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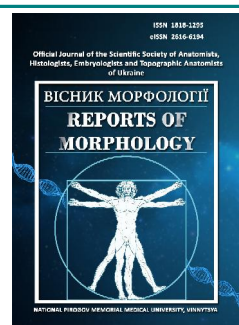
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Correlations of anthropo-somatotypological indicators with indicators of personality traits in practically healthy women of average intermediate somatotype

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The purpose of the work is to determine and analyze the peculiarities of correlations between indicators of personality features and anthropo-somatotypological parameters of the body of practically healthy women of middle intermediate somatotype. Primary personality indicators and anthropo-somatotypological parameters of the body of 17 practically healthy Ukrainian women of the first mature age of the middle intermediate somatotype were selected from the database of materials of the research center of National Pirogov Memorial Medical University, Vinnytsya. Correlation analysis was performed in the licensed package "Statistica 6.1" using the non-parametric Spearman's method. In the analysis of correlations between personality indicators and anthropo-somatotypological parameters of the body of almost healthy Ukrainian women of middle intermediate somatotype, multiple, in most cases, moderate inverse, reliable and unreliable relationships of Spielberger's personal anxiety index with all indicators of distal epiphyseal width (WDE) of limbs, almost half of the thickness of skin and fat folds (TSFF), endo- and mesomorphic components of the somatotype and bone and fat components of body weight; indicators of accentuation of the nature of the stuck and exciting types according to Shmishek with the majority of the transverse sizes of a trunk and a pelvis; indicators of accentuation of character of cyclothymic and demonstrative types according to Shmishek with the majority of longitudinal and third of circumferential sizes of a body; indicators of accentuation of the character of dysthymic and exalted types according to Shmishek with almost all indicators of WDE of the extremities, a third of the circumferential size of the body and the bone component of body weight; indicators of the scale of general internality of the level of subjective control, the level of subjective control in areas of achievement, and educational (professional) relations according to Rotter with the majority of cephalometric dimensions, body weight, most longitudinal, girth body sizes and indicators body weight; an indicator of the level of subjective control in the field of family relations according to Rotter with the majority of indicators of WDE of extremities and TSFF of extremities. Quantitative analysis of reliable and average strength of unreliable correlations revealed the highest relative percentage of relationships between: the leading typological characteristics of temperament according to Eysenck and the components of somatotype, WDE limbs and TSFF; psychodynamic features of personality according to Spielberger and WDE of extremities, components of somatotype, indicators of component composition of body weight, transverse body sizes and TSFF; indicators of severity and features of accentuated personality traits according to Shmishek and WDE extremities, transverse, longitudinal, girth body size and somatotype components; indicators of the level of subjective control by Rotter and WDE of the extremities, indicators of the component composition of body weight, longitudinal and girth body dimensions, TSFF and cephalometric dimensions.

Keywords: correlations, indicators of personality traits, anthropometric and somatotypological indicators, practically healthy women of middle intermediate somatotype.

Introduction

The ability to predict pathology using such an easy-to-use research method as anthropometric is a promising area of research for any researcher. However, the first step to be taken in the case of such an experiment is to study the normative indicators for the local population, taking into account ethnicity, age and sex.

Kretschmer's and Sheldon's theories were among the first to scientifically substantiate and prove the relationship between psychological characteristics and the type of human constitution. Through simple observations, Kretschmer found that asthenics are more prone to schizophrenia than manic-depressive syndrome [3].

In addition to anthropo-somatotypological indicators, the existence of a connection between dermatoglyphic indicators and indicators of personality traits, in particular for the Ukrainian population, has been proved [22]. The results of this kind of work can be successfully applied in various fields of clinical medicine, in particular in sports [7] and forensic medicine [22]. Thus, there is a need to conduct an experimental study taking into account as many variables as possible that are essential for determining normative anthropometric indicators and indicators of personality and their relationships within a particular population.

The purpose of the work is to determine and analyze the peculiarities of correlations between indicators of personality features and anthropo-somatotypological parameters of the body of practically healthy women of middle intermediate somatotype.

Materials and methods

Primary indicators of personality traits and anthropo-somatotypological indicators of practically healthy Ukrainian women of middle intermediate somatotype (n=17) aged 21 to 35 years were selected from the database of materials of the research center of National Pirogov Memorial Medical University, Vinnytsya.

With the help of personal questionnaires the definition was made of [9, 19]:

- leading typological characteristics of temperament according to Eysenck G., which included the definition (score) - an indicator on the scale of extraversion-introversion (AZ_E), an indicator on the scale of neuroticism (AZ_N) and an indicator on the scale of insincerity (AZ_L);

- psychodynamic features of personality according to Spielberger C.D. in the modification of Khanin Yu.L., which included the definition (score) - an indicator of situational (reactive) anxiety (SP_ST) and an indicator of personal anxiety (SP_LT);

- expressiveness and features of accentuated personality traits according to Shmishek G., which included the definition (score) - indicator of accentuation of character of hyperthymic type (SH_G), indicator of accentuation of character of stuck type (SH_Z), indicator of accentuation of character of emotional type (SH_EM), indicator of accentuation of character of pedantic type (SH_P), character

type accentuation index (SH_T), cyclothymic type character accentuation index (SH_C), demonstrative type character accentuation index (SH_DM), excitatory type character accentuation index (SH_V), dysthymic type character accentuation index (SH_DC) indicator of character accentuation of exalted type (SH_EK);

- components of internality by Rotter J. in the modification of Bazhin E.F., Golinkina S.O. and Etkind O.M., which included the definition (stens): the indicator of the scale of general internality of the level of subjective control (USK_1), the level of sub of subjective control in the field of achievements (USK_2), indicator of the level of subjective control in the field of failures (USK_3), indicator of the level of subjective control in the field of family relations (USK_4), indicator of the level of subjective control in the field of educational (professional) relations (USK_5), the indicator of the level of subjective control in the field of interpersonal relations (USK_6) and the indicator of the level of subjective control in the field of health and disease (USK_7).

Anthropometric examination according to Bunak V.V. [5] included determination of: head size (cm) - girth (OB_GL), maximum length (B_DL_GL), smallest width (N_SH_GL), width of the mandible (SH_N_CH), sagittal arch (SAG_DUG), maximum width (B_SH_GL) and face width (SH_LICA); body weight (kg) (W); longitudinal body dimensions (cm) - length (H), height of the upper thoracic point (ATND), height of the pubic point (ATL), height of the acromial point (ATPL), height of the finger point (ATP) and height of the acetabulum (ATV); the width of the distal epiphyses (WDE) of the long tubular bones of the limbs (cm) - shoulder (EPPL), forearm (EPPR); thighs (EPB) and shins (EPG); body girth (cm) - shoulder in a tense state (OBPL1), shoulder in a relaxed state (OBPL2), forearm in the upper part (OBPR1), forearm in the lower part (OBPR2), thighs (OBB), shins in the upper part (OBG1), lower legs (OBG2), neck (OBSh), waist (OBT), thighs (OBbb), hands (OBK), feet (OBS), chest on inspiration (OBGK1), chest on exhalation (OBGK2) and chest with calm breathing (OBGK3); transverse dimensions (cm) - transverse mid-thoracic (PSG), transverse lower thoracic (PNG), anterior-posterior chest size (SGK) and shoulder width (ACR), pelvic interspinal distance (SPIN), pelvic intercrystal distance (CRIS), pelvic intertrochanteric distance (TROCH) and only in women, superficial conjugates (CONJ); thickness of skin and fat folds (TSFF) (mm) - on the back surface of the shoulder (GZPL), on the front surface of the shoulder (GPPL), on the forearm (GPR), under the shoulder blade (GL), on the chest (GGR), on the abdomen (GG), on the side (GB), on the thigh (GBD) and on the shin (GGL).

The somatotype was calculated according to the mathematical scheme of Carter J. and Heath B. [6]. It included definitions (score): endomorphic component (FX), mesomorphic component (MX) and ectomorphic component (LX). The component composition of body weight (kg) was determined by the formulas of Matiegka J. [16]: muscle (MM), bone (OM) and fat (DM). The muscle component of body weight (MA) was also determined by the method of the American

Institute of Nutrition (AIN) [24].

Correlation assessment was performed in the licensed package "Statistica 6.1" using the non-parametric Spearman's method.

Results

The results of correlations between anthropometric and somatotypological parameters of the body of women of middle intermediate somatotype with indicators of the leading typological characteristics of temperament and psychodynamic features of personality are presented in table 1.

The results of correlations between anthropometric and somatotypological parameters of the body of women of middle intermediate somatotype with indicators of severity

Table 1. Correlations of anthropometric and somatotypological parameters of the body with the leading typological characteristics of temperament and psychodynamic personality traits of practically healthy women of middle intermediate somatotype (n=16-17).

Body parameters	Characteristics of temperament			Psychodynamic features of personality	
	AZ_E	AZ_N	AZ_L	SP_ST	SP_LT
OB_GL	-0.11	0.07	-0.28	-0.06	-0.07
B_DL_GL	-0.18	0.09	0.11	-0.24	-0.43
N_SH_GL	-0.38	0.01	0.02	0.02	-0.02
SH_N_CH	-0.18	-0.11	0.12	-0.19	-0.15
SAG_DUG	0.21	0.17	0.00	-0.15	-0.13
B_SH_GL	-0.39	0.06	0.49	-0.20	-0.02
SH_LICA	-0.25	-0.08	0.09	-0.26	-0.22
W	-0.24	0.14	-0.09	-0.04	-0.01
H	-0.19	-0.04	-0.01	-0.17	-0.24
ATND	-0.16	-0.03	-0.06	-0.20	-0.21
ATL	-0.43	-0.02	-0.06	-0.08	-0.05
ATPL	-0.40	0.07	-0.16	0.00	0.03
ATP	-0.03	0.21	0.12	-0.31	-0.06
ATV	-0.17	-0.03	-0.36	0.12	0.17
EPPL	0.05	-0.26	0.33	-0.22	-0.65
EPPR	0.14	-0.52	0.00	-0.23	-0.58
EPB	0.40	-0.19	-0.02	-0.41	-0.52
EPG	0.07	-0.17	0.11	-0.14	-0.44
OBPL ₁	-0.20	-0.07	0.23	-0.17	-0.26
OBPL ₂	-0.18	0.14	0.22	-0.08	-0.13
OBPR ₁	-0.33	-0.13	0.05	0.00	-0.05
OBPR ₂	0.05	-0.05	-0.10	-0.38	-0.23
OBB	-0.30	0.24	-0.18	0.11	0.15
OBG ₁	0.02	-0.12	0.13	-0.23	-0.48
OBG ₂	0.20	-0.07	-0.20	-0.19	-0.23
OBSH	0.01	0.09	-0.32	0.09	0.03

Continuation of table 1.

Body parameters	Characteristics of temperament			Psychodynamic features of personality	
	AZ_E	AZ_N	AZ_L	SP_ST	SP_LT
OBT	-0.22	0.26	-0.18	-0.05	0.14
OBBS	-0.47	0.18	0.21	0.13	-0.02
OBK	-0.22	-0.08	-0.03	-0.04	-0.22
OBS	0.06	0.08	0.06	0.06	-0.21
OBGK ₁	-0.21	0.01	-0.21	-0.02	0.00
OBGK ₂	-0.29	-0.23	-0.06	0.06	-0.14
OBGK ₃	-0.24	-0.04	-0.22	-0.06	-0.01
PSG	-0.06	-0.07	0.22	-0.15	-0.46
PNG	-0.06	-0.02	0.21	-0.30	-0.49
SGK	-0.29	0.29	-0.27	0.06	0.39
ACR	-0.07	-0.18	0.01	0.07	-0.04
SPIN	0.20	-0.04	-0.12	-0.11	-0.20
CRIS	0.01	0.15	0.00	-0.13	-0.11
TROCH	-0.10	0.25	0.13	0.08	-0.04
CONJ	-0.09	0.08	-0.04	-0.21	-0.07
GZPL	-0.02	-0.32	0.19	0.19	-0.34
GPPL	-0.05	-0.42	0.19	0.10	-0.48
GPR	-0.19	-0.12	0.33	-0.07	-0.29
GL	0.03	0.13	0.42	-0.24	-0.34
GGR	0.20	-0.21	0.21	-0.25	-0.44
GG	0.14	0.06	-0.17	0.18	0.12
GB	0.14	-0.27	0.05	-0.22	-0.16
GBD	0.14	0.04	-0.33	-0.02	-0.08
GGL	0.07	-0.12	-0.42	0.20	-0.13
FX	0.10	-0.16	0.31	-0.22	-0.41
MX	0.24	-0.24	0.41	-0.31	-0.64
LX	0.23	-0.33	0.08	-0.23	-0.24
MM	-0.18	0.09	-0.01	-0.10	-0.08
OM	0.26	-0.32	0.07	-0.36	-0.68
DM	0.07	-0.06	-0.02	-0.04	-0.37
MA	-0.18	0.09	0.12	-0.14	-0.05

Notes: here and in the following tables, brown background - reliable medium-strength direct correlations; yellow background - unreliable medium-strength direct correlations; purple background - reliable strong feedback correlations; blue background - reliable medium-strength feedback correlations; green background - unreliable medium-strength feedback correlations.

and features of accentuated personality traits are presented in table 2.

The results of correlations between anthropometric and somatotypological parameters of the body in women of middle intermediate somatotype with indicators of the level of subjective control are presented in table 3.

Correlations of anthropo-somatotypological indicators with indicators of personality traits in practically healthy...

Table 2. Correlations of anthropometric and somatotypological parameters of the body with indicators of severity and features of accentuated personality traits of practically healthy women of middle intermediate somatotype (n=16-17).

Body parameters	Indicators of severity and features of accentuated personality traits									
	SH_G	SH_Z	SH_EM	SH_P	SH_T	SH_C	SH_DM	SH_V	SH_DC	SH_EK
OB_GL	0.25	0.11	0.23	-0.10	0.02	-0.27	0.37	-0.21	-0.29	0.11
B_DL_GL	0.12	-0.07	0.23	0.15	0.16	-0.13	-0.03	0.18	-0.08	-0.15
N_SH_GL	-0.30	-0.39	0.25	0.11	0.01	-0.34	-0.21	0.13	-0.20	-0.02
SH_N_CH	-0.04	-0.12	0.14	-0.16	0.06	-0.59	-0.14	-0.15	-0.25	-0.01
SAG_DUG	0.16	-0.25	0.26	0.10	-0.09	0.28	0.25	0.64	-0.37	-0.01
B_SH_GL	-0.24	-0.06	0.40	0.17	0.13	-0.25	-0.31	-0.01	0.12	0.09
SH_LICA	-0.04	-0.32	0.10	-0.11	0.02	-0.48	-0.16	0.02	-0.31	0.02
W	-0.14	0.02	0.11	0.08	0.14	-0.35	-0.15	0.12	-0.21	0.00
H	-0.06	0.04	0.02	0.04	-0.01	-0.46	-0.17	-0.03	-0.14	-0.11
ATND	-0.02	-0.04	0.01	0.07	0.00	-0.38	-0.17	0.06	-0.23	-0.02
ATL	-0.20	-0.17	-0.02	0.05	0.14	-0.43	-0.41	-0.08	-0.08	0.05
ATPL	-0.12	0.06	-0.07	0.08	0.23	-0.34	-0.38	-0.04	-0.12	0.05
ATP	-0.10	-0.16	0.02	0.32	0.14	0.15	-0.30	0.70	-0.32	0.20
ATV	-0.04	0.06	-0.03	-0.16	0.05	-0.35	-0.31	-0.23	-0.01	-0.05
EPPL	-0.06	-0.02	-0.02	-0.01	-0.16	-0.28	-0.12	0.13	-0.12	-0.56
EPPR	-0.12	-0.10	-0.23	-0.33	-0.30	-0.52	0.00	-0.16	-0.33	-0.68
EPB	0.31	0.29	-0.22	-0.03	-0.21	-0.13	0.07	0.30	-0.46	-0.47
EPG	0.09	-0.06	0.02	0.00	-0.09	-0.12	0.00	0.22	-0.31	-0.45
OBPL ₁	-0.25	0.25	-0.09	0.13	0.05	-0.32	-0.38	0.01	0.00	-0.26
OBPL ₂	-0.23	0.09	0.05	0.19	0.21	-0.24	-0.32	0.22	-0.05	-0.07
OBPR ₁	-0.48	-0.02	-0.14	-0.09	0.18	-0.49	-0.44	-0.06	-0.15	-0.20
OBPR ₂	0.09	-0.06	-0.12	-0.08	-0.03	-0.13	-0.08	0.37	-0.32	-0.14
OBB	-0.38	-0.16	0.17	0.28	0.18	-0.20	-0.23	0.19	0.01	0.08
OBG ₁	0.06	0.00	0.02	-0.05	-0.22	-0.42	0.03	0.07	-0.16	-0.31
OBG ₂	0.27	0.24	-0.07	-0.05	0.03	-0.19	0.03	0.12	-0.30	-0.24
OBSH	0.06	0.15	0.13	0.08	0.09	-0.22	0.05	0.03	-0.14	0.02
OBT	-0.04	-0.01	0.05	0.04	0.33	-0.16	-0.20	0.33	-0.36	0.18
OBBS	-0.42	-0.27	0.23	0.28	0.31	-0.22	-0.38	0.22	0.00	-0.03
OBK	-0.40	-0.21	-0.12	-0.18	0.14	-0.29	-0.31	0.09	-0.07	-0.33
OBS	-0.05	0.02	0.28	-0.19	0.11	-0.05	0.07	0.05	-0.01	-0.34
OBGK ₁	-0.10	-0.01	0.08	-0.22	0.14	-0.53	-0.05	-0.07	-0.35	-0.09
OBGK ₂	-0.21	-0.20	0.00	-0.36	0.02	-0.71	-0.13	-0.30	-0.40	-0.23
OBGK ₃	-0.06	-0.10	0.09	-0.31	0.09	-0.57	0.01	-0.15	-0.42	-0.05
PSG	-0.08	-0.43	0.21	-0.18	-0.05	-0.23	0.14	0.16	-0.35	-0.23
PNG	-0.04	-0.39	0.10	0.09	-0.13	-0.05	-0.02	0.37	-0.20	-0.15
SGK	-0.34	-0.38	0.13	0.22	0.24	-0.08	-0.31	0.41	-0.18	0.44
ACR	0.00	0.47	-0.34	-0.38	0.14	-0.26	-0.17	-0.45	-0.12	-0.38
SPIN	-0.06	-0.26	0.32	-0.06	-0.03	-0.10	0.08	0.30	-0.36	-0.20
CRIS	-0.20	-0.31	0.19	0.13	0.07	0.12	-0.16	0.63	-0.24	-0.12
TROCH	-0.24	-0.31	0.39	0.15	0.10	-0.09	-0.14	0.39	0.02	0.02

Continuation of table 2.

Body parameters	Indicators of severity and features of accentuated personality traits									
	SH_G	SH_Z	SH_EM	SH_P	SH_T	SH_C	SH_DM	SH_V	SH_DC	SH_EK
CONJ	-0.25	-0.20	0.16	0.13	0.14	-0.25	-0.14	0.38	-0.43	0.00
GZPL	-0.14	-0.31	-0.12	0.13	-0.13	0.10	0.00	-0.15	0.08	-0.30
GPPL	-0.12	-0.30	-0.18	0.02	-0.12	-0.07	-0.15	-0.16	-0.04	-0.45
GPR	-0.15	-0.26	-0.03	0.12	-0.07	0.03	0.12	-0.10	0.03	-0.04
GL	0.12	-0.06	0.27	-0.06	-0.09	0.09	0.27	0.13	-0.02	-0.11
GGR	0.04	-0.17	0.05	-0.04	-0.30	0.01	0.50	-0.03	-0.12	-0.28
GG	0.20	0.31	-0.19	-0.18	0.24	0.10	-0.11	0.02	-0.05	-0.25
GB	0.17	0.04	-0.48	0.10	-0.09	0.29	-0.17	0.19	-0.34	-0.09
GBD	0.43	0.28	-0.29	0.09	0.04	0.13	-0.09	0.28	-0.29	-0.10
GGL	0.27	0.26	-0.09	0.10	-0.10	-0.10	0.08	-0.16	-0.07	-0.23
FX	0.16	-0.08	-0.04	0.16	-0.14	0.27	0.12	0.11	-0.14	-0.19
MX	0.30	0.27	-0.10	-0.08	-0.31	-0.15	0.05	0.12	-0.19	-0.57
LX	0.23	0.11	-0.32	-0.20	-0.33	0.06	0.12	-0.39	0.25	-0.08
MM	-0.18	-0.08	0.15	0.03	0.03	-0.42	-0.11	0.08	-0.14	0.00
OM	0.20	0.05	-0.07	-0.09	-0.29	-0.30	0.14	0.14	-0.46	-0.57
DM	0.20	0.01	-0.10	-0.04	0.03	-0.06	-0.03	0.17	-0.29	-0.37
MA	-0.20	0.19	0.02	0.15	0.14	-0.28	-0.34	0.11	-0.04	0.02

Note: red background - reliable strong direct correlations.

Table 3. Correlations of anthropometric and somatotypological parameters of the body with indicators of the level of subjective control of practically healthy women of middle intermediate somatotype (n=16-17).

Body parameters	Indicators of the level of subjective control according to Rotter						
	USK_1	USK_2	USK_3	USK_4	USK_5	USK_6	USK_7
OB_GL	-0.40	-0.72	0.09	0.15	-0.05	-0.17	-0.19
B_DL_GL	-0.18	-0.68	0.10	-0.09	-0.31	0.16	0.19
N_SH_GL	-0.31	-0.44	-0.06	0.02	-0.53	-0.05	0.02
SH_N_CH	-0.20	-0.32	0.29	0.38	-0.49	0.20	0.03
SAG_DUG	0.22	-0.14	0.06	-0.07	0.14	-0.27	0.26
B_SH_GL	-0.15	-0.04	-0.07	0.23	-0.65	0.05	-0.02
SH_LICA	-0.11	-0.48	0.45	0.33	-0.46	0.15	0.02
W	-0.32	-0.40	0.10	0.16	-0.41	0.09	-0.10
H	-0.40	-0.49	0.06	0.12	-0.55	0.13	-0.14
ATND	-0.35	-0.41	0.12	0.17	-0.52	0.23	-0.11
ATL	-0.41	-0.49	0.19	0.17	-0.61	0.28	-0.23
ATPL	-0.47	-0.52	0.09	0.04	-0.48	0.25	-0.27
ATP	-0.04	0.05	0.24	0.19	-0.33	0.31	-0.05
ATV	-0.21	-0.32	0.16	0.24	-0.35	0.17	-0.41
EPPL	-0.30	-0.49	-0.37	-0.47	-0.38	0.04	0.31
EPPR	-0.44	-0.54	-0.32	-0.34	-0.42	-0.01	0.23
EPB	0.32	-0.19	0.23	-0.04	-0.01	0.33	0.39
EPG	-0.09	-0.42	-0.27	-0.44	-0.16	0.05	0.47
OBPL ₁	-0.34	-0.32	-0.12	-0.10	-0.46	0.28	-0.16

Continuation of table 3.

Body parameters	Indicators of the level of subjective control according to Rotter						
	USK_1	USK_2	USK_3	USK_4	USK_5	USK_6	USK_7
OBPL ₂	-0.08	-0.09	0.13	0.13	-0.30	0.38	0.03
OBPR ₁	-0.58	-0.41	-0.11	-0.10	-0.53	0.15	-0.16
OBPR ₂	-0.31	-0.39	0.01	-0.09	-0.48	-0.22	0.02
OBB	-0.17	-0.14	0.13	0.26	-0.37	0.24	-0.11
OBG ₁	-0.29	-0.48	-0.10	-0.09	-0.43	-0.16	0.09
OBG ₂	-0.35	-0.31	-0.18	-0.13	-0.32	0.13	0.18
OBSH	-0.62	-0.42	-0.27	-0.03	-0.34	-0.01	-0.17
OBT	-0.22	-0.39	0.33	0.19	-0.21	0.15	-0.12
OBBB	-0.18	-0.25	-0.02	-0.05	-0.38	0.32	0.21
OBK	-0.54	-0.63	-0.07	-0.24	-0.34	-0.04	-0.20
OBS	-0.25	-0.45	-0.21	-0.15	0.06	0.00	-0.11
OBGK ₁	-0.42	-0.59	0.10	0.13	-0.35	-0.07	-0.08
OBGK ₂	-0.41	-0.65	0.08	0.04	-0.33	0.05	-0.01
OBGK ₃	-0.39	-0.63	0.20	0.22	-0.34	-0.13	-0.10
PSG	0.01	-0.56	0.23	0.00	0.05	0.02	0.22
PNG	-0.07	-0.39	0.09	-0.06	-0.27	0.01	0.13
SGK	-0.30	-0.10	0.32	0.41	-0.41	0.10	-0.38
ACR	-0.09	-0.09	-0.10	-0.16	0.13	0.34	-0.03
SPIN	-0.18	-0.43	0.03	0.10	-0.13	0.15	0.00
CRIS	-0.05	-0.25	0.04	-0.05	-0.19	0.02	0.02
TROCH	-0.26	-0.19	-0.06	0.13	-0.32	0.01	-0.13
CONJ	-0.14	-0.28	0.31	0.33	-0.34	0.36	0.03
GZPL	0.05	-0.04	-0.37	-0.59	0.22	0.28	0.52
GPPL	-0.04	-0.35	-0.26	-0.61	0.07	0.40	0.46
GPR	0.17	-0.07	0.06	-0.18	0.19	0.07	0.34
GL	0.23	-0.07	0.10	0.12	0.16	-0.09	0.06
GGR	0.33	-0.03	0.03	-0.09	0.26	-0.15	0.53
GG	0.34	0.12	0.07	-0.19	0.36	0.26	0.28
GB	0.50	0.27	0.19	-0.26	0.26	0.45	0.42
GBD	0.03	-0.16	-0.05	-0.33	0.03	0.15	0.21
GGL	-0.52	-0.46	-0.60	-0.52	-0.19	-0.03	0.09
FX	0.36	0.03	-0.03	-0.27	0.25	0.32	0.46
MX	0.06	-0.28	-0.29	-0.44	-0.11	-0.06	0.37
LX	0.12	0.21	0.00	-0.02	0.07	-0.11	-0.14
MM	-0.36	-0.33	0.11	0.29	-0.49	0.04	-0.19
OM	-0.12	-0.50	-0.17	-0.29	-0.25	0.11	0.43
DM	0.07	-0.35	-0.01	-0.31	0.08	0.33	0.40
MA	-0.36	-0.18	0.04	0.19	-0.50	0.23	-0.30

Discussion

In the analysis of correlations between personality indicators and anthropo-somatotypological parameters of

the body of practically healthy Ukrainian women of middle intermediate somatotype, the following multiple correlations

were established: inverse, mostly moderate ($r =$ from -0.34 to -0.65) reliable and *unreliable indicators of personal anxiety* according to Spielberger with all indicators of WDE of extremities, almost half of indicators of TSFF, endo- and mesomorphic components of a somatotype and bone and fatty components of body weight; of medium force are unreliable, mostly inverse ($r =$ from -0.31 to -0.43), the *indicator of accentuation of the character of the stuck type* and mostly direct medium force are unreliable ($r =$ from 0.30 to 0.63) of the *indicator of accentuation of the character of excitable type* according to Shmishek with most transverse torso and pelvis; inverse, mostly of medium strength ($r =$ from -0.30 to -0.71) *unreliable indicators of accentuation of the character of cyclothymic and demonstrative types* according to Shmishek with most of the longitudinal and one third of the girth body size; inverse, mostly medium strength ($r =$ from -0.30 to -0.68) *unreliable indicators of accentuation of the character of the dysthymic and exalted types* according to Shmishek with almost all indicators of WDE of the extremities, one third of the girth body size (only for the accentuation of the character of the dysthymic type) and bone component of body weight; inverse, mostly medium-strength reliable ($r =$ from -0.49 to -0.72) and unreliable ($r =$ from -0.30 to -0.48) *indicators of the scale of general internality of the level of subjective control, the level of subjective control in areas of achievement, and training (professional)* relationship according to Rotter with most cephalometric dimensions (except for the scale of general internality of the level of subjective control), body weight, most longitudinal, girth body size and indicators of WDE limbs and muscle components of body weight according to Matiegka and AIN; inverse, mostly of medium strength, reliable ($r =$ from -0.52 to -0.61) and unreliable ($r =$ from -0.31 to -0.47) *indicators of the level of subjective control in the field of family relations* according to Rotter with most indicators of WDE extremities and TSFF extremities; medium-strength, mostly unreliable ($r =$ from 0.34 to 0.52), the *level of subjective control in health and disease* according to Rotter with most indicators of WDE and TSFF, endo- and mesomorphic components of the somatotype and bone and fat components of body weight.

Quantitative analysis of reliable and medium-strength unreliable correlations between personality indicators and anthropo-somatotypological parameters of the body of practically healthy women of middle intermediate somatotype revealed the following distribution of correlations:

- *with the leading typological characteristics of temperament according to Eysenck* 22 correlations out of 171 possible (12.87%), of which, the average strength of direct reliable 0.58% and direct unreliable 3.51% and the average strength of reverse reliable 0.58% and reverse unreliable 8.19%, among which - with cephalometric indicators 3 correlations out of 21 possible (4.76% of direct reliable and 9.52% of inverse unreliable); with longitudinal

body size 3 inaccurate feedback out of 18 possible (16.67%); with WDE extremities 3 correlations from 12 possible (16.67% of direct unreliable and 8.33% of return reliable); with girth body size 3 inaccurate feedback out of 45 possible (6.67%); with TSFF 6 correlations from 27 possible (7.41% of direct unreliable and 14.81% of return unreliable); with components of somatotype 3 correlations out of 9 possible (22.22% of direct unreliable and 11.11% of inverse unreliable); with indicators of component composition of body weight 1 inaccurate feedback out of 18 possible (8.33%);

- *with psychodynamic features of personality according to Spielberger* 23 correlations out of 114 possible (20.18%), of which, the average strength of direct unreliable 0.88%, strong reverse reliable 2.63%, the average strength of reverse reliable 1.75% and the average strength of reverse unreliable 14.91%, among of which - with cephalometric indicators 1 inverse mean force unreliable correlations out of 14 possible (7.14%); with longitudinal body size 1 feedback of medium strength unreliable correlations out of 12 possible (8.33%); with WDE extremities 5 feedbacks from 8 possible (12.50% of strong reliable, 25.00% of average force of reliable and 25.00% of average force of unreliable); with girth body size of 2 inverse medium-strength unreliable correlations out of 30 possible (6.67%); with transverse body size 4 medium strength unreliable connections out of 16 possible (6.25% direct and 18.75% reverse); with TSFF 4 reversals of medium strength unreliable correlations out of 18 possible (22.22%); with components of somatotype 3 feedback out of 6 possible (16.67% strong reliable and 33.33% average strength unreliable); with indicators of component composition of body weight 3 feedbacks out of 8 possible (12.50% strong reliable and 25.00% average strength unreliable);

- *with indicators of severity and features of accentuated personality traits according to Shmishek* 114 correlations out of 570 possible (20.00%), of which, strong direct reliable 0.53%, average strength of direct reliable 0.18% and average strength of direct unreliable 3.68% and strong inverse reliable 0.35%, the average strength of the inverse reliable 1.93% and the average strength of the inverse unreliable 13.33%, among which - with cephalometric indicators 12 correlations out of 70 possible (1.43% of direct strong reliable, 2.86% of the direct average force unreliable, 2.86% of the inverse of the average reliable and 10.00% of the average strength is unreliable); with body weight 1 feedback medium force unreliable correlations out of 10 possible (10.00%); with longitudinal body sizes 12 correlations out of 60 possible (1.67% of direct strong reliable, 1.67% of direct average force unreliable and 16.67% of reverse average force unreliable); with WDE extremities 12 correlations from 40 possible (5.00% of direct average force unreliable, 2.50% of return strong reliable, 5.00% of return of average force reliable and 17.50% of return of average force unreliable); with body girth 31 correlations out of 150 possible (2.67% of direct medium-

strength unreliable, 0.67% of reverse strong-force reliable, 2.67% of reverse medium-strength reliable and 14.67% of reverse medium-strength unreliable); with transverse body sizes 24 correlations out of 80 possible (1.25% of direct strong reliable, 11.25% of direct average force unreliable and 17.50% of reverse average force unreliable); with TSFF 10 average strength of correlations from 90 possible (1.11% of direct reliable, 2.22% of direct unreliable, 1.11% of return reliable and 6.67% of return unreliable); with components of somatotype 6 of average strength of correlations from 30 possible (3.33% of direct unreliable, 3.33% of return reliable and 13.33% of return unreliable); with indicators of the component composition of body weight 6 inverse average strengths of the 40 possible (2.50% reliable and 12.50% unreliable);

- *with indicators of the level of subjective control by Rotter* 135 correlations out of 399 possible (33.83%), of which, the average strength of direct reliable 0.75% and the average strength of direct unreliable 8.02% and strong reverse reliable 2.51%, the average strength of reverse reliable 4.01% and average strength of inverse unreliable 18.55%, *among which* - with cephalometric indicators of 15 correlations out of 49 possible (6.12% of direct average strength of unreliable, 6.12% of inverse strong reliable, 4.08% of inverse of medium strength reliable and 14.29% of inverse medium strength unreliable); with body weight 3 reverse medium strength unreliable correlations out of 7 possible (42.86%); with longitudinal body sizes 17 correlations out of 42 possible (2.38% of direct medium strength unreliable, 2.38% of reverse strong reliable, 11.90% of reverse medium strength reliable and 23.81% of reverse medium strength unreliable); with WDE extremities 17 average force of correlations from 28 possible (17.86% of direct unreliable, 7.14% of return reliable and 35.71% of return unreliable); with girth body size 37 correlations out of 105 possible (2.86% of the average medium strength unreliable, 3.81% of the reverse strong reliable, 3.81% of the reverse medium strength reliable and 24.76% of the reverse medium strength unreliable); with transverse body sizes 13 of medium strength of correlations out of 56 possible (8.93% of direct unreliable, 1.79% of inverse reliable and 12.50% of inverse unreliable); with TSFF 20 correlations from 63 possible (4.76% of direct average force reliable, 12.70% of direct average force unreliable, 3.17% of return strong reliable, 4.76% of return of average force reliable and 6.35% of return of average force unreliable); with components of somatotype 5 of medium strength of unreliable correlations out of 21 possible (19.05% direct and 4.76% reverse); with indicators of the component composition of body weight 12 of the average strength correlations out of 28 possible (10.71% of direct unreliable, 10.71% of inverse reliable and 21.43% of inverse unreliable).

Data from foreign authors confirm the connection between anthropo-somatotypological indicators and indicators of personality traits [8, 12, 13, 14, 20, 23]. Taking

into account the body mass index (BMI) and the subjective status of men, the processing of results by hierarchical regression revealed that the tendency to muscularity in men is significantly associated with neuroticism ($\beta = 0.29$) [4].

For men living in Asian countries, in contrast to European men, higher BMI rates are associated with higher rates of extraversion and consent [25].

A survey of 233 men revealed a significant positive relationship between impulsivity and BMI. This relationship was mediated through associations with food addiction [17].

Overweight is also associated with low cognitive performance, while neuroticism can only be used to detect weight variability, but not overweight or obesity [18].

Schmitt D.P. and co-authors [21] emphasize the differences in the characteristics of personality depending on sex in different cultures and ethnic groups. Thus, data from studies in 55 countries found that men have a lower level of neuroticism than women.

Gabarre-Mir J. and others [10] used in the study of bizigomal width to study indicators of personality. A group of people with a limited type of bizigomal arch had greater self-sufficiency and independence, but at the same time more difficulty in expressing their emotions, worse ability to express themselves through other forms of communication.

The ratio of width and height of the face (fWHR) is associated with the willingness and degree of men to deceive, as well as fearless dominance. At the same time, no associations in women were found [11]. This indicator is also associated with aggression in men and women [15].

The results of this study consistently complement the data of previous studies [1, 2] and are fully consistent with both them and the data of international studies, however, are still not sufficient to see the final picture and require further research.

Conclusion

1. Among the indicators of personality traits in practically healthy Ukrainian women of intermediate somatotype, multiple, in most cases, moderate inverse reliable and unreliable correlations with anthropo-somatotypological parameters of the body are established for the Spielberger personal anxiety index; indicators of accentuation of the nature of stuck, exciting, cyclothymic, demonstrative, dysthymic and exalted types of types according to Shmishek; indicators of the scale of general internality of the level of subjective control, the level of subjective control in the areas of achievement, educational (professional) relations, family relations and health and illness according to Rotter.

2. Quantitative analysis of reliable and unreliable average correlations between personality indicators and anthropo-somatotypological parameters of the body of practically healthy women of middle intermediate

somatotype showed that the percentage of such relationships ranges from 12.87% with leading typological characteristics of temperament according to Eysenck to 33.83% with level of subjective control by Rotter.

3. In women of medium intermediate somatotype the highest relative percentage of reliable and average strength of unreliable correlations between personality indicators and anthropo-somatotypological parameters of the body was found: for leading typological characteristics of temperament according to Eysenck - with components of somatotype (33.33%), WDE of extremities (25.00%) and TSFF (22.22%); for psychodynamic features of personality according to Spielberger - with WDE of extremities (62.50%),

components of somatotype (50.00%) and indicators of component composition of body weight (37.50%); for indicators of severity and features of accentuated personality traits according to Shmishek - with transverse and longitudinal body dimensions (30.00% each), girth (20.67%) and longitudinal body dimensions and somatotype components (20.00% each); for indicators of the level of subjective control by Rotter - with WDE of the extremities (60.71%), indicators of the component composition of body weight (42.86%), longitudinal (40.48%), circumferential body size (35.24%), TSFF (31.75%) and cephalometric indicators (30.61%).

References

- [1] Andriievskiy, I.I., Serebrennikova, O.A., Gunas, I.V., Cherkasova, O.V., & Kyrychenko, V.I. (2019). Correlations of anthropo-somatotypological indicators with indicators of personality traits of practically healthy Ukrainian women. *Biomedical and Biosocial Anthropology*, (37), 22-31. doi: 10.31393/bba37-2019-04
- [2] Andriievskiy, I.I., Serebrennikova, O.A., Kyrychenko, I.M., Zhuchenko, I.I., & Gunas, V.I. (2020). Correlations of body structure and size indicators with personality indicators of practically healthy women with mesomorphic somatotype. *Biomedical and Biosocial Anthropology*, (39), 35-44. doi: 10.31393/bba39-2020-06
- [3] Ann, G. (2012). Psychiatric disorders, mitochondrial dysfunction, and somatotypes. *Russian Bulletin of Perinatology and Pediatrics*, 57(4-2), 70-75.
- [4] Benford, K., & Swami, V. (2014). Body image and personality among British men: Associations between the Big Five personality domains, drive for muscularity, and body appreciation. *Body Image*, 11(4), 454-457. doi: 10.1016/j.bodyim.2014.07.004
- [5] Bunak, V.V. (1941). *Антропометрия: практический курс [Anthropometry: a practical course]*. М.: Учпедгиз - М.: Учпедгиз.
- [6] Carter, J.L., & Heath, B.H. (1990). *Somatotyping - development and applications*. Cambridge University Press.
- [7] Čavala, M., Trninić, V., Jašić, D., & Tomljanović, M. (2013). The influence of somatotype components and personality traits on the playing position and the quality of top Croatian female cadet handball players. *Collegium Anthropologicum*, 37(2), 97-100. PMID: 23914494
- [8] Deska, J.C., Lloyd, E.P., & Hugenberg, K. (2018). Facing humanness: Facial width-to-height ratio predicts ascriptions of humanity. *Journal of Personality and Social Psychology*, 114(1), 75-94. doi: 10.1037/pspi0000110
- [9] Eliseev, O.P. (2010). *Практикум по психологии [Workshop on psychology]*. СПб: Питер. - St. Petersburg: Peter.
- [10] Gabarre-Mir, J., Navarro-Pastor, J.B., Gabarre-Armengol, C., & Estaún-Ferrer, S. (2017). Bizygomatic Width and its Association with Social and Personality Traits in Males. *International Journal of Morphology*, 35(3), 1037-1042. doi: 10.4067/S0717-95022017000300036
- [11] Geniole, S.N., Keyes, A.E., Carré, J.M., & McCormick, C.M. (2014). Fearless dominance mediates the relationship between the facial width-to-height ratio and willingness to cheat. *Personality and Individual Differences*, 57, 59-64. doi: 10.1016/j.paid.2013.09.023
- [12] Gerlach, G., Herpertz, S., & Loeber, S. (2015). Personality traits and obesity: a systematic review. *Obesity Reviews*, 16(1), 32-63. <https://doi.org/10.1111/obr.12235>
- [13] Hampson, S.E., Vollrath, M.E., & Júlíusson, P.B. (2015). Personality and Overweight in 6-12 year-old Children. *Pediatric Obesity*, 10(5), e5-e7. doi: 10.1111/ijpo.12014
- [14] Kim, J., Song, K., & Sutin, A.R. (2021). Gender differences in the relationship between perceived discrimination and personality traits in young adulthood: Evidence using sibling fixed effects. *Social Science & Medicine*, 286, 114329. doi: 10.1016/j.socscimed.2021.114329
- [15] Lefevre, C.E., Etchells, P.J., Howell, E.C., Clark, A.P., & Penton-Voak, I.S. (2014). Facial width-to-height ratio predicts self-reported dominance and aggression in males and females, but a measure of masculinity does not. *Biology Letters*, 10(10), 20140729. doi: 10.1098/rsbl.2014.0729
- [16] Matiegka, J. (1921). The testing of physical efficiency. *Am. J. Phys. Antropol.*, 2(3), 25-38. doi: 10.1002/ajpa.1330040302
- [17] Murphy, C.M., Stojek, M.K., & MacKillop, J. (2014). Interrelationships among impulsive personality traits, food addiction, and body mass index. *Appetite*, 73, 45-50. doi: 10.1016/j.appet.2013.10.008
- [18] Olivo, G., Gour, S., & Schiöth, H.B. (2019). Low neuroticism and cognitive performance are differently associated to overweight and obesity: A cross-sectional and longitudinal UK Biobank study. *Psychoneuroendocrinology*, 101, 167-174. doi: 10.1016/j.psyneuen.2018.11.014
- [19] Raigorodskii, D.Ia. (2004). *Практическая психодиагностика. Методики и тесты [Practical psychodiagnostics. Methods and tests]*. Самара: Издательский дом "Бахрах-М" - Samara: Publishing House "Bahrah-M".
- [20] Rosa, V., Tomai, M., Lauriola, M., & Martino, G. (2019). Body mass index, personality traits, and body image in Italian pre-adolescents: An opportunity for overweight prevention. *Psihologija*, 52(4), 379-393. doi: 10.2298/PSI181121009R
- [21] Schmitt, D.P., Long, A.E., McPhearson, A., O'Brien, K., Remmert, B., & Shah, S.H. (2017). Personality and gender differences in global perspective. *International Journal of Psychology*, 52, 45-56. doi: 10.1002/ijop.12265
- [22] Serebrennikova, O.A., Gunas, V.I., Klimas, L.A., Ocheretna, N.P., & Shayuk, A.V. (2019). Predictive assessment of the association of dermatoglyphic indicators with indicators of personality traits, established by factor analysis. *Reports of Morphology*, 25(1), 12-18. doi: 10.31393/morphology-journal-2019-25(1)-02
- [23] Soto, C.J., John, O.P., Gosling, S.D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of*

- Personality and Social Psychology*, 100(2), 330-348. doi: 10.1037/a0021717
- [24] Sutin, A.R., & Terracciano, A. (2016). Personality traits and body mass index: Modifiers and mechanisms. *Psychology & Health*, 31(3), 259-275. doi: 10.1080/08870446.2015.1082561
- [25] Sutin, A.R., Stephan, Y., Wang, L., Gao, S., Wang, P., & Terracciano, A. (2015). Personality traits and body mass index in Asian populations. *Journal of Research in Personality*, 58, 137-142. doi: 10.1016/j.jrp.2015.07.006

КОРЕЛЯЦІЇ АНТРОПО-СОМАТОТИПОЛОГІЧНИХ ПОКАЗНИКІВ ІЗ ПОКАЗНИКАМИ ОСОБЛИВОСТЕЙ ОСОБИСТОСТІ ПРАКТИЧНО ЗДОРОВИХ ЖІНОК СЕРЕДЬОГО ПРОМІЖНОГО СОМАТОТИПУ

Андрієвський І.І.

