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PECULIARITIES OF GENERAL MORBIDITY AMONG RAILWAY CONDUCTORS

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ABSTRACT — An analysis of the incidence of incidence of occupational diseases among railway conductors has allowed to assess the effects of external adverse production factors on the health of this category of workers, the effect of production factors on health, in order to form effective prevention strategies.

KEYWORDS — morbidity, conductors of railway transport, unfavorable production factors, length of service.

Purpose of work

Identification of the specific features of the incidence of railway conductors.

The tasks

included the analysis and assessment of the incidence of railway conductors, the determinants of morbidity. In the work nonparametric statistics methods were used.

Results of the study

21.6 ± 1.95% of women had no chronic somatic pathology, and 78.4 ± 1.95% of conductors had chronic somatic pathology. According to the frequency of registration, the first ranked place was occupied by diseases of the digestive system 31.3 ± 2.22%, the second place — diseases of the musculoskeletal system 17.5 ± 1.82%, the third place — respiratory diseases — 9.9 ± 1.43%, the fourth place — diseases of the cardiovascular system — 8.1 ± 1.3%, the fifth — diseases of the kidneys and urinary tracts 6.7 ± 1.19%, and the sixth — other diseases — 5.1 ± 1.05%.

In conductors among diseases of the digestive system, chronic gastroduodenitis — 228‰, ulcer disease of the stomach and duodenum — 44‰, more rarely chronic cholecystitis — 37‰ were most often recorded. Given the classic risk factors for the diseases of this group (irregular nutrition and its inferiority), it can be argued that there is an important role of preventing diseases of the digestive tract among conductors who have been working on trips for a long time. Dementia-degenerative lesions of the joints — 85‰, chronic dystrophic polyarthritis — 59‰, and deforming spondylosis — 29‰ prevailed for diseases of the musculoskeletal system of female workers. In the class of diseases of the cardiovascular system, neurocirculatory dystonia — 151‰ and hypertensive disease — 30‰, were noted. For diseases of the respiratory system — chronic tonsillitis — 51‰ and chronic laryngitis — 25‰ with chronic bronchitis — 23‰. High enough among the conductors was the frequency of varicose veins of the lower limbs — 85‰, which could be a consequence of the combined action of overloads, vibration and a significant static load. Among the diseases of the kidneys and urinary system, the first place was occupied by chronic pyelonephritis — 230‰, cystitis — 25‰, urolithiasis — 18‰.Correlation analysis made it possible to reveal a direct relationship with a sufficient level of significance between the frequency of registration of pathology (according to the data of referral to outpatient facilities) and the length of service as a conductor ($r = 0.58$, with a difference from zero greater than 95%, $p < 0.05$). An analysis was made of the incidence rate for the groups of workers. In total, four different groups were distinguished: up to 3 years, from 3 to 6 years, from 7 to 10 years and more than 10 years. The first trainee group (experience up to 3 years) was considered as a control in relation to others, taking into account a short period for the implementation of occupational risk factors. The incidence rate characteristic of the first trainee group was taken as a *zero level*, since it was practically independent of the working conditions, but was a consequence of the risk factors that existed before the beginning of labor activity.

As a result of the analysis it is established that in the first group (up to 3 years) first place among chronic somatic pathology was won by diseases of digestive organs of — 158‰, the second place — the diseases of kidneys and urinary tract registered at every third conductor — 118‰, the third place — diseases of respiratory organs — 93‰, the fourth place — violation of fatty exchange — 65‰, the fifth place — blood circulatory system diseases — 57‰, the sixth place of a disease of the musculoskeletal device — 39‰. The overall level of chronic morbidity was 526‰, which is significantly lower than the statistical data on the population, however, taking into account the age of the contingent of the study group, the difference is not very significant. In the next trainee group of conductors (from 3 to 6 years), occupational risk factors already prevailed over general population. The

first ranked place, as well as in the group up to 3 years, belonged to the group of diseases of the digestive tract 330‰, but the incidence rate increased more than 2 times (p <0,05). The group of endocrine diseases (violation of fatty exchange) — 155‰ moved to the second rank place from the fourth. For this group, there was also a twofold increase in the incidence rate (p <0.05).The third ranking place was preserved for a group of respiratory diseases — 145‰. The increase in the frequency of registration was 2.23 times (p <0.05). The ranked place decreased from the second to the fourth for a group of kidney and urinary tract diseases — 116‰ (the differences are not reliable, p> 0.05).The frequency of detection of diseases of the musculoskeletal system has significantly increased (in 2.7 times from 39‰ to 106‰, p <0.05) — the fifth ranked place. The sixth ranked place in this trainee group is circulatory system diseases — 87‰.In the third group of trainees (from 7 to 10 years), the first ranked place was preserved for a group of diseases of the digestive system. The incidence rate has increased, but not significantly (from 330‰ to 391‰). On the second ranked place, moving from the third — the disease of the respiratory system. With respect to this group, the most significant increase in the incidence rate was observed from 145‰ to 246‰ (p <0.05).The growth of structural significance of diseases of the musculoskeletal system continued from the fifth to the third place. Increase in the incidence rate more than 2 times from 106‰ to 210‰ (p <0,05). The structural significance of the second to fourth violations of fat metabolism decreased due to a moderate increase in the registration of this type of pathology (from 155‰ to 196‰) against a background of more pronounced increase in the level of registration of other groups of diseases. The structural importance (growth from the sixth to the fifth place) of the group of diseases of the organs of blood circulation increased slightly (from 87‰ to 152‰). The decrease in structural significance from the fourth to the sixth group of kidney and urinary tract diseases — 137‰ continued (the differences were not significant, p>0 0.05).A group of respiratory diseases moved to the first ranked place in the fourth group of patients (more than 10 years), having outstripped the group of diseases of the digestive organs due to a more significant increase in the incidence rate of respiratory diseases and the absence of an increase in the incidence rate (even some reduction) in respect of diseases of the digestive system. The third ranked locus of the locomotor system was preserved. The group of circulatory system diseases moved from the fifth to the fourth place. Closed ranked list of structural significance of the group of diseases of the genitourinary system and violations of fat metabolism. The analysis of the dynamics of somatic incidence rates showed a practically linear increase in the incidence rates with an increase in the work experience of the conductors, except for a group of diseases of the digestive organs, against which there is a decrease in the morbidity rate with experience of more than 10 years. High somatic diseases of the digestive organs in the conductors is understandable and productive due to the fact that their nutrition can be considered inadequate, irrational and unbalanced. The incidence of diseases of the musculoskeletal system was quite high, which could be a consequence of the combined effect of overloads and work in an upright position. Consequently, external environmental influences and professional factors are of great importance for persons whose work activity is associated with a significant psychoemotional load, in part by noise and vibration, in which conductors work. For conductors of railway transport, with a critical period of professional activity, when the negative consequences of labor activity begin to appear, you can consider the experience of more than 3 years. With the increase in length of service, the severity of negative consequences increases, which requires the development of a set of preventive measures aimed at reducing the negative consequences of occupational risk factors. Thus, the analysis of the structure and levels of the spread of chronic somatic pathology among railway conductors has shown the presence of a direct link between work experience and the frequency of pathology registration.

REFERENCES

1. **Atamanchuk AA** Actual problems of labor medicine of the XXI century - the production of conditioned diseases of the cardiovascular system, caused by the influence of unfavorable physical factors // Actual biotechnology. 2014. No. 3 (10). P. 50–52.
2. **Deryabina N.N.** Characteristics of feeding railroad conductors / Bulletin of the National Scientific Research Institute of Public Health named after N.A. Semashko .– 2016.– No. 7. – P. 13–18.
3. **Shapovalova MA, Koretskaya L.R.** Analysis of hospitalized morbidity and assessment of the need for medical care in the neurological department / Bulletin of the National Scientific Research Institute of Public Health named after NA Semashko. 2016. № 4. P. 117–125.
4. **Shapovalova MA, Mamedov IG, Udochkina K.N.** Analysis of the technology of studying the health of the able-bodied population in the scientific practice of the health organization / Bulletin of the National Scientific Research Institute of Public Health named after N.A. Semashko. – 2016. 4. P. 126–137.
5. **Shapovalova M.A.** Reproduction of the population as a medical and economic problem / dissertation for the degree of Doctor of Medical Sciences / State

Educational Establishment of Higher Professional Education "Russian State Medical University". Moscow, 2004

6. **Shapovalova MA** Socio-economic aspects of population reproduction. – Economics of Public Health – 2004. – No. 4. – P. 12–16.
7. **I.G. Mamedov, M.A. Shapovalova, D.A. Shapovalova, A.A. Abramov** Medico-social activity of workers of shipbuilding and ship repair // Archiv euromedica 2017 – vol. 7 – 2 – P. 10–13
8. **Khubriev RU, Cherkasov SN, Eghiazaryan KA, Attaeva L.Zh.** The current state of the problem of injuries / / Problems of social hygiene, health and history of medicine-2017 – T. 25. № 1. P. 4–7.

ASSESSMENT OF HEMODYNAMIC PARAMETERS OF THE CADETS OF THE COSSACK CORPS

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ABSTRACT — The study of the adaptive capacity of the cardiovascular system of students of specialized schools based on the assessment of hemodynamic indices.

KEYWORDS — adaptation, cardiovascular system, children, schoolchildren, hemodynamic indices.

The child's body, unlike an adult, is significantly more affected by the environment. Exogenous and endogenous factors that have a direct impact on physical development, health and psycho-emotional state, form the basis of his future adult life [1, 9]. Adapting to the new conditions, the child's body responds with an increase in sustainability due to the economical operation and rational use of energy [2, 10]. Improving the functioning of organ systems and regulatory mechanisms in children is a manifestation of adaptive restructuring at the level of the whole organism [9].

The cardiovascular system, being an integral system, is one of the first to respond to changing conditions. The need for adequate blood supply to organs and tissues in changing conditions, causes a change in the functional and structural reserves of the circulatory system. The study of its functional state gives an idea of the physiological and adaptive status of the organism [3].

Training in specialized cadet corps with round-the-clock stay has distinctive features: compulsory execution of orders, regulation of life, increase in training and physical activity, mandatory self-preparation, the need to wear a military uniform [8]. As a result, there is a tension in the mechanisms of adaptation to new conditions, manifested by a decrease in physical performance, an increase in psycho-emotional stress and morbidity.

The aim of the study is to study the processes of adaptation of the cardiovascular system of students in specialized schools.

30 cadets aged 13–17 years studying in the Cossack Cadet Corps from 2015 to 2018 were surveyed. General educational curriculum, includes elements of drill and mandatory participation in sports clubs and sections.

Calculation of indicators was carried out according to the results of the survey at the beginning and at the end of education in the Cossack cadet corps. With the help of the hardware-software complex HEALTH-EXPRESS, the following parameters were determined: physical development indicators using standard anthropometric methods; the state of the cardiovascular system - heart rate (HR), blood pressure (BP) according to standard unified methods. On their basis, hemodynamic indices were calculated: double product, blood circulation efficiency coefficient, Kerdo index, Kvass endurance coefficient, type of blood circulation self-regulation.

RESULTS AND DISCUSSION

Blood pressure indicators, at the beginning and end of training, meet age standards for all students.

Pulse rates after four years of education in the Cossack school decreased from 83.2±12.5 to 80.2±12.7 beats/min, which indicates a positive trend in the cardiovascular system.

The double product at rest is used to characterize the cardiovascular system (CVS) in children. This indicator reflects the growth of the mechanical work of the heart and, indirectly, oxygen consumption [4]. Students have high rates of double work, which indicates the stress of the CVS. However, by the end of education, this figure decreases.

Despite the fact that by the end of the education, the systolic and minute volume figures slightly decreased, their values exceed the age norm as a result of adaptation of the CVS.

The coefficient of profitability of blood circulation characterizes the body's costs for the movement of blood in the bloodstream. Normally, the coefficient of profitability of blood circulation for this age group is 2600–3000, with pronounced fatigue, the indicator increases, which is observed among the cadets of the Cossack corps.

The Kerdo index reflects the degree of adaptation of the organism to environmental conditions, in which a deviation from the zero line is considered as a sign of violation of adaptation mechanisms. A positive Kerdo index characterizes the strengthening of catabolism processes, which is characteristic of intense functioning and expenditure of body reserves, a negative one about an anabolic variant of metabolism and an economical mode of functioning [7]. Among

the cadets, there is an increase in this indicator by the end of education in the Cossack corps.

Among the students, the vascular type of blood circulation self-regulation prevailed both at the beginning of education (78.3%) and at the end (85.2%). A change in the regulation of blood circulation towards the predominance of the vascular component indicates its economization, an increase in functional reserves.

The Kvass endurance coefficient among the cadets is above average, but it is declining by the end of the year. An increase in this indicator indicates a weakening, and a decrease indicates an increase in the functional capabilities of the cardiovascular system.

CONCLUSIONS

The training program of the Cossack cadet corps has a positive effect on the development of effective adaptive mechanisms of the cardiovascular system. However, there are deviations in some indicators of the cardiovascular system from the age norm, which reflects the need to further study the influence of learning conditions in specialized schools on the health and physical development of students.

REFERENCES

1. **Antonova A.A., Chentsova S.N., Serdyukov V.G.** Comparative characteristics of the physical development of children // A.A. Antonova, // Astrakhan Medical Journal, 2012, Volume 7, № 4 – P. 26–29;
2. **Buzinov, R.V., Averina, E.A., Unguryanu, T.N.** The influence of the conditions of the educational environment on the health of children of preschool and school age in the territory of the Arkhangelsk region // Analysis of health risk. – 2015. – № 3 (11);
3. **Vlasova S.V., Nifontova OL, Sokolovskaya L.V.** Adaptation of the cardiovascular system of students to physical loads // Basic research. – 2012. – № 11–6. – P. 1320–1323;
4. **Gritsuk A.D., Gorodnichenko E.A.** Adaptive reactions of central hemodynamics in young men 18–22 years old under static loads of increasing power // Modern problems of science and education. – 2006. – № 4;
5. **Katashinskaya L.I., Gubanova L.V.** Analysis of factors influencing the health of urban and rural schoolchildren // Modern problems of science and education. 2014, № 4;
6. **Katashinskaya L.I., Gubanova L.V.** Study of morphofunctional indicators of senior schoolchildren of the Ishim district // Bulletin of the Tyumen State University. – 2013. – № 6. P. 110–117;
7. **Kuchma V.R., Sukhareva L.M.** Biomedical and psychosocial problems of adolescence (monograph). Moscow, 2004. P. 45–47;
8. **Shmatov A.P.** Adaptation of the cardiovascular system and the intravascular microcirculation component of cadets of higher military educational institutions to the conditions of vocational training depending on their psychophysiological features // dissertation for the degree of candidate of medical sciences / Saratov State Medical University. Saratov, 2008;
9. **Yamanova G.A., Davydenko D.V., Antonova A.A.** Hygienic assessment of the effectiveness of physical education students. In the collection: Science Week – 2016 Materials of the All-Russian Youth Forum with international participation. 2016, P. 460–463;
10. **Yamanova G.A., Serdyukov V.G., Antonova A.A.** Adaptation potential of the cadets cardiovascular system // Scientific-theoretical medical journal archive of anatomy, histology and embryology, Volume 153, №. 3, St. Petersburg, "ESCULAP", 2018, P. 329.

NURSING PERSONNEL AND QUALITY OF HEALTH CARE

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ABSTRACT — The key role in the organization of medical care is assigned to nursing personnel, which provides both the processes of organization of medical care and its implementation under the guidance of a doctor or independently, to actual issues of optimization of the healthcare system and the implementation of innovative mechanisms of personnel policy. In this regard, an important issue to date is the quality of nursing care and the conditions for achieving it.

KEYWORDS — average medical staff, quality of medical care, determinants of nursing staff.

Objective:

To determine the willingness of nursing staff to participate in the quality management of nursing care.

Methods

To assess the quality of nursing care, a sociological method was used.

The tasks

included the analysis of factors affecting the quality of nursing staff.

Results of the study

Nurses aged 20 to 30 years were 13.5%; from 30 to 40 years — 25.5%; from 40 to 50 years and from 50 years and older — 30.5%, respectively. More than half of the respondents (54.5%) had a general medical experience of more than 20 years. To the question *Is the model of integrated care for patients viable when 5–10 patients are assigned to one nurse?* About 50% of the respondents gave a positive response and believed that such an approach would improve the quality of work (23%), increase individual responsibility (18%) and will contribute to the professional growth of the nurse (13%). About 40% of respondents denied the existence of this model, 10% of respondents found it difficult to answer the question. However, in many medical organizations, the staff daily performed a limited amount of medical manipulation, working in the procedural, dressing or post, while losing the basic knowledge and skills obtained during training in educational institutions. As a result, a specialist who increases his qualification and receives a certificate in the specialty *Nursing* does not have all the competencies within the acquired specialty. To the question *Would the increase in the volume of independent interventions through the acquisition of new skills affect the quality of nursing care?* 54% of the respondents answered positively, and 32% found it difficult to answer, indicating that the average medical staff was not sufficiently informed about the scope and feasibility of introducing new functions, and the absence clear opinion on this issue.

To the question *Should the growth of professional skills and the quality of nursing care depend on wages?* 71% of the respondents gave a negative answer. The majority of respondents sought to improve their professional level and acquire new competencies. Priorities in increasing knowledge and skills were distributed as follows: 70% of respondents sought to learn new technologies and improve professionally; 68% relied on knowledge of simple medical services; 45% sought to improve their psychological communication skills; knowledge of legal documents and application and interaction of drugs are relevant for 38% and 32% of respondents, respectively; 27% were interested in the main causes of diseases. The interest of medical workers in the study of standards and new technologies indicated a persistent motivation of staff to increase professionalism. The application of the standards facilitated the work of nursing staff, optimized the costs of material and working time, improved the quality of service and reduced the probability of errors, 76% of respondents confirmed that the developed algorithms and instructions approved directly by the medical organization are at the workplace. However, only 65.5% agreed with the introduction of the personal responsibility of the nurse for the overall outcome of the disease (improving the patient's condition), and 15% of the average medical workers did not consider it necessary to introduce personal responsibility for the provision of nursing care. In this case, middle managers need to be educated within the Nursing Development Program, where the role and functions of a nurse in society are aimed at increasing the responsibility for providing nursing care and increasing the authority to provide it.

On the question *What factors can affect the quality of care?*, The respondents gave several answers. In the first place there was an improvement in material and technical support (55%), on the second — improvement of working conditions (53%), at the third

— load reduction (26%), on the fourth — optimization of the number of documents (20%), on the fifth — continuous training in the workplace (21%), the sixth — training of the staff in psychological aspects of communication with patients (16%), in the seventh — material compensation (13%).

The most important criterion for the quality of nursing care (with several variants of answers) was the overwhelming number of respondents who considered timely performance of medical appointments (92%) and adherence to the curative-protective and sanitary-epidemiological regimes (57%). Approximately one third of respondents are oriented toward the patient, considering it an important criterion for taking care of the patient (35%) and communicating with the patient and his relatives (27%). However, about 80% of medical workers claimed that they taught the patient and his relatives the methods of self-management and patient care. The reason for this was the shortage of working hours of the nurse and the possibility of fulfilling only the main purposes, the preparation of documentation. And the time for communication with patients and their training was minimal. It can be assumed that this distribution of priorities in the use of working time had an impact on 46% of respondents' answers about disagreement in the distribution of incentive payments based on the opinions of patients. 36% of the respondents answered positively. The determinants of improving the quality of nursing care in the opinion of 79% of respondents were: reducing the risk of professional errors; 21% — professional discipline. Improvement of the patient's health was important only for 55% of average medical workers, an increase in the quality of nursing care for the prestige of the medical organization was important only 17% of respondents. These data point to the fact that employees lack motivation for external quality control. There is no clear focus on the final result of the provision of medical services: improving the patient's health and increasing the prestige of the medical organization in order to attract patients.

The current monitoring of the quality of nursing care according to the survey is as follows: 36% of the respondents are verbally verified; 51% claim that the results of the control are fixed in expert cards and the register of defects, and only 19% of the respondents are informed of the results; up to 14% of the respondents do not receive the results of the control. The overwhelming majority of respondents (71%) answered that the quality of nursing care was monitored continuously, 17% learned about the results once a month, and 10% could not answer this question.

However, the question *Who directly controls the quality of their work?* Caused some difficulties, and 33% of respondents could not answer the question. The rest of the respondents had the answers: senior nurse (45%), head of the department (11%), chief nurse (11%). That is, the average medical staff is most motivated to the internal level of quality control. He considers professional performance indicators as important criteria for his work (92% for medical appointments), and is less motivated to improve the patient's health (57%).

Staff motivation aimed at improving professional skills is based on improving knowledge and skills, knowledge of standards of simple medical services, knowledge of regulatory documents and improving psychological communication skills. The work of middle managers should be aimed at nurturing and forming personal interest of personnel in the quality of nursing assistance, professional growth. Nursing personnel need to be involved in the management and improvement of quality of patient care.

The staff is not sufficiently informed about the procedure for assessing the quality of nursing care, its purposes. Based on the survey conducted, it can be argued that the analysis of the errors is not performed with the staff in full. At oral delivery of results (33%) the personnel had no information about criteria of an estimation of quality of the nursing help.

Thus, the assessment of the willingness of nursing staff to participate in the management of the quality of nursing care has shown the lack of awareness of nurses about the procedure for assessing the quality of nursing care, its goals, considering the most important criteria for its work indicators of professional activity.

REFERENCES

1. **Ogul L.A., Anopko V.P., Shapovalova M.A.** Planning of strategies for health facilities / Science of Krasnoyarsk .- 2012.-№5.- C 60-68.
2. **Shapovalova M.A., Anopko V.P.** Professional culture as a factor in the formation of new health facility personnel / Nursing. - 2010.-№7.- P.18-19.
3. **Gorelova N.V., Ogul L.A., Shapovalova M.A.** Timing of the work of nursing staff in the clinical maternity hospital / Health Economics .- 2011.- № 3.- P.54-57.
4. **Koretskaya L.R., Shapovalova MA** Stationary medical care in neurological practice as a medical and economic problem / Almanac of Clinical Medicine .- 2013.- № 29.- P. 52-55
5. **Cherkasov S.N,** Evaluation of the importance of motivational attitudes toward work in district nurses / SN Cherkasov, ARSaraev // Sisterhood (scientific issue). – 2010. – №7.– P. 20–24.
6. **Shapovalova M.A.** Medico-demographic and economic aspects of population reproduction. Monograph. Shapovalova; Astrakh.Gos.med.akad. Astrakhan.

7. **Shapovalova MA** Socio-economic aspects of population reproduction / Health Economics.2004. №4. P. 12–16.
8. **Deryabina N.N., Shapovalova.M.A.** To the question of the quality of medical care / In the book: Proceedings of the Astrakhan State Medical Academy. abstracts of the 87th summary scientific and practical conference of the Academy staff, doctors of the city and the region. . – 2010. – p. 12.

THE PROBLEM OF THE FORMATION OF SOCIAL HEALTH IN MEDICAL STUDENTS

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ABSTRACT — the article examines the main component of health of medical students — social health. Arguments of research work put forward factors that shape social health in the student environment. Social health is considered in the context of successful adaptation to the conditions of education in a medical college. The statistics of diseases during the training of medical students is given. A scientific analysis has been carried out to the concept of *social health*. Also, the influence of various factors on the social health of medical students in the educational environment is considered.

KEYWORDS — health, medical students, social health, adaptation, social health factors, medical high school.

In a higher educational institution, not only qualified specialists are educated, but also full-fledged individuals. One of the main problems that a medical college faces is the health of students. In this article, we consider the main component of health — this is the social health of the individual. The state of social health of medical students is one of the acute problems of modern society. Medical students are the main personnel reserve of domestic health care, therefore the main task of the medical educational institution is the training of physically healthy people who can be effective specialists.

Training in a medical college is accompanied by enormous psychological, physical, mental expenses, which, in turn, affects the level of health of medical students. A difficult situation has developed, characterized by the fact that, on the whole, the young people of Russia, who logically should be the healthiest part of society, are not. The situation is aggravated by the fact that public attention to the health of young people is now reduced, as the number of preventive examinations is reduced, dispensary observation system does not work, research interest to the problems of the younger generation is reduced.

The health of medical students in the learning process, as a rule, worsens. This trend is proved by numerous studies.

Studies of many authors [8,9] according to the data on the incidence and turnover of students revealed that, in the structure of problems, fatigue occupies the first place (50% of students noted), mild ailments (26%), depressed psychological state (25%), headaches (18%). The level of colds (21%), diseases of the cardiovascular (14%) and digestive system (14%) does not decrease.

