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Clinical and biological factors with prognostic value in acute pancreatitis

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ABSTRACT

Acute pancreatitis is an acute inflammatory process of the pancreas, which can remain localized at the level of the gland or can extend to the peripancreatic and retroperitoneal tissues. The use and interpretation of paraclinical examinations at the onset can predict the form of evolution of acute pancreatitis (mild or severe). Depending on the evolution, these data are useful in determining the type of surgical intervention that might be necessary based on severity.

We present a retrospective study consisting of 118 patients diagnosed and hospitalized with acute pancreatitis during 2016-2020 in the Surgery I section of the Sibiu County Emergency Clinical Hospital. Several parameters were taken into account at hospitalization such as age, sex, the environment of origin, etiology of pancreatitis, biochemical parameters with their repetition at 24, 72 hours, and at discharge, and clinical signs at hospitalization. surgeries performed depending on the severity of pancreatitis specifying their complications.

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Introduction

Acute pancreatitis is described by Dieulafoy as the "great abdominal drama", being a complex pathology with multifactorial etiology, diagnostic difficulties, evolution that causes functional repercussions on the body and with a treatment that does not correspond to a clear protocol [1]. The latest research and discussions on the diagnosis and treatment of acute pancreatitis are focused on solving some major problems, one of them being the establishment of the indication and the optimal time for surgery, the therapeutic strategy for severe cases and the evaluation of local complications. Global mortality from pancreatitis increased by 64.8% between 1990 and 2019 [2]. In Romania, the incidence of pancreatitis is 40-50,000 to 100,000 people per year, with a distribution of 25-30% in the Ardeal region and a mortality of 30-40% [3].

The cost of medical care for patients suffering from acute pancreatitis is directly proportional to the length of hospitalization, plus the total costs of medical and surgical treatment, where necessary, and paraclinical investigations performed.

The rapid and effective diagnosis of acute pancreatitis on admission is very important for the prescription of a personalized treatment for each patient depending on the type of pancreatitis (acute or severe) and the complications that have occurred [4].

Multiple specialized studies use the values of hemoglobin, hematocrit, leukocytes, creatinine and pancreatic enzymes as predictive factors for assessing the severity of acute pancreatitis, obtaining positive statistical results by using these parameters.

Materials and Methods

This is a retrospective study from January 2006 to December 2020 on a set of 118 patients diagnosed in the emergency room and admitted to the general surgery department with acute pancreatitis. Proper handling of

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personal protective equipment (PPE) and adherence to hygiene rules were carefully observed for inpatients during the COVID-19 pandemic to prevent contamination of staff and other inpatients [5].

Several parameters were monitored, among which we list those of significant value for our study: age, sex, environment, hemoglobin value upon admission and after 72 hours, hematocrit value upon admission and after 24 hours, the value of leukocytes upon admission and in evolution up to discharge, the value of pancreatic amylase upon admission and in evolution up to discharge. In terms of imaging studies, the following parameters were monitored: abdominal ultrasonography, plain chest and abdominal radiography, and computed tomography with calculation of the Balthazar score. Apache and Ranson scores were calculated for the 118 patients.

The severity of the form of acute pancreatitis presented by the patients in our study was established according to the calculation of the Apache, Ranson scores, as well as by the calculation of the Balthazar score after performing the computed tomography.

Patients diagnosed with acute pancreatitis hospitalized and treated in other medical departments, patients suffering from chronic pancreatitis, and patients with severe acute pancreatitis in critical condition who died within the first 24 hours were excluded from the study. For patients admitted during the Covid-19 pandemic, all precautions to prevent spread in the hospital have been taken.

The general group contains 118 patients divided into three groups. Group A includes patients who underwent conservative treatment of acute pancreatitis and consists of 28 patients (23.72%). Group B includes patients who benefited from the protocol of the surgical therapeutic window for acute pancreatitis and consists of 60 patients (50.84%). Group C includes patients who underwent surgical treatment for complications of acute pancreatitis and consists of 30 patients (25.42%).

The data used in this study were collected from patient records. Such data were represented by general information (age, sex, family medical history, associated diseases, the way the disease started, weight), clinical data (clinical signs and symptoms), laboratory data (upon admission, during the evolution of the disease, preoperative and postoperative), imaging investigations (echography, pulmonary x-ray, abdominal x-ray, computer tomography), intraoperative data (extension of pancreatic peripancreatic necrosis, the condition of the gallbladder and of extrahepatic bile ducts, the existence of pathological fluids which should be sampled for culture and antibiogram, associated visceral injuries), treatment (conservative, minimally invasive and surgically open), therapeutic results (recovery, complications, recurrences, death).

