DOI 10.26724/2079-8334-2022-1-79-74-79
UDC 616.71-001.514-089

F.I. Ibrahimov
Azerbaijan State Advanced Training Institute for Doctors named after A. Aliyev, Baku, Azerbaijan

NEW SYSTEMATIC APPROACHES IN TREATMENT OF COEXISTENT DAMAGES OF ABDOMEN AND EXTREMITIES

e-mail: Statya2021@mail.ru

A retrospective and prospective analysis of the data of 1033 patients with severe combined trauma who were treated in 2009–2015 at the Baku City Clinical Hospital No.3 was carried out. For the purpose of comparative analysis of treatment methods, patients were divided into two groups. In total, there were 216 patients with combined injuries to remove icons in the words of the abdomen and limbs, 171 of them were included in the main group, 45 in the comparative group. The scales of injury severity (Abbreviated Injury Scale and Injury Severity Scale) assessed the severity of injuries of patients in the main group; they were assisted taking into account the principle of "damage control". In 52.1 % of patients of the main group with severe combined trauma of the abdomen and extremities, who were treated taking into, account the principle of "damage control" and the use of programmed multi-stage surgical tactics, with subcompensation of traumatic disease. The mortality rate was 16 %, in the comparative group – 44.4 %, with decompensation – 51.6 and 89.7 %, respectively. The results of using multi-stage surgical tactics with severe combined abdominal and limb injury demonstrate its obvious advantages.

Key words: severe combined trauma, fractures of the tubular bones of the limbs, concept of "damage control", tactics of programmed multi-stage surgical treatment, surgical activity, lethality.

Ф.І. Ібрагімов

ВПРОВАДЖЕННЯ БАГАТОЕТАПНОЇ ХІРУРГІЧНОЇ ТАКТИКИ ПРИ ЛІКУВАННІ ПОЄДНАНИХ ПОШКОДЖЕНЬ ЖИВОТА І КІНЦІВОК

Проведено ретроспективний та проспективний аналіз даних 1033 хворих з тяжкою поєднаною травмою, яким проводили лікування у 2009–2015 роках у Міській клінічній лікарні № 3 м. Баку. З метою порівняльного аналізу методів лікування хворих поділили на дві групи. Усього з поєднаними пошкодженнями живота та кінцівок було 216 пацієнтів, з них 171 включили до основної групи, 45 – до порівняльної. Ступінь тяжкості пошкоджень хворих основної групи оцінювали за шкалами тяжкості травми (Abbreviated Injury Scale та Injury Severity Scale), їм надавали допомогу з урахуванням принципу "damage control". У 52,1 % хворих основної групи з тяжкою поєднаною травмою живота та кінцівок, яких лікували з урахуванням принципу "damage control" та застосуванням запрограмованої багатоетапної хірургічної тактики, при субкомпенсації травматичної хвороби летальність становила 16 %, у порівняльній групі – 44,4 %. , при декомпенсації відповідно 51,6 та 89,7 %. Отримані результати застосування багатоетапної хірургічної тактики при тяжкій поєднаній травмі живота та кінцівок демонструють явні її переваги.

Ключові слова: важка комбінована травма, переломи трубчастих кісток кінцівок, концепція "damage control", тактика запрограмованого багатоетапного хірургічного лікування, летальність.

In the structure of injuries, severe combined injury (SCI) ranges from 18 to 25 %, and their number does not tend to decrease. The high level of mortality and disability has turned the treatment of such victims into an urgent medical and social problem. At the same time, there is a high mortality rate, which ranges from 22–43 %, and sometimes reaches 50–80 %. In severe multiple (SM) and combined injuries (CI), accompanied by damage to the musculoskeletal system, chest, abdomen and skull, mortality increases to 90–100 % [1, 7, 10]. For many years, SCI have been encouraging scientists from different countries to look for new effective ways to treat and prevent them [3, 4, 12]. The urgency of the problem is determined by the complexity of treatment and timely diagnosis and their complications [8, 9, 11]. The development of scientific and technological progress, the introduction of high-tech processes in everyday life, logistics and production have led to an increase in the number of high-energy damages in various CI [2, 5, 7]. Treatment of polytrauma in the second half of the XX century has become one of the key problems of domestic and world medicine, as it affects the interests of young active able-bodied citizens. This, in turn, dictates the urgent need to develop fundamentally new both organizational and therapeutic and tactical measures aimed at providing systemic primary, specialized and qualified medical care to victims with SCI. Despite the fact that the problem has a certain development in modern traumatology, surgery and anesthesiology, it remains complex and unresolved to the end, due to its multidisciplinary nature. There are many publications that highlight various aspects of this problem. However, a unified system approach has not yet been developed. It should be noted that the most rational and comprehensive is the damage control system adopted at the end of the last century in most Western countries. Nevertheless, there are different opinions regarding this system, organizational and logistical features, which does not allow creating a single standard program for providing assistance with SCI.