Researchers VB. Mandrikov, I.A. Ushakov, M.P. Mitsulina, cite information that medical students have lower health indicators compared to students from other universities. According to the data, the number of students assigned to the I group of health is from 23.8 to 30.0%, to II — from 32.8 to 40.0% and to III — from 30.0 to 43.4% [1, p.78].

It is established that in the course of training students of the medical profession have digestive disorders and metabolic disorders (40.3%), a high incidence of endocrine system diseases (35.8%), respiratory system organs (35%), eye diseases (28%), circulatory system (26.3%), bone, muscle and connective tissue (23%), genitourinary system (7.6%) [2, p.131].

Also, the situation with diseases that require more attention from students, and from relatives and doctors remains significant. For diseases of allergy indicate 11% of medical students, teeth — 10%. A characteristic feature is a high tendency to chronization of pathological processes. At the same time, many authors [2, p.231] note a relatively low average annual rate of increase in the indicator for the group of respiratory diseases. The main factors that have a negative effect on health are: large intellectual loads, disruption of the daily regimen and diet, insufficient physical activity, the presence of bad habits. In this regard, there is a need to optimize the activity of a medical university in the sphere of health care for medical students, unite the efforts of all employees of the educational process in order to involve students in a healthy lifestyle. High level of health of students in medical universities is a key condition for obtaining vocational education.

The very specifics of the educational process with inevitable tests and exams, during which a state of stress develops, can be the cause of somatovegetative disorders and a decrease in the functional state of the central nervous system [3].

Students who have a high grade score are very often characterized by either a low level of health or a low coefficient of mental adaptation [1]. When training in intensive programs, they were significantly more likely to detect various violations of refraction and accommodation.

In this article the social health of students is examined. The level of social health of medical students is an indicator that characterizes the quality of life, showing the level of economic and cultural development of the society. Sociologists consider health as a sociological category, as a phenomenon, a system of interaction between an individual and society in the form of social activity and social processes.

By social health is meant *a state of the individual that allows him to realize his own functions in the process of life, to lead a social, active, saturated life* [3] *As a category characterizing the state of the viability of society as a social organism*. An important component of social health is a harmonious relationship with surrounding people.

The components of health in general are physical, psycho-emotional and social health. The basis of physical health is morphological and functional reserves, providing adaptive responses. Psycho-emotional health is a state of general mental comfort, providing an adequate behavioral response. The social component of health is influenced by parents, friends, classmates at school, fellow students at the university, work colleagues, and housemates and reflects social connections and interpersonal contacts [1].

Following the sociological understanding of social health, we can say that in its most general form it is a complex social phenomenon arising in the process of interaction of an individual with a social environment, within which there is a constant mutual influence and mutual transformation [1]. That is, social health is understood as a measure of social activity, the active attitude of the individual to the world, its social relevance.

The methodological basis for the study of social health was the medico-social direction, namely the integration of the sociocentric and sociogenic approaches. Sociocentric approach involves the study of the characteristics of the inclusiveness of the personality of a young person in society, ensuring self-actualization of the individual, the development of society, and the harmonious interaction of the individual with society [1].

Sociogenic approach involves the study of the effect on health of the characteristics of individual involvement in society, the determination by social health of physical and mental well-being (social well-being) [3].

The combination of the socio-centric and sociogenic approaches (in the terminology of L.V. Kolpina) allows us to investigate the objective and subjective characteristics of the state of social health of young people. Objective criteria provide an opportunity to assess the involvement in social contacts, subjective - satisfaction with their position, social well-being.

According to this opinion, a person can be considered socially healthy if he feels comfortable in the social environment, in social groups, fulfills and accepts the norms and values that are accepted and existing in them, which are held by the majority of individuals. Particular importance in the conditions of training in medical universities is the activity that is aimed at strengthening the social health of medical students, which, in turn, together with professional competence, is an indicator of the quality of training of highly qualified specialists, showing the economic and social well-being of society.

The development of the social health of medical students is the pedagogical conditions in the educational institution, which, with the help of established rules, norms m, values, affect the level of social health among students.

In the formation of social health in students in learning conditions, this scheme can be presented in the form of four stages:

1) social adaptation to the conditions of the university;

2) individualization of students;

3) integration into the university environment and social functioning in the conditions of the university. Thus, social health is a very important component in the life of medical students. It can be defined as a comfortable interaction between a person and society on the basis of universal human values and social norms.

Social health is determined by the willingness to accept universal human values and social norms by the individual. Based on the above, it seems necessary to have a comprehensive study of the health status of students, including medical students, in conjunction with socio-hygienic medically organized risk factors, on the basis of which recommendations should be developed on the improvement of the system of organization and medical and social assistance to students of medical educational institutions.

REFERENCES

1. **Mandrykov V.B.** Ways of formation of a healthy way of life in students / Mandrikov V.B, Ushakov I.A., Mitsulina M.P. – Volgograd, 2006. – 471 p.
2. **Davidenko, D.N.** Health and way of life of students / D.N. Davidenko, Y.N. Shchedrin, V.A. Shchegolev // State University of Information Technologies, Mechanics and Optics, 2005. – P. – 467.
3. **Zuzulya, I.V.** Social Youth Health as a Factor of Successful Socialization / I.V. Zuzulya // Socialization of the Youth of the South of Russia in the 21st Century. – Rostov-on-Don, 2007, P. 476.

ECOLOGICAL AND TOXICOLOGICAL EVALUATION OF THE IMPACT OF SELENIUM CONTAINED IN FEED ON MORPHOLOGICAL AND FUNCTIONAL CHANGES IN THE BONE TISSUE OF ANIMALS

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ABSTRACT — Physiological role and toxic-metric characteristics of selenium compounds for animals and humans are poorly studied. In this regard, this article studies morphological changes in bone tissue against the background of selenium intoxication within a chronic experiment. 2 groups of animals were studied during the experiment — reference and experimental ones. Animals (Wistar rats) received plants (rapeseed, spring wheat) grown on meadow chernozem soil using selenium at a dose of 2 MAC (*Selenium* experimental group). An increase in selenium concentration in the diet leads to reactive changes in osteogenic process.

KEYWORDS — selenium, animals, intoxication, osteogenic process.

Selenium is one of biogenic elements, it is a permanent component of animal and human organs and tissues [1, 2, 3, 4]. Selenium deficiency is considered as a factor contributing to the development of oncological diseases, diseases of cardiovascular system [5, 6, 7]. The deficiency can cause a decrease in functional activity of the thyroid gland, liver and pancreas, chronic diseases, diabetes mellitus and depressive state. It results in the development of dysbacteriosis and allergies, dystrophic changes in muscles, multiple sclerosis, growth and development retardation, increased number of gastroenterological disorders. Therefore, it is likely that one of the leading causes of occurence and rapid growth of the *diseases of civilization* during the 20th century is an increase of selenium deficiency — because the more toxic factors affect a human, the more acute is the body's need for this element [8, 9, 10, 11].

Physiological role of selenium is not completely studied. The content of this element in plants is of particular importance, since this element plays an important role in nutrition of animals, especially domestic ones, since it can simultaneously be both a microcomponent of nutrition and a toxin [10, 11].

Toxic-metric characteristics of selenium compounds for animals and humans are poorly studied. In general, the mechanism of toxic action of selenium is associated with impaired metabolism of sulfur in the body and effect of anomalies caused by it [9, 12]. To date, the toxic effect of selenium on a number of parenchymal organs has been studied. At the same time, its effect on bone tissue is not studied enough. In this regard, this article studies morphological changes in bone tissue against the background of selenium intoxication within a chronic experiment.

MATERIALS AND METHODS

2 groups of animals were studied during the experiment — reference and experimental ones. Animals (Wistar rats) received plants (rapeseed, spring wheat) grown on meadow chernozem soil using selenium at a dose of 2 MAC (*Selenium* experimental group). Selenium content in the feed was 5 mg/kg. Animals of the reference group received the same feed, but grown without the use of the microelement. The experiment lasted 6 months [4]. At the end of the experiment, bone tissue of the animals was examined.

Material of the study comprised areas of alveolar bone of the upper jaw fixed in 10% formalin. Decalcification was performed using Jenkins fluid, after which the material was washed in two changes of absolute alcohol and poured into paraffin according to the standard technique. 4 μm thick sections were made from the blocks obtained, and subsequently stained with hematoxylin and eosin.

RESULTS

When describing morphological picture of changes in the bone tissue against the background of intoxication with selenium in a chronic experiment, there was found that, compared with the reference group, histological examination of spongy bone tissue sections revealed signs of bone alternation, which manifested as both osteosclerosis and resorptive processes.

Signs of reactive osteogenesis consisted in thickening of trabeculae of the preexisting bone and formation of new trabeculae, occlusion of Haversian canals.

The newly formed bone was characterized by richness of the bone substance, increase in straight and even basophilous gluing lines, which obtained concentric features (Fig. 1).

Against the background of events of reactive osteogenesis, there were signs of loss of bone substance in form of various forms of resorption. Presence of lacunar resorption areas was typical. Along the edge of the bone trabeculae, there were formed pits (so-called Howship lacunae) (Fig. 2), which had osteoclasts comprised large giant cells containing up to 8 nuclei (Fig. 3).

In addition, there were areas of axillary resorption in form of formation of spaces filled with *liquid* bone in form of a plasma-like amorphous substance stained in pink (Fig. 4). These areas were quickly replaced by delicate fibrous connective tissue, poor in vessels (Fig. 5).

CONCLUSION

Thus, an increase in selenium concentration in the diet leads to reactive changes in osteogenic process, which have a dual character. On the one hand, there is an increase in production of the main substance of the spongy bone, which is manifested by events of osteosclerotic process. On the other hand, excess of newly formed bone leads to activation of resorptive processes, manifested by both cellular (lacunar) and non-cellular (axillary) forms. As a result, fibrous connective tissue grows in the areas of loss of the bone substance.

REFERENCES

1. **Golubkina N.A., Papazyan T.T.** Selen v pitanii. Rasteniya, zhivotnye, chelovek [Selenium in Nutrition. Plants, animals, human beings]. Moscow, Pechatny Gorod Publ., 2006. 254 p. (In Russ.)
2. **Golubkina N.A., Sindireva A.V., Zaiko O.A., Alfthan G.** The human selenium status of Omsk region. Sibirskii ekologicheskii zhurnal [Siberian ecological journal]. 2012. Vol. 3, pp. 389–396. (In Russ.)
3. **Ermakov V.V.** Biogeochemistry of selenium and its significance in prophylactics of endemic human diseases. Vestnik otdeleniya nauk o zemle RAN [Vestnik of Earth science RAS]. 2004. no. 1 (22), pp. 1–17. (In Russian)
4. **Sindireva A. V.** Criteria and parameters of the action of trace elements in the system soil–plant–animal Diss. ... Doc. Biol. Sciences / A.V. Sindireva. – Tyumen, 2012. – 420 p.
5. **Alfthan G., Aro A., Arvilommi H.** Selenium metabolism and platelet glutathione peroxidase activity in healthy Finnish men: effects of selenium yeast, selenite and selenate. American Journal of Clinical Nutrition. 1991.vol. 53, pp. 120–125.

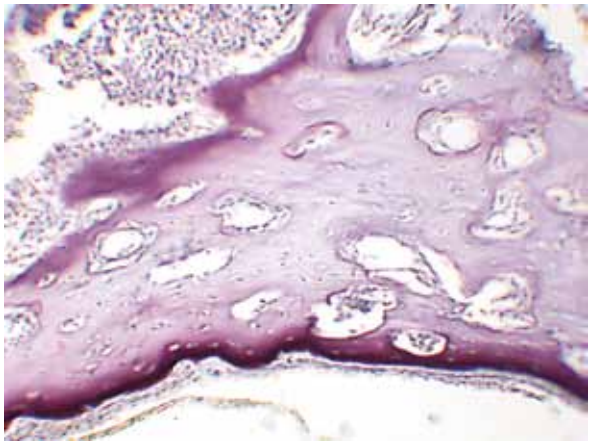

Fig.1. *Manifestation of osteosclerosis of spongy vone tissue dring chronic administration of the feed grown using selenium in a dose of 2 MAC. Staining with hematoxylin and eosin. x270*

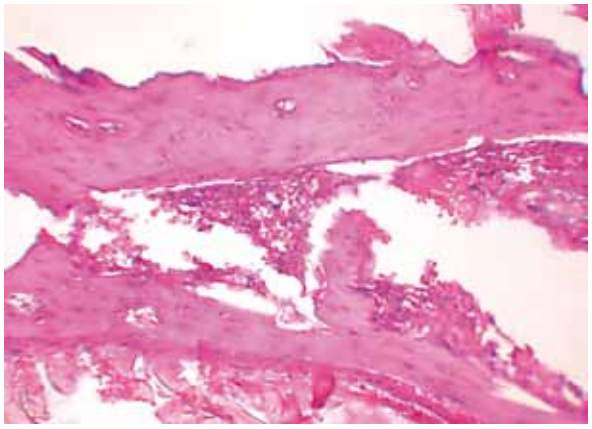

Fig.2. *Areas of lacunar resorption of sclerotic bone changes in animals of "Selenium" experimental group. Stained with hematoxylin and eosin. x270*

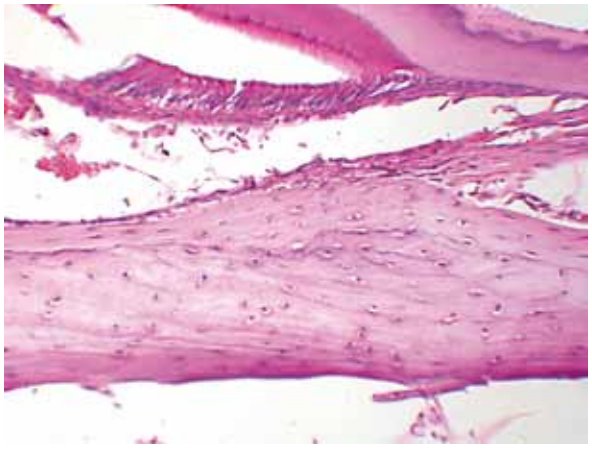

Fig.3. *Areas of lacunar resorption of sclerotic bone changes in animals of "Selenium" experimental group. Stained with hematoxylin and eosin. x900*

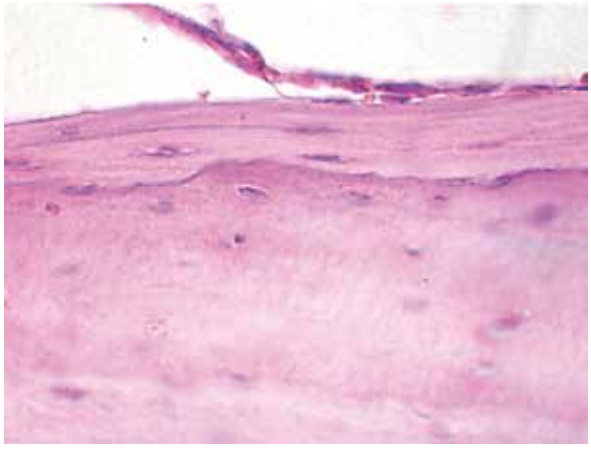

Fig.4. *Area of axillary bone resorption, replaced by fibrous connective tissue in animals of "Selenium" experimental group. Stained with hematoxylin and eosin. x900*

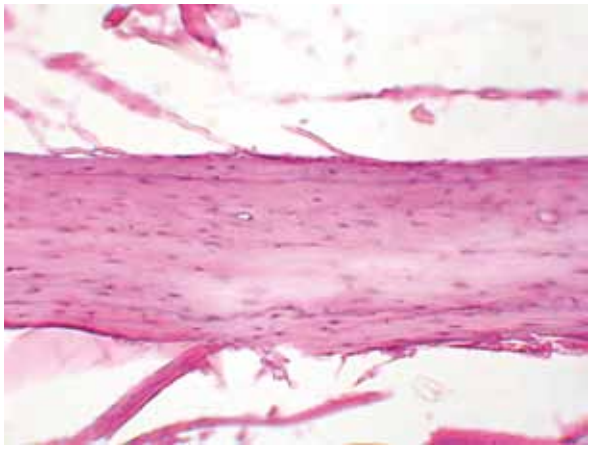

Fig.5. *Formation of delicate fibrous connective tissue in place of foci of axillary bone resorption in animals of "Selenium" experimental group. Staining with hematoxylin and eosin*

6. **Combs G.F.** Biomarkers of selenium status. Nutrients. 2015. vol. 7, pp. 2209-2236. DOI: 10.3390/nu7042209
7. **Combs GF.** Selenium in global food systems//British Journal of Nutrition-2001-Vol. 85-P. 517–547
8. **Fairweather-Tait SJ, Bao Y, Broadley MR, Collings R, Ford D, Hesketh JT, Hurst R** Selenium in human health and disease//Antioxidants and redox signaling – 2011 – Vol.14(7) – P.1337–1383
9. **Fordyce F.M.** Selenium deficiency and toxicity in the environment. Essentials of Medical Geology. 2012, pp. 375–416. DOI 10.1007/978-94-007-4375-5-16
10. **Golubkina NA, Alfthan GV.** The human selenium status in 27 regions of Russia//J Trace Elem Med Biol. – 1999 – Vol.13(1–2) – P.15–20.
11. **Yang G., Wang S., Zhou R., Sun S.** Endemic selenium intoxication of humans in China. American Journal of Clinical Nutrition. 1983. vol. 37, pp. 872–881.

APPLICATION OF THE DIABETES RISK SCORE (FINDRISC) IN A BARRA DO GARÇAS (MT), LEGAL AMAZON, BRAZIL

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ABSTRACT — Aims: to study the populational risk of type 2 diabetes mellitus among a population from epidemiology a municipality of the Central-Western Brazilian region. Methods: the Finnish Diabetes Risk Score (FINDRISC) was applied in 304 (99 men, and 205 women) adults of Barra do Garças, MT. Results: more men had lower risk score, and more women had light increased risk of type 2 diabetes according to FINDRISC score ($p<0.0001$). However, considering moderate, higher and highest risks of diabetes, there was no statistical difference among gender. Conclusion: this population of the Middle Araguaia Region, Legal Amazon, had a considerable risk of type 2 diabetes, which raises a new paradigm in primary health care for diabetes prevention.

KEYWORDS — type 2 diabetes mellitus, risk, score, Brazil, Amazon.

INTRODUCTION

In a few decades, there was a great growth on incidence and prevalence of diabetes and metabolic syndrome in Brazil (Schmidt et al., 2011).

Beyond unhealthy lifestyles, cultural, social, economic, educational, and environmental determinants have been associated with spreading of type 2 diabetes mellitus and other chronic non-communicable diseases (CNCD) in Brazil (Sá & Catarina, 2010; Dias et al., 2011; Schmidt et al., 2011; Galego et al., 2014; Farias jr et al., 2014; Garcia & Freitas, 2015; Malta et al., 2015; Azevedo & Silva et al., 2016).

Type 2 diabetes mellitus and other CNCDs are relevant causes of premature morbidity and mortality and high treatment costs for the Brazilian nation, including morbidity, economic costs, and years of life lost due to leg amputations (Alves & Morais Neto, 2015; Tavares et al., 2015; Santos et al., 2018).

In the 2000's, the Finnish Diabetes Association created a simple score to measure the risk of type 2 diabetes mellitus, the Finnish Diabetes Risk Score (FINDRISC). This is a simple, easy to use, and reliable score for estimation of the diabetes risk among population (Saaristo et al., 2005; Fokkens et al., 2018). The FINDRISC is also a reliable tool to detect cases of prediabetes and metabolic syndrome (Janghorbani et al., 2013; Silvestre et al., 2017).

Then, this is the first work regarding population risk of type 2 diabetes mellitus in the Mato Grosso State, Central-Western Brazil.

SUBJECTS AND METHODS

This descriptive transversal study covered 304 subjects from Aragarças (geographic coordinates 15°53'52" S, 52°15'3" W; 19,959 inhabitants), Pontal do Araguaia (15°56'2" S, 52°19'1" W; 6,578 inhabitants) and Barra do Garças (15'53'24" S, 52°15'25" W; 60,661 inhabitants) municipalities (IBGE, 2018). Those municipalities comprised the Middle Araguaia region located at the Central Western Brazil in the border of Goiás and Mato Grosso states.

Those 304 subjects (99 men and 205 women) presented aging variation between 20 and 60 years old, with a mean of 35.7±11.12 years-old.

The inclusion criteria were being 18 years old or more, of both gender, be willing to participate in the study after signed the informed consent form. Exclusion criteria were the refusal to participate in the study. A Portuguese version of the Finnish Diabetes Risk Score (FINDRISC) (Saaristo et al., 2005) was applied between April and August 2018.

Ethical and statistical aspects

Before engaging into the research people received an explanation regarding the procedures and they signed a written informed consent. This study is a subsample from study "The Epidemiology and Risk Factors of Chronic Non-Communicable Diseases: Development and Application of a Health Promotion Scale (HPS) which was approved by the Ethics Committee on Research of the "Campus Universitário do Araguaia" from "Universidade Federal de Mato Grosso (UFMT)" (protocol CAAE: 62989416.1.0000.5587 – 2017). Statistical analysis was done using the program Epitools® (Australia). In order to correct, standardize and balance the samples by gender, a two-tailed, 2-proportion z-test was performed. Statistical significant differences were considered when $p<0.05$.

RESULTS

More men had lower risk score (59% x 36.92% with 5.5 z-value and $p<0.0001$), and more women had light increased risk (37.51% x 21% with 4.5 z-value and

p<0.0001) of type 2 diabetes according to FINDRISC score. However, considering moderate (1.4 z-value and p=0.1661), higher (0.6 z-value and p=0.5359) and highest (0.7 z-value and p=0.4958) risks of diabetes, there was no statistical difference among gender (Fig. 1).

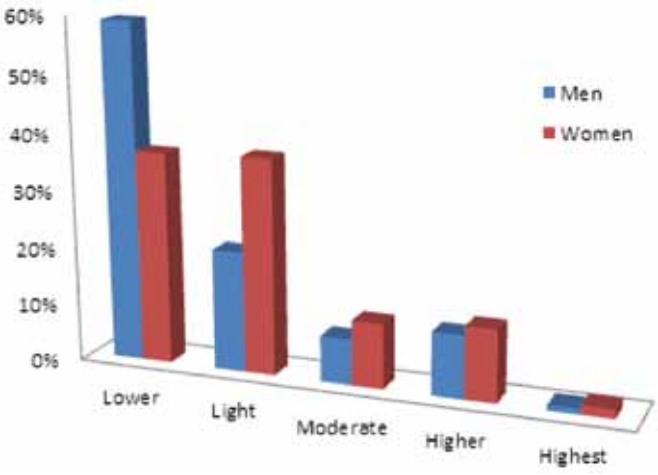

Fig. 1. *Categories of the FINDRISC, according to gender, in a population from the Middle Araguaia region, Brazil*

In the past few years, many authors have grouped the people with moderate and high risk of diabetes. The sum of those groups resulted in a frequency 19.2% for men and 23.9% for women.

DISCUSSION

A study in Zulia, Venezuela, reported frequencies of high and highest risks of type 2 diabetes mellitus, respectively, of 10.89% and 0.99% which were similar to those found in the current work (Paredes et al., 2014).

Studying university students in Jordan, authors found that 5.2% and 1.8% had moderate and higher risk of type 2 diabetes mellitus, respectively (Al-Shudifat et al., 2017).

Considering the sum of moderate and high risk groups, a study in Amarante, Portugal, reported that 12.8% presented elevated risk of disease (Valente et al., 2012).

In the present study, the frequency was higher even for men (19.2%) than women (23.9%).

The high risk of diabetes found in the current study was also higher to the 14.7% of frequency reported by a study developed in Horizonte, Ceará, Northeast Brazil (Cândido et al., 2017).

However, in the Mexico city the frequency of high risk of type 2 diabetes mellitus reached 44.8%, which was the double compared with the work presented here (Avilés et al., 2018).

A previous study of Fonseca et al. (2012) in Barra do Garças (MT), revealed an adult prevalence of type 2 diabetes mellitus of 19.8%.

Considering the above discussion it is important to note that health promotion practices in Brazil, especially targeted to prevention of chronic non-communicable diseases are absent in the majority of the country territories and is also very poor and insufficient (Ferrari, 2018) to face the epidemics of diabetes and other CNCDs.

