МЕДИЦИНА НЕВІДКЛАДНИХ СТАНІВ ®

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Clinical efficacy of different infusion regimens in high surgical risk patients with urgent abdominal pathology

Abstract. ***Background.*** *Long-term inpatient treatment and associated significant mortality are specifically attributed to urgent surgeries, 53 % of which are accounted for acute surgical pathology. The prolonged postoperative ileus is considered as one of the most severe complications. The purpose: to assess the efficacy of restrictive and goal-directed regimens of infusion therapy based on comparative analysis of clinical resolution of postoperative motor bowel disorders in high surgical risk patients with urgent abdominal pathology.* ***Materials and methods.*** *We examined 80 patients with urgent abdominal pathology. All patients underwent emergency laparotomy and were divided into 2 groups. In the first one (n = 40), the persons received goal-directed infusion therapy. The patients of the second group (n = 40) received infusion therapy in restrictive regimen. We measured fluid compartments of the body by the method of noninvasive bioelectrical impedance analysis of the body structure, function of gastrointestinal tract — by clinical implications, intra-abdominal pressure and ultrasound visualization of the intestinal wall condition.* ***Results.*** *Goal-directed infusion therapy formed the interstitial edema on the 1st day ($p < 0.04$), it correlated with an increase in the small intestine wall thickness ($R = 0.86$, $p = 0.02$), hyperextension of intestinal loops ($R = 0.65$, $p = 0.02$) and progression of intra-abdominal hypertension degree 1. Clinical recovery of gastric emptying occurred in 45 % patients within 5 postoperative days. In 55 % of patients, we observed prolongation of postoperative ileus. Restrictive regimen of infusion therapy was associated with physiological volume of interstitium during the whole period of observation, restoration of thickness ($p < 0.02$) and diameter ($p < 0.01$) of the small intestine from the 3rd day, absence of intra-abdominal hypertension signs. Autonomous defecation was observed from the 5th day in 70 % of patients.* ***Conclusions.*** *Goal-directed regimen of infusion therapy in high surgical risk patients with urgent abdominal pathology was accompanied by progression of interstitial edema on the 1st day, intra-abdominal hypertension degree 1 during two days, prolongation of postoperative ileus to the 7th day after surgery. Restrictive regimen of infusion in the perioperative period in high surgical risk patients with urgent abdominal pathology allows us to prevent the development of interstitial edema and intra-abdominal hypertension and reduce the terms of full recovery of gastric emptying to 5 days.*

Keywords: *urgent surgery; high surgical risk; regimen of infusion therapy; postoperative intestinal obstruction; intra-abdominal hypertension; sonographic diagnosis*

Introduction

Long-term inpatient treatment and significant mortality are specific to urgent surgeries, 53 % of which are accounted for acute surgical pathology. It is due to limitation of time for examination and services on necessary preoperative preparation of the patient, poses a threat of undertriage and is accompanied by high frequency of post-surgery complications. The prolonged postoperative ileus (POI) is considered as one of the most severe complications. Progression of POI significantly extends the length of stay in the intensive care unit and at the inpatient department, increases the cost of treatment, and is associated with risk of delayed mortality [1–6].

Postoperative ileus develops in post-surgical period and is characterized by delay of coordinated intestinal motility, which obstructs the efficient gastric emptying

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and/or oral administration of fluid and food. Time of post-surgical functional recovery of stomach is 24–48 hours, small intestine — 24, large intestine — 48–72 hours [5]. Validity of ileus symptoms with no evidence of mechanical obstruction for more than three-five days after surgery is interpreted as progression of POI, the incidence of which is 10–40 % in elective abdominal surgeries [6]. Urgent surgeries, age of patients, severity of co-morbidity increase the risk of postoperative ileus progression. The latter is characterized by several mechanisms, one of which is water and sodium retention as response to surgical aggression. It causes edema of interstitial tissue and activation of Na^+/H^+ exchanger, which additionally decreases contractility of the intestinal tract muscular tissue and inhibits its peristalsis [6]. The fatal results of interstitial edema and paralytic changes of intestine are formation of abdominal compartment syndrome/intra-abdominal hypertension (IAH) in combination with multiple organ dysfunction/failure and increased mortality. Severity of multiple organ disorders straightforwardly depends on the degree of intra-abdominal hypertension. There is mild, moderate and severe intra-abdominal hypertension corresponding to the values of intra-abdominal pressure (IAP) of 10–20, 21–35 and more than 35 mm Hg [4]. For this reason, one of the main tasks of intensive care or pre-surgical period in patients with urgent abdominal pathology is prevention of interstitial edema progression, when fluid replacement is needed. There are several regimens of infusion therapy (IT), such as liberal, restrictive and goal-directed. Over the last years, the restrictive and goal-directed infusion therapies are ones of the safest regimens of fluid resuscitation in patients at high surgical risk [7].

