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G.V. Nevoit, M.M. Potiazhenko, O.P. Mintser[1]
Poltava State Medical University, Poltava
[1]Shupyk National Healthcare University of Ukraine, Kyiv

SYSTEMIC DEPENDENCES OF CHANGES IN BODY COMPOSITION WITH THE PROGRESSION OF NON-COMMUNICABLE DISEASES

e-mail: umsainua@ukr.net

The article covers practical issues of assessing the clinical significance of the use of instrumental impedancemetry to determine body composition as an objective reflection of the consequences of the lifestyle of patients. The purpose of the study is to determine the clinical and pathogenic features of Non-communicable Diseases based on the results of instrumental impedancemetry and to improve approaches to the management of patients with non-communicable diseases in the first and second stages of therapeutic care. The article presents the results of instrumental impedancemetry of body composition of functionally healthy people of different levels of physical fitness and patients with non-communicable diseases, which were distributed depending on the level of comorbidity and the stage of the cardiovascular continuum. Based on the assessment of impedancemetry parameters, conclusions were made about the presence of systemic dependences of body composition in the progression of Non-communicable Diseases, the significant clinical significance of instrumental impedancemetry in the examination of patients was established, and the percentage of non-communicable diseases.

Key words: non-communicable diseases, objective structured clinical examination, impedance body composition, obesity, muscle percentage.

Г.В. Невойт, М.М. Потяженко, О.П. Мінцер

СИСТЕМНІ ЗАЛЕЖНОСТІ ЗМІН СКЛАДУ ТІЛА ПРИ ПРОГРЕСУВАННІ НЕІНФЕКЦІЙНИХ ЗАХВОРЮВАНЬ

Стаття висвітлює практичні питання оцінки клінічного значення використання інструментальної імпедансометрії для визначення складу тіла як об'єктивного відображення наслідку ведення способу життя пацієнтів. Мета дослідження – визначити клініко-патогенетичні особливості перебігу неінфекційних захворювань за результатами інструментальної імпедансометрії та вдосконалити підходи до ведення хворих на неінфекційні захворювання на першому та другому етапах надання терапевтичної допомоги. У статті представлені результати інструментальної імпедансометрії складу тіла функціонально здорових людей різного рівня фізичної тренованості і хворих на неінфекційні захворювання, які були розподілені в залежності від рівня коморбідності та етапу серцево-судинного континууму. На підставі оцінки параметрів імпедансометрії були зроблені висновки про наявність системних залежностей складу тіла при прогресуванні неінфекційних захворювань, встановлено суттєве клінічне значення інструментальної імпендансометрії в обстеженні пацієнтів, а також вперше запропоновано у якості нового раннього предиктору виникнення неінфекційних захворювань здійснювати оцінку відсоткового вмісту м'язів.

Ключові слова: неінфекційні захворювання, клінічне об'єктивне обстеження, імпедансометрія складу тіла, ожиріння, відсотковий вміст м'язів.

The work is a fragment of the research project "Development of algorithms and technology for introducing a healthy lifestyle in patients with non-communicable diseases based on the study of functional status" state registration No. 0121U108237, UDC 613:616-056-06:616.1/9-03.

Non-communicable diseases (NCDs) are a significant medical and social problem. They cause the death of 41 million people annually, of which - 15 million people under the age of old age. The "WHO Global Plan of Action for the Prevention and Control of NCDs for 2013–2020" has been activated in response to the global pandemic. However, it did not produce the expected results, as reported on May 27, 2021 in the online report of the WHO Office in Ukraine on "Lessons learned from the implementation of the WHO package of basic measures on NCDs (PEN) in Ukraine". This determines the relevance of continuing the scientific search for ways to increase the efficacy of prevention and treatment of NCDs to overcome this medical and social problem at the world level. The issue of introducing modern science-intensive instrumental techniques that can help identify and stratify risk factors for NCDs remains important for the primary levels of therapeutic care in Ukraine. This is necessary for further optimization of the management of patients with NCDs at the first and second stages of providing therapeutic care to strengthen measures for prevention and early diagnosis of NCDs [1, 2]. Instrumental study of body composition may be of fundamental clinical importance in the management of NCDs [4, 14]. The latest in-depth insights into the role of skeletal muscle in metabolism make this study relevant as well [3, 5, 15].

