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ABDOMINAL COMPARTMENT SYNDROME IN PATIENTS WITH ABDOMINAL SEPSIS

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Abstract

Investigations were carried out in 53 patients who were operated on in 2015 about abdominal sepsis (AS). All patients were assigned according the severity of the condition, which was determined depending on the severity of the systemic inflammatory response and multiple organ failure: I group - patients with AS (28); II group - patients with severe AS (14); III group - patients with septic shock (11). Surgical management of all patients included two major components: control source of infection (source control) and control of organ damaged and the protective mechanisms system (damage control). In the first group, the laparotomy ended by suturing the wounds tightly with traditional drainage; in groups II and III surgical treatment were supplemented by the use of techniques aimed at the prevention and reduction of elevated intra-abdominal pressure. Studies have shown that 100 % of patients with AS showed an increase in intra-abdominal pressure and the development of intra-abdominal hypertension. While ACS developed in 18.9 % of cases (4 patients with severe sepsis and 6 - with septic shock). The highest mortality rate was observed among patients with grade III and IV intra-abdominal hypertension (11 of 25 patients).

Key words: **intra-abdominal pressure, abdominal sepsis, abdominal compartment syndrome, treatment.**

The Abdominal Compartment Syndrome is aset of symptoms, developing due to the increase of pressure in the abdominal cavity and characterized by the further development of multiple organ insufficiency. According to the World Society of the Abdominal Compartment Syndrome, WSACS, intra-abdominal hypertension is a temporary or constant pathological increase of intra-abdominal pressure to the level of 12 mm Hg or more. The intra-abdominal hypertension is a widespread syndrome for patients who are in a critical condition, the syndrome displays that intra-abdominal hypertension arises only when pressure in the closed abdominal cavity raises to a specific value which interrupts normal blood supply to the internal organs [1]. Until now, the value of this pressure is not understood as the main point, because the level of complications due to high intra-abdominal pressure depends on the physiological peculiarities of an individual organism.

The aim of this investigation was to study the dynamics of intra-abdominal pressure for patients with abdominal sepsis (AS), with evaluation of the estimated course of this pathological condition.

Materials and methods. For understanding the influence of intra-abdominal hypertension, the result of treatment for patients with AS was done, in which the investigation of 53 patients that had an operation in 2015 for peritoneal and pancreatogenic AS. All the patients were distributed on the severity of their condition, which depended on expressiveness of the inflammatory reaction system and multiple organ insufficiency (table 1): I group – patients with AS, II group – patients with severe AS, III group – patients with septic shock.

The philosophy of surgery conducts all patients to include two basic components: control source of infection (source control); control of organ damaged and the protective mechanisms system (damage control). The first group included 28 patients and at the end by laparotomy with wound closing and traditional drainage; the second group included 14 patient with severe AS; and the third group included 11 patients with septic shock. The last two groups of patients had surgical treatment for decreasing intra-abdominal pressure (IAP), prophylaxis and treatment of ACS eby using a semi-open method and closing the laparotomy wounds with special stiches (10 patients) and an open method which used temporary methods of closing the abdominal cavity by technology for carrying out VAC therapy (15 patients) [2]. At the level of estimation for IAP, WSACS classification has been used and accepted by the consensus in 2007: I-st degree of IAP can be registered at pressure of 12-15 mm Hg; II-nd degree - 16-20 mm Hg; III-rd degree - 21-25

mm Hg; IV-th degree-> 25 mm Hg. At IAP-> 20 mm Hg, is associated with multiple organ insufficiency, and we find plausible cause to talk about ACS [3].

