EDITORIAL

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ASSESSMENT OF ADAPTATION OF INFANTS BORN WITH DIFFERENT TYPES MILD INTRAUTERINE GROWTH AND DEVELOPMENT RETARDATION

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Objective. To estimate adaptation of an organism of the babies born with different types of light severity of a delay of pre-natal growth and development. **Material and methods.** 609 children are examined. Since the birth under observation 141 children, from them are born in the result of the complicated pregnancy and childbirth, including with asymmetric type of light severity of a growth inhibition and development of a fruit – 57 (Group 1a) and with symmetric – 15 (Group 1b) and without that – 69 (Group 2) from mothers with the burdened somatic and obstetric and gynecologic anamnesis. Children are full-term, mature, looked round in 1 (131), 3 (118), 6 (109), 12 (110 children) months. Outcome recording methods were a comprehensive case history analysis, physical examination, assessment of cardiointervalography and body adaptation to the environment. Distribution-free statistical analysis methods. **Results.** At children in Groups 1a and 1b satisfactory adaptation of an organism to conditions of the environment took place at the birth of 28.07 and 26.67%, in 1 month of 32.69 and 35.71%, in 3 months of 31.11 and 25%, in 6 months of 51.16 and 46.15%, in 12 months of 48.78 and 36.36%. Tension and an overstrain of adaptation is recorded at 22.81 and 40%, 36.54 and 28.57%, 33.33 and 41.67%, 30.23 and 23.04%, 19.51 and 18.18%. Unsatisfactory adaptation is defined at 42.11 and 13.33%, 21.15 and 21.43%, 24.44 and 16.67%, 11.63 and 23.04%, 21.95 and 18.18%. Failure of adaptation is revealed at 7.02 and 20%, 9.62 and 14.29%, 11.11 and 16.67%, 6.98 and 7.69%, 9.76 and 9.09% of children respectively. **Conclusion.** Study of characteristics of body adaptation to the environment in the scientific community is a perspective area, and any practical application (starting with perinatal centres) of assessment of body adaptation to the environment with follow-up groups identification and further determination during critical periods of growth and development (outpatient monitoring) justify patient-specific approach to outpatient follow-up of infants born with different types of mild intrauterine growth and development retardation.

Keywords: asymmetric and symmetric of intrauterine growth and development retardation; adaptation; infants.

ОЦЕНКА АДАПТАЦИИ ОРГАНИЗМА МЛАДЕНЦЕВ, РОЖДЕННЫХ С РАЗНЫМИ ТИПАМИ ЛЕГКОЙ СТЕПЕНИ ТЯЖЕСТИ ЗАМЕДЛЕНИЯ ВНУТРИУТРОБНОГО РОСТА

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Цель – оценить адаптацию организма младенцев, рожденных с разными типами легкой степени тяжести замедления внутриутробного роста. **Материал и методы.** Обследовано 609 детей. С рождения под наблюдением находился 141 ребенок, появившейся на свет в исходе осложненных беременностей и родов, в том числе с асимметричным типом легкой степени тяжести замедления роста плода – 57 (группа 1а) и симметричным – 15 (группа 1б) и без таковой – 69 (группа 2), от матерей с отягощенным соматическим и акушерско-гинекологическим анамнезом. Детей доношенных, зрелых, осматривали в 1 месяц – 131 ребенок, в 3 месяца – 118 детей, в 6 месяцев – 109 детей, в 12 месяцев – 110 детей. Проведен анализ данных анамнеза, физикального осмотра, кардиоинтервалографии и степени адаптации организма к условиям среды. Использовали непараметрические методы статистического анализа. **Результаты.** У детей групп 1а и 1б удовлетворительная адаптация отмечена при рождении у 28,07 и 26,67 %,

в 1 месяц – у 32,69 и 35,71 %, в 3 месяца – у 31,11 и 25 %, в 6 месяцев – у 51,16 и 46,15 %, в 12 месяцев – у 48,78 и 36,36 %. Напряжение и перенапряжение адаптации зафиксировано у 22,81 и 40 %, 36,54 и 28,57 %, 33,33 и 41,67 %, 30,23 и 23,04 %, 19,51 и 18,18 % соответственно. Неудовлетворительная адаптация определена у 42,11 и 13,33 %, 21,15 и 21,43 %, 24,44 и 16,67 %, 11,63 и 23,04 %, 21,95 и 18,18 % соответственно. Срыв адаптации выявлен у 7,02 и 20 %, 9,62 и 14,29 %, 11,11 и 16,67 %, 6,98 и 7,69 %, 9,76 и 9,09 % детей соответственно. **Вывод.** Изучение особенностей адаптации организма к условиям среды у детей в научном мире является перспективным, а внедрение в практическое здравоохранение на этапе перинатального центра оценки степени адаптации организма к условиям среды с выделением группы диспансерного наблюдения и последующим определением ее в критические возрастные периоды роста обосновывает индивидуальный подход в системе диспансерного наблюдения младенцев, рожденных с разными типами замедления внутриутробного роста.

Ключевые слова: асимметричный и симметричный типы замедления внутриутробного роста; адаптация; младенцы.