The minimally invasive/ laparoscopic surgical interventions proposed and performed on group B patients was analyzed from several points of view: the timing of the operation, the location of the necrosis in necrotizing pancreatitis, the length of stay, reinterventions, postoperative complications and deaths. The collection of all these data highlighted the value of laparoscopic treatment in acute pancreatitis.

The resulting data has been processed on the computer, by using the set of statistical applications Microsoft Excel and MedCalc. For the graphic illustration of the obtained results, the data were presented in tables and graphs. The quantity variables are presented at medium value and with intervals (± limits). The Mann-Whitney test, the t Student test, $p<0.05$ have been used for comparisons between analysis groups. The chi-square or x^2 test has been used for value association.

Results

Most of the patients included in the study group were males (75, 63%) and from rural area (72%). The age of the general lot ranges from 20 to 75 years, with a medium age of 53.2+/-9.8 years (Table 1). Most frequent associated comorbidities were arterial hypertension (38.1%), ischemic cardiac disease (19.5%), and diabetes (11%).

Table 1. General characteristics of the patients in the study group.

Parameter	No of cases (%)
AP etiology:	
Biliary	53(44.9%)
Alcoholic	37 (31.3%)
Metabolic	6 (5%)
Posttraumatic	2 (1.6%)
After surgery	9 (7.6%)
Idiopathic	11(9.3%)
Comorbidities:	
Arterial hypertension	45(38.1%)
Diabetes	13(11%)
Ischemic cardiac diseases	23(19.5%)
Respiratory diseases	5 (4.2%)
Time elapsed since the onset of symptoms:	
24-48 h	5 (4.3%)
48-72 h	47(39.8%)
3-5 days	35 (29.6%)
5-7 days	31 (26.3%)
AP form:	
Mild	86 (72.8%)
Severe	32 (27.2%)

The classification by levels of severity was achieved by following the Atlanta criteria, respectively one or more of the following criteria: Glasgow score at admission ≥ 3 (recalculated after 48 hours); Apache II score ≥ 8 (during disease progression); the presence of one or more organ dysfunctions (shock, multiple organ failure, acute renal

failure, upper digestive hemorrhage, disseminated intravascular coagulation); the presence of one or more local complications (abscess, necrosis or pancreatic pseudocyst).

Regarding the severity of pancreatitis, 86 pancreatitis were mild forms (72.88%) and 32 pancreatitis were severe forms (27.11%).

According to our study, the frequency of alcohol-induced acute pancreatitis is 30% and has the highest incidence among male patients, and that of biliary pancreatitis is 45% and is more common in women.

The clinical picture was dominated by the main symptom, that is abdominal pain on both sides, present in 118 (100%) patients. The type of pain has been described as long-lasting, in some cases even resisting even strong analgesic drugs, requiring the installation of an epidural catheter. Dyspeptic syndrome characterized by nausea and vomiting was present in 110 (93.22%) patients. Paralytic ileus caused by excruciating abdominal pain was experienced by 75 (63.55%) patients. The presence of a palpable abdominal formation has been present in 24 (20.33%) patients. The acute surgical abdomen has been present in 28 (23.72%) patients. Fever has been experienced in 36 (30.5%) cases while tachycardia in 85 (72%) cases. Superior digestive hemorrhage manifested as hematemesis and melena has been recorded in 7 (5.93%) cases, being associated to shock or severe sepsis.

Clinical examination by palpation revealed epigastric abdominal pain radiating to both sides in 118 cases (100%). Twenty-eight patients have presented signs of acute surgical abdomen, sensitivity in Mallet-Guy and positive Mayo-Robson points was present in 74 patients (62.71%). Abdominal ecchymoses were present in 4 patients as Cullen (periumbilical ecchymoses) and Gray-Turner (flank ecchymoses) signs.

In our study, 23 patients out of 32 presented severe pancreatitis, compared to 18 out of 86 suffering from mild acute pancreatitis with the hematocrit > 46% upon admission. The hematocrit value has been calculated upon admission for all patients (Table 2).

Table 2. Clinical, biological and imagistic parameters in patients in the study group.

	Mild form (n=86)					Sever form (n=32)					Total	p
Ht. at admission	18					23					41	
Ht. at 24 h	24					8					32	
Hb. at admission (mg/dl)	8-10	10-12	12-14	14-16	>16	8-10	10-12	12-14	14-16	>16		
	1	5	52	26	2	17	6	9	0	0		
Hb. at 72 h	0	0	83	3	0	0	9	22	1	0		
Leukocytes at admission (e/dl)	4000-9000	9000-10000	10000-150000	15000-20000		4000-9000	9000-10000	10000-15000	15000-20000	>20000		
	8	3	53	22		0	0	2	8	22		
Leukocytes at 72h	17	43	19	7		0	4	5	8	15		
Leukocytes at discharge	67	19	0	0		25	5	2	0	0		
Amylases at admission	<25 u/l		25-125 u/l			3x125 u/l		5x125u/l			118	
	2		20			37		59				
Creatinine at admission	<1.8 mg/dl		>1.8 mg/dl			<1.8 mg/dl		>1.8 mg/dl			85	<0.001
	19		39			15		12				
Creatinine at 48 h	<1.8 mg/dl		>1.8 mg/dl			<1.8 mg/dl		>1.8 mg/dl			118	<0.0001
	71		**15**			**11**		**21**				