The purpose: to assess the efficacy of restrictive and goal-directed regimens of infusion therapy based on comparative analysis of post-surgical solution of gastrointestinal motility disorders in high surgical risk patients with urgent abdominal pathology.

Materials and methods

A prospective observational study was conducted on the basis of anesthesiology and intensive care department no. 2 and three surgery departments of Clinical Association "Emergency Health Service" of Dnipropetrovsk Municipal Council. On approval of ethics committee of State Institution "Dnipropetrovsk Medical Academy of the Ministry of Health of Ukraine", we examined 80 patients, 41 (51 %) men and 39 (49 %) women, with urgent abdominal pathology, who underwent emergency laparotomy. Middle age of patients was 71 [Me 61 : 75] years. Surgical pathologies were as follows: acute intestinal obstruction (n = 40), perforated gastric and duodenal ulcer (n = 9), strangulated hernia (n = 31).

The study was conducted in accordance with main bioethical standards of World Medical Association Declaration of Helsinki regarding ethical principles of scientific and medical researches with amendments (2000, with amendments 2008), Universal Declaration on Bioethics and Human Rights (1997), Council of Europe Convention on Human Rights and Biomedicine (1997). Each participant received written information consent, and all the precautions on provision of anonymity of patients were taken.

Inclusion criteria: urgent laparotomy; age 45–75 years; level of volume depletion 10–30 % [8]; high degree of surgical risk (predicted occurrence of post-surgical complications and mortality is 50 % and higher on P-POSSUM score) [9]; ASA III; patient's informed consent on participation in the study.

Exclusion criteria: elective surgical interventions; age less than 45 and more than 75 years; level of volume depletion less than 10 and more than 30 %; low, moderate surgical risk (predicted occurrence of post-surgical complications and mortality is less than 50 % on P-POSSUM score); gastrointestinal hemorrhages; volume of preoperative blood loss is higher than level I by Briusov [8]; ASA I–II–IV; patient's refusal to participate in the study.

Using sealed envelope method, the patients were divided into 2 groups. In the first one (n = 40), the persons received goal-directed infusion therapy. The patients of the second group (n = 40) received infusion therapy in restrictive regimen. The groups were representative by age, gender-based distribution, nature of surgical and comorbid somatic pathology.

Preoperative preparation of all the patients was conducted in the conditions of intensive care unit according to protocol of the Ministry of Health of Ukraine no. 297 (02.04.2010) [8]. According **to goal-directed therapy protocol**, before the surgery subjects underwent initial haemodynamic examination based on stroke volume (SV), cardiac index, and mean arterial pressure. After evaluation of fluid responsiveness by passive leg raising, fluid responsiveness was reconfirmed by infusion loading with crystalloid solution and determining the maximum increase in SV. Subjects were given 500 ml boluses of balanced crystalloid solution. If we observed fluid responsiveness in the form of SV increase by 10 % or more, 500-ml fluid challenge was repeated until SV failed to increase by 10 %. In this situation, preload was considered optimized, SV was determined and used as the haemodynamic goal. Subsequently, the patients were treated according to restrictive regimen of infusion therapy. Persons with fluid resistance, in the setting of restrictive regimen of infusion therapy, received dopamine in inotrope dose — 2–10 mkg/kg^{-1}/min^{-1} to reach a minimum cardiac index of 2.5 L/min/m^2 as an alternative to prevent low cardiac output. When SV was optimized and cardiac index was within the target range, but mean arterial pressure was < 65 mm Hg, dopamine was given in vasopressor dose — 11–15 mkg/kg^{-1}/min^{-1} [10]. Restrictive regimen of infusion therapy allowed us to take into account pre-surgical deficiency of fluid in patients and basic physiological requirement, injury rates of surgical aggression, preoperative and postoperative pathologic losses [11]. We used balanced crystalloid solutions.