INTRODUCTION

Intrauterine growth retardation (IUGR) is a condition that occurs during the prenatal period and is characterized by a slowdown, arrest, or negative dynamics of fetal size. It is manifested by a decrease in the infant's body weight, as it is an integral indicator of fetal size, by two or more standard deviations or below the 10th centile compared with that appropriate for the gestational age, i. e., at the time of birth [2, 8]. Despite the given criteria and advances in modern medicine, diagnosing fetal growth retardation (FGR) and identifying its consequences are challenging. FGR is one of the most hard-to-diagnose conditions and even not diagnosable in some cases. The significance of IUGR for the health status of infants is discussed in the literature [1, 2, 4–11].

The consequences of IUGR are traced throughout the life of an affected individual. Medical institutions of the Russian Federation reported that a majority of children born with IUGR appear healthy upon discharge from the pediatric physiology departments and are observed on an outpatient basis. There is a need to develop and implement a set of systemic measures to improve the quality of medical care for these patients and establish an individual approach in follow-up monitoring.

This study aims to assess the adaptation of the infants with mild IUGR of different types.

MATERIAL AND RESEARCH METHODS

The study was conducted using the data from the pediatric physiology departments and perinatal diagnostic centers of St. Petersburg State Pediatric Medical University under the Ministry of Health of Russia and the St. Petersburg National Medical Research Center named after V.A. Almazov. No factors affecting the external generalizability of our findings were noted, and there were no significant study limitations.

The inclusion criterion of this study was complicated pregnancies, including those with mild IUGR of different types and those without it. The physical and gynecological medical history of all the patients was burdened. The exclusion criterion was FGR due to hereditary and infectious factors. Participation in the study was terminated at the voluntary request of legal representatives and at the end of the planned observation period.

FGR was initially diagnosed by gynecologists and confirmed by neonatologists and documented. An infant was diagnosed with IUGR if there is a decrease in body weight by two or more standard deviations (or below the 10th centile) compared with the weight normal for the gestational age, i. e. at the time of birth. Mild asymmetrical IUGR was characterized by a body mass deficit of 1.5–2 standard deviations, i. e., in the range of P_{10}–P_3 centiles, with a normal or moderately reduced relative to gestational-age body length, whereas mild symmetrical IUGR was characterized by a decrease in both weight and body length of more than 2 standard deviations (below the 3rd centile) with respect to gestational age.

Two groups of mature, term-born, infants were observed from birth up to 1 year. Group 1 consisted of children born at the end of complicated pregnancies, including those with mild FGR, and the group 2 consisted of children born out of complicated pregnancies without FGR from mothers with burdened somatic and gynecological history. Group 1 was subdivided into group 1a, which included children born with asymmetrical IUGR, and group 1b, which included children born with symmetrical IUGR (Table 1).

From group 1 and 2, 55 (76.39%) and 59 children (85.51%), respectively, were born through natural vaginal birth. All the children examined were born at 37–42 weeks of gestation and were examined at 1, 3, 6, and 12 months of life. The observation was done for 18 months and there was no shift in time intervals. Medical intervention was performed when required.

The body weight and body length of the infants were assessed and the results are presented in Tables 2 and 3.

In group 1 and 2, 49 (85.96%) and 48 children (78.69%), respectively, were breastfed for 3 months.

Table 1 / Таблица 1

The number of the examined children during the studied age periods of growth of an organism
Количество обследованных детей в изучаемые возрастные периоды роста организма

Number, *n* (abs.) & age (months) / Количество, *n* (абс.) и возраст (мес.)	Group 1 / Группа 1			Group 2 / Группа 2	All / Всего
	1	1a	1б/b		
2–3 days / 2–3-е сутки	72	57	15	69	141
1	66	52	14	65	131
3	57	45	12	61	118
6	55	42	13	54	109
12	52	41	11	58	110
Total / Итого	302	237	65	307	609

Table 2 / Таблица 2

Assessment of descriptive statistics of dynamics of body weight (g) and length to a body (cm) at newborns at the birth
Оценка описательной статистики динамики массы тела (г) и длины тела (см) у новорожденных при рождении

Indication / Показатель		*n*	*Me*	min	max	Q_{25}	Q_{75}	Scope / Размах	Interquartile scope /Интерквартильный размах
Mass of a body, g / Масса тела, г	Group 1a / Группа 1a	57	2770	2120	3100	2600	2900	980	300
	Group 1b / Группа 1б	15	2390	1960	2870	2300	2590	910	290
	Group 2 / Группа 2	69	3350	2630	4070	3020	3610	1440	590
	Group 1 / Группа 1	72	2720	1960	3100	2540	2840	1140	300
	Norm / Норма	25	3350	3100	3650	3250	3450	550	200
Length of a body, cm / Длина тела, см	Group 1a / Группа 1a	57	49.00	47	52	48	50	5.00	2.00
	Group 1b / Группа 1б	15	48.00	45	50	47	49	5.00	2.00
	Group 2 / Группа 2	69	52.00	49	57	50	53	8.00	3.00
	Group 1 / Группа 1	72	49.00	45	52	48	50	7.00	2.00
	Norm / Норма	25	51.00	49.5	53	50.5	52	3.50	1.50

Note. Me – Mediana, max – maximum, min – minimum, *n* – numbers, *Q* – quartile.
Примечание. Me — медиана, max — максимальное значение, min — минимальное значение, *n* — количество, *Q* — квартиль.

In addition, 42 children (76.36%) from group 1 and 38 (70.37%) from group 2 were breast fed for up to 6 months, and 12 children (23.07%) from group 1 and 12 (20.69%) from group 2 for up to 12 months.