Мета роботи - визначити та провести аналіз особливостей кореляцій між показниками особливостей особистості та антропо-соматотипологічними параметрами тіла практично здорових жінок середнього проміжного соматотипу. Первинні показники особливостей особистості та антропо-соматотипологічні параметри тіла 17 практично здорових українських жінок першого зрілого віку середнього проміжного соматотипу відібрані з банку даних матеріалів науково-дослідного центру Вінницького національного медичного університету ім. М.І.Пирогова. Аналіз кореляцій проведено в ліцензійному пакеті "Statistica 6.1" з використанням непараметричного методу Спірмена. При аналізі кореляцій між показниками особливостей особистості та антропо-соматотипологічними параметрами тіла практично здорових українських жінок середнього проміжного соматотипу встановлені множинні, в більшості випадків, зворотні середньої сили достовірні та недостовірні зв'язки показника особистісної тривожності за Spielberg з усіма показниками ширини дистальних епіфізів (ШДЕ) кінцівок, майже половиною числа показників товщини шкірно-жирових складок (ТШЖС), ендо- та мезоморфним компонентами соматотипу та кістковим і жировим компонентами маси тіла; показників акцентуації характеру застрягаючого та збудливого типів за Shmishkek із більшістю поперечних розмірів тулуба й таза; показників акцентуації характеру демонстративного типів за Shmishkek із більшістю поздовжніх і третиною обхватних розмірів тіла; показників акцентуації характеру дистимного та екзальтованого типів за Shmishkek із практично усіма показниками ШДЕ кінцівок, третиною обхватних розмірів тіла та кістковим компонентом маси тіла; показників шкали загальної інтернальності рівня суб'єктивного контролю, рівня суб'єктивного контролю в галузях досягнень, та навчальних (професійних) відносин за Rotter з більшістю кефалометричних розмірів, масою тіла, більшістю поздовжніх, обхватних розмірів тіла та показників ШДЕ кінцівок і м'язовими компонентами маси тіла; показника рівня суб'єктивного контролю в галузі сімейних відносин за Rotter з більшістю показників ШДЕ кінцівок і ТШЖС кінцівок. В результаті кількісного аналізу достовірних і середньої сили недостовірних кореляцій встановлено найбільший відносний відсоток зв'язків між: провідними типологічними характеристиками темпераменту за Eysenck і компонентами соматотипу, ШДЕ кінцівок і ТШЖС; психодинамічними особливостями особистості за Spielberg і ШДЕ кінцівок, компонентами соматотипу, показниками компонентного складу маси тіла, поперечними розмірами тіла та ТШЖС; показниками вираженості та особливостей акцентуйованих рис особистості за Shmishkek і ШДЕ кінцівок, поперечними, поздовжніми, обхватними розмірами тіла та компонентами соматотипу; показниками рівня суб'єктивного контролю за Rotter і ШДЕ кінцівок, показниками компонентного складу маси тіла, поздовжніми та обхватними розмірами тіла, ТШЖС і кефалометричними розмірами.

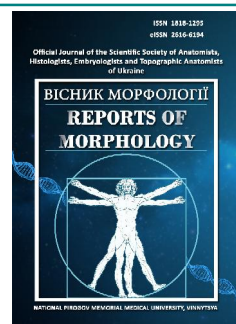
Ключові слова: кореляції, показники особливостей особистості, антропометричні та соматотипологічні показники, практично здорові жінки середнього проміжного соматотипу.



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Modeling of individual telerradiographic indicators according to the Steiner method for Ukrainian young men with wide and young women with a very wide and wide face types

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Cephalometric methods of analysis of lateral telerradiograms are one of the key elements of orthodontic planning of treatment of a patient with pathology of the dental-jaw system. Determining normative telerradiographic indicators for the local population is a key step for the successful application of one or another method of analysis, in particular, for Ukraine. The aim of the study was to construct and analyze regression models of telerradiographic parameters used in the Steiner method for Ukrainian young men and young women with orthognathic occlusion with different face types. 49 young men and 76 young women with orthognathic occlusion in the software OnyxCeph³™, version 3DPro, the company Image Instruments GmbH, Germany (license № URSQ-1799) conducted a cephalometric study using the Steiner method. The division into facial types was performed using the Garson index. Cephalometric parameters were divided into three groups: the first - indicators used in cephalometric analyzes of Schwarz, Ricketts, Steiner, Roth-Jarabak, Burstone and Bjork and are included in the parameters that usually do not change during surgical and orthodontic treatment; the second - dental-maxillary characteristics according to the Steiner method which surgical methods can be used to change the length, width, angles and position of the jaws; third - indicators according to the Steiner method that characterize the position of each tooth relative to each other, cranial structures and the profile of the soft tissues of the face. Modeling of individual telerradiographic indicators was performed in the licensed package "Statistica 6.0" using step-by-step regression analysis. When analyzing reliable models of telerradiographic indicators according to the Steiner method, which were included in the second group depending on the indicators of the first group with a coefficient of determination higher than 0.6, it was found that out of 7 possible, 5 models were built for young men with a wide face type, which most often include the value of the distances Ar-Go and N-S and the angles H and N-S-Ar; young women with a very wide type of face - 3 models (R^2 = from 0.604 to 0.812) which most often include the value of the angles N-S-Ar and H; in young women with a wide type of face - 4 models (R^2 = from 0.694 to 0.771) which most often include the value of the angles POr-NBa and H, the distance P-PTV and the ratio S-ar:ar-Go. When analyzing reliable models of telerradiographic indicators according to the Steiner method, which were included in the third group depending on the indicators of the first and second groups with a coefficient of determination higher than 0.6, it was found that out of 8 possible in young people with a wide face type, 7 models were built (R^2 = from 0.662 to 0.946). which most often include the magnitude of the angles ANB and SN-GoGn and the distance P-PTV; in young women with a very wide face type - 4 models (R^2 = from 0.635 to 0.844) which most often include the value of the angles ANB, SNA, POr-NBa and the distance Pog-NB; in young women with a wide type of face - 6 models (R^2 = from 0.617 to 0.923), which most often include the value of the distances Pog-NB and N-CC and the angle ANB. Construction of regression models of telerradiographic indicators used in the Steiner method in Ukrainian young men and young women with orthognathic occlusion is the foundation for creating a database of normative cephalometric indicators in Ukraine, which will provide dental care to the population at the current level.

Keywords: regression analysis, telerradiography, Steiner cephalometry, young men and young women with orthognathic occlusion, facial types.

Introduction

Orthodontics is one of the branches of dentistry that requires the practitioner not only to understand the basic anatomical concepts of the entire face, dental apparatus and features of orthodontic pathology, but also a certain understanding of the aesthetic beauty of the face, the ability to predict the end result of treatment.

However, the implementation of this type of treatment, relying only on experience and "premonition" and a view of the beauty of an orthodontist is not acceptable in modern conditions. Therefore, the scientifically proven method currently used by physicians to plan the results of orthodontic care is cephalometric analysis [2].

Thus, the importance of using this method is evidenced by studies by A.R.Durrío and co-authors [7] where 43 patients underwent orthodontic treatment without the use of cephalometric method, with the participation of doctors of two conditional categories - experienced and inexperienced orthodontists. However, as a control during the first visit, a cephalometric analysis was performed to predict treatment outcomes. At the end of treatment, the results were compared - how well the orthodontists achieved the desired result, calculated by cephalometric analysis. As it turned out, inexperienced orthodontists had a success rate of 28%, and experienced - 67%.

Although there are studies that indicate that the cephalometric method of analysis is not required for use in orthodontic treatment. As shown by statistical analysis - the use of this method does not significantly affect ($p=0.80$) the choice of orthodontic treatment when planning treatment of the patient [10].

The key to solving this problem would be the related use of both the experience of an orthodontist and cephalometric analysis using neural networks to calculate cephalometric parameters and three-dimensional research methods such as CT and MRI [12].

Indeed, modern medicine requires scientists to use the latest methods to improve orthodontic treatment or improve existing ones. All this occurs against the background of increasing the number of antenatal and postnatal risk factors for this type of pathology, in particular, changes in the functioning of the masticatory apparatus, increasing the number of comorbid somatic diseases, bad habits, deteriorating socio-economic conditions, etc. [13].

One of the priority measures to be taken is the adaptation of telerradiography indicators for the local population. The fact that taking the ethnic component into account in studies of this kind is fundamentally important has already been proven [4]. Thus, in particular, it is insufficient to study the average indicators of a group of peoples, because the indicators can be radically different, even within one such group [8]. Moreover, odontological indicators can differ strikingly even within one homogeneously populated country depending on one or another region [9].

All these facts indicate the need for continuous

improvement of existing data, and their refinement, using as many variables as possible.

The aim of the study was to construct and analyze regression models of telerradiographic parameters used in the Steiner method for Ukrainian young men and young women with orthognathic occlusion with different face types.

Materials and methods

49 young men and 76 young women with orthognathic occlusion in OnyxCeph^{3TM} software, 3DPro version, Image Instruments GmbH, Germany (license № URSQ-1799) underwent a cephalometric study using the Steiner method. Cephalometric points were determined according to the recommendations of Phulari B. S. [17] and Doroshenko S. I. and Kulginsky E. A. [5].

To divide into facial types, the morphological index of Garson was determined [18]. The following distribution is established: young men - 5 with a very wide face, 22 with a wide face, 11 with a medium face, 8 with a narrow face; young women - 25 with a very wide face, 25 with a wide face, 10 with a medium face, 12 with a narrow face.

Cephalometric parameters were divided into three groups [3]: the first - cephalometric measurements used in the analyzes of Schwarz, Ricketts, Steiner, Roth-Jarabak, Burstone and Bjork and are included in the basic parameters that usually do not change during surgical and orthodontic treatment; second - metric dental-jaw characteristics by the method of Steiner which surgical methods can change the length, width, angles and positions of the upper and lower jaws; third - indicators by the Steiner method that characterize the position of the teeth relative to each other, cranial structures and the profile of the soft tissues of the face.

Cephalometric parameters included in the *first group*: **N-Se** - length of the anterior part of the skull base according to Schwarz (mm); **N-S** - length of the front part of the skull base according to Jarabak (mm); **N-CC** - anterior length of the skull base by Ricketts (mm); **S-E** - length of the back of the skull base according to Steiner (mm); **S-Ar** - length of the lateral cranial base according to Jarabak (mm); **P-PTV** - distance of P-PTV by Ricketts (mm); **Ar-Go** - the length of the branch of the mandible by Burstone (mm); **H** - H-angle by Schwarz (°); **POr-NBa** - cranial deflection angle according to Ricketts (°); **N-S-Ba** - angle N-S-Ba by Bjork (°); **N-S-Ar** - saddle angle according to Bjork (°); **S-Ar'** - the distance of the joint by Bjork (mm); **N-S:S-Ar'** - the ratio of the distances S-Ar' and N-S in cephalometric analysis by Bjork (conventional units); **S-ar:ar-Go** - the ratio of the distances S-Ar and Ar-Go in the cephalometric analysis by Jarabak (%).

Cephalometric parameters according to the Steiner method [22], which belong to the *second group*: the **SNA** angle, characterizes the position of the upper jaw, namely the anterior contour, in the sagittal plane (°); **SNB** angle, characterizing the position of the lower jaw, namely the

anterior contour of the chin, in the sagittal plane (°); angle **ANB**, characterizes the position of the lower jaw relative to the upper jaw, in the sagittal plane (°); **SND** angle, characterizing the position of the lower jaw, namely the center of the chin, in the sagittal plane (°); the angle **SN-GoGn**, characterizes the inclination of the body of the mandible relative to the anterior cranial base **S-N** (°); the **Pog-NB** distance characterizing the position of the anterior contour of the bony chin relative to the line **N-B** (mm); distance **S-L**, characterizes the position of the anterior contour of the mandible (mm).

Cephalometric indicators according to the method of Steiner [22], included in the *third group*: angle **II**, characterizes the inclination of the upper and lower medial incisors relative to each other (°); the angle **SN-OcP**, characterizing the inclination of the closing plane relative to the anterior cranial base **S-N** (°); angle **Max1-NA**, characterizes the position of the upper medial incisor to the line **N-A** (°); angle **Max1-SN**, characterizes the position of the medial incisor to the anterior cranial base **S-N** (°); angle **Mand1-NB**, characterizes the position of the lower medial incisor to the line **N-B** (°); distance **1u-NA**, characterizes the position of the crown of the upper medial incisor in the boom plane relative to the line **N-A** (mm); distance **1I-NB**, characterizes the position of the crown of the lower medial incisor in the sagittal plane relative to the line **N-B** (mm); **Holdaway Ratio**, characterizes the position of the crown of the lower medial incisor in the sagittal plane relative to the bony chin **Pog** (mm).

Modeling of individual teleradiographic parameters in young men with wide and in young women with wide and very wide facial types was performed in the licensed package "Statistica 6.0" using step-by-step regression analysis.

Results

Models of teleradiographic indicators by the Steiner method with a coefficient of determination (R^2) greater than 0.6, which were included in the second group depending on the indicators of the *first group in young men with a wide face type* have the form of the following linear equations:

angle SNA = 129,1 - 0,237 x N-S-Ar + 0,373 x Ar-Go - 0,382 x H ($R^2=0,665$; $F_{(3,18)}=11,90$; $p<0,0002$; *Std.Error of estimate*=2,272);

angle SNB = 136,5 - 0,338 x N-S-Ar + 0,495 x Ar-Go - 0,419 x H ($R^2=0,895$; $F_{(3,18)}=51,15$; $p<0,0000$; *Std.Error of estimate*=1,423);

angle SND = 132,3 - 0,301 x N-S-Ar + 0,490 x Ar-Go - 0,444 x H ($R^2=0,850$; $F_{(3,18)}=33,95$; $p<0,0000$; *Std.Error of estimate*=1,697);

angle SN-GoGn = 47,08 - 0,801 x Ar-Go + 0,759 x H - 2,513 x N-S:S-Ar' - 0,580 x N-S ($R^2=0,917$; $F_{(4,17)}=46,75$; $p<0,0000$; *Std.Error of estimate*=2,016);

distance S-L = 75,38 + 1,019 x Ar-Go - 0,600 x N-S-Ar + 1,119 x N-S - 0,815 x H ($R^2=0,888$; $F_{(4,17)}=33,60$; $p<0,0000$; *Std.Error of estimate*=3,476);

where, here and hereafter, $F_{(!,!!)} = !!$ - critical (!, !!) and obtained (!, !!) value of Fisher's criterion; St. Error of estimate - standard error of the standardized regression coefficient.

The coefficients of determination of the regression equations of the value of the angle **ANB** and the distance **Pog-NB** in *young men with a wide type of face* are equal to 0.100 and 0.518 and therefore have no practical significance.

Models of teleradiographic indicators by the Steiner method with a coefficient of determination greater than 0.6, which were included in the *second group depending on the indicators of the first group in young women with a very wide face type* have the form of the following linear equations:

angle SNA = 128,2 - 0,297 x N-S-Ar - 0,513 x N-CC + 0,280 x S-Ar + 0,223 x Ar-Go ($R^2=0,604$; $F_{(4,20)}=7,62$; $p<0,0007$; *Std.Error of estimate*=2,564);

angle SN-GoGn = -90,82 + 1,550 x H - 1,164 x POr-NBa ($R^2=0,623$; $F_{(2,22)}=18,17$; $p<0,0000$; *Std.Error of estimate*=2,985);

distance S-L = 120,0 + 0,868 x N-Se - 0,807 x H - 0,373 x N-S-Ar ($R^2=0,812$; $F_{(3,21)}=30,14$; $p<0,0000$; *Std.Error of estimate*=4,058).

The coefficients of determination of the regression equations of the magnitude of the angles **SNB** and **SND** and the magnitude of the distance **Pog-NB** in *young women with a very wide face type* are from 0.449 to 0.523 and therefore have no practical significance; and the regression equation for the value of the angle **ANB** is not constructed at all.

Models of teleradiographic indicators by the Steiner method with a coefficient of determination greater than 0.6, which were included in the *second group depending on the indicators of the first group in young women with a wide face type* have the form of the following linear equations:

angle SNB = 187,7 - 0,432 x S-ar:ar-Go + 1,208 x POr-NBa - 0,977 x H - 0,257 x N-Se ($R^2=0,702$; $F_{(4,19)}=11,17$; $p<0,0001$; *Std.Error of estimate*=2,324);

angle SND = 139,1 - 0,317 x S-ar:ar-Go + 0,907 x POr-NBa - 0,547 x H + 0,302 x P-PTV ($R^2=0,694$; $F_{(4,19)}=10,77$; $p<0,0001$; *Std.Error of estimate*=2,200);

angle SN-GoGn = 30,73 - 0,483 x Ar-Go - 0,676 x P-PTV - 0,676 x N-Se + 0,703 x N-CC ($R^2=0,697$; $F_{(4,19)}=10,91$; $p<0,0001$; *Std.Error of estimate*=2,796);

distance S-L = 18,67 + 1,246 x N-Se + 1,146 x P-PTV - 0,519 x S-ar:ar-Go + 1,197 x POr-NBa ($R^2=0,771$; $F_{(4,19)}=16,00$; $p<0,0000$; *Std.Error of estimate*=4,935).

The coefficients of determination of the regression equation of the value of the **SNA** angle in *young women with a wide type of face* is equal to 0.531 and therefore has no practical significance; and the regression equations for the value of the angle **ANB** and the value of the distance **Pog-NB** are not constructed at all.

Models of teleradiographic indicators by the Steiner method with a coefficient of determination greater than 0.6, which were included in the *third group depending on the*

indicators of the first and second groups in young men with a wide face type have the form of the following linear equations:

angle II = 144,4 + 0,842 x SN-GoGn - 1,020 x ANB - 0,924 x S-E + 1,005 x N-CC - 1,019 x N-S ($R^2=0,696$; $F_{(5,16)}=7,31$; $p<0,0010$; Std.Error of estimate=3,837);

angle SN-OcP = 50,68 + 0,502 x SN-GoGn - 0,265 x S-L - 0,397 x S-Ar - 0,243 x H ($R^2=0,929$; $F_{(4,17)}=55,76$; $p<0,0000$; Std.Error of estimate=1,607);

angle Max1-NA = 39,73 - 1,723 x ANB + 0,391 x S-L - 3,776 x N-S:S-Ar + 0,543 x P-PTV ($R^2=0,919$; $F_{(4,17)}=48,21$; $p<0,0000$; Std.Error of estimate=1,875);

angle Max1-SN = -49,78 + 2,665 x SNB - 0,969 x SNA - 2,581 x N-S:S-Ar + 0,421 x N-S ($R^2=0,946$; $F_{(4,17)}=74,86$; $p<0,0000$; Std.Error of estimate=1,984);

angle Mand1-NB = 82,50 + 1,956 x ANB - 0,746 x SN-GoGn - 0,590 x P-PTV - 0,503 x N-CC - 0,481 x SND ($R^2=0,745$; $F_{(5,16)}=9,36$; $p<0,0003$; Std.Error of estimate=3,031);

distance 1u-NB = -17,35 + 0,246 x ANB - 0,284 x P-PTV - 0,419 x Pog-NB + 0,087 x N-S-Ba ($R^2=0,662$; $F_{(4,17)}=8,34$; $p<0,0007$; Std.Error of estimate=0,990);

distance Holdaway Ratio = -7,821 - 1,224 x Pog-NB - 0,309 x P-PTV + 0,293 x ANB ($R^2=0,812$; $F_{(3,18)}=25,89$; $p<0,0000$; Std.Error of estimate=1,079).

Only the coefficient of determination of the regression equation of the distance **1u-NA** in young men with a wide face type is equal to 0.519 and therefore has no practical significance.

Models of teleradiographic indicators by the Steiner method with a coefficient of determination greater than 0.6, which were included in the *third group depending on the indicators of the first and second groups in young women with a very wide face type* have the form of the following linear equations:

angle SN-OcP = 26,37 - 1,021 x SND + 0,248 x N-S-Ar + 0,445 x SNA ($R^2=0,672$; $F_{(3,21)}=14,36$; $p<0,0000$; Std.Error of estimate=2,551);

angle Max1-SN = 42,68 + 1,925 x SNB - 0,962 x SNA - 0,451 x SN-GoGn - 0,774 x Pog-NB ($R^2=0,688$; $F_{(4,20)}=11,02$; $p<0,0001$; Std.Error of estimate=4,149);

angle Mand1-NB = 16,64 + 2,356 x ANB - 0,631 x S-E + 0,606 x POr-NBa ($R^2=0,635$; $F_{(3,21)}=12,17$; $p<0,0001$; Std.Error of estimate=4,127);

distance Holdaway Ratio = 8,842 - 1,225 x Pog-NB + 0,450 x ANB - 0,070 x N-S-Ba + 0,146 x POr-NBa ($R^2=0,844$; $F_{(4,20)}=27,11$; $p<0,0000$; Std.Error of estimate=1,052).

The coefficients of determination of regression equations of the angle **II**, distances **Max1-NA**, **1u-NA** and **11-NB** in young women with a very wide face type are from 0.405 to 0.564 and therefore have no practical significance.

Models of teleradiographic indicators by the Steiner method with a coefficient of determination greater than 0.6, which were included in the *third group depending on the indicators of the first and second groups in young women with a wide face type* have the form of the following linear

equations:

angle SN-OcP = 80,75 - 4,569 x SND - 0,494 x P-PTV - 0,245 x N-CC + 3,489 x SNB + 1,556 x Pog-NB ($R^2=0,868$; $F_{(5,18)}=23,72$; $p<0,0000$; Std.Error of estimate=1,980);

angle Max1-SN = -42,97 + 2,855 x SNB - 1,194 x SNA + 0,588 x SN-GoGn ($R^2=0,617$; $F_{(3,20)}=10,72$; $p<0,0002$; Std.Error of estimate=4,196);

angle Mand1-NB = -162,6 + 1,281 x ANB + 11,84 x N-S:S-Ar + 0,859 x N-S-Ar - 0,950 x Pog-NB + 0,228 x S-ar:ar-Go + 0,374 x N-CC ($R^2=0,833$; $F_{(6,17)}=14,10$; $p<0,0000$; Std.Error of estimate=2,731);

distance 1u-NA = -4,658 - 0,716 x ANB - 0,470 x Pog-NB + 0,176 x N-CC - 0,083 x Ar-Go + 0,083 x SND ($R^2=0,831$; $F_{(5,18)}=17,69$; $p<0,0000$; Std.Error of estimate=0,757);

distance 1u-NB = -5,249 - 0,588 x Pog-NB + 0,284 x ANB + 0,264 x N-CC - 0,092 x Ar-Go ($R^2=0,718$; $F_{(4,19)}=12,07$; $p<0,0001$; Std.Error of estimate=1,049);

distance Holdaway Ratio = -8,447 - 1,513 x Pog-NB + 0,382 x ANB + 0,232 x N-CC + 0,064 x S-ar:ar-Go + 0,115 x P-PTV ($R^2=0,923$; $F_{(5,18)}=42,88$; $p<0,0000$; Std.Error of estimate=1,014).

The coefficients of determination of the regression equations of the magnitude of the angle **II** and the distance **Max1-NA** in young women with a wide type of face are equal to 0.219 and 0.527 and therefore have no practical significance.

Discussion

Thus, for young men with a wide facial type, 5 reliable regression models of teleradiographic indicators out of 7 were constructed according to the Steiner method with a coefficient of determination higher than 0.6 ($R^2=$ from 0.665 to 0.895) which were included in the *second group* depending on the indicators of the *first group*. The models most often include: the value of the distance Ar-Go and the angle H (29.41% each), the value of the angle N-S-Ar (23.53%) and the distance N-S (11.76%).

In young women with a very wide facial type, out of 7 possible, only 3 reliable regression models of teleradiographic parameters were constructed according to the Steiner method with a coefficient of determination higher than 0.6 ($R^2=$ from 0.604 to 0.812) which were included in the *second group* depending on the *first group* data. The models most often include the value of the angles N-S-Ar and H (22.22% each).

In young women with a wide face type, out of 7 possible, 4 reliable regression models of teleradiographic indicators were constructed according to the Steiner method with a coefficient of determination higher than 0.6 ($R^2=$ from 0.694 to 0.771) which were included in the *second group* depending on the indicators of the *first group*. The models most often include: the value of the distance P-PTV, the angle POr-NBa and the ratio S-ar:ar-Go (21.43% each), as well as the angle H (14.29%).

In young men with a wide face type, 7 reliable regression models of teleradiographic indicators out of 8

were constructed according to the Steiner method with a coefficient of determination higher than 0.6 (R^2 = from 0.662 to 0.946) which were included in the *third group* depending on the indicators of the *first* and *second groups*. The most commonly constructed models include: ANB angle (17.24%), P-PTV distance (13.79%), and SN-GoGn angle (10.34%).

In *young women with a very wide face type*, out of 8 possible, 4 reliable regression models of telerradiographic indicators were built according to the Steiner method with a coefficient of determination higher than 0.6 (R^2 = from 0.635 to 0.844) which were included in the *third group* depending on the *first* and *second groups*. The constructed models most often include the value of ANB, SNA, PO-NBa angles and Pog-NB distances (14.29% each).

In *young women with a wide face type*, out of 8 possible, 6 reliable regression models of telerradiographic indicators were constructed according to the Steiner method with a coefficient of determination higher than 0.6 (R^2 = from 0.617 to 0.923) which were included in the *third group* depending on the indicators of the *first* and *second groups*. The constructed models most often include: the value of the distance Pog-NB (17.86%) and the value of the angle ANB and the distance N-CC (14.29% each).

Domestic work on the study of the features of telerradiometric, cephalometric and odontometric indicators among Ukrainians is not isolated, although they still cannot fully meet the needs of clinicians.

Regional features of interrelations of odontometric and cephalometric indicators for men living in the southern region of Ukraine are determined. The largest number of statistically significant relationships was found between molar size and facial size, of which 7.4% were upper jaw molars and 13.2% were lower jaw molars. In addition, relationships between skull size and tooth height, root length and facial skull, and vestibular-lingual and mesiodistal tooth sizes have been identified [21].

In a similar work, regression models of individual telerradiographic indicators were constructed by the Ricketts method for adolescents, Ukrainians with different facial types [6].

The study of the influence of facial type on odontometric parameters for the Ukrainian population was partially investigated by a team of authors led by A.V.Marchenko [14].

If we analyze the foreign work performed in this area, we can also see the logical conclusions about the existence of features of telerradiographic indicators within different populations [19, 20]. A.M. Aldrees [1] conducted a meta-analysis of the results of various types of work where we studied the features of telerradiographic indicators for the population of Saudi Arabia. Out of 485 studies devoted to this topic, the author selected 8 that met the inclusion criterion. The analysis confirmed the significance of the differences between the Arabs and the control indicators on the basis of European data, namely - the Arabs have

more convex facial profiles and more inclined incisors.

Kurds living in Iran have significant differences ($p < 0.05$) with SNA, SNB, ANB, SND, incisor angle, GoGn-SN L1-NB, SL and SE compared to normative Steiner data. At the same time, no significant difference was found between the studied indicators in Kurdish men and women ($p > 0.05$) [11].

Also, significant differences were found in the study of ethnic Malays, residents of Malaysia. The local population has a more anterior location of both the upper and lower jaws, protrusion of the upper and lower lips and a less pronounced chin than the Steiner's European data [15].

The largest difference for the Moroccan sample compared to Steiner's data was shown in terms of skeletal parameters in the sagittal direction, as well as the assigned position of the upper and lower jaws. In addition, the authors of the study draw attention to the fact that the sample was based on the inhabitants of Casablanca and therefore in the future it is necessary to study the regional characteristics of indicators within Morocco [16].

Thus, the results of this study are in line with global trends in the study of telerradiography in different ethnic and regional groups. Modeling of individual telerradiographic indicators by the Steiner method for members of the Ukrainian population taking into account age, sex and face type is a successful step in approximating a personalized approach to the methodology of planning orthodontic treatment in order to achieve the best functional and aesthetic results.

Conclusions

1. In young men with a wide type of face according to the Steiner method, 5 reliable models of telerradiographic indicators with a coefficient of determination higher than 0.6 were included in the *second group* depending on the indicators of the *first group* (R^2 = from 0.665 to 0.895) and 7 models included in the *third groups* depending on the indicators of the *first* and *second groups* (R^2 = from 0.662 to 0.946); in young women with a very wide type of face - respectively only 3 (R^2 = from 0.604 to 0.812) and 4 (R^2 = from 0.635 to 0.844) models; in young women with a wide face type - respectively 4 (R^2 = from 0.694 to 0.771) and 6 (R^2 = from 0.617 to 0.923) models.

2. In young men with a wide type of face among the telerradiographic indicators of the first group included in the models of the second group according to the Steiner method most often included the value of the distance Ar-Go and angle H (29.41% each), angle N-S-Ar (23.53%) and distance N-S (11.76%); in young women with a very wide type of face - the value of the angles N-S-Ar and H (22.22% each); in young women with a wide type of face - the value of the distance P-PTV, the angle PO-NBa and the ratio of S-ar:ar-Go (21.43% each) and the angle H (14.29%).

3. In young men with a wide type of face among the telerradiographic indicators of the first and second groups included in the models of indicators of the third group

according to the Steiner method most often included the value of the ANB angle (17.24%), P-PTV distance (13.79%), and also the angle SN-GoGn (10.34%); in young women with a very wide type of face - the value of the angles ANB,

SNA, PO-NBa and the distance Pog-NB (14.29% each); in young women with a wide type of face - the value of the distance Pog-NB (17.86%), the angle ANB and the distance N-CC (14.29% each).

References

- [1] Aldrees, A.M. (2011). Lateral cephalometric norms for Saudi adults: A meta-analysis. *The Saudi Dental Journal*, 23(1), 3-7. doi: 10.1016/j.sdentj.2010.09.002
- [2] Devereux, L., Moles, D., Cunningham, S.J., & McKnight, M. (2011). How important are lateral cephalometric radiographs in orthodontic treatment planning? *American Journal of Orthodontics and Dentofacial Orthopedics*, 139(2), e175-e181. doi: 10.1016/j.ajodo.2010.09.021
- [3] Dmitriev, M.O. (2017). Зв'язки основних краніальних показників з характеристиками положення зубів верхньої і нижньої щелеп та профілем м'яких тканин обличчя в юнаків і дівчат [Relations of key cranial indicators with the characteristics of the teeth of the upper and lower jaws and profile face soft tissue in boys and girls]. *Вісник морфології - Reports of Morphology*, 23(1), 125-131.
- [4] Dmitriev, M., Gunas, V., Polishchuk, S., Olkhova, I., & Kumar, A. (2020). Modeling of Central Incisors Position Indicators in boys and girls according to CC. Steiner method for Forensic Dental Identification. *The Official Publication of Indian Academy of Forensic Medicine*, 42(3), 155-160. doi: 10.5958/0974-0848.2020.00043.3
- [5] Doroshenko, S.I., & Kuljinsky, E.A. (2007). *Основи телерентгенографії [Fundamentals of Teleradiography]*. К.: Здоров'я - К.: Zdorovija.
- [6] Drachevska, I.Yu. (2021). Regression models of individual telerradiographic indicators according to Ricketts method in Ukrainian young men and young women with different face types. *Вісник Вінницького національного медичного університету - Reports of Vinnytsia National Medical University*, 25(2), 238-246. doi: 10.31393/reports-vnmedical-2021-25(2)-09
- [7] Durão, A.R., Alqerban, A., Ferreira, A.P., & Jacobs, R. (2015). Influence of lateral cephalometric radiography in orthodontic diagnosis and treatment planning. *The Angle Orthodontist*, 85(2), 206-210. doi: 10.2319/011214-41.1
- [8] Govinakovi, P.S., Al-Busaidi, I., & Senguttuvan, V. (2018). Cephalometric Norms in an Omani Adult Population of Arab Descent. *Sultan Qaboos University Medical Journal*, 18(2), e182-e189. doi: 10.18295/squmj.2018.18.02.010
- [9] Gunas, V.I., Kotsyura, O.O., Babych, L.V., Shevchuk, Y.G., & Cherkasova, O.V. (2020). Features correlations of the sizes of molars with cephalometric indicators of men of the western region of Ukraine. *Reports of Morphology*, 26(2), 51-61. doi: 10.31393/morphology-journal-2020-26(2)-08
- [10] Helal, N.M., Basri, O.A., & Baeshen, H.A. (2019). Significance of cephalometric radiograph in orthodontic treatment plan decision. *J. Contemp. Dent. Pract.*, 20(7), 789-793. doi: 10.5005/jp-journals-10024-2598
- [11] Imani, M.M., Farzaneh, S., Ghanbari, A., & Arab, S. (2019). Cephalometric norms in an Iranian Kurdish population according to the Steiner analysis. *Iranian Journal of Orthodontics*, 14(1), e63439. doi: 10.5812/ijo.63439
- [12] Kolokitha, O.E., & Topouzelis, N. (2011). Cephalometric methods of prediction in orthognathic surgery. *Journal of Maxillofacial and Oral Surgery*, 10(3), 236. doi: 10.1007/s12663-011-0228-7
- [13] Lyakhova, N.A. (2018). Analysis of Risk Factors of Orthodontic Pathology: Literature Review. *Wiadomosci Lekarskie (Warsaw, Poland: 1960)*, 71(5), 1084-1088.
- [14] Marchenko, A.V., Shinkaruk-Dykovytska, M.M., Pozur, T.P., Gunas, V.I., & Orlovskiy, V.O. (2020). Models of individual linear dimensions necessary for the construction of the correct form of dental arches in young men with a wide face, depending on the features of odontometric and cephalometric indicators. *Wiadomosci Lekarskie (Warsaw, Poland: 1960)*, 73(6), 1103-1107. PMID: 32723934
- [15] Mohammad, H.A., Hassan, A., & Hussain, S.F. (2011). Cephalometric evaluation for Malaysian Malay by Steiner analysis. *Scientific Research and Essays*, 6(3), 627-634. doi: 10.5897/SRE10.869
- [16] Ousehal, L., Lazrak, L., & Chafii, A. (2012). Cephalometric norms for a Moroccan population. *International Orthodontics*, 10(1), 122-134. doi: 10.1016/j.ortho.2011.12.001
- [17] Phulari, B. (2013). *An atlas on cephalometric landmarks*. JP Medical Ltd. doi: 10.5005/jp/books/11877
- [18] Profit, W.R. (2017). *Современная ортодонтия* (4-е изд., пер. с англ.) [*Modern orthodontics* (4th ed., trans. from English)]. М.: МЕДпресс-информ - М.: MEDpress-inform.
- [19] Rathore, A.S., Dhar, V., Arora, R., & Diwanji, A. (2012). Cephalometric norms for Mewari children using Steiner's analysis. *International Journal of Clinical Pediatric Dentistry*, 5(3), 173-177. https://doi.org/10.5005/jp-journals-10005-1161
- [20] Sharma, J.N. (2011). Steiner's cephalometric norms for the Nepalese population. *Journal of Orthodontics*, 38(1), 21-31. doi: 10.1179/14653121141209
- [21] Soboń, J.S., Cherkasova, O.V., Gunas, V.I., Babych, L.V., & Kotsyura, O.O. (2020). Correlations of linear sizes of molars with cephalometric indicators of practically healthy men of the southern region of Ukraine. *Biomedical and Biosocial Anthropology*, (38), 36-46. https://doi.org/10.31393/bba38-2020-06
- [22] Steiner, C.C. (1959). Cephalometrics in clinical practice. *Angle Orthod.*, (29), 8-29. doi: 10.1043/0003-3219(1959)029<0008:CICP>2.0.CO;2

МОДЕЛЮВАННЯ ІНДИВІДУАЛЬНИХ ТЕЛЕРЕНТГЕНОГРАФІЧНИХ ПОКАЗНИКІВ ЗА МЕТОДОМ STEINER В УКРАЇНСЬКИХ ЮНАКІВ ІЗ ШИРОКИМ ТА ДІВЧАТ ІЗ ДУЖЕ ШИРОКИМ І ШИРОКИМ ТИПАМИ ОБЛИЧЧЯ Драчевська І.Ю.

Цефалометричні методи аналізу бокових телерентгенограм є одним із ключових елементів ортодонтичного планування лікування пацієнта з патологією зубо-щелепної системи. Визначення нормативних телерентгенографічних показників для місцевої популяції населення є ключовим етапом для успішного застосування тієї чи іншої методики аналізу, зокрема, і для України. Мета дослідження - в українських юнаків і дівчат з ортогнатичним прикусом з різними типами обличчя побудувати та провести аналіз регресійних моделей телерентгенографічних показників, що використовують у методиці Steiner. 49 юнакам і 76 дівчатам з ортогнатичним прикусом у програмному забезпеченні OnyxСerph³™, версії 3DPro, компанії Image

Instruments GmbH, Німеччина (ліцензія № URSQ-1799) проведено цефалометричне дослідження за методикою Steiner. Розподіл на типи обличчя проводили за допомогою індексу Гарсона. Цефалометричні показники були розділені на три групи: перша - показники, що використовують у цефалометричних аналізах Schwarz, Ricketts, Steiner, Roth-Jarabak, Burstone і Bjork і входять до параметрів, які зазвичай не змінюються під час хірургічного та ортодонтичного лікування; друга - зубо-щелепні характеристики за методом Steiner, яким хірургічними методами можна змінювати довжину, ширину, куту та положення щелеп; третя - показники за методом Steiner, які характеризують положення кожного зуба відносно один одного, черепних структур та профілю м'яких тканин обличчя. Моделювання індивідуальних телерентгенографічних показників проведено в ліцензійному пакеті "Statistica 6,0" за допомогою покрокового регресійного аналізу. При аналізі достовірних моделей телерентгенографічних показників за методикою Steiner, які увійшли до другої групи, в залежності від показників першої групи із коефіцієнтом детермінації вищим 0,6, встановлено, що із 7 можливих в юнаків із широким типом обличчя побудовано 5 моделей (R^2 = від 0,665 до 0,895), до яких найбільш часто входять величина відстаней Ar-Go і N-S та кутів H і N-S-Ar; у дівчат з дуже широким типом обличчя - 3 моделі (R^2 = від 0,604 до 0,812), до яких найбільш часто входять величина кутів N-S-Ar і H; у дівчат із широким типом обличчя - 4 моделі (R^2 = від 0,694 до 0,771), до яких найбільш часто входять величина кутів POr-NBa та H, відстані P-PTV і співвідношення S-ar : ar-Go. При аналізі достовірних моделей телерентгенографічних показників за методикою Steiner, які увійшли до третьої групи в залежності від показників першої та другої груп із коефіцієнтом детермінації вищим 0,6, встановлено, що із 8 можливих в юнаків із широким типом обличчя побудовано 7 моделей (R^2 = від 0,662 до 0,946), до яких найбільш часто входять величина кутів ANB і SN-GoGn та відстані P-PTV; у дівчат із дуже широким типом обличчя - 4 моделі (R^2 = від 0,635 до 0,844), до яких найбільш часто входять величина кутів ANB, SNA, POr-NBa та відстані Pog-NB; у дівчат із широким типом обличчя - 6 моделей (R^2 = від 0,617 до 0,923), до яких найбільш часто входять величина відстаней Pog-NB і N-CC та кута ANB. Побудова регресійних моделей телерентгенографічних показників, що використовують у методиці Steiner в українських юнаків і дівчат із ортогнатичним прикусом є фундаментом для створення в Україні бази нормативних цефалометричних показників, що дозволить надавати стоматологічну допомогу населенню на сучасному рівні.

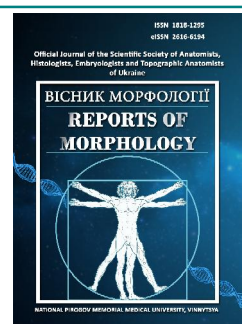
Ключові слова: регресійний аналіз, телерентгенографія, цефалометрія за методикою Steiner, юнаки та дівчата з ортогнатичним прикусом, типи обличчя.



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Morphological research of the effectiveness of perioperative local use of anesthetics and antiseptics in patients with purulent-necrotic lesions of lower extremities in diabetes mellitus

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Ulcer-necrotic lesions of the feet are detected in 5-15% of patients with diabetes mellitus (DM). According to the literature today in Ukraine, patients with DM perform high amputation of the lower extremities with diabetic foot syndrome with a frequency of 19.6-42.6%, at the same time, mortality ranges from 8.9% to 25.0%, and the total mortality rate at the DM varies from 6.6% to 13.5%, often associated with the occurrence of postoperative complications. The aim of the work was to study morphological indicators of reparation of soft tissues of the lower extremities in patients with diabetic foot syndrome on the background of local treatment during the perioperative period. We investigated changes in histologic structure and character of reactions of skin tissues, muscles and fascia during the period of visceral disease in patients with diabetes mellitus after different types of local treatment. Then, samples of skin tissues, muscles and fascia were photographed and analyzed using a light microscope OLIMPUS BX 41. In the first group of the comparison, which used standard methods of anesthesia and local antiseptic povidone-iodine, granulation tissue was characterized by the complete absence of fibrous structures (collagen fibers) and the presence of a small number of newly formed small-diameter vessels with blistered endothelium. Vessels of young granulation tissue were dilated, full-blooded, the endothelium was swollen, there was significant perivascular edema. In the second group of patients (where povidone-iodine and infiltration anesthesia with 2% lidocaine solution anesthetic was used locally) there were almost no remains of necrotic tissues in the affected tissues. It should be noted that there was better granulation development with fewer inflammatory-cell elements, more young forms of fibroblasts and a moderate pathological vascular reaction. In the first (control) group, wound healing by 3-7 days is characterized by somewhat slow regeneration. Wound healing was most favorable in patients of the second group, where infiltration anesthesia was used by local anesthetic and antiseptic povidone-iodine.

Key words: *diabetic foot syndrome, wound, inflammation, Povidone-iodine, Lidocaine.*

Introduction

Purulent-necrotic lesions of the tissues of the foot in patients with diabetes mellitus (DM) are serious complications that lead to serious consequences: from high amputation of the lower extremities to the death of patients. According to European researchers, mortality after amputation below the knee in patients with diabetic foot (DF) within 1 year is 24.6%, during the first 5 years - 66.3%; after hip amputation, mortality during the year was noted in 43.3% of cases, five-year mortality was 83.3% [7, 12]. Solving the problems of mortality and disability through DF is the adoption and adherence to a strategy that includes

prevention and implementation of an interdisciplinary approach to the treatment of trophic and purulent lesions of diabetic foot [11, 23, 27].

The subject of constant study and discussion are the issues of the general strategy of operative and local perioperative therapy of purulent-necrotic foci in DF [5, 11, 23]. International experts on DF emphasize the importance of surgical treatment of chronic wounds in diabetes and active local treatment with antiseptics [4, 11, 30].

