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Evaluation of prognostic factors for acute pancreatitis—A retrospective study

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Abstract
Background: Acute pancreatitis is a common disease frequently caused by choledocholithiasis or excess alcohol ingestion. A three category classification of severity of acute pancreatitis was recently designed. The management of acute pancreatitis is frequently challenging, and multidisciplinary approach should be used for the management of the patient with acute pancreatitis. In this study we aim to evaluate early indicators that predict the mortality of Acute Pancreatitis. **Materials & Methods:** Total number of subjects in this study was 100 patients with clinical diagnosis of acute pancreatitis were treated at M.G.M. Medical College& L.S.K. Hospital and analyzed retrospectively during the period from October 2018 to August 2020. **Results:** 69.7% of patients who developed acute pancreatitis had a mild clinical disease without complication. The remainder had a moderate to severe illness with complications, prolonged hospital stay and this group as a whole had a mortality of (52.0%).The overall morality was15.0%. In this study 42.0% had addiction to alcohol. Biliary tract disease was present in 26.9% of cases. 30%had neither history of alcoholism nor biliary tract disease i.e. idiopathic group. Post ERCP acute pancreatitis was found in 2.0% of patients and 1% had a history of blunt trauma. The mortality rate for the idiopathic group (24.1%) was higher than that of alcoholic group (14.3%) or that of biliary tract disease (7.7%). **Conclusion:** Despite earlier recognition of severe attack of acute pancreatitis by reliable and sophisticated diagnostic techniques, appropriate care and supportive measures the morbidity and mortality rates have remained unacceptably high. To reduce this high mortality the major aim of management should be to anticipate and treat complications and systemic failure, which may develop.
Keywords: Acute pancreatitis, mortality, morbidity

Introduction

Acute pancreatitis is a common disease with high mortality[1], and often caused by gallstone disease[2] or excessive ingestion of alcohol[3]. An elevation of the serum amylase and lipase levels supports the diagnosis of acute pancreatitis. The level of amylase increases within hours of the pain development and may remain elevated for 3 to 5 days. Serum lipase hasa higher specificity for pancreatic disease, but may also elevate its level under other conditions. Laboratory anomalies experienced in acute pancreatitis include hyperglycemia, hypocalcaemia, leukocytosis, and moderate elevations in liver function test results.

The first attempt to classify the severity of acute pancreatitis was made by Fitz in 1889, and until the most recent Atlanta symposium in 1992, a morphological component has always been included[4]. Whereas Fitz believed that the morphological features of severe disease were evidence of pancreatic hemorrhage and disseminated fat necrosis, the morphological features of severe disease in the original Atlanta classification were pancreatic necrosis, abscess, and pseudo cyst[5].

As stated by Petrov[5], there is an ongoing effort to revise the 1992 Atlanta classification of acute pancreatitis in the light of emerging evidence. From clinician's view, persist entorgan failure is predictive of death in acute pancreatitis. Local complications without organ failure are associated with morbidity, prolonged hospital stay but low mortality. However, the categorization of the severity of acute pancreatitis is one of the key elements of the classification[5].

A three category classification of severity of acute pancreatitis was recently designed.

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Hammel et al concluded that three new category classification of severity of acute pancreatitis identifies patients with high morbidity and mortality (severe acute pancreatitis), high morbidity without mortality (moderate acute pancreatitis) and low morbidity without mortality (mild acute pancreatitis)[6]. The entity of moderately severe acute pancreatitis is characterized by local complications without organ failure. Mortality in moderately severe acute pancreatitis is similar to that in mild pancreatitis but hospitalization prolonged like in severe pancreatitis. Local complications are defined as pancreatic necrosis or fluid collections[7].

Patients with pancreatic infection may have infected necrosis, pancreatic abscess, and/or infected pseudo cysts[8]. The microbes most frequently involved are gram-negative organisms including *Escherichiacoli, Enterococcus, and Klebsiella*[9].

Sterile pancreatic necrosis is typically managed conservatively without drainage. It may be challenging to distinguish between sterile and infected pancreatic necrosis, and therefore, some study suggested CT-guided fine-needle aspiration as a diagnose of the infected pancreatic necrosis. However, fine-needle aspiration is associated with significant risks, and patients with extensive pancreatic necrosis and low C-reactive protein should be observed. CT-guidedfine-needle aspiration is indicated only when there is clinical suspicion of infection and CRP >55mg/L[10].

