PO Box 2345, Beijing 100023, China
Fax: +86-10-85381893
E-mail: wjg@wjgnet.com www.wjgnet.com

WJG, 1999 August; 5(4):283-285
World Journal of Gastroenterology
 ISSN 1007-9327

Assessment of severity of acute pancreatitis: a comparison between old and most recent modalities used to evaluate this perennial problem

Raffaele Pezzilli and Francesco Mancini

Subject headings pancreatitis/diagnosis; pancreatitis/radiography; severity assessment; evaluating studies

Acute pancreatitis is an acute inflammatory process of the pancreatic gland. According to the Atlanta classification system, there are two forms of acute pancreatitis: mild acute pancreatitis, characterized by interstitial edema, which is self-limiting and severe acute pancreatitis characterized by local complications such as necrosis, abscesses, pseudocysts and the presence of organ dysfunction[1]. The mortality due to severe pancreatitis is about 25%-50% and is due mainly to infection of the necrosis[2]. Early identification of patients with severe acute pancreatitis is essential for the correct care of the disease and the avoidance of complications.

Over the past 20 years, many schemes have been proposed for identifying severe pancreatitis. The aim of this paper is to review the current criteria for the early assessment of severity of acute pancreatitis.

CLINICAL CRITERIA

Bank *et al*[3] analyzed the incidence of cardiac, pulmonary, kidney, hematological, metabolic and neurological complications in 75 patients with acute pancreatitis and they reported a mortality rate of 56% if one or more complications were present. Subsequently, Agarwall and Pitchumoni[4] conducted a retrospective study involving 76 patients and proposed a scheme comprised of simplified clinical criteria. In both studies, a 48-hour observation period was necessary for the clinical criteria. Furthermore, these clinical assessments depend on the experience of the clinical team and are difficult to standardize.

CLINICAL AND LABORATORY CRITERIA

Ranson *et al*[5] identified a series of 11 criteria evaluated in 100 patients with acute pancreatitis in 1974. The Ranson score is still widely used at present in judging severity. Five of the 11 criteria are considered upon hospital admission and 6 in the following 48 hours. They reported that most patients with less than two positive items survived; in those with 3 or 5 positive items, the mortality rate was about 20%, and in those with 6 or more positive items, the mortality reached about 50%. There is a correlation between 3 or more Ranson positive criteria and the high incidence of pancreatic necrosis and systemic complications. Later studies confirmed a sensitivity from 40% to 90%[4,6]. The Ranson score has been recently criticized for the following reasons: a good assessment of severity requires the determination of all items and requires 48 hours of observation for the judgement of severity, thus delaying the proper treatment after the onset of pain. Talamini *et al*[7] have simplified the original Ranson score by evaluating only the items considered on admission and concluded that this simplified system is of little use for predicting severity. Finally, this criteria correlate to the severity of acute pancreatitis only at the opposite ends of the scheme (< 2 and > 6 items) but not between 3 and 5 positive items. Twelve to 24 hours after the onset of pain, the score is completely useless. It can be applied only to biliary pancreatitis and the same authors have therefore proposed a new modified score[8].

Imrie *et al*[9] have proposed a score called the Glasgow score which seems to be more precise than that of Ranson, with a sensibility for the assessment of severe acute pancreatitis of 56%-85%[10,11].

Another simplified score has been set up by Fan *et al*[12], utilizing only two biochemical parameters (azotemia and glycemia). This score system has a sensitivity of about 75% in the assessment of the severity of acute pancreatitis.

More recently the APACHE II score[13] which takes into consideration age, presence of chronic associated diseases and some biochemical parameters has been proposed for the assessment of the severity of acute pancreatitis. Wilson *et al*[14] have reported a score of 6.3 in patients with mild acute pancreatitis, of 9.4 in those with severe pancreatitis and of 14.1 in those with fulminant pancreatitis.

Emergency Department, Sant'Orsola Hospital, Bologna, Italy
Correspondence to: Raffaele Pezzilli, Medicina d'Urgenza e Pronto Soccorso, Ospedale Sant'Orsola, Via Massarenti 9, 40138 Bologna, Italy
Tel. +39·51·6364701, Fax. +39·51·6364794
Email.pezzilli@orsola-malpighi.med.unibo.it
Received 1999-06-21

BIOCHEMICAL CRITERIA

The search for a marker able to evaluate the severity of acute pancreatitis at the early stage is the aim of the present research in the field of pancreatology. The evaluation of the severity of acute pancreatitis by means of serum pancreatic enzyme determination has been a boon[15-17]. We recently evaluated serum amylase and lipase in 66 patients with acute pancreatitis[15]. Most of these patients were studied within 24 hours from the onset of pain. Twenty patients had no alterations of the pancreatic gland at imaging, 36 had pancreatic edema and 10, pancreatic necrosis. The elevation of the serum pancreatic enzyme s overlapped in the three groups.