V.V. Derevtsov performed a comprehensive analysis on the medical history and recorded clinical examination data of the subjects, including results of cardiointervalography, electrocardiography, echoencephalography, echocardiography, and dopplerography. Cardiointervalography was done following the standard method [3] using the EK1T–1/3–07 Axion electrocardiograph (JSC Izhevsk Motor-plant Aksion-holding, Russian Federation).

Adaptive capability was studied based on the functioning of the autonomic nervous system, which determines the work of the systems and the organism as a whole, adequate to the loads. The body's degree of adaptation to environmental conditions was classified by L.V. Kozlova [3] into four levels:

1) Satisfactory adaptation – full or partial body's adaptation to environmental conditions with a minimum stress on regulatory systems.

Table 3 / Таблица 3

Assessment of the comparative statistical analysis of dynamics of body weight (g) and length of body (cm) at newborns at the birth

Оценка сравнительного статистического анализа динамики массы тела (г) и длины тела (см) у новорожденных при рождении

Indication / Показатель		*n*	*Me*	Q_{25}	Q_{75}	Criterion of Kolmogorov–Smirnov / Критерий Колмогорова–Смирнова
Mass of a body, g / Масса тела, г	Group 1a & 1b / Группа 1а и 1б	57 & / и 15	2770 & / и 2390	2600 & / и 2300	2900 & / и 2590	0.001
	Group 1a & 1b / Группа 1а и 2	57 & / и 69	2770 & / и 3350	2300 & / и 3020	2590 & / и 3610	0.001
	Group 1b & 2 / Группа 1б и 2	15 & / и 69	2390 & / и 3350	2300 & / и 3020	2590 & / и 3610	0.001
	Group 1b & 2 / Группа 1б и 2	15 & / и 25	2390 & / и 3350	2300 & / и 3250	2590 & / и 3450	0.001
	Group 1 & 2 / Группа 1 и 2	72 & / и 69	2720 & / и 3350	2540 & / и 3020	2840 & / и 3610	0.001
Length of a body, cm / Длина тела, см						
Group 1b & 2 / Группа 1б и 2		15 & / и 69	48 & / и 52	47 & / и 50	49 & / и 53	0.001

Note. Me – mediana, *n* – numbers, *Q* – quartile. *Примечание. Me* — медиана, *n* — количество, *Q* — квартиль.

2) Stress and overstress adaptation – a change in indicators that are mainly associated with function regulation processes. It ensures a short-term adaptation to environmental conditions.

3) Unsatisfactory adaptation – characterized by even more pronounced changes in regulatory processes including asthenization and decreased functional reserve, while regulatory processes cannot bring the child's body to an optimal, adequate reaction to environmental factors.

4) Adaptation failure – characterized by the presence of homeostatic disturbances under rest conditions manifested by an inadequate change in functioning level of the basic body systems.

This study was performed in accordance with the Russian Federation laws, international ethical standards, and regulatory documents of research organizations and was approved by relevant committees, including the ethics committees of St. Petersburg National Medical Research Center, named after V.A. Almazov (extract from protocol No. 59 of March 17, 2014), and St. Petersburg State Pediatric Medical University (extract from protocol No. 12/3 of December 4, 2017).

Statistical analysis. The sample size was not previously calculated. StatSoft Statistica v 6.1 was used for statistical analysis of data and in calculating parameters such as quantity (*n*), median (*Me*), quartiles (Q_{25}; Q_{75}), minimum (min) and maximum (max) values, range, and interquartile range. A comparison of the two dependent groups was done using the nonparametric Wilcoxon test and the nonparametric Kolmogorov–Smirnov test. Statistical significance was defined as $p < 0.05$.

RESULTS

An assessment of the transitory physiological conditions indicated that for infants from group 1a and group 2, the incidence of transient loss of initial body weight on the first or second day of life was approximately the same (56.14 and 52.17%). In the other cases, it was noted on the third or fourth day of life. An estimate of the timing of the restoration of the transient loss of the initial body weight was impossible since the majority of infants were discharged from the perinatal center on the third or fifth day of life. Moreover, the incidence of transient hypoglycemia, not corrected in most of the patients, was 1.58 times higher; the incidence of toxic erythema was 1.69 times higher, whereas that of birth tumor was 1.75 times lower. In all the cases, toxic erythema disappeared by the time the patients were discharged, whereas

the birth tumor in majority of the infants was not detected on the third day of life. All the children developed transient hyperbilirubinemia and erythrodieresis; however, transient hyperbilirubinemia associated with physiological jaundice was diagnosed 1.27 times more often, while transient erythrodieresis associated with transient anemia was diagnosed 2.08 times less often. Functioning atrial communication and open ductus arteriosus from the second to fifth day of life were reported 1.32 and 1.71 times less often; transient polycythemia was diagnosed 1.27 times more often; transient hyperfunction and impaired myocardial metabolism were approximately the same (70.17% and 79.71%); and transient activation of the sympathoadrenal system was less pronounced (Tables 4–6).

Evaluation of changes in the central nervous system showed that the incidence of grade 1 and 2 cerebral ischemia is 1.17 times higher in infants from group 1a than in infants from group 2. Clinically, inhibition of the central nervous system was recorded 2.23 times more often; the incidence of the autonomic nervous system disorders was high (40.63%); and cephalohematoma was diagnosed 2.07 times less often (see Table 4).

Neurosonographic data analysis revealed that vascular plexus cysts were diagnosed 1.3 times more often in group 1a infants than in group 2 infants, and grade 1 intraventricular hemorrhage and grade 1 ventricular expansion were diagnosed 8.33 and 1.6 times less often, respectively (see Table 4).

