patient presents. Its advantage is the relative ease of data collection and risk assessment for severe disease. Patients with a BISAP score of 3 or more develop severe acute pancreatitis with a frequency of 41.7%, therefore, these patients need close monitoring and intensive care.

Key words: severe acute pancreatitis; forecast, BISAP.

Introduction. Despite the advances achieved by medicine in recent years, at the moment, acute pancreatitis (AP) firmly continues to occupy the third place (12.5%) among all pathologies with which patients were hospitalized in emergency surgery departments, and in terms of the total number of bed-days and generally ranks second. According to the literature, AP is one of the five causes of in-hospital mortality, which once again shows the importance of comprehensive and at the same time reliable knowledge about this disease [1,2,3,4]. In most cases (75-80%) this disease is mild, but about 15-20% of patients have severe acute pancreatitis. The overall mortality in AP is from 3 to 5-6% [5,6,7], and in the severe form of the disease, these indicators are 20% -30% [4,8,9],

even in clinics specialized for the treatment of this pathology, the indicators mortality is not less than 15% [10,11].

Despite new diagnostic methods and new knowledge about the etiopathogenesis of AP, it is not always possible to timely and adequately assess the severity of the patient's condition. Underestimation of the severity of the condition can end up sadly for the patient, therefore, patients with severe acute pancreatitis (SEP) should be identified in the early stages of the disease. In recent years, integral scales for scoring the parameters of the physiological state of patients have been used to assess the severity of acute pancreatitis. The most widespread are: Ranson (1974), Glasgow-Imrie (1984), APACHE II (1984), SAPS (1985), MODS (1995), SOFA (1996) and BISAP (2009). The existing "traditional" scales for determining the severity of AP, although they are valuable diagnostic criteria at the hospital stage, do not fully meet the requirements of practical medicine. For example, the Ranson, APACHE II, SAPS scales require the determination of complex indicators and parameters that go beyond the capabilities of the admission departments of hospitals [12].

In 2008, Wu B.U. et al. proposed a new predictive assessment system for early determination of the severity of acute pancreatitis, which they called BISAP (Bedside Index of Severity in Acute Pancreatitis - an indicator of the bedside index of severity of acute pancreatitis) [13,14]. The analysis revealed five most informative indicators for determining the severity of AP and predicting in-hospital mortality: 1) blood urea level ≥ 8.1 mmol / l; 2) impaired consciousness; 3) the presence of SIRS (SSVR); 4) age over 60; 5) the presence of effusion in the pleural cavity. If one of the listed criteria is met, one point is awarded. Based on the studies carried out, it can be concluded that using the BISAP scale already in the first day of a patient's stay in the hospital, it becomes possible to identify a group with an increased risk, even before the onset of complications [13,15,16].

Objective: to study the possibilities of using the BISAP scale for predicting the development of severe acute pancreatitis.

Materials and methods: The study included 243 patients with acute pancreatitis who were hospitalized in the emergency surgery department of the Samarkand branch of the Republican Scientific Center for Emergency Medical Aid, for the period from 2017 to 2020.

Clinical and laboratory data were collected and studied from the case histories of only patients who were hospitalized within the first 48 hours from the onset of the disease. The time of the onset of the disease was considered the moment of appearance of abdominal pain typical for acute pancreatitis. For comparative factor analysis, the patients were divided into 2 groups, the first group consisted of patients with severe acute pancreatitis (n 36), and the control group consisted of all other patients with a mild form of the disease (n 207). The diagnosis was made in accordance with the classification system for acute pancreatitis - Atlanta 2012 (according to it, in order to diagnose AP, two of the following three features are required: 1) characteristic abdominal pain (severe persistent epigastric pain with an acute onset, often radiating to the back); 2) indicators of amylase (lipase) of blood plasma at least 3 times higher than the upper limit of the norm; 3) detection of characteristic features on ultrasound, CT with intravenous contrast enhancement or MRI. Severe acute pancreatitis was assessed on the basis of the presence of organ failure (more than 2 points on the Marshall scale in one or more of the three systems, lasting more than 48 hours) and / or the identification of local or

systemic complications, as well as if there was mortality in the early period of the disease. Mild acute pancreatitis (LOP) was exhibited in the absence of all of the above. Exacerbation of pre-existing concomitant diseases, such as ischemic heart disease (IHD), chronic lung diseases, chronic renal failure, etc., developed as a result of AP, was also defined as a systemic complication, and these patients were included in the group with severe acute pancreatitis. Patients who had organ failure at the time of admission were excluded from the study.

To study the possibility of using the BISAP scale in predicting the development of severe acute pancreatitis, the following clinical and laboratory parameters were studied: blood urea level, the presence of impaired consciousness, the presence of SIRS (SIRS), the age of the patients, and the presence of effusion in the pleural cavity. Only the data obtained during the first 24 hours after admission and before the development of organ failure were taken into account. The relationship between the above indicators on the first day after hospitalization and the development of severe acute pancreatitis was investigated.

Results and discussion.

A total of 243 patients were included in the study, women accounted for 57.2% (139) of all patients, and men, respectively, 42.8% (104). The average age of the patients was 54.6 ± 16.1. The most common reasons for the development of AP were: gallstone disease (53.9%) and the consumption of alcohol and fatty foods (29.2%). About 48.1% (117) of patients had at least one concomitant disease, mainly obesity (26.3%), coronary artery disease (25.5%) and diabetes mellitus (13.9%).

To study the possibility of using the BISAP scale as an independent prognostic marker for the development of complications, data from 36 patients with severe acute pancreatitis were studied. The results obtained were compared with the data obtained from all other studied patients, namely the results of studies of 207 patients with a mild form of the disease.