The purpose of the study was to develop a new systematic approach to providing medical care to patients with severe combined abdominal and limb injuries based on a comparative analysis of treatment results.

Materials and methods. The study included 1033 patients with SCI who were treated at the Baku City Clinical Hospital No. 3 (Clinical Base of AzSATI for Doctors named after A. Aliyev) in 2009–2015. All patients are divided into two groups according to the method of medical care. The 1st group included 205 patients who were treated at the clinic from 2009 to 2010 using a standard scheme, the 2nd group included 828 patients who were treated at the clinic from 2011 to 2015 according to a fundamentally new scheme containing elements of a damage control system. In total, there were 216 patients with combined abdominal and limb injuries, of which 171 were included in the main group, 45 in the comparative group.

Since the modified treatment regimen included elements of the "damage control" system, it was necessary to assess the severity of injuries according to the modern AIS and ISS scales, which reflect in more detail the degree of damage in each anatomical area and are therefore more preferable in the practice of many countries. According to the ISS scale, with the number of points equal to 17–25, the degree of damage is assessed as moderate, 26–40 – severe, 41–50 – extremely severe, up to 75 points-critical.

We applied the principles of "damage control", taking into account three important signs: the severity of the main injury ("First hit"); the biological constitution of the patient (age, body weight, concomitant diseases, etc.); the number of absolutely necessary urgent surgical interventions, the expected time of their execution, traumatism and possible blood loss. These operations for patients with combined injuries are a "second hit".

The introduction of the principles of "damage control" began with the implementation, first of all, of emergency operations on the organs of the thoracic, abdominal cavities and skull. In case of damage to the musculoskeletal system, immobilization devices (spikes, splints, etc.) were applied at the first stage, fewer often devices for external fixation. Correction of open fractures, amputations and surgical treatment of wounds were not performed. Only antiseptic treatment of the wound was used, free foreign bodies were removed, a clamp was applied to the damaged main vessels and wounds were covered with a bandage with antiseptics. At the same time, intensive post-syndrome resuscitation was performed. Treatment of open wounds of limbs and amputations was performed after 24–36 hours, and 3–4 hours after previous operations on the organs of the thoracic and abdominal cavities. Performing operations on the skeleton and organs of the thoracic and abdominal cavities at the same time is unacceptable. In some patients, with the adequate restoration of vital functions, it is possible after 6–8 days to use minimally invasive methods of osteosynthesis.

Statistical processing of the obtained data was carried out by a nonparametric method with the calculation of the Pearson criterion (χ^2). The criterion of the statistical reliability of the results was considered differences with a confidence interval of 95 % ($p<0.05$), the analysis was carried out using the method of variation and discriminants.

Results of the study and their discussion. Within the framework of the proposed system of measures for all victims with injuries, repeated surgical interventions are permissible as the following criteria for the effectiveness of resuscitation stabilize: blood pressure below 13.3 kPa (100 mm Hg); pulse 90 in 1 min and below; saturation 97 % and above; partial pressure of carbon dioxide below 5.3 kPa (40 mm Hg. art.); pH greater than 7.35; hematocrit 0.20; prothrombin index above 50 %; diuresis above 0.5 ml/kg/h; normothermia. The use of multi-stage surgical tactics is impossible without strict resuscitation and anesthesiological control. The resuscitation strategy "damage control" is aimed at combating the components of the "lethal triad" coagulopathy, hypothermia and acidosis that occur against the background of traumatic blood loss and contribute to its continuation. Developing hypoperfusion leads to a decrease in oxygen delivery, anaerobic metabolism, lactate accumulation, and metabolic acidosis. Anaerobic metabolism limits the formation of endogenous heat, increasing hypothermia. There is a vicious pathogenetic circle. The core temperature of the body less than 35 ° C is an independent predictor of death in severe trauma.