Compared with group 2 infants, the occurrence of cryptorchidism and hydrocele were, respectively, 1.66 and 1.65 times lower in group 1a infants. Renal pyelectasis was diagnosed 3.02 times more often (see Table 4).

As regards the heart profile, the anterior mitral valve leaflet in group 1a infants was deflected 6.14 times more often than in group 2 infants, and interventricular septal defect was diagnosed 2.93 times less often. Additional chords and/or trabeculae incidence was similar (65.96 and 62.5%) (Table 4).

Assessment of transitory physiological conditions revealed the following: in group 1b compared with group 2, transient loss of initial body weight on the first or second day was diagnosed 1.66 times more often, while transient hypoglycemia (which was not corrected in most of the patients) was diagnosed

Table 4 / Таблица 4

Assessment of a current of the early neonatal period of life at newborns
Оценка течения раннего неонатального периода жизни у новорожденных

Indication, abs. (%) / Показатель, абс. (%)	Groups / Группа		Group 2 / Группа 2, *n* = 69
	1a, *n* = 57	1б/b, *n* = 15	
Transitional physiological states / Переходные физиологические состояния			
Transient features from metabolism / Транзиторные особенности со стороны метаболизма			
Loss of initial body weight, % for 1–2 days of life / Потеря первоначальной массы тела, % на 1–2-е сутки жизни	32 (56.14)	13 (86.7)	36 (52.17)
Hypoglycemia / Гипогликемия	13 (46.43)	1 (7.14)	5 (29.41)
Transient changes from integuments / Транзиторные изменения со стороны кожных покровов			
Toxic eritema / Эритема токсическая	7 (12.28)	2 (13.33)	5 (7.25)
Generic tumor / Родовая опухоль	8 (14.04)	2 (13.33)	17 (24.64)
Tranzitorny features from an early neonatal hematopoiesis / Транзиторные особенности со стороны раннего неонатального гемопоэза			
Erythrodiasis followed by transient anemia / Эритродиерез, сопровождавшийся транзиторной анемией	9 (20.45)	0	17 (42.5)
Hiperbilirubinemia followed by physiological jaundice / Гипербилирубинемия, сопровождавшаяся физиологической желтухой	41 (71.93)	8 (53.33)	39 (56.52)
Transient features from blood circulation / Транзиторные особенности со стороны кровообращения			
The functioning interatrial communication / Функционирующее межпредсердное сообщение	23 (48.94)	9 (60)	31 (64.58)
Open arterial channel for 2–5 days of life / Открытый артериальный проток на 2–5-е сутки жизни	4 (8.51)	3 (20)	7 (14.58)
Polycythemia / Полицитемия	14 (31.82)	4 (26.67)	10 (25)

Table 4 (continued) / Окончание табл. 4

Indication, abs. (%) / Показатель, абс. (%)	Groups / Группа		Group 2 / Группа 2, *n* = 69
	1a, *n* = 57	1б/b, *n* = 15	
Transient features from blood circulation / Транзиторные особенности со стороны кровообращения			
Hyperfunction and violation of metabolism of a myocardium / Гиперфункция и нарушение метаболизма миокарда	40 (70.17)	7 (46.67)	55 (79.71)
Transient activation of a sympathoadrenalic system / Транзиторная активация симпатоадреналовой системы			
Hypersympathicotonia / Гиперсимпатикотония	53 (92.98)	13 (86.67)	67 (97.1)
Hypersympathicotonic neurovegetative reactivity / Гиперсимпатикотоническая нейровегетативная реактивность	15 (26.37)	4 (26.67)	14 (20.29)
Changes of the central nervous system / Изменения со стороны центральной нервной системы			
Cerebral ischemia of the degree I–II / Церебральная ишемия I–II степени	32 (56.14)	15 (100)	33 (47.83)
Clinical manifestations / Клинические проявления:	32 (56.14)	15 (100)	33 (47.83)
• oppression of the central nervous system / угнетение центральной нервной системы	13 (40.63)	8 (53.33)	6 (18.18)
• excitement of the central nervous system / возбуждение центральной нервной системы	5 (15.63)	3 (20)	12 (36.36)
• frustration from the autonomic nervous system / расстройства со стороны вегетативной нервной системы	13 (40.63)	5 (33.33)	15 (45.46)
Cefalohematoma / Кефалогематома	2 (3.51)	1 (6.67)	5 (7.25)
Data of neurosonography / Данные нейросонографии			
Cysts of vascular textures / Кисты сосудистых сплетений	15 (65.22)	4 (50)	12 (50)
Intra ventricular hemorrhages of the degree I / Внутрижелудочковые кровоизлияния I степени	0	2 (25)	2 (8.33)
Expansion of ventricles of a brain to the degree I / Расширение желудочков головного мозга до I степени	6 (26.09)	4 (50)	10 (41.67)
Other changes / Другие изменения			
Cryptorchidism / Крипторхизм	1 (1.75)	2 (13.33)	2 (2.9)
Hydrocele / Гидроцеле	2 (3.51)	0	4 (5.8)
Pyeloectasia of kidneys / Пиелоэктазия почек	5 (8.77)	1 (6.67)	2 (2.9)
Changes of a heart / Изменения со стороны сердца			
Aneurysm of an interatrial septum / Аневризма межпредсердной перегородки	2 (4.26)	0	2 (4.17)
Deflection of a front shutter of the mitral valve / Прогиб передней створки митрального клапана	6 (12.77)	0	1 (2.08)
Defect of an interventricular septum / Дефект межжелудочковой перегородки	2 (4.26)	4 (26.67)	6 (12.5)
Additional trabeculas and/or chords in a cavity of the left ventricle / Дополнительные трабекулы и/или хорды в полости левого желудочка	31 (65.96)	9 (60)	30 (62.5)