Table 1

Demographic, clinical and laboratory characteristics of patients with AS at the first 96 hours after the beginning of a disease

Parametres	I group (n=28)	II group (n=14)	III group (n=11)	p
Age	49,8±2,3	50,1±2,6	49,4±3,1	0,5
Male	21	12	7	—
Female	8	2	4	—
Diffuse purulent peritonitis	19	8	9	—
Infected pancreonecrosis	9	6	2	—
Level of leukocytes, 10^9/л, control – 6,5±0,8	14,9±1,2	16,4±1,4	22,1±2,1	0,05
C-reactive protein, мг/мл, control– 2,4±0,3	87,8±19,3	193,6±24,5	237,5±39,2	0,05
IL-6, пкг/мл, control – 2,8±0,6	42,9±8,8	126,4±28,6	245,5±31,3	0,05
APACHE II scale	13,1±1,4	18,1±2,4	25,4±2,3	0,05
SOFA scale	9,6±0,99	12±1,1	15,1±1,7	0,05
Relaparotomy:				
according program				
- «semi-open » technique	—	6	4	—
- «open» technique	—	8	7	—
number of the dyed patients	—	4	7	—

$\chi 2$=30,026, p=0,000

Terms of investigation: before the operation, every 6 hours after the operation for 24 hours, and further more within first 3-4 days of the early postoperative period of all patients. For diagnosis of intra-abdominal hypertensive syndrome, we used an algorithm that is adapted to the specific conditions of our clinic; it identifies risk factors by the evaluation of chances of the latter by employing mathematical methods (fig. 1).

Result of investigation and discussion. With AS 36 operations were performed when the cause was acute peritonitis, 17 operations when the cause was acute necrotic infected pancreatitis. Of them 28 patients showed signs of sepsis, 14 with severe sepsis and 11 with septic shock.