The main components of the resuscitation strategy "damage control", permissible (intentional) hypotension with limited infusion volume for the formation of reliable homeostasis; the earliest possible use of blood components as primary infusion therapy and the appointment of hemostatic pharmacological agents.

We consider the following to be an obligatory protocol of any kind of tactical approach in TST: pain elimination; ensuring patency of the upper respiratory tract and adequate breathing; stopping the bleeding with the restoration of blood loss; decompression in intracranial hematomas, prevention of acute cerebral edema; restoration of the integrity of the chest, prevention of dislocations; infusion and antimicrobial therapy and adequate immobilization.

For the full implementation of this protocol within the framework of multi-stage surgical tactics (MST), an evaluation scale is necessary. The existing evaluation scales are mostly of limited use and are not always effective. We have improved the evaluation scale for conducting multi-stage surgical tactics in SCI (Table 1).

Table 1

Evaluation scale of MST at TST

Type (type) of damage and complications	Availability	Scores
Blood pressure at admission below 9.3 kPa (70 mmHg)	–	0
	+	1
Intracranial injuries and depressed fractures requiring urgent intervention	–	0
	+	3
Injuries of the thoracic cavity organs requiring thoracotomy; amputation of limbs; damage to the main vessels; open polysegmental fractures involving the lower extremities	–	0
	+	3
Blood loss at the start of the operation, ml	before 1000	0
	1000-2000	2
	above 2000	4
Large retroperitoneal and intrabasic hematomas	–	0
	+	3
Hard-to-reach source of bleeding	–	0
	+	2
Damage to large vessels of the abdomen or pelvis	–	0
	+	3
Multiple abdominal injuries	–	0
	+	2
Multiple abdominal injuries	–	0
	+	2
Unstable hemodynamics during surgery, requiring medical correction	–	0
	+	6

Based on the data given in table 1, we have developed a scale index of multi-stage surgical tactics, which allows us to quickly assess the severity of the patient's condition and determine the order of emergency care in accordance with the principles of damage control. To calculate the index of the scale of multi-stage surgical tactics, it is necessary to summarize the scores of the existing signs. Of the 171 victims of the main group, according to the index of the scale of multi-stage surgical tactics, 42 (24.5 %) had moderate injuries, 53 (31 %) – severe, 50 (29.2 %) – very severe, 26 (15.3 %) – critical.

In 15 (31.3 %) patients, the MST scale index was 8–10 points, in 16 (33.3 %) – 11–12, in 17 (35.4 %) – 13–15 points. In 8 (50 %) of 16 patients with an MST scale index of 11-12 points, a standard treatment regimen was used, as in the comparative group, the remaining 8 (50 %) patients were assisted according to the principles of multi-stage surgical tactics. Among the victims, whose MST scale index was 8-10 points, the mortality rate was 13.3 % (2 patients out of 15 died), 11–12 points – 75 % when using the standard scheme (6 patients out of 8 died) and 12.5 % when treated according to the new scheme (1 patient out of 8 died). Among the victims with the index of the scale of multi-stage surgical tactics of 13–15 points, who received medical care using multi-stage surgical tactics, the mortality rate was 17.6 % (3 patients out of 17 died).

Victims whose severity of the injury is assessed on the scale of multi-stage surgical tactics with a score higher than 15 or on the ISS scale with a score equal to 41–50 develop a decompensated variant of the traumatic disease. In these patients, after performing life-saving interventions, indications for the next stage of treatment (surgery) were determined in compliance with the principles of damage control (upon reaching indicators similar to the subcompensated variant of traumatic illness). At the same time, the mortality rate in the main group was 71.7 %, in the comparative group – 90 %.

In the decompensated variant of the traumatic disease, emergency laparotomies were life-saving in 91 (53.3 %) patients of the main group and in 19 (53.0 %) patients of the comparative group (Table 2).