Note. The general blood test was made at 44 children in Group 1a, at 15 children in Groups 1b, 40 children in Group 2; sugar of blood was defined respectively at 28, 14, 17 children; the neurosonography is carried out at 21, 10, 25 children; the echocardiography was executed at 47, 15, 48 children. *Примечание.* Общий анализ крови выполнили у 44 детей группы 1а, у 15 детей группы 1б, у 40 детей группы 2; сахар крови определили у 28, 14, 17; нейросонография проведена у 21, 10, 25; эхокардиографию выполнили у 47, 15, 48 соответственно.

Table 5 / Таблица 5

Assessment of descriptive statistics of sympathetic activity at babies for 2–3 days of life
Оценка описательной статистики симпатической активности у младенцев на 2–3-е сутки жизни

Amplitude of fashion, AM_0, conv. un. / Амплитуда моды, AM_0, усл. ед.	*n*	*Me*	Min	Max	Q_{25}	Q_{75}	Scope / Размах	Interquartile scope / Интерквартильный размах
Group 1a / Группа 1a	57	39.00	15.00	81.00	30.00	44.00	66.00	14.00
Group 1б / Группа 1b	15	39.00	14.00	61.00	29.00	45.00	47.00	16.00
Group 2 / Группа 2	69	43.00	16.00	93.00	31.00	55.00	77.00	24.00
Norm / Норма	25	38.00	32.00	44.00	35.00	41.00	12.00	6.00

Note. Me – Mediana, Max – maximum, Min – minimum, *n* – numbers, *Q* – quartile.
Примечание. Me — медиана, Max — максимальное значение, Min — минимальное значение, *n* — количество, *Q* — квартиль.

Table 6 / Таблица 6

Assessment of descriptive statistics of sympathetic activity at babies for 2–3 days of life
Оценка описательной статистики симпатической активности у младенцев на 2–3-е сутки жизни

Amplitude of fashion, AM_0, conv. un. / Амплитуда моды, AM_0, усл. ед.	*n*	*Me*	Q_{25}	Q_{75}	Criterion of Kolmogorova–Smirnova / Критерий Колмогорова–Смирнова
Groups 1a & 2 / Группы 1a и 2	57 & 69	39 & 43	30 & 31	44 & 55	0.001
Groups 1b & 2 / Группы 1б и 2	15 & 69	39 & 43	29 & 31	45 & 55	0.001

Note. Me – Mediana, Max – maximum, Min – minimum, *n* – numbers, *Q* – quartile.
Примечание. Me — медиана, Max — максимальное значение, Min — минимальное значение, *n* — количество, *Q* — квартиль.

4.12 times less often; and toxic erythema was 1.84 times higher, while the incidence of birth tumor was 1.85 times lower. In all the cases, toxic erythema disappeared by the time the infant was discharged from the perinatal center, and the birth tumor in most of the infants was not found on the third day of life. All the children developed transient hyperbilirubinemia and erythrodieresis, with transient hyperbilirubinemia associated with physiological jaundice with the same incidence (53.33 and 56.52%). The incidence of functioning atrial communication was similar (60% and 64.58%). From the second to fifth day of life, open ductus arteriosus was observed 1.37 times more often. The incidence of transient polycythemia was approximately the same (26.67 and 25%), transient hyperfunction and impaired myocardial metabolism were noted 1.71 times less often, and transient activation of the sympathoadrenal system was less pronounced (Tables 4–6).

Assessment of the central nervous system changes showed that in group 1b, the incidence of grade 1 cerebral ischemia was 2.09 times higher compared with that in group 2. Inhibition of the central nervous system was recorded 2.93 times more often. Autonomic nervous system disorder occurrence was high (33.33%). Cephalohematoma was diagnosed in a comparable percentage of cases (6.67% and 7.25%) (Table 4).

Neurosonography revealed that the incidence of vascular plexus cysts and grade 1 cerebral ventricular dilatation in group 1b and in group 2 infants was the same. In both groups, it was diagnosed in every second infant. The incidence of intraventricular hemorrhage was three times higher (Table 4).

Group 1b infants showed an incidence of cryptorchidism 4.6 times higher than group 2 infants, whereas the incidence of hydrocele was 5.8 times lower. Renal pyelectasis was detected 2.3 times more often (Table 4).

Regarding the heart profile, deflection of the anterior mitral valve leaflet in group 1b was observed 2.08 times rarer than in group 2. Moreover, interventricular septum defect was 2.13 times higher, and the incidence of additional chords and/or trabeculae was the same (60% and 62.5%) (Table 4).