We propose to use instrumental impedancemetry for this purpose to determine the composition of the body as an objective criterion for reflecting the state of health, as this technique is not used enough in Ukraine.

The purpose of the work was to determine the clinical and pathogenetic features of the non-communicable diseases according to the results of instrumental impedancemetry and to improve the approaches to the management of non-communicable diseases patients at the first and second stages of therapeutic care in Ukraine.

Materials and methods. An open, non-randomized, controlled study was performed at the Educational and practical Center of Biophotonics and Valeology of the Department of Internal Medicine and Emergency Medicine of the Ukrainian Medical Stomatological Academy (UMSA, Poltava, Ukraine). 70 patients with NCDs without cardiovascular disease (mean age – 46.2±9.7 years; median age – 49 (20; 65) years; 22 (32 %) men) and 183 patients with NCDs with cardiovascular disease (mean age – 56.06±14.56 years; men – 10 (32 %) were included in the study. Patients with NCDs with cardiovascular disease had a verified diagnosis of Coronary Heart Disease: functional angina pectoris II-III according to the classification of the Canadian Cardiovascular Society – English Canadian Cardiovascular Society (1976) as the main disease in combination with other comorbid pathology. The results of the survey of functionally healthy individuals with varying degrees of physical fitness were control. The first subgroup of control (Group C1) consisted of functionally healthy young people without NCDs, who regularly play sports – professional football players (n=75 people, median age – 19 (15; 34) men – 100 %;) who were examined during the annual medical examination. The second subgroup of control (Group C2) consisted of functionally healthy young people without NCDs who did not regularly engage in sports - students, interns, clinical residents of UMSA, (n=111 people; 87 (78 %) men, median age – 23 (19; 34) years).

Patients with NCDs were divided into groups according to the stage of the Cardiovascular Disease Continuum (CVDC) according to the classification of the American College and the American Heart Association (2001). Patients with stage A of the CVDC (stage of formation of risk factors) were Group 1 (n=70; mean age – 46.2±9.7 years; mean age – 49 (20; 65) years; 22 (32 %) men). Patients with stage B–C of the CVDC (cardiovascular pathology with short-term follow-up (up to 5 years), without verified complications from the target organs are available) were Group 2 (n=69; mean age – 57.6±13.7 years; median age – 60 (23; 82) years; 28 (41 %) men). Patients with stage C–D of the CVDC (cardiovascular pathology with prolonged follow-up) (over 5 years), with existing complications from the target organs (Transient Ischemic Attack, Stroke, Myocardial Infarction in the anamnesis) were Group 3 (n=72; mean age – 62.7±11.6 years, median age – 62 (44; 87) years, 54 (75%) men). Group 4 (n=43; mean age – 62.8±10.6 years; median age – 63 (38; 80) years; 35 (81%) men) was for comparison. It included patients with NCDs with stage C-D, in whom the study was carried out during the treatment of Coronary Heart Disease: myocardial infarction at the subacute stage [9].

Exclusion criteria were the presence of mental illness, severe somatic pathology at the stage of decompensation, drug use, condition after surgery, terminal cancer, diffuse connective tissue diseases, infectious diseases, including Covid-19 infection, postpartum syndrome, and pregnancy. All NCD patients included in the study were treated in specialized departments of accredited hospitals and underwent general clinical, laboratory and specialized instrumental examination in accordance with the nosological diagnosis and profile of the department. Clinical assessment of comorbidity was performed by counting the number of verified diagnoses in the patient's medical records, the Cumulative Illness Rating Scale (CIRS) and the Charlson Index, (ChI) [7, 11].