CONCLUSION

In this population from the Middle Araguaia region, a territory belonging to the Legal Amazon region, the frequency of type 2 diabetes mellitus risk was elevated, which shows the urgency of a new paradigm in primary health care diabetes mellitus prevention.

REFERENCES

1. **AL-SHUDIFAT, A.-E., AL-SHDAIFAT, A., AL-ABDOUH, A.A., ABUROMAN, M.I., OTOUM, S.M., SWEEDAN, A.G., KHRAIS, I., ABDEL-HAFEZ, I.H., JOHANNESSEN, A (2017).** Diabetes risk score in a young student population in Jordan: a cross-sectional study. Journal of Diabete Research 2017; Article ID 8290710: https://doi.org/10.1155/2017/8290710
2. **ALVES, C.G., MORAIS NETO, O.L. DE (2015).** Tendência da mortalidade prematura por doenças crônicas não transmissíveis nas unidades federadas brasileiras. Ciência & Saúde Coletiva, 20, 641–54.
3. **AVILÉS, A.G.P., ROSAS, E.R.P., BELLOT, F.T., GILES, O.A., MENDOZA, R.D (2018).** FINDRISC FINnish Diabetes Risk Score questionnaire for the detection of undiagnosed diabetes and pre-diabetes. Archivos de Medicine Familiar, 20(1), 5–13.
4. **BERNABE-ORTIZA, A., PEREL, P., MIRANDA, J.J., SMEETH, L (2018).** Diagnostic accuracy of the Finnish Diabetes Risk Score (FINDRISC) for undiagnosed T2DM in Peruvian population. Primary Care Diabetes, 12(6), 517–525.
5. **CÂNDIDO, J.A.B., TORRES, G.M.C., FIGUEIREDO, I.D.T., MORAIS, A.P.P., PINTO, F.J.M., PINTO A.G.A., MOREIRA, M.R.C., ALMEIDA, M.I. (2017).** FINDRISK: Diabetes Mellitus risk stratification in community health. Revista Brasileira de Promoção da Saúde, 30(3), 1–8.
6. **FERRARI, C.K.B (2018).** Implementation of public health policies for healthy lifestyles promotion: what Brazil should tell us? Health Promotion Perspectives, 8(3), 243–248.
7. **FOKKENS, B.T., VAN WAATERINGE, R.P., MULDER, D.J., WOLFFENBUTTEL, B.H.R., SMIT, A.J (2018)** Skin autofluorescence improves the Finnish Diabetes Risk Score in the detection of

diabetes in a large population-based cohort: The Life-Lines Cohort Study. Diabetology & Metabolism, 44, 424–430.

8. **FONSECA, G.A.A., DAVID, L.A., FERRARI, G.S.L., FERRARI, C.K.B (2012).** Prevalence of metabolic syndrome in patients attended in the health family strategy of Barra do Garças, MT. Revista de Ciências Médicas e Biológicas, 11(3), 290–295.
9. **GARCIA, L.P. & FREITAS, L.R.S DE (2015).** Consumo abusivo de álcool no Brasil: resultados da pesquisa nacional de Saúde 2013. Epidemiologia e Serviços de Saúde, 24, 227–37.
10. IBGE. Instituto Brasileiro de Geografia e Estatística. IBGE cidades. https://cidades.ibge.gov.br/pesquisas [11/30/2018].
11. **MALTA, D.C., CAMPOS, M.O., OLIVEIRA, M.M. DE, ISER, B.P.M., BERNAL, R.T.I., CLARO, R.M., MONTEIRO, C.A & REIS, A.A.C. (2015).** Prevalência de fatores de risco e proteção para doenças crônicas não transmissíveis em adultos residentes em capitais brasileiras, 2013. Epidemiologia e Serviços de Saúde, 24, 373–387.
12. **PAREDES, N., OJEDA, M.M.A., LÓPEZ, J., LÓPEZ, A., ROSALES, J., SCAGLIA, R., HERRERA, E.L., NAJUL, M., CHACÓN-LOZSÁN, F (2014).** Aplicacion del test Findrisk para calculo del riesgo de padecer diabetes mellitus tipo 2. Medicina Interna (Caracas), 30(1): 34–41.
13. **SÁ, N.N.B. DE & MOURA, E.C. (2010).** Fatores associados à carga de doenças da síndrome metabólica entre adultos brasileiros. Cadernos de Saúde Pública, 26, 1853–1862.
14. **SAARISTO, T., PELTONEN, M., LINDSTRÖM, J., SAARIKOSKI, L., SUNDVALL, J., ERIKSSON, J.G., ET AL. (2005).** Cross-sectional evaluation of the Finnish Diabetes Risk Score: a tool to identify undetected type 2 diabetes, abnormal glucose tolerance and metabolic syndrome. Diabetes and Vascular Disease Research, 2(2), 67–72.
15. **SANTOS, K.P.B., LUZ, S.C.T., MOCHIZUKI, L., D'ORSI, E (2018).** Burden of disease from lower limb amputations attributable to diabetes mellitus in Santa Catarina State, Brazil, 2008-2013. Cadernos de Saúde Pública, 34(1), e00013116.
16. **SCHMIDT, M.I., DUNCAN, B.B., AZEVEDO, S.G., MENEZES, A.M., MONTEIRO, C.A., BARRETO, S.M., CHOR, D. & MENEZES, P.R (2011).** Chronic non-communicable diseases in Brazil: burden and current challenges. The Lancet, 377, 1949–1979.
17. **SILVESTRE MP, JIANG Y, VOLKOVA K, CHISHOLM H, LEE W, POPPITT SD (2017).** Evaluating FINDRISC as a screening tool for type 2 diabetes among overweight adults in the PREVIEW:NZ cohort. Primary Care Diabetes, 11(6), 561–569. Doi: 10.1016/j.pcd.2017.07.003
18. **TAVARES, N.U.L., COSTA, K.S., MENGUE, S.S., MALTA, D.C., SILVA JR, J.B. DA (2015).** Uso de medicamentos para tratamento de doenças crônicas não transmissíveis no Brasil: resultados da pesquisa nacional de saúde, 2013. Epidemiologia e Serviços de Saúde, 24, 315–323.
19. **VALENTE, T., AZEVEDO, L. (2012)** Estudo RADAR- Risco Aumentado de Diabetes em Amarante. Revista Portguesa de Medicina Geral e Familiar, 28, 18–24.
20. **SILVESTRE, M.P., JIANG, Y., VOLKOVA, K., CHISHOLM, H., LEE, W., POPPITT, S.D (2017).** Evaluating FINDRISC as a screening tool for type 2 diabetes among overweight adults in the PREVIEW:NZ cohort. Primary Care Diabetes, 11(6): 561–569. Doi: 10.1016/j.pcd.2017.07.003
21. **JANGHORBANI, M., ADINEH, H., AMINI, M (2013).** Evaluation of the Finnish Diabetes Risk Score (FINDRISC) as a screening tool for the metabolic syndrome. Review of Diabetic Studies 2013;10(4): 283–292.

PERCEIVED QUALITY OF LIFE AND RESPONSIBILITY FOR OWN HEALTH CONDITION. MICRO-RESEARCH

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ABSTRACT — Managing the patient's self-care can be a framework in which he or she expresses responsibility for their own health condition. The present research starts from the hypothesis that there is a tendency in the Romanian population, it also manifests to young people with an average level of education and easy access to information for self-care, but this is done by avoiding the specialized medical consultation, the information being often obtained online or from members of the younger entourage. a therapeutic adherence. As regards mistrust in allopathic medicine, this, although it exists, does little to the extent of therapeutic adherence. Objective factors such as the relative lack of specialist medical services or difficult access, in other words of resource allocation in general as part of the social responsibility of the state (Frunză, 2011), are not a major impediment to targeting young people and family members to appropriate specialist medical services. The neglect of one's own health condition, when it is conscious, is due to laziness and lack of care (responsibility). Optimism (perhaps exaggerated) about current health care and its possible evolution is one of the most important factors in the decision to postpone medical examinations and therapeutic non-adherence in the case of mild symptoms.

KEYWORDS — quality of life; responsibility; health condition; therapeutic adherence.

INTRODUCTION

Managing the patient's self-care can be a framework in which he or she expresses responsibility for their own health condition. The research starts from the conclusions of studies on self-care management (Sandu, Cojocaru, & Oprea, 2013; Oprea, Cojocaru, Sandu, & Bulgaru-Iliescu, 2013) whose conclusion was that there is a direct leeway between the responsibility of the individual health condition and therapeutic adherence, especially in chronic patients. The paper is based on a micro-research conducted between October and November 2018, using the questionnaire survey applied to students at non-medical specializations from a University in the N-E area of Romania. The research aims at young people's perception of the quality of life related to the perceived health-state of the family.

RESEARCH OBJECTIVES

The research targets the young people's perception of quality of life related to family health. In the research it was considered the analysis of the predominant sources of information used by the young people in the process of self-care, the frequency and the moment when specialized health care services are being applied to the perceived moment of the onset of a disease. It is worth highlighting possible causes of postponement of the specialized consultation: lack of financial resources needed for calling to specialized medical services, unavailability of specialized medical services needed in the home area, lack of trust in allopathic medicine, etc. In the context of the study of the quality of life related to the state of health, we have been interested in the assumed responsibility for our own health, as well as that of our own family.

LITERATURE REVIEW

The patient's responsibility for self-care, when correlated with therapeutic adherence, is part of the strategies to create a therapeutic alliance between physician and patient in chronic disease management (Oprea et al., 2013). Self-medication in the absence of medical supervision leads to a worsening of the patient's health condition and the quality of his life. Sociological studies on quality of life bring together research in disparate areas, which provide them with gnoseological coherence (Gemene, Unguru, & Sandu, 2018).

The quality of life is often considered an opera- tion of the concept of happiness (Zamfir, 1982). The criteria taken into account in the quality of life research also refer to the objective conditions in which an individual, group or community is living, as well as to the subjective way in which social actors assess their living standards. From a sociological point of view, the concept of quality of life is an evaluation concept. It does not refer to any class of objects or social phenomena as descriptive concepts, but to their evaluation (Gemene et al., 2018). In contrast to general quality of life studies, health-related quality of life analyzes the

extent to which the health condition and the therapeutic processes influence well-being or maintain it within the limits of a relative normal. The term health-related quality of life refers to the extent to which significant aspects of personal life are influenced by health and health-related interventions such as medical care. Health-related quality of life studies are used in the assessment of health programs, the construction of health policies, and also in current clinical practice. The quality of life correlates the perceptions of individuals about their own social situation and how they relate to cultural values and their own standards and aspirations (Gemene et al., 2018).

RESEARCH HYPOTHESIS

The present research starts from the premise - with value of hypothesis - that there is a trend in the Romanian population, it also manifests to young people with an average level of education and easy access to information towards self-care, but this is done with the avoidance of consultation medical specialty, the information being often obtained online or from the members of the younger entourage.

METHODOLOGY

The article is based on a micro-research conducted between October and November 2018, through the questionnaire survey applied to students at non-medical specializations from a University in the N-E area of Romania. The research aims at young people's perception of the quality of life related to the perceived health of the family.

The research was attended by 86 respondents, day-care students at non-medical specializations, from a university in the N-E region of Romania. The majority of respondents are between the ages of 18 and 25, with only two of them reporting a higher age. Of the respondents, 62 were female and 24 male. Of the respondents 83 are unmarried and only 3 participants say they are married. As far as the environment of origin is concerned, 56 come from urban and 28 from rural areas.

The questionnaire was self-applied by groups of respondents in the presence of the researcher. No other information was provided to participants than those included in the research report. The sampling was non-random, all students attending the questionnaire attended the classroom, were given a form, and were invited to complete it after they had received the necessary information in advance and their informed consent.

The questionnaire contained a series of 24 closed questions, self-supervised by the operator.

RESULTS

The importance of family health is being recognized by all respondents, which is appreciated as important or very important by all participants (fig. 1).

The Trust in Medicine

As for trust in medicine, 45% of respondents trust in allopathic, western medicine, and 19% trust mainly in traditional and natural medicine. A significant percentage of 30% of respondents express their mistrust in modern medicine, preferring to self-care themselves the way they think is best — taking their information mainly from family and acquaintances — while 6% of them report neglecting their own health care, until the health problem becomes serious or even very serious (fig. 2).

Satisfaction with Existing Health Care Opportunities within the Area Where People Reside

Available health care opportunities within the area where people reside are considered sufficient by 50% of respondents, while only 1% of them think that such care resources are totally missing or inaccessible, while 3% of them considers them to be insufficient. It is noteworthy that only 8% of the respondents appreciate that these resources are plenty, which shows that we actually have a level of service that is acceptable, but which could be improved (fig. 3).

Perceived Health Status of the Family

Respondents state that the health state of their families is good (68%) or very good (30%), and only 2% show signs of worry about the health of their families (fig. 4).

Perception of Family Members' Efforts to Maintain their Health

The efforts made by family members to maintain their health are generally considered to be little (74%), very little (18%) or even nonexistent (8%). None of the respondents appreciate that their family members would make sustained or even excessive efforts to maintain their health. However, at the previous question, the health of family members was perceived as good or very good, which is why it was not perceived that efforts were made to maintain or improve their health condition (fig. 5).

Satisfaction with the Health of Family Members

Respondents declare themselves to be very satisfied (10%) or satisfied (73%) with the family health condition, including their own. Only 4% of the respondents are dissatisfied with their family health, but none of them have expressed total dissatisfaction (fig. 6).

The (Declared) Attitude towards the Family Health

The declared attitude towards the health of the family members is that of responsibility, 57% of the respondents considering themselves accountable for their family's state of health. 29% of the respondents are rather negligent about their state of health, while only 12% are extremely concerned (fig. 7).

Expectations Regarding the Evolution of the Health Status of Family Members

Even if the respondents are generally satisfied with the health status of family members, they (41% of them) expect improvement and even significant improvement (7%) Respondents do not expect the health condition of their family members to get any worse, but even if 8% felt that such a situation was possible, none were convinced that the worsening would be significant. Maintaining health at the same level is considered to be the most likely evolution of the health status of family members. Expected results are due to a lack of efforts to care for health. The optimism towards the evolution of the health status is based on the general appreciation of the family health condition, and the assumption that it will not degrade. The correlation between the answers to the 3 questions seems to suggest a lack of accountability to their own health, given a high optimism regarding the health condition (fig. 8).

Sources of Information on Health Care

Regarding the sources of information on optimal health care, respondents point to physicians, 23% of them consider physicians are the sole source of information, while for 63% of them, physicians are a source of information only when the suffering is perceived as serious. Other sources of information on health care are represented by family or close friends (12%) and the internet (4%). Other sources of information were not mentioned (fig. 9).

The Perceived Importance of Specialised Medical Services for Family Members

The existence and accessibility of health services are considered important (33%) and very important (57%) for family members. Only 1% of respondents consider access to specialized medical services as being of no importance to the quality of life of their own family members. Only 29% of the respondents complain that themselves or their family members do not have / have had access to necessary (specialized) medical services, while 71% of them show that they had access to the specialized health services necessary for their own health care or that of their family members (fig. 10).

Efforts Undertaken to Access Specialized Medical Services

Although the participants stated that they and their family members had access to specialized medical services, the effort to obtain such services was considered to be significant by 41% of the respondents and even very significantly by 16% of them. Only 1% of participants considered that they made almost no effort, while 11% consider the efforts made to access specialized health services as being small (fig. 11).

Expectations for the Development of Specialized Medical Services and their Accessibility

Regarding the development of specialized medical services and their accessibility in the residential area of the respondents, they are generally optimistic, 57% considering that they will improve in the following years, and 11% considering that they will improve very much, while only 1% expect a decrease in quality or accessibility, and 31% consider that they will remain roughly the same (fig. 12).

DISCUSSIONS AND LIMITATIONS

The research is exploratory, aiming at outlining the relationship between responsibility for one's own health and perceived quality of life. The small size of the sample on which the questionnaire survey was applied to does not allow an adequate generalization of the results, in the sense of fully assuming that the research hypothesis was validated.

The fact that the sample is formed mostly of unmarried people is likely to influence general outcomes, because marriage gives a sense of maturity about responsibility for their own health condition. However, among this category of population, meaning students, most of them are unmarried persons, this period of life being a period of conjugal couples' construction.

The increased proportion of urban respondents influences the responses regarding the accessibility of specialized medical services.

RESPECTING THE ETHICS OF RESEARCH

Regarding the observance of the ethics of research, this research does not present any discomfort or risk for respondents. Given the student-teacher authority relationship, as the one between the researcher and the respondents, the self-application method was used. Respondents filled out the questionnaire anonymously, under conditions that ensured anonymity of responses including for the researcher. The participating students were informed about the purpose and objectives of the research, of its exploratory nature, and of their right to withdraw from research, or not to answer one or more questions. The structure of the

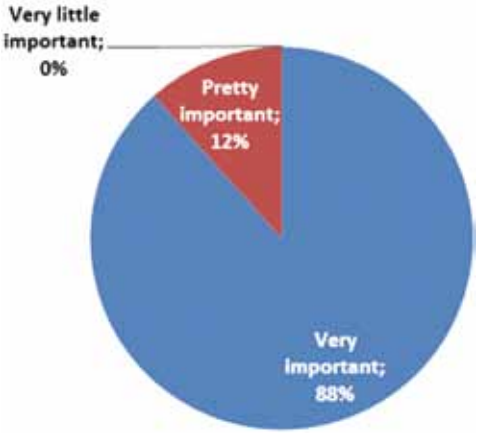

Fig.1. *The perceived importance of health for the family's quality of life*

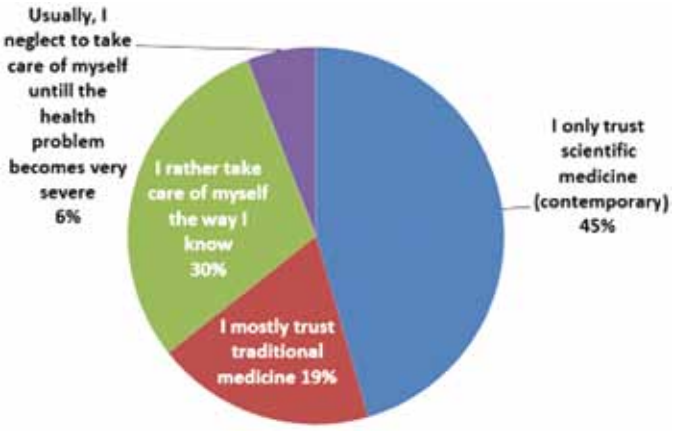

Fig. 2. *Trust in contemporary medicine. Regarding health care...*

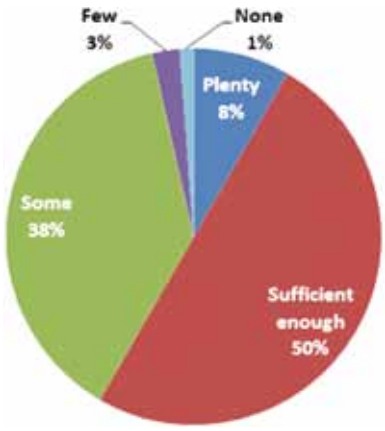

Fig. 3. *Health care opportunities considered to be satisfactory within the area where people reside*

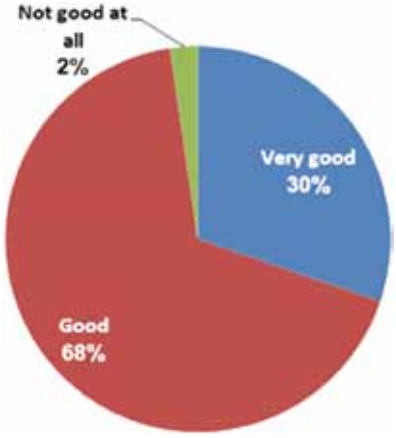

Fig.4. *Perceived health status of the family*

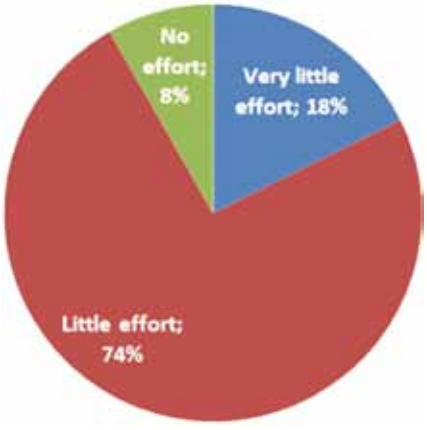

Fig. 5. *Perception of family members' efforts to maintain their health*

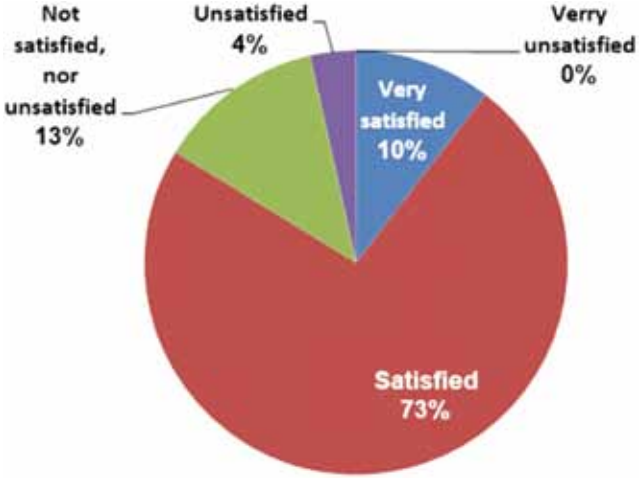

Fig. 6. *Satisfaction with the health of family members*

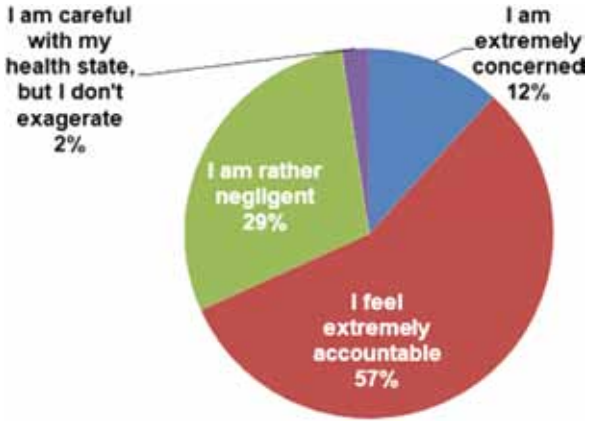

Fig. 7. *The (declared) attitude towards the family health*

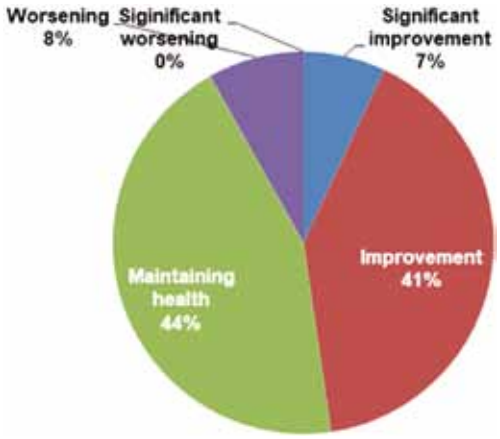

Fig. 8. *Expectations regarding the evolution of the health status of family members*

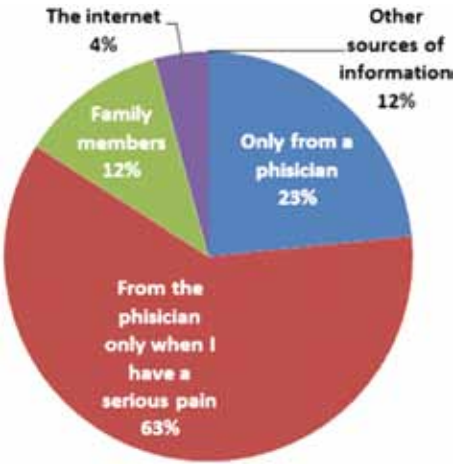

Fig.9. *Sources of information on health care*

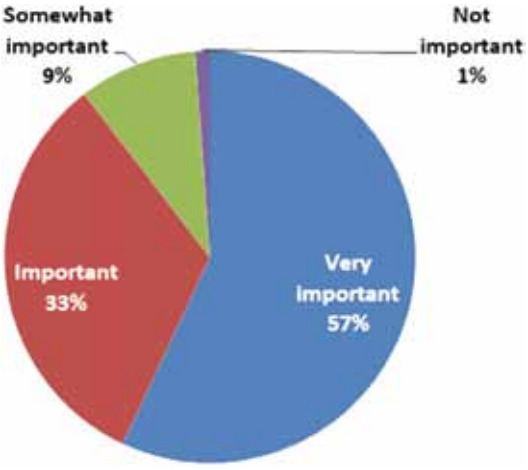

Fig.10. *The perceived importance of specialised medical services for family members*

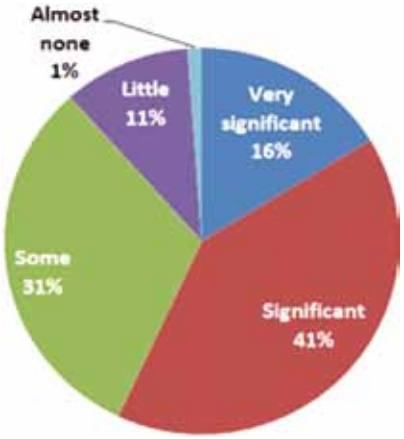

Fig11. *Efforts undertaken to access specialized medical services*

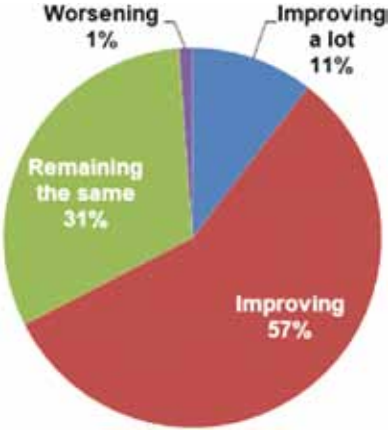

Fig.12 . *It is likely that the support you receive from specialized medical services will...*

research tool also included the non-response option, but this was not significant to influence the coding of the results. Informed consent was obtained from all participants.