Through an assessment of the transitory physiological conditions, it was found that the incidence of transient loss of initial body weight on the first or second day of life was 1.54 times higher in group 1b than in group 1a, while the incidence of transient hypoglycemia (which was corrected in the vast majority of cases) was 6.5 times lower. Toxic erythema (13.33 and 12.28%) and birth tumor (13.33 and 14.04%) were observed in a comparable percentage of cases. The children developed transient hyperbilirubinemia and erythrodieresis, with transient hyperbilirubinemia as-

sociated with physiological jaundice 1.35 times less often; functioning interatrial communication and open ductus arteriosus from the second to fifth day of life were 1.09 and 2.35 times higher, respectively; transient polycythemia was 1.19 times lower; transient hyperfunction and myocardial metabolic disorder was 1.5 times lower; and transient activation of the sympathoadrenal system did not have statistically significant differences (Tables 4–6).

Assessment of changes in the central nervous system revealed that in group 1b, the incidence of grade 1–2 cerebral ischemia was 1.78 times higher than in group 1a. Inhibition of the central nervous system was diagnosed 1.31 times more often, and the incidence of the autonomic nervous system disorders was similarly high (33.33% and 40.63%). Cephalohematoma was determined 1.9 times more often (Table 4).

Analysis of the neurosonographic data revealed that occurrence of vascular plexus cysts in group 1b was 1.3 times lower than in group 1a, grade 1 ventricular dilatation was 1.92 times higher, and the incidence of grade 1 intraventricular hemorrhages was higher. It was diagnosed in every fourth infant (Table 4).

Cryptorchidism was diagnosed 7.62 times more often in group 1b infants than in group 1a infants, and hydrocele was diagnosed 3.51 times less often. The incidence of renal pyelectasis was 1.31 times lower (Table 4).

As regards the heart profile, the incidence of the deflection of the anterior mitral valve leaflet in group 1b was observed to be 2.08 times rarer than in group 2, the incidence of the interventricular septum defect was 6.26 times higher, and additional chords and/or trabeculae was the same (60% and 65.96%) (Table 4).

At 1 month, acute respiratory infection incidence in group 1b infants was, respectively, 4.94 times and 3.72 times higher than in groups 1a and 2 infants; the incidence of anemia was 7.14 times higher; and dermatitis was 7.69 times and 15.39 times lower, respectively. In group 1a, compared with group 2, the incidence of acute respiratory infections and dermatitis were 1.33 times and 2 times lower, respectively. At 3 months, the incidence of anemia in group 1b compared with groups 1a and 2 was 4.38 and 3.56 times higher, respectively. Moreover, the incidence of acute respiratory infections was 1.47 and 1.18 times lower. In group 1b, atopic dermatitis was 1.33 times lower than in group 1a and 2.54 times higher than in group 2b. Compared with group 2, the incidence of acute respiratory infections and atopic dermatitis was 1.24 and 3.39 times higher in group 1a, and the incidence of anemia was 1.23 times lower. At 6 months, in group 1b compared with groups 1a and 2, the incidence of anemia was 3.23 and 2.37 times higher, the incidence of acute respiratory infections was 2.32 and 2.17 times lower, and the incidence of atopic dermatitis was 2.17 and 1.44 times lower, respectively. In group 1a, the incidence of acute respiratory infections and atopic dermatitis was higher and the incidence of anemia was lower than in group 2.

At 9 months, the incidence of acute respiratory infections in group 1b compared with groups 1a and 2 was 1.21 and 1.52 times lower and atopic dermatitis was 2.44 and 1.77 times lower, respectively. In group 1b, compared with groups 1a and 2, the incidence of anemia was approximately the same (9.09% and 9.76%). In group 1a, compared with group 2, the incidence of acute respiratory infections, anemia, and atopic dermatitis was the same in groups 1a and 2.

At 12 months, in group 1b compared with groups 1a and 2, the incidence of acute respiratory infections was 1.36 and 1.76 times higher, respectively. In groups 1a and 1b, anemia was not noted, while in group 2, its incidence was 3.45%. Atopic dermatitis was diagnosed in 2.44% of children from group 1a, in 9.09% from group 1b, and in 17.24% from group 2 (Fig. 1).

Figure 1 indicates that in group 1a, the peak incidence of acute respiratory infections was at 6 months and the increase in incidence was registered at 12 months. In group 1b, the peak incidence of acute respiratory infections was observed at 12 months; in group 2, it was at 6 months. In groups 1a, 1b, and 2, the peak incidence of anemia was observed at 3 months. In group 1a, the peak of atopic dermatitis occurrence was at 6 months; in group 1b, it was at 12 months; and in group 2, it was at 1, 6, and 12 months.

Assessment of the degree of body's adaptation to environmental conditions on the second or the third day of life showed high percentage of its violation. Thus, violation of the degree of body's adaptation to environmental conditions was found in 71.93% of infants from group 1a, in 73.33% of infants from group 1b, and in 81.16% of infants from group 2. The most unsatisfactory degree of the body's adaptation to environmental conditions (Table 7) was shown in groups 1a and 2 (42.11% and 40.58%, respectively). In group 1b, stress and overstress adaptation (40%) were noted. In group 1b, compared with groups 1a and 2, the incidence of adaptation failure was high (20%).

An analysis of the degree of the body's adaptation to environmental conditions at age 1 month revealed its decrease in dynamics but high incidence of its violation. But in groups 1a and 1b, it was lower (67.31% and 64.29%, respectively) compared with infants from group 2 (75.36%). Among violations of the degree of the body's adaptation to environmental conditions presented in Table 7, stress and overstress

adaptation were the most frequent among the infants from groups 1a and 2, while satisfactory adaptation was the most frequent among the infants from group 1b. However, the incidence of adaptation failure was higher in groups 1b and 2 than in group 1a.