A total calculated volume of infusion was administered according to the following phases: rescue, optimization and stabilization (Table 2) [12]. Rescue phase lasted for 1 hour, conformed with the time of preoperative preparation and comprised 25 % of the calculated

Table 1. Calculation of infusion volume in restrictive regimen

Infusion therapy regimen	Level of volume depletion, %	Fluid volume per day (ml/kg*/day)	Average rate of fluid administration (ml/kg*/h)
Restrictive	20	50 ± 10	1.6–2.5

Note: kg* — ideal body weight in patients.

Table 2. Calculation of infusion volume according to infusion therapy regimen and phase, ml/kg/h

Phase regimen	Restrictive regimen of infusion therapy
Rescue (25 % of the calculated volume of infusion, 1 hour)	10–15
Optimization (25 % of the calculated volume of infusion, 2 hours)	5–7.5
Stabilization (50 % of the calculated volume of infusion to the end of day 1)	1.6–2.0

volume of infusion. Optimization phase lasted for the following 2 hours and included preoperative period. In this phase, we administered 25 % of the calculated volume of infusion and restored preoperative losses. In the stabilization phase, we administered the rest of calculated 50 % infusion volume, increasing it to the volume of identified pathologic losses to the end of the first day of treatment.

We started **de-escalation** phase from the 2nd day of postoperative period by combining intravenous and oral administration of fluids. Daily fluid requirement included the above calculations according to the regimen of infusion therapy and pathological losses. On the 2nd day of postoperative period, water was administered orally at a rate of 20 ml/h, from the 3rd day — up to 40 ml/h, with maximum volume of up to 70 ml/h. Volume of intravenous infusion was reduced in accordance with oral administration. The contraindication to oral administration of fluid was remaining gastric volume (ReGV) more than 300 ml in 6 hours.

Such indicators of the body fluid compartments as the extracellular fluid (ECF), intracellular fluid (ICF), the total volume of fluid (TVF), the plasma volume (PV), intra-vascular volume (IVV) were measured by the method of noninvasive bioelectrical impedance analysis of the body structure with the Diamant monitor complex. In view of basic physiology of fluid distribution among fluid compartments of the body, we calculated interstitial volume (IV) as difference between extracellular and vascular volumes [13]. Gastric emptying was assessed on the basis of clinical implications: nausea, vomiting, abdominal distension, flatulence, autonomous evacuation, and also identification of IAP and remaining gastric volume. Intra-abdominal pressure was measured using indirect vesical administration of 25 ml of sterile isotonic solution, then the patient was in supine position for 30–60 seconds. We considered midaxillary line as zero point. We achieved the result in centimeters of water and converted millimeters of mercury by formula [8]:

$$1\ mm\ Hg = 1.36\ cm\ H_2O.$$

We identified intra-abdominal hypertension, IAP was measured twice and exceeded the norm during 12 hours. Using sonographic apparatus Mindray DP 6600, we assessed the presence of free fluid in the abdominal cavity, the nature of peristalsis, diameter of small intestine (DSI) and thickness of the intestinal wall (TIW) [14, 15].

Points of follow-up: preoperatively; 1st, 2nd, 3rd, 5th and 7th days postoperatively.

Statistical analysis of results was conducted using package MS Excel 2007, Statistica v6.1 (license no. AJAR909E415822FA). The results were represented as M ± m, we considered level $p < 0.05$ as statistically significant. In order to assess the interaction between the signs, we used correlation analysis with calculation of Spearman's rank correlation (R).

Results

According to the preset principle, the patients of both groups were assigned as moderate grade of intravascular volume depletion/moderate hypovolemia. Our results revealed the redistribution of fluid between all of the fluid compartments (Table 3). There were no differences in absolute values of ECF and ICF. So, the ECF decreased consequently due to the volume of circulating blood, namely, by reducing the plasma volume (85.1 % of the norm; $p < 0.02$). We did not detect intracellular dehydration (95.5 % of the norm; $p > 0.05$), but the patients with high surgical risk had a decrease in circulating blood volume due to plasma volume reduction. So, extracellular volume comprised 80 % ($p < 0.05$) of the norm and did not differ statistically between the groups. Reduction of volume of plasma by 15 % ($p < 0.05$) of the norm formed 17% deficit of intravascular sector ($p < 0.05$) without relevant difference between the groups. Interstitial volume comprised 79 % of the norm ($p < 0.05$). There was moderate volume depletion followed by reduction of TVF by 10 % from the norm ($p < 0.05$) in both groups of patients without signs of dehydration.

