

INTRA-ABDOMINAL PRESSURE AND PROCALCITONIN AS MARKERS IN PREDICTING THE EVOLUTION OF ACUTE PANCREATITIS

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Keywords: acute pancreatitis, intra-abdominal pressure, procalcitonin
Abstract: Acute pancreatitis is one of the main causes of intra-abdominal high pressure and intra-abdominal compartment syndrome. The aim of this study is to identify the correlation between procalcitonin (PCT) and intra-abdominal pressure (IAP) and to demonstrate their importance in the prediction of the severity of acute pancreatitis. To classify the severity of acute pancreatitis we used as prognostic indicators Ranson score and Apache II score.

Cuvinte cheie: pancreatita acută, hipertensiune intraabdominală, procalcitonină
Rezumat: Pancreatita acută este una dintre principalele cauze de hipertensiune intraabdominală, de sindrom de compartiment intraabdominal. Scopul acestui studiu este de a identifica corelația dintre procalcitonină (PCT) și presiunea intraabdominală (PIA) și de a demonstra importanța lor ca markeri în predicția severității pancreatitei acute. Pentru a clasifica severitatea pancreatitei acute am folosit ca și indicatori de prognostic scorul Ranson și APACHE II.

INTRODUCTION

High intra-abdominal pressure is defined as a sustained or repeated pathologic increase in IAP >12 mmHg.(1) The mechanisms of the growth of the intra-abdominal pressure in acute pancreatitis include the growth of the capillary permeability caused by sepsis, hypoalbuminemia, with the expansion of the third space, with retroperitoneal and visceral oedema.(2) The patient with IAP < 14 mmHg tend to develop mild pancreatitis, while the patients with IAP > or equal to 14 mmHg develop severe acute pancreatitis.(2) The decrease of sanguine flow in mesenteric artery, next to the intra-abdominal pressure leads to alteration of the intestinal barrier with ischemia, reperfusion, bacterial translocation and suprainfectum of the pancreatic and peripancreatic necrosis.(3)

Procalcitonin (PCT) represents an important marker to identify the severe forms of acute pancreatitis.(4) Value of PCT 2-10 ng/ml signifies the presence of the sepsis with high risk of evolution to severe sepsis. PCT > 10 ng/ml signifies the presence of severe sepsis or septic shock.(5)

PURPOSE

The aim of this study is to identify the correlation between procalcitonin (PCT) and intra-abdominal pressure (IAP) and to demonstrate their importance in the prediction of the severity of acute pancreatitis.

METHODS

The study was approved by the Ethic Board of County Clinical Emergency Hospital Sibiu. It is a prospective, double blind, randomized study. In this study were included 48 patients admitted in Surgical Clinics and ICU of the Clinical Emergency Hospital County Sibiu, during the period Oct. 2011 – Jan. 2013. The patients have been evaluated by score systems Ranson and APACHE II (used as prognosis indicators) and measurement of IAP and PCT. From the total of 48 patients, 26 patients developed severe acute pancreatitis (evaluated by Ranson score > 3, and APACHE score > 8).

Intra-abdominal pressure (IAP) was measured by the technique described by Kron. et al.(6) To determine IAP, we used a catheter inserted into the bladder, connected to a pressure transducer. Fifty millilitres of 0,9% NaCl was instilled in bladder and the pubic symphysis was considered level 0. The IAP was determined every 24 hours during hospitalization. Maximum IAP was defined as the highest pressure reached in all measures. IAP was compared to the following variables: Ranson's criteria, Apache score at admission and at 72 hours, serum procalcitonin levels, presence of septic complications, intra-abdominal collections, presence of systemic inflammatory response syndrome (SIRS) or multiorgan failure (MOF).

Procalcitonin (PCT) was measured with a significant method, using BRAHMS kits. The procalcitonin was measured three times during the first week and three times during the second week, while the intra-abdominal pressure has been daily measured. Statistical analysis was performed with the SPSS v.11.5 program. Quantitative variables were expressed as the mean and standard deviation (SD). Statistical analysis of the quantitative variables was carried out with either the Student *t* test or the Mann-Whitney *U* test if applicable. The results of the statistical tests were presented as the mean +/- SD (standard deviation). A *p* value < 0,05 was considered to be statistically significant.

RESULTS

A total of 48 patients with acute pancreatitis were included in our study. From the total of 48 patients, 25 patients were developed severe acute pancreatitis, evaluated by Ranson score >3 and Apache II score >8. Table no. 1 shows the demographic and clinical data of these patients.

Table no. 1. Demographic and clinical variables of the whole series

Demographic variables	
Age (years)	60 (21)

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CLINICAL ASPECTS

Gender	28 men/ 20 women
Clinical variables	
Etiology	66% litiazic 30% gallstone-related 4% hypertriglyceridemia
Apache II score at admission	7,2 (6,8)
Apache II score at 72 h	6,4 (4,2)
Ranson score at admission	1,9 (1,2)
Ranson score at 48 h	0,6 (1)

There is a significant relationship between the maximum IAP and prognostic factors (Ranson score, Apache II score).

