

A Prospective Study of Intra Abdominal Pressure (IAP) Monitoring to Predict Severity and Prognosis in Patients of Acute Severe Pancreatitis

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Abstract: *In cases of acute severe pancreatitis mortality rate remains high. Few of these patients develop increased intra abdominal pressure. This study used utility of intra abdominal pressure monitoring to assess severity of severe acute pancreatitis and its comparison with CT severity index and to predict prognosis of patients of acute severe pancreatitis by measuring intra abdominal pressure and to assess outcome. Frequent measurement of IAP during intensive care is important in predicting mortality in severe acute pancreatitis and recognizing patients potentially benefitting from decompressive laparotomy.*

Keywords: IAP, Acute Pancreatitis, CTSI, Mortality

1. Introduction

Acute pancreatitis is defined as an acute inflammatory process of the pancreas with variable involvement of other regional tissues and organ systems. Mild pancreatitis is associated with minimal organ dysfunction with complete recovery while severe pancreatitis is associated with multiple organ failure with local complications. Severe pancreatitis is associated with high mortality upto 25%^{1,2}.

Acute pancreatitis is diagnosed on clinical grounds on the basis of medical history, clinical presentation along with appropriate laboratory and radiological findings. There are various methods for assessment and monitoring of acute severe pancreatitis. They are

- Clinical assessment
- Multiple prognostic criteria
- Peritoneal lavage
- Imaging methods
- Single biochemical prognostic factor.

The most widely used criteria used to assess severity, prognosis and outcome of acute pancreatitis is RANSON criteria(1971)³. It takes into account various biochemical and physiological parameters to assess the patient in first 48 hours of acute pancreatitis. Knaus et al⁴ described APACHE SCORE in 1981 which took into account many physiological variables and included any previous systemic illness of the patient. It was modified in 1985 to APACHE II Score which contained 12 variables and score ranging from 0 to 71. The main advantage of this scoring system is that it can continually quantify the severity of illness

Various radiological methods are used in modern era to assess severity of acute pancreatitis. They are

- USG Abdomen
- CT scan
- MRI
- MRCP

Endoscopic USG has shown superiority over trans-abdominal USG in determining gall stone pancreatitis and it also has therapeutic benefit of endoscopic stone removal

The CECT abdomen is being considered as the gold standard method for detecting the severity of acute pancreatitis. The Balthazar CT grading system⁵ and CT Severity index are thus helpful in predicting the outcome of the disease in terms of morbidity and mortality.

MRI is equally effective in determining the extent of pancreatic necrosis, peri pancreatic inflammatory changes and fluid collection. MRCP gives information about biliary tree and pancreatic ducts and it is useful in gall stone pancreatitis to determine choledocholithiasis.

It has been shown that severe acute pancreatitis is one of the main cause of intra abdominal hypertension and may lead to multiple organ dysfunction. New consensus definitions for IAH (Intra-abdominal Hypertension) and ACS (Abdominal Compartment Syndrome) were set by the World Society on the Abdominal Compartment Syndrome (WSACS)⁶. IAH is a sustained increase in IAP above 12 mmHg. ACS is a sustained increase in IAP above 20 mmHg with new onset organ failure. However, even values of lower than 15 mmHg may cause organ dysfunction^{7,8}. Intra abdominal pressure can predict the severity and prognosis of patients with severe acute pancreatitis. Urinary bladder pressure when bladder is partially filled, accurately reflects intra abdominal pressure.

2. Materials and Methods

The study was conducted in Mahatma Gandhi Medical College, Jaipur. All patients of severe pancreatitis were included in the study. Diagnosis was made on clinical and radiological evidence. CBC, serum amylase and lipase, blood sugar, RFT, LFT, serum calcium, USG abdomen, CECT abdomen were done in all patients. CTSI was calculated and patients with CTSI 7-10 were included in the study. Bladder pressure was measured every 48 hours. Patients were divided into two groups based on maximum bladder pressure Group A (<15cm of water) & Group B

(>15cm of water). Outcome was noted in both groups in terms of survival or death. Mortality and mean CTSI in the two groups were calculated.

Method of bladder pressure measurement:

- 1) Placement of 16F Foleys catheter in bladder through urethra
- 2) The catheter is to be connected to a 3 way stop cock and bedside water manometer with patient in supine position and pubic symphysis as 0 reference point.
- 3) Bladder is to be emptied
- 4) 50 ml of NS is to be injected into the bladder through catheter and value of bladder pressure is to be read on manometer.

3. Observations and Results

Table 1: Age Wise Distribution

Age Group	No. of Patients
10-20 YRS	1
21-30 YRS	4
31-40 YRS	8
41-50 YRS	6
51-60 YRS	5
>60	1

Maximum number of patients of severe acute pancreatitis were in 30-50 yrs of age group.

