

• CLINICAL RESEARCH •

Clinical characteristics and prognostic factors of severe acute pancreatitis

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Abstract

AIM: To investigate the clinical characteristics and prognostic factors of a consecutive series of patients with severe acute pancreatitis (SAP).

METHODS: Clinical data of SAP patients admitted to our hospital from January 2003 to January 2004 were retrospectively reviewed. Collected data included the age, gender, etiology, length of hospitalization, APACHE II score at admission, local and organ/systemic complications of the patients.

RESULTS: Of the 268 acute pancreatitis patients, 94 developed SAP. The mean age of SAP patients was 52 years, the commonest etiology was cholelithiasis (45.7%), the mean length of hospitalization was 70 d, the mean score of APACHE II was 7.7. Fifty-four percent of the patients developed necrosis, 25% abscess, 58% organ/systemic failure. A total of 23.4% (22/94) of the SAP patients died. Respiratory failure was the most common organ dysfunction (90.9%) in deceased SAP patients, followed by cardiovascular failure (86.4%), renal failure (50.0%). In the SAP patients, 90.9% (20/22) developed multiple organ/systemic failures. There were significant differences in age, length of hospitalization, APACHE II score and incidences of respiratory failure, renal failure, cardiovascular failure and hematological failure between deceased SAP patients and survived SAP patients. By multivariate logistic regression analysis, independent prognostic factors for mortality were respiratory failure, cardiovascular failure and renal failure.

CONCLUSION: SAP patients are characterized by advanced age, high APACHE II score, organ failure and their death is mainly due to multiple organ/systemic failures. In patients with SAP, respiratory, cardiovascular and renal failures can predict the fatal outcome and more attention should be paid to their clinical evaluation.

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INTRODUCTION

Acute pancreatitis, as a relatively common pancreatic disease,

can be found in every part of the world with an incidence of 35-80 cases per 100 000 inhabitants per year^[1,2]. According to Atlanta Classification, acute pancreatitis is clinically classified into a mild or severe type depending on the presence of local and systemic complications^[3]. Severe acute pancreatitis (SAP) is characterized by high morbidity and mortality. The mortality of SAP patients varies from 7% to 47%^[4]. The factors most closely linked to a poor prognosis are pancreatic necrosis, infection and multiple organ/systemic failures, which are associated with a mortality of 50%^[4-7]; although in recent years this mortality rate has tended to decrease^[8]. Many attempts have been made to achieve an early prognosis of SAP. However, none seems to be reliable enough to justify its routine use.

In view of the high mortality associated with SAP, it is important to identify the cases that require close monitoring and aggressive resuscitation. The aim of this study was therefore to investigate the clinical characteristics and factors which could predict the outcome of patients with organ/systemic failure admitted to our hospital.

MATERIALS AND METHODS

Clinical data

From January 2003 to January 2004, the clinical histories of patients with acute pancreatitis (AP), admitted to the Department of Surgery, Ruijin Hospital of Shanghai Second Medical University, were retrospectively reviewed. The diagnosis of AP was established in cases with clinical presentations and biochemical findings when other causes were excluded. The severities of AP were assessed according to the Atlanta classification system^[3]. Etiology was divided into two groups: cholelithiasis and non-cholelithiasis. A biliary etiology was confirmed by ultrasonography, CT scan, ERCP, MRCP and operation. Pancreatic necrosis and abscess were defined by the findings on contrast-enhanced CT scan or in operation. The local and organ/systemic complications were defined according to the Atlanta classification system^[3,9].

The patients with SAP were divided according to their outcomes into two groups: deceased group and survived group. The data recorded for each patient included age, gender, etiology, length of hospitalization, APACHE II score at admission and the presence and type of local and organ/systemic complications. The relationship between clinical characteristics, specific single or multiple organ/systemic failures with mortality was evaluated in above-mentioned two groups.

Statistical analysis

Results were expressed as mean±SD. Statistical studies were made using SAS 6.12. Continuous data were evaluated by *t* test, and categorized data were analyzed by Chi-square test or Fisher's exact test. To identify the risk factors for SAP, multiple logistic regression analysis with backward elimination was used. *P*<0.05 was considered statistically significant.

RESULTS

Of the 268 patients with AP, 35.1% (94/268) developed SAP. Of the 94 SAP patients, 23.4% (22/94) died. The patients in the deceased group were significantly older and had a higher

APACHE II score than those in the survived group. The length of hospitalization was significantly shorter in those with a fatal outcome. There was no difference in etiology or gender (Table 1).

Regarding the local complications, the incidences of necrosis and abscess were significantly higher in the survived group than those in the deceased group. No patient in the deceased group developed pseudocysts (Table 2).