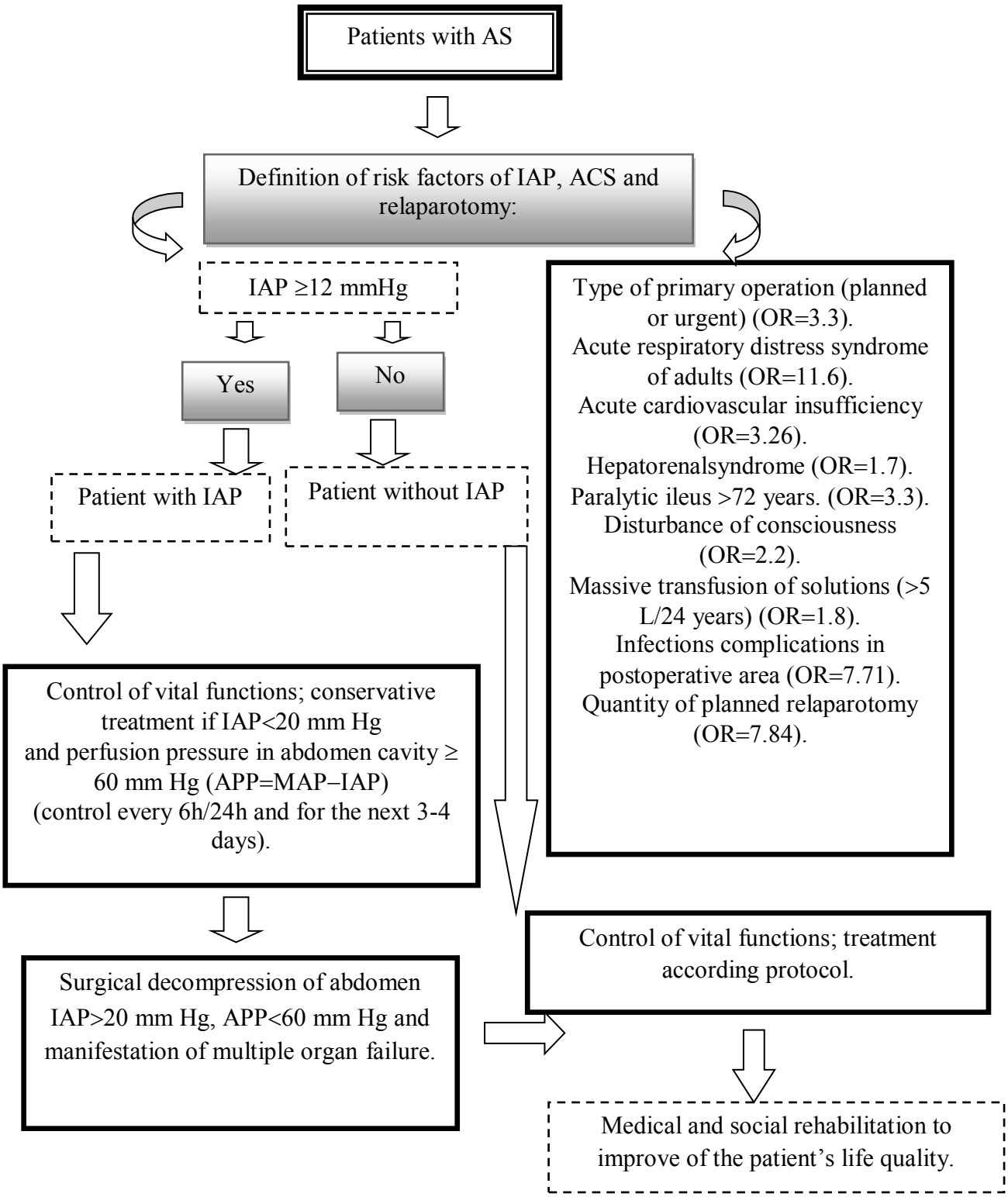

Figure 1. Algorithm for diagnostic and treatment of IAP and ACS.
(APP – Abdominal Perfusion Pressure: APP=MAP–IAP; MAP – Mean Arterial Pressure: APdiastolic pressure + 1/3 APpulse pressure, APpulse pressure = AP systolic pressure – APdiastolic pressure; IAP – Intra Abdominal Pressure; OR – odds rate.

The use of "semi-open" treatment technique has been provided to each patient, ranging from 1 to 5 sanitation of the abdominal cavity for the period 7±1,5 days, and the use of an "open" technique ranging from 1 to 4 planned sanitation of the abdominal cavity. After which, on the 4±1,2 days, the skin flab excluding the tension of muscular-aponeurotic was taken only.

The patients of I-st group (AS) after admission to the hospital with levels of intra-abdominal pressure (IAP) had an average of 14,6±2,3 mm Hg, this corresponded to I-st degree of hypertension development in the abdominal cavity. In the first day, the pressure in abdominal cavity dubiously decreased, but on the second day there was a noticeable increase in pressure that averaged to 18,4±2,9 mm Hg that corresponded to hypertensive development in the abdominal cavity of II degree. In the 3rd-4th days of the postoperative period, the abdominal cavity pressure has decreased and has averaged to 11,4±1,9 mm Hg. Wherein, the average value of indicators showed that the perfusion pressure of the abdominal cavity before operation had become 72,4±6,9 mm Hg, on the 2nd day after operation - 76,3±7,2 mm Hg, and for the 3rd-4th days - 74,8±6.1 mm Hg. Thus, in early periods after operation, the indicator APP did not go below 60 mm Hg, which testifies that this is the adequate level of perfusion of the organ in the abdominal cavity during with the correction of hypovolemia.

In the patients suffering from severe AS, the value of IAP before operation significantly did not differ among themselves and remained on the average in limits of 19,8±3,9 mm Hg and 20,3±2,2 mm Hg with patients on whom "semi-opened" (6 patients) and "opened" (8 patients) techniques of surgical treatment had been applied, respectively. Wherein, average indexes APP before operation were accordingly 53,7±3,1 mm Hg and 52,4±3,5 mm Hg. Reference values of IAP corresponded to the development of II and III degrees of the intra-abdominal hypertension where as; there was a decrease in perfusion of internal organs in a majority of the patients. On the 3^{rd}-4^{th} days after operation, average values of IAP accordingly summed up to 21,8±2,1 mm Hg and 11,2±1,6 mm Hg; and the average values of the data of perfusion pressure in the abdominal cavity, in these terms of research, have scored 65,2±2,6 mm Hg and 76,8±3,1 mm Hg, accordingly. This testifies to the preservation of adequate levels of perfusion of the organs in the abdominal cavity, in majority of patients with severe AS (fig. 2).