Preoperative treatment of infected foot wounds almost always requires antimicrobial therapy, which is carried out

systemically (oral or parenteral antibiotics) and topically (by using antiseptics, antibiotics or other antimicrobials in the form of solutions, gels, ointments or dressings). The rationale for the use of topical antimicrobial therapy is to destroy or at least stop the replication of pathogenic microorganisms on the skin, mucous membranes and in the wound. Topical antimicrobials can be used as a single component or in combination with other topical or systemic antimicrobials [3, 18, 21, 22].

Topical therapy with antiseptic and antimicrobial drugs has many potential advantages over the appointment of systemic antibacterial therapy, including: high and stable concentration of antimicrobial agent in the site of infection; the need to use only a limited amount of antimicrobial agent on the affected area; prevention of potential toxicity associated with systemic treatment; ability to use new agents not available for system use; ease of use in an outpatient setting; and potentially better patient adherence to treatment. Local treatments may also be helpful in addressing the growing worldwide problem of antibiotic resistance [4, 5].

It is clear that the currently available literature does not provide an adequate overview of whether topical antimicrobial therapy is safe and effective in foot ulcers in people with diabetes. In addition, antimicrobial therapy does not solve all the important problems in the case of foot ulcers in patients with diabetes, namely the reduction of local pain, disruption of the normal skin microflora, insufficient penetration of the drug into intact skin and soft tissues, etc. [8, 9]. Therefore, the morphological study of the features of the wound process is one of the main directions for solving the problem of treatment of purulent-necrotic complications of diabetic foot syndrome [25].

The aim is a comparative morphological study of the course of the wound process in purulent-necrotic lesions of the lower extremities of patients with diabetes mellitus with different approaches to local treatment in the perioperative period.

Materials and methods

The study involved 20 patients with diabetes who were hospitalized at the Vinnytsia Regional Clinical Highly Specialized Endocrinology Center of the Vinnytsia Regional Council and required surgical correction for purulent-necrotic lesions of the lower extremities. We studied changes in the histological structure and the nature of the reactions of skin, muscle and fascia tissues during the healing of an ulcer defect in patients with diabetes. Morphological and histochemical studies were performed on the first day after surgery (material for the study was removed intraoperatively), 3 days and 7 days after surgery. The study was conducted in 2020-2021 in accordance with the requirements of the Declaration of Helsinki [13]. Each study subject was provided with all the details of the medical procedures, given the opportunity to discuss any issues with the health care providers, and then signed a detailed form of informed consent for the study.

All patients were divided into 2 groups (10 patients in each group).

The first group (comparison) included patients who underwent standard anesthesia (non-narcotic analgesics) (Paracetamol, NSAIDs) and, if necessary, narcotic analgesics (Morphine), as well as local antimicrobial therapy with Povidone-iodine.

Observation group II - patients who underwent local infiltration analgesia (locally administered anesthetic 2% lidocaine 2 mg/kg) + local antimicrobial therapy with Povidone-iodine.

During the above-mentioned terms, the patients were operatively excised ulcers and removed fragments of skin with underlying tissues from the location of the ulcer defect, departing from their edges by 0.5 cm, as well as fragments of affected muscle tissue and fascia 1-1.5 cm.

The test material was fixed with a 10% aqueous solution of neutral formalin for at least 48 h, followed by washing with running water, dehydration in a system of polyhydric alcohols and pouring into paraffin according to the standard scheme. Prepared sections 7-8 μm thick were stained with hematoxylin and eosin.

Microscopy of histological specimens was performed using a light microscope OLIMPUS BX 41 (Ministry of Health of Ukraine Certificate of State Registration №8120/2008, code 9011800000) using magnifications of x40, x100, x200 and x400. Image visualization and morphometry were performed using the morphometric program Quickphoto micro 2.3 (license agreement №925113924).

Microscopy was used to assess the morphological condition and composition of skin tissues at the edges and days of the ulcer defect, the presence of pathological and reparative changes, their nature, as well as the nature of pathological changes in muscle tissue and fascia in diabetes.

The obtained data were processed statistically using the statistical application software package SPSS for Windows 10 and STATISTICA 5.5. The difference was considered significant when the p values were less than 0.05.

Results

In the study of patients of different groups, we studied the following morphometric parameters of the affected tissues in ulcerative defects of the skin, muscle tissue and fascia: the relative area of stromal edema; the relative area of the vessels of the granulation tissue; the diameter of the vessels of the granulation tissue; the number of vessels in 1 mm^2 ; density of inflammatory-cellular infiltrate of granulation tissue (segmental leukocytes, plasma cells, macrophage elements) in 1 mm^2 ; the number of fibroblasts in 1 mm^2 .

On the first day of observation, the edges and bottom of the ulcer defect were characterized by the complete absence of newly formed fibrous structures (collagen fibers). Granulation tissue was not determined at this time. In the tissues that formed the bottom and edges of the ulcer defect,

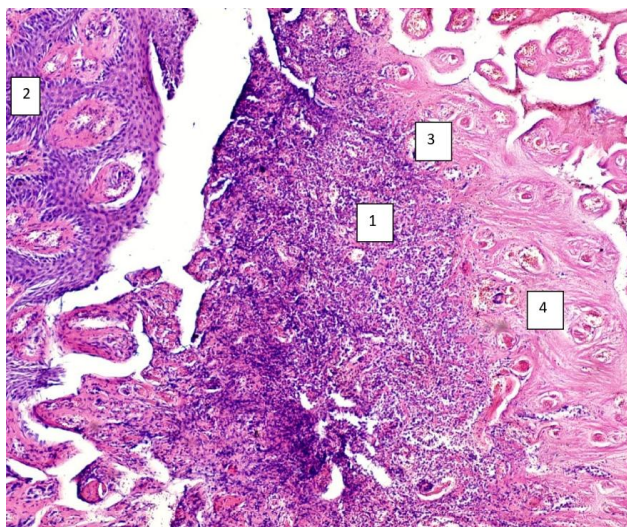


Fig. 1. The edges of the ulcer defect in the first day: diffuse inflammatory polymorphonuclear infiltration (1), pseudoepitheliomatous hyperplasia of the epidermis (2), widespread necrosis of the dermis (3) with stagnant plethora of blood vessels (4). Hematoxylin-eosin. x100.

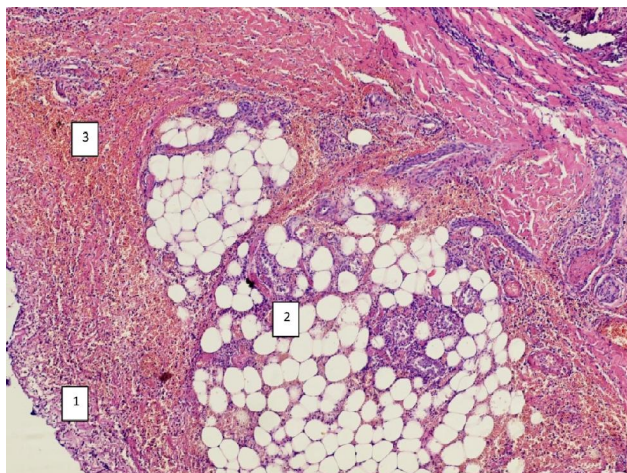


Fig. 2. The bottom of the ulcer defect on the first day before surgery: diffuse purulent-productive inflammation of the deep layers of the dermis (1) with the transition to the hypodermis (2) with widespread hemorrhage (3). Hematoxylin-eosin. x100.

common areas of necrosis and diffuse polymorphic cell infiltration were identified, which was represented mainly by segmental leukocytes. The number of segmental leukocytes was 328.2 ± 56.3 cells in 1 mm^2 . Among other cells of the inflammatory series were determined plasma cells - 132.0 ± 25.2 in 1 mm^2 , cells of the lymphohistiocytic series - 106.0 ± 39.2 in 1 mm^2 . The density of inflammatory cell infiltrate was 566.1 ± 28.1 cells in 1 mm^2 .

Newly formed vessels were absent during this period, which is evidence of the absence of vascular response in the affected tissue.

Young fibroblasts were also not identified. The vessels of the tissues at the edges and days of the ulcer defect were dilated, full-blooded, and some thrombosed, the wall of the vessels and their endothelium were swollen, sometimes

necrotized, there was significant perivascular edema. These changes in the vessels indicated significant disturbances of microhemocirculation in the affected tissues.

Thus, in the studied samples were determined the remains of necrotic tissues, the absence of granulations, a large number of inflammatory cell elements, a pronounced pathological vascular reaction, morphometric parameters did not differ by groups ($p < 0,05$) (Fig. 1, 2).

On the third day of observation in patients of group I (comparison group) granulation tissue was characterized by the complete absence of fibrous structures (collagen fibers) and the presence of a small number of newly formed vessels of small caliber with swollen endothelium. The relative area of the vascular bed of granulation tissue was $12.68 \pm 2.80\%$, and their average diameter was $16.14 \pm 1.62 \mu\text{m}$. The relative area of stromal edema was $25.12 \pm 3.41\%$, which is evidence of vascular response and increased permeability of their wall in the affected tissue.

Various forms of inflammatory-cellular elements of granulation tissue (segmental leukocytes, plasma cells, macrophage cells) were determined in the amorphous intermediate. The number of segmental leukocytes was $304,2 \pm 25,3$ cells in 1 mm^2 , plasma cells - $122,0 \pm 40,3$ in 1 mm^2 , lymphohistiocytic elements - $86,70 \pm 12,60$ in 1 mm^2 . The density of inflammatory cell infiltrate was $512,2 \pm 58,7$ cells in 1 mm^2 . At this time, young fibroblasts were also not identified.

The vessels of the young granulation tissue were dilated, full-blooded, the endothelium was swollen, there was significant perivascular edema. Sludge phenomenon of erythrocytes was observed in some vessels. These changes in the vessels indicated significant violations of microhemocirculation in the affected tissues (Fig. 3).

In the second group of observations on the third day we

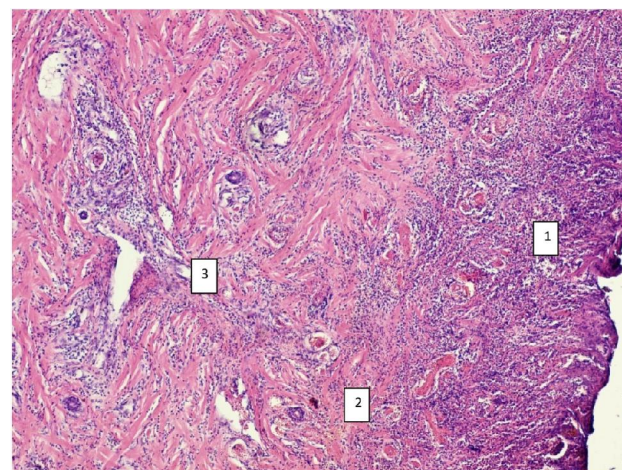


Fig. 3. The area of skin with an ulcer defect three days after treatment, group I of patients. Significant infiltration of segmental neutrophilic leukocytes of the dermis at the edges of the ulcer defect with the presence of lymphocytes (1), stagnant plethora of vessels with erythostasis (2), moderate edema of the fibrous tissue of the dermis (3). Hematoxylin-eosin. x100.

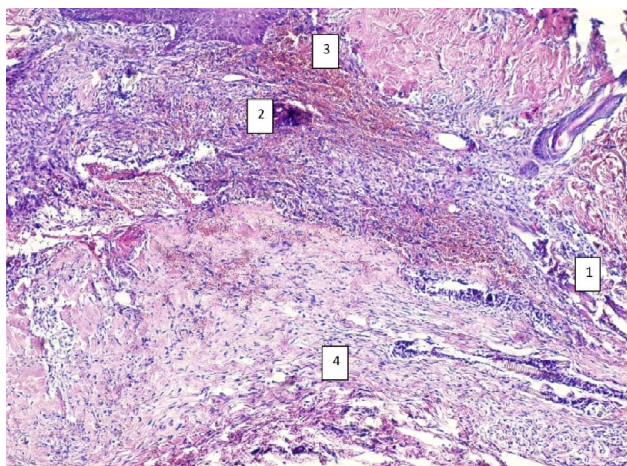


Fig. 4. An area of skin with an ulcer defect three days after surgery. Group II. Layer of necrotized tissues (1), diffuse polymorphonuclear infiltration in the surface layers of the dermis (2), epidermis on the edge of the ulcer defect (3), edema, diffuse inflammatory cell infiltration in the deep layers of the dermis (4). Hematoxylin-eosin. x100.

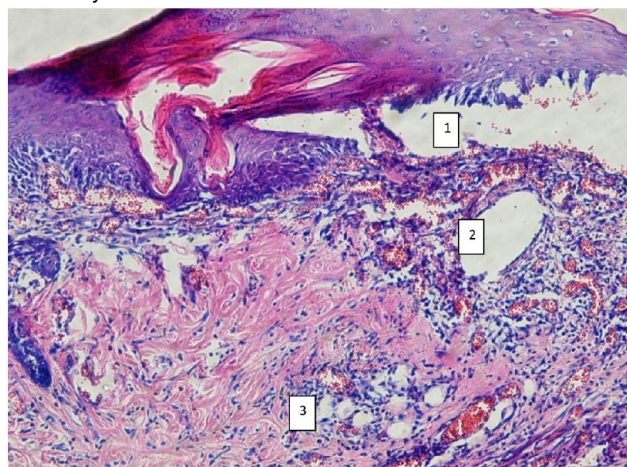


Fig. 5. Bottom, edges of the ulcer defect on the 7th day after surgery. Group I. Proliferation of the epithelium (1) at the edges of the ulcer defect, granulation tissue rich in blood vessels, with inflammation (2), in the deep layers of the granulation tissue is replaced by young scar (3). Hematoxylin-eosin x100.

determined a slightly better dynamics of morphometric parameters. During this period, granulation tissue was also characterized by almost complete absence of fibrous structures, its main substance was also represented by amorphous unstructured eosinophilic substance, but it identified a much smaller number of inflammatory cells, more macrophage elements - precursors of young forms of fibroblasts, recorded the appearance. Large, capillary-type, moderately full-blooded vessels of granulations were determined in a larger number. Signs of erythrostasis and sludge phenomenon were almost not determined (Fig. 4). The number of segmental leukocytes was 262.9 ± 23.6 cells in 1 mm^2 , plasma cells - 103.2 ± 11.2 in 1 mm^2 , lymphohistiocytic elements - 70.41 ± 5.67 in 1 mm^2 . The density of inflammatory cell infiltrate was 435.9 ± 34.7 cells

in 1 mm^2 . Young fibroblasts were in the amount of 12.00 ± 2.67 cells in 1 mm^2 .

The relative area of the vascular bed of the granulation tissue was $9.620 \pm 1.900\%$, and their average diameter was $19.32 \pm 2.70 \mu\text{m}$. These changes in the vessels indicated moderate disturbances of microhemocirculation in the affected tissues.

The relative area of stromal edema was $21.28 \pm 1.34\%$, which is evidence of a moderate vascular response and increased permeability of their wall in the affected tissue.

On the seventh day of observation in patients of comparison group (group I) there were signs of incomplete inflammatory changes with completely unformed full-fledged cicatricial fibrous tissue with a large number of fibrocytes and collagen fibers, reduced slit-like non-functioning vessels. Patients in the comparison group had inflammatory-cell infiltration for 7 days - segmental leukocytes were 125.8 ± 12.5 cells in 1 mm^2 , there was a significant number of lymphohistiocytic elements - 52.31 ± 3.89 in 1 mm^2 , a significant number of young forms of fibroblasts - 24.41 ± 1.60 in 1 mm^2 . The density of the inflammatory cell infiltrate was 284.8 ± 12.5 cells in 1 mm^2 . Stromal edema and other signs of pathological vascular reaction were mild. The diameter of the granulation vessels was $13.16 \pm 5.80 \mu\text{m}$, their relative area was $10.06 \pm 2.50\%$. The relative area of perivascular and stromal edema was $22.42 \pm 5.80\%$. Part of the vessels was in a state of reduction (Fig. 5).

On the seventh day of observation in patients of the second group of comparison there was no complete resolution of inflammatory changes with the formation of full-fledged scar coarse fibrous tissue with a large number of fibrocytes and collagen fibers, reduced slit-like non-functioning vessels. At the same time, there was a decrease

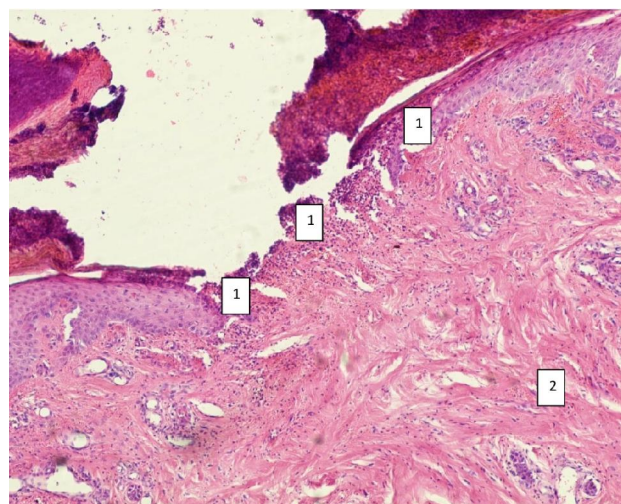


Fig. 6. Bottom, edges of the ulcer defect on the 7th day after surgery, group II. The growth of the epidermis in a layer on the young granulation tissue (1), the granulation tissue is replaced by scar fibrous tissue, which is sometimes determined by a slight infiltration of lymphohistiocytic elements (2). Hematoxylin-eosin. x100.

in the dynamics of signs of inflammatory cell infiltration - segmental leukocytes did not exceed $104,5 \pm 12,6$ cells in 1 mm^2 , there was an increase in lymphohistiocytic elements - $92,50 \pm 3,78$ in 1 mm^2 , recorded a significant number of young forms of fibroblasts - $42,00 \pm 4,60$ in 1 mm^2 . The density of the inflammatory cell infiltrate was $274,8 \pm 23,8$ cells per 1 mm^2 . Stromal edema and other pathological vascular reactions were less pronounced. The diameter of the vessels of the granulations was $212,0 \pm 5,4 \text{ }\mu\text{m}$, their relative area was $9,620 \pm 1,450\%$. The relative area of perivascular and stromal edema was $22,42 \pm 2,50\%$. Histologically, part of the vessels was in a state of reduction (Fig. 6).

Discussion

This study compared the morphological parameters of skin fragments during ulcer excision and at the stage of ulcer healing after different methods of local treatment. Thus, on the first day of the experiment in all studied samples determined the remains of necrotic tissues, lack of granulation, a large number of inflammatory cell elements, a pronounced pathological vascular reaction, morphometric parameters did not differ by groups ($p < 0,05$) (Fig. 1, 2).

On day 3 of the experiment in the first comparison group, which used standard methods of analgesia and topical antiseptic povidone-iodine, granulation tissue was characterized by complete absence of fibrous structures (collagen fibers) and the presence of a small number of newly formed small vessels with swollen endothelium. The vessels of the young granulation tissue were dilated, full-blooded, the endothelium was swollen, there was significant perivascular edema. Sludge phenomenon of erythrocytes was observed in some vessels. These changes in the vessels indicated significant disturbances of microhemocirculation in the affected tissues.

In group II of patients (where povidone-iodine and infiltration anesthesia with anesthetic 2% lidocaine solution were used topically) there were almost no residues of necrotic tissue in the affected tissues, there was a better development of granulations with fewer inflammatory cell elements, more young forms of fibroblasts, moderate pathological vascular reaction was observed (Fig. 4).

On day 7 of the study, the best ulcer healing rates were in group 2, where infiltration anesthesia with a local anesthetic was used prior to local antiseptic therapy. Thus, in patients of comparison group (group I) there were signs of incomplete inflammatory changes with completely unformed full-fledged cicatricial fibrous tissue with a large number of fibrocytes and collagen fibers, reduced slit-like non-functioning vessels. Patients of the second comparison group also did not yet fully resolve inflammatory changes with the formation of full-fledged scar coarse fibrous tissue with a large number of fibrocytes and collagen fibers, reduced slit-like dysfunctional vessels, while a decrease in the dynamics of inflammatory cell signs was found.

One of the main components of effective treatment of trophic ulcers is adequate wound disinfection [29]. In this

experiment, we studied the antiseptic povidone-iodine. According to domestic and foreign in vitro studies, povidone-iodine has a broad spectrum of action against gram-positive (including methicillin-resistant *Staphylococcus aureus* [MRSA]) and gram-negative bacteria, fungi, viruses, protozoa and bacterial spores [8, 21, 22].

Another serious problem for effective healing of trophic ulcers today is the formation of bacterial biofilms, which lead to resistance of microorganisms to antibacterial therapy and slow down the wound healing process [14, 19], especially for chronic ulcers.

That is why the great advantage of povidone-iodine drugs is their high efficiency even in the presence of biofilms, which has been proven in a number of studies [8, 9, 14]. Thus, studies have shown that povidone-iodine exhibits antibacterial activity, especially against *Pseudomonas* and *S.aureus* species, which predominate in biofilms, and improve healing [6]. Povidone-iodine has many characteristics that confirm its place in the treatment of epithelial injuries. It has a prooxidant effect on healing [9, 10], is better tolerated than silver sulfadiazine or chlorhexidine, on histological evaluation of wound healing [2, 3] and enhances angiogenesis [5]. It also supports healing through a pronounced anti-inflammatory effect on cytokines, T lymphocytes and macrophages [10, 15]. Povidone-iodine can also inhibit excessive protease levels in chronic non-healing wounds. Some in vitro data indicate that 10% of povidone-iodine is toxic to cells involved in wound repair, such as fibroblasts and keratinocytes [14, 28]; however, these data have not been clinically proven [1].

According to our morphological data, the best result of local treatment of trophic ulcers was after the use of infiltration anesthesia with 2% lidocaine. Thus, according to international and domestic data, it is currently good practice to infiltrate local anesthetics along the incision to prevent postoperative pain. This can reduce the use of opioids and the side effects they cause. However, local anesthetics have, in addition to the main analgesic effect, also antimicrobial and anti-inflammatory action [15, 16, 19]. The antimicrobial action of local anesthetics has been described in the in vitro literature and in experimental studies. In experimental studies, it was reported that 1-3% lidocaine had antimicrobial activity on *S. aureus* [20, 24, 26].

A comprehensive literature search using MEDLINE 1950 - for in vitro and in vivo studies on the antimicrobial activity of various local anesthetics in a wide range of bacterial and fungal pathogens [16, 19]. According to various studies, local anesthetics (as a class) have antimicrobial properties against a wide range of human pathogens. Several local anesthetics at concentrations commonly used in clinical settings (eg, bupivacaine 0.125-0.75%; lidocaine 1-3%) inhibit the growth of numerous bacteria and fungi under different conditions. Different local anesthetics showed different degrees of antimicrobial ability; bupivacaine and lidocaine, for example, inhibit growth to a much greater extent than ropivacaine. Higher concentrations, longer exposure

and higher temperatures correlate with a proportional increase in microbial growth inhibition. Limited studies attribute the mechanism of action of antimicrobial activity of local anesthetics to the violation of the permeability of microbial cell membranes, which leads to leakage of cellular components and subsequent lysis of cells. In this capacity, local anesthetics can be considered as an adjunct to traditional antimicrobial use in clinical or laboratory settings [19].

Further study of local anesthetics as antimicrobials, in monotherapy and in combination with antiseptics in the laboratory and in the clinic in order to develop alternative methods for the prevention and treatment of infectious perioperative complications in surgery seems promising.

Conclusions

1. Healing of postoperative wounds in patients with diabetic foot ulcers using various methods of postoperative local treatment occurs through a natural wound process with the presence of mandatory stages: damage, inflammation and regeneration.

2. The use of various methods of perioperative analgesia and local antimicrobial treatment affects the second stage of healing - inflammation.

3. When using standard anesthesia and local

antimicrobial therapy with the antiseptic drug povidone-iodine in the postoperative period, wound healing for 3-7 days was characterized by somewhat delayed regeneration.

4. Wound healing was most favorable in patients of the second group, where infiltration anesthesia with a local anesthetic was used.

5. Local anesthetics are used to control pain in the postoperative period, and, in particular, are used to anesthetize the wound in the acute period and to reduce stress when changing bandages. However, given their antimicrobial properties and the current state of antibiotic resistance in Ukraine and the world at large, these observations suggest that the surgical benefits of local anesthesia may go beyond its analgesic properties and may play an antimicrobial role in the prevention and treatment of surgical wound infection.

6. The obtained morphological data suggest the need for further research to study the effectiveness of local use of local anesthetics in the wound, which will be safer, increase patient comfort and safety, reduce consumption of opioid analgesics after surgery and their toxic effects, will not increase the risk of infection and will not interfere with wound healing processes, as well as reduce the length of hospital stay of patients with purulent-necrotic ulcers of the lower extremities.

References

- [1] Amin, N., & Doupis, J. (2016). Diabetic foot disease: From the evaluation of the "foot at risk" to the novel diabetic ulcer treatment modalities. *World Journal of Diabetes*, 7(7), 153-164. <https://doi.org/10.4239/wjd.v7.i7.153>
- [2] Antonyuk-Kysil, V.M., Kucheruk, E.F., Nevmerzhiysky, A.S., & Les, V.M. (2016). Можливості хірургічного лікування трофічних виразок венозного генезу нижніх кінцівок у пацієнтів похилого і старечого віку в амбулаторних умовах [Possibilities of surgical treatment of trophic ulcers of venous origin of the lower extremities in elderly and senile patients in an outpatient setting]. *Вісник наукових досліджень - Bulletin of scientific research*, (3), 46-50.
- [3] Babina, Y.M., Dmitriev, D.V., & Nazarchuk, O.A. (2019). Антимікробна активність локальних анальгетиків проти збудників ранової інфекції, пов'язаної з наданням медичної допомоги [Antimicrobial activity of local analgesics against pathogens of wound infection associated with medical care]. *Медицина невідкладних станів - Emergency medicine*, (2), 162.
- [4] Bondarenko, O.N., Galstyan, G.R., & Dedov, I.I. (2015). Особенности клинического течения критической ишемии нижних конечностей и роль эндоваскулярной реваскуляризации у больных сахарным диабетом [Features of the clinical course of critical lower limb ischemia and the role of endovascular revascularization in patients with diabetes mellitus]. *Сахарный диабет - Diabetes Mellitus*, 18(3), 57-69. doi: 10.14341/DM2015357-69
- [5] Braun, L.R., Fisk, W.A., Lev-Tov, H., Kirsner, R.S., & Isseroff, R.R. (2014). Diabetic foot ulcer: An evidence-based treatment update. *Am. J. Clin. Dermatol.*, 15, 267-281. doi: 10.1007/s40257-014-0081-9
- [6] Cooper, R.A., (2007). Iodine revisited. *Int. Wound J.*, 4(2), 124-137. doi: 10.1111/j.1742-481X.2007.00314.x.
- [7] Conte, M.S., Bradbury, A.W., Kolh, P., White, J.V., Dick, F., Fritridge, R. ... Murad, M.H. (2019). Global vascular guidelines on the management of chronic limb-threatening ischemia. *GVG Writing Group J. Vasc. Surg.*, 69(6S), 3-125. doi: 10.1016/j.jvs.2019.02.016
- [8] Drosou, A., Falabella, A., & Kirsner, R.S. (2003). Antiseptics on wounds: an area of controversy. *Wounds*, 15, 149-166.
- [9] Dumville, J.C., Lipsky, B.A., Hoey, C., Cruciani, M., Fiscon, M., & Xia, J. (2017). Topical antimicrobial agents for treating foot ulcers in people with diabetes. *Cochrane Database Syst. Rev.*, 6(6), 110-138. doi:10.1002/14651858.CD011038.pub2
- [10] Galkowska, H., Wojewodzka, U., & Olszewski, W.L. (2006). Chemokines, cytokines, and growth factors in keratinocytes and dermal endothelial cells in the margin of chronic diabetic foot ulcers. *Wound Repair Regen.*, 14(5), 558-565. doi: 10.1111/j.1743-6109.2006.00155.x
- [11] Graziani, L., & Piaggese, A. (2010). Indications and clinical outcomes for below knee endovascular therapy: Review article. *Catheter Cardiovasc. Interv.*, 75, 433-443. doi: 10.1002/ccd.22287
- [12] Gök, Ü., Selek, Ö., Selek, A., Güdük, A., & Güner, M.Ç. (2016). Survival evaluation of the patients with diabetic major lower-extremity amputations. *Musculoskelet Surg.*, 100, 145-148. doi: 10.1007/s12306-016-0399-y
- [13] Helsinki Declaration of the World Medical Association "Ethical principles of medical research with human participation as an object of study": adopted by the 18th General Assembly of the Military Medical Academy, Helsinki, Finland. (1964). Ed.: from 01.10.2008 [Electronic resource]. Legislation of Ukraine. Available: http://zakon5.rada.gov.ua/laws/show/990_005
- [14] Hoekstra, M.J., Westgate, S.J., & Mueller, S. (2017). Povidone-iodine ointment demonstrates in vitro efficacy against biofilm formation. *Int. Wound J.*, 14(1), 172-179. doi: 10.1111/iwj.12578

- [15] Hoogeveen, R.C., Dorresteyn, J.A.N., Kriegsman, D.M.W., & Valk, G.D. (2015). Complex interventions for preventing diabetic foot ulceration. *Cochrane Database of Systematic Reviews*, 8. Art. No.: CD007610. doi: 10.1002/14651858.CD007610.pub3
- [16] Johnson, S.M., Saint John, B.E., & Dine, A.P. (2008). Local anesthetics as antimicrobial agents: a review. *Surgical Infections*, 9(2), 205-213. doi: 10.1089/sur.2007.036
- [17] Korejba, K.A., Minabutdinov, A.R., Tuneshev, L.M., Nuretdinov, A.R., & Lukin, P.S. (2019). Синдром диабетической стопы. Стационарзамещающая методика на основе fast track-хирургии [Diabetic foot syndrome. Replacement for inpatient treatment technique based on the fast track surgery]. *Амбулаторная хирургия - Ambulatory Surgery*, (1-2), 72-79. <https://doi.org/10.21518/1995-1477-2019-1-2-72-79>
- [18] Kovalchuk, V.P. (2006). Характеристика арсеналу антисептических засобів, зареєстрованих в Україні [Characteristics of the arsenal of antiseptic agents registered in Ukraine]. *Biomedical and Biosocial Anthropology*, 6, 71-76.
- [19] Lu, C.W., Lin, T.Y., Shieh, J.S., Wang, M.J., & Chiu, K.M. (2014). Antimicrobial effect of continuous lidocaine infusion in a Staphylococcus aureus-induced wound infection in a mouse model. *Ann. Plast. Surg.*, 73(5), 598-601. doi: <https://doi.org/10.17085/apm.2019.14.2.165>
- [20] Maillard, J.Y., Kampf, G., & Cooper, R. (2021). Antimicrobial stewardship of antiseptics that are pertinent to wounds: the need for a united approach. *JAC - Antimicrob. Resist.*, 3(1), dlab027. doi: 10.1093/jacamr/dlab027
- [21] Nazarchuk, O.A. (2016). Антисептики: сучасна стратегія боротьби зі збудниками інфекційних ускладнень [Antiseptics: the current strategy of fighting against infectious diseases]. *Клінічна хірургія - Clinical Surgery*, 9, 59-61.
- [22] Nazarchuk, O.A. (2019). Дослідження протимікробної ефективності сучасних антисептичних засобів на основі декаметоксину та повідону йоду [Research of antimicrobial efficacy of modern antiseptic agents based on decamethoxine and povidone-iodine]. *Періопераційна медицина - Perioperative Medicine*, 2(1), 4-10. doi: 10.31636/prmd.v2i1.1
- [23] Paisley, A.N., Kalavalapalli, S., Subudhi, C.P., Chadwick, P.R., Chadwick, P.J., & Young, B. (2012). Real time presence of a microbiologist in a multidisciplinary diabetes foot clinic. *Diabetes Res. Clin. Pract.*, 96(1), 1-3. doi: 10.1016/j.diabres.2011.11.024
- [24] Parr, A.M., Zoutman, D.E., & Davidson, J.S. (1999). Antimicrobial activity of lidocaine against bacteria associated with nosocomial wound infection. *Ann. Plast. Surg.*, 43(3), 239-245. doi: 10.1097/0000637-199909000-00003
- [25] Proshin, A.V. (2010). Морфологическая характеристика раневого процесса у больных с гнойно-некротическими формами поражений нижних конечностей при сахарном диабете [Morphological characteristics of the wound process in patients with purulent-necrotic forms of lower limb lesions in diabetes mellitus]. *Вестник Новгородского государственного университета имени Ярослава Мудрого - Bulletin of the Novgorod State University named after Yaroslav Mudryy*, (59), 63-66.
- [26] Stratford, A.F., Zoutman, D.E., & Davidson, J.S. (2002). Effect of Lidocaine and Epinephrine on Staphylococcus aureus in a Guinea pig model of surgical wound infection. *Plast. Reconstr. Surg.*, 110, 1275-1279. doi: 10.1097/01.PRS.0000025427.86301.8A
- [27] Uccioli, L., Meloni, M., Izzo, V., Giurato, L., Merolla, S., & Gandini, R. (2018). Critical limb ischemia: current challenges and future prospects. *Vasc. Health Risk Manag.*, 26(14), 63-74. doi: 10.2147/VHRM.S125065
- [28] Vermeulen, H., Westerbos, S.J., & Ubbink, D.T. (2010). Benefit and harm of iodine in wound care: a systematic review. *J. Hosp. Infect.*, 76(3), 191-199. doi: 10.1016/j.jhin.2010.04.026
- [29] Vuorisalo, S., Venermo, M., & Lepäntalo, M. (2009). Treatment of diabetic foot ulcers. *J. Cardiovasc. Surg. (Torino)*, 50(3), 275-291. PMID: 19543189.
- [30] Zaitseva, E.L., Doronina, L.P., Molchkov, R.V., Voronkova, I.A., Mitish, V.A., & Tokmakova, A.I. (2014). Особенности репаративной ткани у пациентов с нейропатической и нейроишемической формами синдрома диабетической стопы на фоне терапии отрицательным давлением [Features of angiogenesis against the background of negative pressure wound therapy in patients with neuropathic and neuroischemic forms of diabetic foot ulcers]. *Вестник хирургии имени И.И.Грекова - Herald of Surgery named after I.I.Grekov*, 173(5), 64-72. PMID: 25823338.

МОРФОЛОГІЧНЕ ДОСЛІДЖЕННЯ ЕФЕКТИВНОСТІ ПЕРІОПЕРАЦІЙНОГО ЛОКАЛЬНОГО ЗАСТОСУВАННЯ АНЕСТЕТИКІВ ТА АНТИСЕПТИКІВ У ХВОРИХ З ГНІЙНО-НЕКРОТИЧНИМИ УРАЖЕННЯМИ НИЖНІХ КІНЦІВОК ПРИ ЦУКРОВОМУ ДІАБЕТИ

Бабіна Ю.М., Дмитрієв Д.В., Назарчук О.А., Гормаш П.П.

Виразково-некротичні ураження стоп виявляють у 5-15% хворих на цукровий діабет (ЦД). Згідно даних літератури сьогодні в Україні у хворих на ЦД виконують високу ампутацію нижніх кінцівок при синдромі диабетичної стопи з частотою 19,6-42,6%, при цьому летальність складає від 8,9% до 25,0%, а загальна смертність при ЦД варіює від 6,6% до 13,5%, що часто пов'язують з виникненням післяопераційних ускладнень. Метою роботи стало вивчення морфологічних показників репарації м'яких тканин нижніх кінцівок у пацієнтів із синдромом диабетичної стопи на фоні місцевого лікування у періопераційному періоді. Досліджували зміни гістологічної структури та характер реакцій тканин шкіри, м'язів та фасцій під час загоєння виразки у хворих на цукровий діабет після різних видів місцевого лікування. Потім зразки тканин шкіри, м'язів та фасцій фотографували та аналізували зображення за допомогою світлового мікроскопа OLIMPUS BX 41. У першій групі порівняння, яка використовувала стандартні методи анестезії та місцево антисептичний повідон-йод, грануляційна тканина характеризувалась повною відсутністю волокнистих структур (колагенових волокон) та наявністю невеликої кількості новоутворених судин малого діаметра з набряклим ендотелієм. Судини молодої грануляційної тканини були дилатовані, повнокровні, ендотелій був набряклий, мав місце значний периваскулярний набряк. У II групі хворих (де місцево використовували повідон-йод та інфільтраційну анестезію анестетиком 2% розчину лідокаїну) в уражених тканинах майже не було залишків некротичних тканин. Слід відмітити, що мав місце кращий розвиток грануляцій з меншою кількістю запально-клітинних елементів, більшою кількістю молодих форм фібробластів та помірно патологічною судинною реакцією. У першій (контрольній) групі загоєння ран на 3-7 добу характеризується дещо повільною регенерацією. Таким чином, загоєння ран було найбільш сприятливим у пацієнтів другої групи, де місцево використовували повідон-йод та інфільтраційну анестезію анестетиком 2% розчину лідокаїну.

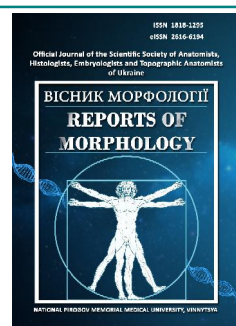
Ключові слова: синдром диабетичної стопи, рана, запалення, повідон-йод, лідокаїн.



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Indicators of the level of subjective control in men with various forms of eczema

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An actual and popular area of research in psychodermatology is to conduct comprehensive studies that comprehensively reveal the mental characteristics of patients with different forms and types of eczema. This will allow in the future to optimize work with patients of this profile and to plan psychotherapeutic measures in the key of a personalized constitutional approach. The aim of the study was to examine the differences in the level of subjective control between healthy and/or eczema patients depending on the severity of dermatosis. Men aged 22 to 35 years, with a diagnosis of true (n=34) and microbial (n=38) eczema, were assessed by the level of subjective control on the basis of the J. Rotter scale edited by E.F. Bazhin et al. (1984). As a control from the data bank of the research center of National Pirogov Memorial Medical University, Vinnytsya indicators of the level of subjective control of 82 practically healthy men of the same age group were selected. Statistical processing of the results was performed in the license package "Statistica 5.5" using non-parametric evaluation methods. Patients with true eczema, compared with the control group, have a higher level of subjective control in the field of general internality, achievements, educational (professional) relations (mild course) and interpersonal relations (severe course). At patients with a microbic eczema of mild and severe course in comparison with healthy investigated size of level of subjective control is smaller in the field of failures and interpersonal relations. Patients with true eczema compared to patients with microbial eczema found significantly higher levels of subjective control in the field of general internality, failures, educational (professional) and interpersonal relationships. In patients with severe dermatosis compared with patients with mild dermatitis there is a decrease in the level of subjective control in the field of educational (professional) relations (true eczema) and interpersonal relations (microbial eczema). Thus, the peculiarities of the level of subjective control in men with various forms of eczema can serve as psychological predictors of exacerbations and exacerbations of eczema, which is certainly important for both clinicians and health care providers in particular.

Keywords: true eczema, microbial eczema, indicators of the level of subjective control, men.

Introduction

World statistics show that the prevalence of eczema is about 1-2% of the adult population, and the proportion among other dermatoses is 30-40% [2, 5, 6]. The causes of eczema are different. This includes genetic predisposition, weakened immunity, predisposition to allergic reactions, stress, exposure to harmful substances, household chemicals, endocrine diseases, digestive diseases, abrasions, wounds and a number of other factors. In recent years, true and microbial eczema tend to be more severe with frequent long-term recurrences, a significant spread of the pathological process on the skin,

resistance to traditional treatments [1, 4, 10, 12].

To prevent the development of eczema with a more severe course, often one of the important conditions is the timeliness of diagnosis and treatment. However, 45.4% of patients see a doctor late, when it is difficult to achieve the effect of treatment and stable remissions [7, 8]. The question remains as to what causes such a careless attitude to the state of one's health in our society, apart from a lack of awareness. In the general population, the reluctance to seek any help from others, including medical, is closely linked to such components of subjective control

as overestimation, shyness, distrust, suspicion, skepticism and negativism. Manifestations of increased hostility, which are also psychological risk factors for eczema and its complications, can play the role of a subjective obstacle to a timely visit to the doctor [14, 18, 19].

It can be assumed that the severity of eczema is due to a complex set of the above and not yet specified personality and behavior, which play a pathogenetic role in the development of dermatosis, reduce willingness to therapeutic cooperation and therefore can affect not only short-term but also long-term results [9, 11]. This requires a comparative analysis of the psychological characteristics of patients with different forms and severity of eczema.

The aim of the study was to examine the differences in the level of subjective control between healthy and/or eczema patients depending on the severity of dermatosis.

Materials and methods

Men aged 22 to 35 years, with a diagnosis of true (n=34, including 16 mild and 18 severe) and microbial (n=38, including 28 mild and 10 severe) eczema, assessment of indicators of the level of subjective control based on the J. Rotter scale in the Research Institute named after Bekhterev and published by E.F.Bazhin et al. in 1984 [3]. This personal questionnaire is designed to diagnose internality - externality, ie the degree of readiness of a person to take responsibility for what happens to her and around her. USK_1 - indicator of the scale of general internality of the level of subjective control according to Rotter; USK_2 - indicator of the level of subjective control in the field of achievements according to Rotter; USK_3 - indicator of the level of subjective control in the field of failures according to Rotter; USK_4 - an indicator of the level of subjective control in the field of family relations according to Rotter; USK_5 - an indicator of the level of subjective control in the field of educational (professional) relations according to Rotter; USK_6 - an indicator of the level of subjective control in the field of interpersonal relations according to Rotter; USK_7 is an indicator of the level of subjective control in the field of health and disease according to Rotter.

As a control from the data bank of the research center of National Pirogov Memorial Medical University, Vinnytsya indicators of the level of subjective control of 82 practically healthy men of the same age group were selected.

Statistical processing of the results was performed in the license package "Statistica 5.5" using non-parametric evaluation methods. The reliability of the difference between the values between the independent quantitative values was determined using the Mann-Whitney U-test.

Results

In practically healthy men, there is a tendency to lower values of the scale of general internality of the level of subjective control according to Rotter (4.831±1.765) st. compared with men with true eczema of mild course (5.813±2.167, p=0.089) st. This figure is significantly higher

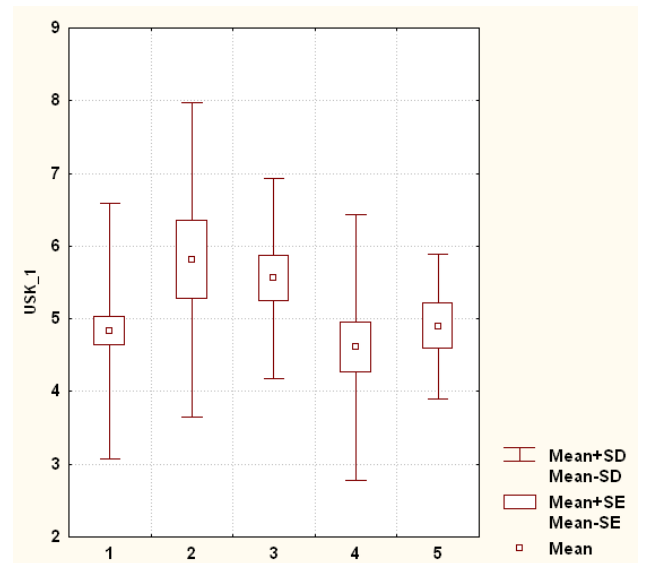


Fig. 1. The magnitude of the scale of general internality of the level of subjective control according to Rotter (USK_1) in healthy and sick men with various forms of eczema (st.).

