

Method of Assessing the Severity of the Course of Closed Injuries of Hollow Organs

Mustafakhulov I. B., Norov M. Ch., Mahamadaminov A. G., Djuraeva Z. A.

Samarkand State Medical University, Uzbekistan

Abstract In this article the authors have developed an integral scale for predicting the probability of a severe course of closed injuries of hollow organs in abdominal traumas on the basis of appropriate calculations, which is characterized by high indicators of sensitivity, specificity and overall accuracy and allows to reliably predict the risk of a severe course of these injuries. Wide application of the integral scale in patients with closed injuries of hollow organs at abdominal traumas allows to optimize the therapeutic-diagnostic process and significantly improve the results of treatment of this severe contingent of urgent patients.

Keywords Integral scale, Hollow organs, Injuries

1. Introduction

Despite modern advances in diagnostic technologies, the development of surgical techniques, anesthesiology and intensive care, pharmacology, to date there is no unambiguous solution to the problem of diagnosis and treatment of closed injuries of hollow organs (CLOH) in abdominal injuries. Meanwhile, the prevalence of CLI in the structure of abdominal injuries reaches from 16.3% to 43% [1,7].

LPSO in abdominal traumas belong to the category of extremely life-threatening emergency conditions and are accompanied by high lethality, which, depending on the nature of injuries, ranges from 27% to 35%. It is noteworthy that lethality is persistent and does not tend to decrease [2]. To choose reasonable treatment tactics in patients with ZPPO in abdominal trauma, predicting the probability of severe course of the existing injuries is important. It is quite obvious that such prediction not only allows to choose the tactics of surgical treatment, but also creates an opportunity to determine the volume of necessary measures of preoperative and postoperative intensive care [3,11].

It should be noted that when solving the problem of objective assessment of the severity of the existing LPSO in abdominal injuries, numerous studies pay much attention to the search for independent prognostic factors (designated in modern literature as predictors) of their outcome. It is generally accepted that predictors can be in the form of anatomical criteria that determine the severity of injuries and physiological parameters that characterize the response of functional systems of the body to the injuries [4,8].

By incorporating predictors into a variety of scoring scales

and statistical models, researchers attempt to quantitatively rank injury severity within defined intervals and calculate the probability of survival. The best known among the latter are ISS (Injury Severity Score) - Injury Severity Index, RTS (Revised Trauma Score) - Revised Trauma Scale, SAPS - Simplified Assessment of Physiologic Disorders Scale [5,9].

It should be emphasized that the creation of a universal scale is complicated by the variety of injuries and disorders occurring in the body after abdominal trauma, insufficient study of predictors of its outcome. In this regard, the above-mentioned scales are not without certain drawbacks. One of the main drawbacks is that the scoring system used in these scales for evaluating selected predictors is based mainly on the clinical experience of specialists and is subjective in nature. In this case, the established scores cannot fully express the degree of change of predictors, i.e. their prognostic "weight" in assessing the severity of the course of existing CLL [6,10].

Therefore, the **aim** of the present study was to develop an integral scale for predicting the probability of severe STEMI in abdominal trauma.

2. Material and Methods of Research

We solved this problem by modifying and adapting the well-known ISS and SAPS scales to closed abdominal injuries. In this regard, we set the task of developing an integral scale for predicting the probability of a severe course of STEMI in abdominal trauma. We solved this problem by modifying and adapting the known ISS and SAPS scales to closed abdominal injuries.

At the same time, we conducted retrospective studies to determine the prognostic significance and statistical reliability of anthropometric, clinical, instrumental and laboratory risk indicators for the development of severe course of closed

abdominal injuries accompanied by damage to the hollow organs of the abdominal cavity.

Statistical analysis was performed separately in the groups of patients who did not have severe course of CLAB and in the group of patients who had severe course of the latter. We calculated χ^2 values for each of the selected parameters. The critical value of the latter was 3.84. Exceeding of the calculated χ^2 values of this critical value was evaluated by us as evidence of statistical reliability of this index ($P < 0.01$).

3. The Results Obtained and Their Discussion

As a result of the corresponding calculations, we obtained data indicating statistical reliability and prognostic significance of 22 predictors (Table 1).

The data presented in Table 1. it is evident that as a result of appropriate calculations such predictors as: age >50 years, ISS ≥ 25 , blood loss >1000 ml, obesity (BMI>30), comorbidities, diabetes mellitus, systolic BP <70 mmHg, pulse >120 per 1 min, Glasgow scale consciousness <11, blood Hb <90 mg/mL, blood leukocytes >10000 (kL/mm³), WBC <3.0 min, FB A <3.2 mmol/L, creatinine >10.0 mg/dL, diuresis <1.0 mL/kg/hour, potassium <2.5 mEq/L, abdominal bloating, dulling in low-lying areas of the abdomen, absence of intestinal peristalsis,

free air in the abdominal cavity, fluid in the abdominal cavity, presence of retroperitoneal hematoma, purulent fecal peritonitis.