The hemoconcentration has been recorded as Ht. > 46% for men and > 42% for women. The medium value of the hematocrit has been 40±5% for women and 44±6% for men ($p<0.01$). Hematocrit values increased from 21% to 72% in patients who had mild or severe pancreatitis. Thus, hematocrit was determined in 104 (88%) patients in the first 24 hours after admission. Of these, 75 (64%) patients had mild forms of pancreatitis and 29 (24%) patients had severe forms of pancreatitis.

In 28 patients from the 86 suffering from mild acute pancreatitis the hemoglobin has a high value as a result of the hemoconcentration which accompanies vomiting and fluid sequestration due to third spacing.

Upon admission, 17 patients have presented a major decrease in hemoglobin levels determined by the sanguine effusion on patients with severe acute pancreatitis. In the case of our study a relatively high decrease of hemoglobin levels has been recorded 72 hours from admission in severe

acute pancreatitis, being associated to the hemorrhages from the pancreatic lodge or to the transfer of sanguine mass to the splanchnic area, caused by states of shock.

In the cases of mild acute pancreatitis, our study shows a leukocyte value ranging from 15,000 to 20,000 in 22 patients with a reduction in their dynamics. Upon discharge we observed that 67 patients had a normal leukocyte value ranging from 4,000 to 9,000 elements/dl.

In the cases of severe acute pancreatitis, we have observed that 22 patients have, upon admission, a leukocyte value over 20,000 elements/dl, with a decrease in their level down to the normal value. 32 patients have been discharged with a normal leukocyte value.

Creatinine value has been recorded for 85 patients upon admission and 48 hours after admission for 118 patients. The p value regarding the relation between creatinine and acute pancreatitis severity with a value of $p < 0.001$ upon admission and 48 hours afterwards, shows a value with high statistical significance regarding the relation between the values of creatinine that exceed 1.8 mg/dl and the severity of acute pancreatitis.

In 48 hours from the admission the creatinine value has been calculated for all the patients in the total study group, observing that 13 out of 15 patients with creatinine values > 1.8 mg/dl have developed necrotizing pancreatitis.

From the total lot of 118 patients diagnosed with acute pancreatitis, the amylase values have been lower than normal values in 2 cases, lacking significance for diagnosis. In 20 cases, the amylase value was normal, in 37 cases it was 3 times higher than the normal values, while in 59 cases the amylase value was 5 times higher than normal values.

All patients underwent abdominal X-ray and chest X-ray at admission. Computer tomography has been recommended for diagnosis and monitoring, as well as in the cases where the clinical symptomatology and biochemical results have been inconclusive. This investigation was carried out in all cases, to evaluate the severity of the current episode of acute pancreatitis. It has identified n=53 (45%) cases in stages A and B corresponding to mild pancreatitis according to Balthazar's classification. In stages C, D, E (corresponding to severe pancreatitis) patients were identified and grouped as follows: n=19 (16%) cases in stage C, n=31 (26%) in stage D and 15 cases (12%) in the E stage.

According to Ranson criteria, 32 patients have been diagnosed with severe acute pancreatitis, score ≥ 3, but still, only 14 of them have developed local and general complications (as a result of data collection from other diagnosis criteria related to acute pancreatitis). By analyzing the Table 2, it can be observed that the Apache II score has a better specificity and positive predictive value than the Ranson score, but having, at the same time an equal negative predictive value.

Table 3. Value of Ranson criteria calculated to predict the severity of acute pancreatitis in the study group

Criteria	Sensitivity	Specificity	VPP	VPN	p-value
Age	0.50	0.61	0.12	0.89	0.02*
Leukocyte	0.40	0.82	0.22	0.83	0.06
Glucose	0.12	0.72	0.21	0.82	0.32
ASAT	0.21	0.63	0.07	0.82	0.83
Hematocrit	0.22	0.63	0.10	0.82	0.60
Calcium	0.52	0.81	0.27	0.90	0.02*
Urea	0.22	0.83	0.31	0.90	0.08
PaO2	0.58	0.64	0.37	0.85	0.07

Footnote: VPP-positive predictive value, VPN-negative predictive value, *statistically significant at $p<0.05$

The mean value of Ranson score was of 1.70+/-1.23 in the mild acute pancreatitis group, and of 3.73±1.80 in the severe acute pancreatitis group ($p<0.0001$). The value of Apache II score at 24 h after admission was 7.62±3.49 for mild and 9.47±4.25 in severe acute pancreatitis group ($p<0.004$). Statistical analysis showed a similar sensitivity and negative predictive value for the two score systems in acute pancreatitis, with a slightly higher specificity (75 vs 68%) and positive predictive value (54% vs 37%) for the Apache II score at 24 hours versus Ranson score in predicting the severity in the study group.