After a comparative analysis of the results obtained, it was revealed that blood urea values equal to or exceeding 8.1 mmol / l were observed in 77 (31.7%) patients with acute pancreatitis, 26 (72.2%) cases were patients with severe acute pancreatitis (first group) and 51 (24.6%) cases were observed in the second group of patients with mild acute pancreatitis. Systemic inflammatory response syndrome (SIRS) was detected in 71 (29.2%) patients, 23 (72.2%) in the first group and 48 (23.1%) in the second. In 7 (2.88%) patients, there was an effusion in the pleural cavity, and in 2 (0.96%), impaired consciousness (Table 1).

Table # 1. Frequency of identified biomarkers of severity on the BISAP scale.

		Patients with TOP (n 36)	Patients with LOP (n 207)
	Blood urea level ≥ 8,1 mmol/L	n 26 (72,2%)	n 51 (24,6%)
	The presence of impaired consciousness	n 2 (5,56%)	n 0 (0%)

	Availability of SIRS (SSVR)	n 23 (63,9%)	n 48 (23,1%)
	Age over 60 years old,	n 11 (30,6%)	n 17 (8,21%)
	The presence of pleural effusion	n 5 (13,9%)	n 2 (0,96%)

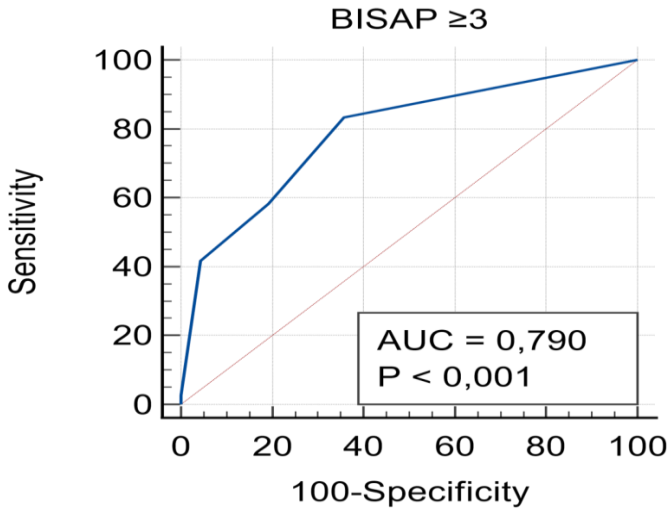
Out of 243 patients with acute pancreatitis, 1 patient had a BISAP score of 4 points, 23 (9.47%) as 3 points, 37 (15.2%) - 2 points, and 43 (17.7%)) patients 1 point. In 24 (9.88%) patients in both groups, at least three out of five biomarkers of the BISAP scale were identified. In the first group of patients with severe acute pancreatitis, out of 36 patients, three or more biomarkers were detected in 15, which amounted to 41.7% of the study group. And in the group of patients with mild acute pancreatitis, this indicator was only 4.35%, three biomarkers of severity were identified only in 9 patients out of 207 (Table 2).

Table 2. The number of patients with at least 3 biomarkers of the BISAP scale in the study groups.

	Patients with TOP (n 36)	Patients with LOP (n 207)
BISAP ≥3 (+)	n **15** True positive results – ***True positives*** **(TP)**	n **9** False positive results - ***False positives*** **(FP)**
BISAP ≥3 (-)	n **11** False negative results – ***False negatives*** **(FN)**	n **198** True negative results - ***True negatives*** **(TN)**

Statistical analysis of the data obtained showed that the sensitivity of the BISAP scale for early diagnosis of severe acute pancreatitis is 0.417 (Sensitivity = TP / TP + FN), and the specificity is 0.957 (Specificity = TN / TN + FP). Further, the positive predictive value (PPV - Positive Prevalence Value) was calculated, which was 0.625 (PPV = TP / TP + FP) and the negative predictive value (NPV - Negative Prevalence Value), which was 0.947. The area under the ROC-curve (AUC) for assessing the BISAP scale in predicting the development of severe acute pancreatitis was 0.790.

Fig. # 1. ROC curve and area under the ROC curve, relationship between BISAP scores ≥3, on the first day after hospitalization, with the development of severe acute pancreatitis (calculated using the MedCalc program).



Note: ROC-curve - (Receiver Operating Characteristic curve) - is a graphical method for assessing the effectiveness of the parameter under study. A quantitative interpretation of ROC is provided by the AUC (Area Under ROC curve) indicator - the area bounded by the ROC curve and the axis of the proportion of false positives is an accurate digital criterion for the information content of the diagnostic method.

On the first day after hospitalization, 3 points or more on the BISAP scale were observed in 24 (9.88%) patients with acute pancreatitis. In the group of patients with severe acute pancreatitis, BISAP ≥3 was detected in 15 (41.7%) cases out of 36 acute pancreatitis, since the positive predictive value of the BISAP scale at a threshold of 3 points is 0.625, and the negative predictive value is 0.947. This means that 94.7% of patients whose BISAP scores were 2 points or less did not develop severe acute pancreatitis. In this connection, the BISAP scale can be used to predict a mild course of the disease. The effectiveness of this scale may be higher when used in combination with other prognostic markers for the development of severe acute pancreatitis.

Conclusions. The BISAP score is a simple way to predict the development of severe acute pancreatitis within the first 24 hours after a patient presents. Its advantage is the relative ease of data collection and early risk assessment of severe disease. Patients with a BISAP score of 3 or more develop severe acute pancreatitis with a frequency of 41.7%, therefore, these patients need close monitoring and intensive care.

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