DOI: 10.47799/pimr.1001.19

Intra-abdominal Pressure as a Prognostic Factor in Severe Acute Pancreatitis

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Date of Submission: 21/09/2021 Date of Review: 25/11/2021 Date of Acceptance: 08/01/2022

ABSTRACT

Objective: To assess the prognostic value of Intra-abdominal Pressure in severe acute pancreatitis, compare it to APACHE II, to determine when to intervene based on intra abdominal pressure.

Materials and Methods:We studied the role of intra-abdominal pressure measurement as a prognostic index and its applicability to determine the timing of intervention in cases of severe acute pancreatitis as a prospective cohort study from 2010- 2012, at Kamineni Hospital, L.B Nagar, Hyderabad. All patients who were admitted with severe acute pancreatitis and consented to take part in the study were enrolled. All patients were evaluated clinically, radiologically, biochemically and by the prognostic indices – APACHE II, Ranson criteria and intra-abdominal pressure measurement. A total of 55 patients were enrolled in this study. Intra-abdominal pressure was measured by intravesical technique using a Foley catheter.Intra-abdominal pressure was measured every 12 hours. Within 24 hours of admission, APACHE II score was obtained. Multivariate analysis was utilised for statistics.

Results: Males comprised 73% of study population. Mean age was 41.23± 13.74 years (17- 83 years). Ten patients (18.81%) died. Among the non-survivors, the intra-abdominal pressure (20.1± 3.1073 Vs 8.97± 4.39) and the APACHE II (17.5 ±4.09 Vs3.93 ±4.345),were significantly greater, P value <0.0001. The AUC for intra-abdominal pressureat 24 hours and at 72 hours was >0.7, which is highly significant. The sensitivity for intra-abdominal pressure(>13 mm Hg) at 72 hours as a marker for mortality was 100%.

Conclusion:The Intra-abdominal pressure monitoring is rapid, reproducible, inexpensive and minimally invasive, and can be used as a marker of the severity and prognosis of severe acute pancreatitis. Intra-abdominal pressure could potentially be used to guide the timing of intervention. Compared to APACHE II, which is inclusive of multiple parameters, intra-abdominal pressure can serve the same purpose as a single prognostic index. Further, we recommend a large, multicentric studies to conclusively establish the predictive power of intra-abdominal pressure in acute pancreatitis and whether interventions known to reduce intra-abdominal pressure, can alter the ultimate outcome.

KEYWORDS: Intra abdominal Pressure, Prognostic marker, Pancreatitis

INTRODUCTION

Pancreatitis has varied etiology and clinical course. In the most severe forms, it has an unpredictably high mortality [1]. There are various clinical and radiological scoring systems to assess the severity and predict the adverse outcomes. Most of these are cumbersome and not cost effective [2]. We focused on measuring the intra-abdominal pressure as a marker for predicting the likely course of the disease. This is a reliable, reproduceble and cheaper test that can effectively predict the likely outcome of pancreatitis.An intra-abdominal pressure of ≥12 mm Hg is defined as intra-abdominal hypertension. Above this pressure, the organ dysfunction may begin to set in although may go undetected because of effective compensatory mechanisms. When the intra-abdominal pressure exceeds 20 mm Hg, it is termed abdominal compartment syndrome, manifests with overt organ dysfunction.

Intra-abdominal pressure can be measured directly with the help of a catheter placed in the peritoneal cavity. This can also be measured indirectly by measuring the pressure inside the urinary bladder, stomach or rectum. Ultrasonography is a promising method of non-invasive route for measuring the same.

MATERIALS AND METHODS

A total of fifty-five patients of acute pancreatitis were enrolled in our study. Fifteen (27.27%) were females and forty were males (72.72%). The mean age of the patients was 41.23± 13.74 (17to 83) years.

Consent and ethical clearance- Prior ethical committee clearance was obtained from the institute. Patients were enrolled in the study after a formal informed consent was obtained.

Study period and design- between 2015 and 2017, all the cases of acute pancreatitis, irrespective of its severity were included in this study. Only those patients who presented within one week of their symptoms were included. Patients who did not wish to participate in this study and those cases of pancreatitis secondary to burns and post-transplant, were excluded from the study.At admission, demographic and medical history of the patient and consent was documented. Computerized tomography of pancreas was performed at-least 48 hours after onset of symptoms along with Balthazar score. APACHE II was measured at 24 hours of admission and Ranson score at 48 hours. As a protocol, intra-abdominal pressure is measured at admission and at 12 hourly intervals till a hospital discharge or death of the patient. In most patients,intra-abdominal pressure was measured till 96 hours, post admission. As a protocol, we chose to perform a decompressive laparostomy at an intra-abdominal pressure of $\geq$20 mm Hg.In patients with raised intra-abdominal pressure and complications of pancreatitis like abscess or necrosis, additional procedures (drainage of abscess, necrosectomy) were done simultaneously with decompressive laparostomy. In other patients with these complications and normal intra-abdominal pressure, procedures were done without laparostomy. In gall-stone related pancreatitis, patients underwent laparoscopic cholecystectomy at the time of discharge.