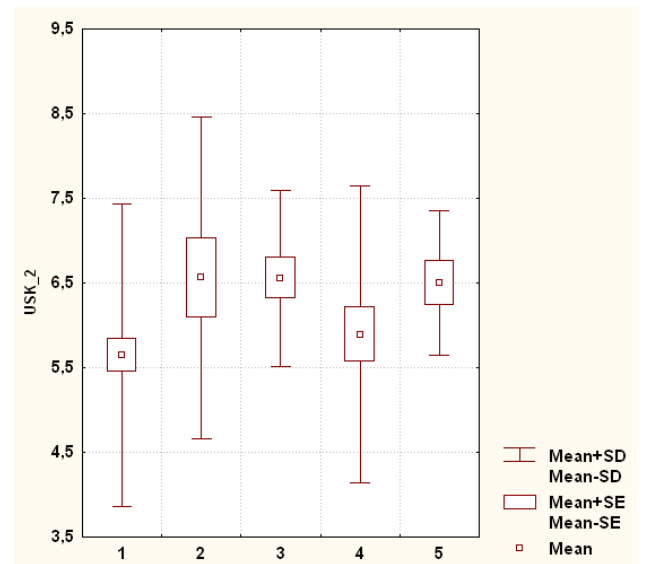


Fig. 2. The value of the indicator of the level of subjective control in the field of achievement according to Rotter (USK_2) in healthy and sick men with various forms of eczema (st.).

in patients with true eczema of severe course (5.556±1.381; p<0.05) st. and tends to greater values in patients with true eczema of mild course (5.813±2.167, p=0.085) st. compared with those studied with mild microbial eczema (4.607±1.833) st. (Fig. 1).

The indicator of the level of subjective control in the field of achievements according to Rotter is significantly higher in patients with true eczema of severe course (6.556±1.042; p<0.05) st. and tends to greater values in patients with true eczema of mild course (6.563±1.896, p=0.066) st. compared with practically healthy subjects (5.649±1.783) st. (Fig. 2).

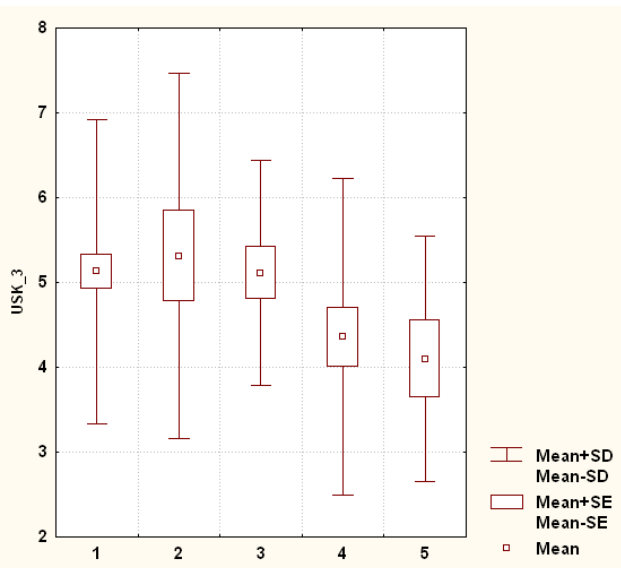


Fig. 3. The value of the level of subjective control in the field of failures according to Rotter (USK_3) in healthy and sick men with various forms of eczema (st).

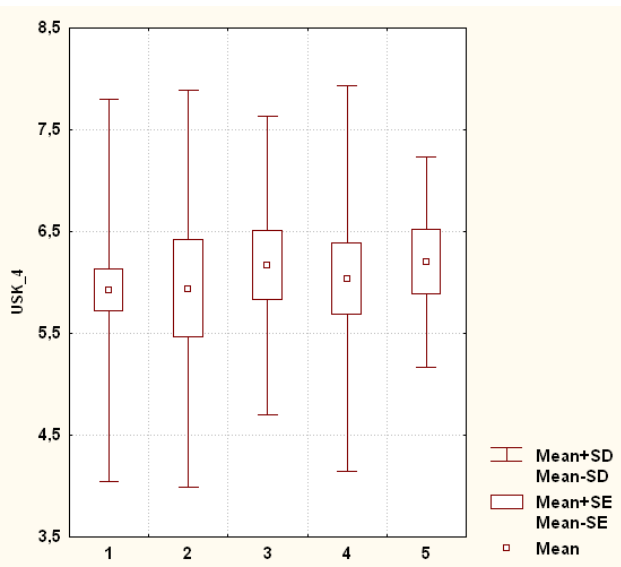


Fig. 4. The value of the level of subjective control in the field of family relations according to Rotter (USK_4) in healthy and choral men with various forms of eczema (st.).

The indicator of the level of subjective control in the field of failures according to Rotter is significantly lower in patients with microbial eczema of mild course (4.357 ± 1.870 ; $p < 0.05$) st. and tends to lower values in patients with severe microbial eczema (4.100 ± 1.499 , $p = 0.098$) st. compared with practically healthy subjects (5.130 ± 1.794) st. This indicator tends to be higher in patients with true eczema of severe course (5.111 ± 1.323 ; $p = 0.057$) st. and in patients with true eczema of mild course (5.313 ± 2.152 , $p = 0.097$) st. compared with those studied with mild microbial eczema (4.357 ± 1.870) st. (Fig. 3).

The indicator of the level of subjective control in the

field of family relations according to Rotter has no reliable and tends to differ between healthy and/or eczema patients depending on the severity of dermatosis (Fig. 4).

The indicator of the level of subjective control in the field of educational (professional) relations according to Rotter is significantly higher in patients with true eczema of mild course (5.313 ± 1.401 ; $p < 0.01$) st. compared with almost healthy subjects (4.104 ± 1.527) st. This figure is significantly higher in patients with true eczema of mild course (5.313 ± 1.401 ; $p < 0.05-0.001$) st. compared with patients with true eczema of severe course (4.389 ± 1.378)

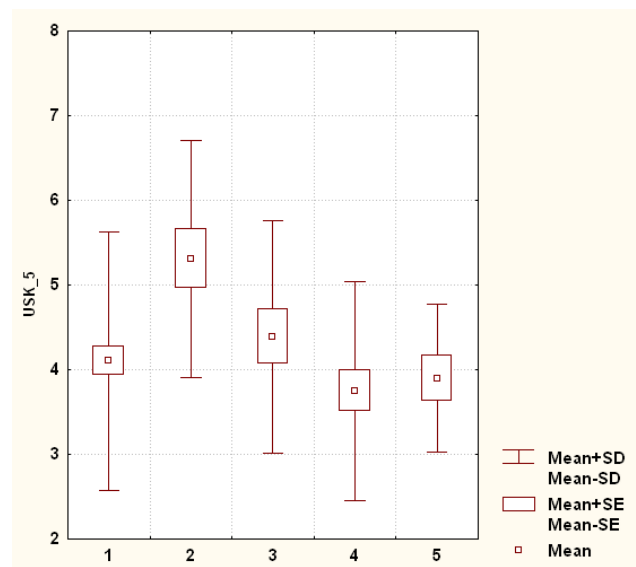


Fig. 5. The value of the indicator of the level of subjective control in the field of educational (professional) relations according to Rotter (USK_5) in healthy and sick men with various forms of eczema (st.).

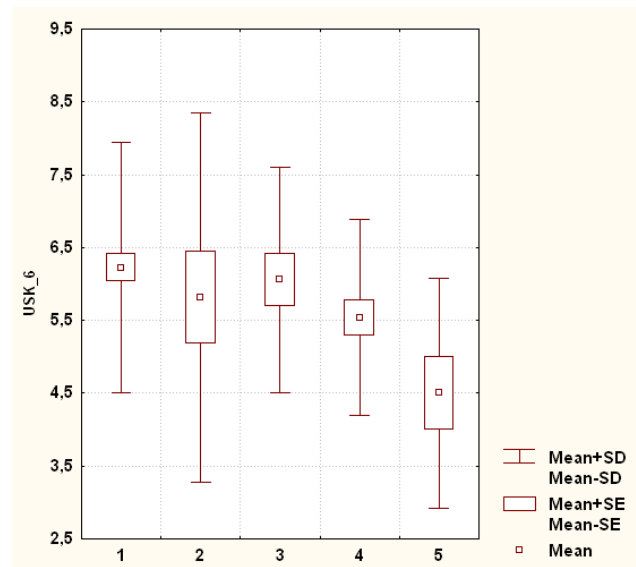


Fig. 6. The value of the level of subjective control in the field of interpersonal relations according to Rotter (USK_6) in healthy and sick men with various forms of eczema (st.).

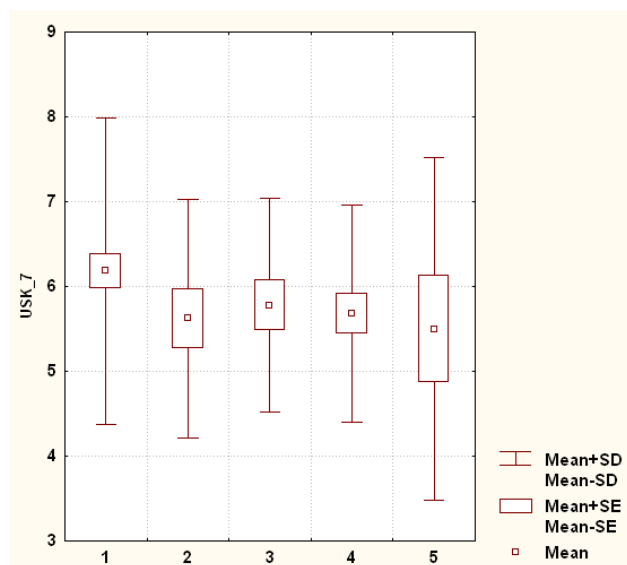


Fig. 7. The value of the indicator of the level of subjective control in the field of health and disease according to Rotter (USK_7) in healthy and sick men with various forms of eczema (st.).

st., studied with microbial eczema of mild (3.750 ± 1.295) st. and severe (3.900 ± 1.876) st. course (Fig. 5).

The indicator of the level of subjective control in the field of interpersonal relations according to Rotter is significantly lower in patients with microbial eczema of the mild (5.536 ± 1.347 ; $p < 0.05$) st. and severe (4.500 ± 1.581 ; $p < 0.01$) st. course in comparison with practically healthy subjects (6.221 ± 1.722) st. This figure is significantly higher in patients with true eczema of severe course (6.056 ± 1.552 ; $p < 0.01$) st. and tends to be higher in patients with truth (5.813 ± 2.536 ; $p = 0.078$) st. and microbial (5.536 ± 1.347 ; $p = 0.071$) st. eczema of mild course in comparison with patients with a severe form of microbial eczema (4.500 ± 1.581) st. (Fig. 6).

The indicator of the level of subjective control in the field of health and disease according to Rotter have no significant and tends to differ when comparing healthy and/or patients with eczema depending on the severity of dermatosis (Fig. 7).

Discussion

In recent decades, the world has seen a sharp increase in the number of people suffering from various forms of eczema [2, 15]. In the case of severe and often recurrent dermatosis there is the destruction of normal activities and attitudes of the individual. Groups with a more severe course of the disease feel that they have little control over their lives, including little control over their health, which reflects the reality of helplessness and limited access to health care. As part of the process of learning helplessness, this situation may well lead to a fairly stable orientation, similar to personality traits. The problem of a person in a situation of severe disease should be considered not only as a medical but also as a social and psychological problem

[13, 16].

Currently, there are a number of studies in psychodermatology, but their results remain contradictory due to the lack of comprehensive studies that comprehensively reveal the mental characteristics of patients with different forms and types of eczema [5, 17, 20]. Our test position, which can be verified, states that the expressed locus of control will be significantly different when compared between healthy and sick subjects and between patients with different forms and course of eczema. We expect healthy individuals and patients with mild dermatosis to be more likely to have more control over important aspects of their lives and health.

According to our results, we see that in healthy subjects and in patients with true eczema with mild and severe course dominate internal locus of control, clearly expressed on the scales of internality-externality (except USK_5 in severe true eczema). Moreover, compared with the control group in the mild course of true eczema in size is dominated by USK_1, USK_2 and USK_5, and in severe true eczema - USK_2. All this means the self-confidence of the subjects, more calm and friendly, with a more positive system of relationships and a greater awareness of meaning and purpose in life.

The internal locus of control USK_1, USK_3 and USK_5 in patients with mild microbial eczema and USK_1, USK_3, USK_5 and USK_6 deviates to the left of normal (< 5.5 stens), indicating an external type of subjective control in these areas of life. Such people do not see a connection between their actions and significant events in their lives, do not consider themselves able to control their development and believe that most of them are the result of chance or actions of other people. Subjects tend to attribute responsibility for such events to other people or consider them the result of bad luck. They tend to attach more importance to external circumstances - management, co-workers, luck - failure. And in patients with severe microbial eczema, a low USK_6 indicates that they do not consider themselves able to actively form their circle of communication and tend to consider their relationship the result of their partners.

Significantly higher levels of subjective control over USK_3 and USK_6 were found in healthy subjects compared with patients with mild and severe microbial eczema.

A comparison between groups with a similar form and different degrees of severity of dermatosis revealed significantly higher levels of subjective control in the mild form of true and microbial eczema, respectively, for USK_5 and USK_6.

It is noteworthy that, regardless of the severity of the course, patients with true eczema have significantly greater differences and trends in the level of subjective control compared with patients with mild and severe microbial eczema. Thus, patients with true eczema have higher values:

USK_1, USK_3 and USK_5 (mild) and USK_6 (severe) compared to microbial eczema with similar severity;

USK_5 and USK_6 (mild) compared with severe microbial eczema and USK_1 and USK_3 (severe) compared with mild microbial eczema.

Summarizing the results of the study, we note that patients with true eczema with different currents are characterized as a pronounced internal personality with features of externality, characterize themselves as good, independent, fair and partially decisive. Patients with microbial eczema showed dependence on external circumstances - environmental conditions, other people's actions, accidents. They have a low level of subjective control, although they soberly assess the situation of their health and the immediate environment. Subjects do not consider their actions an important factor in the organization of their own production activities, in complex relationships in the team, in their promotion. Thus, in a comparative study of the level of subjective control over different areas of life between healthy and/or patients with eczema depending on the severity of dermatosis, an idea of the content of the disease, revealed the psychological characteristics of patients (phenotypic manifestation), which can be used to

optimize work with patients of this profile, as well as in the framework of rehabilitation for psychotherapeutic measures in the key of a personalized constitutional approach.

Conclusion

1. Compared with healthy subjects, patients with true eczema have a higher level of subjective control in the field of general internality, achievements, educational (professional) relations (easy course) and interpersonal relations (severe course). In patients with microbial eczema, the opposite situation is observed: compared with the control group in mild and severe course, the value of the studied indicator is smaller in the field of failures and interpersonal relationships.

2. Patients with true eczema differ significantly from patients with microbial eczema by higher levels of subjective control in the field of general internality, failures, educational (professional) and interpersonal relationships.

3. Decreased level of subjective control in the field of educational (professional) relations (truth of eczema) and interpersonal relations (microbial eczema) distinguishes patients with severe dermatosis from patients with mild.

References

- [1] Ban, L., Langan, S.M., Abuabara, K., Thomas, K.S., Sultan, A.A., Sach, T. ... Ratib, S. (2018). Incidence and sociodemographic characteristics of eczema diagnosis in children: a cohort study. *Journal of Allergy and Clinical Immunology*, 141(5), 1927-1929. doi: 10.1016/j.jaci.2017.12.997
- [2] Barbarot, S., Auziere, S., Gadkari, A., Girolomoni, G., Puig, L., Simpson, E.L. ... Eckert, L. (2018). Epidemiology of atopic dermatitis in adults: results from an international survey. *Allergy*, 73(6), 1284-1293. doi: 10.1111/all.13401
- [3] Bazhin, E.F., Golyunkina, E.A., & Etkind, A.M. (1984). Метод исследования уровня субъективного контроля [Method for researching the level of subjective control]. *Психологический журнал - Psychological Journal*, 5(3), 152-162.
- [4] Brunner, P.M., & Guttman-Yassky, E. (2019). Racial differences in atopic dermatitis. *Annals of Allergy, Asthma & Immunology*, 122(5), 449-455. doi: 10.1016/j.anai.2018.11.015
- [5] Dalgard, F.J., Gieler, U., Tomas-Aragones, L., Lien, L., Poot, F., Jemec, G.B. ... Kupfer, J. (2015). The psychological burden of skin diseases: a cross-sectional multicenter study among dermatological out-patients in 13 European countries. *Journal of Investigative Dermatology*, 135(4), 984-991. doi: 10.1038/jid.2014.530
- [6] de Lusignan, S., Alexander, H., Broderick, C., Dennis, J., McGovern, A., Feeney, C., & Flohr, C. (2020). Epidemiology and management of atopic dermatitis in England: an observational cohort study protocol. *BMJ Open*, 10(9), e037518. doi: 10.1136/bmjopen-2020-037518
- [7] de Lusignan, S., Alexander, H., Broderick, C., Dennis, J., McGovern, A., Feeney, C., & Flohr, C. (2021). Patterns and trends in eczema management in UK primary care (2009-2018): A population-based cohort study. *Clinical & Experimental Allergy*, 51(3), 483-494. doi: 10.1111/cea.13783
- [8] Drucker, A.M., Wang, A.R., Li, W.Q., Severson, E., Block, J.K., & Qureshi, A.A. (2017). The burden of atopic dermatitis: summary of a report for the National Eczema Association. *Journal of Investigative Dermatology*, 137(1), 26-30. doi: 10.1016/j.jid.2016.07.012
- [9] Ersner, S.J., Cowdell, F., Latter, S., Gardiner, E., Flohr, C., Thompson, A. R. ... Drury, A. (2014). Psychological and educational interventions for atopic eczema in children. *Cochrane Database of Systematic Reviews*, (1), CD004054. doi: 10.1002/14651858.CD004054.pub3
- [10] Fuxench, Z.C.C., Block, J.K., Boguniewicz, M., Boyle, J., Fonacier, L., Gelfand, J.M. ... Ong, P.Y. (2019). Atopic dermatitis in America study: a cross-sectional study examining the prevalence and disease burden of atopic dermatitis in the US adult population. *Journal of Investigative Dermatology*, 139(3), 583-590. doi: 10.1016/j.jid.2018.08.028
- [11] Gieler, U., Gieler, T., Peters, E.M.J., & Linder, D. (2020). Skin and Psychosomatics-Psychodermatology today. *JDDG: Journal der Deutschen Dermatologischen Gesellschaft*, 18(11), 1280-1298. doi: 10.1111/ddg.14328
- [12] Kaufman, B.P., Guttman-Yassky, E., & Alexis, A.F. (2018). Atopic dermatitis in diverse racial and ethnic groups - Variations in epidemiology, genetics, clinical presentation and treatment. *Experimental Dermatology*, 27(4), 340-357. doi: 10.1111/exd.13514
- [13] Kimball, A.B., & Linder, M.D. (Eds.). (2013). *Dermatological Diseases and Cumulative Life Course Impairment* (Vol. 44). Karger Medical and Scientific Publishers.
- [14] Le Roux, E., Powell, K., Banks, J.P., & Ridd, M.J. (2018). GPs' experiences of diagnosing and managing childhood eczema: a qualitative study in primary care. *British Journal of General Practice*, 68(667), e73-e80. doi: 10.3399/bjgp18X694529
- [15] Lim, H.W., Collins, S.A., Resneck Jr, J.S., Bologna, J.L., Hodge, J.A., Rohrer, T.A. ... Moyano, J.V. (2017). The burden of skin disease in the United States. *Journal of the American Academy of Dermatology*, 76(5), 958-972.
- [16] Schut, C., Bosbach, S., Gieler, U., & Kupfer, J. (2014). Personality

- traits, depression and itch in patients with atopic dermatitis in an experimental setting: a regression analysis. *Acta Dermatovenereologica*, 94(1), 20-25. doi: 10.2340/00015555-1634
- [17] Schut, C., Weik, U., Tews, N., Gieler, U., Deinzer, R., & Kupfer, J. (2015). Coping as mediator of the relationship between stress and itch in patients with atopic dermatitis: a regression and mediation analysis. *Experimental Dermatology*, 24(2), 148-150. doi: 10.1111/exd.12578
- [18] Shi, V.Y., Nanda, S., Lee, K., Armstrong, A.W., & Lio, P.A. (2013). Improving patient education with an eczema action plan: a randomized controlled trial. *JAMA Dermatology*, 149(4), 481-483. doi: 10.1001/jamadermatol.2013.2143
- [19] Tanei, R., & Hasegawa, Y. (2016). Atopic dermatitis in older adults: a viewpoint from geriatric dermatology. *Geriatrics & Gerontology International*, 16(1), 75-86. doi: 10.1111/ggi.12771
- [20] Wise, T.N. (2014). Psychosomatics: past, present and future. *Psychotherapy and Psychosomatics*, 83(2), 65-69. doi: 10.1159/000356518

**ОСОБЛИВОСТІ ПОКАЗНИКІВ РІВНЯ СУБ'ЄКТИВНОГО КОНТРОЛЮ У ЧОЛОВІКІВ, ХВОРИХ НА РІЗНІ ФОРМИ ЕКЗЕМИ
Аль-Омарі Ала'а Осама Ахмад**

Актуальним і затребуваним напрямком досліджень в психодерматології є проведення комплексних досліджень, які різнобічно розкривають психічні особливості пацієнтів з різними формами і типом перебігу екземи. Це дозволить у майбутньому оптимізувати роботу з хворими даного профілю та спланувати психотерапевтичні заходи в ключі персоналізованого конституціонального підходу. Мета дослідження - вивчити відмінності показників рівня суб'єктивного контролю між здоровими та/або хворими на екзему в залежності від тяжкості перебігу дерматоза. Чоловікам віком від 22 до 35 років, з діагнозом істинної (n=34) та мікробної (n=38) екземи, проведено оцінку показників рівня суб'єктивного контролю на основі шкали Дж. Роттера за редакцією Є.Ф.Бажина зі співавторами (1984). В якості контролю з банку даних науково-дослідного центру Вінницького національного медичного університету ім. М.І.Пирогова були відібрані показники рівня суб'єктивного контролю 82 практично здорових чоловіків аналогічної вікової групи. Статистичну обробку результатів проведено в ліцензійному пакеті "Statistica 5.5" з використанням непараметричних методів оцінки. У хворих на істинну екзему порівняно із групою контролю відмічається більший рівень суб'єктивного контролю в області загальної інтернальності, досягнень, навчальних (професійних) відносин (легкий перебіг) і міжособистісних відносин (тяжкий перебіг). У хворих на мікробну екзему легкого і важкого перебігу, порівняно зі здоровими досліджуваними, величина рівня суб'єктивного контролю менша в області невдач і міжособистісних відносин. У хворих на істинну екзему, порівняно із пацієнтами з мікробною екземою, встановлено достовірно вищі показники рівня суб'єктивного контролю в області загальної інтернальності, невдач, навчальних (професійних) і міжособистісних відносин. У хворих з тяжким перебігом дерматоза, порівняно із пацієнтами з легким перебігом, відмічається зниження рівня суб'єктивного контролю в області навчальних (професійних) відносин (істинна екзема) і міжособистісних відносин (мікробна екзема). Таким чином, особливості показників рівня суб'єктивного контролю у чоловіків, хворих на різні форми екземи, слугуватимуть в якості психологічних предикторів випадків загострення і поважчання екземи, що безумовно важливо як для клініцистів, так і організаторів охорони здоров'я зокрема.

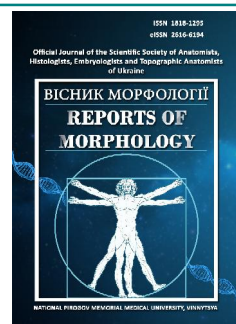
Ключові слова: істинна екзема, мікробна екзема, показники рівня суб'єктивного контролю, чоловіки.



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Regression models of teleradiographic parameters according to the Jarabak method in young men and young women with orthognathic occlusion

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Obtaining orthognathic occlusion in a patient as a result of treatment is a key goal of any orthodontist. However, the thorny path that both the patient and the doctor must go through involves painstaking work, which primarily begins with planning and choosing a method of orthodontic treatment, predicting and modeling its results. However, the latter is possible only if previously conducted research to determine the normative indicators for a population. The aim of the study was to construct and analyze regression models of teleradiographic parameters according to the Jarabak method in Ukrainian young men and young women with orthognathic occlusion. 49 young men and 76 young women with orthognathic occlusion underwent cephalometric analysis of lateral radiographs according to the modification of the method Jarabak J. R. - Roth-Jarabak, performed using the software OnyxCeph³™. All parameters according to the Jarabak method were divided into three groups: the first group included metric characteristics of the skull, which are used as baseline indicators; to the second group - dental-jaw in which the skeleton has already been formed and which surgical methods can change the length, width, angles and positions of the upper and lower jaws; to the third group - indicators that characterize the position of each individual tooth relative to each other, cranial structures and the profile of the soft tissues of the face. Construction of regression models of teleradiographic indicators by the Jarabak method was performed in the licensed package "Statistica 6.0" using step-by-step regression analysis. When modeling teleradiographic parameters according to the Jarabak method, which were included in the second group, depending on the indicators of the first group in young men with orthognathic occlusion, 8 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 (R^2 =from 0.589 to 0.950) were constructed. The constructed equations most often include the value of the angle N-S-Ar and the distances Ar-Go and N-S. In young women with orthognathic occlusion, 6 reliable regression models of the second group were constructed depending on the indicators of the first group (R^2 =from 0.609 to 0.971). The constructed equations most often include the value of the distances Ar-Go, S-Ar, N-S and the angle N-S-Ar. When modeling teleradiographic indicators included in the third group, depending on the indicators of the first and second groups in young men, 5 out of 8 possible reliable regression models with a coefficient of determination greater than 0.5 (R^2 =from 0.658 to 0.751) were constructed. The constructed equations most often include the values of the angles N-A-Pog, N-Go-Gn, S-N-B and A-N-B. In young women with orthognathic occlusion, 6 reliable regression models of the third group were constructed depending on the indicators of the first and second groups (R^2 =from 0.509 to 0.772). The constructed regression equations most often include the value of the angles N-A-Pog, A-N-B, S-Ar-Go, S-N-A and the ratio Go_Me:N-S. The obtained models will allow orthodontists to automatically calculate the required cephalometric parameters.

Keywords: regression analysis, teleradiography, cephalometric analysis according to the Jarabak method, Ukrainian young men and young women with orthognathic occlusion.

Introduction

Physiologically correct, or as it is called in dentistry - orthognathic occlusion, promotes the proper functioning

and development of the dental system in general and other systems indirectly, namely: promotes the formation and

maintenance of oral hygiene, quality machining of food for the digestive system, uniform load on the teeth and joints, the proper functioning of nasal breathing, the formation of a harmonious and proportionate face, the creation of an aesthetically pleasing smile, which in turn ensures the proper psycho-emotional development of person.

And although congenital orthognathic occlusion is quite common, occlusal pathology and other orthodontic diseases occur in almost all populations, different segments of the population with varying frequency. Studies conducted in Northern Finland have revealed at least one bite pathology in 39.5% of subjects. The most common pathologies were lateral occlusion (17.9%), deep occlusion (11.7%) and cross-occlusion (9.7%) [13].

In order to perform orthodontic treatment is primarily its planning with the use of clinical and instrumental examination [10, 19]. One of the key places at this stage is the cephalometric analysis of lateral teleradiograms [6].

However, to ensure the best results of orthodontic intervention, it is necessary to take into account the fact that the normative indicators established for a particular type of cephalometric analysis were created for a certain population, according to the country and region of the author. That is, for their full implementation it is necessary to conduct research on the normative indicators of the local population, taking into account their nationality [8], regional affiliation [11, 20], sex, age and type of face [16], etc.

Thus, it is necessary to perform extensive and painstaking work in the form of clinical trials, taking into account as many factors as possible for better adaptation of cephalometric analysis techniques for the needs of Ukrainian orthodontics.

The aim of the study was to construct and analyze regression models of teleradiographic parameters according to the Jarabak method in Ukrainian young men and young women with orthognathic occlusion.

Materials and methods

Teleradiography in the mode of cephalometric examination was performed using a dental cone-beam tomograph Veraviewepocs 3D Morita (Japan) for 49 young men (aged 17 to 21 years) and 76 young women (aged 16 to 20 years) who had a physiological bite as close as possible to orthognathic (further orthognathic) which is defined on 11 points by Bushan M. G., etc. [5]. Cephalometric analysis modified by the method Jarabak J. R. [12] - Roth-Jarabak was performed using OnyxCeph^{3TM} software, 3DPro version, Image Instruments GmbH, Germany (software license № URSQ-1799).

Cephalometric points were determined according to the recommendations of Phulari B. S. [18] and Doroshenko S. I. and Kulginisky E. A. [9].

Cephalometric parameters according to the method of Jarabak in this study were divided into three groups according to Dmitriev M. O. [7]. The first group includes metric characteristics of the skull, which are used as basic

indicators in the methods of cephalometric analysis; to the second group - dental-jaw in which the skeleton has already been formed and which surgical methods can change the length, width, angles and positions of the upper and lower jaws; to the third group - indicators that actually characterize the position of each individual tooth relative to each other, cranial structures and the profile of the soft tissues of the face.

Cephalometric measurements by the method of Jarabak included the determination of the following parameters [22, 23]:

the first group - the distance **Ar-Go**, characterizes the length of the branch of the mandible (mm); distance **S-Ar**, characterizes the location of the temporomandibular joint relative to the Turkish saddle (mm); distance **N-S**, characterizes the length of the anterior base of the skull (mm); angle **N-S-Ar**, characterizes the position of the temporomandibular joint (°); the ratio of **S-Ar:Ar-Go**, allows you to assess the degree of development of the branch of the mandible relative to its body (%);

the second group - the distance **Go_Me**, characterizes the length of the body of the mandible (mm); **N-Go** distance, characterizes the height of the bony base of the face, and the actual distance of the chin from the point N in the vertical plane (mm); distance **S-Gn**, characterizes the length of the face determined by the axis Y, and the actual distance of the chin from the Turkish saddle (mm); the distance **S-Go**, which characterizes the posterior height of the face, and the actual distance of the angle of the lower jaw from the Turkish saddle, also determines the degree of development of the branch of the lower jaw mainly in the vertical plane (mm); distance **N-Me**, characterizes the anterior height of the face (mm); angle **S-Ar-Go**, characterizes the position of the temporomandibular joint and the branch of the mandible (°); angle **Ar-Go-Gn** (gonial angle), characterizes the value of the angle of the mandible (°); **Sum** indicator, characterizes the direction of development (vertical when increasing and horizontal when decreasing) of the lower jaw (°); the angle **N-Go-Ar**, characterizes the angle of inclination of the branch of the mandible to the line N-tGo (°); angle **N-Go-Gn**, characterizes the angle of the mandible to the line N-tGo (°); angle **S-N-A**, characterizes the position of the upper jaw in the sagittal plane (°); angle **S-N-B**, characterizes the position of the lower jaw in the sagittal plane (°); angle **A-N-B**, characterizes the inter-jaw ratio in the sagittal plane (°); angle **SN-GoGn**, characterizes the inclination of the body of the mandible to the anterior base of the skull (°); angle **N-S-Gn**, characterizes the direction of the axis of development of the mandible (°); angle **S-N-Pog**, characterizes the position of the lower jaw, namely the bony chin in the sagittal plane (°); angle **N-A-Pog** (angle of facial convexity), characterizes the convexity of the bony profile of the face (°); the ratio of **Go_Me:N-S**, allows to estimate the degree of development of the lower jaw relative to the anterior base of the skull (%); the ratio **S-Go:N-Me**, characterizes the ratio between the front and rear heights

of the face (%);

the third group - the distance **Li-NsPog'**, characterizes the position of the lower lip relative to the "Aesthetic line" - the line Ns-Pog` (mm); distance **Ls-NsPog'**, characterizes the position of the upper lip relative to the "Aesthetic line" - the line Ns-Pog` (mm); distance **1lo-NPog**, characterizes the anterior-posterior position of the lower medial incisor (mm); distance **1up-NPog**, characterizes the anterior-posterior position of the upper medial incisor (mm); angle **II** (inter-incisor angle), characterizes the angular ratio of the medial incisors of the upper and lower jaws (°); angle **Mand1-GoMe**, characterizes the inclination of the lower medial incisor to the mandibular plane (°); angle **Max1-SN**, characterizes the inclination of the upper medial incisor to the anterior base of the skull (°); angle **OcP-GoGn**, characterizes the inclination of the closing plane to the mandibular plane (°).

It should be noted that, unlike the original Jarabak analysis, the Roth-Jarabak analysis does not use a specific A-point which is placed 2 mm in front of the apex of the median maxillary incisor, but uses the more common Downs A-point.

Construction of regression models of teleradiographic indicators by the Jarabak method was performed in the licensed package "Statistica 6.0" using step-by-step regression analysis.

Results

Models of teleradiographic indicators by the Jarabak method with a coefficient of determination (R^2) greater than 0.5, which are included in the second group depending on the indicators of the first group have the form of the following linear equations:

Sum (*young men*) = 411.8 - 0.930 x Ar-Go + 0.374 x N-S-Ar - 0.341 x N-S ($R^2=0.645$; $F_{(3,45)}=27.27$; $p<0.0000$; Error of estimate =3.971);

S-N-B (*young men*) = 97.23 + 0.461 x Ar-Go - 0.325 x N-S-Ar ($R^2=0.607$; $F_{(2,46)}=35.51$; $p<0.0000$; Error of estimate =2.163);

SN-GoGn (*young men*) = 51.84 - 0.930 x Ar-Go + 0.374 x N-S-Ar - 0.341 x N-S ($R^2=0.645$; $F_{(3,45)}=27.27$; $p<0.0000$; Error of estimate =3.971);

N-Go (*young men*) = -42.89 + 0.940 x Ar-Go + 0.382 x S-Ar:Ar-Go + 0.347 x N-S-Ar + 0.626 x N-S ($R^2=0.642$; $F_{(4,44)}=19.73$; $p<0.0000$; Error of estimate=3.546);

N-S-Gn (*young men*) = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2=0.589$; $F_{(3,45)}=21.50$; $p<0.0000$; Error of estimate=2.785);

S-Go (*young men*) = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2=0.950$; $F_{(3,45)}=286.2$; $p<0.0000$; Error of estimate=1.244);

S-Go:N-Me (*young men*) = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2=0.725$; $F_{(3,45)}=39.59$; $p<0.0000$; Error of estimate=3.051);

S-N-Pog (*young men*) = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2=0.612$; $F_{(2,46)}=36.29$; $p<0.0000$; Error

of estimate=2.244);

Go_Me (*young women*) = -12.12 + 0.575 x N-S + 0.303 x Ar-Go + 0.454 x S-Ar + 0.114 x N-S-Ar ($R^2=0.662$; $F_{(4,71)}=34.71$; $p<0.0000$; Error of estimate=3.569);

N-Go (*young women*) = -57.84 + 0.818 x N-S + 1.205 x Ar-Go + 0.403 x S-Ar:Ar-Go + 0.242 x N-S-Ar ($R^2=0.866$; $F_{(4,71)}=114.7$; $p<0.0000$; Error of estimate=3.305);

S-Gn (*young women*) = 40.43 + 0.856 x N-S + 1.631 x S-Ar - 0.423 x S-Ar:Ar-Go ($R^2=0.808$; $F_{(3,72)}=100.7$; $p<0.0000$; Error of estimate=4.068);

S-Go (*young women*) = 21.28 + 0.993 x Ar-Go + 0.893 x S-Ar - 0.171 x N-S-Ar ($R^2=0.971$; $F_{(3,72)}=812.1$; $p<0.0000$; Error of estimate=1.204);

N-Me (*young women*) = -12.12 + 0.575 x N-S + 0.303 x Ar-Go + 0.454 x S-Ar + 0.114 x N-S-Ar ($R^2=0.652$; $F_{(4,71)}=33.25$; $p<0.0000$; Error of estimate=5.008);

S-Go:N-Me (*young women*) = 21.28 + 0.993 x Ar-Go + 0.893 x S-Ar - 0.171 x N-S-Ar ($R^2=0.609$; $F_{(4,71)}=27.68$; $p<0.0000$; Error of estimate=2.955);

where, $F_{(n, N)}$ = !!! - critical (!!!) and obtained (!!!) value of Fisher's criterion; p - the level of reliability of the model; Std. Error of estimate - standard estimation error.

Models of teleradiographic indicators by the method of Jarabak with a coefficient of determination greater than 0.5, which are included in the third group depending on the indicators of the first and second groups have the form of the following linear equations:

OcP-GoGn (*young men*) = -37.73 + 0.508 x N-Go-Gn + 1.333 x S-N-Pog - 0.863 x S-N-B - 0.331 x S-Go:N-Me ($R^2=0.658$; $F_{(4,44)}=21.14$; $p<0.0000$; Error of estimate=2.451);

Max1-SN (*young men*) = -1.072 + 1.571 x S-N-B - 0.155 x S-Ar-Go ($R^2=0.683$; $F_{(2,46)}=49.65$; $p<0.0000$; Error of estimate=3.864);

Mand1-GoMe (*young men*) = 151.2 - 0.996 x N-Go-Gn + 0.831 x N-A-Pog + 0.359 x S-Go - 0.229 x Go_Me ($R^2=0.751$; $F_{(4,44)}=33.17$; $p<0.0000$; Error of estimate=3.817);

1up-NPog (*young men*) = -8.488 + 0.766 x N-A-Pog - 0.874 x A-N-B + 0.173 x S-N-B ($R^2=0.712$; $F_{(3,45)}=37.10$; $p<0.0000$; Error of estimate=1.572);

1lo-NPog (*young men*) = 2.736 + 0.711 x N-A-Pog - 0.831 x A-N-B ($R^2=0.714$; $F_{(2,46)}=57.48$; $p<0.0000$; Error of estimate=1.461);

OcP-GoGn (*young women*) = -88.36 + 0.678 x N-Go-Gn + 0.420 x N-Go-Ar - 0.091 x N-A-Pog + 0.150 x S-Ar-Go + 0.120 x Go_Me:N-S ($R^2=0.606$; $F_{(5,70)}=21.57$; $p<0.0000$; Error of estimate=2.545);

Max1-SN (*young women*) = -4.292 + 3.132 x S-N-B - 2.036 x S-N-A + 0.138 x S-Ar:Ar-Go + 0.543 x N-A-Pog + 0.137 x Go_Me:N-S ($R^2=0.574$; $F_{(5,70)}=18.83$; $p<0.0000$; Error of estimate=4.208);

Mand1-GoMe (*young women*) = 229.0 + 1.305 x N-A-Pog - 1.247 x S-N-A - 1.161 x SN-GoGn ($R^2=0.623$; $F_{(3,72)}=39.58$; $p<0.0000$; Error of estimate=4.290);

1up-NPog (*young women*) = 4.921 + 0.987 x N-A-Pog - 1.550 x A-N-B + 0.107 x Go_Me - 0.127 x Ar-Go ($R^2=0.731$; $F_{(4,71)}=48.18$; $p<0.0000$; Error of estimate=1.463);

1Io-NPog (young women) = $-1.585 + 0.947 \times \text{N-A-Pog} - 1.510 \times \text{A-N-B} + 0.036 \times \text{S-Ar-Go}$ ($R^2=0.772$; $F_{(3,72)}=62.39$; $p<0.0000$; Error of estimate=1.426);

Ls-NsPog' (young women) = $14.61 + 0.692 \times \text{N-A-Pog} - 1.170 \times \text{A-N-B} - 0.100 \times \text{N-S-Ar} - 0.057 \times \text{N-Me}$ ($R^2=0.509$; $F_{(4,71)}=18.39$; $p<0.0000$; Error of estimate=1.750).

Discussion

When modeling teleradiographic parameters according to the Jarabak method, included in the *second group*, depending on the indicators of the *first group* in young men with orthognathic occlusion, 8 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2=$ from 0.589 to 0.950) were constructed. The constructed regression equations most often include the value of the angle N-S-Ar (33.33%) and the distances Ar-Go and N-S (29.12% each). In young men, the coefficients of determination of the regression equations of the angles S-Ar-Go, Ar-Go-Gn, N-Go-Ar, N-Go-Gn, S-N-A and N-A-Pog, the distances Go_Me, S-Gn and N-Me and the ratio Go_Me:N-S according to the Jarabak method, depending on the teleradiographic characteristics of the basal cranial structures were from 0.05 to 0.48 and therefore the constructed models had no practical significance; and the regression equation of the value of the angle A-N-B was not constructed at all.

When modeling teleradiographic indicators according to the Jarabak method, which were included in the *second group*, depending on the indicators of the *first group* in young women with orthognathic occlusion, 6 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2=$ from 0.609 to 0.971) were constructed. The constructed regression equations most often include the value of the distances Ar-Go, S-Ar and the angle N-S-Ar (23.81% each) and the distance N-S (19.05%). In young women, the coefficients of determination of the regression equations of the magnitude of the angles S-Ar-Go, Ar-Go-Gn, Sum, N-Go-Ar, N-Go-Gn, S-N-A, S-N-B, SN-GoGn, N-S-Gn and S-N-Pog and the ratio of Go_Me:N-S by the method of Jarabak depending on the teleradiographic characteristics of the basal cranial structures was from 0.10 to 0.45 and therefore the constructed models had no practical significance; and the regression equations of the magnitude of the angles A-N-B and N-A-Pog were not constructed at all.

When modeling teleradiographic parameters according to the Jarabak method, which were included in the *third group*, depending on the indicators of the *first* and *second groups* in young men with orthognathic occlusion, 5 out of 8 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2=$ 0.658 to 0.751) were constructed. The constructed regression equations most often include the value of the angle N-A-Pog (20.00%) and the angles N-Go-Gn, S-N-B and A-N-B (13.3 3% each). In young men, the coefficients of determination of the regression equations of the angle II and the distances Ls-

NsPog' and Li-NsPog' by the method of Jarabak depending on the teleradiographic characteristics of the basal cranial structures and upper and lower jaws were from 0.30 to 0.35 and therefore the models are not had practical significance.

When modeling teleradiographic parameters according to the Jarabak method, which were included in the *third group*, depending on the indicators of the *first* and *second groups* in young women with orthognathic occlusion, 6 out of 8 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2=$ from 0.509 to 0.772) were constructed. The constructed regression equations most often include the value of the angle N-A-Pog (25.00%), the angle A-N-B (12.50%) and the angles S-Ar-Go, S-N-A and the ratio Go_Me:N-S (8.33% each). In young women, the coefficients of determination of regression equations of the angle II and the distance Li-NsPog' by the method of Jarabak depending on the teleradiographic characteristics of the basal cranial structures and upper and lower jaws were 0.22 and 0.50 and therefore the models were not practical.

A study in Iraq found that the local population was dominated by individuals with average cephalic indices of 79.45 and 74.34 in men and women, respectively (ie mesocephalus). When compared with data from Saudi Arabia, it was found that Iraqis have a smaller average facial proportion and less common data with the norms according to the Jarabak method (55.38% and 63.5% respectively) [1].

A survey of the population of Nepal with occlusion of class I occlusion revealed a hyperdivergent growth pattern in 10.57% of subjects, normodivergent in 18.26% and hypodivergent in 71.15% of people. The average ratio of Jarabak for individuals with hyperdivergent growth was 58.65 ± 1.94 , for normodivergent growth 63.98 ± 0.85 and hypodivergent was 69.98 ± 4.13 . The greatest correlation was found between AFH and PFH in individuals with hyperdivergent and normodivergent growth types ($r=0.821$ and $r=0.978$, respectively) [2].