These patients were immediately referred to the operating unit upon admission. During the emergency operation, 5 patients were found to have liver and spleen injuries, 3 – liver and gallbladder, 2 – liver, gallbladder and spleen, 3 – liver and mesentery of the small intestine, 1 – spleen and colon. 4 patients had isolated damage to the spleen, 1 patient had a ruptured bladder. All these patients also underwent intensive resuscitation according to the principle of the "damage control resuscitation" system.

In 17 patients, resuscitation measures managed to stabilize vital functions and achieve subcompensation. These patients underwent relaparotomy after 36–48 hours as the final stage of the operation (restoration of intestinal continuity – in 3 patients, final hemostasis in liver injury – in 11, removal of the spleen – in 1, imposition of a colonic stoma – in 3). However, 8 (47 %) of 17 patients had complications that led to decompensation of the condition and death. 7 out of 8 deceased patients had a severe injury to the liver and pelvis, 1 had an injury to the spleen and hip. The remaining 9 (53 %) patients recovered.

□□bl□2

The nature of surgical interventions

The nature of surgical interventions	Indications for operations							
	Emergency				Urgent			
	Groups				Groups			
	Main		comparison		Main		comparison	
	abs.	%	abs.	%	abs.	%	abs.	%
Suturing and tamponade of the liver	27	15.8	6	13.3	–	–	–	–
Puncture of a liver hematoma	–	–	–	–	6	3,5	2	4.4
Cholecystectomy	14	8.2	3	6.7	–	–	–	–
Splenectomy	32	18.7	9	17.8	–	–	–	–
Suturing of small intestine wounds	13	7.6	3	6.7	–	–	–	–
Resection of the small intestine	6	3.5	2	4.4	–	–	–	–
Suturing of the mesentery of the small intestine	14	8.2	4	8.9	–	–	–	–
Suturing of colon wounds (colostomy)	26	15.2	5	11.1	–	–	–	–
Nephrectomy	6	3.5	2	4.4	–	–	–	–
Suturing of kidney wounds	4	2.3	–	–	–	–	–	–
Suturing of the duodenal wound	3	1.8	–	–	–	–	–	–
Suturing of bladder wounds	17	9.9	5	11.1	–	–	–	–
Suturing of stomach wounds	16	9.4	4	8.9	–	–	–	–
Caesarean section as a result of traumatic placental abruption	–	–	1	2.2	–	–	–	–

The development of a decompensated variant of traumatic illness in 34 victims was an indication for hospitalization in the intensive care unit. In 25 (73.5 %) of them, after stabilization of vital functions, surgical interventions were urgently performed taking into account MST. It was not possible to stabilize vital functions in 9 (26.5 %) patients, they died. Of the 25 patients operated on urgent indications, 11 (44 %) died on the operating table. In 14 (56 %) of the victims, the use of multi-stage surgical tactics gave a positive result, all of them recovered.

The results of the study suggest that in severe abdominal injuries, surgical tactics should be multi-stage. It is also necessary to take into account the nature of limb injuries. Of the 45 patients in the comparative group with abdominal injuries, 29 (64.4 %) had fractures of long tubular bones. Of these 29 patients, 13 (44.8 %) died. The remaining 16 (35.6 %) patients had polysegmental limb fractures: hip fracture – in 56.2 %, lower leg – in 55.6 %, shoulder – in 57.1 %, forearm - in 50 %.

Of the 171 patients in the main group, 117 (68.4 %) had a fracture of long tubular bones, 26 (22.2 %) of them died, 91 (77.8 %) patients recovered. Among the recovered patients, 49 had a femoral fracture, including 5 – open, 3 **–** both thighs. An external fixation device was used in 9 (18.4 %) of these patients, extracortical hip osteosynthesis was performed in 16 (32.7 %), intramedullary osteosynthesis was performed in 15 (30.6 %), skeletal traction was performed in 9 (18.4 %). 42 patients had a fracture of the lower leg, including 33 – closed, 5 – open, 4 – closed both legs. Ilizarov apparatus was used in 16 (38.1 %) of these patients, extracortical osteosynthesis of the tibia was performed in 18 (42.9 %), intramedullary osteosynthesis was performed in 2 (4.8 %). The remaining 6 (14.3 %) patients underwent conservative treatment.