The standard examination, according to the existing recommendations in accordance with the current Order of the Ministry of Health of Ukraine dated 13.06.2016 No. 564 “On approval and implementation of medical and technological documents for standardization of medical care for the prevention of cardiovascular disease” carried out to all respondents entered the study. Additional valeological clinical and instrumental study was performed in accordance with the developed method of determining the direction of personalized correction of the patient's lifestyle with the assessment of body composition by instrumental impedancemetry. Instrumental impedancemetry determining body composition was performed with a Body Composition Monitor (model HBF-500-E, Omron Healthcare, Japan) according to the recommended measurement technique. The BIM monitor automatically calculates the following indices: body weight (kg), Body Mass Index (BMI), Body Fat Percentage (BFP) (5.0-60.0 % in 0.1 % increments), Visceral Fat Level (VFL) (at 30 levels in increments of 1 level), Skeletal Muscle Percentage (SMP) (5.0–50.0 % in 0.1 % increments), Resting Metabolism (RM) (385–5000 kcal) [6, 14].

The study was approved by the Ethics Committee of the UMSA. It was carried out in compliance with all applicable ethical rules.

Statistical analysis was performed using the Prism 5.0 software package. The data obtained are presented as mean values with their mean error (M±m) and medians and percentiles [Q25; Q75]. Nonparametric ranking criterion – Mann-Whitney U-test was used to compare and determine the statistical significance of differences between groups. The differences were considered significant at $p<0.05$. Correlation analysis was performed by determining the linear parametric Pearson correlation coefficient (r_p) and the nonparametric correlation coefficient of Spearman's ranks (r_s).

Results of the study and their discussion. Clinical assessment of comorbidity in patients with NCDs was performed to further improve the methodology of the system approach and criterion diagnosis in patients with NCDs depending on the degree of comorbidity and stage of CVDC. This was appropriate to further optimize the personalized approach to patient management and to avoid the principle of diagnostic monism in research because most patients are now comorbid. The results of the study of the level of comorbidity with the progression of NCDs are shown in table 1.

Table 1

Assessment of the degree of Comorbidity and the stage of CVDC by analysis of medical records, CIRS, ChI

Parameter	Patients with NCDs (n=253)			
	Group 1 (n=70)	Group 2 (n=69)	Group 3 (n=72)	Group 4 (n=43)
Age, year	46.2±9.7	57.6±13.7	62.7±11.6	46.2±9.7
CIRS, M±m, median [25; 75]	2.26±1 2 (1;4)	8.55±2.66 8 (4;16)	13.51±3.84 14 (6;26)	13.51±3.45 14 (8;26)
ChI, M±m, median [25; 75]	1±0.93 1 (0;4)	1.77±1.27 2 (0;5)	3.53±1.39; 3 (1;5)	4.14±0.71 4 (3;5)
CVDC uncomplicated, n (%)	2 (3)	69 (100)	9 (13)	0
CVDC complicated, n (%)	0	0	63 (87)	43 (100)
Number of diagnoses, M±m, median [25; 75]	2.43±0.94 2 (1:7)	6.49±2.21; 6 (2;11)	9.88±1.62 10 (8;15)	8.16±2.18 8 (6;14)

We established from the general analysis of parameters that Group 1 was characterized by a mild degree of comorbidity, Group 2 had a medium level of comorbidity, Group 3 and group 4 had a high degree of comorbidity. It was found that comorbidity is a characteristic feature of NCDs and it probably increases with age. 4 (6 %) cases with one diagnosis were verified in Group 1. 0 cases with one diagnosis were verified in Groups 1–4. An increase in the number of diagnoses was found between Group 1 and Groups 2–4 ($p<0.0001$) and between Group 2 and Group 3 and Group 4 ($p<0.0001$). A significant increase in the level of comorbidity on the average CIRS index was found between group 1 and groups 2–4 ($p<0.0001$), between Group 2 and Group 3 and Group 4 ($p<0.0001$). A significant increase in CIRS and the ChI was observed in Group 3 and Group 4 against Group 2 and Group 1. An increase in the average number of diagnoses was observed in Group 3 and Group 4 against Group 1 and Group 2.