Surgical intervention consisted of open or laparoscopic surgery. Early surgery was accompanied with relatively small number of specific local complications, including bleeding, intestinal fistulas and pancreatic fistulas[11].

Pancreatitis-induced inflammatory exudates can get to a spleen immediately. Clinical and radiological changes in the spleen were estimated mostly by computer tomography or ultra sonography. Spleen damages can be categorized as infarct, sub capsular fluid collections, sub capsular hematoma and abscess. The spleen changes in acute pancreatitis are transgent, and thus primary conservative treatment can be the strategy in most patients[12].

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Aims & objectives

- To diagnose acute pancreatitis in the setting of an acute abdomen.
- Evaluation of data to anticipate local complications and systemic failure, which may develop with the idea to reduce morbidity and mortality.
- To select those patients, who are going to require intensive monitoring and treatment. But who initially may not have seemed particularly ill.
- Detection of complications, their mode and timing of treatment with their end results.

Materials and methods

A Retrospective Analytical study was done in the Department of General Surgery, M.G.M. medical college and L.S.K. Hospital was carried out from October 2018 to August 2020.

The clinical data of the 100 patients who were included in the study were retrospectively collected from medical records and examination results of the patients. 124 patients were excluded as the detailed clinical history was not available in these cases.

Year	No. of Patients Admitted
2016	72
2017	68
2018	84
Total	**224**

71 patients had mild attack responded to conservative treatment and without any complication. Of the remaining 29 patients, 16 patients had moderate attack and 13 had severe attack developing complications, prolonged hospital stay, requiring intensive care and had higher morbidity and mortality. This study comprised of 68 males and 32 females.

A thorough physical examination was done. This included general survey, local and systemic examination. On analysis of the patient's complaints and physical examination, a tentative diagnosis was made from the possible differential diagnosis. Various laboratory investigations, routine and special, were undertaken. These include routine examination of blood (Total and differential counts and Hb%); urine and stool. Biochemical studies were done in the department of Biochemistry in this institution and also from other laboratories. Blood sugar, blood urea, serum creatinine, serum albumin, serum bilirubin, serum lactic dehy drogenase(LDH), serum as part ate aminotransferase and serum calcium were estimated. Serum lipase was studied only in 42 cases. Serum amylase estimation was done as a routine procedure in all case of acute pancreatitis.

Serum amylase study was done as a routine procedure in all emergent admission with acute abdomen like acute pancreatitis, peptic perforation, intestinal obstruction, colicky pain, and abdominal distension. Straight x-ray was also done for follow-up cases particularly those with abdominal lump like phlegm nor pseudo cyst of pancreas.

The following radio logical studies were undertaken:-

a) Straight x-ray of abdomen was done in the hospital in all emergent cases.

b) X ray chest was performed in all patients with acute pancreatitis to demonstrate any pulmonary pathology like, pleural effusion, basal atelectasis, and pulmonary oedema mainly of the left side.

c) E. C. G. was done for moderate and severe attack i.e.in 29 patients

d) Ultra sonography was done for 56 patients with acute pancreatitis and subsequently for detection of local complication e.g. phlegmon, pseudo cyst or abscess.

e) C.T. Scan was done for selective cases (twenty nine cases)as it is expensive and it was advised upon clinical diagnosis of per pancreatic fluid collection, pseudo cyst, pancreatic necrosis, and pancreatic abscess.

f) Peritoneal tapping was performed on four cases to examine colour of fluid and for estimation of amylase content of peritoneal fluid.