A survey of 58 residents of Hazaribakh (India) revealed the following distribution by type of growth: hyperdivergent - 10.3%, normodivergent - 17.2%, hypodivergent - 72.4%. Manifestations of sexual dimorphism were revealed - the average values of all linear measurements were higher in men. The strongest correlations were observed between the posterior height of the face and the gonial angle, the lower gonial angle and the angle of the mandibular plane [14].

Examination of persons with class II occlusion pathology revealed the following specific changes in cephalometric parameters: decrease in the length of the mandible, decrease in the lower anterior height of the face, decrease in the value of the gonial angle and increase in the value of the incisal angle [3].

The following features of odontometric indicators have been identified in Javanese with class III occlusion

pathology: the angle Go1 has lower values than normal, the angle Go2, on the contrary, has higher values than normal. The general gonial angle at such persons is within norm. The authors of the study did not find a difference in the values of the gonial angle between men and women ($p=0.939$ and $p=0.861$, respectively). A negative correlation of PFH with Go2 ($p=0.018$) and a positive correlation of the position of the mandibular branch and Go1 ($p=0.003$) were established [4].

In individuals with class III and I occlusion pathology, 14 indicators were identified that can be used to construct reliable regression models, including indicators: Holdaway and AFH ratios, Ao-Bo and 1u-NPog distances, and SNB, SND, FMA, IMPA, MeGoOcP, Mand 1-MeGo, NSAr, ArGoMe, NGoMe and SNPog angles [24].

Mangla R. and co-authors [15] in the cephalometric examination of 110 telerradiograms of men and women aged 18-25 years found features of the parameters of the mandible in different types of faces. A significant relationship has been established between the vertical pattern of the mandible and the significant height, depth and symphysis ratio, decreasing height and width of the mandibular branch, decreasing its depth, increasing the gonial angle, and decreasing the mandibular arch angle.

When evaluating the relationships between cephalometric indicators and facial indicators, a significant inverse correlation was found between FMA and Jarabak index ($r= -0.6$, $p<0.05$) [17].

The thickness of the masticatory muscles correlates with the cephalometric parameters of the face. In persons with a low value of the angle of the face, the thickness of the masticatory muscles is higher than in persons with a normal and high angle of the face, both during the contraction of the masticatory muscles and during their relaxation ($p<0.001$). There was also a positive correlation between masticatory muscle thickness and Jarabak ratio and mandibular branch thickness, and a negative

correlation with LAFH, FMA, MMPA and gonial angle [21].

The work on the construction and analysis of regression models of telerradiographic indicators by the method of Jarabak for adolescents with orthognathic occlusion, taking into account sex and ethnicity is another positive step towards the introduction of new scientific achievements in the active practice of Ukrainian orthodontists.

Conclusions

1. When modeling telerradiographic indicators included in the second group according to the Jarabak method, depending on the indicators of the first group, 8 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2=$ from 0.589 to 0.950) were constructed for young men, and for young women - 6 models ($R^2=$ from 0.609 to 0.971). When modeling telerradiographic indicators included in the third group, depending on the indicators of the first and second groups, 5 out of 8 possible models were built for young men ($R^2=$ from 0.658 to 0.751), and for young women - 6 models ($R^2=$ from 0.509 to 0.772).

2. When modeling the indicators of the second group, depending on the indicators of the first group in young men, the constructed equations most often include the value of the angle N-S-Ar (33.33%) and the distances Ar-Go and N-S (29.12% each), and in young women - the value of the distances Ar-Go, S-Ar and the angle N-S-Ar (23.81% each) and the distance N-S (19.05%). When modeling the indicators of the third group, depending on the indicators of the first and second groups in young men, the constructed equations most often include the value of the angle N-A-Pog (20.00%) and the angles N-Go-Gn, S-N-B and A-N-B (13.33% each), and in young women - the value of the angle N-A-Pog (25.00%), the angle A-N-B (12.50%) and the angles S-Ar-Go, S-N-A and the ratio Go_Me:N-S (8.33% each).

References

- [1] Alhussiny, N.M.H., & Majeed, A.A. (2015). Cephalometric Measurements and Morphological Evaluation for Head and face of an Iraqis adult for cephalic x-ray. *Engineering and Technology Journal*, 33(2B), 346-372.
- [2] Amatya, S., Shrestha, R.M., & Napit, S. (2021). Growth Pattern in Skeletal Class I Malocclusion: A Cephalometric Study. *Orthodontic Journal of Nepal*, 11(1), 49-54. doi: 10.3126/ojn.v11i1.39088
- [3] Bratu, D.C., Balan, R.A., Szuhaneck, C.A., Pop, S.I., Bratu, E.A., & Popa, G. (2014). Craniofacial morphology in patients with Angle Class II division 2 malocclusion. *Rom. J. Morphol. Embryol.*, 55(3), 909-913. PMID: 25329119
- [4] Budipramana, M., Budhy, T.I., & Ardani, I. (2021). Gonial Angle Characteristics of Class III Malocclusion in Javanese Ethnic. *Pesquisa Brasileira em Odontopediatria e Clinica Integrada*, 21, e0153. doi: 10.1590/pboci.2021.051
- [5] Bushan, M.H., Vasylenko, Z.S., & Hryhoreva, L.P. (1990). *Справочник по ортодонтии [Handbook of Orthodontics]*. Кишинев: Картия Молдовеняскэ - Kishinev: Kartia Moldoveniaske.
- [6] Cazzolla, A.P., Lo Muzio, L., Di Fede, O., Lacarbonara, V., Colaprico, A., Testa, N.F. ... Lacaia, M.G. (2018). Orthopedic-orthodontic treatment of the patient with Turner's syndrome: Review of the literature and case report. *Special Care in Dentistry*, 38(4), 239-248. doi: 10.1111/scd.12295
- [7] Dmitriev, M.O. (2017). Зв'язки основних краніальних показників з характеристиками положення зубів верхньої і нижньої щелеп та профілем м'яких тканин обличчя в юнаків і дівчат [Relations of key cranial indicators with the characteristics of the teeth of the upper and lower jaws and profile face soft tissue in boys and girls]. *Вісник морфології - Reports of Morphology*, 23(1), 125-131.
- [8] Dmitriev, M., Gunas, V., Polishchuk, S., Olkhova, I., & Kumar, A. (2020). Modeling of Central Incisors Position Indicators in boys and girls according to CC. Steiner method for Forensic Dental Identification. *The Official Publication of Indian Academy of Forensic Medicine*, 42(3), 155-160. doi: 10.5958/0974-0848.2020.00043.3
- [9] Doroshenko, S.I., & Kulginsky, E.A. (2007). *Основы телерент-*

- тєнографію [Fundamentals of Teleradiography].* К.: Здоров'я - К.: Zdorovija.
- [10] Fichera, G., Greco, M., & Leonardi, R. (2011). Effectiveness of the passive lingual arch for E space maintenance in subjects with anterior or posterior rotation of the mandible: a retrospective study. *Medical Principles and Practice*, 20(2), 165-170. doi: 10.1159/000319914
- [11] Gunas, V.I., Kotsyura, O.O., Babych, L.V., Shevchuk, Y.G., & Cherkasova, O.V. (2020). Features correlations of the sizes of molars with cephalometric indicators of men of the western region of Ukraine. *Reports of Morphology*, 26(2), 51-61. doi: 10.31393/morphology-journal-2020-26(2)-08
- [12] Jarabak, J.R., & Fizzell, J.A. (1972). *Technique and treatment with light-wire edgewise appliances*, ed. 2, St. Louis, The CV Mosby Company. ISBN 9780801624292
- [13] Krooks, L., Pirtiniemi, P., Kanavakis, G., & Lähdesmäki, R. (2016). Prevalence of malocclusion traits and orthodontic treatment in a Finnish adult population. *Acta Odontologica Scandinavica*, 74(5), 362-367. doi: 10.3109/00016357.2016.1151547
- [14] Lall, R., Kumari, S., Sahu, A., Kumar, V., Thakur, S., Rai, S., & Bharti, P. (2018). Facial Morphology and Malocclusion Is there any Relation? A Cephalometric Analysis in Hazaribag Population. *Journal of Contemporary Orthodontics*, 2(2), 64-69.
- [15] Mangla, R., Singh, N., Dua, V., Padmanabhan, P., & Khanna, M. (2011). Evaluation of mandibular morphology in different facial types. *Contemporary Clinical Dentistry*, 2(3), 200-206. doi: 10.4103/0976-237X.86458
- [16] Marchenko, A.V., Shinkaruk-Dykovytska, M.M., Pozur, T.P., Gunas, V.I., & Orlovskiy, V.O. (2020). Models of individual linear dimensions necessary for the construction of the correct form of dental arches in young men with a wide face, depending on the features of odontometric and cephalometric indicators. *Wiadomosci Lekarskie* (Warsaw, Poland: 1960), 73(6), 1103-1107. PMID: 32723934
- [17] Nicoo, M., Fakhri, F., Nikou, F., & Parastesh, A. (2019). Correlation Between Cephalometric and Photographic Results of Determining the Lower Anterior Facial Height. *Hormozgan Medical Journal*, 23(1), e86932. doi: 10.5812/hmj.86932
- [18] Phulari, B. (2013). *An atlas on cephalometric landmarks*. JP Medical Ltd. doi: 10.5005/jp/books/11877
- [19] Singh, K., Agarwal, B., Siddharth, R., & Rao, J. (2020). A study to evaluate changes in maxillomandibular relationships in long term complete denture wearer following new prosthesis fabrication by using Jarabak ratio. *Journal of Dental and Medical Sciences*, 11(1), 59-63. doi: 10.9790/0853-1911015963
- [20] Soboń, J.S., Cherkasova, O.V., Gunas, V.I., Babych, L.V., & Kotsyura, O.O. (2020). Correlations of linear sizes of molars with cephalometric indicators of practically healthy men of the southern region of Ukraine. *Biomedical and Biosocial Anthropology*, (38), 36-46. doi: 10.31393/bba38-2020-06
- [21] Soyoye, O.A., Otuyemi, O.D., Kolawole, K.A., & Ayoola, O.O. (2018). Relationship between masseter muscle thickness and maxillofacial morphology in pre-orthodontic treatment patients. *International Orthodontics*, 16(4), 698-711. doi: 10.1016/j.ortho.2018.09.015
- [22] Vakhovskiy, V.V. (2021). Correlations of teleradiographic parameters of teeth location determined by the methods of Bjork, Jarabak and Sassouni with the parameters of the upper and lower jaws in young men and young women with orthognathic occlusion. *Вісник Вінницького національного медичного університету - Reports of Vinnytsia National Medical University*, 25(2), 229-237. doi: 10.31393/reports-vnmedical-2021-25(2)-08
- [23] Vakhovskiy, V.V., Shinkaruk-Dykovytska, M.M., Pogorila, A.V., Likhitskiy, O.O., & Gunas, I.V. (2020). Correlations of basal cranial structures characteristics determined by Bjork and Jarabak methods with teleradiographic parameters of the upper and lower jaws and tooth location in young men and young women with orthognathic occlusion. *Biomedical and Biosocial Anthropology*, 41, 52-59. doi: 10.31393/bba41-2020-09
- [24] Zegan, G., Dascalu, C.G., Mavru, R.B., & Anistoroaei, D. (2015). Cephalometric features of class III malocclusion. *The Medical-Surgical Journal*, 119(4), 1153-1160. PMID: 26793863

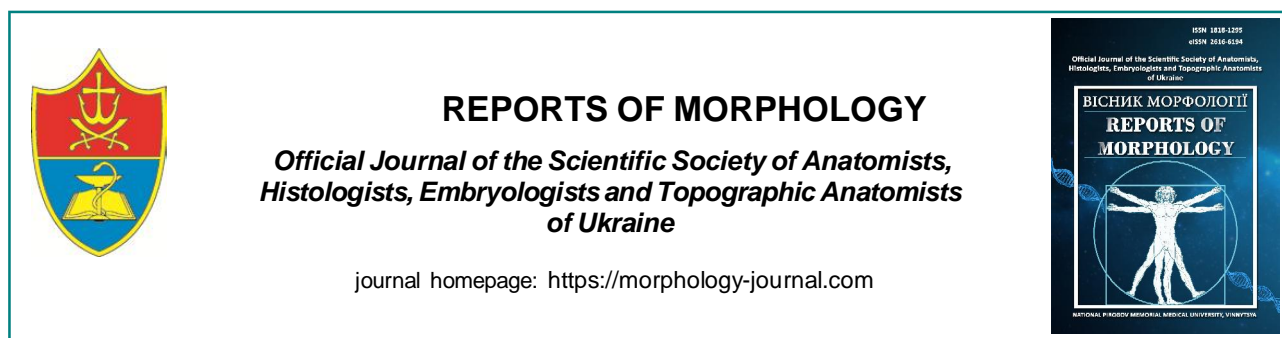
РЕГРЕСІЙНІ МОДЕЛІ ТЕЛЕРЕНТГЕНОГРАФІЧНИХ ПОКАЗНИКІВ ЗА МЕТОДОМ JARABAK В ЮНАКІВ І ДІВЧАТ З ОРТОГНАТИЧНИМ ПРИКУСОМ

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Отримання в результаті лікування ортогнатичного прикусу у пацієнта є ключовою ціллю роботи будь якого лікаря ортодонта. Проте тернистий шлях, що його мають пройти сумісно як пацієнт, так і лікар, передбачає проведення кропіткої роботи, яка в першу чергу починається з планування і вибору методу ортодонтичного лікування, передбачення та моделювання його результатів. Проте, проведення останнього можливе лише за умови попередньо проведених досліджень для визначення нормативних показників для тієї, чи іншої популяції населення. Мета дослідження - в українських юнаків і дівчат з ортогнатичним прикусом побудувати та провести аналіз регресійних моделей тelerентгенографічних показників за методом Jarabak. 49 юнакам і 76 дівчатам із ортогнатичним прикусом проведено цефалометричний аналіз бокових тelerентгенограм за модифікацією методики J.R. Jarabak - Roth-Jarabak, виконаний за допомогою програмного забезпечення *ОпукСерп³™*. Усі параметри за методикою Jarabak були розділені на три групи: до першої групи увійшли метричні характеристики черепа, які використовують як базові показники; до другої групи - зубо-щелепні, в яких кістковий скелет вже сформувався і яким хірургічними методами можна змінювати довжину, ширину, кути та положення верхньої і нижньої щелеп; до третьої групи - показники які характеризують положення кожного окремого зуба відносно один одного, черепних структур та профілю м'яких тканин обличчя. Побудова регресійних моделей тelerентгенографічних показників за методом Jarabak проведена в ліцензійному пакеті "Statistica 6.0" за допомогою покрокового регресійного аналізу. При моделюванні тelerентгенографічних показників за методикою Jarabak, що увійшли до другої групи, в залежності від показників першої групи в юнаків із ортогнатичним прикусом побудовані 8 із 19 можливих достовірних регресійних моделей з коефіцієнтом детермінації більшим 0,5 ($R^2 = \text{від } 0,589 \text{ до } 0,950$). До побудованих рівнянь найбільш часто входять величина кута N-S-Ar та відстаней Ar-Go і N-S. У дівчат із ортогнатичним прикусом побудовані 6 достовірних регресійних моделей показників другої групи в залежності від показників першої групи ($R^2 = \text{від } 0,609 \text{ до } 0,971$). До побудованих рівнянь найбільш часто входять величина відстаней Ar-Go, S-Ar, N-S і кута N-S-Ar. При моделюванні тelerентгенографічних показників, що увійшли до третьої групи в залежності від показників першої та другої груп в юнаків побудовані 5 із 8 можливих достовірних регресійних

моделей з коефіцієнтом детермінації більшим 0,5 ($R^2 =$ від 0,658 до 0,751). До побудованих рівнянь найбільш часто входять величина кутів N-A-Pog, N-Go-Gn, S-N-B і A-N-B. У дівчат із ортогнатичним прикусом побудовані 6 достовірних регресійних моделей показників третьої групи в залежності від показників першої та другої груп ($R^2 =$ від 0,509 до 0,772). До побудованих регресійних рівнянь найбільш часто входять величина кутів N-A-Pog, A-N-B, S-Ar-Go, S-N-A і співвідношення Go_Me:N-S. Отримані моделі дозволять лікарям-ортодонтам автоматично вираховувати необхідні цефалометричні показники.

Ключові слова: регресійний аналіз, телерентгенографія, цефалометричний аналіз за методом Jarabak, українські юнаки та дівчата з ортогнатичним прикусом.



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Peculiarities of gynecological history and reproductive status of women with psycho-emotional disorders related to prenatal stress

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Persistent anovulation, menstrual disorders lead to the development of endocrine-dependent gynecological diseases, one of the manifestations of which is primary infertility. The aim of the study: to assess the clinical features of history and reproductive status in women with psycho-emotional disorders associated with prenatal stress. The study involved 120 patients, 80 of whom suffered prenatal stress: 1 - the main group, which is divided into 1A subgroup - women who underwent in vitro fertilization, and 1B subgroup - women who did not undergo in vitro fertilization. For comparison, a 2 - control group of 40 women without prenatal stress with exclusively tubal factor of infertility, in which the parameters of the functional state of the reproductive system corresponded to the normal ovarian reserve. The age of patients ranged from 22 to 45 years. Complaints, anamnesis of disease and life, gynecological anamnesis, level of education were studied in all patients, the causes of infertility were assessed. The results of the study were processed using the statistical package of the licensed program "STATISTICA® for Windows 13.0". The normality of the distribution of indicators was established by the Shapiro-Wilk criterion. Descriptive statistics are presented as the arithmetic mean and standard deviation of $M \pm SD$ or the median and quartile interval $Me (Q1-Q2)$ depending on the distribution of the trait. It was found that in place of residence, social status, the presence of bad habits, gynecological history of infertile patients in in vitro fertilization programs do not differ from healthy women with tubal-peritoneal factor infertility. There was a significant difference between the indicators of the nature of the menstrual cycle in the comparison groups. It has been found that a menstrual cycle of less than 23 days is a predictor of reduced functional activity of the hypothalamic-pituitary-ovarian axis in women. Analysis of hormonal regulation of reproductive function of the examined groups of women found the prevalence of FSH in the main group over the control ($9,611 \pm 0,212$ vs. $6,221 \pm 0,113$ mMod/ml, respectively, ($p < 0.05$), and the level of TSH was not differences between comparison groups. We proposed to identify 3 states of ovarian reserve - normal, low and extremely low for women with a history of infertility and prenatal stress. Conclusion: timely comprehensive assessment of the endocrine system, ovarian status in relation to the state of regulatory mechanisms of psychoemotional adaptation of women with infertility associated with prenatal stress, which we studied, requires a partial revision of approaches to this group of patients and timely use of in vitro extracorporeal the effectiveness of infertility treatment.

Keywords: infertility, prenatal stress, ovarian reserve, in vitro fertilization.

Introduction

Acting along with the mechanisms of excitation of the central and peripheral nervous system, the hypothalamic-pituitary-adrenal system (HPAS) is involved in ensuring the adaptive response of the body to stress. The whole system is activated during stress, resulting in a clinic of stress syndrome [3, 5, 10]. Under stress, the central nervous system (CNS) undergoes changes that help prolong life.

At the same time, there is a mobilization of behavioral functions and reactions that help the body adapt more quickly to adverse conditions. Behavioral reactions and functions that ensure reproduction, nutrition and growth of the body during this period are suppressed [4, 7, 12, 14].

The main regulators of HPAS activity are corticotropin-releasing hormone (CRH) and arginine-vasopressin [1,

11], which have a synergistic stimulating effect on the secretion of adrenocorticotrophic hormone (ACTH), increasing the secretion of cortisol in the adrenal cortex. Noradrenergic neurons in the brain stem have reciprocal connections with small neurosecretory cells of the hypothalamus and neurons of the paraventricular nucleus that secrete ADH [2, 8]. Decreased activity of the female reproductive system under stress is due to the activation of HPAS: 1) CRH and endorphin inhibit the secretion of gonadotropin-releasing hormone (GTRG) in the hypothalamus; 2) cortisol inhibits the secretion of GTRG in the hypothalamus, luteinizing hormone (LH) in the pituitary gland and estradiol (E2) in the ovaries; 3) cortisol reduces tissue sensitivity to estradiol [2, 15]. Activation of the nervous system stimulates the reproductive system, while the effect of HPAS is stronger. However, activation of hypothalamic neurons that secrete CRH may increase the reproductive system's resistance to the inhibitory effect of HPAS. The reproductive system with the help of estradiol has a positive reverse effect on the links of the stress system, stimulating the secretion of CRH.

Menstrual disorders are manifested by hypothalamic-pituitary-ovarian failure and related changes during ovulation [3, 6, 19]. The development of endocrine-dependent pathological conditions is caused by: lack of adequate correction of menstrual disorders and persistent anovulation. One of the manifestations of such pathological conditions is primary infertility [3, 6, 10, 13]. Clinically, the most difficult are patients with infertility and regular menstruation [4, 6, 8, 20]. The role of endocrine-dependent diseases as causes of infertility in women with a preserved menstrual cycle is still a matter of discussion [7, 8, 17]. Of particular note is the group of patients with elevated levels of blood prolactin (38% of patients with endocrine forms of infertility) [9]. It should be noted that 12-45% of women with infertility and increased prolactin secretion have functional hyperprolactinemia, which is not associated with the presence of tumors [2, 13]. In patients with normal prolactin levels, frequent factors of endocrine infertility are polycystic ovary syndrome, hyperandrogenism, dysfunction of the hypothalamic-pituitary system. Given the data of various authors, endocrine infertility is 32-40%, successful treatment - 60-70% [2]. Endocrine infertility is 32-45%, according to Ukrainian scientists [5, 16] in 40-42% of infertile women there is a violation of ovulation.

Anthropogenic factors in modern conditions cause the influence of altered psycho-emotional state of mothers as a risk factor for pathological abnormalities in the offspring [7, 17]. Psychotraumatic effects can lead to acute stress and depressive disorders, in the presence of which women at different stages of pregnancy and breastfeeding can have an adverse effect on the child [4, 11], which determines the need to study this problem and develop methods to prevent possible disorders in offspring.

Stress experienced by mothers during pregnancy causes abnormalities in many physiological functions,

disrupts the interaction between the immune, hormonal and mediator systems in children. This is confirmed by modern research. The mother's condition at the stage of pregnancy planning can also negatively affect the development of future offspring, as indicated by some scientific papers [7, 10, 18]. However, comparative data on the impact of maternal psychogenic trauma during pregnancy or before conception on the formation of offspring in the literature are very few. However, such data appear to be important for the prediction, development and development of methods for correcting prenatal stress.

Almost all researchers recognize the influence of psychological state on the outcome of treatment [1, 10]. Age and duration of marriage can affect the severity of stress [6]. In most women, after the detection of infertility, the feeling of depression reaches a maximum at 3 years, and at 4 years begins to adapt to infertility. Women diagnosed with idiopathic infertility are more optimistic than patients whose infertility is due to diseases that require surgical treatment [8].

The purpose of the study: to assess the clinical features of history and reproductive status in women with psycho-emotional disorders associated with prenatal stress.

Materials and methods

The study was conducted on the basis of the Department of Reproductive Health of the municipal non-profit enterprise "Regional Medical Center for Human Reproduction" Zaporizhzhya Regional Council, which involved 120 patients, 80 of whom suffered prenatal stress: 1 - main group, which was divided into: 1A subgroup - women, who underwent in vitro fertilization (IVF), subgroup 1B - women who did not perform IVF. For comparison, a control group of 40 women without prenatal stress with exclusively tubal infertility factor was formed. In such women, the characteristics of the functional state of the reproductive system corresponded to the normal ovarian reserve [2, 7]. Exclusion criteria from the study were: patients with acute inflammatory, autoimmune, cancer and mental illness; with decompensated stage of somatic pathology.

Each patient was previously issued a questionnaire, which the patient completed only after obtaining consent to participate in the study. In the clinical study of patients studied complaints, medical history and life, gynecological history, level of education, assessed the causes of infertility. Prenatal stress was considered to be the presence in women during pregnancy of patients who subsequently developed infertility, symptoms of severe preeclampsia and/or the birth of children from this pregnancy with signs of intrauterine growth retardation.

The results of the study were processed using the statistical package of the licensed program "STATISTICA® for Windows 13.0". The normality of the distribution of indicators was established by the Shapiro-Wilk test. Descriptive statistics are presented as the arithmetic mean

and standard deviation of $M \pm SD$, or the median and quartile interval $Me (Q1-Q2)$ depending on the distribution of the trait. The comparisons of the three unrelated samples were performed according to the Mann-Whitney test. Comparisons of the three related samples were performed followed by pairwise comparison of groups using the nonparametric Wilcoxon T-test.

Results

The mean age of patients was 27.92 ± 1.04 years (28.32 ± 1.31 years in the main and 27.64 ± 1.88 years in the control group ($p > 0.05$)). In analyzing the age structure of women who applied for diagnosis and treatment of infertility, we registered a significant percentage of patients over 35 years of age. We studied marital status, education, the state of the reproductive system, the parity of the surveyed women.

Among the women surveyed, 69% were urban residents and 31% were rural residents. Most women worked (82%), 18% were housewives, and single persons were students. The social status of the studied patients is presented as follows: in 1A subgroup employees were 28 women (70%), workers - 6 (15%), housewives - 3 (8%), students - 3 (8%), in 1B subgroup and control group respectively, employees were 27 and 11 women (68% and 28%), workers - 6 and 10 women (15% and 25%), housewives - 4 and 16 patients (10% and 40%), students - 3 women in each group (8%). 52% of the employees were patients with higher education, 25% of them were business owners, executive and financial directors, accountants, 16% were doctors, nurses, laboratory assistants, teachers, methodologists and educators. Scientists accounted for a smaller percentage - 16%. In terms of social status, the distribution in all the groups we studied was homogeneous. A significant difference between these indicators of clinical groups was not detected ($p > 0.05$). No occupational hazards were detected. Among patients of subgroup 1A, 22 women smoked tobacco (48%), subgroup 1B smoked 25 (47%). Among patients in the control group - 19 (53%) ($p > 0.05$). Accordingly, the average number of cigarettes smoked per day was: 5.761 ± 0.542 ; 5.371 ± 0.362 and 5.422 ± 0.321 . Thus, the study groups were homogeneous in terms of the number of women who smoked and the intensity of cigarette smoking.

The table 1 show the characteristics of the menstrual cycle in the examined women, the nature of menstruation. Analysis of menstrual function showed no differences

between patients in the main and control groups by age of menarche (12.27 ± 0.07 in subgroup 1A and 12.38 ± 0.15 in subgroup 1B versus 12.28 ± 0.13 years in the control group), by the average duration of the menstrual cycle (27.18 ± 0.16 and 27.14 ± 0.19 vs. 27.27 ± 0.21 days), by the average number of menstrual cycles per year (12.14 ± 0.12 and 12.17 ± 0.11 vs. 12.14 ± 0.18). The longer duration of menstrual bleeding compared with the control was observed among patients of the main group (5.381 ± 0.212 days) in subgroup 1A 1.10 times (5.941 ± 0.121 days, $p < 0.03$) and in subgroup 1B - 1.19 times (6.142 ± 0.121 days, $p < 0.01$).

When studying the nature of menstrual function, it was found that most women had a regular menstrual cycle lasting from 23 to 33 days. Menstrual cycles lasting less than 23 days were found in most women of subgroups 1A and 1B, oligomenorrhea and metrorrhagia were observed in the same patients. At the same time, in patients of the control group, the menstrual cycle did not change. After receiving the results of the study, we concluded that a clinical sign such as a menstrual cycle lasting less than 23 days may be a symptom of reduced functional activity in women (Table 2).

The average age of onset of sexual life in subgroup 1A was 19.18 ± 0.22 years, in 1B - 19.21 ± 0.21 against 18.94 ± 0.44 years in the control group. We examined 34 persons of subgroup 1A (84%) and 35 persons of subgroup 1B (86%), as well as 34 persons of the control group (84%) were married and had a regular sexual life. Hormonal contraception was used by 16 (28%), 7 (21%) and 19 (38%) women, respectively ($p > 0.05$). It was found that the distribution of the average age of onset of sexual life, the presence of regular sexual life in marriage, the use of combined oral contraceptives is evenly distributed in the main and control groups (Table 3).

The majority of women were in a registered marriage: 84% of marriages lasted more than 5 years, 1 marriage took place 3 months before the application, the longest marriage lasted 25 years. Among the women surveyed, 77% were remarried, 22% were in their first marriage. Among women who were remarried, 86% had healthy children from the previous one, and therefore, their motivation to apply to the reproduction center was the desire to have a child with the current husband.

The mean age of examination and treatment among patients with primary infertility was 12 years. Most patients first sought infertility treatment after 7-9 years of marriage,

Table 1. Characteristics of the menstrual cycle.

Groups	The average age of onset of menstruation	Average duration of menstruation, days	The average duration of the menstrual cycle, days	The average number of menstrual cycles per year
1A subgroup, n=40	$12.27 \pm 0.07^*$	$5.941 \pm 0.12^{***}$	27.18 ± 0.16	12.14 ± 0.12
1B subgroup, n=40	12.38 ± 0.15	$6.142 \pm 0.12^{***}$	27.14 ± 0.19	12.17 ± 0.11
Control group, n=40	12.28 ± 0.13	$5.381 \pm 0.21^{**}$	27.27 ± 0.21	12.14 ± 0.18

Notes: * - $p_{1-k} < 0.05$; ** - $p_{2-k} < 0.05$; *** - $p_{1-2} < 0.05$.

Table 2. Characteristics of the menstrual cycle in the examined women.

	1A subgroup, n=40	1B subgroup, n=40	Control group, n=40
Regular menstrual cycle	24%	18%	96%
Menstrual irregularities	85%	88%	4%
Short menstrual cycle	72%	96%	0%
Oligomenorrhea	64%	76%	2%
Metrorrhagia	7%	8%	0%

Table 3. The nature of the sexual life of the examined patients.

Groups	The average age of onset of sexual activity, M±SE	Regular sex in marriage, n (%)	Application of COCP, n (%)
1A subgroup, n=40	19.18±0.22	34 (84)	16 (28)
1B subgroup, n=40	19.21±0.21	35 (86)	7 (21)
Control group, n=40	18.94±0.44	34 (84)	19 (38)

40% of them used various methods of contraception in the first 3 years of marriage, 28% of women were recommended reconstructive plastic surgery on the fallopian tubes, 14% of men in couples underwent repeated infertility treatment courses. In particular, multiple courses of therapy for urogenital infections were conducted, the stages of examination and treatment were quite long, with the use of numerous hormonal drugs in the absence of evidence for their appointment.

The main complaint of all patients was the lack of the desired pregnancy. The duration of infertility was 5.331±0.422 years. After collecting the anamnestic data (genealogical anamnesis, transferred childhood infections, etc.) no deviations from the population norm were revealed. Somatic health was also determined. The somatic anamnesis of the studied women was represented by the following diseases: diseases of the cardiovascular system occurred in 37 women - 31%, neuro-circulatory dystonia by hypertensive type - in 7 women (6%), hypertension - in 30 patients (25%), disease of respiratory system - in 9 women, which was 8%, chronic tonsillitis - in 7 patients (5.5%), chronic bronchitis - in 2 (1.5%), pneumonia - in 1 woman (1%), diseases of the digestive system - in 49 women (41%), biliary tract diseases - in 7 women (6%), chronic gastritis - in 8 women (7%), chronic cholecystitis - in 10 women (9%), gastric ulcer - in 1 patient (1%), chronic pancreatitis - in 10 women (9%), gallstone disease - in 10 women (9%), urinary tract disease - in 5 women (4.5%), chronic pyelonephritis - in 3 women (3%), chronic cystitis - in 2 women, which amounted to 1.5%, varicose veins of the lower extremities - in 3 patients (3%). However, these conditions were compensated and were not a contraindication to planning and carrying a pregnancy.

Among the examined patients' parity was studied: in 5% - preterm birth, in 36% - preterm birth and artificial

abortion, 25% of patients had a history of preterm birth and miscarriage, 15% - miscarriage, artificial abortion, 7% - ectopic pregnancy, 11% - artificial abortions (Fig. 1).

The analysis of the reproductive function of patients revealed that 46% of patients had primary infertility and 54% had secondary infertility. When analyzing the causes of infertility in women with prenatal stress, only a small proportion of patients revealed monofactorial causes: 48% had a combination of two or more factors of reproductive dysfunction, 13% - idiopathic infertility. Chronic endometritis (9.8%), cylindrical epithelial ectopia (29%), uterine and/or ovarian endometriosis (17%), chronic salpingitis and oophoritis were found in 47% of gynecological patients.

In 30% of women (n = 36) gynecological operations were performed according to the indications: laparotomy - in 14 patients (11%), laparoscopy - in 24 patients (20%), 1 hysteroscopy - in 120 patients (100%), 2 hysteroscopies - in 33 women (28%), 3 hysteroscopies - in 17 patients (14%), total surgical interventions - 208. Diagnostic hysteroscopy with mandatory determination of markers of chronic endometritis in the biopsy was performed in all patients 2-3 cycles before embryo transfer. From the anamnesis, 76% of women underwent hysteroscopy or medical-diagnostic scraping of the uterine mucosa and cervical canal. Such procedures were performed for endometrial polyps in every second or third case. All previous diagnoses were confirmed histologically.

The concentration of basic hormones in the serum of the examined groups of women was determined. Follicle-stimulating hormone (FSH) in subgroup 1A was 9.034±0.213 mIU/ml, in subgroup 1B 10.51±0.62 mIU/ml, against 6.207±0.411 mIU/ml in the control group. LH in subgroup 1A was 8.731±0.401 mIU/ml, in subgroup 1B - 9.231±0.303 mIU/ml, against 5.521±0.411 mIU/ml in the control group. The level of estradiol in subgroup 1A was 39.04±5.31 pg/ml, in subgroup 1B - 37.21±4.22 pg/ml, against 3.112±3.213 pg/ml in the control group. The level of free testosterone in the 1A subgroup was 0.721±0.022 pg/ml, in the 1B subgroup - 0.641±0.032 pg/ml, against 0.542±0.211 pg/ml in the control group. The level of thyroid-

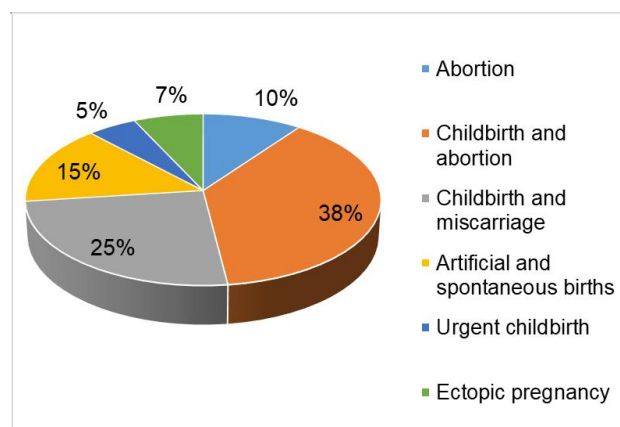


Fig. 1. Results of previous pregnancies of surveyed women.

stimulating hormone in subgroup 1A was 0.921 ± 0.421 $\mu\text{IU/ml}$, versus 0.651 ± 0.092 $\mu\text{IU/ml}$ and 1.003 ± 0.511 $\mu\text{IU/ml}$ in subgroup 1B and control group, respectively. The level of progesterone in subgroup 1A was 0.631 ± 0.312 nmol/l , in subgroup 1B - 0.761 ± 0.213 nmol/l , against 0.652 ± 0.231 nmol/l in the control group. When analyzing the average indicators of the concentration of hormones in the blood of the examined women, it was found that the indicators of FSH are higher in the main group ($p < 0.05$). The level of TSH did not differ between the comparison groups. In the main group of women studied, the concentration of antimullerian hormone (AMP) in the blood for 2-5 days of the menstrual cycle was below normal, the concentration of total testosterone - within normal limits. In the control group, the AMP was within normal limits (3.321 ± 0.221 ng/ml).

The ovarian reserve (OR) of women was assessed by the following indicators: the level of AMP, FSH, the number of antral follicles (NAF) in both ovaries in total and the volume of the ovaries. In the women who participated in the study, OR was found: AMH - 1.4 ng/ml in the main group, 3.3 ng/ml in the control group ($p < 0.01$). FSH - 9.6 mIU/ml in the main group, and 6.2 mIU/ml in the control group ($p < 0.1$). NAF in both ovaries, respectively, was 4.106 ± 0.202 in the main and 12.41 ± 0.10 antral follicles in the control groups. The average ovarian volume was determined by ultrasound, it was: 6.101 ± 0.224 cm^3 in the main and 9.601 ± 0.221 cm^3 in the control groups. Thus, unchanged ovarian reserve was determined in women of the control group. According to the above indicators of OR, we proposed to identify 3 states of OR - normal, low and extremely low for women with a history of infertility and prenatal stress. Normal ovarian reserve was determined as follows with the following parameters: 1) regular menstrual cycle on average 28-30 days, FSH less than 10 mIU/ml ; AMH level greater than 1.0 ng/ml ; ovarian volume not less than 5 cm^3 , NAF - not less than 10 in both ovaries; 2) reduced OR: menstrual cycle lasting 21-23 days; FSH level > 15 mIU/ml ; AMH level < 1.0 ng/ml ; ovarian volume from 3 to 5 cm^3 ; NAF no more than 6 pieces in both ovaries; 3) extremely low OR: menstrual irregularities on the background of prenatal stress; increasing the level of FSH > 15 mIU/ml ; AMH level less than 0.01 ng/ml ; ovarian volume < 3 cm^3 ; NAF - no more than 4 pieces in both ovaries.

Discussion

According to the results of our study, it was found that the place of residence, social status, the presence of bad habits, gynecological history of patients with infertility in IVF programs do not differ from healthy women with tubal-peritoneal infertility [1, 3, 24, 26]. Similar data are reflected in scientific papers, which provide evidence of the frequency of infertility, the percentage between primary and secondary infertility, the frequency of pregnancy after IVF [4, 9, 10, 22]. There was a significant difference between the indicators of the nature of the menstrual cycle in the comparison groups, such as: the duration of the menstrual cycle, the average age of menstruation, the average duration of

menstruation, the average duration of the menstrual cycle, the average number of menstrual cycles per year. We found that a menstrual cycle lasting less than 23 days is a predictor of reduced functional activity of the hypothalamic-pituitary-ovarian axis in women. These data are consonant with the works of A.V. Kaminsky [7], where it is shown that the stress experienced by patients affects the regulation of hypothalamic-pituitary-ovarian relations, and in the long run on food and coping behavior, lipid and carbohydrate metabolism.

Analysis of hormonal regulation of reproductive function of the examined groups of women found the prevalence of FSH in the main group over the control (9.611 ± 0.212 vs. 6.221 ± 0.113 mIU/ml , respectively, $p < 0.1$), and the level of TSH had no differences between the studied groups. In the main group of women studied, the concentration of AMH is below normal (according to normal laboratory reference values - 1.0-2.5 ng/ml), ie less than 1.0 ng/ml , compared with the control group ($p < 0.1$), the concentration of total testosterone is within normal limits, while in the control group the average value of AMH was equal to 3.321 ± 0.221 ng/ml . According to these indicators of OR, we proposed to identify 3 states of OR - normal, low and extremely low for women with a history of infertility and prenatal stress. The basis for this distribution were the results of previous studies by various authors [13, 15, 21, 23], but for the first time we detailed the criteria for determining OR for a group of women with infertility and history of prenatal stress. An important result of the study is the fact that in most patients with a history of infertility and prenatal stress, who were treated with IVF, there is a decrease in OR. These data were the basis for the development of treatment tactics and recommendations of this group of women on the feasibility and timely use of IVF programs [13, 25]. Similar data are given by T.F. Tatarchuk and co-authors [8]. We were unable to compare the features of the anamnesis, the state of neuroendocrine regulation of women with infertility and prenatal stress in the anamnesis with other literature data due to the lack of publications on this topic.

The identified features of gynecological history and reproductive status of women with psychoemotional disorders associated with prenatal stress will allow obstetricians and gynecologists to further analyze the state of the reproductive system, thereby increasing the frequency of natural fertility cycles and the effectiveness of fertilization in IVF programs.

Conclusions

1. One of the clinical signs of violation of regulatory relationships in the hypothalamic-pituitary regulation of reproductive function in women with infertility and prenatal stress in the anamnesis can be considered the duration of the menstrual cycle less than 23 days.

2. In women with infertility and prenatal stress while maintaining the optimal size of the ovaries there is a

decrease in OR in the form of an increase in the concentration of FSH more than 15 mIU/ml ($p < 0.01$) and a decrease in AMH less than 1.0 ng/ml ($p < 0.01$), as well as reducing the number of antral follicles to 6 pieces in both ovaries.

3. Timely comprehensive assessment of the endocrine

system, ovarian status in relation to the state of regulatory mechanisms of psychoemotional adaptation of women with infertility associated with prenatal stress, which we studied, requires a partial review of approaches to this group of women and timely use of IVF to improve performance infertility treatment.