The existing systemic dependence of fat metabolism disorders and the progression of the CVDC in NCDs was confirmed by personal analysis of data, as the results of impedancemetry showed the dynamics of the number of cases of fat metabolism disorders and their degree in the study groups. Obesity was verified by BFP in 12 (17 %) persons of Group 1, obesity was verified in 26 (37 %) persons of Group 1 and in 21 (31 %) and 34 (48 %) persons of Group 2, in 14 (20 %) and 41 (56 %) persons of Group 3, and in 15 (35 %) and in 22 (51 %) persons of Group 4, respectively. This confirmed the significant efficacy of instrumental impedancemetry for the verification of disorders of fat metabolism, as according to the processing of medical records, the diagnosis of obesity was established in only 3 (1 %) patients with NCDs. Estimates of body composition based on the results of instrumental impedancemetry depending on the stage of the CVDC and the level of comorbidity in patients with NCDs are shown in table 2.

Table 2

Group interpretation of body composition indicators based on the results of instrumental impedancemetry depending on the stage of the CVDC and the level of comorbidity in patients with NCDs

Parameter	Group C1 (n=75)	Group C2 (n=111)	Group 1 (n=70)	Group 2 (n=69)	Group 3 (n=72)	Group 4 (n=43)
BMI	22.53± 2.61	23.54± 3.74[1]	29.14± 19.69[1,2]	31.6± 19.52[1,2]	29.86± 5.37[1,2,3]	29.18± 5.12[1,2,3]
BMI median [25; 75]	22.4 [21.5; 23,2]	23.2 [21.2; 25.3]	25.8 [22.3; 31.23]	28.7 [24.6; 32.75]	29.7 [26; 33.3]	28.2 [24.9; 31.9]
BFP (norm 8-19.9%)	15.32±3.87	25.36±8.54[1]	30.73±11.27[1,2]	32.99±9.57[1,2]	29.66±9.59[1]	28.48±8,37[1]
BFP median [25; 75]	15.8 [12.4; 18.5]	25.35 [18.58; 31.42]	32 [19.9; 39.6]	33,5 [27.45; 39.15]	29.6 [22.5; 35.23]	28,4 [22.1; 33.2]
VFL (norm 1-9 level)	4.16±1.16	4.92±2.7	8.24±4.5[1,2]	11.71±5.75[1,2]	12.79±5.37[1,2]	12.42±4.56[1,2]
VFL median [25; 75]	4 [4; 5]	4 [3; 6]	7,5 [5; 10]	10 [7; 14.5]	12 [9; 16.75]	11 [9; 16]
SMP (norm 42-54 %)	41.6± 6.98	34.23± 6.16[1]	30.42± 6.09[1,2]	29.86± 4.67[1,2]	30.99± 5.19[1,2]	31.25± 4.77[1,2]
SMP median [25; 75]	42.3 [40; 44.05]	33,1 [29; 40]	30,8 [24.95; 35.25]	29,1 [26.2; 33.75]	31,6 [26.8; 34.5]	31.4 [27; 34.5]

Note: [1] – the difference is reliable at $p<0.05$ between the characteristics Group C1 and other groups, [2]- between the characteristics Group C2 and other groups, [3] – between the characteristics Group 1 and other groups; [4] – between the characteristics Group 2 and other groups; [5] – between the characteristics Group 3 and Groups 4.

Normal body composition was found in professional athletes in contrast to functionally healthy non-athletes and patients with NCDs. The indicators of fat metabolism in groups 1-4 were significantly different from those in Group C1 and Group C2. The established difference between BFP Group C2 versus Group C1 and the fact that overweight was detected in 26 (23 %) people in Group C2 and obesity in 6 (6 %) people in Group C2 confirmed the clinical sensitivity of instrumental impedancemetry for early prediction of obesity as a functional risk factor healthy people. The level of visceral fat probably differed in all groups of patients with NCDs from the control groups and it increased with the progression of NCDs and comorbidity. The number of persons with visceral obesity increased with the progression of the CVDC and comorbidity. Elevated VFL was diagnosed in 3 (3 %) people in Group C2 and high VFL in 2 (2 %) people in Group C2, in 18 (6%) and 6 (9 %) people in Group 1, in 14 (20 %) and in 25 (36 %) persons of Group 2, in 25 (35 %) and 18 (25 %) persons of Group 3, in 18 (42 %) and 15 (35 %) of Group 4.