CONCLUSIONS

The correlations found between the perceptions expressed by the respondents regarding their family health status, the concerns about the quality of life, correlated with the state of health, on the one hand, and the minimal efforts undertaken to maintain their state of health, on the other side, lead us to conclude that the hypothesis can be considered only partially valid for the studied population.

Self-perception of the health state becomes the background of self-medication and self-care, which is only partially the result of therapeutic adherence. As regards mistrust in allopathic medicine, this, although it exists, does little to affect therapeutic adherence.

Objective factors, such as the relative lack of specialized medical services or difficult access to such services are not a major impediment to the targeted group of young people and their family members to find specialized medical services.

The neglect of one's own health condition, when it is conscious, is due to laziness and lack of care (responsibility). Optimism (perhaps exaggerated) about current health care and its possible evolution is one of the most important factors in the decision to postpone medical examinations and therapeutic non-adherence in the case of mild symptoms.

REFERENCES

1. **Gemene, C., Unguru, E., & Sandu, A.** (2018). Sociological perspectives on the quality of life correlated with the state of health. Postmodern Openings, 9(3), 76–98. Doi:10.18662/po/37
2. **Oprea, L., Cojocaru, D., Sandu, A., & Bulgaru-Iliescu, D. (2013).** The chronic care model (CCM) and the social gradient in health. Revista de Cercetare şi Intervenţie Socială, 41, 176–189. Retrieved from: https://www.rcis.ro/en/section1/84-volumul-412013iunie/974-the-chronic-care-model-ccm-and-the-social-gradient-in-health.html
3. **Sandu, A, Cojocaru, D., & Oprea, L.** (2013). Autonomia pacientului în contextul îngrijirilor medicale. In: Oprea. L., Gavrilovici, C., Vicol, M. C., Astărăstoae, V. (Coords.), Relaţia medic-pacient (pp. 125–165). Iaşi, Romania: Polirom.
4. **Zamfir, C.** (1982). Modul de viaţă şi calitatea vieţii. Bucharest, Romania: Politică.

THE ROLE OF SOCIAL ASSISTANCE IN THERAPEUTIC EDUCATION

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ABSTRACT — Therapeutic education is a decisive factor in the management of self-care for people with chronic diseases. The theoretical perspective is based on the model of chronic care, focusing on therapeutic education as part of the general system of care for cronic patients.
In the context of this article, we will interpret the results of a questionnaire applied to patients with various chronic diseases, who due to their status of vulnerability, are beneficiaries of social services. The questionnaire was applied to 60 patients with chronic disease: diabetes mellitus, hypertension, chronic renal failure, chronic hepatitis and HIV infection, patients living in the northeastern region of Romania, beneficiaries of social services. We will also highlight the role of social assistance as a form of therapeutic education, aiming at shaping a social assistance profile in the general context of public health.

KEYWORDS — chronic illness; social care; self-care management; chronic care model; therapeutic education.

INTRODUCTION

Therapeutic education is a decisive factor in the management of self-care for people with chronic diseases. The theoretical perspective is based on the model of chronic care, focusing on therapeutic education as part of the general system of care for cronic patients.

In the context of this article, we will interpret the results of a questionnaire applied to patients with various chronic diseases, who due to their status of vulnerability, are beneficiaries of social services. The questionnaire was applied to 60 patients with chronic disease: diabetes mellitus, hypertension, chronic renal failure, chronic hepatitis and HIV infection, patients living in the northeastern region of Romania, beneficiaries of social services. We will also highlight the role of social assistance (Christ & Divan, n.d.; Coleman et al., 2004; Frăţilă, 2017; NASHW, 2005; WHO, 1998) as a form of therapeutic education, aiming at shaping a social assistance profile in the general context of public health..

Difficulties in accessing care services by young people in the conditions of the lack of health education, as well as the increased labor migration, especially of young people, as well as the pressures on the labor market, determine the management of the self-care of chronic conditions outside medical institutions.

Self-care management (Bandol, 2015; Bodenheimer, Lorig, Holman, & Grumbach, 2002; Findley, 2013; Nelson, Meyer, & Bohmer, 2014; Oprea, Cojocaru, Sandu, & Bulgaru-Iliescu, 2013; Verzea & Necula, 2012) most often involves major lifestyle changes involving proper medication, due to a proper diet and increased attention to various risk factors that may lead to the worsening of the chronic condition. Appropriate lifestyles often involve additional costs for both medication, diet and care for complementary pathologies.

RESEARCH METHODOLOGY

The research is based on the sociological survey by questionnaire (Blackstone, 2012; Leahey, 2011), applied to 77 patients with chronic disease: diabetes mellitus, hypertension, chronic renal failure, chronic hepatitis and mental illness in the North-East of Romania, during May-September 2015, who benefited from / benefited from medical and social assistance services through medical and social institutions in North-Eastern Romania.

The questionnaire was completed by a number of 42 female and 35 male respondents. The age structure of the respondents is: 3% people under the age of 18, 3% of people aged between 18 and 25 years, 6% of people between 25 and 35 years of age, 9% of people aged 35 to 50, and 79% of people over 50 years of age.

The large number of respondents over the age of 50 may be due to the particularities of the sample, i.e. those in the health and medical-social system, but may also reflect a possible lack of therapeutic education for young people who "live with the sickness", calling for medical care only at the last minute. Another cause may be the large number of people suffering from chronic illnesses in social services records, amid a rapidly aging population and also due to the migratory phenomenon and negative population growth.

The sample included: 12% non-primary or primary educated respondents, 56% middle-schooled, and 32% university graduates.

The occupational status of the respondents is represented by: 3% students and 10% unemployed and/or who only work in their households, 17% employees, 70% pensioners.

DISCUSSIONS

The exploratory nature of the research (Reiter, 2013, 2017) makes it so that the sample is not necessarily representative for the total population of people with chronic illness in the evidence of medical services. This is due to the particularity that subjects must necessarily belong to a category of vulnerable populations in the sphere of those under the protection of social services. Regarding the two requirements, that of being a person suffering from a chronic disease and that of being a person in the care of social services, we show that there are no cumulative statistics. The sample size was divided by quotas, based on the age and level of education of the respondents who are in the care of social services.

RESEARCH RESULTS

When asked about the type of chronic illness they suffered from, respondents particularly highlighted: chronic cardiovascular disease, diabetes mellitus, chronic liver disease. Diseases reported by respondents in the sample are generally the same as those with the highest incidence at the European level, which may be a confirmation of the correctness and representativeness of the sample chosen (fig. 1).

Respondents mostly declared that they suffer from chronic illness of about 5–10 years, but there are also people who have been suffering from less than 1 year (7%) and others over 10 years (21%) (fig. 2).

The results obtained can be explained by the fact that, in general, the management of self-care for chronic conditions is mainly performed outside the health care institutions during the onset period of the illness, with an emphasized trend for hospitalized care after the first 3 years from the onset of the disease.

It is possible to have hospital care of chronic illness in the first few months after the onset of the disease through daily admissions, given the current conditions for financing health care services (fig. 3).

Most of the respondents benefite d from social services care, at least from the social survey for initial evaluation. Only 11% of respondents say they have not benefited from social services at all (fig. 4, 5).

We note that a relatively high number of respondents are not in the records of social services. Of those who are in the records of social services, a significant proportion of people are classified as disabled. In practice, the other forms of social assistance that chronic patients might be entitled to benefit from (guaranteed minimum income, exceptional benefits) occupy a small percentage of the total target group surveyed for this research. We believe there is a need to increase the involvement of social assistance services in chronic care institutions.

Given the fact that the beneficiaries of the minimum guaranteed income are missing from the sample chosen for this research, although we have tried to ensure the largest possible diversity of respondents, who are chronic patients and beneficiaries of social services, we can conclude that a very small number of people at the limit / below the poverty line — which entitles them to benefit from the minimum guaranteed income — calls for health services, even when suffering of chronic illnesses, which affects even more their quality of life.

As far as the specialized services to which respondents turned to are involved, they mainly indicated the social worker, followed by the physician, and the family doctor/nurse. A large number of respondents indicated multiple responses, including both social and medical assistance. Social assistance has a privileged role, being the first option of the respondents (within the multiple responses given, the role of social assistance was also included).

Specialized services were generally provided by health and medical staff. The role of the priest was not emphasized - spiritual counseling was not considered a specialized service. The role of the psychologist and civil society is particularly low.

Therapeutic education was mentioned by the majority of the respondents among the specialized services they benefited from (fig. 6).

Generally, respondents who stated that they had received specialized services from a certain category of staff, showed that they also received therapeutic education mainly from the same category of specialists. Considerations on specialized services also apply to therapeutic education (the reduced role of the priest, psychologist and civil society, the increased role of the social worker). Although, one mention should be made about the priest, because spiritual counseling, although it contains obvious elements of therapeutic education and supportive intervention (Gavrilovici, Macarie, Damian, Necula, & Tebeanu, 2012), is not placed by respondents in this category (fig. 7).

Although most respondents show that they are aware of the necessary lifestyle changes, these are often unfeasible due to high costs.

The vast majority of respondents said they were satisfied or very satisfied with the involvement of the

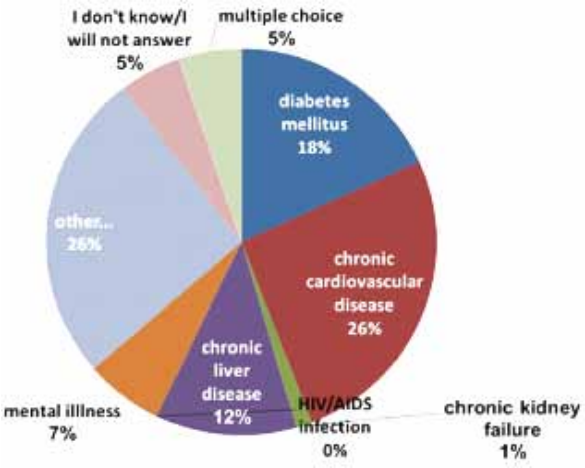

Fig.1. Type of chronic illness the respondents suffer from

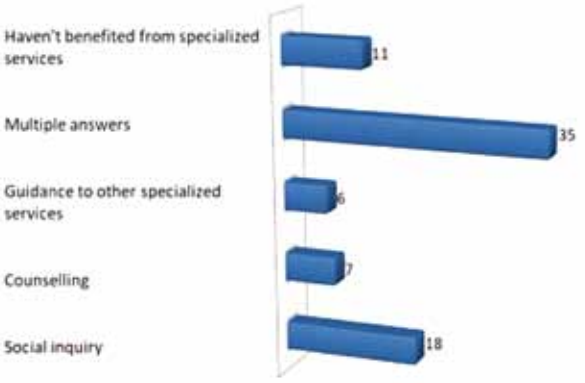

Fig. 3. Access of respondents to specialized services

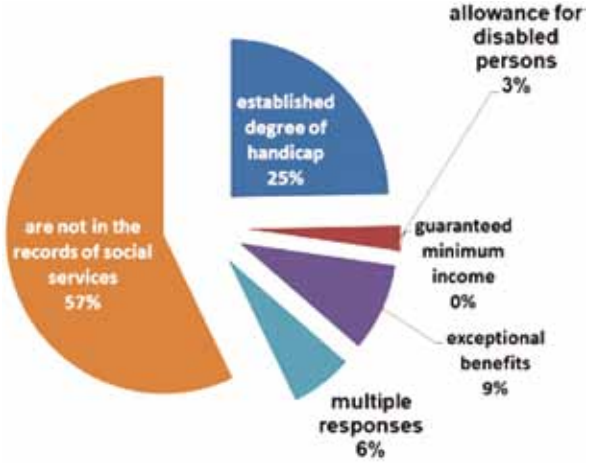

Fig. 5. Access of Respondents to Types of Social Services

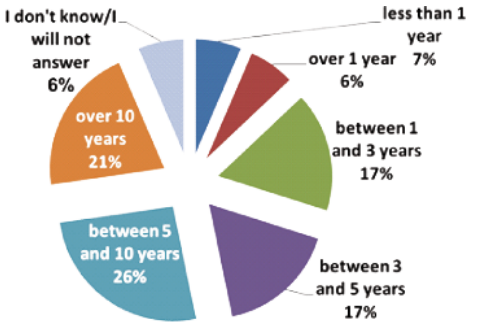

Fig. 2. How long have you been diagnosed?

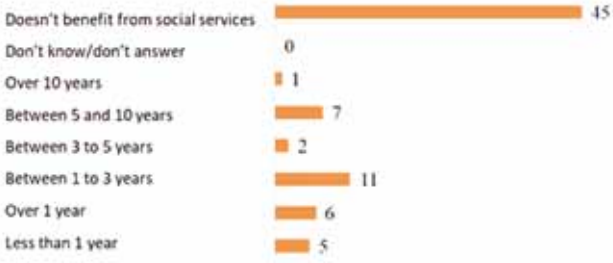

Fig. 4. Period since respondents have benefited from social services

Fig. 6. Therapeutic education and its place among specialized services

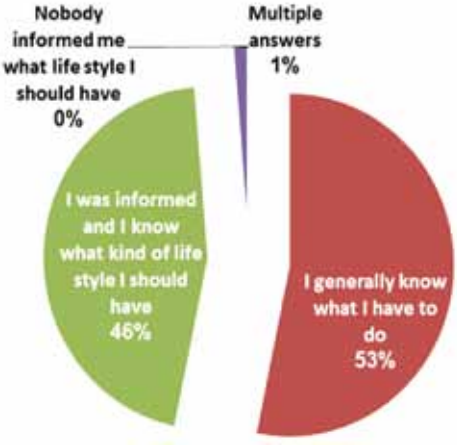

Fig. 7. Therapeutic education received by respondents

social workers in their support for chronic disease management (fig. 8).

Only 5% of respondents consider that they have not benefited from the services of the social worker at all.

The social worker's intervention has led to an increase in the quality of life of patients with chronic diseases, both in general terms, as well as regarding its various components: family life, soul contentment, conflict resolution. Some respondents mentioned an improvement in the health status resulting from the intervention of the social worker (fig. 9).

The role of the social worker in the institutional environment is generally polyvalent, and correlates with both the function of chronic care and the general attributions of social assistance practice in public and private institutions. Among these an important place in occupied by community social services (that activate under the jurisdiction of the City Halls), which account for 20% of the respondents' preferences (fig. 10).

Regarding the areas where social services offered to chronic patients can be improved, research results indicate:

— Good patient information on social services offered by the state;
— Patient counseling, supporting them at the time of admission / discharge from a medical institution;
— Establishment of state-funded centers for patients with chronic illnesses, where they should receive treatment and free counseling for a longer period;
— Visiting chronic patients at home and checking their needs;
— Paying more attention to chronic patients by health and social workers;
— Funding of specialized projects / programs for chronic patients;
— Establishment of non-governmental organizations especially for chronic patients (programs, counseling, daily activities);
— Professional development of employees through regular training programs;
— Good collaboration between the social, educational and health sector;
— Increasing the number of experts working in the social field.

A second dimension of this research is represented by the particularities of self-care management for chronic patients in situations of social vulnerability and which would require the intervention of the social worker.

Some respondents show that they are unable or unwilling to assume these costs in part or in full, choosing not to respect the lifestyle specific to their chronic illness, even at the risk of diminishing their quality of life or even their life expectancy (fig. 11).

It is necessary to develop social services for chronic patients, together with the special social benefits necessary to ensure the minimum level of self-care.

Counseling services for health and therapeutic education are significant sources of education regarding the need to adopt a lifestyle suitable for chronic illness. Respondents have shown that information on the particularities of their own chronic conditions has been obtained:

— In the counseling sessions;
— During admission to hospitals;
— Through information obtained from specialists: family doctors, specialist MD, nutritionists, social workers, psychologists, priests;
— Newspapers, flyers, brochures, internet, TV, media, books, relatives;
— Meetings with pensioners within the retirement home;
— At the office of the institutions social worker;
— During the services provided by the social worker;
— Through counseling hours with the school psychologist.

One of the major risks of inadequate self-care management is the diminishing of the patient's social, functional, and decision-making autonomy (Sandu, Necula, Frunză, Unguru, & Damian, 2017). Here we see a significant role of the social worker in building the patient's autonomy, both within the context of institutional care and regarding the integration of the subject within the other social constructs of chronic illness: family, working environment, social and interpersonal relationships etc (fig. 12).

A significant concern in the context of chronic illness care is represented by the overall quality of respondents' lives. Quality of life is a global approach to the subjective status of patients, given by the way they refer to their own lives. In the context of this research, we considered the self-perceived quality of life as a partial indicator of patient satisfaction with care, both medical and social, with a strong impact on self-care management (fig. 13).

33% of respondents said they were completely satisfied with the quality of their own lives, while only 7% were completely dissatisfied.

CONCLUSIONS

Social assistance has a significant role in the care system of chronic patients, especially in self-care management. In our opinion, through the results of this research one can not emphasize the real and functional

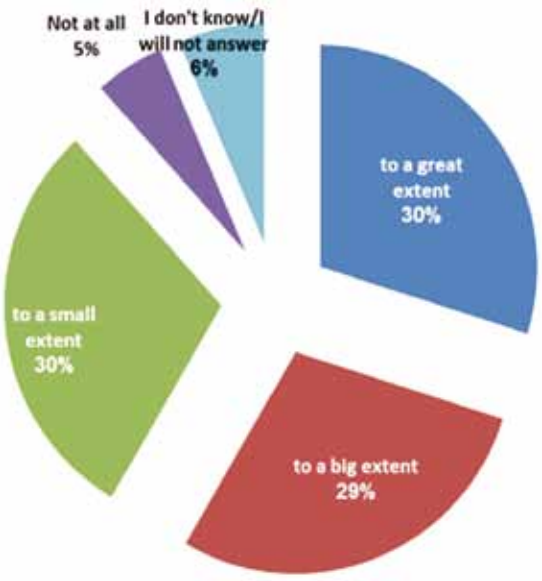

Fig. 8. Did the social worker help you?

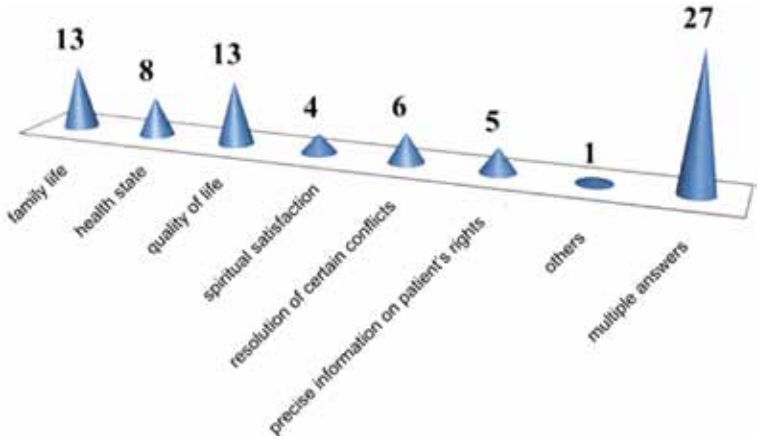

Fig. 9. Did the intervention of the social worker improve the life of the respondents?

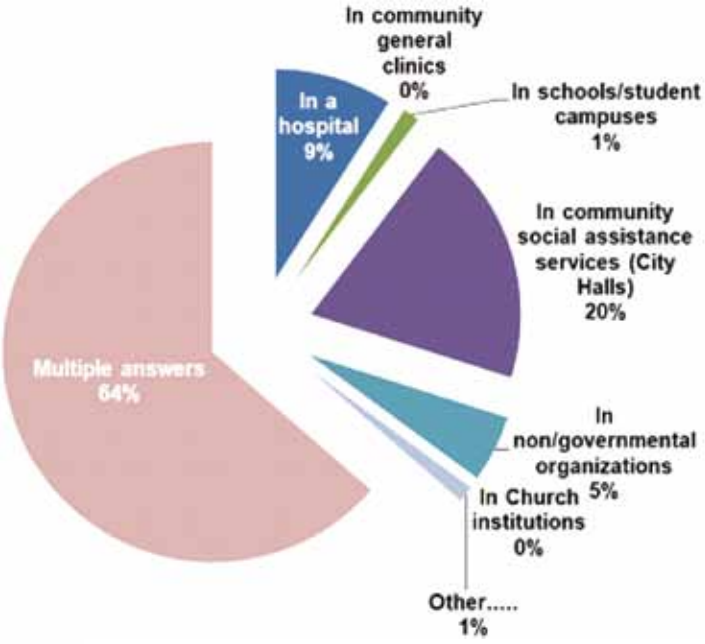

Fig. 10. The role of the social worker in institutions

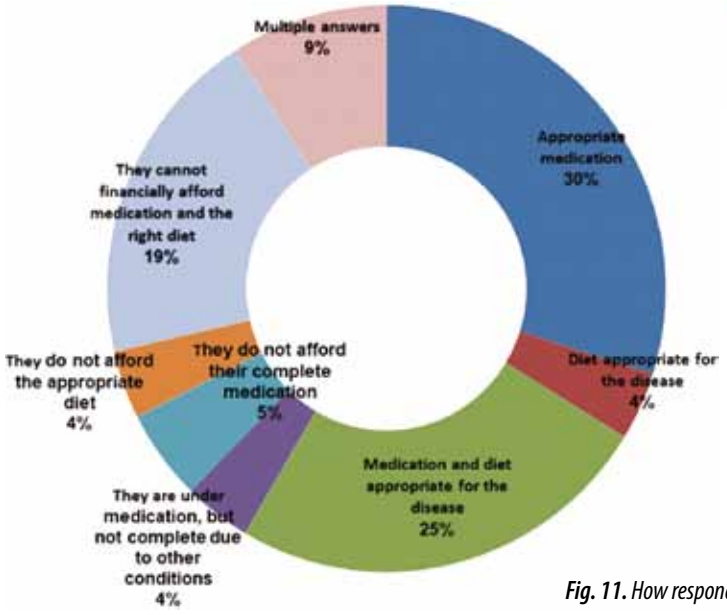

Fig. 11. How respondents care for themselves

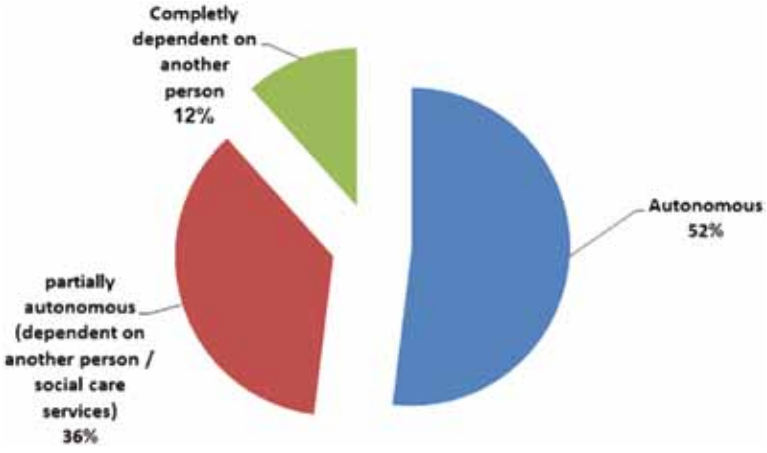

Fig. 12. Care and self-care of respondents

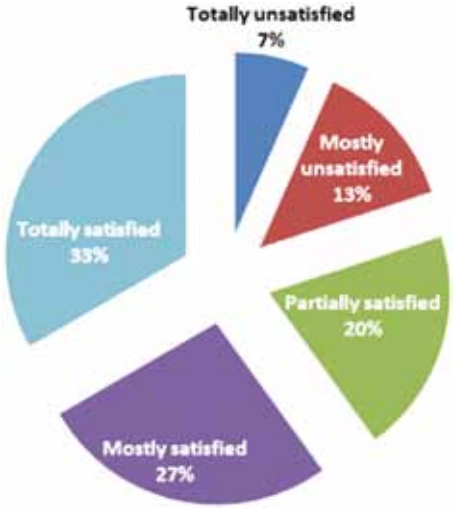

Fig. 13. Overall level of quality of respondents' lives

existence of some transdisciplinary teams involved in the care of chronic patients. It is necessary to increase the involvement of civil society in increasing the quality of patients' lives.