Table 4. Comparison of predictive values between Ranson score and Apache II

Parameter	Ranson	Apache II 24 h
Sensitivity	81%	81%
Specificity	68%	75%
Positive predictive value	37%	45%
Negative predictive value	95%	95%
P value	<0.001	<0.001

Informing patients about the therapeutic options, complications and outcomes is particularly important, as they will become an active partner in the patient-physician relationship in preoperative training and postoperative care [6]. In the study group, the patients were treated according to the international guidelines for acute pancreatitis. Only biliary pancreatitis were considered a surgical indication from the beginning. For the other etiologies, surgery was decided when local complications were documented under adequate medical treatment. Laparoscopy allow an exploration of the peritoneal cavity, with staging of pancreatitis, sampling of pancreatic ascites, evaluation of cytosteatonecrosis and pancreatic necrosis. The minimal invasive approach also permits biliopancreatic decompression by cholecystostomy, contact vagolysis by laparoscopic insertion of a periesophageal catheter, continuous capsular analgesia by administration of contact anesthetics. As radical indications, we performed

laparoscopic drainage of the peripancreatic collections with lavage-drainage, necrectomies being performed in laparoscopically selected cases, if not performed by open surgery and pathogenic treatment. In advanced cases, drainage of the omental bursa may be performed through the gastrocolic ligament section and necrectomy in necrotic pancreatitis. Drainage and continuous postoperative lavage are performed with large caliber tubes to allow the evacuation of purulent secretions and sphaceli, with saline, lactic acid. In order to allow the approach and exploration of the whole pancreas, the alternative insertion of the working channel telescope can be performed in all three 15 mm trocars (supraumbilical, epigastric and on the right flank, facilitating the direct access to the necrotic body and tail pancreatic areas. 77 interventions/ reinterventions were performed on the 60 patients out the 118 in the study group (50.8%).

The average hospital days were of 13.2+/-10.7 days, with variations between 7 and 34 days. The ICU hospital days were of 7.6 +/-8.2 days (5-22 days).

Local complications were present in 21 cases, being represented by pancreatic abscesses (10 cases), pancreatic fistulas (5 cases), ileus (3 cases), pancreatic pseudocysts (4 cases) and hemorrhages from the omental bursa in 2 cases (after performing pancreatic necrectomies, that were solved by laparoscopic hemostasis). Pancreatic pseudocysts were solved in 3 cases an external drainage performed laparoscopically, and the other had a favorable evolution by conservative treatment (no surgical treatment being necessary).

General complications occurred in 21 patients, being represented by upper digestive hemorrhage in 2 cases, respiratory failure in 2 cases, pleurisy in 3 cases, acute renal failure in one case, pulmonary embolism in one case, MSOF in 12 cases. Mortality in the study group was 14.4% (17 cases). The data analysis reveals that the patients who died were older and had greater APACHE II scores upon admission. The experienced surgical team(s), good communication between ICU and surgical departments, proactive management of co-morbidities and hydro-electrolytic imbalance, as well as implementing clinical protocols are currently considered key elements to increase patient safety and provide better outcomes [7].

Discussion

The increased number of severe pancreatitis cases in the studied group, compared to those from the literature (80% being mild acute pancreatitis and 20% being severe) is due to the increased use of alcohol in our country and delayed presentation of the patients from rural areas. In addition, such severe forms of pancreatitis could also be a result of the development of diagnosis procedures and of the experience accumulated in the field of diagnosis and treatment of this type of pathology [8].

The literature indicates a frequency of biliary acute pancreatitis ranging between 35 and 49%, and a percentage of approximately 20% for alcohol-induced pancreatitis [9]. In our study, the most frequent causes were also biliary and alcoholic. However, we identified an important percentage (about 10%) that is represented by idiopathic acute pancreatitis, while 15% is represented by pancreatitis caused by other factors. The absence of a gold standard for the diagnosis of this disease can explain the increased frequency of acute pancreatitis of unknown etiology and thus makes it difficult to evaluate several tests proposed for the diagnosis [10,11].

According to our study, pain is a symptom found in all patients in the investigated group and may in some cases mimic different causes of acute surgical abdomen. It can be accompanied by shock phenomena, such as perforated peptic ulcer, mesenteric ischemia, bowel occlusion, acute cholecystitis, acute appendicitis or Amyand`s hernia [12-15].