We found preoperative gastrointestinal motility disorder followed by complaining of nausea in 68 patients (85 %), vomiting — in 50 (63 %), sonographically identified pathologic pendular movements, thickening of intestinal wall by 16 % ($p < 0.04$) of the norm, hyperextension of intestinal loops by 75 % ($p < 0.001$) of the norm. IAP comprised 110 % ($p < 0.05$) of the norm (Table 4).

Goal-directed regimen of IT in patients with urgent abdominal pathology was followed by an increase in interstitial edema by 14 % ($p < 0.02$) on day 1 after surgery. Reduction of interstitial edema to the level of norm was observed on the 2nd day, whereas values of IV did not differ significantly compared to the norm, and we observed this during further postoperative period. Regression of interstitial edema was consistent with an increase in TIW, whose values exceeded the norm by 56 %, by 40 % compared with the initial level on the 1st day, and had a direct correlation with IV and TIW ($R = 0.86$, $p = 0.02$). Since the 2nd day, values of TIW decreased and comprised 143 % ($p < 0.02$) of the norm, which continued during further days of observation and corresponded to the norm since the 7th day (Table 4). Diameter of intestine has also increased compared to the baseline. The

Table 3. Fluid compartments of the body (L) in different regimens of IT in high surgical risk patients with urgent abdominal pathology

Indicator	Norm	Baseline	1st day	2nd day	3rd day	5th day	7th day
Goal-directed regimen							
ECV	14.1	11.4 ± 0.3*	15.1 ± 0.3*†	14.8 ± 0.2*	12.9 ± 0.1†	12.8 ± 0.2*	13.3 ± 0.3†
ICF	24.9	23.6 ± 0.7	23.7 ± 1.3	24.0 ± 13.0*	23.4 ± 0.9†	24.7 ± 0.7*	23.9 ± 0.4†
TVF	39	35.1 ± 1.0*	38.8 ± 1.1*†	38.8 ± 0.6*	36.3 ± 1.3†	37.5 ± 0.9*	37.2 ± 1.3†
PV	2.7	2.3 ± 0.2*	2.6 ± 0.1	3.0 ± 0.1	2.4 ± 0.1	2.8 ± 0.1	2.4 ± 0.1
IVV	4.9	4.1 ± 0.3*	4.6 ± 0.2	5.2 ± 0.1	4.3 ± 0.1	5.1 ± 0.4	4.5 ± 0.2
IV	9.2	7.3 ± 0.5*	10.5 ± 0.3*†	9.6 ± 0.2*	8.6 ± 0.2†	7.7 ± 0.3*	8.8 ± 0.2
Restrictive regimen							
ECV	14.1	11.4 ± 0.4*	12.8 ± 0.2*†	12.6 ± 0.2*	13.6 ± 0.1†	13.1 ± 0.2*	13.7 ± 0.3†
ICF	24.9	23.7 ± 0.8	23.7 ± 1.3	23.5 ± 1.3*	24.5 ± 0.9†	23.3 ± 0.7*	24.3 ± 0.4†
TVF	39	35.1 ± 1.3*	36.5 ± 1.1*†	36.1 ± 0.6*	38.1 ± 1.3†	36.4 ± 0.9*	38.0 ± 1.3†
PV	2.7	2.3 ± 0.1*	2.7 ± 0.1	2.6 ± 0.1	2.8 ± 0.1	2.7 ± 0.1	2.7 ± 0.1
IVV	4.9	4.1 ± 0.2*	4.6 ± 0.2	4.5 ± 0.1	4.7 ± 0.1	4.6 ± 0.3	4.9 ± 0.1
IV	9.2	7.3 ± 0.4*	8.2 ± 0.3*†	8.1 ± 0.2*	8.9 ± 0.2†	8.5 ± 0.3*	8.8 ± 0.2

Notes: here and in Table 4: * — $p < 0.05$ compared to the norm, † — $p < 0.05$ compared to foregoing phase of observation.