REFERENCES

Bandol, R. (2015). Self-care as actualization of the human model in the philosophy of medicine. Postmodern Openings, 6(1), 35–53. Retrieved from: http://postmodernopenings.com/wp-content/uploads/2015/07/PO_June2015_35to53.pdf

Blackstone, A. (2012). Principles of sociological inquiry – Qualitative and quantitative methods. Washington, D.C., USA: Saylor Foundation.

Bodenheimer, T., Lorig, K., Holman, H. & Grumbach, K. (2002). Patient self-management of chronic disease in primary care. Journal of American Medical Association, 288, 2469–75.

Christ, G., & Divan, S. (n.d.). Chronic ilness and aging. The role of social work in managing chronic ilness care. USA: Council on Social Work Education. Retrieved from: https://www.cswe.org/getattachment/Centers-Initiatives/Gero-Ed-Center/Initiatives/Past-Programs/MAC-Project/Resource-Reviews/Health/CI-Sec2-Role-SW-(2).pdf.aspx

Coleman, E. A., Smith, J. D., Frank, J. C., Min, S., Parry, C., & Kramer, A. M. (2004). Preparing patients and caregivers to participate in care delivered across settings: The care transitions intervention. Journal of the American Geriatrics Society, 52(11), 1817–1825.

Findley, P. A. (2013). Social work practice in the chronic care model: Chronic illness and disability care. Journal of Social Work, 14(1), 83–95.

Frățilă, C. (2017). Social assistance. Compendium of History, Theory and Practice. Logos Universality Mentality Education Novelty: Social Sciences, 6(2), 50–52. Retrieved from: http://lumenpublishing.com/journals/index.php/lumenss/article/view/205/pdf

Gavrilovici, O., Macarie, G. F., Damian, S. I., Necula, R., & Tebeanu, A. V. (2012). The centering of the professional caregiver. Physicians and priests taking the diabetic patients' scene. Psychology & Health, 27(S1, SI), e48.

Leahey, E. (2011). Quantitative methods in sociological research. Oxford Bibliographies Online Datasets. Retrieved from: http://www.oxfordbibliographies.com/view/document/obo-9780199756384/obo-9780199756384-0044.xml

National Association of Social Workers (NASW). (2005). NASW standards for social work practice in health care settings. Retrieved from: http://www.socialworkers.org/practice/standards/NASWHealthCareStandards.pdf.

Nelson, E. C., Meyer, G., & Bohmer, R. (2014). Self-care: the new principal care. Journal of Ambulatory Care Management, 37(3), 219–225.

Oprea, L., Cojocaru, D., Sandu, A., & Bulgaru-Iliescu, D. (2013). The chronic care model (CCM) and the social gradient in health. Revista de Cercetare și Intervenție Socială, 41, 176–189. Retrieved from: https://www.rcis.ro/images/documente/rcis41_12.pdf

Reiter, B. (2013). The epistemology and methodology of exploratory social science research: Crossing Popper with Marcuse. Government and International Affairs Faculty Publications. Paper 99. Retrieved from: https://scholarcommons.usf.edu/gia_facpub/99

Reiter, B. (2017). Theory and methodology of exploratory social science research. International Journal of Science and Research Methodology, 5(4), 129–150. Retrieved from: https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1134&context=gia_facpub

Sandu, A., Necula, R., Frunza, A., Unguru, E., & Damian, S. I. (2017). A qualitative inquiry in the social construction of chronic illness. Case study on diabetes mellitus. Doctor's perspectives. Archiv Euromedica, 7(2), 18–23.

Verzea, D. S., & Necula, M. R. (2012). Relevance of educational factors in the treatment of pancreatic cancer. Revista Românească pentru Educație Multidimensională, 4(1), 7–14. Retrieved from: http://revistaromaneasca.ro/wp-content/uploads/2012/05/1-Relevance-of-Educational.pdf

World Health Organization (WHO). (1998). Therapeutic patient education. Continuing education programmes for health care providers in the field of prevention of chronic diseases. Retrieved from: http://www.euro.who.int/__data/assets/pdf_file/0007/145294/E63674.pdf

THE TYPE OF INFLAMMATORY REACTION AND THE PROTEOMIC SPECTRUM OF PERITONEAL FLUID IN RATS AFTER IMPLANTATION OF SYNTHETIC MESH ENDOPROSTHESES

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ABSTRACT — In experiments on 80 rats, the type of proliferative and exudative inflammatory reaction and the protein spectrum of peritoneal fluid was studied after implantation of four types of polypropylene and one metal titanium mesh hernioprosthesis. It has been established that the minimal proliferative and exudative reaction is caused by the implantation of the Esphil polypropylene mesh endoprosthesis. The maximum fibrous capsule is formed after the implantation of the rats with the *titanium silk*, and the maximum volume of peritoneal fluid stimulates the implantation of the Ergon endoprosthesis. Proteomic analysis of peritoneal fluid revealed various changes in the content of albumin, IgG, ferritin, lactoferrin, CRP and α2-macroglobulin after implantation of all types of endoprostheses. Analysis of the protein spectrum is a more accurate and sensitive method of assessing the severity of the inflammatory response of the body to the implantation of mesh materials.

KEYWORDS — reticular hernioprosthesis, experiment, implantation, inflammatory proteins.

Alloprosthesis of the abdominal wall with synthetic materials, such as polypropylene mesh, is the gold standard for the surgical treatment of ventral hernias [1, 2, 3]. However, the use of synthetic materials for hernioplasty led to the appearance of new types of complications, previously with these operations not developing. There are the migration of a synthetic implant into the abdominal cavity, adhesive intestinal obstruction due to adhesion of the intestine and mesh, the formation of fistulas as a result of pressure ulcers of the intestinal wall and endoprosthesis, and the formation of seroma in the region of the implant location [1, 2]. Therefore, the task of further searching for a plastic material that meets the requirements of an ideal hernio-prosthesis, which has high strength and maximum histocompatibility, remains topical [3].

Great hopes are associated with the latest Russian project *Titanium Silk*. Mesh endoprostheses made of titanium or nickel titanium are highly elastic, which is ensured by a special form of weaving of metallic threads [4].

Today, the mechanical properties of modern polypropylene, metal and composite mesh prostheses satisfy surgeons [1, 3, 8], the problem of reducing the pronounced inflammatory response of the body to the implantation of mesh materials, which allows to avoid a number of complications, is preserved [5, 6, 7].

The purpose of the research was to compare the type of proliferative and exudative inflammatory response and the proteomic spectrum of peritoneal fluid in rats after intraperitoneal implantation of polypropylene or metal reticular hernioprosthesis.

MATERIALS AND METHODS

The experiments were performed on 80 white not purebred rat males with body mass 150–170 g, whose are contained in standard vivarium conditions in accordance with the International Recommendations for Biomedical Research using Laboratory Animals (Strasbourg, 1986). Rats under aseptic conditions under ether anesthesia made a puncture of the abdominal wall with a scalpel up to 5 mm in length in the inguinal region. In the position of the rat head down, through the access with the help of tweezers sterile fragments of a 2×2 cm mesh endoprosthesis rolled into a tube were inserted into the abdominal cavity, which were straightened in the abdominal cavity, without touching the intestinal loops. The surgical wound was not sutured in order to avoid the additional influence of the suture material on the processes of inflammation and regeneration.

We investigated the reaction to polypropylene mesh implants Esfil light (Lintex, SPb, Russia), Ergon (Ergon EST, Italy), Optilene Mesh LP (B.Braun, Germany), Optomesh®ThinLight (Matopat, Poland) and mesh metal endoprosthesis Titanium Silk (Yekaterinburg, Russia). The animals were withdrawn from the experiment on day 7 after surgery by overdosing

anesthetics. The abdominal cavity was opened, washed with 5 ml of saline and aspirated diluted peritoneal fluid.

In rat peritoneal fluid (PF), the glucose level and the protein spectrum were determined by 2D polyacrylamide gel electrophoresis, identified by their peptide fingerprint using the MALDI mass spectrum method, and inflammatory proteins were identified by various immunochemical assays. The baseline volume of the PF was calculated by recalculating the glucose concentration in it to the norm (10 mmol/l). The statistic work-out of data was carried out on a personal computer using specialized program Statistica 6.0 for Windows-XP.

RESULTS AND DISCUSSION

The masses of implanted fragments measuring 4 cm^2 were from 70 to 90 mg, and the *titanium silk* mesh was about 300 mg. Intraperitoneal implantation of the sterile mesh endoprosthesis in rats caused them both proliferative inflammatory reaction with formation of connective tissue capsule around the foreign body, and exudative reaction with accumulation of peritoneal fluid (Table 1). Implantation of the titanium mesh from the first days was accompanied by a powerful proliferative inflammation and the formation of the most massive fibrous capsule. The maximum exudative inflammation was detected after implantation of Ergon polypropylene mesh and *titanium silk* metal mesh. The minimal inflammatory reaction was caused by the implantation of the Esphil mesh, so the rates in the remaining groups of rats were compared with Esfil (Table 1).

When comparing 2D electrophoresis of PF proteins after implantation of mesh endoprostheses, it was found that differences in proteinograms compared with the intact rats are primarily associated with high-molecular fractions of serum proteins identified by databases as albumin, IgG, ferritin, lactoferrin, CRP and α2-macroglobulin. The concentrations of these proteins in the peritoneal fluid were determined (Table 1).

It was found that the spectrum of inflammation proteins in the peritoneal fluid depends on the type of implanted mesh endoprosthesis, and the analysis of the proteomic spectrum is a more accurate and sensitive method of assessing the severity of the inflammatory response of the body to the implantation of mesh materials. Thus, by maintaining inflammation, some polypropylene and titanium mesh can create the conditions necessary for the biosynthesis of collagen and the formation of connective tissue.

CONCLUSIONS

Implantation of polypropylene mesh endoprosthesis Esphil causes minimal proliferative and exudative reaction. The maximum fibrous capsule is formed after the implantation of the rats with the *titanium silk* endoprosthesis, and the maximum volume of peritoneal fluid stimulates the implantation of the Ergon mesh.

After implantation of all types of endoprostheses, proteomic analysis of the peritoneal fluid revealed significant changes in the levels of IgG, ferritin, lactoferrin, CRP and α2-macroglobulin of varying

Table 1. *Influence of implantation of mesh implants on parameters of proliferative and exudative inflammation and levels of indicator proteins in peritoneal fluid in rats*

Indicators	Esfil	Ergon	B.Braun	Optomesh	Titanium silk
Implant weight (mg)	69,7±7,81	72,8±8,29*	91,4±12,77*	76,5±8,53*	297,6±31,94*
Fibrous capsule weight (mg)	163±29,2	545±46,6	574±64,3	353±38,8*	638±66,9*
PF volume (ml)	1,7±0,25	3,8±0,57*	2,2±0,36	2,6±0,48	3,0±0,39*
Albumin (g / L)	3,3±0,38	3,7±0,59	3,3±0,55	2,9±0,69	3,4±1,36
IgG (g / L)	0,9±0,14	1,5±0,21	1,0±0,26	0,7±0,15	1,8±0,17*
α2- macroglobulin (mg / L)	461±56,4	670±71,0*	735±68,4*	568±53,7	892±60,5*
Ferritin (ng / ml)	235±15,3	384±21,2*	361±49,3*	279±26,9	403±46,5*
Lactoferrin (ng / ml)	1140±132	1710±153*	1500±119	1960±260*	2580±333*
CRP (mg / L)	21,7±1,75	23,4±1,70	28,3±2,45	26,9±2,26	32,9±2,72*

** — significant differences with the group "Esfil" (p<0,05).*

degrees. The protein composition of the peritoneal fluid depends on the type of implanted mesh endoprosthesis, and the analysis of the protein spectrum is a more accurate and sensitive method of assessing the degree of the inflammatory response of the body to the implantation of mesh materials.

REFERENCES

1. **Kaliev D.R., Kchibekov E.A., Zurnajyants V.A., Kokhanov A.V., Serdyukov M.A.** The analysis of different types of polypropylene implants in surgical treatment of ventral hernias. Astrakhan Medical Journal. 2017. V. 12. #4. P.6–12.
2. **Bondarev V.A., Zurnajyants V.A.** Causes of recurrences after prosthetics of hernioplasty and the possibility of their prevention. Materials of the VII conference Actual questions of herniology. – Moscow, 2010. – P. 49–51.
3. **Gostevskoy A.A.** Substantiation and evaluation of the effectiveness of new materials and methods in the treatment of postoperative ventral hernias (clinical and experimental research) / Thesis of dissertation of DM. St. Petersburg, 2008. – 34 p. (In Russ.)
4. **Parshikov V.V., Mironov A.A., Anikina E.A., Kazantsev A.A., Zaslavskaya M.I., Alekhin A.I.** To the question of the possibility of using ultralight titanium-containing reticular endoprostheses for abdominal wall plasty under infection conditions (experimental study)./ Surgery. The journal named after N.I. Pirogov. 2016. #11 (November). P. 64–70.
5. **Mamedov R.A.** Morphological evaluation of the local reaction of the organism when using mesh materials for prosthetics of the anterior abdominal wall. News of Surgery. 2013. #1. P. 23–28.
6. **Mishina E.S.** Reactive changes in the connective tissue of the anterior abdominal wall in the early postoperative period using prototypes of reticular endoprostheses with antibacterial coating. Modern problems of science and education. 2015. #2. P. 55–55; URL: http://www.science-education.ru/ru/article/view?id=18056.
7. **Kchibekov E.A., Kokhanov A.V., Kaliev D.R., Kudaev S.V., Bondarev V.A., Serdyukov M.A.** Features of the inflammatory reaction of rats to the implantation of modern reticular endoprostheses for hernioplasty. Modern problems of science and education. 2018. #1; URL: http://www.science-education.ru/article/view?id=27384.

CLASMATOSIS AS A MEANS OF EXTRACELLULAR MATRIX COMPONENTS SECRETION IN RELIANCE ON SMOOTH MUSCLE CELLS IN RAT CERVIX

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ABSTRACT — A number of morphological changes in rat cervix uteri at childbirth provide apropos disclosure of the cervix channel facilitating unobstructed fetus expulsion. The research in cervix disclosure morphogenesis is important for the development of effective methods of the birth process management.
The objective: to conduct an ultrastructural level study of the morphological clasmatosis manifestations in laboratory rats cervix myocytes at childbirth, at the fetus expulsion stage; and specify its functional role for a cell in the given section of the organ.
The research has shown that clasmatosis is a variation of the smooth muscle cell definitive form functioning, implemented at the high functional pressure. This process in labor leads to the increase in a fraction volume of extracellular matrix due to the urgent protein synthesis and, as a result, to the change in its quality.

KEYWORDS — clasmatosis, smooth muscle cells, cervix uteri.

INTRODUCTION

The uterus of mammals is an internal organ adapted to considerable morphofunctional changes due to the myometrium myocytes activity. Despite rather extensive literary data on the structure and changes in uterus myocytes a number of unsolved issues remains [1,2,5]. For example, knowing the cervix tissues morphogenesis in labor is important for development of effective methods of management of labor process to provide cervix channel disclosure for fetus expulsion without injury to the organ sides [1,8].

Examining the structure of cervix myometrium smooth muscle cell in laboratory rats at childbirth, we observed the clasmatosis phenomenon which functional role is not clear.

The objective of the research: to study morphological clasmatosis manifestations in laboratory rats cervix myocytes at the ultrastructural level and specify its functional role for a cell in the given section of the organ.

MATERIALS AND METHODS

The research has been carried out in accordance with the laboratory practice rules of the Russian Federation: the order of the Ministry of Health of the USSR N 755 of 12.08.1977; the order of the Ministry of Health of the Russian Federation N 267 of 19.06.2003; the law "On Protection of Animals against Ill Treatment" ch. V, art. 104679-GD of 01.12.1999. The research has been granted a permission of the SamSMU Committee on Bioethics (the protocol N 176 of 03.08.2016).

The object of the research were pregnant white not purebred laboratory rats at the age of 6–7 months, in number of 5 individuals. The animals with the dated term of pregnancy were obtained with the standard technique described earlier by E. Zussman (1977) [3]. The material for the research was cervix uteri. Material sampling was carried out during the childbirth, after the birth of 1–2 infant rats, and after killing the animals with a lethal dose of aether anesthesia.

Electronic transmission microscopy (ETM) was applied in the research. The material was fixed in glutaric aldehyde (BASF, Germany), poured in an epon-araldit mix and contrasted with uranil acetate and lead citrate (EMS, USA). Precisely executed cuts were observed with an electronic microscope (JEOL JEM-1400 PLUS, Japan).

RESULTS OF THE RESEARCH

The research has shown that there are ultrastructural transformations characteristic of clazmatosis in cervix myocytes of laboratory rats at childbirth. In some myocytes changes affect the membrane contours, cytoplasmic protrusions of different volume are formed. The latter then detach from the cell and fill intercellular spaces. It leads to separation of myocytes and destruction of intercellular contacts.

Formation of cytoplasmatic protrusions is followed by loosening and destruction of contractile ap-

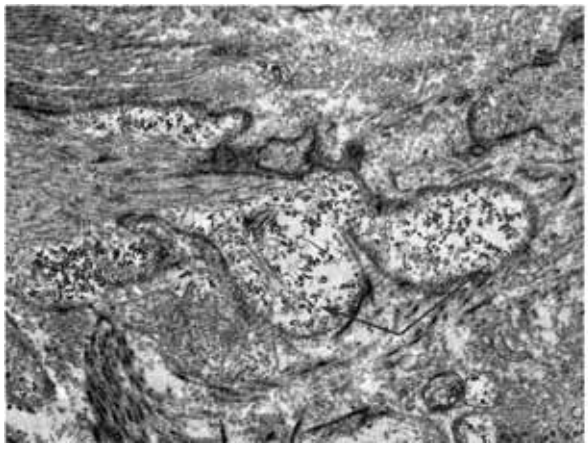

Fig. 1. *The myocyte site with cytoplasmatic protrusions containing ribosomes, vesicles, contractile components (specified by the arrow). ETM. 20000 ×*

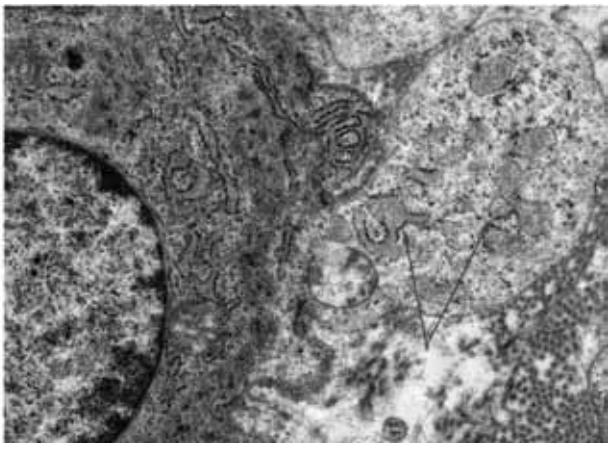

Fig. 2. *The myocyte site with cytoplasmatic protrusions. Contents of protrusions is presented by ribosomes and rough endoplasmic reticulum cistern (specified by the arrow). ETM. 20000 ×*

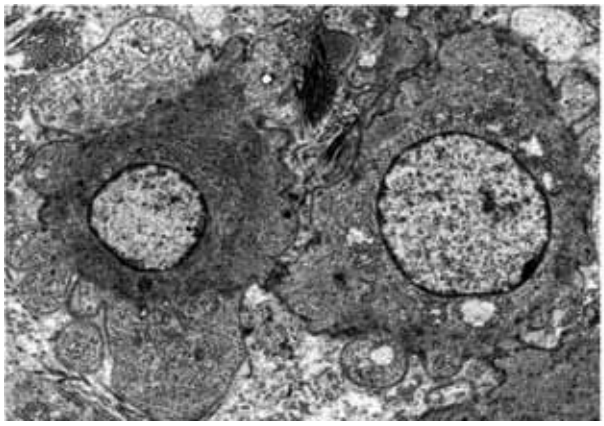

Fig. 3. *Dark and light myocytes of the inner layer in cervix myometrium with clasmatosis at childbirth. ETM. 4000 ×*

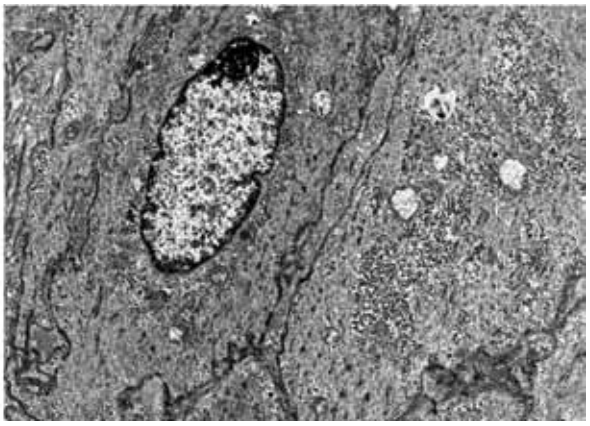

Fig. 4. *External myometrium layer smooth muscle cells at childbirth. ETM. 4000 ×*

paratus components in the peripheral part of myocytes sarcoplasm. In certain cases, contents of protrusions are presented by myofilament, mitochondrions and pinocytosis vesicles (fig. 1). But in most cases, rough endoplasmic reticulum development with accumulation of ribosomes and polisomes in myocytes sarcoplasm was observed. These ultrastructures present the main contents of the sections separated from cells (fig. 2).

The light and dark myocytes which are characterized by various levels of cytoplasm density were equally involved in this process (fig. 3).

However, some difference in participation of smooth muscle cell in this process depending on their localization in myometrium layers was noted. Marked clasmatosis is observed in all perimeters of a cell in myocyte of vascular and internal myometrium layers (fig. 3). The external layer myocytes at childbirth keep the structure as a part of functional layer with no clasmatosis present (fig. 4). It indicates various functional roles of smooth muscle cells as a part of myometrium layers.

DISCUSSION

Analysis of the literary sources has shown that clasmatosis is considered as pathology of cellular membranes [6]. Clasmatosis is considered characteristic of cells with phagocytic activity, and promotes antigene information transfer [7]. In uterus myocytes the clasmatosis phenomenon is described during postnatal involution, and is considered as one of elimination mechanisms in hypertrophied myometrium structures

providing reduction of its weight without the loss in the number of smooth muscle cells and threat of inflammation development [2]. Some authors associate clasmatosis with substances transport, for example, regarding it as one of the means of collagen secretion in actively synthesizing fibroblast [4]. The data obtained in our research prove that clasmatosis is a way of secretion which is implemented in emergency synthesis conditions, when synthesized material from rough endoplasmic reticulum cisterns, bypassing a lamellar complex via transport vacuoles, arrives in intercellular space . Thus, clasmatosis is suggested to be considered as physiological process which occurs in cells during emergency secretion.

CONCLUSIONS

Basing on the research and literature analysis conclusion has been made that clasmatosis in cervix myometrium myocytes at labor is one of functioning options in definitive cell form which is implemented under high functional pressure. This process in childbirth leads to an increase in a volume fraction of extracellular matrix due to synthesis of proteins and their emergency evacuation.

Authors report about no conflict of interests.