Table no. 2. Values (x +/- SD) of maximum IAP (mmHg) in relation to the presence or absence of clinical variables

Variables	Presence		Absence		P value
	IAP	n	IAP	n	
Apache II > 8	16 +/- 25	2	10 +/- 23	2	< 0,01
Ranson > 3	15 +/- 28	4	11 +/- 20	4	0,2 (NS)
PCT 2-10 ng/ml	19 +/- 20	5	11 +/- 28	4	< 0,04
PCT >10 ng/ml	19 +/- 9	4	11 +/- 39	3	< 0,03
SIRS	16 +/- 26	2	11 +/- 22	3	< 0,01
MSOF	18 +/- 12	4	11 +/- 36	3	< 0,01

APACHE, *Acute Physiology and Chronic Health Evaluation*; IAP, *intra-abdominal pressure*; SIRS *systemic inflammatory response syndrome*; MOF, *multiple organ failure*; NT, *not significant*; SD, *standard deviation*.

The sensibility/ the specificity for the prediction of the severity of acute pancreatitis after 24 hours since admission were 80% / 66% for PCT and 70% / 75% for IAP.

DISCUSSIONS

In abdominal compartment syndrome, a value of abdominal perfusion pressure (the mean arterial pressure minus intra-abdominal pressure) of at least 60 mmHg have been associated with improved survival in those patients.(1)

Acute pancreatitis is one of the main causes of intra-abdominal hypertension of retroperitoneal origin.(7,8) A major problem in the acute pancreatitis is the anticipation of the complications which appears in acute pancreatitis evolution. The prognosis factors can be with a single variable (PCT) or with several variables (Ranson Score, APACHE Score). The ideal marker must not only be cheap, easy to obtain, but also with a predictable value so that it can be used in therapeutic and diagnosis manoeuvres.(9) The intra-abdominal pressure (IAP) was significantly increased and correlated with prognosis markers (PCT, APACHE II) and less correlated with Ranson score at admission. The predictive value of IAP to the onset of complications, and the relationship between increase IAP and septic complications (expressed by PCT) of pancreatic gland was demonstrated with this study. Patients with maximum IAP 13 mmHg tend to have mild pancreatitis, whereas patients with IAP more or equal with 14 mmHg develop severe pancreatitis.(2)

CONCLUSIONS

The values of PCT and IAP were significant increased in the patients with severe acute pancreatitis, existing a strong

correlation between the values of PCT and IAP at 24 hours after admission and between maximum values of PCT and IAP.

The growth of IAP was accompanied by the growth of serum concentration of PCT in patients with severe acute pancreatitis. A significant relationship exists between an increase in IAP and indicators of septic pancreatic processes, intra-abdominal collections.

Procalcitonin and intra-abdominal pressure can be used as early markers to appreciate the severity of acute pancreatitis.(4)

REFERENCES

- Papavramidis TS, Marinis AD, Pliakos I, Kesisoglou I and Papavramidou N. Abdominal compartment syndrome – Intra-abdominal hypertension: Defining, diagnosing, and managing. *J. Emerg Trauma Shock* 2011;279-29.
- Hidalgo Rosas JM, MD, Navarro Soto S, Serra Araciel S, MD, Rebasa Cladera P, MD. Intra-abdominal pressure as a marker of severity in acute pancreatitis. *Original Communications, Barcelona, Spain; 2006.*
- Diebel LN, Dulchavsky SA, Wilson RF. Effect of increased intra-abdominal pressure on mesenteric arterial and intestinal mucosal blood-flow. *J Trauma* 1992;33:45-9.
- Bezmarevic M, Mirokovic D, Soldatovic D, Mitrovic N, Perisic N, Marjanovic I, Mickovic S, Karanikolas M. Correlation between procalcitonin and intra-abdominal pressure and their role in prediction of severity of acute pancreatitis. *Pancreatology; 2012. p. 337-43.*
- B.R.A.H.M.S – PCT – Q - Rapid diagnosis of septic infections; 2012.
- Kron IL, Harman PK, Nolan SP. The measurement of intra-abdominal pressure as a criterion for abdominal re-exploration. *Ann Surg* 1984;199:28-30.
- De Waele JJ, Haste E, Blot S, Decruyenaere J, Colardyn F. Intra-abdominal hypertension in patients with severe acute pancreatitis. *Crit Care* 2005;9:452-7.
- Pupelis G, Austrums E, Snippe K, Berzins M. Clinical significance of increased intra-abdominal pressure in severe acute pancreatitis. *Acta Chir Belg* 2002;102:71-4.
- Windsor JA. Search for prognostic markers for acute pancreatitis. *Lancet* 2000;355:1924-5.