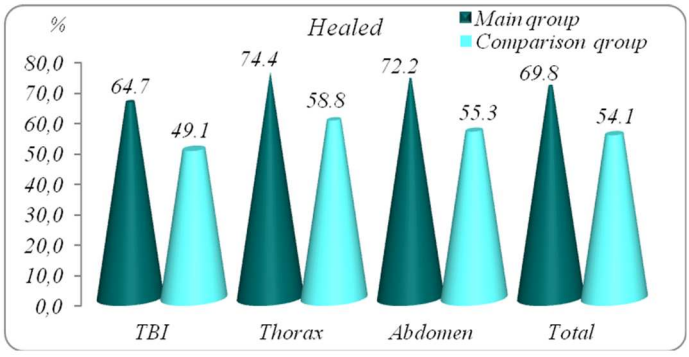

Fig 1. The ratio of the degree of improvement of combined injuries of long tubular bones and various anatomical areas by patient groups

It follows from the figure that in the main group of patients, improvement was observed in 69.8 % versus 54.1 %.

Analysis of the results of treatment of patients of the compared groups showed that, despite the high severity of injuries, mortality was significantly lower in the main group, which is associated with the use of multi-stage surgical tactics and compliance with the principles of damage control in combined trauma. The higher the severity of the injuries, the less time is left for diagnosis and preparation of the patient for surgery, so it is necessary to clearly identify life-threatening injuries to internal organs and the skeleton using a special therapeutic and diagnostic algorithm.

With the development of a subcompensated variant of traumatic disease in the main group, the severity of the patients condition was assessed by the index of the scale of multi-stage surgical tactics. With index values equal to 11–12 points, the described system of measures was used. As a result, the mortality

rate in this group, compared with the group where standard methods of treatment were used, decreased by almost 2 times – 22.9 and 42.2 %, respectively. According to the literature, in the acute period of traumatic disease with SCI, the mortality rate is about 30 % [6]. The final osteosynthesis of long tubular bones was performed after 11–14 days.

In the decompensated variant of traumatic disease, the final osteosynthesis was performed on the 17th–20th day from the moment of injury. At the same time, the mortality rate in the main group was 51.6 % and was 1.7 times lower than in the comparative group – 89.7 %.

Thus, with the compensated variant of traumatic illness, the protocol of therapeutic and diagnostic measures in both compared groups did not differ significantly and there was no lethality. With subcompensation in 52.1 % of patients of the main group who were treated with the use, the mortality rate was 16 %, that is, it was 2.8 times lower than in the comparative group – 44.4 %. Gaidarov G.M. et al. in their work, we analyzed the mortality rate in combined trauma in three neighboring large cities of the Russian Federation. The mortality rate for polytrauma in patients in the cities of Ulan-Ude, Irkutsk and Barnaul was 37.7 %, 35.4 % and 30.2 %, respectively. Hospital mortality in combined trauma varies very widely from 13.34 % to 37.7 % [1].

Thus, with the compensated variant of traumatic illness, the protocol of therapeutic and diagnostic measures in both compared groups did not differ significantly and there was no lethality. With subcompensation, in 52.1 % of patients of the main group who were treated with the use, the mortality rate was 16 %, that is, it was 2.8 times lower than in the comparative group – 44.4 %. With decompensation of traumatic illness in the main group, the mortality rate was 51.6 % and was 1.7 times lower than in the comparative group – 89.7 %.

The dynamics of mortality rates among patients with SCI, as well as the frequency and structure of complications, duration of hospitalization, economic costs, laboratory indicators, temporary disability do not allow to fully objectively assess the effectiveness of the new treatment tactics. In this regard, consideration of the late results of treatment and the quality of life of such patients may allow a more adequate assessment of the benefits of a particular treatment method; in the tactics of treatment on the principle of "damage control", this stage is the last in assessing the effectiveness of treatment. For this reason, in this research paper, we have set ourselves the task of investigating these indicators, too. To solve this problem, we used a questionnaire on the quality of life of patients in the late period (the follow-up period ranged from 1 to 5 years). The study showed that early and comprehensive treatment based on the principle of "damage control" can improve the quality of life of patients, moreover, the quality of life is significantly improved with the use of minimally invasive therapeutic and diagnostic methods and treatment using a scale of multi-stage surgical tactics.