Table 4. Parameters of the gastrointestinal tract in different regimens of IT in high surgical risk patients with urgent abdominal pathology

Indicator	Norm	Baseline	1st day	2nd day	3rd day	5th day	7th day
Goal-directed regimen							
IV, L	9.2	7.3 ± 0.5*	10.5 ± 0.3*†	9.6 ± 0.2*	8.6 ± 0.2†	7.7 ± 0.3*	8.8 ± 0.2
ReGV, ml	300	–	–	420 ± 110*†	290 ± 120*†	300 ± 100†	210 ± 80†
Intestinal evacuation/number of patients	+	–	–	+/1	+/2	+/15	+/22
IAP, mm Hg	5–10	11.3 ± 2.8*	12.6 ± 1.7*†	12.1 ± 1.5*†	11.8 ± 2.9*†	11.2 ± 3.6†	9.4 ± 1.1
TIW, mm	3	3.5 ± 1.2	4.7 ± 0.9	4.3 ± 1.7*†	3.7 ± 1.1*	3.5 ± 1.0*	3.1 ± 1.1*†
DSI, cm	2.4	4.2 ± 1.1*	5.0 ± 1.2*†	4.9 ± 1.1*†	3.2 ± 1.3*†	2.6 ± 1.2*†	2.6 ± 0.8*
Restrictive regimen							
IV, L	9.2	7.3 ± 0.4*	8.2 ± 0.3*†	8.1 ± 0.2*	8.9 ± 0.2†	8.5 ± 0.3*	8.8 ± 0.2
ReGV, ml	300	–	–	380 ± 90*	300 ± 100†	260 ± 50†	160 ± 90
Intestinal evacuation/number of patients		–	–	+/6	+/3	+/19	+/12
IAP, mm Hg	5–10	11.3 ± 2.8	12.1 ± 1.1*	11.9 ± 1.0*	11.3 ± 0.8	10.6 ± 1.2†	8.3 ± 1.0
TIW, mm	3	3.5 ± 1.1	3.9 ± 0.8*	3.7 ± 0.9*	3.6 ± 0.6	3.5 ± 0.8	3.2 ± 0.5
DSI, cm	2.4	4.1 ± 1.3*	4.6 ± 1.1*	4.2 ± 1.3*†	2.9 ± 0.4†	2.7 ± 0.6	2.8 ± 0.6

highest hyperextension of intestinal loops was found on the 1st and the 2nd days after surgery, when values of DSI 2-fold exceeded the norm and comprised 208 % ($p < 0.001$) and 204 % ($p < 0.02$), respectively, and directly correlated with IV ($R = 0.65$, $p = 0.02$). We observed progression of IAH stage 1 from the 1st to the 2nd day of postoperative period. This was followed by increased ReGV on the 1st day. Autonomous defecation was found in 1 patient (2.5 %) on the 1st day, in 2 (5 %) — on the 2nd, in 15 (37.5 %) — on the 5th, in 22 (55 %) on the 7th day after surgery.

When we used restrictive regimen of IT, IV did not exceed the norm during the whole period of observation (Table 3). We found an increase in TIW from the norm by 30 % ($p < 0.04$) and 23 % ($p < 0.05$) in the first two days after surgery with further recovery to the norm on the 7th day. DSI exceeded the norm by 90 % ($p < 0.02$) and 75 % ($p < 0.04$) on the 1st and the 2nd days, respectively, moderately correlated with TIW ($R = 0.51$, $p = 0.02$) and was not associated with IAH. Since the 5th day of postoperative period and further, the mentioned findings did not differ significantly from the norm. The remaining volume of stomach exceeded permissible values on the 2nd day, autonomous defecation was recovered in 6 (15 %) patients on the 2nd day, in 3 (7.5 %) — on the 3rd, in 19 (47.5 %) — on the 5th and in 12 (30 %) — on the 7th day after surgery.

Discussion

Urgent abdominal surgery is associated with limited time, tool and diagnosis possibilities. Improvement of treatment results in patients with urgent abdominal pathology is an important factor. Implementation of advanced protocols of infusion therapy led to the reduced incidence of surgical complications and number of readmissions. The new principles of infusion therapy are restriction of infusion volumes and therapy directed to hemodynamic parameters [1–3, 10].

In our research, we found volume depletion due to reduction of both plasma and interstitial volumes in high surgical risk patients with urgent abdominal pathology. The achieved results do not confirm formation of intracellular dehydration, which extends the data of the previous researches about the nature of fluid changes in acute abdominal pathology [1–6].

