Original Paper

Assessing the Degree of Severity of Acute Pancreatitis by Using Multiparameter Scores

ELENA IRINA CĂLUIANU[1], D.O. ALEXANDRU[2], D. MERCUȚ[3], M. GEORGESCU[4], E.T. TRAȘCĂ[3], MARIA IANCAU[1]

[1]*Department of Physiology, University of Medicine and Pharmacy of Craiova, Romania*

[2]*Department Medical Informatic and Biostatistic, University of Medicine and Pharmacy of Craiova, Romania*

[3]*Department of Surgery, Military Emergency Hospital "Dr. Ștefan Odobleja", Craiova, Romania*

[4]*Department III Functional Sciences Physiology, "Victor Babes" University of Medicine and Pharmacy, Timișoara*

ABSTRACT: Aim: To establish a clinical severity diagnosis and a therapeutical strategy in acute pancreatitis (A.P.) by using multiparameter bioclinical and morphological scores. Material and Method: 71 patients, diagnosed with A.P., between 2012-2016, admitted to the surgical clinics of the Military Emergency Hospital "Dr. Stefan Odobleja" and the Clinical County Emergency Hospital of Craiova, were investigated, following the severity diagnosis, both at admission and in evolution, with the aim of obtaining an optimal therapeutic approach. The Ranson, Imre, Marshall, Balthazar and EPIC scores were used. Results: By analyzing specially the values of the computer tomography severity index of the study group patients, 14.29% of patients were classified as light severity AP with favorable prognosis, 37.14% of patients moderate severity AP, and 48.57% severe AP. The examination of the CT, one of the most important diagnosis tests for AP, established that 34.29% of patients suffered from AP in Balthazar grade B and 22.85% Balthazar grade C, the severity forms we encountered most in our study. The correlation between HCT (hematocrit) value and Ranson score presents a Pearson correlation coefficient r of-0.339, which indicates the existence of a statistically significant inversely proportional relation. Conclusion: Corroboration of the bioclinical and imagistic data, summed as multiparameter scores, allowed us to classify AP into different severity forms: moderate severity AP (14.29%), moderate-severe AP (37.14%) and severe AP (48.57%), which will then facilitate choosing the right therapeutic approach.

KEYWORDS: *multiparameter scores, biochemical and imagistic, acute pancreatitis*

Introduction

Despite advances made in understanding many underling pathophysiological processes, acute pancreatitis (AP) is still recognized as being an evolving and unpredictable pathology with an ambiguous hierarchy of severity. Acute pancreatitis has remained a complex pathology, with an uncertain prognosis, since its first description by Reginald Fitz made in 1889 [1]. The introduction of multifactor scoring systems (MSS), such as the Ranson, Imre and Marshall scores has helped clinicians in simplifying pathology severity [2]. These are based on objectiveclinical findings and exact laboratory results. Used properly, they can be considered severity markers for AP [3,4]. Furthermore MSS can be efficiently used both in clinics and research [2].

Among the most common paraclinical investigations in AP, computed tomography (CT) is now considered as a standard diagnosis test. It's use can, assess necrosis of the pancreatic parenchyma and can also the highlighting fluid collections in both the peripancreatic space or intra-abdominal cavity. Although CT is an important tool, the initial assessment of AP must include also the clinical and biological status of patients, as to correctly establish the severity of the AP episode.

Material and method

A retrospective study of acute pancreatitis in surgical clinics of the Military Emergency Hospital "Dr. Stefan Odobleja" and the Clinical County Emergency Hospital of Craiova, was conducted, between 2012-2016, using dynamic clinical, biological and imaging data. 71 AP patients were investigated, of whom 61.97% were men and 38.03% women, with an asymmetrical distribution of ages, the categories best represented being those of patients with ages between 50-59 and 60-69 years old, who make up 50% of patients (central categories).

Initial, pathology diagnosis on admission was made on the classical syndrome: abdominal pain (epigastric with posterior radiation), high serum levels (at least 3 times the normal) of pancreatic amylase and pathology specific computer tomography morphological changes.