The septic shock data of IAP from the patients who was admit to the hospital significantly did not differ among themselves, and on the average were 22,7±3,3 and 23,2 ±2,9 mm Hg, in

respect to patients who had been provided with "semi-open" techniques of surgical treatment (4), and to patients on whom "open" techniques of surgical treatment (7) have been applied.

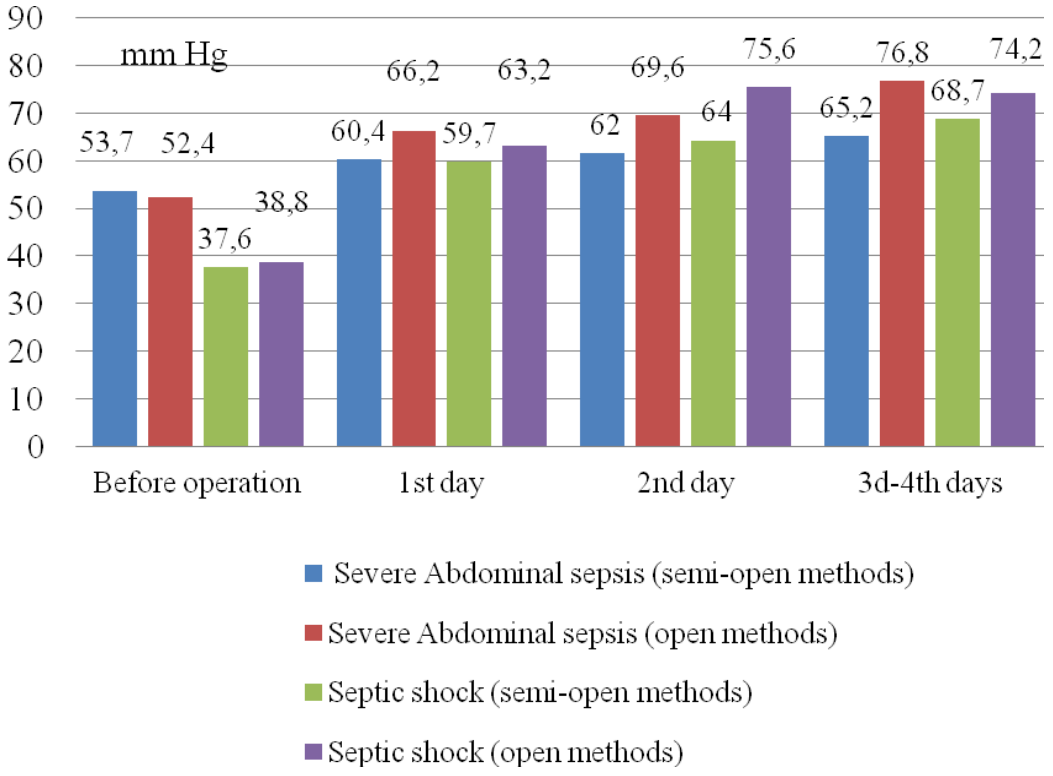

Figure 2. Dynamic of change of perfusion pressure of abdominal cavity in patient with severe asepsis and septic shock

Wherein average values of data of APP before operation have accumulated to 37,6±1,3 and 38,8±1,6 mm Hg respectively (fig. 2). Thus, the patients who were investigated, showed development of intra-abdominal hypertension of III-rd and IV-th degrees and disorders of perfusion in the internal organs. In a 3-4 days after operation, the patients who received "semi-open" surgical techniques; the level of IAP rose up to 21,8±3,3 mm Hg with average indexes of APP being 68,7±2,1 mm Hg. Patients with septic shock who received treatment with the use of "open" surgical techniques, the average index of IAP at 3rd-4th days of the postoperative period were 12,8±2,3 mm Hg, and adequate perfusion of the organs in the abdominal cavity was observed (74,2±2,7 mm Hg).