g) Exploratory laparotomy was done in 5 cases with a suspected diagnosis of other acute abdomen like peptic perforation or acute intestinal obstruction. No case was deliberately operated upon with a diagnosis of acute pancreatitis.
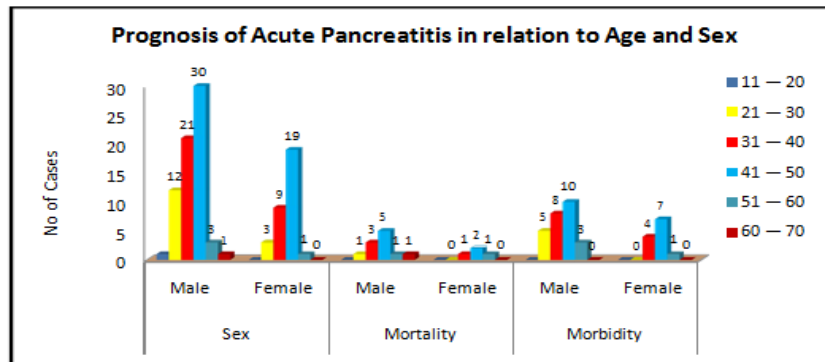
Results & analysis

Figure1: Prognosis of Acute Pancreatitis in relation to Age and Sex

The overall mortality for the study group was 15.0% and morbidity rate was 38.0%. The mortality for male (17.18%) was significantly greater than that for female(12.5%).The mortality for patients over 50 years of age was significantly greater than that of patients below 50 years of age.

Illustrates the association of increased mortality with increased age, a trend which is consistent for the male and female patients as well the total group. Though mortality was higher for older patients, morbidity was higher for younger patients particularly among 30–40 years of age.

The mean duration of hospitalization for total cases was 14 days and was greater for males(21 days)than for female(12days).
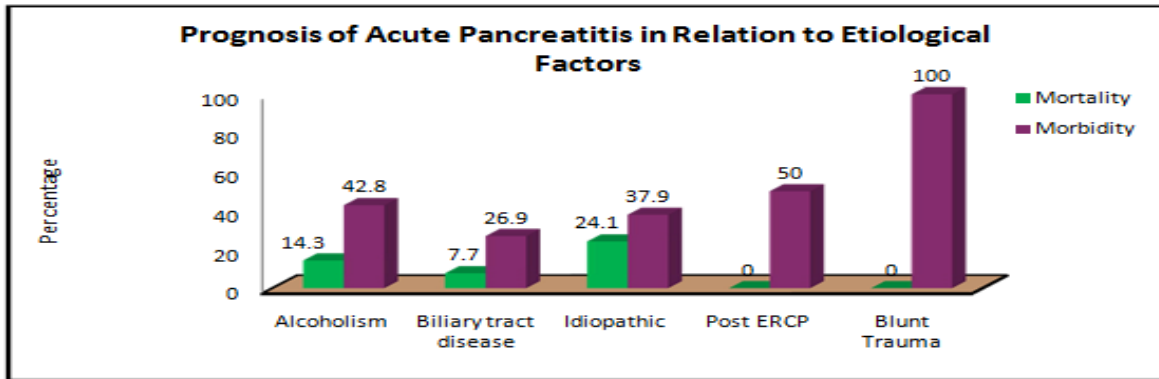
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Figure2: Prognosis of Acute Pancreatitis in Relation to Etiological Factors

Etiologic factors Relating to Morbidity and Mortality
Illustrates the morbidity and mortality relative to etiologic factors. Thirty eight patients, 42% of the total patients, had history of alcoholism, and 26 patients (26%) of the total study group had a history of biliary tract disease. Of these latter patients, 20 had pre-existing gall stone and 8 patients had under gone biliary surgery more than three months prior to diagnosis. 29 patients (29%) of total patients were neither alcoholic nor had biliary tract disease, were considered to be idiopathic group. The mortality for this idiopathic group(24.1%) was significantly higher than for with alcoholism (14.3%) and for those with biliary tract disease (7.7%). Thus though alcoholism correlated more than biliary tract disease in relation with severity of the disease without any significant change in mortality, idiopathic group had a positive correlation with mortality. 2 patients (2.0%) had a history of ERCP and in one patient (1.0%)blunt trauma were followed by acute pancreatitis.