The Ranson score, devised in 1974, is the first numerical system of assessing AP and the most widespread in gastroenterology centers, intensive care and surgery. It contains two sets

of criteria, the first one on admission, which includes age over 55 years, leukocytosis over 16 000/mm^3, SGOT (glutamic-oxaloacetic transaminase)>250U/l, LDH (lactate dehydrogenase)>350U/l, glycemia>200mg/dl, and the second after 48 hours of evolution, which includes hematocrit decrease by more than 10% the initial value, PaO2<60mmHg, serum Calcium <8mg/dl (2mmol/l), increase of blood ureic nitrogen over 5mg/dl, fluid retention >6l, bases deficit of over 4mEq/l. For each criteria one point is awarded, the Ranson score being the sum of points on admission and after 48 hours.

In 1978 Imre modified 3 of the original criteria of the Ranson score, considering that it would allow for a better assessment of the severity of AP. For admission criteria the value of LDH was changed to a value higher than 600U/l, the deficit of bases is removed from this set of criteria and replaced by the decrease of serum albumin below 32g/l [5].

The Balthazar score is divided into 5 degrees of severity. Grade A signifies a normal CT pancreatography (0 points), grade B focal or diffuse enlargement of the pancreas (1 point), grade C a heterogeneous pancreas and densification of peripancreatic fat (2 points), grade D a unique peripancreatic collection (3 points) and grade E multiple collections or the presence of bubbles of gas inside a collection (4 points). The organ necrosis is evidenced by contrast CT. Thus, in grade A there is no necrosis (0 points), in grade B necrosis under 30% (2 points), in grade C necrosis between 30-50% (3 points), and in grade D necrosis over 50% (6 points) [6].

The severity index (EPIC score) is useful in hierarchizing the severity of AP into 3 grades: grade 1-no organ dysfunction, grade 2-transient organ dysfunction present (below 48h) and grade 3-organ dysfunction present (over 48h). In our study 15.49% of patients suffered from the light form, 36.62% the moderate one and 47.89% the severe form.

The CT examination represents an important investigation in the diagnosis of this pathology and its inclusion in the Balthazar score was used in all study patients together with the computer tomography severity index (EPIC-score-Extrapancreatic inflammation on computed tomography).

Results

Following CT examination, most patients were diagnosed with AP Balthazar grade B (34.29%) and Balthazar grade C (22.85%), with lower percentages for those with grades A, D and E (11.43%, 17.14%, 14.29%) (Fig.1).

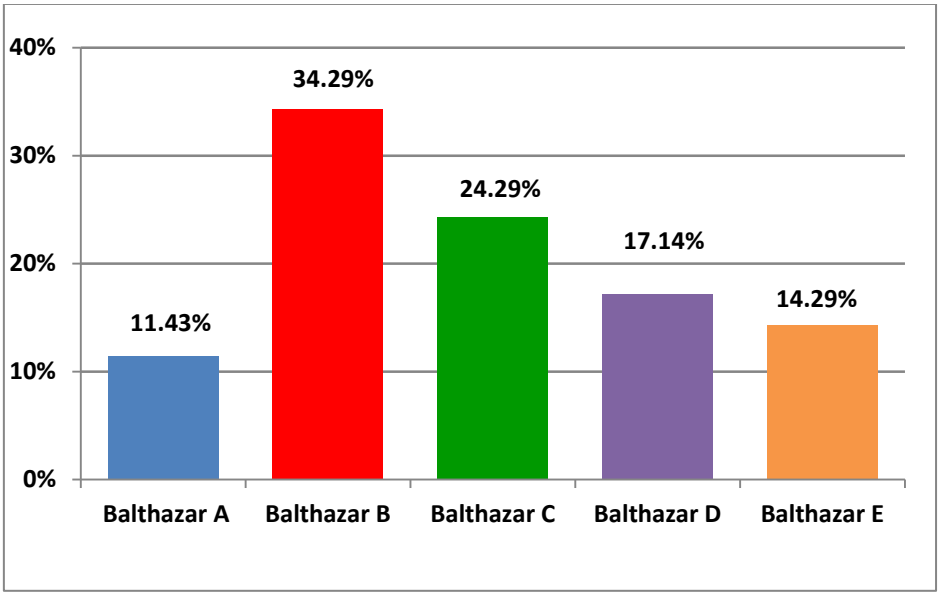

Fig.1. Distribution of group according to Balthazar score

For all 5 Balthazar classes, biological exploration showed the increase of amylase over 3 times the normal value on admission (p ANOVA<0.001), in comparison with the following days of hospitalization, and statistically insignificant differences between the different classes, according to the Balthazar score, due to the high variability of bioclinical data (Table 1).