The increase in hemoglobin and hematocrit values in 45-50% of the patients with acute pancreatitis is a variation that is due to blood hemoconcentration resulting from vomiting as well as fluid sequestration in the third spacing, such data being also confirmed in our study [16]. The dehydration which produces hemoconcentration is a factor which appears to contribute to pancreatic necrosis and organ failure [17]. If the hematocrit is 45-50% or greater upon admission and no improvement is recorded in the first 24 hours, the probability to develop a necrotizing pancreatitis increases significantly (sensitivity of 81%, specificity of 88%) [18,19].

Gray and Rosenman showed in 1965 that the hemoconcentration upon admission had no prognosis value in patients suffering from acute pancreatitis [20]. Talamini et al. found no significant differences between 24-hour hematocrit levels in patients with acute pancreatitis and in patients who died of this condition [21]. On the other hand, the Ranson study shows that a greater than 10% reduction in the first 48 hours of therapy is correlated with a decrease in severity and mortality.

Remes and Duarte published results similar to those obtained in our study, but applied to a larger number of patients and calculating the prognosis according to organ failure and intrapancreatic extension of the areas of necrosis [22,23]. In this study we found that patients with no hemoconcentration have low chances of developing pancreatic necrosis or organ failure.

Leukocytosis > 16,000 mm^3 is significant both in statistical $p < 0.001$ and percentage terms for patients suffering from severe pancreatitis at 72 hours, n=22 (68%). The high level of creatinine values is known as a negative prognosis factor in acute pancreatitis. High creatinine values recorded at 48 hours from admission have been recently described as an indicator of pancreatic necrosis [24].

Our study suggests that creatinine values higher than 1.8 mg/dl recorded 48 hours after admission are closely correlated with the development of pancreatic necrosis, with a positive predictive value of 89%. Similar values have been presented in other studies, such as Muddana's data showing a VPP of 93% [25]. In correlation with pleural effusion, it is a useful factor for the prognosis of severity in the first 24 hours.

The data from the global statistics of several published studies have revealed that the serum amylase sensitivity in the diagnosis of acute pancreatitis is 83% (ranging between 81% and 85%). Pancreatic amylase has a sensitivity close to that of lipase (95%), both of them having a sensitivity which is significantly higher than that of total amylase in the diagnosis of acute pancreatitis [26].

Imaging explorations provide valuable information regarding the etiology and local complications of acute pancreatitis [27]. Plain abdominal x-ray had small contribution to the diagnosis of acute pancreatitis, but was mandatory in cases requiring emergency differential diagnosis when CT examination was unavailable or contraindicated [28]. Pulmonary x-ray has been used routinely for the identification of pleural collections or of pulmonary infiltrates. Pleurisy is strongly correlated to severe pancreatitis, being encountered in our study in n=30 (26%) cases. In correlation with creatinine value, it is a useful factor for the prognosis of severity in the first 24 hours. The benefit of abdominal radiography and ultrasound is represented by the discovery of vesicular stones, the appearance of changes in the main bile duct, monitoring the evolution of pancreatic and peripancreatic pathological collections [29].

Computed tomography is one of the essential imaging techniques for staging and early detection of complications of acute pancreatitis. It has a sensitivity of around 87% and a detection rate of pancreatic necrosis of over 90%, data that correspond to the results of our study [30-32].

The evolutive spread of the necrosis has been correlated with the increase in morbidity and mortality. In patients without necrosis the mortality rate is approximately 0% and the morbidity is around 5%, while the presence of 50% necrosis resulted in a 25% mortality rate within the group and a 75% morbidity. In the group that developed necrosis over 50% there was a mortality of 10% and a morbidity of 100% (33).

The study revealed that the Apache II test is not significantly different from the Ranson scoring system in predicting the severity of acute pancreatitis. The result obtained in our study are similar to those published in the literature, with values ranging from 67% to 93% [31-33].

Mortality rates have recorded statistically significant difference between the patients treated with minimally invasive techniques and the ones treated with conservative techniques or open surgeries. The factors which have influenced the survival are represented by age ($p < 0.05$), APACHE II scoring upon admission ($p < 0.01$) and the presence of multiple organ disfunction ($p < 0.001$) [33].

Long term follow-up of the patients with acute pancreatitis is important, not only for documentation of the local complication (pancreatic pseudocysts or fistulas) but also for metabolic status [34-38]. Abdominal pain causing decreased oral intake, as well as exocrine and endocrine insufficiency are frequent complications of the disease [34]. Therefore, all patients with acute or chronic pancreatitis should be screened for malnutrition. Significant weight loss may impose differential diagnosis with gastrointestinal cancer, by superior endoscopic and colonoscopy screening [39,40]. Large abdominal surgeries for pancreatitis related complications, such as necrotic collections may lead to long term postoperative issues related to intraperitoneal adherences due to imbalance between fibrinolytic activity and adhesiogenesis [41].