Non-compliance with the norm of body composition by SMP was found in 92 (83 %) respondents of Group C2, in 60 (85 %) persons of Group 1, in 60 (91 %) persons of Group 2, 64 (89 %) persons of Group 3, 38 (88 %) persons of Group 4 persons respectively. Directly proportional dynamics between the growth of SMP deficit and the progression of the cardiovascular continuum in NCDs were characteristic. SMP in patients with NCDs was lower than age gender norms and probably lower than control groups.

The study of correlations of SMP with other indicators of body composition according to the results of impedancemetry in patients with NCDs depending on comorbidity and CVDC proved the presence of a close relationship with body structure, fat metabolism and NCDs progression. SMP correlated with Height (rp=0.53; rs=0.57, p <0.05), BFP (rp=-0.91; rs = -0.91, p <0.05), VFL (rs = -0.49, p <0.05), BMI = -0.46, p <0.05) in Group C1. SMP correlated with Height (r_p=-0.29; r_s=0.28, p<0.05), BFP (r_p=-0.29; r_s=-0.7, p<0.05), VFL (r_s=-0.49, p<0.05), RM (r_p=0.48; r_s=0.51, p<0.05) in Group C2. SMP correlated with Height (r_s=0.41, p<0.05), Weight (r_s=-0.24, p<0.05), BFP (r_p=-0.76; r_s=-0.79, p<0.05), VFL (r_p=-0.33; r_s=-0.44, p<0.05), BMI (r_s=-0.47, p<0.05) in Group 1. SMP correlated with Height (r_s=0.55, p<0.05), Weight (r_p=-0.22; p<0.05), BFP (r_p=-0.87; r_s=-0.86, p<0.05), VFL (r_p=-0.33; r_s=-0.27, p<0.05), BMI (r_p=-0.56; r_s=-0,52, p<0.05) in Group 2. SMP correlated with Height (r_s=0.39, p<0.05), BFP (r_p=-0.92; r_s=-0.91, p<0.05), VFL (r_p=-0.31; r_s=-0.38, p<0.05), BMI (r_p=-0.53; r_s=-0,51, p<0.05), із CIRS (r_p=-0.27; r_s=-0.24, p<0.05) in Group 3. SMP correlated with Height (r_p=0.32; r_s=0.35, p<0.05), вага (r_p=-0.42; r_s=-0.3, p<0.05), BFP (r_p=-0.91; r_s=-0.9, p<0.05), VFL (r_p=-0.48; r_s=-0.51, p<0.05), BMI (r_p=-0.6; r_s=-0,6, p<0.05) in Group 4.

The expressed direct correlation was established between indicators of BMI, BFP, VFL, criterion of comorbidity of CIRS, ChI at patients with NCDs at carrying out the correlation analysis. This indicates the existing systemic dependence of disorders of fat metabolism and the progression of the CVDC in NCDs as well. This is reflected most clearly in Group 3 (fig. 1).

W	**-0.47***						
H	**-0.29***	**0.56***					
BMI	**-0.33***	**0.81***	0.06				
SMP	-0.16	-0.17	**0.39***	**-0.51***			
BFP	-0.1	**0.34***	**-0.3***	**0.64***	**-0.91***		
VFL	-0.17	**0.73***	0.18	**0.83***	**-0.38***	**0.44***	
RM	**-0.42***	**0.85***	**0.54***	0.69*	0.01	0.14	
CIRS	**0.24***	-0.01	-0.2	0.12	**-0.24***	0.17	-0.06
ChI	**0.33***	-0.07	-0.19	0.04	-0.12	0.09	-0.01
	Age	**W**	**H**	**BMI**	**SMP**	**BFP**	**RM**

Fig. 1. Spearman correlation matrix of Group 3 indices. Note: W – Weight; H – Height; *– value p<0.05; the light gray color of the cell is a negative correlation; the dark gray color of the cell is a positive correlation between the comparison parameters.