REFERENCES

1. **Bakhmach V.O., Chekhonatskaya M. L., Yannayeva N. E. et al.** Changes in uterus and a cervix during pregnancy and before childbirth (review). Saratov scientific and medical journal 2011; 2(7): 396–400. (In Russian)
2. **Dolgikh O.V., Agafonov Y. V., Zashikhin A. L.** Adaptive myometrium transformation of rats at pregnancy and after delivery. Morphology. 2012; 142(5): 59–63. (In Russian)
3. **Zussman E.** Development biology; English M.: MIR; 1977: 301. (In Russian)
4. **Serov V.V., Shekhter A. B.** Connective tissue (functional morphology and general pathology). M.: Medicine; 1981: 312. (In Russian)
5. **Sozykin A. A.** Morphological aspects of normal hystogenesis and reactive changes of myometrium smooth muscular tissue of rats [thesis]: Volgograd; 2004: 107. (In Russian)
6. **Strukov A. I., Serov V. V.** Pathological anatomy. B: Strukov A. I., Serov V. V. General pathological anatomy. Damage. 5th prod. Moscow: Litterra; 2010: 5–37. (In Russian)
7. **Bier O.G., Götze D., Mota I., Dias da Silva W.** Experimentelle und klinische Immunologie. Springer-Verlag; 2013:370.
8. **Oxlund B.S., Ørtoft G., Brüel A. et al.** Cervical collagen and biomechanical strength in non-pregnant women with a history of cervical insufficiency. Reprod. Biol. Endocrinol. 2010; 8: 92.

THE EFFECT OF PIR-4 SUBSTANCE ON THE NECROSIS ZONE IN EXPERIMENTAL FOCAL CEREBRAL ISCHEMIA IN RATS

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ABSTRACT — A study to assess the effect of a new pyrimidine derivative (PIR-4 at a dose of 50 mg/kg) on the size of the necrosis zone resulting from experimentally simulated focal cerebral ischemia in rats was carried out. It has been confirmed that the investigated substance PIR-4 contributes to a 16,48% reduction in the necrosis area ($p<0,05$) as compared to that in rats treated with a reference drug Cinnarizine (5,6 mg/kg); its potency is also comparable to that of Vinpocetine (3,2 mg/kg).

Introduction: Currently, there is an increase in the incidence of cerebral ischemia in the working-age population [1]. The development of new neuroprotective agents is a a high-priority task of modern Russian researchers. A potential cerebroprotective activity of pyrimidine derivatives [2] has been confirmed earlier; therefore the problem of the effect of these compounds on an ischemic zone (zone of necrosis) is of great interest.

Objective: To study the effect of PIR-4 substance on the necrosis zone in experimental focal cerebral ischemia in rats.

Materials and methods: The study was conducted in accordance with the "Guidelines for Preclinical Trials of Drug Products" ed. by A.N. Mironov (a 2012 edition.) [3]. The experiment was performed on 40 male Wistar rats (m=200–220 g) divided into 4 groups (n=10). Rats were kept on a standard vivarium diet, with a natural succession of light and darkness. Purified water with tween-80 was introduced to the first group rats (negative controls). The second and third groups received reference drugs: Cinnarizine (5,6 mg/kg) and Vinpocetine (3,2 mg/kg), respectively [4]. The fourth group received the investigational pyrimidine derivative PIR-4 (50 mg/kg) [5]. The model of focal cerebral ischemia was simulated by occlusion of the left middle cerebral artery (under chloral hydrate anesthesia, 350 mg/kg) [6]. All objects were injected intraperitoneally immediately after the surgery and then once daily for three days. The size of the necrosis zone was determined by means of the triphenyltetrazolium chloride method [7,8]. All findings were processed by means of variation statistics methods using the STATISTICA 6.0 software. The normality of distribution was assessed by the Shapiro-Wilk test. In the case of a normal distribution of the data, a parametric t-test was applied. In the case of abnormal distribution of the data, the statistical processing was performed using the Mann-Whitney U-test. The difference was considered significant at the significance level of more than 95% ($p<0,05$).

Results and discussion: The simulated pathology led to the necrosis of 25,92±0,58% of the brain tissue in a group of animals who did not receive any pharmacological support (Fig. 1). Administration of Cinnarizine contributed to the reduction of the necrosis zone to 16,89±0,46 %, which is lower than that in untreated rats by 34,84%.($p<0,05$) The percentage of the necrotic brain tissue while using Vinpocetine was less than that in negative control rats by 44,06% ($p<0,05$). It must be noted that the necrosis zone in rats receiving Vinpocetine also differed significantly from that of rats treated with Cinnarizine (by 16,48%, $p<0,05$). The use of the experimental substance PIR-4 contributed to the reduction in the necrosis percentage to 13,51±0,65%, which significantly differed from the group of untreated rats and from animals receiving Cinnarizine injections (by 47,88% ($p<0,05$) and 20,01% ($p<0,05$), respectively). No significant differences between groups of animals treated with Vinpocetine and PIR-4 were detected.

Conclusion: In the experimentally simulated cerebrovascular insufficiency, a pyrimidine derivative (known under laboratory code PIR-4) reduced the percentage of necrotic brain tissue and showed the potency which was not inferior to that of the reference drug Vinpocetine and superior to that of Cinnarizine.

REFERENCES:

1. **Shmonin A. A.** Ligation of the middle cerebral artery in rats: comparison of models of focal cerebral ischemia//Regional circulation and microcirculation. 2011. No. 3. P. 68–76. (In Russ.)
2. **Voronkov A.V., Shabanova N.B., Kodonidi I.P., Shatalov I.S.** Cerebroprotective activity of new derivatives of pirimidine-4-(1H)-one PIR-9 and PIR-10 in irreversible occlusion of the common carotid artery. Pharmacy & Pharmacology. 2018;6(2):167–181. (In Russ.) DOI: 10.19163/2307-9266-2018-6-2-167-181

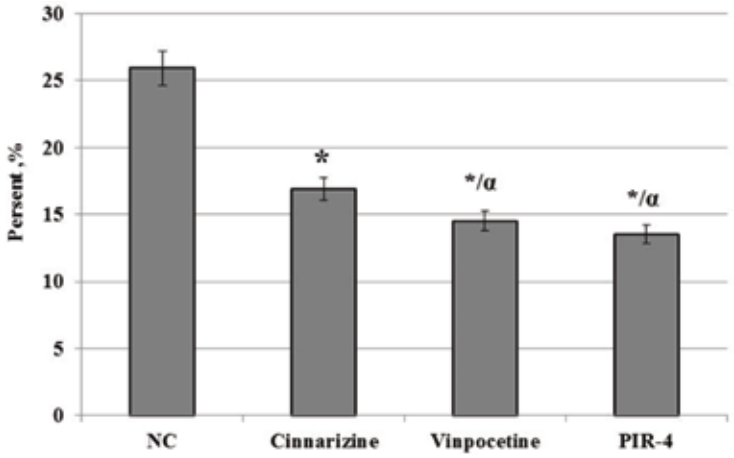

Figure 1. *Assessment of the effect of PIR-4 substance and the reference drugs on the necrosis zone under conditions of focal cerebral ischemia in rats*

Note: *NC — negative control rats; Cinnarizine — a group rats treated with Cinnarizine; Vinpocetine — a group of rats receiving Vinpocetine; PIR-4 — a group of rats treated with PIR-4; * — statistically significant as compared to the NC rats (p<0,05); a — statistically significant as compared to rats treated with Cinnarizine (p<0,05).*

3. **Mironov A. N.** The guidelines for preclinical studies of pharmaceuticals. Part one. – M.: Grif and K, 2012. – 944 p. (In Russ.)
4. **Nazarova L. E., Dyakova I. N.** Influence of ferulic acid on the necrosis zone resulting from occlusion of the middle cerebral artery //medical Bulletin of Bashkortostan 2011. No. 3. P. 133–135. (In Russ.)
5. **Voronkov A.V., Shabanova N. B., Pozdnyakov D. I., Lugovoj I.S., Kodonidi I.P.** nfluence of new derivatives of pyrimidine-4(1H)-she's on the psycho-emotional imbalance and certain violations of energy metabolism in rats on the background of cerebral ischemia // Modern problems of science and education. – 2017– №5. (In Russ.)
6. Manual of stroke models in rats / ed. by Y. Wang-Fischer. – [S. l.] : CRC Press : Taylor& Francis Group, 2009. – XIII, 332 p.
7. **Bernauer, W.** Inhibiting effect of dexamethasone on evolving myocardial necrosis in coronary-ligated rats, with and without reperfusion/W. Bernauer// Pharmacology.- 1985. – Vol. 31, N 6. – P. 328–336.
8. **Gu M, Zheng A, Jin J, et al.** Cardioprotective Effects of Genistin in Rat Myocardial Ischemia-Reperfusion Injury Studies by Regulation of P2X7/NF-κB Pathway. Evidence-based Complementary and Alternative Medicine : eCAM. 2016;2016:5381290. doi:10.1155/2016/5381290.

HISTOMORPHOLOGICAL CHANGES 3 AND 24 HOURS AFTER CLOZAPINE-ETHANOL POISONING

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Introduction: Clozapine is an *atypical* neuroleptic used to treat some psychiatric diseases [1–3]. The lung is one of the *target* organs in case of clozapine poisonings [4]. However, the dynamics of morphological changes in the lung has not been studied before.

The objectives of the study: The purpose of our study is to reveal morphological changes in the lungs in acute clozapine and ethanol poisoning 3 and 24 hours after the intoxication.

Materials and methods: A comparative study of histological sections of the lungs of outbreed male rats weighing 290–350 g was performed. The group of comparison (5) included intact animals. Animals of study group 1 (5) and study group 2 (5) were treated with clozapine (150 ml/kg) and ethanol (5 ml/kg) and decapitated 3 and 24 hours after drug administration, respectively. Fisher's ratio test was used to estimate the reliability of the difference between the groups. We also performed morphometric analysis.

Results: No pathological changes were observed in the group of comparison. The following signs were detected in study group 1: hemorrhages into alveolar septi and alveoli, perivascular hemorrhages, thickening of the intraalveolar septi due to edema, an increase in WBC number, atelectasis, distelectasis. The signs detected in study group 2 were as follows: hemorhage into alveolar septi and alveoli, infiltration of intraalveolar septi by leucocytes, perivascular hemorrhage, thickening of the intraalveolar septi due to edema, an increase in WBC number, atelectasis, distelectasis.

The share of the alveoli was significantly lower in both study group than in group of comparison. The share of the area of intraalveolar septi, the share of the area of vessels, the share of the area of WBC, the share of the area of WBC in intraalveolar septi, the share of the area of distelectasis, the share of the area of edema were higher in both study group than in the group of comparison.

Conclusion: All these pathological changes can be used to diagnose clozapine and clozapine-ethanol poisonings and the cause of death.

REFERENCES:

1. **Burns M.J.** The pharmacology and toxicology of atypical antipsychotic agents. Journal of toxicology, clinical toxicology. 2001. 39 (1): 1–14.
2. **Kervin R.W.** Clozapine: back to future for shizophrenia research. Lancet. 1995; 345 (8957): 1063–1064.
3. **Subramanian S., Völlm B.A.** Clozapine dose for schizophrenia. Huband Cochrane Database of Systematic Reviews., 2017.
4. **Gardiner T.H., Lewis J.M., Shore P.A.** Distribution of clozapine in the rat: localization in lung. J. Pharmacol. Exp. Ther. 1978; 206 (1): 151–157.

CLOZAPINE DISTRIBUTION IN ACUTE CLOZAPINE POISONING

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Introduction: Clozapine (leponex©, clozaril) belongs to the so called *atypical* antipsychotics [1]. It is a highly lipophilic substance and it is metabolized in the liver [2]. Its main metabolites are norclozapine and clozapine-N-oxide [3]. Clozapine and its metabolites are capable of accumulating in body tissues including the liver, the lungs and others [4]. The distribution of clozapine and its metabolites between the liver, the kidney, the heart and the lung hasn't been studied before.

The objectives of the study: The objectives of the study are to assess the distribution of clozapine and its main metabolites between the liver, the lung, the kidney and the heart in case of clozapine poisoning.

Materials and methods: The study was performed on 10 outbreed male rats aged 20 weeks. The weight of the rats was 290–350 g. The animals were divided into 2 groups (5 rats in each group): group 1 (clozapine, 3 hours), group 2 (clozapine, 24 hours). The animals were narcotized and after that clozapine was administered. The dosage of clozapine was 150 mg/kg. 3 and 24 hours after the drug administration the animals were euthanized. The samples of the lung, kidney, liver, heart tissue (about 2 g) were mixed with 5 ml of saline and homogenized on Ultra Turrax Tube Drive control «IKA» (Germany) within 2 minutes at 4000 rpm to obtain homogenate. Acetonitrile (CH3CN) was added to 100 μl of the homogenate up to 500 μl, than mixed on Vortex, centrifuged on the Centrifuge 5425 «Eppendorf» (Germany) within 10 minutes. We performed a chemical analysis of the homogenates using the method of high performance liquid chromatography method with mass spectrograph detection (HPLC-MS/MS).

RESULTS: 3 hours after clozapine administration the concentration of clozapine decreased in the following sequence: lung-liver-kidney-heart; the concentration of norclozapine correspondently: kidney-lung-liver-heart. 24 hours after clozapine administration the concentration of clozapine decreased in the following sequence: kidney-lung-liver-heart; the concentration of norclozapine correspondently: lung-kidney- liver-heart.

Conclusion: the results of the chemical analysis along with the results of histological study will help to determine the fact of clozapine poisoning and its exact time.

REFERENCES:

1. **Burns M.J.** The pharmacology and toxicology of atypical antipsychotic agents. Journal of toxicology, clinical toxicology. 2001. 39 (1): 1–14.
2. **Dain J.G., Nicoletti J., Ballard F.** Biotransformation of clozapine in humans.Drug Metabolism & Disposition. 1997. 25 (5): 603–609.
3. **Lovedahl M.J., Perry P.J., Miller D.D.** The assay of clozapine and N-desmethylclozapine in human plasma by high-peformance liquid chromatography Therapeutical Drug Monitoring.1991; 13: 69–72.
4. **Renwick A.C., Renwick A.G., Flanagan R.J.** Monitoring of clozapine and nor-clozapine plasma concentration–time curves in acute overdose. Clinical Toxicology. 2000; 38(3): 325–328.

THE COURSE EFFECT OF THE NAPHTHALAN BATHS ON THE STRUCTURAL CHANGES IN THE LYMPHOID APPARATUS OF THE VAGINAL VESTIBULE OF RATS

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ABSTRACT — Relevance. Lymphoid formations of mucous membranes of hollow organs are considered as indicators, changes in which may indicate the effectiveness of any actions. For this purpose, the work was the identification of dynamic changes in the macromicroscopic parameters of the lymphoid tissue of the vaginal vestibule of rats subjected to the course effects of naphthalan baths.
Material and methods. Mature female Wistar rats exposed to naphthalan baths were used in the experiment. As a control, rats subjected to the course of exposure to fresh water baths were analyzed. After fixing the actual material in neutral formalin and subsequent alcohol wiring at the middle of the anterior, middle and posterior third parts of the vagina, cross sections were made with hematoxylin-eosin and picrofuxin according to van Gieson and Weigert. Obtained during the study of digital data were subjected to statistical processing.
The results of the study. The analysis of the data obtained showed that the exchange rate effect of naphthalan baths does not cause pathological changes in the walls of the rat's vaginal vestibule. The course effect of naphthalan baths leads to an increase in the number of lymphoid tissue in the mucous membrane of the vestibule, activation of lymphocytopoiesis, and a decrease in the level of cellular destruction of lymphoid tissue.

INTRODUCTION

Diverse and frequent diseases of the vulva are an important medico-social problem, with threats to health and quality of life, often reducing its duration (7, 2, 4, 13). It is obvious that the effectiveness of various methods and approaches of surgical and conservative treatment depends on the specifics of the nosological forms, stage of the process, the age of the woman and many other factors. An essential role in therapeutic and preventive measures is given to balneological procedures, including the use of naphthalan baths, the clinical effectiveness of which has been repeatedly proven (17, 6). The therapeutic effect of naphthalan is mainly due to the presence in its composition of polycyclic naphthenic hydrocarbons — derivatives of cyclopentanperhydrophenanthrene, having a quad core (ring) structure (8).

It is believed that such a ring system is present in the composition of various hormones, stearins, bile acids, vitamin D and some other biologically active substances (3). The anti-inflammatory effect of naphthalan oil, including the non-tarred naphthalan, is enhanced by its antiallergic (16) and desensitizing effects (3).

Despite the clinical efficacy of naphthalan, however, in the scientific literature there are no experimental substantiations of their efficacy and safety, which are the basis for the development of new regimens for prevention, treatment and rehabilitation for diseases of the vulva and gynecological profile in general.

This makes it possible to consider lymphoid formations as indicators (biomarkers), changes in which may indicate the safety and effectiveness of any environmental effects (11).

The aim of the work was to identify dynamic changes in macroscopic microscopic indicators of the lymphoid tissue of the vaginal vestibule of rats subjected to the course effects of naphthalan baths.

MATERIAL AND METHODS

The experiment was performed using sexually mature female Wistar rats exposed to naphthalan baths (30 rats), in accordance with the schemes adopted in balneological practice. As a control, rats subjected to the course of exposure to fresh water baths and intact animals (30 rats in each group) were analyzed. Analysis of the vaginal smear confirmed the same state (phase) of the ovarian cycle. The total duration of the course effects of naphthalan and fresh water baths is 20 days each. The duration of each bath was 8–10 minutes. Rats were placed in a bath, with contents of 37–38° C. From the experiment, rats were derived simultaneously (by decapitation, in compliance with all ethical standards). After fixing the actual material in neutral formalin and subsequent alcohol wiring at the middle of the anterior, middle and posterior third parts of the vagina, cross sections were made with hematoxylin-eosin and picrofuxin according to van Gieson and Weigert. For lymphoid tissue of the walls of the vaginal vestibule, the percentage of lymphoid nodules with a center of reproduction was determined (the total set

of lymphoid nodules was taken as 100%), the length, width and area of the section at the lymphoid nodules with and without a center of reproduction; the length, width and area of the reproduction centers themselves, the total number of cells of the lymphoid series (their number per 880 μm^2 section) was also measured as part of the diffuse lymphoid tissue, lymphoid nodules without reproduction centers, in the reproduction centers and the mantle of lymphoid nodules.

The percentage composition of cells of different types of lymphoid formations (different morphogenetic forms of lymphoid tissue) was determined: lymphocytes, plasma cells, macrophages, cells with a mitosis picture, lymphoid cells in a state of degeneration, etc. The significance of differences was determined by the value of p ($p < 0.05$) by the method of confidence intervals by the student's criterion.

The results of the investigation and their discussion. According to our data, there are no pathological changes in the walls of the vaginal vestibule of rats as a result of the course action of naphthalan baths, which may indicate their safety.

According to our data, in the mucous membrane of the vaginal vestibule of rats of the experimental groups, all morphogenetic forms of lymphoid tissue are determined by microanatomical methods — lymphocytes in the integumentary epithelium, diffuse lymphoid tissue, located mainly subepithelially, and the same lymphoid nodules located near the small glands vestibule with and without reproduction centers. Lymphoid formations are always located predominantly near the initial sections of the glands, accompanied by their excretory ducts in the form of a rim of three to five rows of cells of the lymphoid series.

In the stroma of the initial divisions, the cells of the lymphoid series are also located in the form of cords, separating the adjacent initial parts; they are arranged in the form of irregularly shaped fields, which are oriented in the loose fibrous connective tissue of the stroma located between the groups of the initial parts (between the lobules of the gland), which can provide immune control over the secretion processes (11). All lymphoid formations of the walls of the vaginal vestibule (diffuse lymphoid tissue, lymphoid nodules) are dominated by lymphocytes, macrophages, reticular cells, plasma cells and other cells of the lymphoid series are constantly determined.

The quantitative analysis shows the almost complete absence of changes with respect to the control after a course of fresh baths. On the contrary, naphthalan baths lead to the activation of the shaping processes of lymphoid tissue, and, in particular, as a result of their use, the proportion of lymphoid nodules with reproduction centers (table 1), considered as the most functionally mature and differentiated form of lymphoid tissue, indicating active flow processes of local immunity (10).

The percentage of lymphoid nodules with a center of reproduction in the walls of the vaginal vestibule of rats of the experimental group as a result of a course of naphthalan baths, compared with the control, in the walls of the anterior third of the vaginal vestibule is 1.97 times more ($p < 0.05$), its middle third — 1.90 times more ($p < 0.05$), posterior third — 1.77 times more ($p < 0.05$) and for the vaginal vestibule as a whole — 1.86 times more ($p < 0.05$) .

The thickness of centered lymphoid nodules in rats as a result of a course of naphthalan baths, compared with the control, in the walls of the anterior third of the vestibule is 1.59 times more ($p < 0.05$), its middle third is 1.42 times more ($p < 0.05$), the posterior third — 1.36 times more ($p < 0.05$) and for the vaginal vestibule as a whole — 1.44 times more ($p < 0.05$), (Table 2).

The length of lymphoid nodules after naphthalan baths, compared with the control, is 1.64 times greater in the walls of the anterior third of the vaginal vestibule ($p < 0.05$), its middle third is 1.59 times more ($p < 0.05$), the posterior third is 1.52 times more ($p < 0.05$) and for the vaginal vestibule as a whole — 1.57 times more ($p < 0.05$), (Table 3).

The area of lymphoid nodules with a center of reproduction in the walls of the vaginal vestibule of rats after the course effects of the naphthalan baths also increases (Table 4)

This indicator, compared with the control, in the walls of the anterior third of the vestibule is 1.48 times more ($p < 0.05$), its middle third is 1.60 times more ($p < 0.05$), the posterior third is 1.55 times more ($p < 0.05$) and for the vaginal as a whole — 1.54 times more ($p < 0.05$).

The individual minimum and maximum of the proportion of lymphoid nodules with the center of reproduction, their length, width, and area in rats after a course of naphthalan baths throughout the entire body are larger compared to the control.

After a course of naphthalan baths, the thickness of the center of reproduction in the lymphoid nodule (for the vaginal vestibule as a whole), relative to the control, increases 1.7 times ($p < 0.05$), the length of the center of reproduction 1.6 times), its area at the cut is 1.6 times ($p < 0.05$). In relation to the control, after a course of naphthalan baths, the thickness of the lymphoid nodule without a center of reproduction increases 2.1 times ($p < 0.05$), its length — 1.5 times ($p < 0.05$), its area at the cut — 1.5 times ($p < 0.05$). As a result of the course of naphthalan baths in the walls of the vaginal vestibule of rats, the number of cells in the

Table 1. *The proportion of lymphoid nodules with a center of reproduction in the walls of the vaginal vestibule of rats after the course of action naphthalan baths (X±Sx; min-max; in %). For 100% of the total set of lymphoid nodules at the cut*

Nature of the effects	N	Division of the vaginal vestibule			
		Anterior third	Middle third	Posterior third	The vaginal vestibule as a whole
Naftalan baths	30	35,6±0,5 30,1-40,2	39,2±0,4 34,4-43,1	40,1±0,5 35,6-46,2	38,3±0,5 35,6-46,2
Fresh baths	30	19,3±0,4 16,3-23,6	22,1±0,3 16,3-23,6	24,2±0,5 18,2-27,8	21,9±0,5 17,2-28,2
Control	30	18,5±0,3 15,2-22,4	20,6±0,3 15,2-22,4	22,7±0,5 16,2-26,6	20,6±0,5 15,2-26,7

Note: *here and below in the tables n is the number of observations.*

Table 2. *The thickness of the lymphoid nodule with a center of reproduction in the walls of the vaginal vestibule in rats after a course of effect of the naphthalan baths(X±Sx; min-max; μm)*

Nature of the effects	n	Division of the vaginal vestibule			
		Anterior third	Middle third	Posterior third	The vaginal vestibule as a whole
Naftalan baths	30	11,6±0,2 8,3-13,7	11,9±0,3 8,3-14,2	12,8±0,3 10,0-15,4	12,1±0,2 9,2-13,7
Fresh baths	30	7,2±0,2 6,0-10,6	8,5±0,3 5,1-10,6	9,8±0,2 7,1-11,4	8,5±0,3 5,0-10,6
Control	30	7,3±0,2 6,0-9,8	8,4±0,3 5,0-10,6	9,4±0,2 7,1-11,4	8,4±0,3 6,1-11,6

Table 3. *The length of the lymphoid nodule with the center of reproduction in the walls of the vestibule of the vagina in rats after the course effect of the naphthalan bath (X±Sx; min-max; μm)*

Nature of the effects	n	Division of the vaginal vestibule			
		Anterior third	Middle third	Posterior third	The vaginal vestibule as a whole
Naftalan baths	30	13,6±0,3 8,2-15,7	14,9±0,4 8,2-17,3	15,8±0,4 10,0-18,5	14,8±0,4 9,2-17,7
Fresh baths	30	8,2±0,2 6,2-10,5	8,5±0,3 5,2-10,5	10,8±0,3 7,6-13,3	9,2±0,4 5,2-13,3
Control	30	8,3±0,2 6,2-9,7	9,4±0,3 5,2-12,4	10,4±0,3 7,6-12,4	9,4±0.2 6,6-11,8

Table 4. *The area of the lymphoid nodule with the center of reproduction in the walls of the vaginal vestibule of rats after the course effect of the naphthalan baths (X±Sx; min-max; $mm^2 x 10^{-4}$)*

Nature of the effects	n	Division of the vaginal vestibule			
		Anterior third	Middle third	Posterior third	The vaginal vestibule as a whole
Naftalan baths	30	22,5±0,3 18,4-25,2	24,1±0,4 18,4-27,1	25,1±0,4 19,6-28,3	23,9±0,4 18,4-27,1
Fresh baths	30	15,7±0,3 11,0-18,6	16,3±0,3 11,0-18,6	17,1±0,4 12,2-20,3	16,4±0,4 11,0-18,6
Control	30	15,2±0,3 12,2-17,1	15,1±0,3 12,2-17,1	16,2±0,3 12,5-19,7	15,5±0,3 12,2-18,3

lymphoid row also increases. In relation to the control, the value of this indicator in the diffuse lymphoid tissue is 1.4 times higher than the control ($p < 0.05$), in lymphoid nodules without a reproduction center — 1.3 times ($p < 0.05$), in reproduction centers lymphoid nodules and in their mantle zone — 1.4 times ($p < 0.05$). The result of naphthalan baths is an increase in the percentage of lymphocytes (1.1–1.2 times, $p < 0.05$) — one of the most active participants in the processes of immune protection (12). There is an increase in the number of cells of the lymphoid series with signs of mitosis, which indicates the activation of lymphocytopoiesis; the level of cellular destruction in the composition of the lymphoid tissue of the vaginal vestibule of rats is reduced.