It well recognized the bidirectional relationship between acute pancreatitis and diabetes. On one hand, there is an increased baseline inflammation level in patients with diabetes, leading to several disfunctions in immune response induced by endogen and exogen triggers [40]. Several studies found that diabetes is a risk factor for severe acute pancreatitis [42]. On the other hand, destructions in the pancreatic tissue may lead to diabetes after acute pancreatitis [35,36].

Conclusions

Early and accurate staging of the severity of acute pancreatitis should be performed through a careful clinical evaluation, and in severe clinical forms, computed tomography, Ranson score and APACHE II should be used. Regular clinical assessment is extremely important and must not be underestimated in medical practice, since it supplies additional information concerning the evolution of the disease.

The factors which correlate with severe forms of acute pancreatitis are age, pain, hematocrit, hemoglobin, leukocytes, urea, creatinine, which present a satisfactory statistical significance.

The mortality rate is influenced by the age of patients and the associated complications and comorbidities (more than by the various disease etiologies), being directly proportional to the severity of complications.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article. The manuscript was read and approved by all authors.

Compliance with ethical standards

Any aspect of the work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

References

1. Constantinoiu S, Cochior D. Severe Acute Pancreatitis-Determinant Factors and Current Therapeutic Conduct. *Chirurgia (Bucur).* 2018 May-Jun;113(3):385-390. doi: 10.21614/chirurgia.113.3.385
2. Ouyang G, Pan G, Liu Q, Wu Y, Liu Z, Lu W, Li S, Zhou Z, Wen Y. The global, regional, and national burden of pancreatitis in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *BMC Med*. 2020 Dec 10;18(1): 388. doi: 10.1186/s12916-020-01859-5
3. Garg SK, Campbell JP, Anugwom C, Wadhwa V, Singh R, Gupta N, Sanaka MR. Incidence and Predictors of Readmissions in Acute Pancreatitis: A Nationwide Analysis. *Pancreas*. 2018 Jan;47(1):46-54. doi: 10.1097/MPA.0000000000000952
4. Pintado MC, Trascasa M, Arenillas C, de Zárate YO, Pardo A, Blandino Ortiz A, de Pablo R. New Atlanta Classification of acute pancreatitis in intensive care unit: Complications and prognosis. *Eur J Intern Med*. 2016 May;30:82-87. doi: 10.1016/j.ejim.2016.01.007
5. Serban D, Socea B, Badiu CD, Tudor C, Balasescu SA, Dumitrescu D, Trotea AM, Spataru RI, Vancea G, Dascalu AM, Tanasescu C. Acute surgical abdomen during the COVID-19 pandemic: Clinical and therapeutic challenges. *Exp Ther Med*. 2021 May; 21(5):519. doi: 10.3892/etm.2021.9950
6. Șerban D, Brănescu CM, Smarandache GC, Tudor C, Tănăsescu C, Tudosie MS, Stana D, Costea DO, Dascălu AM, Spătaru RI: Safe surgery in day care centers: focus on preventing medical legal issues. *Rom J Leg Med*. 2021;29(1):60-64. doi: 10.4323/rjlm.2021.60
7. Serban D, Smarandache AM, Cristian D, Tudor C, Duta L, Dascalu AM: Medical errors and patient safety culture - shifting the healthcare paradigm in Romanian hospitals. *Rom J Leg Med*. 2020; 28(2)195-201. doi: 10.4323/rjlm.2020.195