10.12865/CHSJ.43.02.04

Table 1. Comparison of amylase values over the admission period

Amylase	AP Balthazar A	AP Balthazar B	AP Balthazar C	AP Balthazar D	AP Balthazar E	p ANOVA
Day 1	804.63 ± 636.18	1481.77 ± 1563.60	1024.88 ± 1103.64	1159.20 ± 778.25	978.63 ± 876.33	0.572
Day 2	353.00 ± 350.70	430.86 ± 485.04	425.80 ± 463.64	351.20 ± 201.30	675.63 ± 836.62	0.584
Day 3	204.50 ± 178.90	300.22 ± 442.89	285.33 ± 494.74	115.29 ± 175.78	247.00 ± 190.99	0.691

The other measured biological parameters didn't show worth-mentioning features or differences among AP classes.

The diagnosis of severity on admission and in evolution, important for the therapeutic approach to follow, was established based on the Ranson and Imre bioclinical criteria. Thus, the study patients suffered from, in a percentage of, 21.13% light severity AP with favorable prognosis, 50.70% severe with risk of complications, 25.35% severe and 2.82% were deceased (Fig.2).

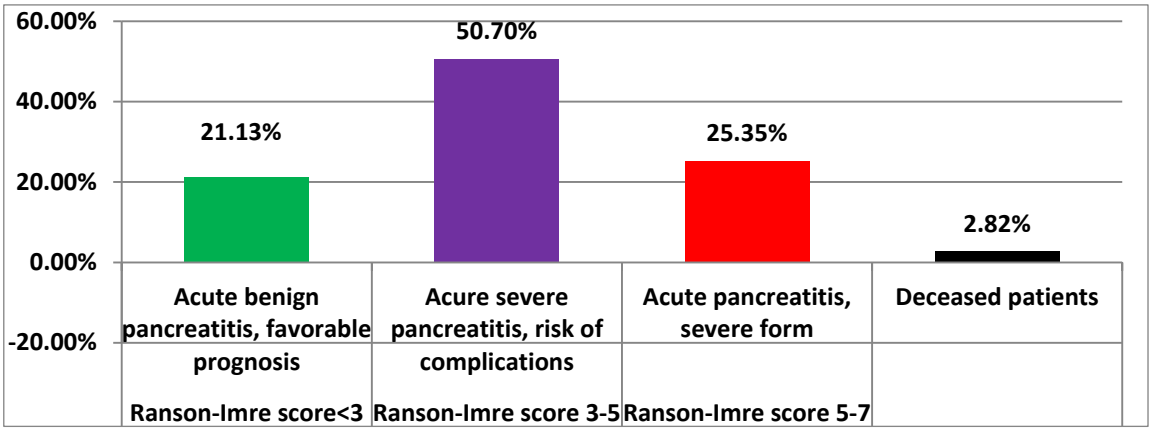

Fig.2. Ranson and Imre Score

The correlation between Ranson score and HCT was found in literature, with the observation that HTC values may predict a severe evolution of AP [7]. Because of this, we proceeded to establish a correlation between the Ranson score and HCT. The result showed the existence of a statistically significant inversely proportional correlation-the Pearson coefficient r was-0.339 and $p<0.05$ (Fig. 3).

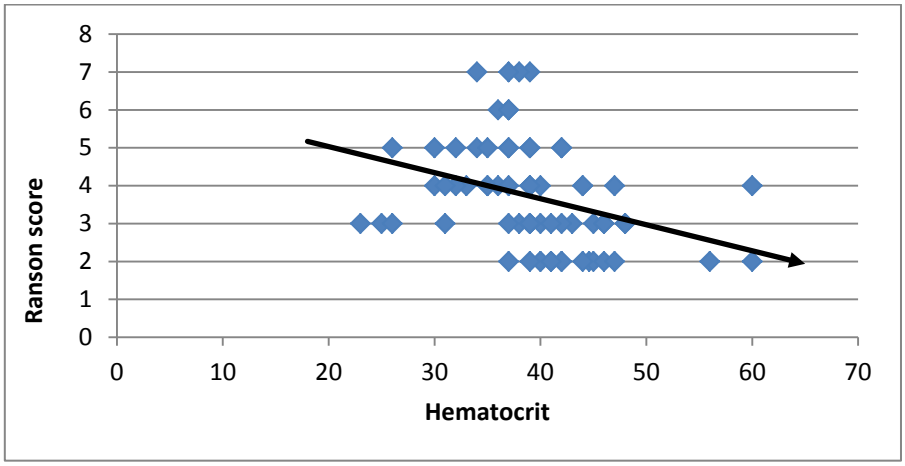

Fig.3. Correlation of the Ranson score with HCT values

Presently, the most faithful marker in defining the severity of the pathology is the presence of organ dysfunction (modified Marshall score), which assesses 3 systems: respiratory, cardiovascular and renal. The results obtained following the evaluation of the 71 patients were: 73.24% of cases presented organ failure, 26.76% presented no organ dysfunction (Fig. 4).