The determination of serum C-reactive protein[18] is at present widely used for the assessment of the severity of acute pancreatitis. Serum levels of this protein greater than 100mg/L indicate a severe acute pancreatitis in about 60%-80% of the cases. The determination of the C-reactive protein is easy to perform and inexpensive. However, its sensitivity is good only after the first 48 hours from the onset of pain[6,19].

Granulocyte elastase has been evaluated in the search for biochemical markers able to evaluate the severity of acute pancreatitis even earlier than the C-reactive protein determination. This protein is released by activated neutrophils and it is able to damage cellular membranes and the extracellular matrix. Gross *et al*[20] and Dominguez-Munoz *et al*[21] have reported that 70%-80% of the patients with severe acute pancreatitis studied within 48 hours from the onset of the pain were correctly identified using this protein. More recently interleukin 6, released by activated macrophages and the interleukin 8 released by neutrophils have been proposed as markers of the severity of acute pancreatitis. These two cytokines are released rapidly in severe forms of acute pancreatitis (within 24 hours from the onset of pain) and have a specificity greater than that of C-reactive protein (80%-100%)[22-24].

The soluble receptor of interleukin 2, which is released by the activated lymphocytes is able to identify 70% of the patients with severe acute pancreatitis studied within 24 hours from the onset of pain[25]. We have demonstrated[26] that the human pancreatic secretory trypsin inhibitor, produced by the pancreatic acinar cells and the hepatocytes is able to correctly identify 70% of the cases studied within 24 hours from the onset of pain. All these studies demonstrate that the immune system is early activated at an early phase during the course of acute pancreatitis. However, the determination of these proteins, except for C-reactive protein and granulocyte elastase, is not feasible for routine use. We hope that in the near future simple techniques for the determination of these proteins will be developed.

RADIOLOGICAL CRITERIA

Balthazar *et al*[27] have demonstrated that contrast enhanced computed tomography is able to assess the severity of acute pancreatitis. They divided the severity of acute pancreatitis into 5 categories. In 83 patients with acute pancreatitis, they found that the mortality was nil in stages A, B and C, and reached 17% in those of grade E. The findings of left-sided or bilateral effusions on chest radiograph within 24 hours of admission were associated with a severe outcome[28].

RADIOLOGICAL AND BIOCHEMICAL CRITERIA

Serum creatinine greater than 152.6 μmol/L and/or the presence of pathological chest radiographs (pulmonary densification and/ or pleural effusions) are capable of identifying, within 24 hours of admission to the hospital, subgroups of both patients at higher risk of adverse clinical outcome and of patients with necrotizing pancreatitis[29].

CONCLUSION

In conclusion, the Ranson, Glasgow and Fan criteria are at present useful in clinical practice for their simplicity and low costs. The APACHE II score gives useful information in patients with a more severe form of acute pancreatitis. Serum determination of interleukins may play a role in the assessment of the severity of acute pancreatitis only when rapid techniques for their determination are developed. At present, C-reactive protein is the marker which is the easiest to perform and which has the lowest cost. The evaluation of both chest radiographs and serum creatinine is also simple to carry out in the Emergency Room.

REFERENCES

1 Bradley EL. A clinically based classification system for acute pancreatitis. Summary of the International Symposium on Acute Pancreatitis, Atlanta, GA, September 11 trough 13, 1992. *Arch Surg*, 1993;128:586-590
2 Banks PA. Predictors of severity in acute pancreatitis. *Pancreas*, 1991;6(Suppl 1):S7-S12
3 Bank S, Wise L, Gersten M. Risk factors in acute pancreatitis. *Am J Gastroenterol*, 1983;78:637-640
4 Agarwall N, Pitchumoni CS. Simplified prognostic criteria in acute pancreatitis. *Pancreas*, 1986;1:69-73
5 Ranson JHC, 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;139:69-81
6 Wilson C, Heads A, Shenkin A, Imrie CW. C reactive protein, antiproteases and complement factors as objective markers of severity in acute pancreatitis. *Br J Surg*, 1989;76:177-181
7 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
8 Ranson JHC. The timing of biliary surgery in acute pancreatitis. *Ann Surg*, 1979;189:654-663