8. Pintado MC, Trascasa M, Arenillas C, de Zárate YO, Pardo A, Blandino Ortiz A, de Pablo R. New Atlanta Classification of acute pancreatitis in intensive care unit: Complications and prognosis. *Eur J Intern Med*. 2016 May;30:82-87. doi: 10.1016/j.ejim.2016.01.007
9. James TW, Crockett SD. Management of acute pancreatitis in the first 72 hours. *Curr Opin Gastroenterol*. 2018 Sep;34(5):330-335. doi: 10.1097/MOG.0000000000000456
10. Yadav D, O'Connell M, Papachristou GI. Natural history following the first attack of acute pancreatitis. *Am J Gastroenterol*. 2012 Jul;107(7):1096-103. doi: 10.1038/ajg.2012.126
11. Fonseca Sepúlveda EV, Guerrero-Lozano R. Acute pancreatitis and recurrent acute pancreatitis: an exploration of clinical and etiologic factors and outcomes. *J Pediatr (Rio J).* 2019 Nov-Dec;95(6):713-719. doi: 10.1016/j.jped.2018.06.011
12. Savlovschi C, Brănescu C, Serban D, Tudor C, Găvan C, Shanabli A, Comandaşu M, Vasilescu L, Borcan R, Dumitrescu D, Sandolache B, Sajin M, Grădinaru S, Munteanu R, Kraft A, Oprescu S. Amyand's hernia--a clinical case. *Chirurgia (Bucur).* 2010 May-Jun; 105(3):409-14.
13. Serban D, Tribus LC, Vancea G, Stoian AP, Dascalu AM, Suceveanu AI, Tanasescu C, Costea AC, Tudosie MS, Tudor C, Gangura GA, Duta L, Costea DO. Acute Mesenteric Ischemia in COVID-19 Patients. *J Clin Med*. 2021 Dec 30;11(1):200. doi: 10.3390/jcm11010200
14. Machicado JD, Yadav D. Epidemiology of Recurrent Acute and Chronic Pancreatitis: Similarities and Differences. *Dig Dis Sci*. 2017 Jul;62(7):1683-1691. doi: 10.1007/s10620-017-4510-5
15. Greenberg JA, Hsu J, Bawazeer M, Marshall J, Friedrich JO, Nathens A, Coburn N, May GR, Pearsall E, McLeod RS. Clinical practice guideline: management of acute pancreatitis. *Can J Surg*. 2016 Apr;59(2):128-40. doi: 10.1503/cjs.015015
16. Goyal H, Awad H, Hu ZD. Prognostic value of admission red blood cell distribution width in acute pancreatitis: a systematic review. *Ann Transl Med*. 2017 Sep;5(17):342. doi: 10.21037/atm.2017.06.61
17. Gravito-Soares M, Gravito-Soares E, Gomes D, Almeida N, Tomé L. Red cell distribution width and red cell distribution width to total serum calcium ratio as major predictors of severity and mortality in acute pancreatitis. *BMC Gastroenterol*. 2018 Jul 5;18(1):108. doi: 10.1186/s12876-018-0834-7
18. Soyalp M, Yalcin M, Oter V, Ozgonul A. Investigation of procalcitonin, IL-6, oxidative stress index (OSI) plasma and tissue levels in experimental mild and severe pancreatitis in rats. *Bratisl Lek Listy*. 2017; 118(3):137-141. doi: 10.4149/BLL_2017_027
19. Ekremoğlu M, Severcan Ç, Pasaoğlu ÖT, Şen B, Pasaoğlu H. An investigation of acute effects at various doses of malathion on glucose homeostasis and insulin resistance in rat liver, pancreas and serum. *J Mind Med Sci*. 2020;7(1):85-93. doi: 10.22543/7674.71.P8593
20. Gray SH, Rosenman LD. Acute pancreatitis. The significance of hemoconcentration at admission to the hospital. *Arch Surg*. 1965;91: 485-489. doi: 10.1001/archsurg.1965.01320150115021
21. Talamini G, Bassi C, Falconi M, Sartori N, Frulloni L, Di Francesco V, Vesentini S, Pederzoli P, Cavallini G. Risk of death from acute pancreatitis. Role of early, simple “routine” data. *Int J Pancreatol*. 1996;19: 15-24. doi: 10.1007/BF02788371
22. Remes-Troche JM, Duarte-Rojo A, Morales G, Robles-Díaz G. Hemoconcentration is a poor predictor of severity in acute pancreatitis. *World J Gastroenterol*. 2005;11(44):7018-23. doi: 10.3748/wjg.v11.i44.7018