Conclusion

The obtained results of the use of multi-stage surgical tactics, with combined injuries of the abdomen and extremities, demonstrate its obvious advantages.

The introduction of the tactics of multi-stage surgical treatment allowed the expansion of the indications for surgical interventions. This made it possible to increase the number of decompensating abdominal operations by 15.6 %, the number of stabilizing operations on the extremities by 39.2 %.

The introduction of the tactics of multi-stage surgical treatment allowed to reduce mortality in the main group with combined traumatic brain injuries to 35.3±2.9 % versus 50.9±6.6 % in the comparison group. This indicator changed with combined abdominal injuries – 27.8±3.6 % vs. 44.7±8.1 %, with chest injuries – 25.6±2.9 % vs. 41.2±6.9 %, and all these indicators are statistically significant: the confidence level was $p<0.001$.

A comparative analysis of patients of the main and comparative groups over a long period of time (from 1 to 5 years) showed that new therapeutic and diagnostic measures applied in the main group of patients helped to reduce the number of complications and undesirable consequences by 30.6 %.

References

1. Gaydarov GM, Novozhilov AV, Apartsin KA, Makarov SV. Rol travma-tsentra v snizhenii letalnosti pri sochetannoy travme. Sibirskiy meditsinskiy zhurnal (Irkutsk). 2008; 81(6): 63–66. [in Russian]
2. Gridasova EI. Rol rannego osteosinteza v profilaktike i lechenii sindroma zhirovoy embolii. Travma. 2013; 1 (14):16–18 [in Russian]
3. Ibragimov FI, Kasumov NA. Khirurgicheskoye lecheniye mnozhestvennykh i sochetannykh travm. Vestnik khirurgii im. I.I. Grekova. 2018; 177(5):30–35. https://doi.org/10.24884/0042-4625-2018-177-5-30-35 [in Russian]
4. Kalinkin OG. Travmaticheskaya bolezn. To General Practitioner. Trauma. 2013; 14 (3): 59–65. [in Russian]
5. Tanija SSh. Lechenie postradavshih s tyazheloy sochetannoy travmoy. Avto-referat dissertatsii na soiskanie uchenoy stepeni doktora meditsinskikh nauk. Sankt-Peterburg. 2015: 51. [in Russian]
6. Tulupov AN. Sochetannaya mehanicheskaya travma: Rukovodstvo dlya vrachey. SPb.: Stiks. 2012: 393. [in Russian]

7. Shapkin YuG, Seliverstov PA. Fenomen vzaimnogo otyagoshcheniya povrezhdeniy pri politravme. Permskiy meditsinskiy zhurnal. 2016; 33(5): 82–94. [in Russian]
8. Ali SR, Mohammad H, Sara Sh. Evaluation of the relationship between pelvic fracture and abdominal compartment syndrome in traumatic patients. J Emerg Trauma Shock. 2013; 6(3):176–179: doi: 10.4103/0974-2700.115330.
9. Arumugam SK, Al-Hassani A, El-Menyar A, Abdelrahman H, Parchani A, Peralta R, et al. Frequency, causes and pattern of abdominal trauma: a 4-year descriptive analysis. Journal of Emergencies, Trauma and Shock. 2015; 8(4): 193–198: doi: 10.4103/0974-2700.166590.
10. Balverde MG, Lizardo EJR, Muñoz EGC, Sutto SET, Benavides LG. Prognostic value of the lethal triad among patients with multiple trauma. Rev Med Chil. 2013; 141(11): 1420–1426: doi: 10.4067/S0034-98872013001 100008.
11. Norrls FH, Slone LB. Understanding Research on the Epidemiology of Trauma and PTSD. PTSD Research Quarterly. 2013. 24; 2–3: 1–13: Available at: http://www.ptsd.va.qov/professional/newsletters/research-quarterly/v24n2-3 /pdf.
12. Pache B, Grass F, Fournier N, Hübner M, Demartines N, Hahnloser D. Surgical teaching does not increase the risk of intraoperative adverse events. Int J Colorectal Dis. 2018; 33(12):1715–1722: doi:10.1007/s00384-018-3143-2.