An assessment of the degree of the body's adaptation to environmental conditions at age 3 months revealed its violation in 68.89% of children from group 1a, while the indicator remained unchanged in dynamics. In 75% of children from group 1b, the indicator increased in dynamics, and decreased in 62.3% of children from group 2. Among violations of the degree of the body's adaptation to environmental conditions presented in Table 7, stress and overstress adaptation were the most frequent among the children from groups 1a (33.33%), 1b (41.67%), and 2 (31.15%). In groups 1a and 1b, the incidence of adaptation failure increased in dynamics, while it decreased in group 2.

An assessment of the degree of the body's adaptation to environmental conditions at age 6 months revealed that all the examined children showed an improvement in adaptation. Among violations of the degree of the body's adaptation to environmental conditions shown in Table 7, stress and overstress adaptation were the most frequent (30.23%) among the children from group 1a, adaptation and overstress adaptation (23.04%) and unsatisfactory adaptation (23.04%) were the most frequent among the children from group 1b, and adaptation and overstress adaptation were the most frequent in group 2a (35.19%). The incidence of adaptation failure decreased in dynamics, depending on the type of IUGR.

An assessment of the degree of the body's adaptation to environmental conditions at age 12 months indicated that it lowered in children with IUGR, especially in those from group 1b compared with children of group 2. Among violations of the degree of the body's adaptation to environmental conditions presented in Table 7, stress and overstress adaptation and unsatisfactory adaptation were the most frequent among children from groups 1a and 1b, whereas stress and overstress adaptation were the most frequent among children of group 2 (24.14%). In children from groups 1a, 1b, and 2, the incidence of failure of adaptation did not significantly change in dynamics and was not associated with the IUGR type.

Determining the body's adaptation to environmental conditions in infants allowed individualized clinical observation. This study is the first to assess the characteristics of the degree of adaptation to environmental conditions of full-term infants with different types of mild IUGR. Indeed, these children can be reported as practically healthy following the guidelines "On the Procedure for Conducting Preventive Medical Examinations of Minors"[1] in first-level medical institutions and with satisfactory body adaptation to environmental conditions. They were recommended a normal daily routine with good nutrition and tempering. Among the children from group 1a, 28.07% needed these measures at birth, 32.69% at 1 month, 31.11% at 3 months, 51.16% at 6 months, and 48.78% at 12 months. Among children from group 1b, 26.67% needed them at birth, 35.71% at 1 month, 25% at 3 months; 46.15% at 6 months, and 36.36% at 12 months.

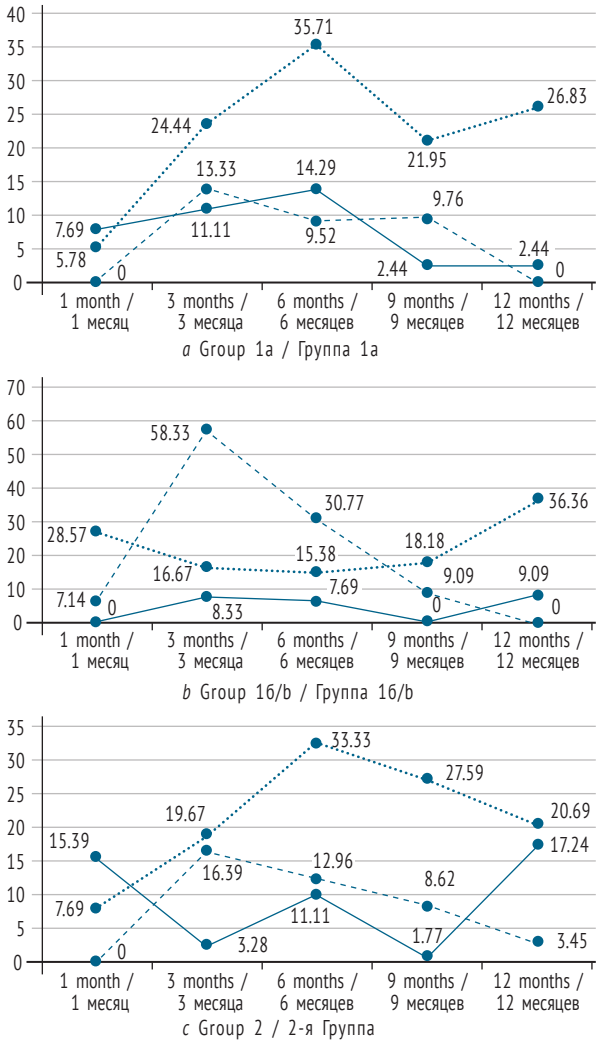

Fig. 1. Assessment of frequency of incidence of anemia, dermatitis, sharp respiratory infections at children: *a* – Group 1a, *b* – Group 1b, *c* – Group 2

Рис. 1. Оценка частоты заболеваемости анемией, дерматитом, острыми респираторными инфекциями у детей: *a* — группа 1а, *b* — группа 1б, *c* — группа 2

[1] Order of the Ministry of Health of the Russian Federation No. 514n of August 10, 2017 "On the procedure for conducting preventive medical examinations of minors". URL: http://sch1368uz.mskobr.ru/files/prikaz_minzdrava_514n_o_profah_rtf.pdf.