Analogous changes in the cellular composition of the lymphoid tissue, as a result of the course action of iodine-bromine and bituminous baths, by the example of the lymphoid apparatus of the larynx of rats previously showed (14). Other authors cite the similar data (15, 1, 5), which indicates the importance of conducting balneological procedures and their effectiveness, which is of significant theoretical and practical importance.

CONCLUSIONS

1. Course effects of naphthalan baths do not cause pathological changes in the walls of the vaginal vestibule of rats, which is proved by morphological methods.
2. As a result of the action of naphthalan baths is the activation of local immune processes (local immunity) of the mucous membrane of the vaginal vestibule of rats.
3. The course effect of the naphthalan baths leads to an increase in the number of lymphoid tissue in the mucous membrane of the vestibule, activation of lymphocytopoiesis, and a decrease in the level of cellular destruction of lymphoid tissue.

REFERENCES

1. **Allahverdiyev M.K.** Structural and functional characteristics and patterns of morphogenesis of the glandular and lymphoid apparatus of the extrahepatic biliary ducts of a person in postnatal ontogenesis / Abstract. Dr. diss. – Baku, 2007. – 40 p.
2. **Andabak Rogulj A., Brkić D., Alajbeg I. et al.** NAVS naphthalan for the treatment of oral mucosal diseases – a pilot study // Acta Dermatovenerol. Croat., 2014, 22(4): 250–8.
3. **Badalov N.** The use of naphthalan in medicine // Press Therm Climat, 2011, 148, 137–140.
4. **Frigo N.V., Zhukova O.V., Kruglova L.S.** Adjuvant therapy of patients with dystrophic processes of the vulva and vulvodynia / Clinical Dermatology and Venereology. – 2015. – T.14. – Issue 6. – P. 28–34.
5. **Huseynov B.M.** Morphological features of the glands and lymphoid structures of the trachea and main bronchi in humans in postnatal ontogenesis and in an experiment in rats when exposed to water procedures with different salt composition / Author. Dr. diss. – Baku 2011. – 40 p.
6. **Kyazimov G.A.** Innovative technologies in naftalanotherapy (balm naftalan for baths) / Theses of scientific works of the III All-Russian Congress of Dermatovenerologists. Kazan, 2009, p. 46
7. **Makarov I.O., Chulkova E.A.Yu, Sheshukova N.A., Mkarova I.I.** Non-neoplastic diseases of the vulva / Obstetrics, gynecology, reproduction. – 2012. – V.6. – Issue 2. – P. 14–17.
8. **Meiselis M., Kruglikova R., Gaibov E. et al.** Effect of cyclopentane naphthenic acids and hydrocarbons on the permeability of the blood-brain barrier. // Questions Kurortol.Fiziother. Exercise therapy. – 1980. – №2. – p. 61–63.
9. **Movsumov N.T.** The morphogenesis of the glands of the human larynx is normal and experimentally with some balneological effects / Author. Dr. diss. – Baku, 2004. – 35 p.
10. **Nikityuk D. B., Klochkova S. V., Alekseeva N. T., Kvaratskhelia A.G.** Modern ideas about the general laws of macro-microscopic anatomy of lymphoid organs // Journal of Anatomy and Histopathology. – 2015. – V.4, №2. – p. 9–13.
11. **Sapin M.R., Nikityuk D.B.** Immune system, stress and immunodeficiency. – M. – Elista, APP "Dzhangar", 2000. – 184p.
12. **Sapin, M.R., Nikityuk D.B.** Immune and glandular structures in the walls of human hollow organs // Morphological statements. – 1998. – №1 / 2. – p. 175–178.
13. **Scherbina NA, Lamia A.** Comparative effectiveness of methods for the conservative correction of genital prolapse in perimenopausal women / Wschodnioeuropejskie Czasopismo Naukove. – 2016. –V.12.–Vol. 16. – P. 39–41
14. **Seyidova Z.R.** Lymphoid apparatus of the larynx of rats when exposed to water procedures with different salt composition / author. Candidate of Dep. Baku, 2001. – 23 p.
15. **Shadlinski V.B., Movsumov N.T.** The glandular lymphoid apparatus of the larynx of rats with balneological influences (experimental morphological studies). Baku: Nurlan, 2002,131 p.
16. **Sizyakova L.A.** Rehabilitation treatment of patients with prolonged pneumonia using natural naphthalan / Author. Ph.D. – M., 2010. – 26p.
17. **Vrzogiç P., Jakiç-Razumoviç J., Pasiç A.** Effect of naphthalan on epidermal proliferation activity and CD3, CD4 and CD8 lymphocyte count // Acta Dermatovenerol.Croat., 2003, 11 (2): 65–9.

THE COURSE, BRANCHES OF THE INFERIOR ALVEOLAR NERVE AND ITS ANATOMICAL FORMS IN THE MANDIBULAR CANAL

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ABSTRACT — The purpose of the study is investigation of branching of the inferior alveolar nerve and its forms in the mandibular canal.

MATERIAL AND METHODS. Using the macro-microscopic method (preparation), the inferior alveolar nerves were studied in adults, as well as in some age groups (fetuses, newborns, early childhood). The total number of cadavers was 30, 54 nerves were examined. Nerve dissection was performed under the control of a stereoscopic microscope MBS-2 on preparations previously fixed in 3–5% formalin solution. Opening of the mandibular canal was made both from the inner and the outer surface of the mandible. Attention was drawn to the topographic relationships of the inferior alveolar nerve with the inferior alveolar artery, the roots of the teeth and the canal walls.

RESULTS OF THE RESEARCH. In a macro-microscopic study, it was established on all the preparations that the inferior alveolar nerve starts from the mandibular nerve at a different level. It is accepted to distinguish two forms of the beginning of the nerve: high and low. The topography of the nerve in the mandibular canal is not the same at different levels. This is due to differences in the levels of branching from the nerve trunk of the large branch to the molars, the presence of variants in its branching (1, 2 or 3 branches), as well as differences in the relationship of the nerve to the inferior alveolar artery. The main trunk of the inferior alveolar nerve after giving the branch to the molars directs respectively the configuration of the mandibular canal downward and forward and at the level of the first premolar or canine reaches the level of the mental foramen. Here it is divided into its terminal branches - the mental and incisive nerves. Grouping all the variants that we have established in the branching of the nerve under consideration (taking into account the literature data), we can distinguish 6 basic forms. The inferior alveolar nerve in the canal consists of one trunk. The branch to the molars differs from the trunk relatively low (at the root level of the teeth). This form can be considered as a magistral. It was observed in 67% of the studied preparations. The inferior alveolar nerve is formed higher than the mandibular nerve and divides into two trunks before entering the mandibular foramen. In the canal, one of the trunks, in turn, is divided into two main branches. Thus, the channel contains three main branches. This form can be considered as scattered (2%).

CONCLUSION. Knowledge of the anatomical features of branching and forms of the inferior alveolar nerve is the main guarantee of success when performing operative procedures on the mandible. In the mandibular canal, the inferior alveolar nerve in most cases consists of a single trunk. The branches from this trunk to the molars depart relatively low.

KEYWORDS — the inferior alveolar nerve, the mandibular canal, magistral form, scattered form.

INTRODUCTION

The study of the anatomy of the trigeminal nerve, especially from the point of view of its variations, has both theoretical and clinical significance (1–4). The inferior alveolar nerve, due to difficult anatomical access, requires special careful preparation of the researcher (5). Also, an in-depth knowledge of the anatomy of the nerve and mandible should be demonstrated by the doctor performing the anesthesia; since both the nerve itself and the mandible containing this nerve are subjects to considerable anatomical variations. In particular, this concerns the structure of the mandible, the location of the mandibular foramen, which is the entrance to the canal, of the angle of mandible — all these structures also vary greatly with age (6–8). Without considering the whole range of this diversity, it is usually not possible to achieve a successful surgical intervention on the mandible. In the literature, the anatomical features of the inferior alveolar nerve are widely considered; however, most of the researches have a descriptive character of *non-standard* cases of the course of the inferior alveolar nerve (usually on the one preparations) or these studies are generalizing, so-called literature reviews (9, 10). Taking into account the above and the extreme importance of the detailed anatomy of this nerve, we conducted a comprehensive study using the entire arsenal of morphological methods — macro-microscopy, histology, X-ray examination, craniometry. In the article presented to you, we limited ourselves to the data obtained with a macro-microscopic study.

MATERIAL AND METHODS

Using the macro-microscopic method (preparation), the inferior alveolar nerves were studied in adults, as well as in some age groups (fetuses, newborns, early childhood). The total number of cadavers was 30, 54 nerves were examined. The actual material of the research was recruited in the morgues of the Union of Forensic Medicine and Pathological Anatomy of the Ministry of Health of the Republic of Azerbaijan and the Department of Human Anatomy of the Azerbaijan Medical University.

When working with sectional material, the requirements of the Federal Law of 12.01.1996 No. 8 *On Burial and Funeral Affairs* are taken into account.

Nerve dissection was performed under the control of a stereoscopic microscope MBS-2 on prepara-

tions previously fixed in 3–5% formalin solution. For a very laborious process — the opening of bone channels during the preparation of nerves, bone nippers, bits of different sizes and a drill were used. When studying the inferior alveolar nerve on the sagittal cuts of the head, the mandibular nerve was first found, and then, in the process of dissecting its branches, the masticator muscles, vessels and other soft tissues that were not related to the nerve we studied were removed. Opening of the mandibular canal was made both from the inner and the outer surface of the mandible. Attention was drawn to the topographic relationships of the inferior alveolar nerve with the inferior alveolar artery, the roots of the teeth and the canal walls.

RESULTS OF THE RESEARCH

According to our research, the level of beginning of the inferior alveolar nerve from the mandibular nerve is different. Despite this, two forms of the beginning of the inferior alveolar nerve can be distinguished: high and low. With a high form, the inferior alveolar nerve departs directly from the mandibular nerve. In this case, the mandibular nerve usually branches in a scattered form. Coming out of the foramen ovale into the infratemporal fossa, it gives branches to the mastication muscles and divides into the lingual, auriculo-temporal and inferior alveolar nerves. In the adult human the mandibular nerve has a different length at the part, which is characterized as extracranial; its branching occurs at a distance of 6 to 14 mm below the foramen ovale. This variant (high form) was observed on 10 of 30 preparations (in adults).

On 6 preparations, the mandibular nerve beneath the foramen ovale firstly ramificated within the muscles and gave off the auriculo-temporal nerve; after followed down like nerve trunk, which divided into two branches-the lingual and inferior alveolar nerves. At the same time, the lingual nerve also directed forward, and the inferior alveolar nerve followed down, being a direct continuation of the main trunk of the mandibular nerve. This form of the beginning of the inferior alveolar nerve was accepted as low; the level of the inferior alveolar nerve was 18–20 mm below the foramen ovale.

The inferior alveolar nerve, begins from the mandibular nerve in the infratemporal fossa, follows back and down between the lateral and medial pterygoid muscles, and then deviates outward and along the external surface of the medial pterygoid muscle approaches the branch of the mandible. The length of this segment of the nerve from its beginning to the mandibular foramen — at its high origin — is 21–36 mm, and at a low is 11–14 mm. Before entering the mandibular canal, the inferior alveolar nerve gives forward and down a large branch - the mylohyoid nerve. According to our data, this nerve in one case (out of 30) began together with the inferior alveolar nerve directly from the mandibular nerve.

The topography of the inferior alveolar nerve in the mandibular canal is different at different levels, which is caused by differences in the levels of branching from the nerve trunk of the large branch to the molars, the presence of variants in its branching (1, 2 or 3 branches), as well as differences in the relationship of the nerve to the artery with the same name. The inferior alveolar nerve, entering the mandibular canal, immediately sends a relatively large branch to the region of molars (fig. 1).

The latter often starts from the anterior periphery of the described nerve 5–10 mm below the mandibular foramen, is directed forward and downward and forms a small arch with convexity downward, followed below the roots of molars, being from their apexes at a distance of 2.5–3.6 mm. This nerve most often gives off branches to the roots of last two molars. Less often (8 preparations) it only innervates the last molar. In addition, a number of its small branches directed to the gum or lost in the bone substance of the mandible. These branches usually begin with common trunks with the inferior dental branches.

The main trunk of the inferior alveolar nerve after giving the branch to the molars directs respectively the configuration of the mandibular canal downward and forward and at the level of the first premolar or canine reaches the level of the mental foramen. Here it is divided into its terminal branches — the mental and incisive nerves.

On our macro-microscopic preparations (60) in the external structure of the inferior alveolar nerve, expressed individual variability was observed. On a number of preparations, the nerve was divided at different levels into 2 or 3 large branches. There were also noted some features in the levels of the formation of branches that extend from the trunk of the nerve to the teeth. Grouping all the variants that we have established in the branching of the nerve under consideration (taking into account the literature data), we can distinguish 6 basic forms (fig. 2).

I form. The inferior alveolar nerve in the canal consists of one trunk. The branch to the molars differs from the trunk relatively low (at the root level of the teeth). This form can be considered as a magistral. It was observed in 67% of the studied preparations.

II form. The branches of the inferior alveolar nerve to the molars are formed at the level of the alveolar border of the mandible. The nerve consists of one trunk (10%).

III form. The branch to the molars is formed high — at the level of the opening of the mandibular foramen or 3–5 mm below (8%).

IV form. The nerve trunk after entering the mandibular canal is divided into two main branches at a distance of 10–12 mm from the mandibular foramen (5%).

V form. The nerve trunk after entering the mandibular canal is divided into two branches, between which there is a large number of connections. It occurs at a distance of 10–12 mm from the mandibular foramen (8%).

VI form. The inferior alveolar nerve is formed higher than the mandibular nerve and divides into two trunks before entering the mandibular foramen. In the canal, one of the trunks, in turn, is divided into two main branches. Thus, the channel contains three main branches. This form can be considered as scattered (2%).

So, on eight preparations the inferior alveolar nerve was divided into two branches at different levels (IV and V forms). One of the branches of a smaller diamet er directed forward, was located closer to the alveolar process of the mandible, under the apexes of the roots of the teeth and gave the lower dental branches to the teeth. In some cases, the distal parts of this branch ended in the region of the incisors, while in others they were joined by the lower branch. Another, inferior, branch of the inferior alveolar nerve follows along the lower wall of the mandibular canal and continues into the mental nerve. These branches along their course are connected among themselves by small nerve trunks.

Thus, a complex macroscopic and microscopic study made it possible to more fully represent the topography of the inferior alveolar nerve in the mandibular canal. The high form of the beginning of the inferior alveolar nerve is more common in the scattered form of the branching of the mandibular nerve, and the lower form — in the magistral.

DISCUSSION

Given the above, the effect of surgical interventions on the mandible directly depends on a detailed knowledge of the anatomical structures located in the mandibular canal (11). The size and length of the canal are related to the degree of development of the body of mandible. This is confirmed by literary data (12). On the studied adult preparations (senile age), features were established in the topography of the inferior alveolar nerve. The main role in changing the topography of the nerve was the safety of the dentition and the morphological condition of the alveolar process. The inferior alveolar nerve, according to macroscopic studies, entered the mandibular canal more often with a single trunk.

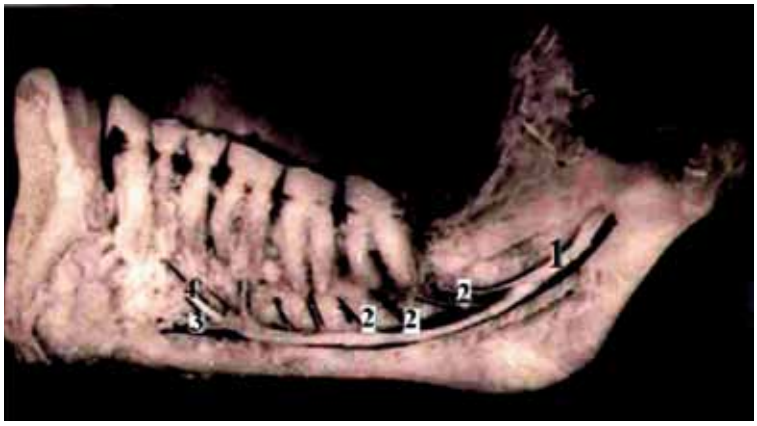

Fig. 1. *Inferior alveolar nerve, right. Photograph of the preparation (man 51 years old). 1- inferior alveolar nerve; 2 – the branches to molars; 3 – the incisive nerve; 4 – the branches to premolars*

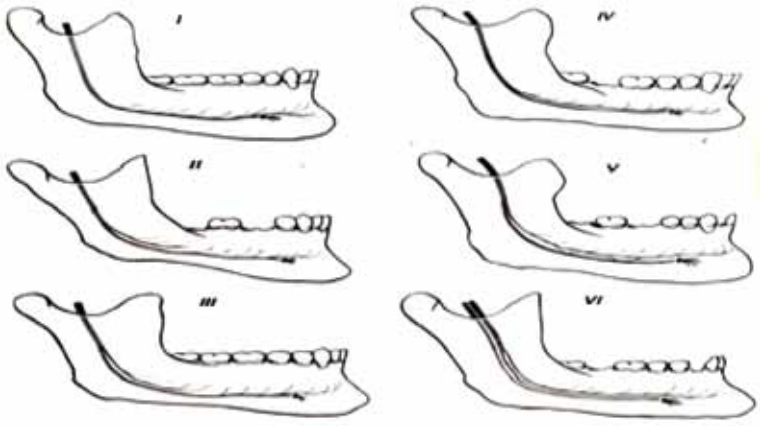

Fig. 2. *(Explanation in the text)*

CONCLUSION

Knowledge of the anatomical features of branching and forms of the inferior alveolar nerve is the main guarantee of success when performing operative procedures on the mandible. In the mandibular canal, the inferior alveolar nerve in most cases consists of a single trunk. The branches from this trunk to the molars depart relatively low.

REFERENCES:

1. **Joo W, Yoshioka F, Funaki T, Mizokami K, Rhoton AL Jr.** Microsurgical anatomy of the trigeminal nerve. Clin Anat 2014 Jan; 27 (1): 61–88.
2. **Zheng JP, Song M, Zhan XX, Li CZ, Zong XY, Zhang YZ.** Endoscopic approach to the trigeminal nerve: an anatomic study. J. Craniomaxillofac.Surg. 2014, Jul; 42 (5): 674–82.

3. **Fortes FS, Sennes LU, Carrau RL, Brito R, Ribas GC, Yasuda A, Rodrigues AL Jr, Snyderman CH, Kassam AB.** Endoscopic anatomy of the pterygopalatine fossa and the transpterygoid approach: development of a surgical instruction model. Laryngoscope, 2008, Jan; 118 (1): 44–9.

4. **Mangala M. Pai, Ravindra S. Swany, Latha V. Prabhu.** A variation in the morphology of the inferior alveolar nerve with potential clinical significance. Biomedicine International, 2010, 1: 93–95.

5. **Kieser JA, Paulin M, Law B.** Intrabony course of the inferior alveolar nerve in the edentulous mandible. Clin Anat 2004, Mar; 17 (2): 107–11.

6. **Shiozaki H, Abe S, Tzumori N, Shiozaki K, Kaneko Y, Ichinohe T.** Macroscopic anatomy of the sphenomandibular ligament related to the inferior alveolar nerve block. Cranio, 2007, Jul; 25 (3):160-5.

7. **Narayana K, Vasudha S.** Intraosseous course of the inferior alveolar (dental) nerve and its relative position in the mandible. Indian J Dent Res. 2004, Jul–Sep;15(3):99–102.

8. **Khoury JN, Mihailidis S, Ghabriel M, Townsend.** Applied anatomy of the pterygomandibular space: improving the success of the inferior alveolar nerve blocks. Australian Dental Journal 2011, 56: 112–121.

9. **Azeredo RA, Cesconetto LA, Torres LHS.** Anatomical variation of te inferior alveolar nerve: a case report. J. Morphol. Sci, 2016, vol. 33, № 4, p.183–185.

10. **Anderson LC, Kosinski TF, Mentag PJ.** A review of the intraosseous course of the nerves of the mandible. J Oral Implantol. 1991; 17 (4) :394–403.

11. **Lee MH, Kim HJ, Kim DK, Yu SK.** Histologic features and fascicular arrangement of the inferior alveolar nerve. Arch Oral Biol. 2015 Dec; 60 (12) : 1736–41.

12. **Gowgiel JM.** The position and course of the mandibular canal. J Oral Implatol 1992; 18 (4) : 383–5.

ISSUES OF DIAGNOSTICS AND TREATMENT OF ECHINOCOCCUS CYST OF RARE LOCALIZATION: A CLINICAL CASE

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ABSTRACT — Echinococcal cysts of the pancreas are a rare pathology, but after surgical treatment they give a high percentage of complications and mortality. This article describes a clinical case of successful surgical treatment of a patient with a diagnosis of pancreas echinococcosis.
A female patient A., 60 years old, was admitted in a planned manner with complaints that allowed her to suspect an echinococcal liver cyst. The correct selection of instrumental methods of diagnosis allowed us to identify a rare form of this disease. With a thorough revision, a cyst is found in the body of the pancreas. Pericistectomy performed. The postoperative period without features, recurrence of the disease was no longer observed. This clinical example shows that the timely identification of echinococcal cysts and their precise localization is fundamental in improving the results of surgical treatment of this category of patients.

KEYWORDS — pancreas, echinococcal cyst, surgical intervention.

INTRODUCTION

Echinococcosis is a helminthiasis that can damage any organ and system of the body. The causative agent is the larval stage of the tapeworm of Echinococcus granulosus. Echinococcal lesion of the pancreas is a rather rare pathology, the incidence of which is not more than 0.21% of all possible localizations of the specified parasitic disease [1]. As a rule, with rare localization, parasitic cysts can simultaneously be detected in other organs - the liver, lungs, spleen, pancreas, etc. [2].

The primary larvae of the helminth (oncospheres) are coated with a membrane, which under the action of gastric juice is lysed. The separated parasites perforate the intestinal mucosa further through the portal vein, are transported to the liver, where they mature to a mature cyst. Most parasites are held in the liver parenchyma, so from 31 to 92% of echinococcal cysts are formed in the liver [1]. Individual eggs that have overcome the hepatic barrier enter the pulmonary circulation and are delayed in the pulmonary capillary bed, which leads to the formation of pulmonary cysts (15–20%). When the parasite enters the great circle of blood circulation, cysts (10–15%) are formed in the spleen, brain and bone marrow, heart, etc. [2].