Table 2: Maximum Bladder Pressure Wise Distribution

Group	Maximum Bladder Pressure	Total Number of Patients
Mildly Elevated	<=15 CM of Water	14(56%)
Severely Elevated	>15 CM of Water	11(44%)

Bladder pressure >15cm of water is seen in less cases.

Table 3: Outcome Wise Distribution

Group	Survived	Death	Total
Mildly Elevated	11(78%)	3(22%)	14
Severely Elevated	3(27%)	8(73%)	11

Statistical analysis using Chi Square test
 Chi Square =4.662 with 1 degree of freedom; p= 0.031
 P value is < 0.05 hence significant

Table 4: Mean Ct Severity Index Wise Distribution

Group	Mean CTSI	Standard Deviation	P Value Student t Test
Mildly Elevated Group	8.14	1.099	P > 0.05
Severely Elevated Group	8.72	1.009	

MEAN CT SEVERITY index of mildly elevated group was less than severely elevated group in mildly elevated group it was 8.14 and in severely elevated it was 8.73.

4. Discussion

Severe acute pancreatitis is a systemic inflammatory disease which may lead to multi organ failure with high mortality. The assessment of severity of acute pancreatitis is important for early detection of patients who may benefit from additional supportive and specific therapeutic procedures.

Previous studies suggested that acute pancreatitis is a cause of abdominal hypertension. With increase in intra abdominal pressure all major organ systems are adversely affected leading to a potentially fatal condition^{9,10,15-17}.

In our series we used CT severity index as a marker of severity of acute pancreatitis. As direct measurement of intra abdominal pressure is impractical as it requires placement of an invasive line into peritoneal space solely for measurement of pressure, we used 48 hourly measurement of bladder pressure which is supposed to reflect intra abdominal pressure according to recent studies¹⁸⁻²⁰.

In our study of 25 patients 2 groups were made based on bladder pressure. Mildly elevated group (<15 cm of water) had 14 patients and severely elevated group(>15 cm of water) had 11 patients.

In our study out of 14 patients in mildly elevated bladder pressure group 11 patients (78%) survived and only 3 patients (22%) died in contrast to severely elevated bladder pressure group in which 8 patients (73%) died and 3 survived (27%) survived out of 11 patients. This shows mortality is more in high bladder pressure group with p value <0.05 which is statistically significant

In a study conducted by Paivi Keskinen et al²¹ it was found that high IAP in critically ill patients with acute pancreatitis correlates with degree of organ dysfunction and length of intensive care. Increased IAP shows deleterious effects on cardiovascular, respiratory and renal systems²². Splanchnic perfusion may diminish due to decrease in cardiac output or direct mechanical compression of splanchnic bed. It may also lead to splanchnic ischemia due to increase in vasopressin²³.

In earlier studies an increase in IAP has been shown to be associated with increased mortality in surgical and trauma patients¹¹⁻¹⁴. In recent multicentre studies IAH during intensive care is an independent predictor for hospital mortality.

Recently published international recommendations on management of severe acute pancreatitis do not specifically address the management of IAH²⁴. Once ACS is recognized prompt treatment with decompressive laparotomy seems to be best option although the exact indications, threshold IAP values and the most appropriate technique needs further research. It is even more crucial in terms of considerable morbidity associated with the procedure itself. As shown in selected trauma and other surgical patients, the risk of organ dysfunction can be reduced with timely decompressive laparotomy in patients who are not responding to non operative management of severe IAH²⁵⁻²⁷.

In patients with severe acute pancreatitis, increased IAP is associated with development of early organ failure fewer ICU free days. Regular measurement of IAP in ICU patients with severe acute pancreatitis could help in optimizing abdominal perfusion pressure and recognizing patients with early decompressive therapy.

Mean CT severity index of mildly elevated pressure group was 8.14 in comparison to 8.73 in severely elevated bladder pressure group. This shows that mean CT severity index of high bladder pressure group is higher than low pressure group.

5. Summary and Conclusion

In this study 25 patients of severe acute pancreatitis with CT severity index ≥ 7 were analysed. Patients were divided into 2 groups based on bladder pressure. 14 patients were taken into mildly elevated bladder pressure group and 11 patients were of severely elevated bladder pressure group. 22% of patients (3 out of 14) expired in mildly elevated pressure group as in comparison to severely elevated bladder pressure group in which 73% (8 out of 11) expired. p value was 0.05 which is statistically significant. As bladder pressure accurately reflects intra abdominal pressure it is concluded that high intra abdominal pressure is a good predictor for prognosis in patients of acute severe pancreatitis

In the same study CT severity index was calculated in mildly elevated bladder pressure group (pressure ≤ 15 cm of water) and in severely elevated bladder (>15 cm of water). In mildly elevated bladder pressure group mean CTSI was 8.14 and in severely elevated bladder pressure group it was 8.72. On statistical analysis p value was >0.05 showing its insignificance. This may be due to less number of patients in study and warrants study on large number of cases to establish utility of intra abdominal pressure monitoring to assess severity in comparison to CT severity index in patients of severe acute pancreatitis.

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