In the treatment of urgent abdominal pathology, it is important to plan and conduct perioperative refilling of fluid deficit efficiently. In patients of low and moderate surgical risk, we recommend restrictive regimen of infusion therapy, or zero balance approach. For patients at high surgical risk, we recommend goal-directed infusion therapy. Optimal perioperative control of infusion volume is an important component in reducing the risks of postoperative complications. Assessment of clinical efficacy of goal-directed regimen of perioperative infusion therapy revealed formation of interstitial edema on the 1st day after surgery ($p < 0.04$). This correlated with an increase in small intestine wall thickness ($R = 0.86$, $p = 0.02$), hyperextension of intestinal loops ($R = 0.65$, $p = 0.02$) and progression of IAH degree 1 in the mentioned period, which was not described in the publications. Oral administration of fluid was possible from the 2nd day, in 81 % of patients it was conducted in full volume from the 3rd day after surgery. Clinical recovery of gastric emptying was registered in 45 % patients within 5 postoperative days. In 55 % of patients, we observed prolongation of postoperative ileus with full restoration of function of gastrointestinal tract only from the 7th day after surgery.

Analysis of the same findings in restrictive regimen of infusion therapy revealed physiological volume of interstitium during the whole period of observation [6], restoration of thickness ($p < 0.02$) and diameter ($p < 0.01$) of the small intestine from the 3rd day, absence of intra-abdominal hypertension signs. Prevention of progression of prolonged postoperative ileus by virtue of oral administration of fluid was possible after the 2nd day, in 85 % of patients it was conducted in full volume from the 3rd day after surgery, autonomous defecation was observed from the 5th day in 70 % of patients. Therefore, the results of the performed clinical research showed advantage of restrictive (limiting) over goal-directed regimen of infusion therapy in high surgical risk patients with urgent abdominal pathology in terms of positive clinical improvement of gastric emptying and solution of postoperative ileus in safe terms [10].

Conclusions

The above allowed us to make the following conclusions:

1. Goal-directed regimen of infusion therapy in high surgical risk patients with urgent abdominal pathology was accompanied:

— by progression of interstitial edema on the 1st day;

— intra-abdominal hypertension degree 1 during two days after surgery;

— prolongation of postoperative ileus solution to the 7th day of postoperative period.

2. Restrictive regimen of infusion in the perioperative period in high surgical risk patients with urgent abdominal pathology allows us:

— to prevent the development of interstitial edema and intra-abdominal hypertension;

— reduce the time of full recovery of gastric emptying to the 5th day.

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Directions for future researches: influence of goal-directed and restrictive regimens of infusion therapy on risks of pulmonary and renal dysfunction in perioperative period in patients with urgent abdominal pathology.

Conflicts of interests. Author declares the absence of any conflicts of interests and his own financial interest that might be construed to influence the results or interpretation of his manuscript.

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Клиническая эффективность разных режимов инфузионной терапии у пациентов высокого хирургического риска с ургентной абдоминальной патологией

Резюме. ***Актуальность.*** Неотложная патология органов брюшной полости составляет 53 % всех ургентных вмешательств, сопровождается длительным стационарным лечением и значительной смертностью. Одним из наиболее опасных осложнений является послеоперационная кишечная непроходимость, или послеоперационный илеус. ***Цель*** — оценить эффективность рестриктивного и целенаправленного режимов инфузионной терапии на основании сравнительного анализа клинического разрешения послеоперационных моторных нарушений кишечника у больных высокого хирургического риска с ургентной абдоминальной патологией. ***Материалы и методы.*** Обследовано 80 пациентов с неотложной патологией органов брюшной полости, оперированных ургентно в объеме лапаратомии. Было сформировано 2 группы: в первой (n = 40) больные получали целенаправленную инфузионную терапию, во второй (n = 40) — рестриктивную. Объемы водных секторов организма исследовали с помощью метода неинвазивной биоэлектрической импедансометрии, функцию кишечника — по клиническим проявлениям, а также посредством измерения внутрибрюшного давления, ультразвуковой визуализации кишечной стенки. ***Результаты.*** Целенаправленный режим инфузии обусловливал формирование интерстициального отека в 1-е сутки после операции ($p < 0,04$), что приводило к увеличению толщины стенки тонкого кишечника ($R = 0,86$; $p = 0,02$), перерастяжению петель кишечника ($R = 0,65$; $p = 0,02$) и развитию интраабдоминальной гипертензии 1-й степени. У 45 % пациентов клиническое восстановление моторно-эвакуаторной функции кишечника наблюдалось