References

- [1] Bobrov, A.E. (2017). Проблема психосоматических соотношений и некоторые методологические вопросы психопатологии [The problem of psychosomatic relations and some methodological issues of psychopathology]. *Социальная и клиническая психиатрия - Social and Clinical Psychiatry*, 27(1), 98-103.
- [2] Dudina, O.O., & Gaborets, Y.Y. (2017). Репродуктивне здоров'я як чинник фертильності жінок і якості здоров'я народжуваних поколінь [Reproductive health as a factor of women's fertility and quality of health of nascent generations]. *Економіка і право охорони здоров'я - Economics and Law of Health Care*, 6(2), 28-35.
- [3] Zhylyka, N.J., Myronjuk, I.S., & Slabkyi, G.O. (2018). Характеристика деяких показників репродуктивного здоров'я жіночого населення України [Characteristics of Some Indicators of Reproductive Health of the Female Population of Ukraine]. *Медичні новини - Wiadomosci Lekarskie*, LXXI(9), 1803-1808.
- [4] Zhuk S.I., & Schurevskaya O.D. (2016). МикроРНК 210, 21 - современные маркеры стресса у беременных [MicroRNA 210, 21 - modern stress marker in pregnant]. Репродуктивное здоровье. *Восточная Европа - Reproductive Health. Eastern Europe*, 5, 615-622.
- [5] Kalinichenko, D.O. (2019). Кількісна оцінка репродуктивного потенціалу жінок раннього фертильного віку [Quantitative assessment of the reproductive potential of women of early fertile age]. *Довкілля та здоров'я - Environment and Health*, (3(92)), 11-16. <https://doi.org/10.32402/dovkil2019.03.011>
- [6] Korolovich, O.V. (2018). Детермінанти психогенного безпліддя: глибинний погляд на проблему [Determinants of psychogenic infertility: an in-depth look at the problem]. *Психологічний журнал - Psychological Journal*, 4(8), 18, 76-85. <https://doi.org/10.31108/1.2018.8.18.5>
- [7] Kaminsky, A.V. (2018). Біоелектрична активність кори головного мозку у пацієнтів з циклами допоміжних репродуктивних технологій [Bioelectric activity of cerebral cortex in patients with cycles of assisted reproductive technologies]. *Журнал освіти, здоров'я та спорту - Journal of Education, Health and Sport*, 8(7), 445-452. doi: <http://dx.doi.org/10.5281/zenodo.1332526>
- [8] Tatarchuk, T.F. (2013). Ефективність застосування препаратів, що надають дофамінергічну дію, в комплексній терапії дисгормональної стрес-індукованої патології [The effectiveness of drugs that have dopaminergic action in the treatment of dyshormonal stress-induced pathology]. *Репродуктивна ендокринологія - Reproductive endocrinology*, 3, 90-94.
- [9] Shevchuk, P.E. (2015). Реконструкція структури народжених за черговістю народження та віком матері [Reconstruction of the structure of births according to the order of birth and mother's age]. *Демографія та соціальна економіка - Demography and Social Economy*, 23(1), 113-125.
- [10] Bennett, L.R., & de Kok, B. (2018). Reproductive Desires and Disappointment. *Medical Anthropology*, 37(2), 91-100. doi: 10.1080/01459740.2017.1416609
- [11] Duhig, K., Chappell, L.C., & Shennan, A.H. (2016). Oxidative stress in pregnancy and reproduction. *Obstetric Medicine*, 9(3), 113-116. <https://doi.org/10.1177/1753495X16648495>
- [12] Elwenspoek, M.M.C., Kuehn, A., Muller, C.P., & Turner, J.D. (2017). The effects of early life adversity on the immune system. *Psychoneuroendocrinology*, 82, 140-154. doi: 10.1016/j.psyneuen.2017.05.012
- [13] Gareri, P., Castagna, A., Cotroneo, A.M., Putignano, S., De Sarro, G., & Bruni, A.C. (2015). The role of citicoline in cognitive impairment: pharmacological characteristics, possible advantages, and doubts for an old drug with new perspectives. *Clin. Interv. Aging*, 10, 1421-1429. doi: 10.2147/CIA.S87886
- [14] Gruzieva, T.S., Diachuk, M.D., Inshakova, H.V., & Zamkevych, V.B. (2019). Modern Demographic Trends in Ukraine as a Ground for Realization of Prevention Strategies. *Wiadomosci Lekarskie*, 72(10), 2033-2039. PMID: 31983148
- [15] Hryshchenko, M.H., Luts'kyu, A.S., & Parashchuk, V.Y. (2017). Оцінка ефективності екстракорпорального запліднення після перенесення вітрифікованих бластоцист у природному циклі та із застосуванням замісної гормональної терапії [Evaluation of the effectiveness of in vitro fertilization after the transfer of vitrified blastocysts in the natural cycle and with the use of hormone replacement therapy]. *Міжнародний медичний журнал - International Medical Journal*, 23(4), 42-46.
- [16] Lee, Y., Oh, J.S., Chung, S.J., Lee, J.J., Chung, S.J., Moon, H. ... Sohn, Y.H. (2018). The presence of depression in de novo Parkinson's disease reflects poor motor compensation. *PLoS ONE*, 13(9), 1-10. <https://doi.org/10.1371/journal.pone.0203303>
- [17] Li, Y.H., & Marren, A. (2018). Recurrent Pregnancy Loss: A Summary of International EvidenceBased Guidelines and Practice. *Aust. J. Gen. Pract.*, 47(7), 432-436. doi: 10.31128/AJGP-01-18-4459
- [18] Lubinsky, M. (2018). Evolutionary Justifications for Human Reproductive Limitations. *J. Assist. Reprod. Genet.*, 35(12), 2133-2139. doi: 10.1007/s10815-018-1285-3
- [19] Malak, A.L.S.B., Vasconcellos, L.F., Pereira, J.S., Greca, D.V., Cruz, M., Alves, H.V.D. ... Charchat-Fichman, H. (2017). Symptoms of depression in patients with mild cognitive impairment in Parkinson's disease. *Dement Neuropsychol.*, 11(2), 145-153. doi: 10.1590/1980-57642016dn11-020007
- [20] Nicoloso-Santa, B.J.M., Lobel, M., Bocca, S., Stelling, J.R., & Pastore, L.M. (2017). Psychological and emotional concomitants of infertility diagnosis in women with diminished ovarian reserve or anatomical cause of infertility. *Fertil. Steril.*, 108(1), 161-167. doi: 10.1016/j.fertnstert.2017.05.008
- [21] Panico, A., Messina, G., Lupoli, G.A., Lupoli, R., Cacciapuoti, M., Moscatelli, F. ... Lupoli, G. (2017). Quality of life in overweight (obese) and normal-weight women with polycystic ovary syndrome. *Patient Prefer Adherence*, 11, 423-429. doi:

- 10.2147/PPA.S119180
- [22] Pinar, M.H., Gibbins, K., He, M., Kostadinov, S., & Silver, R. (2018). Early Pregnancy Losses: Review of Nomenclature, Histopathology, and Possible Etiologies. *Fetal Pediatric Pathology* 37(3), 191-209. doi: 10.1080/15513815.2018.1455775
- [23] Plana-Ripoll, O., Li, J., Kesmodel, U.S., Olsen, J., Parner, E., & Basso, O. (2016). Maternal stress before and during pregnancy and subsequent infertility in daughters: a nationwide population-based cohort study. *Hum. Reprod.*, 31(2), 454-462. doi: 10.1093/humrep/dev309
- [24] Simmons, A.D. (2018). *Parkinson's Disease*. In: D.Rakel (Ed.), *Integrative Medicine* (Fourth Edition). Philadelphia, PA: Elsevier.
- [25] Skorvanek, M., Martinez-Martin, P., Kovacs, N., Rodriguez-Violante, M., Corvol, J., Taba, P. ... Stebbins, G.T. (2017). Differences in MDS-UPDRS Scores Based on Hoehn and Yahr Stage and Disease Duration. *Movement Disorders Clinical Practice*, 4(4), 536-544. doi: 10.1002/mdc3.12476
- [26] Yusuf, L. (2016). Depression, anxiety and stress among female patients of infertility; a case control study. *Pak. J. Med. Sci.*, 32(6), P.1340-1343. doi: 10.12669/pjms.326.10828

ОСОБЛИВОСТІ ГІНЕКОЛОГІЧНОГО АНАМНЕЗУ ТА РЕПРОДУКТИВНОГО СТАТУСУ ЖІНОК ІЗ ПСИХОЕМОЦІЙНИМИ ПОРУШЕННЯМИ, ПОВ'ЯЗАНИМИ З ПЕРЕНЕСЕНИМ ПРЕНАТАЛЬНИМ СТРЕСОМ

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Стійка ановуляція, порушення менструального циклу призводять до розвитку ендокринозалежних патологічних станів. Первинна неплідність є проявом таких гінекологічних захворювань. Мета дослідження: провести оцінку клінічних особливостей анамнезу та репродуктивного статусу у жінок із психоемоційними порушеннями, пов'язаними з перенесеним пренатальним стресом. У дослідженні взяли участь 120 пацієнток, 80 з яких перенесли пренатальний стрес: 1 - основна група, яка розподілена відповідно на 1А підгрупу - жінки, котрим проводили екстракорпоральне запліднення, та 1Б підгрупу - жінки, котрим екстракорпоральне запліднення не проводили. Для порівняння сформовано 2 - контрольну групу із 40 жінок без пренатального стреса з виключно трубним фактором безпліддя. У цих жінок всі характеристики репродуктивного статусу відповідали нормальному яєчниковому резерву. Вік пацієнток коливався від 22 до 45 років. У всіх пацієнток вивчали скарги, анамнез захворювання та життя, гінекологічний анамнез, рівень освіти, оцінювали причини безпліддя. Результати дослідження оброблені із застосуванням статистичного пакету ліцензійної програми "STATISTICA® for Windows 13.0". Нормальність розподілу показників встановлювали за критерієм Шапіро-Уїлка. Дані описової статистики подано у вигляді середнього арифметичного та стандартного відхилення $M \pm SD$ або медіани та міжквартильного інтервалу Me (Q1-Q2) залежно від розподілу ознаки. Встановлено, що за місцем проживання, соціальним статусом, наявністю шкідливих звичок, даними гінекологічного анамнезу безплідні пацієнтки в програмах екстракорпорального запліднення не відрізняються від здорових жінок із трубно-перітонеальним фактором безпліддя. Виявлено достовірну відмінність між показниками характеру менструального циклу у групах, що порівнювали. З'ясовано, що менструальний цикл тривалістю менше 23 днів є предиктором зниженої функціональної активності гіпоталамо-гіпофізарно-яєчничової вісі у жінок. Аналіз гормональної регуляції репродуктивної функції обстежених груп жінок встановив превалювання показників фолікулостимулюючого гормону в основній групі над контрольною ($9,611 \pm 0,212$ проти $6,221 \pm 0,113$ мМод/мл відповідно, $p < 0,05$), а рівень ТТГ не відрізнявся між досліджуваними групами. Нами запропоновано для жінок з безпліддям та перенесеним пренатальним стресом в анамнезі виділити 3 стани яєчникового резерву, а саме: нормальний, низький та вкрай низький. Таким чином, своєчасна комплексна оцінка стану ендокринної системи, стану яєчників у взаємозв'язку зі станом регуляторних механізмів психоемоційної адаптації жінок з безпліддям, асоційованим з пренатальним стресом, яка була нами досліджена, вимагає часткового перегляду підходів до цієї групи пацієнток та своєчасного застосування екстракорпорального запліднення для покращення результативності лікування безпліддя.

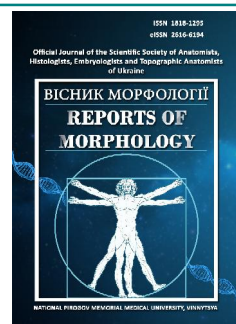
Ключові слова: безпліддя, пренатальний стрес, оваріальний резерв, екстракорпоральне запліднення.



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Dynamics of ultrastructural changes in glial cells and nerve fibers of the optic nerve of rats after intra-abdominal injection of a mixture of 40% Ethanol solution and 100% Methanol

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There are, quite often, cases of poisoning of human population with poor-quality alcoholic drinks, which include methanol. The optic nerve, retina and brain tissues are initially affected. A long-term study aimed at identifying initial structural changes in the visual analyzer in the application of various doses of methanol and its mixture with ethanol was carried out. Purpose: to study the dynamics of ultrastructural changes in glial cells and nerve fibers of the optic nerve, which are caused by mixture of ethanol 40% and methanol 100% in a ratio of 3:1 with a dose of methanol of 0.75 g/kg of rat weight. We examined the ultrastructure of the orbit part of the optic nerve of 43 adult rats (Wistar line) in the period from 3 hours to 14 days after one-time intra-abdominal injection of ethanol 40% and methanol 100%, 100% methanol, the dose of methanol is 0.75 g/kg of rat weight. In rats, LD50 is 9.5 g/kg of their weight. It was found out, that within 3 hours after the injection of the mixture of alcohols, the myelin sheath of large-caliber nerve fibers exfoliated, the axoplasm swelled and the mitochondria in their axons pathologically changed, the mitochondria altered in glial cells, which influenced the quality of nerve impulses and axoplasmic transport of substances. In the dynamics of the study, alternative changes in structures of the optic nerve progressed with the complete destruction of part of glial cells by 7 days, mainly in the first 3 days. After the use of methanol 100%, changes in structures of the optic nerve were similar to changes in them after the use of a mixture of alcohols, but with more significant pathology at all periods of observation with the peak of their manifestation on the 7th day. In glial cells and axons of nerve fibers from the 1st day of the study, signs of compensatory and restorative processes were found: they increased protein-synthesizing and energy-forming functions that were aimed at restoring the damaged ultrastructure. It is established, that 3 hours after the injection of a mixture of alcohols, reactive changes in the structures of the optic nerve of rats took place, which from the 1st day develop into pathological changes and are observed up to 14 days with the peak of their activity on the 7th day of the study. After the use of methanol 100%, the ultrastructure of the optic nerve of rats is more damaged than after the injection of a mixture of alcohols. It is proved, that methanol has a leading place in the development of pathological changes in structures of the optic nerve after the injection of a mixture of alcohols.

Keywords: ultrastructure, glial cells, nerve fibers, optic nerve, mixture of alcohols, ethanol, methanol.

Introduction

Recently, methanol, which is a highly toxic alcohol, is being introduced into many spheres of life, in particular, for the production of low-quality alcoholic beverages. When using methanol up to 10 ml, blindness occurs, and when using it in a dose of 30-50 ml - death. In this regard, it is important to study the initial ultrastructural changes in the toxic effects of methanol on organs and systems of the

human body in order to invent effective and targeted methods of treatment of its victims.

It is known that methanol primarily affects the optic nerve (ON), retina and brain tissue [2, 4, 8, 12, 14, 17, 18, 28]. In addition, acute methanol poisoning can also cause hemorrhage in the brain [2]. According to clinical data [21, 24, 27] in acute methanol poisoning there is optic nerve

neuropathy. Studies in rats have shown that methanol poisoning in ON damages nerve fibers (NF), disrupts axoplasmic circulation due to blockade of energy-producing processes associated with mitochondrial pathology [1, 7, 20, 22]. We previously found that a single intra-abdominal injection of rats 100% methanol at a dose of 0.75 g/kg body weight, which is 10 part of the lethal dose, causes in ON, primarily changes in the myelin sheaths of nerve fibers of large caliber already in the first hours of observation [6]. Studies by other authors, which were devoted to the study of electrophysiological parameters and ultrastructure of the visual analyzer of rats after methanol poisoning at a dose of 1.8 g/kg body weight, revealed significant dystrophic-degenerative changes in the structures of the retina, optic nerve and occipital cortex [23].

It is known that ethanol is an antidote to methanol and is actively used in the clinic in detoxification of victims of low-quality alcoholic beverages containing methanol, as ethanol can compete with methanol for binding to the enzyme alcohol dehydrogenase, which metabolizes alcohols [10, 16]. According to the authors [9] in white mice, methanol and ethanol have different pathways of penetration into cells through cell membranes, and ethanol has a stronger effect on the structural properties of membranes and the transport of substances from the gastrointestinal tract into the bloodstream. At the same time, in the literature there are reports [26] that in white rats ethanol, when used as an antidote for acute methanol intoxication (1.0 LD₅₀), causes increased immunotoxic effects. Immunotoxic effects have also been found in acute ethanol poisoning [25].

In people with acute poisoning by 40% ethyl alcohol, or with its chronic use, pathological changes of internal organs are often observed [11, 15]. After conducting a series of experiments on monkeys J.Bouskila and co-authors (2018) proved the negative effects of ethanol on fetal development [4]. In our study in 2015 [13], which examines the dynamics of ultrastructural changes in the choroid and retina of white rats after intra-abdominal injection of a mixture of alcohols (40% Ethanol and 100% Methanol) in a ratio of 3:1, at different doses of methanol, it was found that after 1 hour and 10 minutes of observation, the initial pathological changes in the endothelial cells of vessels and capillaries of the choroid, in the cells of the pigment epithelium, in the synapses of photoreceptor cells and in the processes of Mueller cells of the retina, which are located below the outer border. In the dynamics of the study, these changes progress and involve in the pathological process of all retinal structures, which last up to 3 months of the study. With increasing doses of methanol in the mixture, the destructive processes in the vascular and retinal membranes become deeper. It should be noted that experimental studies on ultrastructural changes in the LV of rats caused by a mixture of 40% ethanol and 100% methanol, in the available world literature is not found.

Purpose of work: to study the dynamics of ultrastructural

changes in glial cells and nerve fibers of the optic nerve, which are caused by 40% ethanol solution and 100% methanol in a ratio of 3:1 with a dose of methanol 0.75 g/kg body weight of rats.

Materials and methods

This work was performed in the framework of the research topic: "Study the effect of a mixture of ethyl and methyl alcohols on the structure of the optic nerve of rats" № state. registration 0120U103694.

The work was performed on 43 adult Wistar rats weighing from 250 g to 300 g, divided into 3 groups: I - experimental group in which the rats were injected intraperitoneally with a mixture of alcohols (40% ethanol solution and 100% methanol) in a ratio of 3:1 (dose of methanol in which is 0.75 g/kg body weight of rats); II - experimental group in which rats were injected intraperitoneally with 100% methanol at a dose of 0.75 g/kg body weight; III - (control group), in which water for injection is injected intraperitoneally in a volume similar to the previous groups.

Animal manipulation and euthanasia were carried out in accordance with the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Purposes (Strasbourg, 1986). Tissues for the study were treated according to the conventional method of electron microscopy. The orbital part of rats ON, which was obtained after enucleation of the eyeball with ON, which were in a state of deep anesthesia, was investigated using an electron microscope PEM-100-01 (Ukraine) 3 hours, 1, 3, 7 and 14 days after administration.

Results

Electron microscopic examination 3 hours after the introduction of a mixture of alcohols in the structure of optic nerve shows enlightenment of the axoplasm, vacuolation of mitochondria and detachment of the axolemma of individual large caliber NF. Glial cells of ON in this period of the experiment remain virtually unchanged, except for mitochondria, some of which have an enlightened mitochondrial matrix with no or partial destruction of the cristae and expanded individual tanks of the granular endoplasmic reticulum (GER) (Fig. 1, 2).

In the period from 1 to 7 days, alternative changes in ON progress somewhat, especially in the first 3 days. The changes that were characteristic of the previous period were supplemented by stratification of the myelin sheath of almost all NF, edema of the axoplasm and its detachment from the myelin sheath of some NF, pathology of mitochondria and a decrease in the number of structures in the axons. In glial cells, both in the perinuclear part of the cell and in its processes surrounding the NF, the phenomena of hydropic dystrophy are determined (Fig. 3).

On the 14th day of observation, the signs of edema in the studied structures of ON are somewhat reduced, with the exception of large-caliber NF, the ultrastructure of which

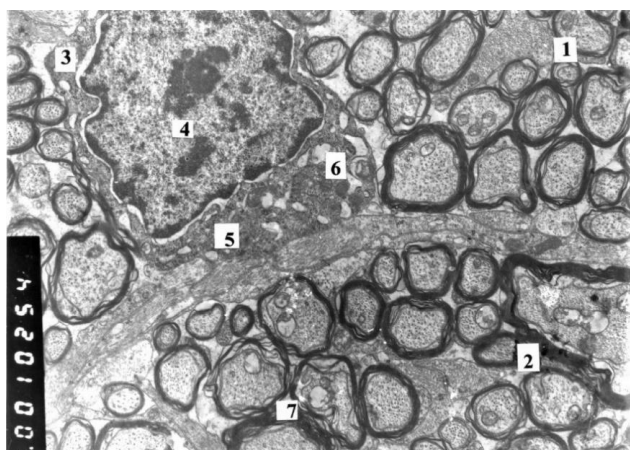


Fig. 1. Ultrastructure of the optic nerve of the rat 3 hours after injection of WFI. Nerve fibers and the glial cell are unchanged. Electronic microphotography. x6000. 1 - optic nerve, 2 - nerve fibers, 3 - glial cell, 4 - nucleus, 5 - cytoplasm, 6 - mitochondria, 7 - myelin sheath.

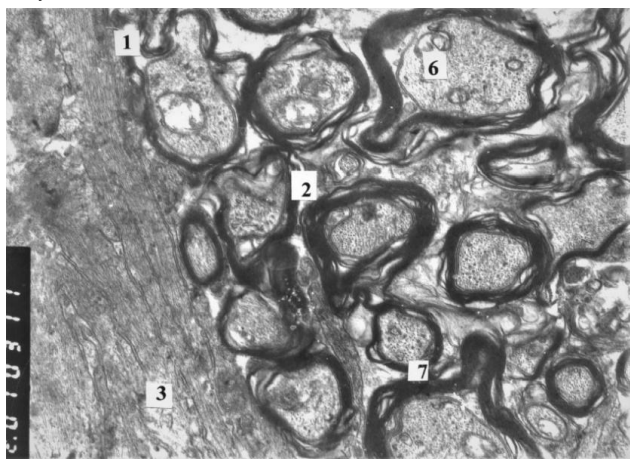


Fig. 2. Ultrastructure of the rat optic nerve 3 hours after intra-abdominal injection of a mixture of solution of ethanol 40% and methanol 100%. Destruction of mitochondrial cristae and axolema detachment in axons, deformation and stratification of medullary sheaths in nerve fibers. Electronic microphotography. x12000. 1 - optic nerve, 2 - nerve fibers, 3 - glial cell processes, 6 - mitochondria, 7 - myelin sheath.

practically does not differ from those described in the previous terms. Glial cells are characterized by heterogeneity: some with hydropic dystrophy and degeneration of organelles, some with a structure close to normal or with elements of compensatory-restorative processes, ie with an increase in the number of organelles that perform protein-synthesizing and energy-forming functions.

In ON after injection of 100% methanol from 3 hours to 14 days, the ultrastructure changes are unidirectional in nature with changes in its structures after the II mixture of alcohols. However, pathological changes in them in the period from 3 days to 14 are more extensive and deeper. However, in the initial period, the elements of edema of the structures of the optic nerve, which are found in the material

of 1 group of animals, are somewhat smaller. At the same time, the phenomena of compensatory-restorative processes in the structures of ON in this group of rats are more active (Fig. 4).

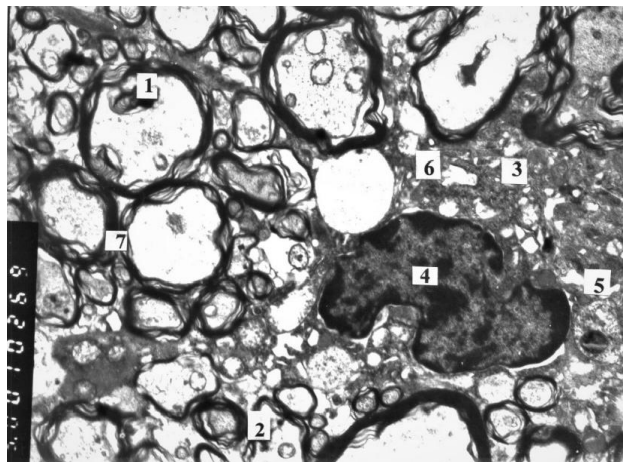


Fig. 3. Ultrastructure of the optic nerve of the rat one day after intra-abdominal injection of a mixture of solution of ethanol 40% and methanol 100%. Hydropic changes of membrane organelles in the glial cell. Edema of the axoplasm, vacuolization of mitochondria and stratification of the medullary sheath in nerve fibers. Electronic microphotography. x5000. 1 - optic nerve, 2 - nerve fibers, 3 - glial cell, 4 - nucleus, 5 - cytoplasm, 6 - mitochondria, 7 - myelin sheath.

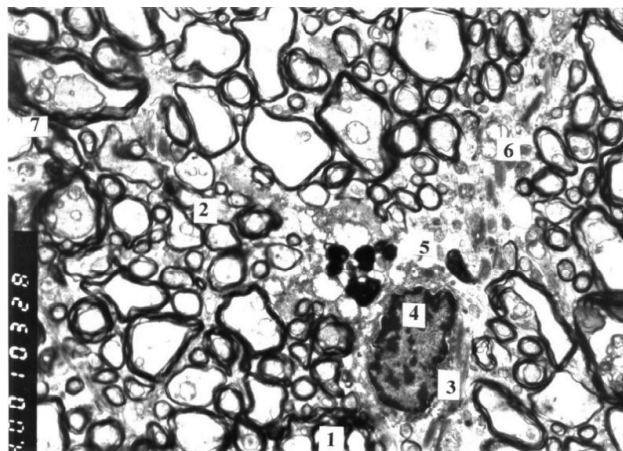


Fig. 4. Ultrastructure of the optic nerve of the rat 14 day after intra-abdominal injection of methanol 100%. Hydropic dystrophy of axons of nerve fibers. Destruction of cytoplasmic structures and damage to glial cell plasmalemma. Electronic microphotography. x4000. 1 - optic nerve, 2 - nerve fibers, 3 - glial cell, 4 - nucleus, 5 - cytoplasm, 6 - mitochondria, 7 - myelin sheath.

Discussion

Analysis of the material studied by us showed that 3 hours after II mixture of alcohols, with a small dose of methanol, causes changes in the structure of large NF caliber, characterized by axoplasmic edema, stratification and deformation of the myelin sheath, mitochondrial pathology, which probably leads to a decrease their excitability and disrupts the conduction of nerve impulses,

as well as hydropic changes in the membrane organelles of individual glial cells, especially mitochondria, which inhibits the supply and recovery of NF. The same type of changes was also found in patients after poisoning by low-quality alcoholic beverages, which is confirmed by a number of authors [7, 18]. In addition, more significant hydropic changes in the structures of ON in 1 group after 3 hours of study than in the material of group 2, most likely found due to faster permeability ethanol through the membranes of cells, as evidenced by N.Ya.Golovenko and co-authors (2008). By day 7 of observation, alternative changes in the ultrastructure of ON increase and are manifested by the phenomena of hydropic dystrophy and degeneration, also involving small and medium-sized NF and most glial cells, some of which are in a state of necrosis. However, the detected changes in the structures of ON are somewhat reduced to 14 days of observation and mainly in NF of small and medium calibers and part of glial cells. From the 1st day of observation in axons and glial cells, reparative processes also appear in parallel, but they are much slower. In this regard, as clinical studies show [12, 27], the recovery of visual acuity in victims after methanol poisoning is very slow.

In ON after injection of 100% methanol, the pathological changes are unidirectional, but more extensive. On the 14th day, the signs of edema in the structures of ON, as in the animals of the previous group, are somewhat reduced, but their pathological manifestations in this group of animals are more significant, especially among glial cells. At the same time in the cells of this group of animals are more active protein-synthesizing and energy-producing processes, there are also binuclear glial cells, which, in general, enhances trophic and recovery of NF, but despite this in the studied structures are still stable and profound destructive changes. This may be due to the fact that methanol slowly penetrates into cells, but is also slowly released from them, forming toxic metabolites [9, 10, 15].

It should be noted that mitochondria are the most vulnerable organelle due to the action of alcohols, in particular methanol, both in glial cells and in the axons of NF in all periods of observation. As a result, the main function of mitochondria changes - the production of energy so necessary for cells to function normally, that is, - suffers oxidative phosphorylation, which affects cell viability and leads to pathology.

It can be assumed that methanol primarily affects the mitochondria, or perhaps a significant amount of energy is expended to restore the ultrastructure and function of the optic nerve due to the destructive effects of methanol. E.Icel and co-authors (2020) in their work also point to the pathology of mitochondria in the optic nerve after methanol

poisoning [7]. Other sources contain information on the pathology of mitochondria in the nervous system under stress of various natures [3, 5]. At the same time, as shown by the author E.Icel and co-authors (2020), intravenous administration of ATP had a significant positive effect on the parameters of oxidative stress and the structure of the optic nerve in rats poisoned with methanol [7]. B.Setiohadji and co-authors (2018) also suggest the use of antioxidant therapy as a possible treatment for toxic optic neuropathy caused by methanol.

Thus, we have shown that, despite a small dose of methanol in a mixture of alcohols, in the elements of the optic nerve there are pathological changes similar to those observed after the use of 100% methanol in a similar dose. We confirmed that ethanol in the applied proportion with methanol in a mixture of alcohols slightly reduces pathological manifestations in the optic nerve at the initial stages of observation, but in the dynamics of the study found that the leading place in the development of pathological changes is methanol. R.A.Rasheed and co-authors in their work published in 2017 also proved the protective effect of ethanol on the retina of rats in acute methanol poisoning [16].

The data obtained by us make it possible to judge some aspects of the toxic effects of both a mixture of alcohols and 100% methanol on the ultrastructure of the optic nerve and to determine the initial pathological changes caused by these substances.

Conclusions

1. It was found that a mixture of 40% ethanol solution with 100% methanol and 100% methanol (at a dose of 0.75 g/kg body weight of rats), after 3 hours of observation cause axoplasmic edema, myelin sheath stratification and nerve mitochondrial pathology large-caliber fibers with reactive changes in glial cells. After injection of the alcohol mixture, these changes are less pronounced.

2. In the dynamics of the study (up to 14 days) in glial cells and axons of nerve fibers there are phenomena of hydropic dystrophy with alteration of organelles, stratification and deformation of myelin sheaths of nerve fibers.

3. The established changes are most pronounced on the 3rd day after injection of a mixture of alcohols and on the 7th day of observation after the use of 100% methanol, but in the initial period after intra-abdominal injection of a mixture of alcohols they are less pronounced. At all times of observation in the studied structures of both experimental groups of animals revealed pathological changes in mitochondria.

References

- [1] Ahiskali, I., Pinar, C.L., Kiki, M., Cankaya, M., Kunak, C.S., & Altuner, D. (2019). Effect of taxifolin on methanol-induced oxidative and inflammatory optic nerve damage in rats. *Cutan. Ocul. Toxicol.*, 38(4), 384-389. doi: 10.1080/15569527.2019.1637348
- [2] Aisa, T.M., Ballut, O.M., & Ballut, E.M. (2016). Methanol intoxication with cerebral hemorrhage. *Neurosciences (Riyadh)*, 21(3), 275-277. doi: 10.17712/nsj.2016.3.20150592
- [3] Arun, S., Liu, L., & Donmez, G. (2016). Mitochondrial biology and neurological diseases. *Curr. Neuropharmacol.*, 14(2),

- 143-154. doi: 10.2174/1570159X13666150703154541
- [4] Bouskila, J., Palmour, R.M., Bouchard, J.F., & Ptito, M. (2018). Retinal structure and function in monkeys with fetal alcohol exposure. *Exp. Eye Res.*, 177, 55-64. doi.org/10.1016/j.exer.2018.07.027
- [5] Duarte, F., Amorim, J.A., Palmeira, C.M., & Rolo, A.P. (2015). Regulation of mitochondrial function and its impact in metabolic stress. *Curr. Med. Chem.*, 22(20), 2468-2479. doi: 10.2174/0929867322666150514095910
- [6] Dumbrova, N.E., & Molchaniuk, N.I. (2010). Ультраструктурные изменения элементов зрительного нерва крыс в динамике после действия метанола [Ultrastructural changes of rat optic nerve elements in the dynamics after the action of methanol]. *Офтальм. журнал - Ophthalm. J.*, 2, 64-66.
- [7] Icel, E., Suleyman, H., Yazici, G.N., Bakan, N., & Sunar, M. (2020). Effects of adenosinetriphosphate on methanol-induced experimental optic nerve damage in rats: biochemical and histopathological evaluation. *Cutan. Ocul. Toxicol.*, 39(3), 244-248. doi: 10.1080/15569527.2020.1778017
- [8] Galvez-Ruiz, A., Elkhamary, S.M., Asghar, N., & Bosley, T.M. (2015). Cupping of the optic disk after methanol poisoning. *Br. J. Ophthalmol.*, 99(9), 1220-3. doi: 10.1136/bjophthalmol-2014-306354
- [9] Golovenko, N.Ya., Larionov, V.B., Ovcharenko, N.V., Borisyuk, I.Yu., & Lihota, E.B. (2008). Токсикокинетическое взаимодействие этилового и метилового спиртов в организме белых мышей [Toxicokinetic interaction of ethanol and methanol in organism of white mice]. *Современные проблемы токсикологии - Modern Problems of Toxicology*, (1), 32-36.
- [10] Kenneth, Mc M., Dag, J., & Knut, E.H. (2016). Antidotes for poisoning by alcohols that form toxic metabolites. *Br. J. Clin. Pharmacol.*, 81(3), 505-515. doi: 10.1111/bcp.12824
- [11] Kursov, S.V., Mykhnevych, K.H., & Kryvobok, V.Y. (2012). Острое отравление этанолом [Acute ethanol poisoning]. *Медицина неотложного состояния - Medical Emergency*, (7-8), 22-35.
- [12] Manuchehri, A.A., Alijanpourm E., Daghmechi, M., Ghaeminan, N., Abedi, S.H., Nikbakhsh, N. ... Amani, N. (2015). A case of methanol poisoning leading to prolonged respirator dependency with consequent blindness and irreversible brain damage. *Caspian Journal of Internal Medicine*, 6(3), 180-183. PMID: PMC4650797
- [13] Molchaniuk, N.I. (2015). Свето- и электронно-микроскопическое изучение хориокапилляров, пигментного эпителия и фоторецепторных клеток сетчатки крыс в динамике после введения различных доз метанола [Light- and electron-microscopic study of choriocapillaries, pigment epithelium and photoreceptor cells of the retina of rats in dynamics after administration of various doses of methanol] *Вісник Київського національного університету імені Тараса Шевченка. Проблеми регуляції фізіологічних функцій - Bulletin of Kiev National Taras Shevchenko University. Problems of regulation of physiological functions*, 18(1), 74-78.
- [14] Mojica, C.V., Pasol, E.A., Dizon, M.L., Kiat, W.A., Tru, L., Dominguez, J.C. ... Tũaño, B.J. (2020). Chronic methanol toxicity through topical and inhalational routes presenting as vision loss and restricted diffusion of the optic nerves on MRI: A case report and literature review. *eNeurological Sci.*, 20, 100258. doi: 10.1016/j.ensci.2020.100258
- [15] Pohanka, M. (2016). Toxicology and the biological role of methanol and ethanol: Current View. *Biomed. Pap. Med. Fac. Univ. Palacky Olomouc. Czech. Repub.*, 160(1), 54-63. doi.org/10.5507/bp.2015.023
- [16] Rasheed, R.A., Youakim, M.F., & Yehia, M.A. (2017). Possible protective effect of ethanol on acute methanol intoxicated retina in rats: A histological and ultrastructural study. *Protection of Intoxicating Retina*, 1(2), 146-153. doi: 10.21608/jmh.2018.1795.1026hia3
- [17] Ran, M., Li, Y., Zhang, L., Wu, W., Lin, J., Liu, Q., & Ou, S. (2019). Clinical features, treatment, and prognosis of acute methanol poisoning: experiences in an outbreak. *Int. J. Clin. Exp. Med.*, 12(5), 5938-5950. ISSN: 1940-5901/IJCEM0085245
- [18] Sayit, A.T., Aslan, K., Elmali, M., & Gungor, I. (2016). Methanol-induced toxic optic neuropathy with diffusion weighted MRI findings. *Cutan. Ocul. Toxicol. Dec.*, 35(4), 337-340. doi: 10.3109/15569527.2015.1122031
- [19] Setiohadji, B., Irfani, I., Rifada, M., Virgana, R., & Kartasasmita, A.S. (2018). The Superoxide Dismutase Mimetic Tempol and Its Effect on Retinal Ganglion Cells in Experimental Methanol-Intoxicated Rats. *Ophthalmol. Ther.*, 7(1), 167-172. doi: 10.1007/s40123-018-0132-z
- [20] Shaughnessy, D.T., McAllister, K., Worth, L., Haugen, A.C., Meyer, J.N., Domann, F.E. ... Tysonet, F.L. (2014). Mitochondria, energetics, epigenetics, and cellular responses to stress. *Environ. Health Perspect.*, 122(12), 1271-1278. doi: 10.1289/ehp.1408418
- [21] Shin, Y.W., & Uhm, K.B. (2011). Case of Optic Nerve Atrophy with Severe Disc Cupping after Methanol Poisoning. *Korean J. Ophthalmol.*, 25(2), 146-150. doi: 10.3341/kjo.2011.25.2.146
- [22] Tasli, N.G., Çimen, F.K., Karakurt, Y., Uçak, T., Mammadov, R., Süleyman, B., & Süleyman, H. (2018). Protective effects of Rutin against methanol induced acute toxic optic neuropathy: an experimental study. *Int. J. Ophthalmol.*, 11(5), 780-785. doi: 10.18240/ijo.2018.05.10
- [23] Tsybalyuk, V.I., Nosov, A.T., Chebotareva, L.L., & Vasyuta, V.A. (2004). Електрофізіологічні та морфологічні показники стану зорового аналізатора в динаміці застосування трофіну при інтоксикації метанолом [Electrophysiological and morphological exponents of the visual analyzer condition in the dynamics of the visual Trophin application in the methanol intoxication]. *Український нейрохірургічний журнал - Ukrainian Neurosurgical Journal*, (3), 97-102.
- [24] Vaneckova, S., Zakharov, J., Klempir, Rusička, E., & Vaneckova, M. (2015). Imaging findings after methanol intoxication (cohort of 46 patients). *Neuro Endocrinol. Lett.*, 36(8), 737-744. PMID: 26921573.
- [25] Zabrodsky, P.F., & Serov, V.V. (2013). *Иммунотоксикологическая характеристика метанола. Коррекция нарушенных функций иммунной системы. [Immunotoxicological Characteristics of Methanol. Correction of Immune System Disorders]*. Саратов. - Saratov.
- [26] Zabrodsky, P.F., & Germanchuk, V.G. (2001). Влияние этанола на изменение иммунотоксичности метанола [The effect of ethanol on the change in the immunotoxicity of methanol]. *Эксперим. и клин. фармакол. - Experim. and Clin. Pharmacol.*, 64(5), 40-42.
- [27] Zakharov, S., Pelclova, D., Diblik, P., Urban, P., Kuthan, P., Nurieva, O. ... Hovdaet, K.E. (2015). Long-term visual damage after acute methanol poisonings: longitudinal cross-sectional study in 50 patients. *Clinical Toxicology*, 53(9), 884-892. doi: 10.3109/15563650.2015.1086488
- [28] Zyoud S.H., Al-Jabi S.W., Sweileh W.M., Awang R., & Waring W.S. (2015). Bibliometric profile of the global scientific research on methanol poisoning (1902-2012). *J. Occup. Med. Toxicol.*, 10(17), 1-8. doi: 10.1186/s12995-015-0062-9

ДИНАМІКА УЛЬТРАСТРУКТУРНИХ ЗМІН В ГЛІАЛЬНИХ КЛІТИНАХ ТА НЕРВОВИХ ВОЛОКНАХ ЗОРОВОГО НЕРВУ ЩУРІВ, ВИКЛИКАНИХ ВНУТРІШНЬООЧЕРЕВНИМ ВВЕДЕННЯМ СУМІШІ 40% РОЗЧИНУ ЕТАНОЛУ І 100% МЕТАНОЛУ

Молчанюк Н.І.

Доволі часто зустрічаються випадки отруєння населення неякісними алкогольними напоями, до складу котрих входить метанол. У постраждалих первинно вражається зоровий нерв, сітківка і тканини головного мозку. Проведено багаторічне дослідження, направлене на виявлення початкових структурних змін у зоровому аналізаторі при застосуванні різних доз метанолу та його суміші з етанолом. Мета роботи: вивчити динаміку ультраструктурних змін у гліальних клітинах та нервових волокнах зорового нерву, які викликані 40% розчином етанолу і 100% метанолом у співвідношенні 3:1 з дозою метанолу 0,75 г/кг маси тіла щура. Дослідили ультраструктуру очноямкової частини зорового нерву 43 дорослих щурів лінії Вістар у період від 3 годин до 14 діб після одноразової внутрішньочеревної ін'єкції суміші 40% етанолу і 100% метанолу та 100% метанолу, доза метанолу становить 0,75 г/кг маси тіла щура. У щурів ЛД50 складає 9,5 г/кг маси їх тіла. Виявлено, що через 3 години після ін'єкції суміші спиртів розшарувалась мієлінова оболонка нервових волокон великого калібру, набрякала аксоплазма та патологічно змінювались мітохондрії в їх аксонах, відбувалась альтерація мітохондрій в гліальних клітинах, що впливало на якість проведення нервових імпульсів та аксоплазматичний транспорт речовин. У динаміці дослідження альтеративні зміни в структурах зорового нерву прогресували з повним руйнуванням частини гліальних клітин до 7 доби, переважно в перші 3 доби. Після застосування 100% метанолу зміни в структурах зорового нерву були аналогічними змінам в них після застосування суміші спиртів, але з більш значною патологією у всі строки спостереження з піком їх прояву на 7 добу. В гліальних клітинах і в аксонах нервових волокон з 1 доби дослідження виявлені ознаки компенсаційно-відновних процесів: у них посилювались білок-синтезуюча та енергоутворююча функції, які були направлені на відновлення пошкодженої ультраструктури. Встановлено, що через 3 години після ін'єкції суміш спиртів відбуваються реактивні зміни в структурах зорового нерву щурів, які з 1 доби переростають в патологічні зміни і спостерігаються до 14 доби з піком їх активності на 7 добу дослідження. Після застосування 100% метанолу ультраструктура зорового нерву щурів більш пошкоджена, ніж після ін'єкції суміші спиртів. Доведено, що провідне місце в розвитку патологічних змін в структурах зорового нерву після ін'єкції суміші спиртів відводиться метанолу.

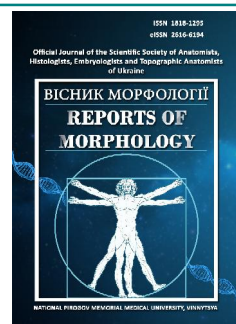
Ключові слова: ультраструктура, гліальні клітини, нервові волокна, зоровий нерв, суміш спиртів, етанол, метанол.



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Changes in the cellular composition of guinea pig's distal airways epithelium in the dynamics of experimental ovalbumin-induced allergic inflammation

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*The problem of studying the processes of restructuring of airways epithelium of humans and animals of adaptive nature under the influence of various factors on the body remains the subject of scientific discussions. The aim of this work is to study morphometric changes in the cellular composition guinea pig's distal airways epithelium in the dynamics of experimental ovalbumin-induced allergic inflammation. We studied lung of 48 male guinea pigs, using histological, morphometric and statistical methods, under conditions of experimental ovalbumin-induced allergic inflammation, simulated by subcutaneous sensitization and subsequent intranasal inhalation with ovalbumin. The average number of epithelial cells of small bronchi and terminal bronchioles was determined: basal epithelium cells, ciliated cells, goblet cells and exocrine bronchiolar cells per unit area of 10000 μm^2 . We have shown the most significant reactive morphometric changes on the 23rd and 30th days of the experiment. We demonstrated a decrease of the number of basal cells (by 1.5 times compared to the control, $p^{**}<0.01$) and ciliated cells (by 1.6 times compared to the control, $p^{**}<0.001$) and an elevation of the average number of goblet cells (by 2.6 times compared to the control, $p^{**}<0.01$) in bronchioles, a decrease of the average number of exocrine bronchiolar cells (by 1.6 times compared to the control, $p^{**}<0.01$) in terminal bronchioles. These changes are the morphological confirmation of the development of bronchial hyperreactivity as a result of the action of the allergen. Sensitization and allergization with ovalbumin cause statistically significant morphological changes in the cellular composition of small bronchi and terminal bronchioles of an alterative nature in the early period and adaptive - in the late period of allergic inflammation, corresponding to the main morphological manifestations of allergic inflammation.*

Keywords: epithelium, airways, allergic inflammation, ovalbumin, guinea pig.

Introduction

The condition of the respiratory epithelium is crucial for maintaining the health of the respiratory system and is a major barrier to various aeroallergens. While the development of allergic inflammation of the airways the epithelium is both a mediator and a target of inflammatory process. Its remodeling is the basis for airways obstruction [1, 2, 12, 14]. In addition, recent studies indicate important immunogenic and immunomodulatory functions of airways epithelium [4, 10, 17]. In particular, a triad of cytokines, including IL-25, IL-33 and TSLP, is synthesized and secreted by airway epithelial cells in response to various environmental stimuli and / or due to cell damage [13, 16]. The latter induce inflammation of airways by Th2-type and cause remodeling and pathological changes in airways

wall. This fact indicates a key role of bronchial epithelial cells in the histophysiology of allergic inflammation [3, 15]. Thus, the respiratory epithelium is not just a structural barrier, but also an "active participant" in allergic airways inflammation [9]. At the same time, a few studies investigated allergic inflammation in the chronobiological aspect is insignificant [19]. Most of the scientific works with focus on the airway epithelium in allergic inflammation, are immunological studies [5, 7, 9, 18]. All the above indicates the need to clarify this topical problem from a morphological point of view in the dynamics of experimental allergic inflammation.

The aim of this work is to study morphometric changes in the cellular composition of guinea pigs distal airways

epithelium in the dynamics of experimental ovalbumin-induced allergic inflammation.

Materials and methods

The object of the experimental study was lung, removed from 48 sexually mature male guinea pigs weighing 450-600 g, kept in standard conditions of the vivarium of the Zaporizhzhya State Medical University. All manipulations were carried out in compliance with the basic principles of working with experimental animals in accordance with the provisions of the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (Strasbourg, 1986), the General Ethical Principles for Animal Experiments adopted by the First National Congress on Bioethics (Kyiv, 2001), the Law of Ukraine "On the protection of animals from cruelty" (from 21.02.2006).