We have chosen the intravesical route for the assessment of intra-abdominal pressure for the sake of ease of performance, simplicity, its cost-effectiveness and reproducibility.

Method of recording the intravesical pressure- after local cleaning and draping, under all the sterile precautions, urethra is adequately lubricated and anesthetized with 2% lignocaine jelly. A suitable Foley catheter is guided in to place. The outlet of the Foley catheter is connected to a three-way stopcock and thence to a manometer. Pubic symphysis was the zero-reference point. 30 ml of saline was injected into the urinary bladder at the time of recording the intra abdominal pressure. The value thus obtained was in cm of water. This was converted in to mm Hg using the conversion ‘1 cm of H2O= 0.74 mm Hg’.

Data analysis- continuous variables were expressed as mean$\pm$ SD. Continuous variables were compared using student- t test. To study the effect of the studied variables on mortality (the final outcome), multivariate regression and logistic regression were used. To determine the predictability of the variables, ROC curves were used.

RESULTS:

Ten patients (18.18%) succumbed to pancreatitis and its complication. The mean age of the patients who died was 48.2$\pm$ 14.22. The intra-abdominal pressure was significantly elevated among the non survivors throughout the study period (20.1 $\pm$3.10 Vs 8.98 $\pm$4.39,P value<0.0001 at admission and 21.37$\pm$ 1.59 Vs 6.85$\pm$ 1.42 on fifth day). The APACHE II score was significantly elevated among the non survivors both at initial evaluation and on fifth day of admission (17.5$\pm$ 4.08 Vs 3.93$\pm$ 4.34 at admission and 21.5$\pm$ 3.66 Vs 1.72$\pm$ 2.35 on the fifth day, P value< 0.0001). Serum markers Amylase and Lipase showed a similar trend.

To determine the effect of each studied variable on final outcome, multiple regression was used.

Regression Equation

When ROC was applied on individual variable factors intra-abdominal pressure at 24 hrs and 72 hrs were found to be very good at predicting outcome.

An Intra-abdominal pressure, cut-off value of 13 mm Hg at 72 hours after admission may help in distinguishing between patients who are and are not likely to survive.

DISCUSSION

Persistent organ failure, beyond 48 hours, in acute pancreatitis defines the “Severe acute pancreatitis”. The course of pancreatitis varies based on the etiology and patient factors unpredictably. The Ranson and APACHE II clinical criteria, Balthazar radiological criteria, to name a few are used to predict the course of the disease. Intrabdominal pressure raises with the ongoing inflammation in course of the disease. The incidence of IAH in acute pancreatitis is about 60-80% [1] Ascites, ileus, aggressive fluid resuscitation contributes to the raised IAH. Patients with raised intra-abdominal pressure in severe acute pancreatitis have longer duration of in-hospital and Intensive care unit stay, local and systemic complications and more invasive treatments [2–4]. But whether intra-abdominal hypertension is the cause of organ failure or an epi-phenomenon is not clear [5].

The APACHE II takes into account, a total of 12 parameters, the core body temperature, blood gases, serum electrolytes, mean arterial pressure, heart rate and respiratory rate and the Glasgow coma scale of the patient. Higher scores are consistently associated with poor prognosis. A score of >10 is associated with increased mortality. In our study, a score of 13 or higher, especially on day 5 is associated with death. CT severity index is also a sensitive index predicting mortality. A severity index of 7 to 10 is associated with 17% mortality. In our study, a CT severity index of $\geq$8 was associated with mortality. Three patients with CT severity index of 8 survived.

Intra-abdominal pressure was significantly elevated right from admission in patients who died. But patients with high intra-abdominal pressures at admission, which normalized towards 72 hours survived. Twelve of the fifty-five patients had Intra abdominal pressure at admission of $\geq$12. But high intra-abdominal pressure at 72 hours was associated with 100% mortality. This correlated well with high APACHE II scores. Among the non survivors, there was no disparity between the APACHE II, CT severity index and the intra-abdominal pressure. In one study, the maximum IAP was significantly higher in patients who died, who required

Independent variables	Coefficient	Std. Error	$r_{partial}$	t	P
(Constant)	-0.2221				
AGE	0.0005067	0.001236	0.1353	0.410	0.6915
amylase	0.000002296	0.00001242	0.06154	0.185	0.8574
lipase	-0.00001660	0.00001536	-0.3389	-1.081	0.3080
APACHE_II	-0.01569	0.007788	-0.5575	-2.015	0.0747
APACHE_II_5	0.03308	0.01760	0.5310	1.880	0.0928
INTRA-ABDOMINAL PRESSURE at Admission	-0.005319	0.008741	-0.1988	-0.609	0.5579
INTRA-ABDOMINAL PRESSURE_12	0.01591	0.01251	0.3903	1.272	0.2353
INTRA-ABDOMINAL PRESSURE_24	-0.01724	0.007328	-0.6170	-2.352	0.0431
INTRA-ABDOMINAL PRESSURE_36	-0.005517	0.01787	-0.1024	-0.309	0.7646
INTRA-ABDOMINAL PRESSURE_48	0.01464	0.01732	0.2711	0.845	0.4200
INTRA-ABDOMINAL PRESSURE_60	0.02074	0.02189	0.3011	0.947	0.3683
INTRA-ABDOMINAL PRESSURE_72	-0.07043	0.03061	-0.6086	-2.301	0.0469
INTRA-ABDOMINAL PRESSURE_84	0.04354	0.02976	0.4384	1.463	0.1774
INTRA-ABDOMINAL PRESSURE_96	0.001729	0.02650	0.02173	0.0652	0.9494
INTRA-ABDOMINAL PRESSURE_108	0.03740	0.02414	0.4589	1.549	0.1557