в течение 5 послеоперационных суток. У 55 % пациентов отмечено пролонгирование послеоперационной кишечной непроходимости. При использовании рестриктивного режима инфузионной терапии объем интерстиция был физиологическим в течение всего периода наблюдения, с 3-х суток восстанавливались толщина ($p < 0,02$) и диаметр ($p < 0,01$) тонкого кишечника, отсутствовали признаки интраабдоминальной гипертензии. Самостоятельная дефекация отмечена с 5-х суток у 70 % пациентов. ***Выводы.*** Целенаправленный режим инфузионной терапии у пациентов высокого хирургического риска с ургентной абдоминальной патологией сопровождается развитием интерстициального отека в 1-е сутки, интраабдомиальной гипертензией 1-й степени в течение двух дней и удлинением сроков разрешения послеоперационной кишечной непроходимости до 7 суток. Рестриктивный режим инфузии в периоперационном периоде у пациентов высокого хирургического риска с ургентной абдоминальной патологией позволяет предупредить развитие интерстициального отека и интраабдоминальной гипертензии, сократить сроки полного восстановления моторно-эвакуаторной функции желудочно-кишечного тракта до 5 суток.

Ключевые слова: ургентная хирургия; высокий хирургический риск; режимы инфузионной терапии; послеоперационная кишечная непроходимость; интраабдоминальная гипертензия; сонографическая диагностика

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Клінічна ефективність різних режимів інфузійної терапії в пацієнтів високого хірургічного ризику з ургентною абдомінальною патологією

Резюме. ***Актуальність.*** Невідкладна патологія органів черевної порожнини становить 53 % усіх ургентних втручань, супроводжується тривалим стаціонарним лікуванням і значною смертністю. Одним з найбільш небезпечних ускладнень є післяопераційна кишкова непрохідність, або післяопераційний ілеус. ***Мета*** — оцінити ефективність рестриктивного і цілеспрямованого режимів інфузійної терапії на підставі порівняльного аналізу клінічного завершення післяопераційних моторних порушень кишечника у хворих високого хірургічного ризику з ургентною абдомінальною патологією. ***Матеріали та методи.*** Обстежено 80 пацієнтів із невідкладною патологією органів черевної порожнини, оперованих ургентно в обсязі лапаротомії. Було сформовано 2 групи: у першій ($n = 40$) хворі отримували цілеспрямовану інфузійну терапію, у другій ($n = 40$) — рестриктивну. Обсяги водних секторів організму досліджували за допомогою методу неінвазивної біоелектричної імпендансометрії, функцію кишечника — за клінічними проявами, а також шляхом вимірювання внутрішньочеревного тиску, ультразвукової візуалізації кишкової стінки. ***Результати.*** Цілеспрямований режим інфузії обумовлював формування інтерстиціального набряку в 1-шу добу після операції ($p < 0,04$), що приводило до збільшення товщини стінки тонкої кишки ($R = 0,86$; $P = 0,02$), перерозтягнення петель кишечника ($R = 0,65$; $P = 0,02$) і розвитку інтраабдомінальної гіпертензії 1-го ступеня. У 45 % пацієнтів клінічне відновлення моторно-евакуаторної функції кишечника спостерігалося протягом 5 післяопераційних діб. У 55 % пацієнтів зазначене пролонгування післяопераційної кишкової непрохідності. При використанні рестриктивного режиму інфузійної терапії обсяг інтерстиція був фізіологічним протягом усього періоду спостереження, з 3-ї доби відновлювалися товщина ($p < 0,02$) і діаметр ($p < 0,01$) тонкого кишечника, були відсутні ознаки інтраабдомінальної гіпертензії. Самостійна дефекація відзначена з 5-ї доби в 70 % пацієнтів. ***Висновки.*** Цілеспрямований режим інфузійної терапії у хворих високого хірургічного ризику з ургентною абдомінальною патологією супроводжується розвитком інтерстиціального набряку в 1-шу добу, інтраабдомінальною гіпертензією 1-го ступеня протягом двох днів і подовженням термінів завершення післяопераційної кишкової непрохідності до 7 діб. Рестриктивний режим інфузії в періопераційному періоді у хворих високого хірургічного ризику з ургентною абдомінальною патологією дозволяє попередити розвиток інтерстиціального набряку й інтраабдомінальної гіпертензії, скоротити терміни повного відновлення моторно-евакуаторної функції шлунково-кишкового тракту до 5 діб.

Ключові слова: ургентна хірургія; високий хірургічний ризик; режими інфузійної терапії; післяопераційна кишкова непрохідність; інтраабдомінальна гіпертензія; сонографічна діагностика