The given correlation matrix shows a significant inverse relationship between age and body composition parameters (W, H, BMI), metabolic rate (RM) as well. We see a significant negative relationship between SMP and fat metabolism (BMP, VFL) and BMI as well. This confirms the fundamental role of muscles in metabolism, the formation of body composition in patients with NCDs.

It is common knowledge that a healthy human body must have age- and gender-specific relative muscle and adipose tissue content. Hypodynamia leads to a reduction in energy expenditure, and excessive nutrition causes the accumulation of adipose tissue in the human body. This forms the risk factors for NCDs. Pathological changes in body composition occur for a long time and gradually in accordance with the CVDC [4, 9, 10, 12, 14].

That is why the objective determination of body composition is of fundamental clinical importance, and this was done in this study. In our study, the results of the use of instrumental impedancemetry as a technique that can improve the early diagnosis of disorders of body composition, as well as it is effective at different stages of CVDC. The obtained results are in agreement with the fundamental researches of the

authors [4, 10, 12] about the significant clinical significance of the instrumental impedancemetry technique. Since the leading pathogenetic role of disorders of fat metabolism, in particular visceral fat as an endocrine-active organ in the progression of CVDC is proven [4, 10] and its objective detection and control in the management of patients to increase the effectiveness of preventive and curative measures is appropriate, it is important to understand that it is instrumental diagnose obesity, latent obesity and visceral obesity, which cannot be determined by anthropometry.

For the first time, we emphasize the importance of BFP as a new and fundamentally important predictor of the emergence of NCDs in the study as well. The fact of relative muscle deficit in individuals of Group C2 to age gender norms and compared with Group C1 as an objective consequence of systematic hypodynamics and a sign of lifestyle mismatch, as well as the correlations between body composition in comparison groups indicate the existing systemic relationship between disorders of fat metabolism, muscle deficiency in NCDs and they confirm the systemicity and relationship of energy metabolism in NCDs. The study of skeletal muscle condition in patients with coronary heart disease is described in study [2]. Our results confirm the importance of clinical assessment of skeletal muscle in NCDs as well.

We can think of muscles as the "energy station" of the body level. They are the main place of conversion of chemical energy into mechanical and other types of energy (thermal/infrared radiation, acoustic) from the standpoint of new system-medical ideas. All five stages of the biochemical cycle of muscle contraction involve the metabolism of adenosine triphosphate, which is the body's universal energy substrate. Muscles have a supply of glycogen and lipids for energy conversion. It can be assumed that the circulation of energy occurs at the body level in the form of photons in the muscle synkinizations. Our conclusions have the same ideological orientation with the research of scientists [3, 5, 15], who confirmed the fundamentally important direct role of the muscular system in the metabolism of the human body. This proves once again the importance of muscles as part of the energy system of the human body, the feasibility of their quantification and the possibility of using instrumental bioimpedancemetry for this purpose, because this method allows their objective determination.

Conclusions

1. The presence of systemic dependences of body composition is characteristic of the emergence and progression of NCDs, namely the progressive increase in the percentage of fat, visceral obesity, BMI with a decrease in the percentage of muscle, accompanied by an increase in comorbidity and progression of the CVDC.

2. Instrumental impedancemetry is of significant clinical importance in the examination of patients and it can be recommended for widespread use in the first and second stages of therapeutic care as a method of preclinical diagnosis of NCDs predictors and monitoring the effectiveness of treatment and prevention measures in NCDs patients.

3. The percentage of muscle according to instrumental impedancemetry is suggested as a new early predictor of NCDs.

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I.I. Nezgoda, A.O. Havryliuk, O.S. Onofriichuk, Y.M. Demchyshyn, Y.V. Haborets, L.G. Rosha[1], S.M. Poprotska[2]
National Pirogov Memorial Medical University, Vinnytsya
[1]Odessa State Agrarian University, Odessa
[2]Communal Nonprofit Enterprise "Vinnitsya Regional Clinical Childrens's Infectious Diseases Hospital, Vinnytsia Regional Council", Vinnytsya