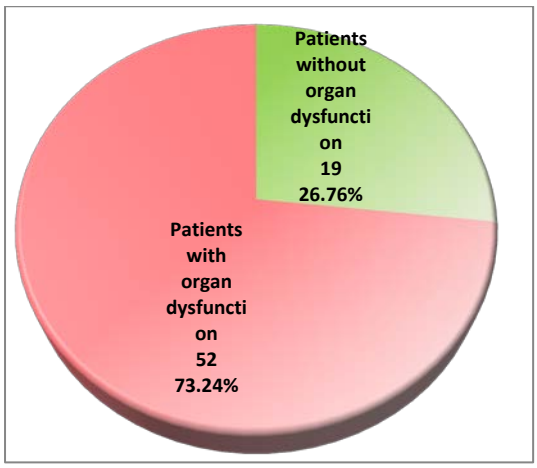

Fig.4. Distribution of patients according to modified Marshall System

The severity index (EPIC score) helps in classifying the severity of the AP, within our study group 15.49% patients presented light severity, 36.62% moderate and 47.89% severe (Fig. 5)

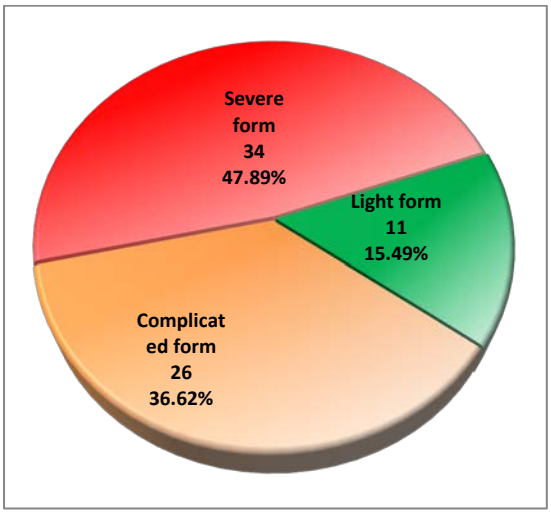

Fig.5. Distribution of patients according to EPIC score

Discussions

The complexity of acute pancreatitis can be perfectly exemplify by the numerous diagnosis and treatment issues that plague the medical professionals. Including all forms of AP, the incidence can reach up to 30-50 cases/100 000 people/year [8], however about 80% have a benign, auto-limiting evolution. The rest, 15-20% cases can present severe evolution towards necrotic-hemorrhagic form [9,10], reaching a mortality of 30 to 40% [10]. As such, early identification of the severity was a focus of many new treatment strategies, basing their finding on bioclinical and imagistic scores, greatly enhancing therapeutical and prognostic outcomes.

One of the first and most used MSS, was the Ranson score. Introduced in 1974, was able to establish the severity in acute pancreatitis, by supplying a large number of parameters in a short time, which prolonged its clinical use to this day.

Recent research shows that in defining the severity of the disease the most faithful marker is represented by the persistent dysfunction/organ failure, with a duration of over 48 hours [11,12], equivalent a score of "2" or higher in one or all systems: respiratory, cardiovascular, renal (the modified Marshal score). Approximately 15-20% of the AP patients develop the severe form of the pathology, which complicates the clinical course and often provokes organ dysfunction [9,10]. In our study, the percentage of severe AP exceeds that of lighter forms by a large margin, unlike previous reports (78.87% to 21.13%).

Hemoconcentration is known as an important factor in developing severe forms of AP, which is why it may be assumed that the HCT level at admission can be an important factor for disease severity prediction [7]. Some studies indicate that a HCT level > 50% is a sign of severity [7], while a HCT value of >44% is associated with developing complications in AP [13,14]. In the present study correlation coefficient indicates the existence of significant inversely proportional relation ($p<0.05$) between the value of HCT and the Ranson score, something that was absent in other studies.