9 Imrie CW, Benjamin IS, Ferguson JC, McKay AJ, Mackenzie I, O' Neill JO, Blumgart LH.A single center double blind trial of Trasylol therapy in primary acute pancreatitis. *Br J Surg*, 1978;65:337-341
10 Blamey SL, Imrie CW, O'Neill J, Gilmour WH, Carter DC. Prognostic factors in acute pancreatitis. *Gut*, 1984;25:1340-1346
11 London NJM, Neoptolemos JP, Lavelle J, Bailey I, James D. Contrastenhanced abdominal computed tomography scanning and prediction of severity of acute pancreatitis: a prospective study. *Br J Surg*, 1989;76:268-272
12 Fan ST, Choi TK, Lai ECS, Wong J. Prediction of severity of acute pancreatitis: an alternative approach. *Gut*, 1989;30:1591-1595
13 Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification. *Crit Care Med*, 1985;13:818-829
14 Wilson C, Heath DI, Imrie CW. Prediction of outcome in acute pancreatitis: a comparative study of APACHE-II, clinical assessment and multiple factor scoring systems. *Br J Surg*, 1990; 77:1260-1264
15 Pezzilli R, Billi P, Miglioli M, Gullo L. Serum amylase and lipase concentrations, and lipase/amylase ratio, in the assessment of etiology and severity of acute pancreatitis. *Dig Dis Sci*, 1993;38:1265-1269
16 Pezzilli R, Billi P, Platè L, Bongiovanni F, Morselli Labate AM, Miglioli M. Human pancreas specific protein/ procarboxypeptidase B: a useful serum marker of acute pancreatitis. *Digestion*, 1994;55:73-77
17 Gullo L, Ventrucci M, Pezzilli R, Platè L, Naldoni P. Diagnostic significance of serum elastase 1 in pancreatic disease. *Br J Surg*,1987;74:44-47
18 Mayer AD, McMahon MJ, Bowen M, Cooper EH. C-reactive protein: an aid to assessment and monitoring of acute pancreatitis. *J Clin Pathol*, 1984;37:207-211
19 Pezzilli R, Billi P, Cappelletti O, Barakat B. Serum C-reactive protein in the acute biliary pancreatitis. Is it a reliable marker for the early assessment of severity of the disease. *Italian J Gastroenterol Hepatol*, 1997;29:554-557
20 Gross V, Scholmerich J, Leser HG, Salm R, Lausen M, Ruckauer K, Schoffel U, Lay L, Heinisch A, Farthmann EH, Gerok W. Granulocyte elastase in assessment of severity of acute pancreatitis. Comparison with acute phase proteins C-reactive protein, α_1 antitrypsin, and protease inhibitor α_2 macroglobulin. *Dig Dis Sci*, 1990;35:97-105
21 Dominguez Munoz JE, Carballo F, Garcia MJ, De Diego JM, Rabago L, Simon MA, de la Morena J. Clinical usefulness of polymorphonuclear elastase in predicting the severity of acute pancreatitis: results of a multicenter study. *Br J Surg*, 1991;78:1230 -1234
22 Heath DI, Cruickshank A, Gudgeon M, Jehanli A, Shenkin A, Imrie CW. Role of interleukin 6 in mediating the acute phase protein response and potential as an early means of severity assessment in acute pancreatitis. *Gut*, 1993;34:41-45
23 Gross V, Andreesen R, Leser HG, Ceska M, Liehl E, Lausen M. Interleukin 8 and neutrophil activation in acute pancreatitis. *Eur J Clin Invest*, 1992;22:200-203
24 Pezzilli R, Billi P, Miniero R, Fiocchi M, Cappelletti O, Morselli Labate AM, Barakat B, Sprovieri G, Miglioli M. Serum interleukin 6, interleukin 8 and α_2 microglobulin in the early assessment of the severity of acute pancreatitis. A comparison with serum Creactive protein.*Dig Dis Sci*, 1995;40:2341-2348
25 Pezzilli R, Billi P, Gullo L, Beltrandi E, Maldini M, Mancini R, Incorvaia L, Miglioli M. Behavior of serum soluble interleukin-2 receptor, soluble CD8 and soluble CD4 in the early phases of acute pancreatitis. *Digestion*, 1994;55:268-273
26 Pezzilli R, Billi P, Plate L, Barakat B, Bongiovanni F, Miglioli M. Human pancreatic secretory trypsin inhibitor in the assessment of the severity of acute pancreatitis. A comparison with C reactive protien. *J Clin Gastroenterol*, 1994;19:112-117
27 Balthazar EJ, Ranson JHC, Naidich DP, Megibow AJ, Caccavale R, Cooper MM. Acute pancreatitis: prognostic value of CT. *Radiology*,1985;156:767-772
28 Pezzilli R, Billi P, Barakat B, Broccoli P, Morselli Labate AM. The use of the peripheral leukocyte count and chest X-ray in early assessment of the severity of acute pancreatitis in comparison with the Ranson score system. *Panminerva Med*, 1999;41:39-42
29 Talamini G, Uomo G, Pezzilli R, Rabitti PG, Billi P, Bassi C, Cavallini G, Pederzoli P. Serum creatinine and chest radiographs in the early assessment of acute pancreatitis. *Am J Surg*, 1999;177:7-14

Edited by MA Jing-Yun