Allergic airway inflammation induced by subcutaneous sensitization and followed challenging by intranasal inhalation with ovalbumin (OVA) (Sigma Aldrich, USA). Guinea pigs were actively sensitized by subcutaneous injections into the interscapular region of ovalbumin (0.5 mg/mL) with alum (10 mg/mL in saline) as an adjuvant (AlumVax Hydroxide vaccine adjuvant, OZ Biosciences France) on days 0, 7 and 14. From 21 to 28 days of the experiment, guinea pigs were challenged for 15 min with inhalation of either OVA (10 mg/mL in saline) via a nebulizer (Little Doctor International, Singapore, LD-211C) coupled to a plastic box. We divided the animals into 6 groups (8 animals in each group). The first four groups are animals sensitized and challenged OVA, withdrawn from the experiment, respectively, on the 23rd, 30th, 36th and 44th days after its start; 5 - control group, received injections and challenged with saline only; 6 - intact group. For the purpose of rational presentation of the obtained data and their interpretation, we conditionally distinguish the early (23rd, 30th days of the experiment) and late (36th and 44th days after the start of the experiment) periods of the development of allergic inflammatory process in lung.

The animals were withdrawn from the experiment by an overdose of thiopental anesthesia (50 mg/kg) according to the established terms (23rd, 30th, 36th and 44th days of the experiment). Histological sections stained by hematoxylin-eosin. The average number of epithelial cells of small bronchi and terminal bronchioles was determined: basal epithelium cells, ciliated cells, goblet cells and exocrine bronchiolar cells per unit area of 10000 μm^2 .

The research results processed by modern statistical methods of analysis on a personal computer using the standard software package Microsoft Office 2010 (Microsoft Excel) and STATISTICA® for Windows 6.0 (StatSoft Inc., USA, license 46 No. AXXR712D833214FAN5). We use the Shapiro-Wilk test and the Kolmogorov-Smirnov test of consistency testing the hypothesis about the normal distribution of the studied parameters. We use the Kolmogorov-Smirnov homogeneity criterion testing the

hypothesis that two independent samples belong to the same distribution law. The mean (M) and standard deviation ($\pm m$) assessed. The statistical significance of intergroup differences according to the data obtained was established using the parametric Student's t-test (p^*) and the nonparametric U-Whitney-Mann test (p^{**}). Differences between the compared values at the level of 95% ($p < 0.05$) were considered statistically significant.

Results

Histological analysis revealed thickening of bronchial wall and terminal bronchioles due to edema of the respiratory mucosal layer and hypertrophy of smooth muscle cells of guinea pigs sensitized with ovalbumin compared to the intact and control groups (Fig. 1). The degree of manifestation of inflammatory changes increases as the caliber of the bronchi decreases, reaching its maximum in the terminal bronchioles (Fig. 1d). We observed, accumulation of mucus, desquamated epithelial cells with impurities of lymphocytes, neutrophils, eosinophils in airways lumen (Fig. 1b, 1d). In the composition of terminal bronchioles, especially in the places of their transition to respiratory bronchioles, we observed the presence of neuroepithelial bodies, consisted of parallel located, low-prismatic non-ciliated cells, contacted with the basal lamina and airways lumen (Fig. 1c).

There was no statistically significant difference between the average number of epithelial cells of the respiratory mucosal layer of bronchioles in animals of intact and control groups ($p^{***} > 0.05$), indicated that the experimental procedure does not affect changes in morphometric parameters of bronchiolar epithelium. There is a tendency to the thinning of bronchiolar epithelium after sensitization and inhalation with ovalbumin in the early period of development of allergic inflammation.

In animals of the 1st experimental group the average number of basal epithelium cells was 7.121 ± 0.142 in the field of view, which is statistically significantly less by 1.5 times ($p^{***} < 0.01$) in comparison with the control group. A statistically significant reduction in the average number of basal epithelium cells, compared to the control group, was also observed in animals of the 2nd experimental group - 7.501 ± 0.184 in the field of view, which is by 1.4 times ($p^{***} < 0.05$) less than the same indicator in the control group (Table 1). During the late period of the development of allergic inflammation, we observed a statistically significant elevation in the average number of basal epithelium cells of bronchioles in animals of the 3rd experimental group compared to the previous experimental group (9.752 ± 0.133 in the field of view), which is by 1.3 times more ($p^{**} < 0.05$) than the same indicator of the 2nd experimental group, shown a tendency towards a gradual normalization of this indicator. On the 44th day of observation, the average number of basal epithelium cells in bronchioles is 9.882 ± 0.101 in the field of view, which is statistically significantly more than the same indicator in

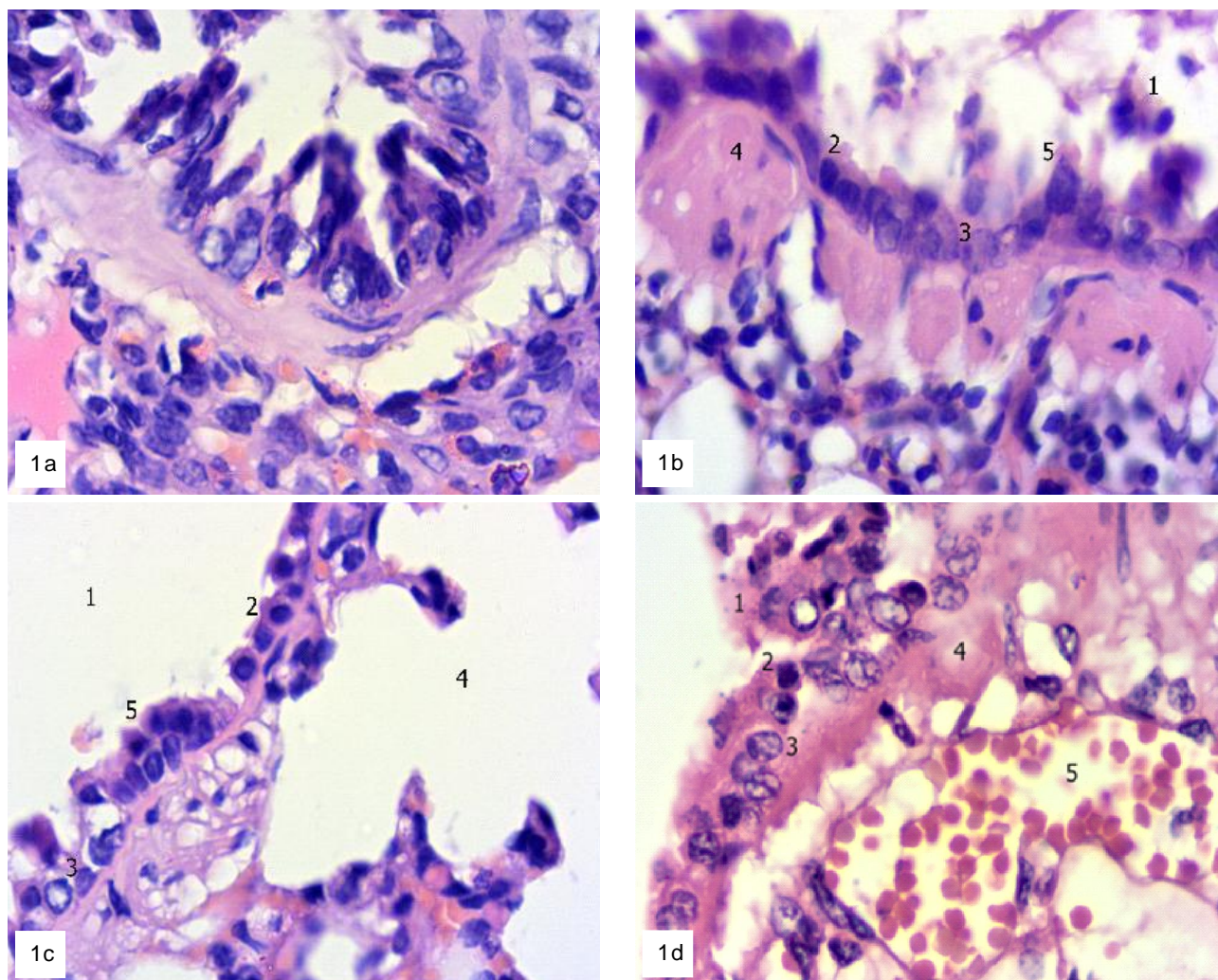


Fig. 1. Microscopic changes of the wall of the small bronchi and terminal bronchioles of guinea pigs after sensitization with ovalbumin at 23 (1d), 30 (1b) days after the start of the experiment compared with the control group (1a, 1c). 1a - small bronchus. 1b - small bronchus: 1 - desquamation of the epithelium into the lumen of the bronchus; 2 - the main epitheliocyte; 3 - bronchiolar exocrinocyte; 4 - uneven thickening of the muscular membrane; 5 - ciliated epitheliocyte. 1c terminal bronchiole: 1 - lumen; 2 - the main epitheliocyte; 3 - bronchiolar exocrinocyte; 4 - cellular duct; 5 - neuroepithelial body. 1d - terminal bronchiole: 1 - desquamation of the epithelium into the lumen; 2 - the main epitheliocyte; 3 - bronchiolar exocrinocyte; 4 - edema and uneven thickening of the muscular membrane; 5 - venule plethora. Hematoxylin-eosin. x1000.

the 2nd experimental group ($p^{**}<0.05$). We observed a statistically significant elevation in the average number of undifferentiated epithelial cells in the epithelium of terminal bronchioles in the early period of the development of allergic inflammation in animals of the 2nd experimental group - $9,621 \pm 0,091$ in the field of view, which is twice as much as in the control group. In the late period of the development of allergic inflammation on the 36th day of observation, the average number of undifferentiated epithelial cells of terminal bronchioles was $6,501 \pm 0,172$ in the field of view, which is statistically significantly less by 1.5 times ($p^{**}<0.01$) compared to the previous observation period (Table 1).

Ciliated cells normally predominate among other cells of the epithelial differon in bronchioles. They have a low-prismatic shape, the narrowed basal part contacted with

the basal lamina, the dilated apical part covered by cilia, contacted with the bronchial lumen. There are no ciliated cells in the epithelium of terminal bronchioles of guinea pigs. There was no statistically significant difference between the average number of ciliated cells of bronchioles in animals of intact and control groups ($p^{**}>0.05$). Sensitization and inhalation with ovalbumin led to a statistically significant reduction in the number of ciliated cells during the early period of development of ovalbumin-induced allergic airways inflammation. On the 23rd day in the 1st experimental group, the average number of ciliated cells of bronchioles of guinea pigs was $9,752 \pm 0,112$ in the field of view, which is by 1.6 times statistically significantly less ($p^{**}<0.001$), compared to the control group. In animals of the 2nd experimental group, the average number

Table 1. Morphometric parameters of epithelium of bronchioles and terminal bronchioles of guinea pigs after sensitization with ovalbumin.

Group		I		II		III		IV
1	A	7.121±0.142 ^{*/**}	A	9.752±0.112 ^{*/**}	A	4.501±0.093 ^{*/**}	A	3.622±0.131 ^{*/**}
	B	4.622±0.161	B	-	B	11.75±0.26 ^{*/**}	B	-
2	A	7.501±0.184 ^{*/**}	A	10.12±0.27 ^{*/**}	A	8.122±0.101	A	4.251±0.113 ^{*/**}
	B	9.621±0.091 ^{*/**}	B	-	B	11.88±0.25 ^{*/**}	B	-
3	A	9.752±0.133	A	12.62±0.14 ^{*/**}	A	9.001±0.201	A	3.251±0.072 ^{*/**}
	B	6.501±0.172	B	-	B	12.01±0.27 ^{*/**}	B	-
4	A	9.882±0.101	A	15.38±0.14	A	7.253±0.112	A	1.623±0.051
	B	5.382±0.161	B	-	B	17.75±0.28	B	-
5	A	10.38±0.10	A	15.25±0.16	A	7.501±0.103	A	1.622±0.071
	B	4.751±0.082	B	-	B	18.52±0.24	B	-
6	A	10.25±0.17	A	15.75±0.27	A	7.252±0.103	A	1.881±0.061
	B	4.621±0.101	B	-	B	18.88±0.20	B	-

Notes: * - p<0.05 (Student's t-test); ** - p<0.05 (Whitney-Mann U-test) compared to the control group (M±m, n=8). A - bronchiole; B - terminal bronchiole. I - the average number of basal/undifferentiated epithelium cells /10000 μm²; II - the average number of ciliated cells/10000 μm²; III - the average number of exocrine bronchiolar cells/10000 μm²; IV - the average number of goblet cells/10000 μm².

of ciliated cells of bronchioles was 10.12±0.27 in the field of view, which is by 1.5 times (p^{*/**}<0.01) less than in the control group. In animals of the 3rd experimental group, the average number of ciliated cells was 12.62±0.14 in the field of view, which is by 1.2 times (p^{*/**}<0.05) less than in the control group, but statistically significantly more (p^{**}<0.05) compared to the previous group. On the 44th day of observation, the average number of ciliated cells was 15.38±0.14 in the field of view, which is by 1.2 times statistically significantly more (p^{*/**}<0.05), compared to the same indicator in the 3rd experimental group.

Exocrine bronchiolar cells occupied mainly terminal and respiratory bronchioles, have a cubic or pyramidal shape, a light nucleus, their apical part protruding into the lumen of terminale bronchiole. A statistically significant decrease in the average number of exocrine bronchiolar cells of bronchioles, compared to the control group, is observed only in the early period of development of allergic inflammation in animals of the 1st experimental group - 4,501±0,09 in the field of view, which is by 1.6 times (p^{*/**}<0.01) less than the same indicator in the control group. During the following periods of observation, there was a gradual elevation of this indicator. In animals of the 2nd experimental group, the average number of exocrine bronchiolar cells in bronchioles was 8,122±0,101 in the field of view, which is by 1.8 times (p^{*/**}<0.001) more than the same indicator of the previous observation period. We also observed a statistically significant decrease in the average number of exocrine bronchiolar cells in terminal bronchioles compared to the control group. In the early period of the development of allergic inflammation in animals of the 1st experimental group, the average number of exocrine bronchiolar cells in terminal bronchioles was 11.75±0.26 in the field of view, which is by 1.6 times (p^{*/**}<0.01) less than the same indicator in the control group.

By the end of the experiment, the average number of exocrine bronchiolar cells was restored to the control indicator. So, in animals of the 4th experimental group, the average number of exocrine bronchiolar cells of terminal bronchioles was 17.75±0.28 in the field of view, which is by 1.5 times (p^{*/**}<0.05) more than the same indicator of previous group.

We have shown the most significant morphometric changes relative to goblet cells of respiratory mucosal layer of bronchioles of guinea pigs after sensitization and aeroallergization with ovalbumin. In animals of the 1st experimental group, the average number of goblet cells was 3,622±0,131 in the field of view, which is statistically significantly more by 2.2 times (p^{*/**}<0.05) than the same indicator in the control group. A statistically significant elevation in the average number of goblet cells of guinea pigs' bronchioles, compared to the control group, is also observed in animals of the 2nd experimental group - 4,251±0,113 in the field of view, which is by 2.6 times (p^{*/**}<0.01) more than the same indicator in the control group. There is a tendency towards a decrease in the number of goblet cells of respiratory mucosal layer in bronchioles and the return of this indicator to normal parameters by the end of the experiment during the late period of the development of allergic inflammation. A statistically significant increase in the average number of goblet cells in bronchioles in comparison with the control group in animals of the 3rd experimental group is 3,251±0,072 in the field of view, which is by 2 times more (p^{*/**}<0.01) than the same indicator in the control group. On the 44th day of observation, the average number of goblet cells in bronchioles was 1,623±0,051 in the field of view, which is statistically significantly less (p^{*/**}<0.01) compared to the 3rd experimental group. There are no goblet cells in guinea pigs' terminal bronchioles.

Discussion

Thus, this study has reported the regularity of changes in the cellular composition of the epithelium in bronchioles and terminal bronchioles in the dynamics of allergic inflammation. We have noted the most significant reactive morphometric changes on the 23rd and 30th days of observation detected in the form of the decrease in the number of basal and ciliated cells and the magnification in the average number of goblet cells in the epithelium of bronchioles, as well as a decrease in the average number of exocrine bronchiolar cells in terminal bronchioles. In our opinion, this is due to alterative phenomena in the early period of development of allergic inflammation of the airways, namely, desquamation of the epithelial layer. Hypertrophy and hyperplasia of goblet cells is a morphological confirmation of the development of bronchial hyperreactivity as a result of the action of an allergen, primarily associated with the action of CGRP (calcitonin gene-related peptide) of respiratory endocrine cells - pro-inflammatory cells. CGRP activates type 2 innate lymphoid cells. These results were in agreement with previous studies [4, 12, 14]. Another secretory product of the neurotransmitter, γ -aminobutyric acid GABA, interacts with IL-13 to activate the secretion of goblet cells mucus. In this case, innate lymphoid cells type II release a large amount of type 2 cytokines after cytokine stimulation of epithelial cells of respiratory mucosal layer (IL-25, IL-33, TSLP) [16, 17]. Recent studies have shown that these cells in lung of small mammals are the main source of IL-5 and IL-13; therefore, it is logical to assume that they are directly involved in the induction of allergic inflammatory process [13, 16, 20]. IL-5 of innate lymphoid cells type II activates eosinophils, promoting the elevation of their number in the connective tissue of lung. The latter, in turn, increase the secretion of mucus by goblet cells and stimulate hypertrophy and contraction of smooth muscle cells. IL-13 of innate lymphoid cells type II directly affects goblet cells, stimulating their hyperplasia and increased mucus secretion [6, 8]. The decrease in the number of exocrine bronchiolar cells in the epithelium of distal airways of guinea

pigs is a confirmation of the alteration of airways due to allergic inflammation. A similar trend of morphological changes in the bronchioles is suggested by other scientists [3, 12, 13, 17]. Exocrine bronchiolar cells perform specialized functions necessary to protect the body in a normal state, but retain the ability to proliferate in response to injury. We consider this population of cells to be facultative progenitor cells of distal airways and the respiratory part of lung, which also was reported by previous scientific data [7]. It is bronchiolar exocrinocytes that provide epithelial renewal after damage to ciliated cells and other cellular phenotypes that we have shown during the late period of allergic inflammation. Exocrine bronchiolar cells in lung also have anti-inflammatory immunomodulatory effect, produce surfactant components SP-A, SP-B, SP-D. These hydrophobic proteins prevent bronchiole wall adhesion and airway collapse at this level. The secretory protein of exocrine bronchiolar cells CC16 regulates the immune response in lung to various allergens. Thus, by influencing the activity of certain cellular phenotypes of the airway epithelium, it is possible to reduce the intensity of allergic inflammatory process, which opens new perspectives in the treatment of bronchial asthma [11].

We are going to study ultramicroscopic changes in epithelial cells of bronchioles and terminal bronchioles of guinea pigs with allergic inflammation.

Conclusions

1. It was found that sensitization and allergization with ovalbumin in experimental animals caused statistically significant morphological changes in the cellular composition of bronchioles and terminal bronchioles: alterative - in the early period, adaptive - in the late period of allergic inflammation, demonstrated the main morphological manifestations of allergic inflammation.

2. Confirmation of the development of hyperreactivity of bronchioles and terminal bronchioles in experimental animals is hypertrophy and hyperplasia of goblet cells, most pronounced during the early period of development of allergic inflammation.

References

- [1] Ahmed, Zaky, E., Fouda, E.M., & Kamel, T.B. (2018). Assessment of small airway impairment in relation to pediatric asthma control and bronchial hyper-responsiveness. *QJM: An International Journal of Medicine*, 111(1). <https://doi.org/10.1093/qjmed/hcy200.132>
- [2] Banno, A., Reddy, Aravind, T., Lakshmi, Sowmya, P., & Reddy, Raju C. (2020). Bidirectional interaction of airway epithelial remodeling and inflammation in asthma. *Clinical Science*, 134(9), 1063-1079. <https://doi.org/10.1042/cs20191309>
- [3] Barrios, J., Kho, A.T., Aven, L., Mitchel, J.A., Park, J.-A., Randell, S.H. ... Ai, X. (2019). Pulmonary Neuroendocrine Cells Secrete γ -Aminobutyric Acid to Induce Goblet Cell Hyperplasia in Primate Models. *American Journal of Respiratory Cell and Molecular Biology*, 60(6), 687-694. <https://doi.org/10.1165/rcmb.2018-0179oc>
- [4] Bartemes, K.R., & Kita, H. (2012). Dynamic role of epithelium-derived cytokines in asthma. *Clinical Immunology*, 143(3), 222-235. <https://doi.org/10.1016/j.clim.2012.03.001>
- [5] Bonser, L.R., & Erle, D.J. (2019). The airway epithelium in asthma. *Advances in Immunology*, 142, 1-34. <https://doi.org/10.1016/bs.ai.2019.05.001>
- [6] Branchfield, K., Nantie, L., Verheyden, J. M., Sui, P., Wienhold, M. D., & Sun, X. (2016). Pulmonary neuroendocrine cells function as airway sensors to control lung immune response. *Science*, 351(6274), 707-710. <https://doi.org/10.1126/science.aad7969>
- [7] Davis, J. D., & Wypych, T. P. (2021). Cellular and functional heterogeneity of the airway epithelium. *Mucosal Immunology*, 14(5), 978-990. <https://doi.org/10.1038/s41385-020-00370-7>
- [8] Denney, L., Byrne, A.J., Shea, T.J., Buckley, J.S., Pease, J.E., Herledan, G.M.F. ... Lloyd, C.M. (2015). Pulmonary Epithelial Cell-Derived Cytokine TGF- β 1 Is a Critical Cofactor for

- Enhanced Innate Lymphoid Cell Function. *Immunity*, 43(5), 945-958. <https://doi.org/10.1016/j.immuni.2015.10.012>
- [9] Frey, A., Lunding, L.P., Ehlers, J.C., Weckmann, M., Zissler, U.M., & Wegmann, M. (2020). More Than Just a Barrier: The Immune Functions of the Airway Epithelium in Asthma Pathogenesis. *Frontiers in Immunology*, 11, 761. <https://doi.org/10.3389/fimmu.2020.00761>
- [10] Gon, Y., & Hashimoto, S. (2018). Role of airway epithelial barrier dysfunction in pathogenesis of asthma. *Allergology International*, 67(1), 12-17. <https://doi.org/10.1016/j.alit.2017.08.011>
- [11] Gras, D., Chanez, P., Vachier, I., Petit, A., & Bourdin, A. (2013). Bronchial epithelium as a target for innovative treatments in asthma. *Pharmacology & Therapeutics*, 140(3), 290-305. <https://doi.org/10.1016/j.pharmthera.2013.07.008>
- [12] Han, Y., Chen, L., Liu, H., Jin, Z., Wu, Y., Wu, Y. ... Yan, F. (2020). Airway Epithelial cGAS Is Critical for Induction of Experimental Allergic Airway Inflammation. *The Journal of Immunology*, 204(6), 1437-1447. <https://doi.org/10.4049/jimmunol.1900869>
- [13] Holgate, S.T. (2008). The Airway Epithelium is Central to the Pathogenesis of Asthma. *Allergology International*, 57(1), 1-10. <https://doi.org/10.2332/allergolint.r-07-154>
- [14] Lambrecht, B.N., & Hammad, H. (2014). The immunology of asthma. *Nature Immunology*, 16(1), 45-56. <https://doi.org/10.1038/ni.3049>
- [15] Li, S., Koziol-White, C., Jude, J., Jiang, M., Zhao, H., Cao, G. ... Morrissey, E. E. (2016). Epithelium-generated neuropeptide Y induces smooth muscle contraction to promote airway hyperresponsiveness. *Journal of Clinical Investigation*, 126(5), 1978-1982. <https://doi.org/10.1172/jci81389>
- [16] Li, Y.-L., Li, H.-J., Ji, F., Zhang, X., Wang, R., Hao, J.-Q. ... Dong, L. (2010). Thymic Stromal Lymphopoietin Promotes Lung Inflammation Through Activation of Dendritic Cells. *Journal of Asthma*, 47(2), 117-123. <https://doi.org/10.3109/02770900903483816>
- [17] Mitchel, J.A., Antoniak, S., Lee, J.-H., Kim, S.-H., McGill, M., Kasahara, D.I. ... Park, J.-A. (2016). IL-13 Augments Compressive Stress-Induced Tissue Factor Expression in Human Airway Epithelial Cells. *American Journal of Respiratory Cell and Molecular Biology*, 54(4), 524-531. <https://doi.org/10.1165/rcmb.2015-0252oc>
- [18] Moro, K., Kabata, H., Tanabe, M., Koga, S., Takeno, N., Mochizuki, M. ... Koyasu, S. (2015). Interferon and IL-27 antagonize the function of group 2 innate lymphoid cells and type 2 innate immune responses. *Nature Immunology*, 17(1), 76-86. <https://doi.org/10.1038/ni.3309>
- [19] Popko, S.S., & Evtushenko, V.M. (2020). Morphometric characteristics of distal airways of guinea pigs sensitized with ovalbumin. *Reports of Morphology*, 26(4), 42-47. [https://doi.org/10.31393/morphology-journal-2020-26\(4\)-07](https://doi.org/10.31393/morphology-journal-2020-26(4)-07)
- [20] Popko, S.S., Evtushenko, V.M., & Syrtsov, V.K. (2020). Influence of pulmonary neuroendocrine cells on lung homeostasis. *Zaporozhye Medical Journal*, 22(4), 568-575. <https://doi.org/10.14739/2310-1210.4.208411>

ЗМІНИ КЛІТИННОГО СКЛАДУ ЕПІТЕЛІЮ ДИСТАЛЬНИХ ВІДДІЛІВ ДИХАЛЬНИХ ШЛЯХІВ МОРСЬКИХ СВИНОК В ДИНАМІЦІ ЕКСПЕРИМЕНТАЛЬНОГО ОВАЛЬБУМІН-ІНДУКОВАНОГО АЛЕРГІЧНОГО ЗАПАЛЕННЯ

Попко С.С.

Проблема вивчення процесів перебудови епітеліального шару дихальних шляхів людини і тварин адаптаційного характеру при дії на організм різноманітних чинників як і раніше залишається предметом наукових дискусій. Мета роботи - дослідити морфометричні зміни клітинного складу епітелію дистальних відділів дихальних шляхів морських свинок в динаміці експериментального овальбумін-індукованого алергічного запалення. За допомогою гістологічного, морфометричного та статистичного методів вивчили легені 48 самців морської свинки в умовах експериментального овальбумін-індукованого алергічного запалення, яке моделювали шляхом підшкірної сенсibiliзації та наступної інтраназальної інгаляції овальбуміном. Визначали середню кількість епітеліоцитів дихальної слизової оболонки малих бронхів і термінальних бронхіол: основних, в'їчастих епітеліоцитів, келихоподібних та бронхіюлярних екзокриноцитів на одиницю площі 10000 мкм². Найбільш значимі реактивні морфометричні зміни встановлено на 23 і 30 добу спостереження у вигляді зменшення кількості основних (у 1,5 рази порівняно з контролем, $p^{**}<0,01$) та в'їчастих епітеліоцитів (в 1,6 рази порівняно з контролем, $p^{**}<0,001$) і зростання середньої кількості келихоподібних екзокриноцитів (в 2,6 рази порівняно з контролем, $p^{**}<0,01$) у складі епітелію малих бронхів, а також зменшення середньої кількості бронхіюлярних екзокриноцитів (в 1,6 рази порівняно з контролем, $p^{**}<0,01$) у складі термінальних бронхіол, що є морфологічним підтвердженням розвитку бронхіальної гіперреактивності у результаті дії алергена. Таким чином, сенсibiliзація та алергізація овальбуміном викликають статистично значимі морфологічні зміни клітинного складу малих бронхів і термінальних бронхіол альтернативного характеру в ранньому періоді та адаптаційного - в пізньому періоді алергічного запалення, що відповідають основним морфологічним проявам алергічного запалення.

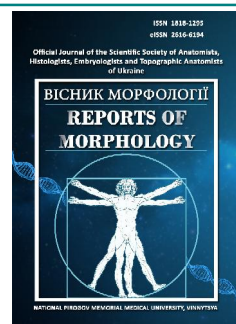
Ключові слова: епітелій, дихальні шляхи, алергічне запалення, овальбумін, морська свинка.



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Features of total and longitudinal body sizes in men with benign nevi

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The use of anthropometric markers to predict the onset or severity of the disease is key to solving the problem of preventive medicine and can be an indispensable tool in preventive examinations in schools, universities and industries. The purpose of the study was to establish total and longitudinal body sizes in men of the first mature age with benign nevi. Anthropometry (determination of total and longitudinal body sizes) was performed according to Bunak's scheme for men (aged 22-35 years) patients with melanocytic benign simple nevi (n=34), melanocytic benign dysplastic nevi (n=27), melanocytic benign congenital nevi (n=14) and non-melanocytic benign nevi (n=17). As a control from the data bank of the research center of National Pirogov Memorial Medical University, Vinnytsya selected total and longitudinal body sizes of 82 practically healthy men of the same age group. Statistical processing of the obtained results was performed in the license package "Statistica 5.5" using non-parametric evaluation methods. It was found that the mass and surface area of the body in healthy men is lower than in patients (except for dysplastic nevi), and in patients with dysplastic nevi - lower than in patients with non-melanocytic nevi; the height of the suprathoracic, acromial and finger anthropometric points in healthy men is lower than in patients with nevi (except for the height acromial point in patients with dysplastic nevi), and the height of the pubic and acetabular anthropometric points - in healthy men is greater than in patients with simple (only pubic point) and dysplastic nevi; in addition, the height of the pubic and acetabular anthropometric points in patients with simple nevi is lower than in patients with non-melanocytic nevi and congenital nevi (only for the acetabulum height). Given the height of anthropometric points and the fact that body length between healthy and sick men has no significant or tendency differences, in sick men we observe a longer torso and shorter lower extremities (most pronounced in patients with simple and dysplastic nevi), which is a manifestation of "subpathological" constitutional types, which indicate a longer torso and shorter lower extremities.

Keywords: benign nevi, total body sizes, longitudinal body sizes, men.

Introduction

Perhaps the most urgent task of medicine of this century is to prevent the disease by modifying the patient's life, or if this is not possible, to alleviate the severity of the disease. However, achieving this goal from a practical point of view is currently practically impossible due not only to the high cost of the study and the requirements for the availability of modern DNA laboratory. Moreover, there can be no question of using this method as a screening among the general population.

That is why clinical anthropology is becoming more widespread, which allows to predict the risks of certain diseases [5], the severity of their course, features of psychoneurological status [3], ethnic and regional affiliation of the person [11] and so on.

In this case, anthropometry is a simple method of examination that does not require long and complex training, material resources or highly developed laboratory and instrumental facilities. Instead, physicians have the opportunity to apply the scientific advances of clinical anthropology in the examination of large masses of the population, in particular, during preventive examinations, which in the future, after processing the information obtained, will create risk groups.

One of the areas of medicine that needs such a powerful preventive tool is oncodermatology, which studies both benign and malignant skin tumors. Benign melanocytic nevi in this group of diseases occupy an important place. Their prevalence is quite heterogeneous and varies from

0.5% to 31.7% of the population in different countries; in newborns, nevi are found in one of 20,000-500,000 births; the ratio of men and women with benign nevi is about 3:2; transformation of benign nevi into melanoma occurs according to some authors in 19-21% of cases, although most authors tend to 1% [1].

In the field of external genitalia in women, the frequency of detection of nevi is 2%, which in turn is 23% of all pigmented tumors in this area. Researchers have also noted frequent cases of malignancy of these nevi with the formation of melanoma [17].

The anthropometric method has proven itself well in research on different types of cancer and their different localizations, in particular, successful data have been obtained on cancer of the head and neck, stomach, colon, pancreas, esophagus, lungs, liver, bladder, kidneys, uterus [5, 9].

Given the possibility of malignancy of such benign skin neoplasms as melanocytic nevi, and the successful experience of foreign researchers to study anthropometric indicators in various cancers, there is a need to study the features of these indicators in people with benign nevi.

The purpose of the study was to establish total and longitudinal body sizes in men of the first mature age with benign nevi.

Materials and methods

Men of the first mature age (22-35 years) with melanocytic benign simple nevi (n=34), melanocytic benign dysplastic nevi (n=27), melanocytic benign congenital nevi (n=14) and melanocytic benign nevi (n=17), who underwent clinical-laboratory and pathohistological examinations on the basis of the Military Medical Clinical Center of the Central Region and the Department of Skin and Venereal Diseases with a course of postgraduate education of National Pirogov Memorial Medical University, Vinnytsya, anthropometry was performed according to the scheme of V.V.Bunak [7].

Diagnosis of nevi was performed according to a two-stage algorithm for the classification of pigmented tumors, which was adopted at the First World Congress of Dermatoscopy (Rome, 2001) [18].

As a control from the database of the research center of the National Pirogov Memorial Medical University, Vinnytsya were selected total and longitudinal body sizes of 82 practically healthy men of the same age group.

Statistical processing of the obtained results was performed in the license package "Statistica 5.5" using non-parametric evaluation methods. The reliability of the difference between the values between the independent quantitative values was determined using the Mann-Whitney U-test.

Results

It was found that body weight in healthy men is significantly (p<0.05-0.001) lower than in men with

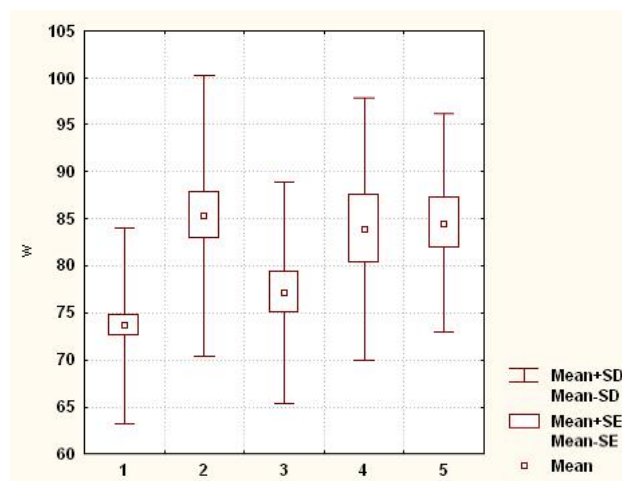


Fig. 1. Body weight (W) in healthy and sick men with melanocytic nevi (kg). In this and the following figures: 1 - healthy men; 2 - men with melanocytic benign simple nevi; 3 - men with melanocytic benign dysplastic nevi; 4 - men with melanocytic benign congenital nevi; 5 - men with non-melanocytic benign nevi; Mean - average value; Mean ± SE - average value ± mean error; Mean±SD - mean ± standard deviation.

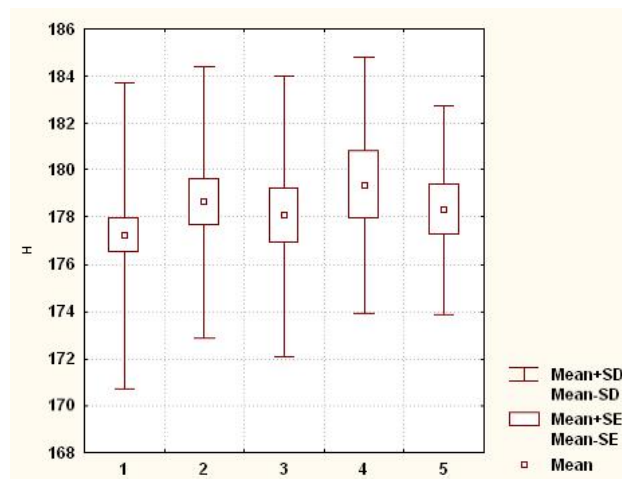


Fig. 2. Body length (H) in healthy and sick men with melanocytic nevi (cm).

melanocytic benign simple and congenital nevi and non-melanocytic benign nevi, and in men with melanocytic benign dysplastic nevi - significantly lower (p<0.05) and tends (p=0.054) to lower values than in patients with melanocytic benign simple and non-melanocytic benign nevi (Fig. 1).

There are no reliable or tendencies of differences between healthy and sick, or between men with benign nevi (Fig. 2).

Body surface area, as well as body weight, in healthy men is significantly (p<0.05-0.001) lower than in men with melanocytic benign simple and congenital nevi and non-melanocytic benign nevi, and in men with melanocytic benign dysplastic nevi - significantly smaller (p<0.05) and tends (p=0.075) to lower values than in patients with

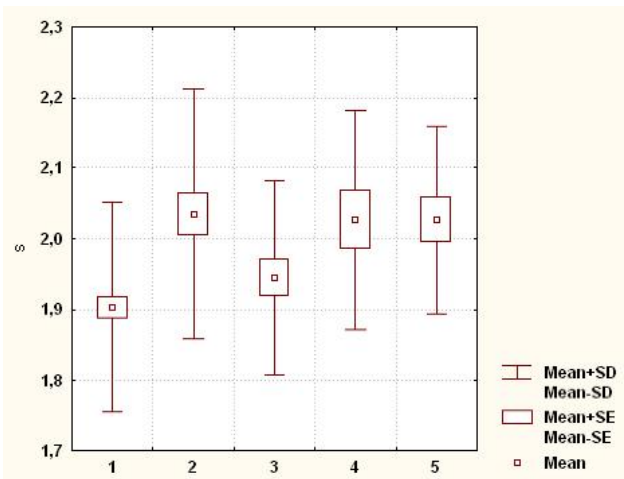


Fig. 3. Body surface area (S) in healthy and sick men with melanocytic nevi (m²).

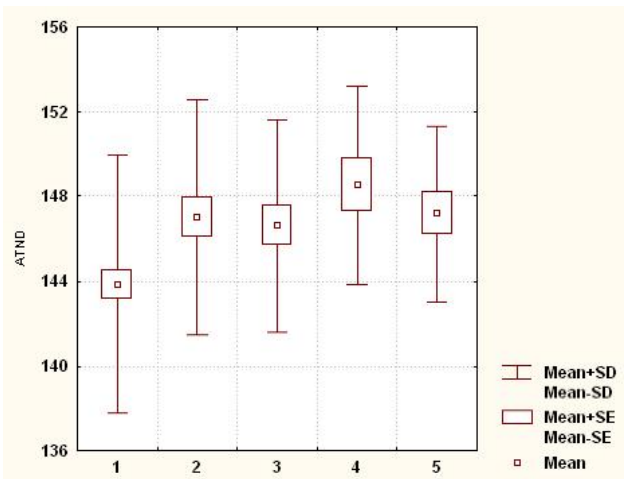


Fig. 4. Height of the suprathoracic anthropometric point (ATND) in healthy and sick men with melanocytic nevi (cm).

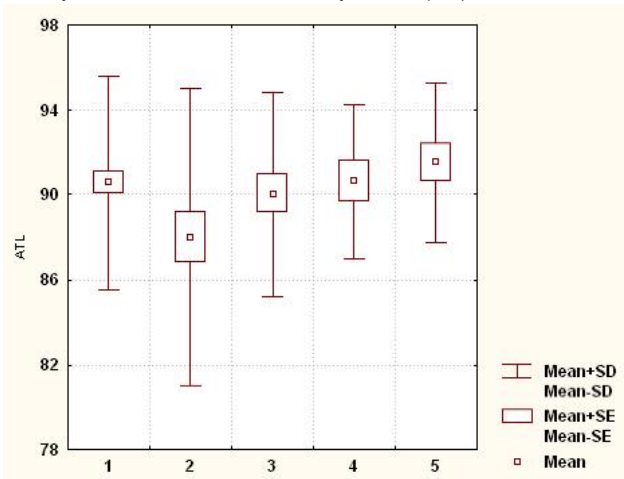


Fig. 5. Height of the pubic anthropometric point (ATL) in healthy and sick men with melanocytic nevi (cm).

melanocytic benign simple and non-melanocytic benign nevi (Fig. 3).

The height of the suprachoroidal anthropometric point in healthy men is significantly ($p < 0.05-0.01$) lower than in men with melanocytic benign simple, dysplastic and congenital nevi and non-melanocytic benign nevi (Fig. 4).

The height of the pubic anthropometric point in patients with melanocytic benign simple nevi of men is significantly ($p < 0.05$) lower than in healthy and patients with non-melanocytic benign nevi of men (Fig. 5).

The height of the acromial anthropometric point in healthy men is significantly ($p < 0.05$) lower and tends ($p = 0.064$) to lower values than in men with melanocytic benign simple and congenital nevi and non-melanocytic benign nevi (Fig. 6).

The height of the finger anthropometric point in healthy men is significantly ($p < 0.05-0.001$) lower than in men with melanocytic benign simple, dysplastic and congenital nevi and non-melanocytic benign nevi (Fig. 7).

The height of the acetabular anthropometric point in healthy men is significantly ($p < 0.01-0.001$) greater than in

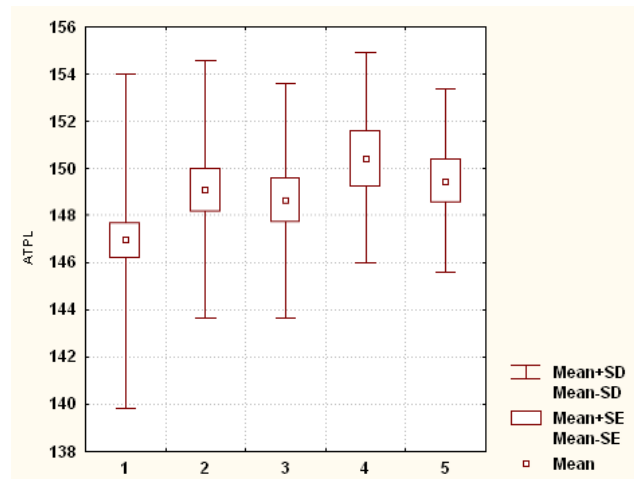


Fig. 6. Height of acromial anthropometric point (ATPL) in healthy and sick men with melanocytic nevi (cm).

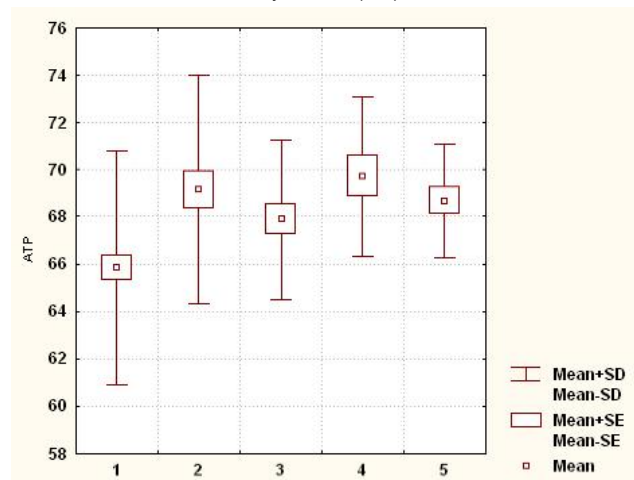


Fig. 7. Height of the finger anthropometric point (ATP) in healthy and sick men with melanocytic nevi (cm).