The CT severity index (EPIC) is used in detecting emergence organ dysfunction in early stages of the disease [15,16], but also the prediction of the emergence of local complications (pancreatic pseudocyst in the early phase of AP [17]. In our research the EPIC score aligned most patients as 3rd degree (47.89%) with organ dysfunction, in comparison with 1st degree without organ dysfunction (15.49%). We were unable to fully estimate all the percentages identified with the CT severity index, because a number of 5 patients were discharged at their own request.

Conclusion

Our study classified patients admitted to surgery clinics mentioned previously on the basis of multiparameter scores allowing the adequate therapeutic conduit and establishing an objectively fundamental prognosis.

10.12865/CHSJ.43.02.04

References

1. Mercut D. Probleme actuale de diagnostic si tratament in Pancreatita Acuta-Teza Doctorat; Universitatea de Medicina si Farmacie Craiova 2001; 67-70.
2. Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, Tsiotos GG, Vege SS. Acute Pancreatitis Classification Working Group. Classification of acute pancreatitis-2012: revision of the Atlanta classification and definitions by international consensus; Gut. 2013; 62(1):102-111.
3. 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; 139(1):69-81.
4. Imrie CW, Benjamin IS, Ferguson JC, McKay AJ, Mackenzie I, O'Neill J, Blumgart LH. Br J Surg. A single-centre double-blind trial of Trasylol therapy in primary acute pancreatitis; 1978; 65(5):337-341.
5. Acute Pancreatitis Classification Working Group. Revision of the Atlanta classification of acute pancreatitis. 2008. www.pancreasclub.com/resources/AtlanticClasification.pdf.
6. Balthazar EJ. Complications of acute pancreatitis: clinical and CT evaluation, Radiologic Clinics of North America; 2002; 40(6):1211-1227.
7. Gan SI, Romagnuolo J. Admission hematocrit: a simple, useful and early predictor of severe pancreatitis; Dig Dis Sci. 2004; 49(11-12):1946-1952.
8. Andersson R., Eckerwall G., Haraldsen P. (2000) Novel Strategies for the Management of Severe Acute Pancreatitis. In: Vincent JL. (eds) Yearbook of Intensive Care and Emergency Medicine 2000; Yearbook of Intensive Care and Emergency Medicine; edited by J.L. Vincent, Springer Verlag. 379-389.
9. Malledant Y, Tanguy M, Seguin P. Pancreatites aigues graves, Actualites en reanimation et urgencies; 2000; 155-168.
10. Bryce Taylor. Acute pancreatitis in the critically ill, Principles of critical Care; edited by J. Hall, G Schmidt, L Wood 1998; 1269-1277.
11. Windsor JA, Petrov MS. Acute pancreatitis reclassified; 2013; 62(1):4-5.
12. Johnson CD, Abu-Hilal M. Persistent organ failure during the first week as a marker of fatal outcome in acute pancreatitis; Gut. 2004; 53(9):1340-1344.
13. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis; Pancreas. 2000; 20(4):367-372.
14. Sun B, Li HL, Gao Y, Xu J, Jiang HC. Factors predisposing to severe acute pancreatitis: evaluation and prevention; World J Gastroenterol. 2003; 9(5):1102-1105.
15. Liu J, Cao F, Dong XM, Li PY, Li HC, Qi BJ, Li F. Early prediction of organ failure under the revised Atlanta classification; Turk J Gastroenterol. 2017; 28(1):46-52.
16. Sharma V, Sharma R, Rana SS. Extra pancreatic inflammation on computed tomography and severity of acute pancreatitis: comparison of extra pancreatic inflammation on CT (EPIC) score with BISAP, SIRS, Renal Rim, CTSI, and MCTSI scoring systems; Gastroenterology 2014; 146-152.
17. Wiesner W, Studler U, Kocher T, Degen L, Buitrago-Tellez CH, Steinbrich W. Colonic involvement in non-necrotizing acute pancreatitis: correlation of CT findings with the clinical course of affected patients; Eur Radiol. 2003; 13(4): 897-902.

Corresponding Author: M. Georgescu, Department III Functional Sciences Physiology, "Victor Babes" University of Medicine and Pharmacy, Timișoara, no. 2, Piata Eftimie Murgu street, Timisoara 300041, e-mail: mgeorgiu83@yahoo.com