Table 1 Comparison of clinical characteristics (mean±SD)

| Characteristics | Survival (n = 72) | Deceased (n = 22) | Total (n = 94) |
|-----------------------------------|-----------------------------------|----------------------|----------------------|
| Mean age (yr) (range) | 49.7±14.9 ^b (15-82) | 62.8±14.4 (42-83) | 52.7±15.8 (15-83) |
| Gender (male/female) | 45/27 | 10/12 | 55/39 |
| Etiology (biliary/non-biliary) | 31/41 | 12/10 | 43/51 |
| Hospitalization (d) (range) | 84.4±65.3 ^b (8-253) | 26.2±28.2 (1-94) | 70.8±63.7 (1-253) |
| APACHE II score (range) | 6.3±3.5 ^b (0-14) | 12.5±6.8 (1-33) | 7.7±5.2 (0-33) |

^bP<0.01 vs deceased group.

Table 2 Comparison of local complications

| Local complications | Survival (n=72) | Deceased (n=22) | Total (n=94) |
|---------------------|------------------------|--------------------|-----------------|
| Necrosis, n (%) | 47 (5.3) ^b | 7 (31.8) | 54 (57.4) |
| Abscess, n (%) | 23 (31.4) ^a | 2 (9.1) | 25 (26.6) |
| Pseudocyst, n (%) | 11 (15.3) | 0 (0) | 11 (11.7) |

^aP<0.05, ^bP<0.01 vs deceased group.

A total of 61.7% (58/94) patients with SAP developed organ/systemic failures. In the deceased group, 90.9% (20/22) patients showed multiple organ/systemic failures (maximum 5 organ/systemic failures), only 18.1% (13/94) patients showed multiple organ/systemic failures in the survived group (Tables 3, 4). With regard to the organ/systemic complications, we found that the deceased group experienced a significantly greater incidence of episodes of respiratory failure, acute renal failure, cardiovascular failure and hematological failure than the survived group (Table 4).

Table 3 Comparison of the number of organ/systemic failure

| Number of organ/systemic failure | Survival (n=72) | Deceased (n=22) | Total (n=94) |
|----------------------------------|------------------------|--------------------|-----------------|
| 1, n (%) | 23 (31.9) ^a | 2 (9.1) | 25 (26.6) |
| 2, n (%) | 10 (13.9) | 6 (4.5) | 16 (17.0) |
| 3, n (%) | 3 (4.2) ^a | 4 (18.2) | 7 (7.4) |
| 4, n (%) | 0 (0) ^b | 7 (31.8) | 7 (7.4) |
| 5, n (%) | 0 (0) ^a | 3 (13.6) | 3 (3.2) |
| Total, n (%) | 36 (50.0) ^b | 22 (100.0) | 58 (61.7) |

^aP<0.05, ^bP<0.01 vs deceased group.

As for the frequency of different specific single organ failures, pulmonary failure occurred in 35.1% (33/94) patients, cardiovascular failure in 22.3% (21/94) patients, gastrointestinal failure in 19.1% (18/94) patients, hepatic failure in 15.9% (15/94) and renal failure in 14.9% (14/94) patients. The incidences of neurologic and hematological failures were relatively lower, only in 8.5% (8/94) patients respectively (Table 5).

Logistic regression analysis was carried out for the independent prognostic factors including all the variables studied. Respiratory failure, cardiovascular failure and renal failure were found to be independent prognostic factors of the mortality in SAP patients (Table 6).

Table 4 Comparison of the features of organ/systemic failure

| Organ/systemic failure | Survival (n=72) | Deceased (n=22) | Total (n=94) |
|--|------------------------|--------------------|-----------------|
| Multiple organ/systemic failures n (%) | 13 (18.1) ^b | 20 (90.9) | 33 (35.1) |
| Respiratory n (%) | 13 (18.1) ^b | 20 (90.9) | 33 (35.1) |
| Renal n (%) | 3 (4.2) ^b | 11 (50.0) | 14 (14.9) |
| Gastrointestinal n (%) | 11 (15.3) | 7 (31.8) | 18 (19.1) |
| Hepatic n (%) | 12 (16.7) | 3 (13.6) | 15 (15.9) |
| Neurologic n (%) | 6 (8.3) | 2 (9.1) | 8 (8.5) |
| Cardiovascular n (%) | 2 (2.8) ^b | 19 (86.4) | 21 (22.3) |
| Hematological n (%) | 2 (2.8) ^b | 6 (27.3) | 8 (8.5) |

^bP<0.01 vs deceased group.