Стаття надійшла 30.01.2021 р.

DOI 10.26724/2079-8334-2022-1-79-79-84
UDC 616.61-006:616.65+576.367

I.O. Komarevtseva, D.G. Posternak, R.V. Cherednichenko, A.S. Shatrova, Yu.A. Chernykh, K.V. Balabanova, V.N. Komarevtsev
Lugansk State Medical University, Rubizhne

CIRCULATING CELL-FREE DNA IS A BIOMARKER OF PREMATURE BIRTH AND COVID-19 AND PREDICTS PRENATAL CEREBRAL ISCHEMIA IN NEWBORNS

e-mail: kialdmu@ukr.net

Circulating cell-free DNA is a possible marker of not only apoptosis, but also COVID-19 in pregnant, which can also be a trigger factor for premature birth and predicts prenatal hypoxic-ischemic encephalopathy injury in newborns. DNA fragmentation in tissues and blood plasma was measured with the diphenylamine assay. The material for the study was the peripheral blood from pregnant women and newborns, cord blood, tissue of the placenta. A comparison of the level of cfDNA in the serum of healthy pregnant and pregnant women with premature birth suggests a high level of it in women with premature birth. Pregnant women with COVID-19 had significantly higher cfDNA values as compared to those in healthy pregnant women in cord blood, placenta and in newborns from women with COVID-19. The level of cfDNA increased with the severity of neonatal hypoxic-ischemic encephalopathy injury in newborns from women with premature birth.

Key words: cfDNA, preterm birth, COVID-19, prenatal hypoxic-ischemic encephalopathy.

І.О. Комаревцева, Д.Г. Постернак, Р.В. Чередніченко, А.С. Шатрова, Ю.А. Черних, К.В. Балабанова, В.Н. Комаревцев

ЦИРКУЛЮЮЧА БЕЗКЛІТИННА ДНК Є БІОМАРКЕРОМ ПЕРЕДЧАСНИХ ПОЛОГІВ ТА COVID-19 І ПЕРЕДБАЧАЄ ПРЕНАТАЛЬНУ ЦЕРЕБРАЛЬНУ ІШЕМІЮ У НОВОНАРОДЖЕНИХ

Циркулююча безклітинна ДНК є можливим маркером не тільки апоптозу, але і COVID-19 у вагітних, що також може бути тригерним фактором для передчасних пологів і передбачає у новонароджених пренатальну гіпоксично-ішемічну енцефалопатію. Фрагментацію ДНК у тканинах та плазмі крові вимірювали за допомогою аналізу на дифеніламін. Матеріалом для дослідження стала периферична кров вагітних жінок та новонароджених, пуповинна кров, тканини плаценти. Порівняння рівня cfDNA у сироватці крові здорових вагітних та вагітних жінок з передчасними пологами свідчить про високий його рівень у жінок з передчасними пологами. Вагітні жінки з COVID-19 мали значно вищі значення cfDNA порівняно із здоровими вагітними жінками у пуповинній крові, плаценті та у новонароджених від жінок хворих на COVID-19. Рівень cfDNA збільшувався у новонароджених із пренатальною гіпоксично-ішемічною енцефалопатією від жінок з передчасними пологами.

Ключові слова: cfDNA, передчасні пологи, COVID-19, пренатальна гіпоксично-ішемічна енцефалопатія.

The study is a fragment of the research project "Development of the strategy of targeted neuroprotection of prenatal cerebral ischemia in newborn children", state registration No. 0118U001026.

About 15 million premature newborns are born annually in the world. One million of them die [12]. The most common cause of infant mortality is a perinatal brain injury, which is due to the degree of functional maturity of newborn infants. Preterm birth is rising globally. The frequency of preterm birth is geographically heterogeneous: from 5 % to 9 % in Europe, from 10.6 % in North America to 11.9 % in Africa [2]. However, amazing data comes from around the world. Namely, an unprecedented reduction of preterm birth was registered during the COVID-19 lockdown in Ireland [14], Canada, Denmark [9], but was not in Sweden, where there was no lockdown [11].