Of the 100 patients, four had drug addiction, in addition to alcoholism, 3 had pre-existing diabetes, 3 had a history of peptic ulcer disease, and 1 had history of hematemesis, neither had influence on the outcome of acute pancreatitis.
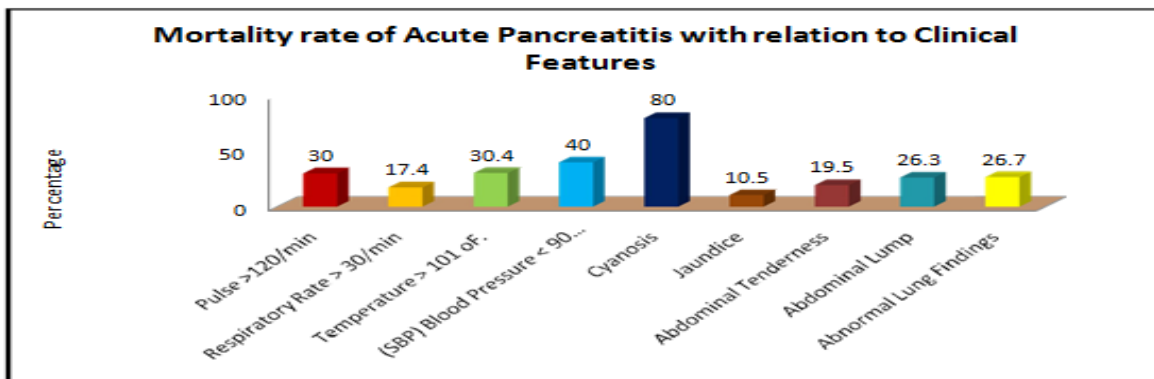

Figure: 3. Prognosis of Acute Pancreatitis with relation to Clinical Features.

Physical Examination
Pulse rate above 120/minutes was present 30 patients. Patients with severe shock (20patients) had tachycardia.
Temperature above 101□Fwas present in 23 patients.
Respiratory rate above30/minutes was present in 46 patients.
Blood pressure
Low systolic blood pressure(below90mmHg) was present in patients with hypovolemic shock(20 patients) at the time of admission.
Cyanosis
Five patients had Cyanosis initially during admission along with severe respiratory insufficiency.

Jaundice
Only 19 patients had Jaundice at the time of admission.
Among vital signs, tachycardia, elevated temperature, low systolic blood pressure, and cyanosis all correlated with severity of acute pancreatitis.
Tachypnea did not correlate with mortality, although abnormal lung findings

e.g. basal rates, left sided pleural effusion or pulmonary oedema as evidence from x-ray chest, were associated with significantly increased morbidity and mortality. Abnormal lung findings were present in twelve patients on clinical examination.

Abdominal Tenderness
Abdominal tenderness was present initially in 77 patients at the time of admission. On 2nd day of admission it was present in 46 patients following conservative management. Persistent abdominal pain (more than 5 days) in epigastric region was present in 31 patients.

Epigastric lump
A palpable epigastric lump was present in 19 patients after 48 hours of admission.
Persistent abdominal tenderness present in 31 patients had a palpable abdomenal lump in 19 patients were significantly associated with severity of disease. These findings were present more frequently in patients below 50 years of age (16cases) than in the patients above 50 years of age (3 cases).

Table1: Prognostic Value of Laboratory Examination: Correlation with Morbidity at the end 24hours

Laboratory Feature	Significant Value	Admission and First Hospital Day	Admission and First Two Hospital Day	Entire Hospital Course	Morbidity(%)
White Blood Cell	>15000/mm^3	24	16	10	41.7
Serum Amylase	>1000unit/L	38	38	12	31.6
Serum Lipase	>200unit/L	36	36	10	27.8
Serum Bilirubin	>4mg/dl	19	12	4	21.1
Serum Lactic Dehydrogenase	>350i.u/ L	16	16	10	62.5
Serum Aspartate Aminotransferase	>250u/L	20	26	9	45.0
Serum Calcium	<8mg/dl	8	6	4	50.0
Blood sugar(R)	>200mg/dl	9	10	5	55.6

In the first twenty-four hours of hospital admission a total of five features in the laboratory examination correlated with severity of disease and increased morbidity i.e. likely developing complication. These are maximum white blood cell count greater than 15, 000 /Cu. mm., maximum blood sugar greater than200 mg/dl, minimum serum calcium level less than 8 mg/dl, maximum serum lactic dehydrogenase level greater than 350 i.u/l and maximum serum as partate amino transferase level greater than250i.u/L.