Table 5 Frequency of organ/systemic failure

| Organ/systemic | Number of organ/systemic failure | Frequency (%) |
|------------------|----------------------------------|---------------|
| Respiratory | 33 | 35.1 |
| Renal | 14 | 14.9 |
| Gastrointestinal | 18 | 19.1 |
| Hepatic | 15 | 15.9 |
| Neurologic | 8 | 8.5 |
| Cardiovascular | 21 | 22.3 |
| Hematological | 8 | 8.5 |

Table 6 Independent factors of the logistic regression model

| Variable | OR | OR 95% confidence interval | P |
|------------------------|-------|----------------------------|-------|
| Respiratory failure | 186.5 | 9.942-999.0 | 0.006 |
| Cardiovascular failure | 29.9 | 2.243-999.0 | 0.021 |
| Renal failure | 118.7 | 3.784-999.0 | 0.029 |
| Hospitalization, days | 0.957 | 0.908-0.989 | 0.037 |

DISCUSSION

Most deaths of SAP patients were mainly related to multiple organ/systemic failures^[10]. Regarding the survival time, patients died more often of multiple organ/systemic failures in the first few days after admission^[5,11]. In the early phase of SAP, multiple organ/systemic failures seemed to be caused by cytokine and inflammatory mediators released due to systemic inflammatory response syndrome, and sterile pancreatic necrosis might even occur^[12]. Early deaths of SAP patients were commonly associated with multiple organ/systemic failure, accounting for 40-60% of mortality, and over the past decade this proportion has not declined^[13]. The present study showed that in the deceased group 90.9% (20/22) patients developed multiple organ/systemic failure and 50% (11/22) patients died within 2 wk after admission.

Previous studies^[14-16] showed that in SAP patients, organ/systemic failure occurred in 72-90.3%, single organ failure in 24.7-37%, multiple organ failure in 35-65.6%. Among the single organ failures, respiratory failure was the most common organ/systemic complications (39.1-63%), followed by cardiovascular failure (23-37.7%), hepatic failure (20.7%) and renal failure (8.5-13%). The present data showed that organ failure occurred in 61.7% (58/94) patients, single organ failure in 26.6% (25/94) patients, and multiple organ failure in 38.3% (36/94) patients. Respiratory failure was the most common single organ failure (35.1%, 33/94), followed by cardiovascular failure (22.3%, 21/94), gastrointestinal failure (19.1%, 18/94), hepatic failure (15.9%, 15/94) and renal failure (14.9%, 14/94). In a recent study, five independent prognostic factors for hospital mortality in SAP patients were the age and chronic health situation of the patients and organ failures (renal, respiratory and cardiovascular)^[4]. In our study, respiratory failure, cardiovascular failure and renal failure were shown to be the independent prognostic factors of

mortality by multivariate logistic analysis, which are consistent with the reports by Fernandez-Cruz *et al.* and Halonen *et al.*^[6, 17]. Apparently, the development of one of the above-mentioned complications is by far the worst prognostic factor in SAP, closely related to mortality.

Up to now, the development of pancreatic necrosis and infection has been considered as an important factor in the occurrence of multiple organ/systemic failure and subsequent death^[6, 18, 19]. There are even studies relating the site and extent of necrosis to the outcome and development of multiple organ failures^[18, 20]. In other studies, infected pancreatic necrosis and combined of organ/systemic failures were the most significant causes for hospital mortality of SAP patients^[1, 21]. The mortality rate of SAP patients was 7-47% (that of sterile necrotizing pancreatitis patients was 6-13% and SAP patients with infected necrosis was 14-80%)^[4, 22-26]. Conversely, there was a higher proportion of patients with necrosis and abscess in the survived group in our study. Using logistic regression analysis failed to identify necrosis and abscess as independent prognostic factors for mortality, although statistically significant difference was found between survived and deceased groups. This suggested that, rather than the development of necrosis or abscess itself, necrosis and abscess were not correlated with an increased mortality. The main factor indicating a poor prognosis in SAP was the development of multiple organ/systemic failures^[27, 28].

Although there was a higher incidence of pseudocysts in the survived group, no statistically significant difference was found compared with the deceased group. This observation must be made cautiously, because 50% (11/22) of the patients in deceased group died within 2 wk, which might be too short to develop a pseudocyst. In addition, in many patients the only complication was a pseudocyst, so they were classified as having SAP according to the Atlanta Criteria, although their clinical recovery was excellent^[3]. Patients with pseudocysts may develop complications, but since it takes at least 4 wk to develop a pseudocyst, it has no effect on early mortality.

Our results did not show that age was an independent poor prognosis factor in mortality, which was consistent with previous studies, but in contradiction to other investigators^[4, 6]. When deaths due to complications of acute pancreatitis were analyzed, the mortality rate was not significantly different between the young and elderly groups. Moreover, the complication rate and the proportion of patients with SAP (judged by the number of prognostic signs) were not higher in the elderly. Thus the severity of acute pancreatitis was not intrinsically due to advanced age when the influence of other secondary factors was not taken into consideration.

In conclusion, SAP patients are characterized by advanced age, high APACHE II score at admission, development of organ/systemic failure, and their death is mainly due to multiple organ/systemic failures. In SAP patients, respiratory, cardiovascular and renal failures can predict their fatal outcome and more attention should be paid to their clinical evaluation.

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