CLINICAL-MORPHOLOGICAL FEATURES OF LIVER CHANGES IN CHILDREN WITH MONO- AND MIXED-ASSOCIATED TYPES OF INFECTIOUS MONONUCLEOSIS

e-mail: yardemchyshyn@gmail.com

This article considers the clinical features of course of mono- and mixed-associated infectious mononucleosis in 60 patients with and without liver lesions. It was established that symptoms duration of infectious mononucleosis in patients with mixed-associated type were significant longer compared to mono-variant. The similar significant deviation was detected in laboratory tests in patients with mixed-associated infectious mononucleosis. The tendency to detection morphometric and echoacoustic changes of the liver, using ultrasound technique, was noted in the same group of patients. Were established clinical independent predictors of liver lesions in patients with infectious mononucleosis as: concomitant anemia, female sex, age>10 years. During scientific studies morphological changes of the liver in patient with infectious mononucleosis were described with typical signs such as: moderate lymphohistiocytic infiltration, hepatocyte protein dystrophy, moderate manifestations of coagulation necrosis of centrilobular hepatocytes, endothelial desquamation and moderate manifestations of intraductal cholestasis. The presence of EBV-virus was confirmed by immunohistochemistry essay.

Keywords: infectious mononucleosis, children, hepatitis, herpes infection.

І.І. Незгода, А.О. Гаврилюк, О.С. Онофрійчук, Я.М. Демчишин, Я.В. Габорець, Л.Г. Роша, С.М. Попроцька

КЛІНІКО-МОРФОЛОГІЧНІ ОСОБЛИВОСТІ ЗМІН ПЕЧІНКИ У ДІТЕЙ ІЗ МОНО- ТА МІКСТ-АСОЦІЙОВАНИМ ВАРІАНТОМ ІНФЕКЦІЙНОГО МОНОНУКЛЕОЗУ

У цій статті наведено клінічні особливості перебігу моно- та мікст-асоційованого варіанту інфекційного мононуклеозу у 60 пацієнтів з та без ураження печінки. Встановлено, що тривалість симптомів інфекційного мононуклеозу у пацієнтів зі мікст-асоційованим типом була значно вищою порівняно з моно-варіантом захворювання. Подібне значне відхилення було виявлено в лабораторних дослідженнях у пацієнтів з мікст-асоційованим інфекційним мононуклеозом. Тенденція до виявлення морфометричних та ехоакустичних змін печінки за допомогою ультразвукового дослідження відзначена у тієї ж групи пацієнтів. Були встановлені незалежні клінічні предиктори ураження печінки у пацієнтів з інфекційним мононуклеозом такі, як: супутня анемія, жіноча стать, вік> 10 років. У процесі наукового дослідження морфологічні зміни печінки у пацієнтів з інфекційним мононуклеозом були описаними з типовими ознаками, такими як: помірна лімфогістіоцітирна інфільтрація, білкова дистрофія гепатоцитів, помірні прояви коагуляційного некрозу центролобулярних гепатоцитів, десквамація ендотелію та помірні прояви внутрішньопротокового холестазу. Наявність ЕВV-вірусу у біоптатах було підтверджено імуногістохімічним дослідженням.

Ключові слова: інфекційний мононуклеоз, діти, гепатит, герпетична інфекція.

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According to the WHO, in the structure of infectious pathology, mortality from diseases caused by herpesviruses took second place after influenza [7]. Among the diseases, which caused by herpes viruses, infection of the immune system such infectious mononucleosis (IM) has been studied by scientists nowadays.

The Epstein-Barr virus (EBV) infects from 16 up to 800 people per 100,000 population each year The incidence of IM is constantly growing both around the world, also in Ukraine: over the last 10 years it has more than doubled [3]. It has been established that the EBV-virus is associated with oncological, mainly lymphoproliferative and autoimmune diseases. Until recently, the development of IM was associated exclusively with EBV-virus. Nowadays, it has become clear that IM can be caused by other pathogens, mainly by members of herpesviruses family (CMV, HHV-6, HHV-7). Carriers of these viruses are more than 90 % of the world's population, however, the acute form of the disease is more common in childhood [5, 9]. These