Six additional features of the laboratory examination attained a significant level of correlation with mortality of the disease when considered over the second time period i.e. first 48 hours of hospitalization. These were minimum hematocrit level$\leq$30%, maximum white blood cell greater than > 15, 000/Cu.mm., minimum serum albumin level less than < 3 gm/dl, maximum serum creatinine level greater than>3mg/dl, maximum blood urea level greater than>100mg/dl, and minimum arterial oxygen tension(PaO$_2$)less than<60mm.Hg.

Table: 2. Prognostic Value of Laboratory Examination: Correlation with Mortality at the end of 48 hours

Laboratory Feature	Significant Value	Admission and First HospitalDay	Admissionand First Two HospitalDay	Entire Hospital Course	Mortality(%)
Hematocrit	$\leq$ 30%	14	14	7	50
White Blood Cell	> 15000/mm^3	24	16	10	62.5
Serum Amylase	> 1000u/L	38	38	12	31.6
Serum Albumin	<3gm/dl	14	16	10	62.5
Serum Creatinine	>3 mg/dl	4	4	1	25.0
Blood Urea	>100mg/dl	4	4	1	25.0
Arterial Oxygen Tension	<60mmHg	5	5	4	80.0

As indicated in Table (1), all the features of the laboratory examination, those attain a significant level of correlation with morbidity of the disease at any time during the patients' entire hospitalization; have attained significance within five to seven days. Table (2) indicated significant correlation of laboratory data with mortality of the acute pancreatitis at the end of 48 hours. The individual prognostic accuracy of features of the laboratory examination at the end of 24hoursisillustratedin.

Maximum level of serum amylase, maximum level of serum lipase and maximum level of serum bilirubin were analysed and no correlation was found with morbidity and mortality.
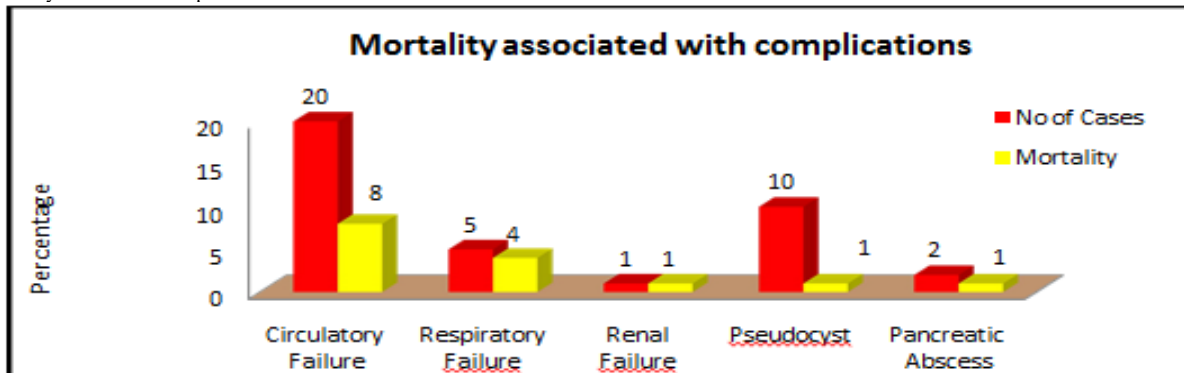

Figure4: Mortality associated with complications.

The morbidity and mortality rates relative to complications (localandsystemic) suffered by 38 patients in this series is shown.

Discussion

The mortality rate for acute pancreatitis was 15.0% and morbidity rate was 38.0% during the same period. Morbidity means developing either local and/or systemic complications or prolonged hospital stay more than 10 days.

Majority of patients analysed in this study had addiction to alcohol 42.0%.Biliary tract disease was present in 26.9 % of cases. 30% had neither history of alcoholism nor biliary tract disease i.e. idiopathic group. Post ERCP acute pancreatitis was found in 2.0% of patients and 1.% had a history of blunt trauma. The mortality rate for the idiopathic group (24.1%) was higher than that of alcoholic group (14.3%)or that of biliary tract disease(7.7%).