Table 1: Regression Equation Of independent variables

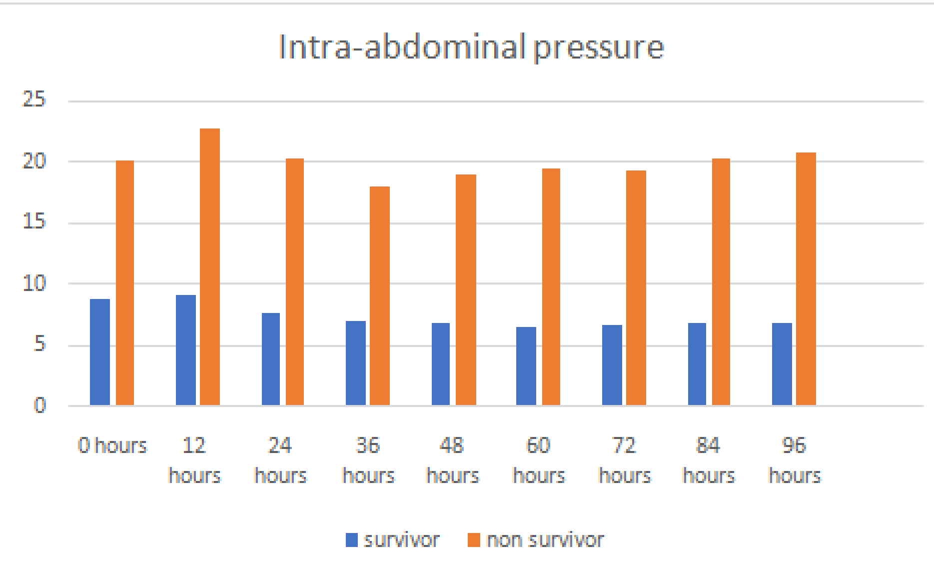

Figure 1: Intra abdominal Pressure changes

higher doses of inotropes and who developed multi organ failure [6].

Intra-abdominal pressure being easy to measure, less cumbersome to calculate than APACHE II (requires online calculators), and CT severity index (dependent on Radiologist) is the prognostic indicator of our choice. However, we feel the need of more RCTs to confirm the same.

There is no consensus on the management of SAP patients with ACS [7, 8]. Initially managed medically with relief of pain and anxiety, nasogastric decompression (no recommendation as per WSACS guidelines) neuromuscular blockade (Grade 2C recommendation) and raising the head end of the bed by not more than 30 degress (Grade 2C recommendation). When these measures fail, intervention technique of placing abdominal drainage catheter percutaneously under radiological control in those with intraperitoneal fluid, abscess or blood is recommended (Grade 2C). when these measures fail, surgical decompression is recommended (Grade 1B). The same can be done presumptively when multiple risk factors are present upon admission in ICU (Grade 1C). one porcine model recommends decompression at intra-abdominal pressure of 25 mm Hg, which resulted in significantly reduced mortality, improved hemodynamics and organ function [9]. Guidelines [10] recommend invasive (surgical) decompression of abdomen at intra-abdominal pressure of 25 mm Hg.

Patients when admitted to ICU, should be screened for risk factors for IAH/ ACS in the presence of new or progressive organ failure (Grade 1B). if two or more risk factors are present, baseline intra-abdominal pressure is recommended (Grade 1C).

Because of its ease of measurement, reproducibility, intra-abdominal pressure can alone be recommended as a prognostic factor in SAP and has an added advantage that it can be useful to guide intervention.

Even though the study is about 10 years old, currently, there are no publications comparing intra-abdominal pressure as a single most prognostic indicator, compared to APACHE II or other prognostic indicators. We therefore strongly believe that our study stands the test of time and is relevant even today.

CONCLUSION:

The APACHE II score involves a range of clinical entities in predicting the prognosis of severe acute pancreatitis. Intra-abdominal pressure is comparable as a single parameter. We therefore recommend routine measurement of intra-abdominal pressure not only as a prognostic indicator, but also for timing intervention. But this being a small study, larger randomized controlled trials are required to validate further.

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How to cite this article: Popuri M, Sistla VC. **Intra-abdominal Pressure as a Prognostic Factor in Severe Acute Pancreatitis**. Perspectives in Medical Research. 2022;10(1):99-102
DOI: 10.47799/pimr.1001.19