The conducted researches have shown that abdominal sepsis in patients who were investigated, in 100 % of cases it is combined with increase of intra-abdominal pressure and development of intra-abdominal hypertension. Where in the syndrome of intra-abdominal hypertension has developed in 18,9 % of cases of patients whom were analyzed (4 patients withsevere sepsis and 6 patients with septic shock). Increase of intra-abdominal pressure in patients with AS can be one of the pathological results of systemic inflammation and can lead to occurrence of irreversible morphological-functional changes in vital organs and further systemic changes caused mechanical and humoral factors as a result of influences of raised intra-abdominal pressure. Using laparostomy for the treatment of patients promotes authentic decrease of intra-abdominal pressure in the postoperative period. It is necessary to notice that a technique of treatment of the most severe category of patients (the severe AS and septic shock) which is analyzed, namely - application of the "semi-open" or "open" method of surgical treatment, authentically did not influence their survival (criterion of Gehan's with the amendment of Jets's: p=0,408, z=0,781, p=0,435) (fig. 3).

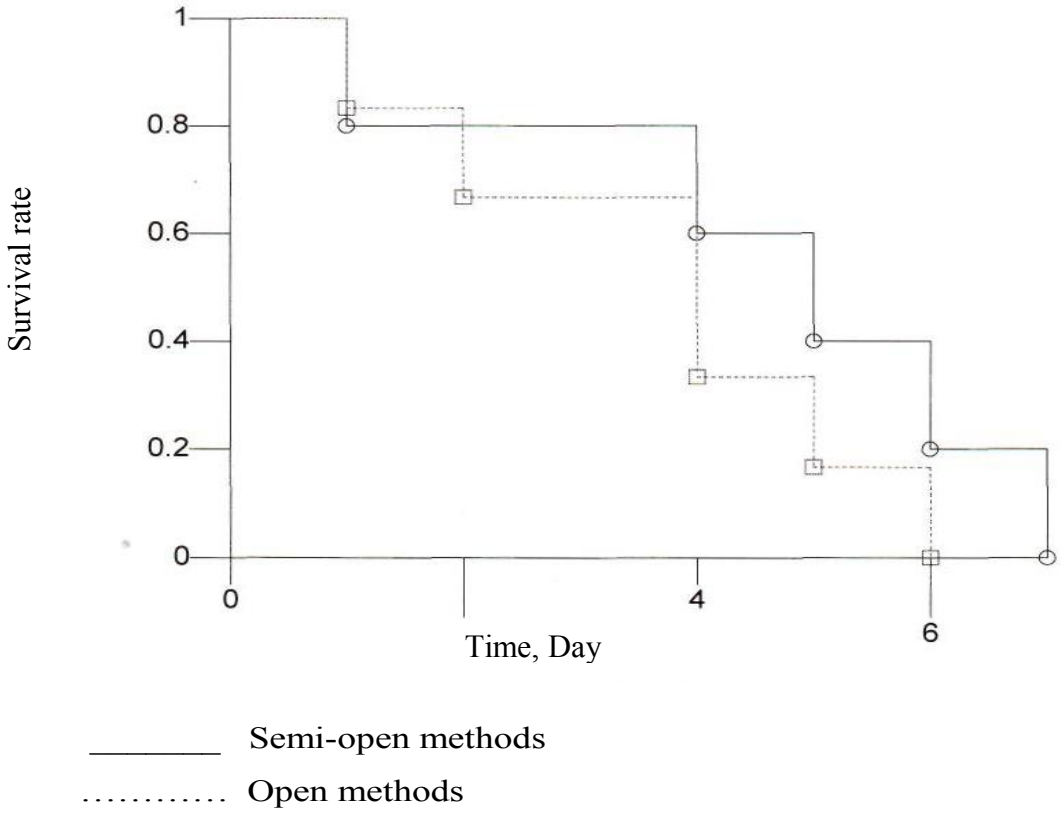

Figure 3. Graph of survival of patients with severe abdominal sepsis and septic shock.

Wherein, the greatest mortality was observed among patients with III and IV degrees of intraabdominal hypertension (11 out of 25 patients), and this syndrome is the independent factor of patients mortalitywith AS.

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