Table 7 / Таблица 7

Assessment of extent of adaptation of an organism to environment conditions at children
Оценка степени адаптации организма к условиям среды у детей

Group / Группа	Period / Период	Extent of adaptation of an organism to environment conditions, abs. % / Степень адаптации организма к условиям среды, абс. %			
		Satisfactory / Удовлетворительная	Tension and overstrain / Напряжение и перенапряжение	Unsatisfactory / Неудовлетворительная	Failure / Срыв
Group 1a / Группа 1а	2–3 days / сутки	16 (28.07)	13 (22.81)	24 (42.11)	4 (7.02)
	1 month / месяц	17 (32.69)	19 (36.54)	11 (21.15)	5 (9.62)
	3 months / месяца	14 (31.11)	15 (33.33)	11 (24.44)	5 (11.11)
	6 months / месяца	21 (51.16)	13 (30.23)	5 (11.63)	3 (6.98)
	12 months / месяца	20 (48.78)	8 (19.51)	9 (21.95)	4 (9.76)
Group 1b / Группа 1б	2–3 days / сутки	4 (26.67)	6 (40)	2 (13.33)	3 (20)
	1 month / месяц	5 (35.71)	4 (28.57)	3 (21.43)	2 (14.29)
	3 months / месяца	3 (25)	5 (41.67)	2 (16.67)	2 (16.67)
	6 months / месяца	6 (46.15)	3 (23.04)	3 (23.04)	1 (7.69)
	12 months / месяца	4 (36.36)	2 (18.18)	2 (18.18)	1 (9.09)
Group 2 / Группа 2	2–3 days / сутки	13 (18.84)	18 (26.09)	28 (40.58)	10 (14.49)
	1 month / месяц	16 (24.62)	22 (33.85)	17 (26.25)	10 (15.38)
	3 months / месяца	23 (37.7)	19 (31.15)	12 (19.67)	7 (11.48)
	6 months / месяца	25 (46.3)	19 (35.19)	5 (9.26)	5 (9.26)
	12 months / месяца	29 (50)	14 (24.14)	11 (18.97)	4 (6.9)

When identifying violations of the degree of the body's adaptation to environmental conditions among infants with congenital mild IUGR, it is necessary to distinguish a group of dispensary observation and to take additional diagnostic and therapeutic measures. Highly qualified doctors, neonatologists, and pediatricians determine their volume, timing, and whether they are needed or not based on the tests and assessments of anamnestic data in critical periods of growth, that is, at birth and at 1, 3, 6, and 12 months of life, considering the characteristics of adaptation to environmental conditions. This will correctly substantiate the high-risk strategy (personalized approach) in dispensary observation of infants, routing, and the level of medical institutions.

The regimen of children with congenital mild IUGR and stress and overstress adaptation can be normal and their feeding rational. They need hardening, nondrug treatments. The degree of their bodies' adaptation to environmental conditions should be determined, feasible in first-level medical institutions. In our study, in group 1a, 22.81% of children required such measures at birth, 36.54% at 1 month, 33.33% at 3 months, 30.23% at 6 months, and 19.51% at 12 months. In group 1b, 40% of children required them at birth, 28.57% at 1 month, 41.67% at 3 months, 23.04% at 6 months, and 18.18% at 12 months.

Medical interventions for congenital mild IUGR children with unsatisfactory adaptation and adaptation failure should be performed in second-level and third-level medical institutions, respectively. In our study, 49.13% of children from group 1a required such measures at birth, 30.77% at 1 month, 35.55% at 3 months, 18.61% at 6 months, and 31.71% at 12 months. Among the children from group 1b, 33.33% required them at birth, 35.72% at 1 month, 33.33% at 3 months, 30.76% at 6 months, and 27.27% at 12 months.

DISCUSSION

IUGR in children, and subsequently in adults, remains understudied. Thus, the issues of features of nosological form correction in affected children are unknown. The results of this study coincide with the literature [2, 5, 7, 8] and suggest that mild IUGR affects the adaptation of infants in subsequent periods of life. Each organ, organ system, and the whole body of the infant with IUGR functions differently in the subsequent stages of life, complicating the differential diagnosis with the onset of diseases. Thus, the differential diagnosis between transitory physiological and pathological conditions in the early neonatal period of the infants with IUGR was challenging. Because the infants were at the early neonatal period of life, most of the diagnosed conditions were not treated, although in some cases it was necessary; we described them as transitory physiological conditions. Difficulties

in differential diagnosis led to delayed identification of the onset of diseases, resulting in untimely and inadequate treatment, increasing morbidity and disability among adults and, subsequently, social and economic costs. Due to the lack of systemic measures, the affected children lack professional medical care.

Despite the fact that the IUGR effects are well-known and well-studied, in Russia, most of the infants with mild IUGR are discharged from perinatal centers in the third to fifth day of life, which is confirmed to be unacceptable based on the results of this study. We first determined the number of children who can be discharged from the perinatal centers in the third to fifth day of life and subsequently observed if they are healthy based on the degree of their bodies' adaptation to environmental conditions. This criterion was met in only 28.07% of infants with mild IUGR of asymmetric type and 26.67% of infants with mild IUGR of symmetric type.

CONCLUSION

Determining the degree of the body's adaptation to environmental conditions makes it possible to identify dispensary observation groups at the perinatal stage, determine the routing and level of the medical institution at the outpatient stage, and timely diagnose and prevent cerebral ischemia, anemia, acute respiratory infections, atopic dermatitis, and changes in the degree of the body's adaptation to environmental conditions and to treat their consequences. The start of treatment and preventive measures, their type, and the need for repeated courses are determined individually.

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