After establishing statistical reliability of the predictors in the study groups, we had to determine their prognostic significance ("weight"). For this purpose, we made appropriate calculations using the formula for calculating prognostic coefficients (PC). PC is usually considered to be the logarithm of the ratio of the probabilities of symptoms in diseases B1 and B2, taken to two decimal places and multiplied by 100. In cases where the accuracy of the probability ratio is low, it is more convenient to use the logarithm with one decimal place and multiply it by 10:

$$PF = 10 \cdot \lg \frac{P(x_i/B_1)}{P(x_i/B_2)}, \text{ where: PF - predictive factor;}$$

x_i - investigated feature; B₁ - disease 1; B₂ - disease 2; P - probability of feature.

After that, the obtained prognostic coefficients were summarized and on the basis of the obtained sum we developed the gradations of prediction of the probability of the development of a severe course of PDVA in abdominal injuries (Table 2.).

According to the data of Table 2. it follows that a low probability of severe course of PDO is predicted at the sum of PCs from 3.38 to 5.17, average - from 5.18 to 10.35, and high probability from 10.36 to 15.52.

Table 1. Reliability and probability of developing severe course of PDO in the presence of the studied predictors (n=72)

Predictors	These predictors were in		χ^2	P<	IIK
	the non-severe course of PEPO (n=32)	severe course of PEPO (n=40)			
ISS ≥ 25	4	38	48,55	0,01	0,88
Blood loss >1000 ml	3	37	49,75	0,01	0,99
Age >50 year	9	34	23,91	0,05	0,48
Obesity (IMT>30)	7	36	34,3	0,01	0,61
Associated pathologies	4	38	48,55	0,05	0,88
Systolic BP <70 mm.rt.st.	4	39	53,40	0,01	1,02
Pulse , in 1 min >120	4	28	23,81	0,01	0,75
Consciousness on the Glasgow scale <11	4	28	23,81	0,01	0,74
Hb in blood <90 mg/ml	7	25	11,88	0,05	0,46
Blood leukocytes >10000 (kl/mm ³)	9	31	17,55	0,05	0,44
VCK <3,0 min.	12	27	6,44	0,05	0,26
FB A <3,2 mmol/L	11	27	7,83	0,05	0,29
Creatinine (mg/dl) > 10,0	7	26	13,32	0,05	0,47
Diuresis (ml/kg/hour) <1,0	4	32	32,40	0,05	0,81
Potassium, in mekv/l <2,5	9	25	8,43	0,05	0,35
Abdominal bloating	4	27	21,93	0,05	0,73
Dullness in the flush areas of the abdomen	3	29	28,69	0,01	0,89
Lack of intestinal peristalsis	3	35	32,40	0,01	0,97
Free air in the abdomen	2	29	31,83	0,01	1,06
Abdominal fluid	3	30	30,84	0,01	0,90
Retroperitoneal hematomas	8	28	14,40	0,05	0,45
Purulent fecal peritonitis	2	32	38,80	0,05	1,11

Table 2. Predictive gradations of the probability of a severe course of PPSO in STEMI

Probabilities of a severe course of PDVA	Sum of prognostic coefficients (PC)
Low probability	from 3,38 to 5,17
Average probability	from 5,18 to 10,35
High probability	from 10,36 to 15,52

Our prospective study of the effectiveness of this integrated scale in predicting the probability of severe PDVA in abdominal trauma in 80 patients examined allowed us to conclude that there is more than 80% concordance between the final diagnosis and the preliminary probability definition. For even more conformity of prediction of the probability of severe course of PDVA according to the developed integral scale to the principles of evidence-based medicine we calculated its "sensitivity" and "specificity". The obtained results are summarized in Table 3.

Table 3. Sensitivity" and "specificity" scores of the scale for predicting the probability of a severe course of ZPPO, (n=80)

Concordance between scale results and final diagnoses	Low probability		Average probability		High probability	
	Yes	No	Yes	No	Yes	No
Positive (match)	17	4	16	5	16	7
Negative (match)	3	1	3	2	4	2
Sensitivity (Se) = $a/(a+c)$	85,0%		84,2%		80,0%	
Specificity (Sp) = $b/(b+d)$	80,0%		71,4%		77,8%	
Overall accuracy (Ac) = $(Se + Sp)/2$	82,5%		77,8%		78,9%	

As can be seen from the presented data in Table 3, the proposed integral scale for predicting the probability of severe course of STEMI in abdominal injuries is characterized by high sensitivity (average 82.5%), specificity (average 77.8%) and overall accuracy (average 78.9%).

On the developed integral scale of prediction of probability of severe course of LPSO in abdominal injuries we received the certificate for rationalization proposal № 1933 from Samarkand State Medical University on 6.11.2023.

Thanks to the inclusion of abdominal MSCT in the diagnostic process and calculations on the proposed integral scale of the probability of the severe course of STEMI in a rather complicated clinical situation, it was possible to establish the correct diagnosis and choose an adequate tactic of treatment of closed abdominal trauma.

4. Conclusions

Thus, based on the conducted studies, we can conclude that the proposed integral scale for predicting the probability of a severe course of STEMI in abdominal injuries is characterized

by high sensitivity, specificity and overall accuracy and allows to reliably predict the risk of severe course of these injuries.

Widespread use of the integral scale in patients with STEMI in abdominal injuries allows to optimize the treatment and diagnostic process and significantly improve the results of treatment of this severe contingent of urgent patients.

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