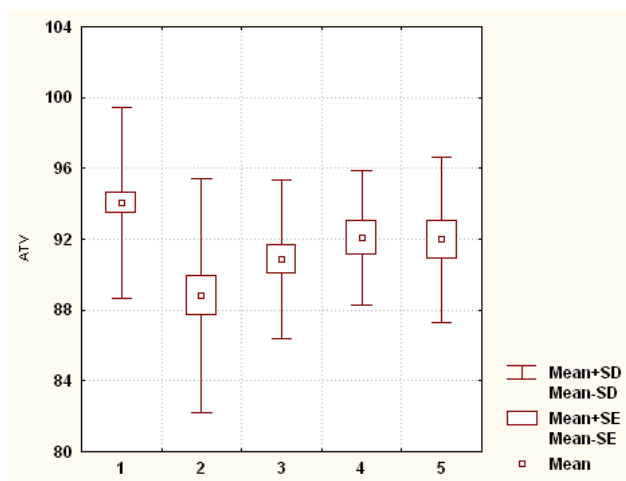


Fig. 8. Height of the acetabular anthropometric point (ATV) in healthy and sick men with melanocytic nevi (cm).

men with melanocytic benign simple and dysplastic nevi, and in men with melanocyte benign simple nevi - significantly lower ($p < 0.05$) than in patients with melanocytic benign congenital and non-melanocytic benign nevi (Fig. 8).

Discussion

In the analysis of total and longitudinal body size between healthy and patients with benign nevi men found (Table 1): body weight and surface area in healthy men is significantly smaller than in patients (except for melanocyte benign dysplastic nevi); the height of the suprathoracic, acromial and finger anthropometric points in healthy men is significantly less or tends to lower values than in patients with nevi (except for the acromial point in men with melanocyte benign dysplastic nevi), and the height of the

Table 1. Differences in total and longitudinal body size between healthy and sick with benign nevi, as well as between sick men.

Indicators	Healthy	Sick			
		MSN	MDN	MCN	NM
Body weight	N	D	-	D	D-
Body surface area	N	D	-	D	D-
Body length					
Height of the suprathoracic point	N	D	D	D	D
Pubic point height	D	N	N		N
The height of the acromial point	N-	-		D	D
The height of the finger point	N	D	D	D	D
The height of the acetabular point	D	N	N	D	D

Notes: MSN - melanocytic benign simple nevi; MDN - melanocytic benign dysplastic nevi; MCN - melanocytic benign congenital nevi; NM - non-melanocytic benign nevi; **D** or **N** - significant differences between healthy and sick men; **-** or **-** - trends in differences between healthy and sick men; **D** or **N** - significant differences in performance between sick men; **-** or **-** - tendencies of differences of indicators between sick men.

pubic and acetabular men are significantly larger than in patients with melanocyte benign simple (pubic point only) and dysplastic nevi. Given the height of anthropometric points and the fact that body length between healthy and sick men has no significant or tendency to differ, in sick men we observe a longer torso and shorter lower extremities (most pronounced in patients with melanocytic benign simple and dysplastic nevi).

In the analysis of total and longitudinal body sizes between men with benign nevi, it was found (see Table 1): body weight and surface area in patients with melanocytic benign dysplastic nevi tend to be lower than in patients with non-melanocytic benign nevi; the height of the pubic and acetabular anthropometric points in patients with melanocytic benign simple nevi is significantly lower than in patients with non-melanocytic benign nevi and melanocytic benign congenital nevi (only for the acetabulum point).

Foreign authors have obtained convincing research results that confirm the relationship between anthropometric indicators and a particular cancer type. Mexican researchers have found that height, BMI, waist, thighs circumferences and their ratio are associated with the risk of breast cancer (from $p < 0.001$ to $p < 0.016$) [2]. Similar data on the relationship of anthropometric parameters with the risk of breast cancer have been found in other works [12, 21].

In addition, an association was found between waist circumference and BMI and the risk of ovarian cancer [4], BMI, WHR and the risk of prostate cancer [6], BMI, WHR in different age categories and the risk of pancreatic cancer [10], BMI, hip circumference and abdominal circumference in both men and women and the risk of colorectal cancer [13, 22], waist and hip circumference, BMI in non-smokers and the risk of lung cancer [15], BMI, weight, hip circumference, waist circumference, WHR and the ratio of waist circumference to the growth and risk of bladder cancer [19] and BMI, WHR and the risk of thyroid cancer [20].

At the same time, studies on about anthropometric parameters in people with benign or malignant skin tumors are quite small in number, and most of the work presented in scientometric databases relate to patients with melanoma.

A long-term survey of 71,645 postmenopausal women found that 18.6% of them developed skin cancer over time. An anthropometric examination found that a body mass index (BMI) ≥ 25 kg/m² or a waist-to-thigh ratio (WHR) ≥ 0.80 was associated with a lower risk of skin cancer [8].

M. Kvaskoff and co-authors [14] established a relationship between the risk of melanoma of the skin and age (RR = 1.27, 95% CI=1.05-1.55 for ≥ 164 cm vs. < 160 cm; $p = 0.02$). These data were confirmed by K.D.Meyle and others [16]. They found an association between growth at age 13 and the risk of melanoma in adulthood.

Thus, the data obtained as a result of our study not only agree with the data of other foreign studies but also

complement the few theoretical data of clinical anthropology related to the study of oncodermatology.

Conclusions

1. Numerous differences of total and longitudinal body sizes have been established between healthy and sick men with benign nevi, which reflect the manifestations of

"subpathological" constitutional types in patients, namely, a longer torso and shorter lower extremities.

2. Differences between men with different benign nevi mainly concern the shorter lower extremities in men with melanocytic benign simple nevi compared to non-melanocytic and melanocytic congenital nevi.

References

- [1] Alikhan, A., Ibrahim, O.A., & Eisen, D.B. (2012). Congenital melanocytic nevi: where are we now?: part I. Clinical presentation, epidemiology, pathogenesis, histology, malignant transformation, and neurocutaneous melanosis. *Journal of the American Academy of Dermatology*, 67(4), 495.e1-495.e17. doi: 10.1016/j.jaad.2012.06.023
- [2] Amadou, A., Mejia, G.T., Fagherazzi, G., Ortega, C., Angeles-Llerenas, A., Chajes, V. ... Romieu, I. (2014). Anthropometry, silhouette trajectory, and risk of breast cancer in Mexican women. *American Journal of Preventive Medicine*, 46(3), S52-S64. doi: 10.1016/j.amepre.2013.10.024
- [3] Andriievskiy, I.I., Serebrennikova, O.A., Kyrychenko, I.M., Zhuchenko, I.I., & Gunas, V.I. (2020). Correlations of body structure and size indicators with personality indicators of practically healthy women with mesomorphic somatotype. *Biomedical and Biosocial Anthropology*, (39), 35-44. doi: 10.31393/bba39-2020-06
- [4] Aune, D., Navarro Rosenblatt, D.A., Chan, D.S.M., Abar, L., Vingeliene, S., Vieira, A.R. ... Norat, T. (2015). Anthropometric factors and ovarian cancer risk: A systematic review and nonlinear dose-response meta-analysis of prospective studies. *International Journal of Cancer*, 136(8), 1888-1898. doi: 10.1002/ijc.29207
- [5] Bandera, E.V., Fay, S.H., Giovannucci, E., Leitzmann, M.F., Marklew, R., McTiernan, A. ... World Cancer Research Fund International Continuous Update Project Panel. (2016). The use and interpretation of anthropometric measures in cancer epidemiology: A perspective from the world cancer research fund international continuous update project. *International Journal of Cancer*, 139(11), 2391-2397. doi: 10.1002/ijc.30248
- [6] Boehm, K., Sun, M., Larcher, A., Blanc-Lapierre, A., Schiffmann, J., Graefen, M. ... Karakiewicz, P.I. (2015). Waist circumference, waist-hip ratio, body mass index, and prostate cancer risk: results from the North-American case-control study Prostate Cancer & Environment Study. *In Urologic Oncology: Seminars and Original Investigations*, 33(11), 494-e1. doi: 10.1016/j.urolonc.2015.07.006
- [7] Bunak, V.V. (1941). *Антропометрия [Anthropometry]*. М.: Наркомпрос РСФСР - М.: People's Commissariat of the RSFSR.
- [8] Chan, A.A., Noguti, J., Pak, Y., Qi, L., Caan, B., Going, S. ... Lee, D.J. (2019). Interaction of body mass index or waist to hip ratio and sun exposure associated with nonmelanoma skin cancer: A prospective study from the Women's Health Initiative. *Cancer*, 125(7), 1133-1142. doi: 10.1002/cncr.31810
- [9] Christakoudi, S., Tsilidis, K.K., Evangelou, E., & Riboli, E. (2021). A Body Shape Index (ABSI), hip index, and risk of cancer in the UK Biobank cohort. *Cancer Medicine*, 10(16), 5614-5628. doi: 10.1002/cam4.4097
- [10] Genkinger, J.M., Spiegelman, D., Anderson, K.E., Bernstein, L., Van Den Brandt, P.A., Calle, E.E. ... Warner, S.A. (2011). A pooled analysis of 14 cohort studies of anthropometric factors and pancreatic cancer risk. *International Journal of Cancer*, 129(7), 1708-1717. doi: 10.1002/ijc.25794
- [11] Gunas, V.I., Mishalov, V.D., Serebrennikova, O.A., Klimas, L.A., & Shayuk, A.V. (2018). Palmar dermatoglyphics of modern Ukrainians: regional trends. *Biomedical and Biosocial Anthropology*, (31), 11-17. doi: 10.31393/bba31-2018-02
- [12] His, M., Biessy, C., Torres-Mejia, G., Angeles-Llerenas, A., Alvarado-Cabrero, I., Sánchez, G.I. ... Rinaldi, S. (2020). Anthropometry, body shape in early-life and risk of premenopausal breast cancer among Latin American women: results from the PRECAMA study. *Scientific Reports*, 10(1), 1-12. doi: 10.1038/s41598-020-59056-6
- [13] Keimling, M., Renehan, A.G., Behrens, G., Fischer, B., Hollenbeck, A.R., Cross, A.J., & Leitzmann, M.F. (2013). Comparison of associations of body mass index, abdominal adiposity, and risk of colorectal cancer in a large prospective cohort study. *Cancer Epidemiology and Prevention Biomarkers*, 22(8), 1383-1394. doi: 10.1158/1055-9965.EPI-13-0353
- [14] Kvaskoff, M., Bijon, A., Mesrine, S., Vilier, A., Clavel-Chapelon, F., & Boutron-Ruault, M.C. (2014). Anthropometric features and cutaneous melanoma risk: a prospective cohort study in French women. *Cancer Epidemiology*, 38(4), 357-363. doi: 10.1016/j.canep.2014.05.008
- [15] Lam, T.K., Moore, S.C., Brinton, L.A., Smith, L., Hollenbeck, A.R., Gierach, G.L., & Freedman, N.D. (2013). Anthropometric measures and physical activity and the risk of lung cancer in never-smokers: a prospective cohort study. *PLoS One*, 8(8), e70672. doi: 10.1371/journal.pone.0070672
- [16] Meyle, K.D., Gamborg, M., Hölmich, L.R., & Baker, J.L. (2016). Childhood body size and the future risk of morphologically different variants of malignant melanoma. *In European Obesity Summit (EOS) - Joint Congress of EASO and IFSO-EC*, 9(1), 60.
- [17] Murzaku, E.C., Penn, L.A., Hale, C.S., Pomeranz, M.K., & Polsky, D. (2014). Vulvar nevi, melanosis, and melanoma: an epidemiologic, clinical, and histopathologic review. *Journal of the American Academy of Dermatology*, 71(6), 1241-1249. doi: 10.1016/j.jaad.2014.08.019
- [18] Potekayev, N.N., Shuginina, Y.K., Kuzmina, T.S., & Arutyunyan, L.S. (2011). *Дерматоскопия в клинической практике. Руководство для врачей [Dermatoscopy in Clinical Practice. A Guide for Doctors]*. М: МДВ, 144 - М: MDV, 144.
- [19] Roswall, N., Freisling, H., Bueno-de-Mesquita, H.B., Ros, M., Christensen, J., Overvad, K. ... Halkjaer, J. (2014). Anthropometric measures and bladder cancer risk: a prospective study in the EPIC cohort. *International Journal of Cancer*, 135(12), 2918-2929. doi: 10.1002/ijc.28936
- [20] Schmid, D., Ricci, C., Behrens, G., & Leitzmann, M.F. (2015). Adiposity and risk of thyroid cancer: a systematic review and meta-analysis. *Obesity Reviews*, 16(12), 1042-1054. doi: 10.1111/obr.12321
- [21] Sexton, K.R., Franzini, L., Day, R.S., Brewster, A., Vernon, S.W., & Bondy, M.L. (2011). A review of body size and breast cancer risk in Hispanic and African American women. *Cancer*,

117(23), 5271-5281. doi: 10.1002/cncr.26217
[22] Wang, N., Khankari, N.K., Cai, H., Li, H.L., Yang, G., Gao, Y.T.
... Zheng, W. (2017). Prediagnosis body mass index and waist-

hip circumference ratio in association with colorectal cancer survival. *International Journal of Cancer*, 140(2), 292-301. doi: 10.1002/ijc.30459

ОСОБЛИВОСТІ ТОТАЛЬНИХ І ПОЗДОВЖНИХ РОЗМІРІВ ТІЛА У ЧОЛОВІКІВ З ДОБРОЯКІСНИМИ НЕВУСАМИ

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Використання антропометричних маркерів для прогнозування виникнення чи тяжкості перебігу захворювання є ключем до розв'язання проблеми профілактичної медицини і може стати незамінним інструментом під час проведення профілактичних оглядів в школах, університетах та на виробництвах. Мета дослідження - встановити особливості тотальних і поздовжніх розмірів тіла у чоловіків першого зрілого віку, хворих на доброякісні невуси. Проведено антропометрію (визначення тотальних і поздовжніх розмірів тіла) за схемою Бунака чоловікам (віком 22-35 років), хворим на меланоцитарні доброякісні прості невуси (n=34), меланоцитарні доброякісні диспластичні невуси (n=27), меланоцитарні доброякісні вроджені невуси (n=14) та немеланоцитарні доброякісні невуси (n=17). В якості контролю з банку даних науково-дослідного центру Вінницького національного медичного університету ім. М.І.Пирогова були відібрані тотальні та поздовжні розміри тіла 82 практично здорових чоловіків аналогічної вікової групи. Статистичну обробку отриманих результатів проведено в ліцензійному пакеті "Statistica 5.5" з використанням непараметричних методів оцінки. Встановлено, що маса та площа поверхні тіла у здорових чоловіків менші, ніж у хворих (за винятком диспластичних невусів), а у хворих на диспластичні невуси - менша, ніж у хворих на немеланоцитарні невуси; висота надерудинної, акроміальної та пальцевої антропометричних точок у здорових чоловіків менша, ніж у хворих на невуси (за винятком висоти акроміальної точки у хворих на диспластичні невуси), а висота лобкової та вертлюгової антропометричних точок - у здорових чоловіків більша, ніж у хворих на прості (лише лобкової точки) та диспластичні невуси; крім того, висота лобкової та вертлюгової антропометричних точок у хворих на прості невуси менша, ніж у хворих на немеланоцитарні невуси та вроджені невуси (лише для висоти вертлюгової точки). Враховуючи висоту антропометричних точок і те, що довжина тіла між здоровими та хворими на невуси чоловіками не має достовірних або тенденцій розбіжностей, у хворих чоловіків ми спостерігаємо більш довгий тулуб і більш короткі нижні кінцівки (найбільш виражено у хворих на прості та диспластичні невуси), що є проявом "субпатологічних" конституціональних типів, які вказують на більш довгий тулуб і більш короткі нижні кінцівки.

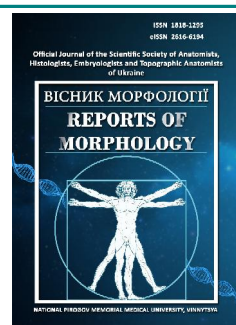
Ключові слова: доброякісні невуси, тотальні розміри тіла, поздовжні розміри тіла, чоловіки.



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Discriminant models of the possibility of occurrence and course of psoriasis in men of the general group and different somatotypes depending on the characteristics of anthropo-somatotypological indicators

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Significant prevalence and multifactorial occurrence of psoriasis are the main reasons why this disease has been studied for years by scientists in the field of dermatology. Finding tools to predict the occurrence and severity of this disease is one of the key unrealized areas of modern medicine in the field of skin diseases. The purpose of the study is to build and analyze discriminant models of the possibility and features of psoriasis course in Ukrainian men without and taking into account the somatotype, depending on the structure and size of the body. Anthropometric and somatotypological examination of 82 practically healthy and 100 patients with mild and severe psoriasis was performed. Construction of discriminant models of the possibility of occurrence and features of psoriasis depending on anthropo-somatotypological indicators is performed in the license package "Statistica 5.5". It was found that men of the general group and representatives of the mesomorphic somatotype can reliably interpret the obtained classification indicators both between healthy and patients with psoriasis of different course, and between men with psoriasis of mild and severe course (correctness 84.1% of cases, statistics Wilks' Lambda=0.074, $p<0.001$ in the general group, correctness 83.6% of cases, statistics Wilks' Lambda=0.077, $p<0.001$ in mesomorphic somatotype). In men of endo-mesomorphic somatotype, a reliable interpretation of the obtained classification indicators is possible only between healthy and psoriatic men (correctness 84.6%, statistics Wilks' Lambda=0.027, $p<0.001$). Discriminant models in men of the general group include body diameters and SFT (44.4% each) and the fat component of body weight (11.1% each); in men of mesomorphic somatotype - body diameters (57.1%), SFT (28.6%) and body surface area (14.3%); in men of endo-mesomorphic somatotype - body diameters (60.0%) and SFT on the thigh and the height of the finger anthropometric point (20.0% each). The greatest contribution to discrimination in men of the general group and representatives of the mesomorphic somatotype is made by shoulder width, and in men of endo-mesomorphic somatotype - shoulder width, interspinous and intercrystal distances. The results obtained, especially in the division of men into somatotypes, indicate a high genetic predisposition to psoriasis.

Keywords: psoriasis, anthropometric and somatotypological indicators, discriminant analysis, men.

Introduction

More than 200 years have passed since the first detailed clinical description of psoriasis and its isolation as a separate disease by the "father" of modern dermatology Robert Willan (hence the outdated name of psoriasis - Willan'slepra). However, since then, researchers have not been able to say for sure what is the trigger for this disease,

which drug treatment will get rid of it or prevent its occurrence. It is still only known that psoriasis is a chronic inflammatory immune-mediated proliferative disease that mainly affects the skin, joints and nails. Such significant attention to psoriasis is primarily due to the high prevalence of this disease.

Data from many studies indicate that 2 to 3% of the world's population suffers from psoriasis. However, the prevalence is heterogeneous in different regions of the world. Thus, in Northern India, the prevalence of psoriasis among children is 0.0002%, and the peak incidence occurs at the age of 6-10 years in boys and 11-15 years in girls; a positive family history was found in 9.8-28.0% of respondents [12].

In the United States, the prevalence of psoriasis ranges from 2.0 to 4.6%. The incidence according to various authors is from 60.4 per 100000 to 14.0 per 10000 people; 75% of people suffering from this disease are working people under the age of 40.

Among the risk factors are primarily smoking, alcohol consumption, stressors, the presence of infectious diseases, etc. [5]. That is why the medical community is actively continuing research to find not only the causes and treatment of psoriasis, but also effective means of predicting the occurrence of this disease in different groups of the population, taking into account somatotype indicators [21].

The experience of domestic researchers in finding relationships between different somatotypological indicators and other, at first glance completely unrelated to them human characteristics, inspires confidence in the possibility of successful use of this approach to predict the occurrence and course of psoriasis [1, 15].

The purpose of the study is to build and analyze discriminant models of the possibility and features of psoriasis course in Ukrainian men without and taking into account the somatotype, depending on the structure and size of the body.

Materials and methods

Anthropometric examination [6] of men (aged 22 to 35 years) with psoriasis of mild (n=32) and severe (n=68) course was conducted on the basis of the Department of Skin and Venereal Diseases with a course of postgraduate education of National Pirogov Memorial Medical University, Vinnytsya and the Military Medical Clinical Center of the Central Region.

The severity and area of psoriatic lesions were calculated using the total PASI index (Psoriasis Area and Severity Index) [14], according to which: mild severity - PASI value <10; moderate severity - PASI values from 10 to 20; severe - PASI value > 20 [3].

Anthropometric data of 82 practically healthy men of the same age group from the data bank of the research center of National Pirogov Memorial Medical University, Vinnytsya was taken as control.

Given the distribution of healthy men with psoriasis of mild and severe course by somatotypes according to the Heath-Carter scheme [7]: endomorphs - respectively 2-0-0; mesomorphs - respectively 39-28-55; ectomorphs - 9-0-2, respectively; ecto-mesomorphs - 13-0-2, respectively; endo-mesomorphs - respectively 13-4-9; representatives

of the middle intermediate somatotype - respectively 6-0-0; only representatives of mesomorphic and endo-mesomorphic somatotypes were selected for further modeling of the possibility of occurrence and peculiarities of psoriasis course.

Construction of discriminant models of the possibility of occurrence and features of psoriasis depending on anthropo-somatotypological indicators was carried out in the license package "Statistica 5.5".

Results

Taking into account anthropometric and somatotypological indicators in practically healthy and patients with mild and severe psoriasis of men of the *general group*, the discriminant function covers 84.1% of cases. Between healthy and patients with mild or severe psoriasis in the *general group*, the discriminant variables are shoulder width (ACR), intercrystal distance (CRIS), skinfold thickness (SFT) on the posterior surface of the shoulder (GZPL), transverse mid-chest diameter (PSG), SFT on anterior shoulder surface (GPPL), SFT on the side (GB), body fat component (DM), anterior-posterior mid-thoracic diameter (SGK) and SFT on the abdomen (GG). Among these indicators, shoulder width is the largest contributor to discrimination between groups. The set of all anthropo-somatotypological variables has a pronounced (Wilks' Lambda=0.074; p<0.001) discrimination between groups of healthy and patients with mild or severe psoriasis in men of the *general group*.

For each of the groups, a classification index (Df) was determined, by means of which anthropo-somatotypological indicators can be attributed to "typical" for healthy or patients with psoriasis of different course men of the *general group*. Below in the form of equations is the definition of the classification index, where the attribution to healthy men is possible at a value of Df close to 216.5; to men with mild psoriasis - at a Df value close to 234.5; to men with severe psoriasis - with a Df value close to 237.8:

$$Df \text{ (for healthy men of the general group)} = ACR \times 5,209 + CRIS \times 3,961 + GZPL \times 3,234 + PSG \times 2,537 - GPPL \times 0,465 - GB \times 0,434 - DM \times 5,995 - SGK \times 2,886 + GG \times 1,164 - 216,5;$$

$$Df \text{ (for men of the general group of patients with mild psoriasis)} = ACR \times 2,551 + CRIS \times 5,937 + GZPL \times 0,158 + PSG \times 4,427 + GPPL \times 2,354 + GB \times 0,297 - DM \times 7,306 + SGK \times 3,179 + GG \times 1,300 - 234,5;$$

$$Df \text{ (for men of the general group of patients with severe psoriasis)} = ACR \times 2,726 + CRIS \times 5,600 + GZPL \times 0,652 + PSG \times 4,525 + GPPL \times 2,260 + GB \times 0,188 - DM \times 7,914 + SGK \times 3,517 + GG \times 1,581 - 237,8;$$

where (here and later), the diameters of the torso and

pelvis - in cm; SFT dimensions - in mm; indicators of the component composition of body weight in kg.

The statistical significance of all discriminant functions was determined using the criterion χ^2 . The results of this analysis indicate that taking into account the above anthropometric and somatotypological indicators, a reliable interpretation of the obtained classification indicators is possible both between healthy and patients with psoriasis of different course, and between patients with mild and severe psoriasis in men of *general groups*.

Taking into account anthropometric and somatotypological indicators in practically healthy and patients with mild and severe psoriasis of men of *mesomorphic somatotype*, the discriminant function covers 83.6% of cases. Shoulder width (ACR), intercrystal distance (CRIS), SFT on the posterior surface of the shoulder (GZPL), transverse mid-chest diameter (PSG), SFT on the anterior surface of the shoulder (GPPL), anterior-posterior mid-thoracic diameter (SGK) and body surface area (S) are discriminant between healthy and severe psoriasis men of *mesomorphic somatotype*. Among these indicators, the largest contribution to discrimination between groups, as in general groups, is shoulder width. The set of all anthropometric variables has a pronounced (Wilks' Lambda=0.077; $p < 0.001$) discrimination between groups of healthy and patients with mild or severe psoriasis of men of mesomorphic somatotype.

Below in the form of equations is the definition of the classification index, where the attribution to healthy men of mesomorphic somatotype is possible at a value of Df close to 154.7; to men of *mesomorphic somatotype* in patients with mild psoriasis - at a Df value close to 159.2; to men of mesomorphic somatotype in patients with severe psoriasis - with a Df value close to 159.8:

Df (for healthy men of mesomorphic somatotype) = ACR x 4,504 + CRIS x 1,688 + GZPL x 0,800 - PSG x 0,307 - GPPL x 2,572 + SGK x 0,280 + S x 40,51 - 154,7;

Df (for men of mesomorphic somatotype in patients with mild psoriasis) = ACR x 1,884 + CRIS x 4,089 - GZPL x 3,012 + PSG x 1,695 - GPPL x 0,033 + SGK x 1,203 + S x 17,95 - 159,2;

Df (for men of mesomorphic somatotype in patients with severe psoriasis) = ACR x 2,050 + CRIS x 3,713 - GZPL x 3,059 + PSG x 2,009 + GPPL x 0,139 + SGK x 1,203 + S x 17,95 - 159,8;

where (here and later), the surface area of the body - in m^2 .

The results of the evaluation of the criterion χ^2 indicate that taking into account the above anthropometric indicators it is possible to reliably interpret the obtained classification indicators both between healthy and patients with psoriasis of different course, and between patients with psoriasis of mild and severe course in men with *mesomorphic*

somatotype.

Taking into account anthropometric and somatotypological indicators in practically healthy and patients with mild and severe psoriasis men of *endo-mesomorphic somatotype*, the discriminant function covers 84.6% of cases. Interspinous distance (SPIN), shoulder width (ACR), intercrystal distance (CRIS), thigh SFT (GBD) and finger anthropometric point height (ATP) are discriminant between healthy and severe psoriasis men of *endo-mesomorphic somatotype*. Among these indicators, shoulder width, interspinous and intercrystal distance have the largest contribution to discrimination between groups. The set of all anthropometric variables has a pronounced (Wilks' Lambda=0.027; $p < 0.001$) discrimination between groups of healthy and patients with mild or severe psoriasis of men of endo-mesomorphic somatotype.

Below in the form of equations is the definition of the classification index, where the attribution to healthy men of endo-mesomorphic somatotype is possible at a value of Df close to 1018; to men of *endo-mesomorphic somatotype* of patients with mild psoriasis - at a Df value close to 1419; to men of endo-mesomorphic somatotype in patients with severe psoriasis - with a Df value close to 1368:

Df (for healthy men of endo-mesomorphic somatotype) = SPIN x 36,64 - ACR x 0,470 + CRIS x 26,56 - GBD x 8,960 + ATP x 6,010 - 1018;

Df (for men of endo-mesomorphic somatotype in patients with mild psoriasis) = SPIN x 44,43 - ACR x 4,330 + CRIS x 33,40 - GBD x 11,32 + ATP x 8,030 - 1419;

Df (for men of endo-mesomorphic somatotype in patients with severe psoriasis) = SPIN x 43,89 - ACR x 4,780 + CRIS x 32,91 - GBD x 11,29 + ATP x 7,980 - 1368;

where, the height of anthropometric points - in cm.

The results of the evaluation of the criterion χ^2 indicate that taking into account the above anthropometric indicators, it is possible to reliably interpret the obtained classification indicators only between healthy and patients with psoriasis of different course in men of *endo-mesomorphic somatotype*.

Discussion

The use of modern medical information technologies and programs is a promising area in medicine for early diagnosis and possible prevention of many multifactorial diseases, including diseases of the skin and its appendages [8, 11, 18].

As diagnostic features for mathematical modeling it is necessary to choose indicators that are available by measurement and have a fairly wide range of values under different disease conditions (eg, form and type of flow), which allows to determine variables (in our case

anthropometric and somatotypological indicators) that discriminate the obtained conditions of patients ("healthy", "sick", "form or type of disease") [22].

We have built discriminant models to predict to which population men of the general group and different somatotypes may belong, depending on anthropo-somatotypological parameters of the body - to potentially healthy, or to potentially patients with mild or severe psoriasis.

In the analysis of discriminant equations in men of the general group and representatives of the mesomorphic somatotype, it was found that a reliable ($p < 0.001$) interpretation of the obtained classification indicators is possible both between healthy and patients with psoriasis of different course and between patients with mild and severe psoriasis (Wilks' Lambda statistics = 0.074 in the general group; Wilks' Lambda statistics = 0.077 in representatives of the mesomorphic somatotype). In men of endo-mesomorphic somatotype, a reliable ($p < 0.001$) interpretation of the obtained classification indicators is possible only between healthy and psoriasis men of different currents (Wilks' Lambda statistics=0.027).

Discriminant models in men of the general group include body diameters and SFT (44.4% each) and the fat component of body weight (11.1% each); in men of mesomorphic somatotype - body diameters (57.1%), SFT (28.6%) and body surface area (14.3%); in men of endo-mesomorphic somatotype - body diameters (60.0%) and SFT on the thigh and the height of the finger anthropometric point (20.0% each). Moreover, the greatest contribution to discrimination in men of the general group and representatives of the mesomorphic somatotype is made by shoulder width, and in men of endo-mesomorphic somatotype - shoulder width, interspinous and intercrystal distance. Similar results (high percentage of participation in models of diameters of a trunk and a pelvis), especially at division of men on somatotypes, specify high genetic predisposition of this multifactorial disease [19].

A meta-analysis of 16 studies on the relationship between somatotypes and the risk of psoriasis, covering a total of 2.1 million people, found that the OR for obese people with psoriasis is 1.66 (95% confidence interval 1.46-1.89) compared with healthy individuals. Regarding the severity of the course of the disease OR for people with obesity and mild course was 1.46 (95% CI 1.17-1.82), and with severe psoriasis was 2.23 (95% CI 1.63-3.05) [2]. An analysis of 14 studies from the EU and the Middle East, involving a total of 25,042 patients with psoriasis, also found a correlation between the occurrence of psoriasis and the presence of metabolic syndrome [20].

A similar study was conducted by a group of authors led by P.Fleming [13]. A literature review of 254 articles was conducted, of which 9 were included in the study, which met the criteria of the study sample. In 7 of 9 studies, a statistically significant association was found between an increase in the severity of psoriasis and an increase in BMI

in patients.

In another study, researchers examined people with psoriasis to determine their area of visceral fat (VFA), subcutaneous fat (SFA) and total fat area (TFA) in the umbilical region. It was found that individuals with psoriasis compared to the control group (healthy individuals) had higher values of VFA and VFA/SFA ratio (123.4 ± 80.3 vs. 81.2 ± 59.8 cm² and 0.734 ± 0.593 vs. 0.491 ± 0.336 ; $p = 0.005$ and $p = 0.017$, respectively) [4].

Correlations between anthropometric indicators and the risk of the disease were found for other dermatological pathologies. Thus, M.J.Chen and co-authors [9] studied the risks of acne in women. As a result of statistical processing of the obtained results, positive correlations were found with such indicators as waist circumference, the ratio of waist and hip circumference and BMI.

Demir S.Pektas and others [10] chose to study patients with rosacea. The anthropometric examination and comparison of data with the results obtained from the control group revealed the following features: patients with rosacea had higher values of the ratio of waist and hips and the value of body mass index (27.9 ± 5.2 kg/m² vs. 23.0 ± 1.4 kg/m², $p < 0.001$ and 0.87 ± 0.10 vs. 0.77 ± 0.80 , $p < 0.001$, respectively).

A survey of the population of Saudi Arabia revealed that certain skin diseases tend to spread in overweight people. Thus, such an association was found for herpes of the foot, bacterial folliculitis and intertrigo [16].

Chinese scientists have confirmed that the body's BMI correlates with the severity of acne. Mean BMI values were higher in individuals with moderate and severe acne compared to healthy individuals (21.86 ± 2.83 kg/m², vs. 20.22 ± 2.43 kg/m², $p < 0.001$) [17].

The results obtained during the study and the data of other authors, both domestic and foreign, allow us to assert the reliability and prospects of using anthropometric research to predict the occurrence and course of psoriasis.

Conclusions

1. Reliable discriminant models developed on the basis of constitutional body parameters allow to predict with high probability the possibility of psoriasis occurrence and course in men of the general group (correctness 84.1% of cases, statistics Wilks' Lambda=0.074; $p < 0.001$) and representatives of mesomorphic somatotype (correctness 83.6% of cases, statistics Wilks' Lambda=0.077, $p < 0.001$). In men of endo-mesomorphic somatotype, only significant discrimination between healthy and psoriatic men is possible (correctness 84.6% of cases; Wilks' Lambda statistics=0.027; $p < 0.001$).

2. The structure of the constructed discriminant equations in men of the general group most often includes body diameters and SFT (44.4% each); in men of mesomorphic and endo-mesomorphic somatotypes - body diameters (57.1% and 60.0%, respectively).

3. The greatest contribution to discrimination in men of

the general group and representatives of the mesomorphic somatotype is made by shoulder width, and in men of endo-

mesomorphic somatotype - shoulder width, interspinous and intercrystal distance.

References

- [1] Andriievskiy, I.I., Serebrennikova, O.A., Kyrychenko, I.M., Zhuchenko, I.I., & Gunas, V.I. (2020). Correlations of body structure and size indicators with personality indicators of practically healthy women with mesomorphic somatotype. *Biomedical and Biosocial Anthropology*, (39), 35-44. doi: 10.31393/bba39-2020-06
- [2] Armstrong, A.W., Harskamp, C.T., & Armstrong, E.J. (2012). The association between psoriasis and obesity: a systematic review and meta-analysis of observational studies. *Nutrition & diabetes*, 2(12), e54-e54. doi: 10.1038/nutd.2012.26
- [3] Augustin, M., Krüger, K., Radtke, M.A., Schwippl, I., & Reich, K. (2008). Disease severity, quality of life and health care in plaque-type psoriasis: a multicenter cross-sectional study in Germany. *Dermatology*, 216(4), 366-372. doi: 10.1159/000119415
- [4] Balci, A., Balci, D.D., Yonden, Z., Korkmaz, I., Yenin, J.Z., Celik, E. ... Egilmez, E. (2010). Increased amount of visceral fat in patients with psoriasis contributes to metabolic syndrome. *Dermatology*, 220(1), 32-37. doi: 10.1159/000254482
- [5] Basko-Plluska, J.L., & Petronic-Rosic, V. (2012). *Psoriasis: epidemiology, natural history, and differential diagnosis*. Psoriasis: Targets and Therapy, 2, 67-76.
- [6] Bunak, V.V. (1941). *Антропометрия [Anthropometry]*. М.: Наркомпрос РСФСР - М.: People's Commissariat of the RSFSR.
- [7] Carter, J. (2003). *The Heath-Carter antropometric somatotype. Instruction manual*. Department of Exercise and Nutritional Sciences San Diego State University. CA. U.S.A.
- [8] Chaplyk-Chyzho, I.O. (2016). Моделювання за допомогою дискримінантного аналізу можливості захворювання на піддермії чоловіків і жінок в залежності від особливостей будови та розмірів тіла [Modeling using discriminant analysis of the possibility of pyoderma in men and women depending on the structure and size of the body]. *Biomedical and Biosocial Anthropology*, 26, 68-71.
- [9] Chen, M.J., Chen, C.D., Yang, J.H., Chen, C.L., Ho, H.N., Yang, W.S., & Yang, Y.S. (2011). High serum dehydroepiandrosterone sulfate is associated with phenotypic acne and a reduced risk of abdominal obesity in women with polycystic ovary syndrome. *Human Reproduction*, 26(1), 227-234. doi: 10.1093/humrep/deq308
- [10] Demir Pektas, S., Cinar, N., Pektas, G., Akbaba, G., Kara, A., Hancer, H.S. ... Yazgan Aksoy, D. (2021). Thiol/disulfide homeostasis and its relationship with insulin resistance in patients with rosacea. *Journal of Cosmetic Dermatology*. doi: 10.1111/jocd.14477
- [11] Dmytrenko, S.V., Maievskiy, O.Ye., & Makarchuk, I.M. (2016). Дискримінантні моделі можливості захворювання та особливостей перебігу вугрової хвороби у дівчат підлітського регіону України в залежності від розмірів тіла [Discriminant models of the possibility of the disease and the peculiarities of the course of acne in girls of the Podillia region of Ukraine depending on body size]. *Світ медицини та біології - World of Medicine and Biology*, 4(58), 30-33.
- [12] Dogra, S., & Mahajan, R. (2016). Psoriasis: Epidemiology, clinical features, co-morbidities, and clinical scoring. *Indian Dermatology Online Journal*, 7(6), 471-480. doi: 10.4103/2229-5178.193906
- [13] Fleming, P., Kraft, J., Gulliver, W.P., & Lynde, C. (2015). The relationship of obesity with the severity of psoriasis: a systematic review. *Journal of Cutaneous Medicine and Surgery*, 19(5), 450-456. doi: 10.1177/1203475415586332
- [14] Fredriksson, T., & Pettersson, U. (1978). Severe psoriasis - oral therapy with a new retinoid. *Dermatology*, 157(4), 238-244. doi: 10.1159/000250839
- [15] Gunas, V.I., Mishalov, V.D., Serebrennikova, O.A., Klimas, L.A., & Shayuk, A.V. (2018). Palmar dermatoglyphics of modern Ukrainians: regional trends. *Biomedical and Biosocial Anthropology*, (31), 11-17. doi: 10.31393/bba31-2018-02
- [16] Khalil, G.M., Al Shobaili, H.A., Alzolbani, A., & Al Robaee, A. (2011). Relationship between obesity and other risk factors and skin disease among adult Saudi population. *The Journal Of The Egyptian Public Health Association*, 86(3 and 4), 56-62. doi: 10.1097/01.EPX.0000398942.36374.5c
- [17] Lu, L., Lai, H.Y., Pan, Z., Wu, Z., Chen, W., & Ju, Q. (2017). Obese/overweight and the risk of acne vulgaris in Chinese adolescents and young adults. *Hong Kong J. Dermatology Venereol.*, 25(1), 5-12.
- [18] Makarchuk, I.M., Maievskiy, O.Ye., & Gunas, I.V. (2016). Моделювання за допомогою дискримінантного аналізу можливості захворювання та особливостей перебігу вугрової хвороби в юнаків Поділля [Modeling with the help of discriminant analysis of the possibility of the disease and the peculiarities of the course of acne in young people of Podillia]. *Вісник морфології - Reports of Morphology*, 22(1), 160-163.
- [19] Nikityuk, V.A., Moroz, V.M., & Nikityuk, D.B. (1998). *Теорія і практика інтегративної антропології. Очерки [Theory and practice of integrative anthropology. Essays]*. Київ-Вінниця, "Здоров'я" - Kiev-Vinnitsa, "Zdorov'ya".
- [20] Rodríguez-Zúñiga, M.J.M., & Garcia-Perdomo, H.A. (2017). Systematic review and meta-analysis of the association between psoriasis and metabolic syndrome. *Journal of the American Academy of Dermatology*, 77(4), 657-666. doi: 10.1016/j.jaad.2017.04.1133
- [21] Singh, S., Young, P., & Armstrong, A.W. (2017). An update on psoriasis and metabolic syndrome: A meta-analysis of observational studies. *PLoS One*, 12(7), e0181039. doi: 10.1371/journal.pone.0181039
- [22] Tabachnick, B.G., & Fidell, L.S. (2006). *Using multivariate statistics*. Fourthed.

ДИСКРИМІНАНТНІ МОДЕЛІ МОЖЛИВОСТІ ВИНИКНЕННЯ ТА ОСОБЛИВОСТЕЙ ПЕРЕБІГУ ПСОРИАЗУ У ЧОЛОВІКІВ ЗАГАЛЬНОЇ ГРУПИ ТА РІЗНИХ СОМАТОТИПІВ В ЗАЛЕЖНОСТІ ВІД ОСОБЛИВОСТЕЙ АНТРОПО-СОМАТОТИПОЛОГІЧНИХ ПОКАЗНИКІВ

Обадед Бассам Абдель-Рахман Аль-Каралех, Дмитренко С.В., Кириченко В.І., Даценко Г.В., Гунас В.І.

Значна поширеність і мультифакторіальність виникнення псоріазу є головними причинами, чому дане захворювання роками продовжують вивчати вчені в області дерматології. Пошук засобів для прогнозування виникнення і тяжкості перебігу даного захворювання є одним із ключових нереалізованих напрямків сучасної медицини в області захворювань шкіри. Мета дослідження - побудувати та провести аналіз дискримінантних моделей можливості виникнення та особливостей перебігу псоріазу в українських чоловіків без і з урахуванням соматотипу в залежності від особливостей будови та розмірів тіла.

Проведено антропометричне та соматотипологічне обстеження 82 практично здорових і 100 хворих на псоріаз легкого та тяжкого перебігу чоловіків. Побудова дискримінантних моделей можливості виникнення та особливостей перебігу псоріазу в залежності від антропо-соматотипологічних показників виконана в ліцензійному пакеті "Statistica 5.5". Встановлено, що у чоловіків загальної групи та представників мезоморфного соматотипу можлива достовірна інтерпретація отриманих показників класифікації як між здоровими та хворими на псоріаз різного перебігу, так і між хворими на псоріаз легкого та тяжкого перебігу чоловіками (коректність 84,1% випадків, статистика Wilks' Lambda=0,074, $p<0,001$ у загальній групі; коректність 83,6% випадків, статистика Wilks' Lambda=0,077, $p<0,001$ у представників мезоморфного соматотипу). У чоловіків ендо-мезоморфного соматотипу достовірна інтерпретація отриманих показників класифікації можлива лише між здоровими та хворими на псоріаз чоловіками (коректність 84,6%, статистика Wilks' Lambda=0,027, $p<0,001$). До складу дискримінантних моделей у чоловіків загальної групи входять діаметри тіла і ТШЖС (по 44,4%) та жировий компонент маси тіла (по 11,1%); у чоловіків мезоморфного соматотипу - діаметри тіла (57,1%), ТШЖС (28,6%) і площа поверхні тіла (14,3%); у чоловіків ендо-мезоморфного соматотипу - діаметри тіла (60,0%) та ТШЖС на стегні і висота пальцевої антропометричної точки (по 20,0%). Найбільший внесок у дискримінацію у чоловіків загальної групи та представників мезоморфного соматотипу вносить ширина плечей, а у чоловіків ендо-мезоморфного соматотипу - ширина плечей, міжкостьова та міжребенева відстані таза. Отримані результати, особливо при розподілі чоловіків на соматотипи, вказують на високу генетичну схильність псоріазу.

Ключові слова: псоріаз, антропометричні та соматотипологічні показники, дискримінантний аналіз, чоловіки.

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The introduction reflects the state of research and the relevance of the problem according to the world scientific literature (at least 15 references to English articles in international journals over the past 5 years). At the end of the entry, the purpose of the article is formulated (contains no more than 2-3 sentences, in which the problem or hypothesis is addressed, which is solved by the author).

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The section should allow other researchers to perform similar studies and check the results obtained by the author. If necessary, this section may be divided into subdivisions. Depending on the research objects, the ethical principles of the European Convention for the protection of vertebrate animals must be observed; Helsinki Declaration; informed consent of the surveyed, etc. (for more details, see "Public Ethics and its Conflict"). At the end of this section, a "statistical processing of results" section is required, which specifies the program and methods for processing the results obtained by the automobile.

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In the discussion, it is necessary to summarize and analyze the results, as possible, compare them with the data of other researchers. It is necessary to highlight the novelty and possible theoretical or practical significance of the results of the research. You should not repeat the information already listed in the "Introduction" section. At the end of the discussion, a separate paragraph should reflect the prospects for using the results obtained by the author.

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