Failure to make the diagnosis has important implications when attempting to define mortality rates and the statement that they continue to fall must be treated with caution. Thus the fall in mortality rates from 17.8% in 1961 to 5.8% in1985 in Scotland[13] has to be taken in conjunction with the fact that no less than 42% of patients dying from acute pancreatitis in Glasgow Royal Infirmary within this period had their disease diagnosed for the first time at autopsy[14]. Similarly, 35% of the fatal cases in Bristol were diagnosed for the first time at autopsy, case mortality remaining at around 20% throughout the study[15]. It is clear that we have no

ground for complacency regarding our ability to diagnose and treat acute pancreatitis.

Jacobs M. L., Daggett W.M., Civetta J. M. et al. reported a mortality rate of12.9% for acute pancreatitis at Massachusetts General Hospital during period1963 to 1969. The mortality for the idiopathic group (12%) was significantly higher that for with alcoholism (8%), and for those with biliary tract disease (6%) in their series[16].

The elderly are at particular risk.Above50 years of age the mortality rate(60%) is greater than that of below 50 years of age (13.18%), but the younger age group was more prone to develop complications i.e. had increased morbidity. In this study, incidence of acute pancreatitis was more in male than in female and also the mortality rate for male (17.18%) was greater than that off male (12.5%). In Hong Kong, mortality rose from 6% in those under 50 years to 21% in those over 75 years, the increase being attributed primarily to a higher incidence of concomitant medicalor surgical disease[17].

Circulatory failure was the most common cause of death. Eight patients died of hypovolemic shock. 20 patients who developed hypovolemic shock, four patients developed respiratory in sufficiency. Renal failure developed in one patient.

Pancreatic phlegmon was developed in 4patients.10 patients developed pseudo cyst and 2 patients developed pancreatic abscess.

Pain in epigastrium was the commonest presentation of acute pancreatitis. Severity of pain correlated negatively with severity of disease.Vomiting, nausea and anorexia all insignificantly correlated with morbidity and mortality of the disease. Marshall L. Jacobs, Daggett. W.M. et al reported a negative correlation between mortality rate and presence of abdominal pain, vomiting, nausea or anorexia[16].

Identification of the severely threatened patient with acute pancreatitis begins with initial phase of physical examination, and recording of vital signs. Tachycardia, hypotension, fever, dyspnoea and cyanosis upon presentation were all associated with increased morbidity and mortality.

Foster and Ziffren reported a high mortality of 86.9% in a group of 23 patients with acute pancreatitis and shock[18]. Faceyetal, Elliotand Ranson, all reported that, in most instances, hypotension did not present in the face of vigorous intravenous replacement. Marshall L. J. and Daggett reported greater than 39% mortality among the 33 patients who presented with a systolic blood pressure less than 90 mmHg. In this present series, there was 40% mortality among the 20 patients who presented with a systolic blood pressure of less than 90 mmHg, though the usual measures were taken to correct hypovolemia.

Black reported fever as a presenting sign in 75% of the group of 250 patients with acute pancreatitis. MarshallL.J.and Daggettetal reported that 142 patients (27%) had an initial temperature greater than 101□F and 20% of these patients died[16]. In the present series 23 patients (23.95%) had an initial temperature greater than 101□Fand30.45% of these patients died.

Five patients developed cyanosis and 80% of these patients died of respiratory failure as evident from clinical as well as arterial blood gas determination.

Of the remainder physical examination, the presence of abdominal mass and abnormal findings over lung fields correlated with increased mortality. The present study suggests that in acute pancreatitis the initial physical finding do in fact help to predict the severity of the clinical course, though little importance has been placed in the past upon their prognostic value.

Ranson and colleagues reported a positive correlation between leucocytosis and severity of disease[19]. Among 100 patients in this series 24 patients had a white blood cell count greater than 15000/mm^{3}during the first 48 hours. Morbidity for this group was 41.7% which is significantly greater than that for total population. Mortality (38.0%) of this group was significantly differing from that of total patients (15.0%).