23. Rompianesi G, Hann A, Komolafe O, Pereira SP, Davidson BR, Gurusamy KS. Serum amylase and lipase and urinary trypsinogen and amylase for diagnosis of acute pancreatitis. *Cochrane Database Syst Rev*. 2017 Apr 21;4(4):CD012010. doi: 10.1002/14651858.CD012010.pub2
24. Conwell DL, Lee LS, Yadav D, Longnecker DS, Miller FH, Mortele KJ, Levy MJ, Kwon R, Lieb JG, Stevens T, Toskes PP, Gardner TB, Gelrud A, Wu BU, Forsmark CE, Vege SS. American Pancreatic Association Practice Guidelines in Chronic Pancreatitis: evidence-based report on diagnostic guidelines. *Pancreas*. 2014 Nov;43(8):1143-62. doi: 10.1097/MPA.0000000000000237
25. Muddana V, Whitcomb DC, Khalid A, Slivka A, Papachristou GI. Elevated serum creatinine as a marker of pancreatic necrosis in acute pancreatitis. *Am J Gastroenterol*. 2009;104(1):164-70. doi: 10.1038/ajg.2008.66.
26. Ranson JH, Rifkind KM, Roses DF, Fink SD, Eng K, Spencer FC. Prognostic signs and the role of operative management in acute pancreatitis. *Surg Gynecol Obstet.* 1974 Jul;139(1):69-81.
27. Şurlin V, Săftoiu A, Dumitrescu D. Imaging tests for accurate diagnosis of acute biliary pancreatitis. *World J Gastroenterol*. 2014 Nov 28;20(44):16544-9. doi: 10.3748/wjg.v20.i44.16544
28. Shahzad N, Khan MR, Inam Pal KM, Khan DB, Effendi MS. Role of early contrast enhanced CT scan in severity prediction of acute pancreatitis. *J Pak Med Assoc*. 2017 Jun;67(6):923-925.
29. Balthazar EJ, Ranson JH, Naidich DP, Megibow AJ, Caccavale R, Cooper MM. Acute pancreatitis: prognostic value of CT. *Radiology*. 1985;156(3):767-72. doi: 10.1148/radiology.156.3.4023241
30. Dervenis C, Johnson CD, Bassi C, Bradley E, Imrie CW, McMahon MJ, Modlin I. Diagnosis, objective assessment of severity, and management of acute pancreatitis. Santorini consensus conference. *Int J Pancreatol*. 1999 Jun;25(3):195-210. doi: 10.1007/BF02925968
31. Harshit Kumar A, Singh Griwan M. A comparison of APACHE II, BISAP, Ranson's score and modified CTSI in predicting the severity of acute pancreatitis based on the 2012 revised Atlanta Classification. *Gastroenterol Rep (Oxf).* 2018 May;6(2):127-131. doi: 10.1093/gastro/gox029
32. Machicado JD, Gougol A, Tan X, Gao X, Paragomi P, Pothoulakis I, et al. Mortality in acute pancreatitis with persistent organ failure is determined by the number, type, and sequence of organ systems affected. *United European Gastroenterol J*. 2021 Mar;9(2):139-149. doi: 10.1002/ueg2.12057
33. Shi N, Liu T, de la Iglesia-Garcia D, Deng L, Jin T, Lan L, Zhu P, Hu W, Zhou Z, Singh V, Dominguez-Munoz JE, Windsor J, Huang W, Xia Q, Sutton R. Duration of organ failure impacts mortality in acute pancreatitis. *Gut*. 2020 Mar;69(3):604-605. doi: 10.1136/gutjnl-2019-318241
34. Naveena RM. Clinical spectrum of obstructive jaundice: a descriptive cross-sectional study. *J Clin Invest Surg*. 2021;6(1):53-57. doi: 10.25083/2559.5555/6.1.10
35. Pantea Stoian AM, Ditu G, Diculescu M, Manuc M, Suceveanu AI, Manuc D, Diaconu C, Suceveanu AP, Nitipir C, Hainarosie R, Poiana C, Serafinceanu C. "Pancreatogenic type 3C diabetes". *J Mind Med Sci*. 2018;5(2):270-277. doi: 10.22543/7674.52.P270277.
36. Gheorghe G, Stoian AP, Gaman MA, Socea B, Neagu TP, Stanescu AMA Bratu OG, Mischianu D, Suceveanu AI, Diaconu CC. The Benefits and Risks of Antioxidant Treatment in Liver Diseases. *Rev Chim(Buc)*. 2019;70(2):651-655.
37. Busnatu SS, Salmen T, Pana MA, Rizzo M, Stallone T, Papanas N, Popovic D, Tanasescu D, Serban D, Stoian AP. The Role of Fructose as a Cardiovascular Risk Factor: An Update. *Metabolites*. 2022 Jan 12;12(1):67. doi: 10.3390/metabo12010067
38. Ardeleanu V, Toma A, Pafili K, Papanas N, Motofei I, Diaconu CC, Rizzo M, Stoian AP. Current Pharmacological Treatment of Painful Diabetic Neuropathy: A Narrative Review. *Medicina (Kaunas)*. 2020 Jan 9;56(1):25. doi: 10.3390/medicina56010025
39. Draghici T, Negreanu L, Bratu OG, Stoian AP, Socea B, Neagu TP, Stanescu AMA, Manuc D, Diaconu CC. Paraneoplastic syndromes in digestive tumors: a review. *Rom Biotechnol Lett*. 2019;24(5): 813-819. doi: 10.25083/rbl/24.5/813.819
40. Şavlovschi C, Comandaşu M, Şerban D. Specifics of diagnosis and treatment in synchronous colorectal cancers (SCC). *Chirurgia (Bucur).* 2013 Jan-Feb; 108(1):43-5.
41. Fometescu SG, Costache M, Coveney A, Oprescu SM, Serban D, Savlovschi C. Peritoneal fibrinolytic activity and adhesiogenesis. *Chirurgia (Bucur).* 2013 May-Jun; 108(3):331-40.
42. Shen HN, Chang YH, Chen HF, Lu CL, Li CY. Increased risk of severe acute pancreatitis in patients with diabetes. *Diabet Med*. 2012 Nov;29(11):1419-24. doi: 10.1111/j.1464-5491.2012.03680.x