A hematocrit of less than 30% at any time during the initial 48 hours correlated with increased mortality. Failure to elevate the hematocrit above 30% during the same period was associated with a mortality rate of 42.8%.The presence of low hematocrit value was a useful prognostic sign and the importance of early treatment by transfusion with whole blood or packed red blood cells is also demonstrated. Present data do not confirm the report by Gray and Rosenmanthat hemo concentration on admission is significant as a poor prognostic sign.Abnormal examination of the lung fields, both physical (Cyanosis, Tachypnea, abnormal breath sound) and roentgeno graphic methods correlated with increased mortality in patients in this series. The importance of diagnosis of respiratory insufficiency early, however, required a high index of suspicion and confirmation by determination of arterial blood gases. Only 20 patients under went arterial blood gas analysis .Ranson[20] reported a high incidence of mild to moderate respiratory in sufficiency based on arterial blood gas determination in a group of patients among whom very few had clinically or roentgenographically apparent signs of respiratory problems. Fishbein and colleagues and Laws onetal noted earlier the relation between respiratory complications and poor prognosis in acute pancreatitis[21]. Warshaw and colleagues[22] recently report eda series of 7 patients with severe pancreatitis and a distinct form of pulmonary injury characterized by disruption of the alveolar-capillary membrane; leading to pulmonary oedema (Acute respiratory di stress syndrome).It should be empha sized that this particular type of pulmonary injury (Acute respiratory distress syndrome) is not shared by all or even most patients with acute pancreatitis complicated by respiratory in sufficiency. Twelve patients in the present series had respiratory complication like left sided pleural effusion. Five of these patients showed arterial oxygen tension less than <60mmHg within 48 hours and required mechanical ventilator support. Four patients subsequently died (mortalityrate-80%).

Many authors have reported the incidence of altered renal function in the presence of acute pancreatitis. In this series, elevations of both blood urea (greater than > 100 mg/dl) and serum creatinine (greater than >3 mg/dl) were associated with significant increase in the mortality rate, even after adequate hydration. Frey reported an 80% mortality rate for patients with acute pancreatitis who suffered from acute renal failure. Among 100 patients 4 patients had a serum creatinine greater than 3 mg/dl and 4 patients had blood urea level greater than >100 mg/dl. The mortality rate was 25% in first 48hours. Three patients subsequently had normal blood urea and serum creatinine levels after proper hydration. Only one patient developed frank renal failure and died in spite of adequate hydration and a level of serum creatinine and blood urea was persistently high and was above 55 years of age. As noted above in the patients under discussion, oliguria during the initial 48 hours is not a reliable indicator of renal failure.

Howard and Jordan[23], Pollack[24], and Trapnell[25] all have pointed out that exploratory laparotomy does not necessarily increase the mortality of acute pancreatitis. In this series 4 patients under went exploratory laparotomy for diagnostic suspicion and all of them survived. They had a mortality rate same as that for other patients but had a prolong hospital stay (more than2weeks).

The fore mentioned studies do not selectively address the question of surgical treatment of those severely ill patients with acute pancreatitis who continue to deteriorate despite maximal medical treatment. These patients might benefitfrom any of several therapeutic modalities currently under evaluation. These included peritoneal lavage, subtotal pancreatectomy and the use of anti-enzymepreparation. Kivilaakso et al 1981 reported their experience of early surgery in30 severely ill patients(mean age37.4 years). Most of theoperationsweredistalpancreaticresectionsandtheoverallmortalitywas37%[26]. This is comparable to the results in reports of conservatively managed patients. They subsequently compared early surgery (distal pancreatic resection) to peritoneallavage performed through catheters placed around the pancreas at laparotomy (Kilvilaakso et al 1984)[27]. The mortality was less in the respected group (4from 18, compared to 8 from 17 in the lavage group) although the number were small. The authors analysed the patients according to the extent of pancreatic damage. In general, the more extensive the damage the higher is the mortality. This early direct

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surgical intervention is seldom advocated in older patients but in younger severely ill patients, not responding to conservative management, it still has a place. No such trial was given in the present series. Only a small portion of all patients with pancreatitis have such severe disease and the experience quoted above is difficult to repeat.

Conclusion

Many of the fatalities associated with acute pancreatitis occurred in older patient with other associated pathologies, but there were still a higher morbidity and mortality in younger patients who presented to hospital with established severe disease.

Acute pancreatitis still represents a condition of variable severity. The adoption of multi parametric criteria proposed together with morphological evaluation consents the formulation of a discretely reliable prognosis on the evolution of the disease a few days from onset, even though this still appears insufficient to plan a varied and really timely therapeutic program.

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