As a rule, patients with rare localization of echinococcal cysts are re-operated and previously could be subjected to surgery for echinococcosis localized in another organ — liver, lung, spleen, pancreas, etc. [1].

Purpose

Presentation of a clinical case of observation and treatment of a patient with localization of an echinococcal cyst in the pancreas.

Materials and methods of research

In the present work the result of treatment of a patient with a diagnosis of "pancreatic echinococcosis" is presented, this diagnosis was established in accordance with international clinical recommendations. Clinical examination included the collection of anamnesis, examination of complaints, physical examination and examination of the patient. Laboratory diagnostics included morphological, biochemical, immunological studies.

Instrumental methods of investigation included ultrasound and spiral computed tomography (SCT). The ultrasonic study was performed with ultrasound scanners Hitachi Aloka SSD-4500 (Hitachi Japan), Esaote My lab 30 ("Esaote" Italy), GE Vivid S5 ("GE", USA) with linear and sector scan sensors with a frequency of 3,5 and 5 MHz in real time.

To identify focal formations, SCT was performed with the introduction of a bolus of contrast substance. SKT parameters: voltage x-ray tube 120 kV, current of 200–350 mA, an image matrix of 512×512. The thickness of the cut was 7 or 5 mm, the feed rate of the table corresponded to the thickness of the allocated layer — 7 or 5 mm (pitch = 1), the reconstruction index — 5 or 4 mm. Metric and densitometric analysis of the obtained images was performed. The density of organs and tissues was determined in Hounsfield units (H units). In addition to the analysis of transverse scans, we used the multiplanar construction and three-dimensional reconstructions.

A CLINICAL CASE

A female patient A. 1957 20.10.17 years admitted to the Department 1 Aleksandro-Mariinsky regional clinical hospital of Astrakhan routinely with complaints of intermittent rapicauda, burning pain in the

right upper hypochondrium, occurs more frequently after errors in diet, bitter taste, dry mouth, nausea in the morning. The patient had a history of cholecystectomy in February 1994, and in May 1996 she was operated on for an echinococcal liver cyst.

Upon admission of the patient performed CT in which the liver is of ordinary size, with clear smooth contours, the structure is heterogeneous. In the projection s7, a totally calcified rounded formation was identified with dimensions 26–17–19 mm. Density indices of liver parenchyma were not changed to + 59 HU. The vascular system is not changed, the intrahepatic ducts are dilated. Additional formations are not revealed. The bile duct expanded to 18xmm, there are no concrements in its lumen. Gall bladder is absent after removal. The pancreas is located as usual, not enlarged: head up to 18 mm, body up to 14 mm, tail section up to 11mm. Its contours are uneven, clear. The structure is heterogeneous, with fatty acinar restructuring. Density values are reduced to 30 NU. Calcification of the parenchyma of the pancreas and the expansion of its duct is not marked.

In the region of the tail of the pancreas, posteriorly there is a round formation of a cyst-like structure, with dimensions 51–34–49 mm, the capsule of formation diffusely calcined.

CONCLUSION

CT-signs of parasitic cysts in the region of the right lobe of the liver (totally calcined), and in the region of the pancreatic tail.

Data from laboratory blood tests dated 10/20/2017: amylase – 79.7 U/L, potassium – 3.8 mmol/L, sodium – 132.9 mmol/L, creatinine – 61.6 μmol/L, glucose – 8.0 mmol/L, total bilirubin – 24.0 μmol/L. The level of total protein in blood plasma is 62.5 g/L. The activity of aspartate transaminase – 47.0 U/L, alanine transaminase – 39.7 U/L. Ethanol and β–naphthol tests are negative. The fibrinogen level in the blood is 4.65 g/L, the activated partial thromboplastin time is 29.2 sec, the prothrombin time in the blood or plasma is 17.0 sec. General blood test: hemoglobin – 121 g/L, Erythrocytes – $3.9 \cdot 10^{12}$/L, Hematocrit – 37.6%, platelets – $265 \cdot 10^{9}$/L, Leukocytes – $12.9 \cdot 10^{9}$/L, segmented neutrophils – 88%, monocytes – 5%, lymphocytes: 7%.

From the hematological analysis, it can be seen that the patient lacked eosinophilia typical of helminth infections. In addition, the ELISA method in its serum did not detect antibodies IGG to echinococcus antigens. Despite the fact that the patient does not have an immune response to echinococcus, on the basis of the clinical and instrumental data, the main clinical diagnosis is made: pancreatic echinococcosis.

The patient is prepared for surgery. 23.10.17 made pericystectomy operation. Protocol of operation: an upper median laparotomy was performed, in the area of the liver there is a pronounced adhesive process, which is divided by blunt and acute route. With a thorough revision of the liver, a cyst was not found. With further revision after the mobilization of the greater curvature detected Echinococcus 5×6 located at the front edge of the pancreas emanating from her cloths. Pericystectomy was performed. Hemostasis. A drainage tube is connected to the operation area. Sutures to the operating wound. Bandage.

The course of the postoperative period without features. The drainage tube was removed on the third day. After the operation, she received planned pain therapy, antibacterial, anticoagulant, infusion therapy, local treatment of postoperative wounds. After the treatment, the patient's condition improved. Postoperative wound healed by primary intention, the sutures were removed on day 7. He was discharged in a satisfactory condition for 11 days. In the dynamic observation and examination of relapse of the disease in this patient, we do not observe.

CONCLUSION

Thus, further study of the possibilities of instrumental methods of research is one of the priorities. Timely detection of this disease is fundamental in improving the results of treatment of this category of patients.

REFERENCES

1. **Abdulzhalilov MK, Guseinov AG.** [Pancreatic localization of hydatid cyst]. Khirurgiia (Mosk). 2015;(11):75-76. doi: 10.17116/hirurgia20151175-76.
2. **Mikhin IV, Kosivtsov OA.** [Hydatid disease of the left hip]. Khirurgiia (Mosk). 2015;(7):97-100. doi: 10.17116/hirurgia2015797-100.

TREATMENT OF ERYSIPELAS IN CHILDREN WITH THE USE OF INTRAVENOUS LASER BLOOD IRRADIATION, HYDROGEL AND OINTMENT DRESSINGS

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ABSTRACT — The work evaluated the clinical effectiveness of complex treatment of erysipelas in children with the use of intravenous laser irradiation of blood, hydrogel dressings of miramistin and ointment dressings of branolind. The study group included 25 children aged 6 to 17 years with erysipelas of various forms, etiology and localization. All children underwent standard conservative therapy. Method of use of complex treatment with application of intravenous laser irradiation of blood, hydrogel dressings of miramistin and ointment dressings of branolind was as follows: after treatment and toilet of the wound made the application of the drug directly on the wound surface. Hydrogel bandage miromistina was carefully modeled in accordance with the size of the wound surface and fixed with gauze bandage. Further, intravenous laser irradiation of blood was carried out. In the phase of healing has been used ointment dressings of branolind. These drugs were first used in combination with standard therapy for the treatment of erysipelas in children of different localization and origin. The therapeutic efficacy has been studied and the indications for the use of a new combined method of treatment of erysipelatous inflammation are substantiated.

KEYWORDS — children, erysipelas, wound process, intravenous laser irradiation of blood.

In pediatric surgery, we have to face more often with erysipelas inflammation. Currently, there is an increase in morbidity in i the children's contingent, independent of regional and social characteristics, living standards.This pathology is most common in children in the form of complications after injuries and burns and prevails in rural areas.

Erysipelas — acute progressive inflammation of the serous nature, affecting the skin. Allocate erythematous (more common), bullous and gangrenous form. [6]

The gold standard in the treatment of patients with erysipelas today is a comprehensive treatment. For the treatment of erysipelas in children at the present time widely used general and local antibacterial therapy, means on the basis of gauze, which, having numerous positive qualities, yet have a number of significant drawbacks [1]. This necessitates the development of new combined methods of treatment of erysipelas in children.

Currently In the clinical practice for the treatment of erysipelas in children began to use drugs on the basis of the hydrogel [2, 3].

Preparations of this group are applicative drugs and have a number of advantages: high elasticity, atraumatic, good drainage properties, a certain strength, which protects the wound surface from mechanical damage. Hydrogel preparations can be used in conjunction with local antibiotics, which increases the antimicrobial activity of drugs based on hydrogel [4, 5].

The purpose of this study was to evaluate the clinical efficacy of complex treatment of erysipelas in children with the use of intravenous laser irradiation of blood, hydrogel dressings of miramistin and ointment dressings of paneling.

The study was conducted at the Department of pediatric surgery of Astrakhan state medical University in the period from 2014 to 2017. The study group included 25 children aged 6 to 17 years with erysipelas of various forms, etiology and localization (erythematous and erythematous-bullous forms). There were 17 boys and 8 girls in the group.

All children underwent standard conservative therapy. The task of conservative treatment was to create optimal conditions for stopping of the inflammatory process.

The method of use of complex treatment with the use of intravenous laser irradiation of blood, hydrogel dressings of miramistin and ointment dressings of paneling was as follows: after treatment and toilet wounds made application of the drug directly to the wound surface. hydrogel dressings of miramistin was carefully modeled according to the size of the wound surface and fixed with gauze bandage. Further intravenous laser irradiation of blood was carried out. In the healing phase ointment dressings of paneling was used.

During the first phase – the phase of inflamma-

tion and exudation, standard conservative therapy was used, after treatment and toilet wounds the application of hydrogel dressings of miramistin was performed on the wound surface in accordance with the size of the wounds. At each ligation was carried out sanitation of the wound with warm saline solution. The wound was treated with an aqueous solution of chlorhexidine. After each ligation the patients were performed intravenous laser irradiation of blood.

In the phase of granulation and epithelialization was used hydrogel dressings of miramistin. Each ligation was carried out sanitation of the wound with warm saline solution. Fixation was carried out with a gauze bandage.

Ligation was carried out through the day. Special antibacterial therapy of wounds was not performed. In the healing phase ointment dressings of paneling was used.

The treatment period lasted from 5 to 12 days depending on the size of the wound surface and the characteristics of the course of the wound process (on average 7–9 days). The evaluation of therapeutic efficacy was carried out according to various criteria: body temperature, changes in the wound surface area, laboratory parameters, the state of the wound edges, the presence of necrotic tissues, the nature of the discharge, the severity of signs of inflammation (hyperemia, edema, local temperature increase).

On the 5th day of treatment there was a decrease in the surface area of wounds, a decrease in the severity of the inflammatory process, changes in the nature of the discharge. A similar study on the 7th day of treatment showed improvement of laboratory results, normalization of body temperature, relief of inflammation, reduction of surface wounds by 60%, the absence of discharge. On the 9th day the area of wounds decreased by 90%, there was a complete relief of inflammation, epithelialization of the edges of wounds.

CONCLUSIONS

1. The use of the method of complex treatment of erysipelas in children in the form of a combined intravenous laser irradiation of blood, hydrogel dressings of miramistin and ointment dressings of paneling allows to achieve greater efficiency of the therapy in the background of standard treatment.

2. The proposed method of combined treatment can be recommended for wide clinical use as a supplement to standard treatment.

The authors declare that there are no conflicts of interest related to this article.

REFERENCES

1. **Uchaykin V.F. Shamsheva O.V., Nisevich N.I.,** Infectious diseases at children, GEOTAR – Media – 2013. – 688 p.
2. **Rybachkov V.V., Potapov P.P., Salnikov, E.V. et al.** Application wound sorption in the complex treatment of destructive forms of erysipelas // Herald of Surgery named., I. I. Grekov: Scientific and practical journal.-2003.-Volume 162, N5.-P. 82-84 (4) .
3. **Shandurenko I.N.** Treatment of trophic ulcers with biologically active hydrogel dressings // Rus. journals dermal and venereal. diseases. – 2003. – №: 1.– P. 25–30 (9).
4. **Chernetskaya Yu.G.** Application dosage form of hydrogel matrix for the treatment of wounds and burns // Man and Medicine: Tez. report XI ROS. nat. Kongr .-– M. , 2004. – 848 p.
5. **Chernetskaya Yu.G.** Qualitative and quantitative analysis of active substances in antimicrobial, wound-healing agents based on hydrogel polymer matrices // Actual problems of modern medicine and pharmacy: Materials 58 total. scientific-practical conf. students and young scientists. – Vitebsk, 2006. – P. 267–269 (8)
6. **Razin M.P, Minayev S.V., Turabov I.A., Strelkov N.S., Zhidovinov A.A.** Pediatric Surgery GEOTAR-Media – 2018. – 688 p.

BIOMECHANICAL CHARACTERISTICS OF FUNCTIONALITY OF THE CERVICAL SPINE IN CASES OF ROTATORY SUBLUXATIONS OF C1-C2 VERTEBRAE IN CHILDREN

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ABSTRACT — The aim of the work is to review with the help of motion capture system the biomechanical characteristics in children who suffer recurrent rotatory subluxation of C1–C2 vertebrae. Subjects of the study were adolescents with a recurrent subluxation of a cervical spine (5). The control group consisted of 22 conditionally healthy adolescents. The study was carried out with the help of "Vicon Motion Capture" motion capture system as well as the AMTI stabilometric system. An individual three-dimensional skeletal model was constructed for each subject that allowed studying the volume of movements of the cervical spine in the stepping cycle. The analysis of digital data, which were presented in the form of diagrams in the Vicon Polygon program, was carried out. There were revealed the changes in the dynamics of rotatory movements of the cervical spine in a single-stage. The data analysis and monitoring of the dynamics of indicators with the use of the innovative motion capture system Motion Capture will allow improving the accuracy of diagnostics and effectiveness of therapeutic measures.

KEYWORDS — motion capture, motion capture system, biomechanics of movements, acute torticollis, rotatory subluxation of C1–C2 vertebrae.

INTRODUCTION

Biomechanical investigation in applied medicine is the field where anatomic-functional distinctions of the skeleton of the growing body are revealed. Fundamental and applied investigations provide opportunities that are used for this purpose and the implementation of modern computer-aided systems gives the essential perspectives.

Nowadays the developed countries have the standards of biomechanical investigations that require the video-analysis of the motion to be made. The innovative methods of motion capture are being introduced due to this fact. It allows having the absolute digital characteristics of linear and angular kinematics of limb joints to be studied, the skeleton in general and the character of walking. The analysis of the findings can both indicate the characteristic features of the skeleton and reveal the diagnostic and prognostic index in different diseases of locomotor apparatus.

The syndrome of acute torticollis which arises from the displacement in segment C1–C2 is often observed in the infant orthopedics surgery. Most children have recurrent pathology and it is combined with hypermobility of different joints and it can be the system dysplasia of connective tissue (SDCT). System dysplasia of connective tissue (SDCT) is an abnormal development of a child which arises from the genetically determined development disorder of peridesmium during prenatal and postnatal periods which results in underdevelopment of different organs and systems. [1, 2]. The prevalence proportion of SDCT in population varies from 48, 5% to 80% [4, 3, 5].

The children population with the above pathology is increasing and it initiates to search the etymological factors as well as the anatomic–physiologic factors with the help of modern technologies.

The publications devoted to the investigation of the change in the motor function of unstable cervical spine where the modern method of motion capture is used have not been found in the resources available.

Objective: to obtain the biomechanical characteristics of the motor function of cervical spine in the gait cycle of children with the recurrent incomplete dislocation of C1–C2 vertebrae with the help of *motion capture*.

MATERIAL AND METHOD

The target was 5 adolescent girls (8–11 years old) with recurrent incomplete dislocation of cervical spine. The model study was performed on 22 healthy female infant and adolescent subjects. The research was performed in the follow-up mode during the gait. Plug-in-gait Fullbody model was used in the research. The subjects were offered to make the sequence of 7 goings on the force platform. The monitoring of biomechanical parameters was performed using the systems of capture and of movement analysis Vicon (Vicon, Oxford, Great Britain) which include 10

IR cameras Vicon N40, two-section force platform AMTI (model OR6-5-1000, Watertown MA, USA) and software Vicon Nexus and Vicon Polygon. The research subject was the angles of flexion-extension, lateroflexion and the rotation cervical spine.

RESULTS

Under normal condition the movements in the sagittal plane (flexion-extension) are characterized by two highest points of maximum value of flexion: one is in the stance and one is in the swing phase. The highest maximum is shown in the swing phase when the bodyweight is held on the contralateral limb (76% of cycle time). The highest maximum of flexion in the stance coincides with the swing of the contralateral limb (26% of cycle time).

Consequently, the maximum value of the flexion in the gait cycle corresponds to the stages of single support; herewith the maximum value of flexion conforms to the stage of single support of contralateral limb. In the gait cycle of the study group two maximum values of flexion were differentiated. However, their beginning happens by 15% of time cycle earlier than in the norm (in the stance it is 15% of time cycle, in the swing phase it is 59%). In the stance the decay of flexion amplitude (in the norm it is 1,18° ± 0,26, in the study group it is 0,44° ± 0,13) is observed but in the swing phase the increase of flexion amplitude (in the normal condition it is 0,38° ± 0,23, in the study group it is it is 0,99° ± 0,33) is observed. During the whole gait cycle the angle of flexion is increasing; in the stance it increases by 3,98° ± 0,45, in the swing phase it increases by 3,31° ± 0,58.

In the normal condition there are two highest points of maximum values of lateroflexion in the stance and in the swing phase. In the stance these maximum values go to the beginning (10%) and the end of the single-support phase (40%). In the swing phase the maximum value of lateroflexion conforms to the beginning (10%) and the end of the single-support phase (40%). In the swing phase the maximum value of lateroflexion conforms to the beginning of the phase the toes of the "leader" foot are losing contact with the support — 60%) and the upright stance of the lower leg of the "leader" leg which in turn correspond to the beginning and the end of the single-support phase of the contralateral leg. The minimum values of lateroflexion conform to the middle of the single-support phase (75%). The study group demonstrates the increase of the total amplitude of lateroflexion 0,23° ± 0,12 with the respect to the norm (Fig. 1). In general, the increase of lateroflexion to the left by 1,05° ± 0,36 was observed in the stance and the swing phase.

In the normal condition the gait cycle demonstrates one highest point of equal maximum values of rotation in each phase. These highest points are in the middle of single-support phase in the stance (30%) and in the swing phase (75%). In the stance the rotation of the cervical spine is directed to the leg responsible for the transfer. The initiation of the gait cycle is usually considered to be the moment of the initial contact of the *leader* foot with the support plate. Then the phase of the "leader" foot support follows (0–60% of the gait cycle). In this phase the rotation is directed to the transferring foot. The phase of its transference starts since the toes of the leading foot lose contact with the support (60%). In this phase the rotation is directed to the leading foot.

The corresponding peaks of maximum values of the rotation in the single-support phase are observed in the study group. However, on contrast to the norm group the decay of rotation movement amplitude takes place. In comparison to the norm the decay of rotation angle to both sides by 1,44° ± 0,38 is observed.

The study group demonstrated the change in the dynamics of rotation movements in the single-support phase. In contrast to the norm group where the rotation value in the single-support phase towards the foot responsible for the transfer was increasing smoothly, the study group demonstrated the highest points of rotation towards the support foot in the beginning and the end of the single-support phase.

CONCLUSION

1. The method of motion capture allows obtaining the distinctive biomechanical characteristics of gait among children with malfunction of cervical spine.

2. The study group demonstrated the changes in kinematic parametres in comparison to the data obtained in the norm group. The monitoring survey of the changes in the parametres in comparison to the data obtained in the norm group allows evaluating the function of cervical spine which in return increases the accuracy of diagnostics and the efficiency of treatment.

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RESOURCES

1. **Kadurina T. I., Gorbunova V. N.** Displaziyasoedinitel'nojtkani. SPb.: EHlbi, 2009. S. 714.

2. **Limarenko M.P.** Differencirovannayadisplaziyasoed initel'noj tkani (klinicheskoe nablyudenie) // ZHurnal «Zdorov'e rebenka». – 2007. – 4(7).

3. **Marushko YU.V., Marushko T.V., Gordienko I.M.** Sovremennoesostoyanie problemysindromagipe rmobil'nostisustavovudetej Mater. // Vseukr. nauchn.

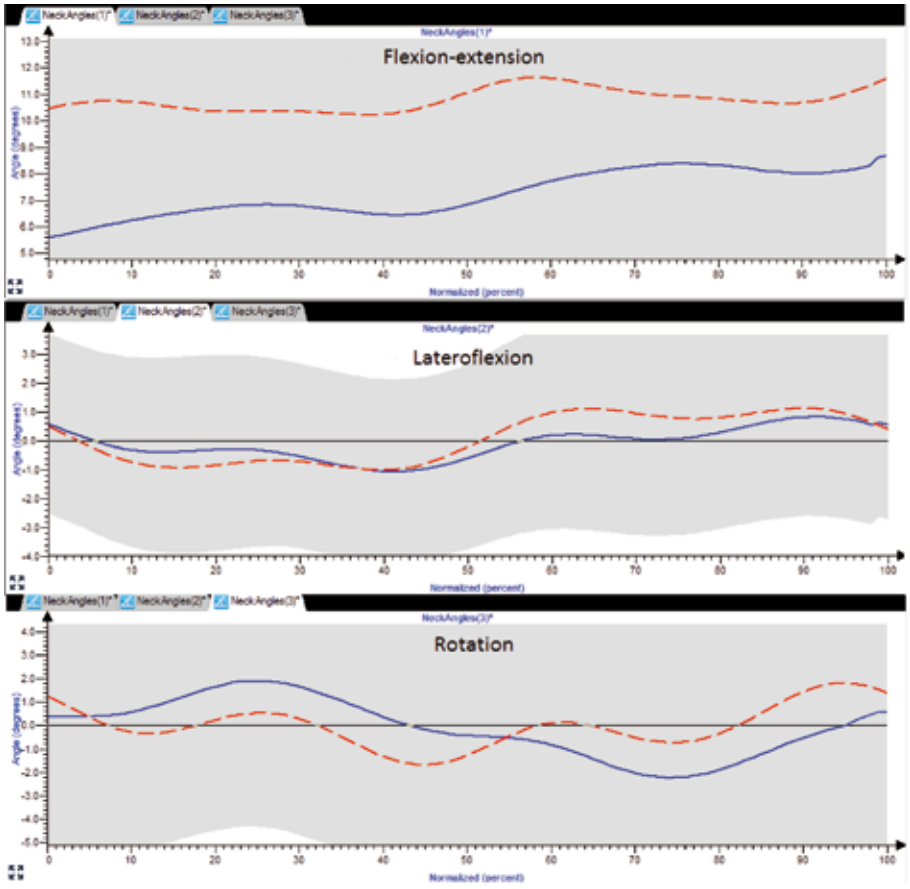

Fig. 1. The range of motion of cervical spine in the gait cycle (blue curve – norm group, red curve – the study group)

prakt. konf.: Suglobovijsindromvprakticipediatra. – 2009. – S. 50-52.

4. **Nechaeva G.I., Viktorova I.A.** Displaziya ST: terminologiya, diagnostika, taktika vedeniyabol'nogo. — Omsk: BLANKOM, 2007. — 188 s.,
5. **SHarmazanova O.P., Mitel'kov D.A.** // Ukr. radiol. zhurn. — 2004. —№ 12.— S. 7—10).

TREATMENT OF POSTOPERATIVE VENTRAL HERNIAS IN ELDERLY PATIENTS

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ABSTRACT — Postoperative ventral hernias in most cases occur in elderly patients who have previously undergone surgery. Treatment of that category of patients is complicated by the presence of comorbidities such as ischemic heart disease. The age-related involution of collagen formation and connective tissue dysplasia leads not only to atrophy of the musculoaponeurotic layer of the anterior abdominal wall but also to dysplasia of the striated cardiac tissue which aggravates the course of coronary heart disease forming additional anomalies of the heart. Therefore, such category of patients are in the high anesthetic risk and require thorough preoperative and postoperative means.

KEYWORDS — postoperative ventral hernia, coronary heart disease, connective tissue dysplasia.

Recently, there has been a worldwide trend of growing scientific interest in patients of older age groups [12] which not surprising because life expectancy has increased significantly in the last decade. According to Rosstat the percentage of elderly people is steadily increasing. The average age of Russian population was 72.1 years in 2016, and in the first half of 2017 it grew up to 72.5 years which also leads to a quantitative increase of surgical operations performed on patients of elderly and senile age groups. According to World Health Organization (WHO) classification of older people are considered to be aged from 60 to 74 years old, the old age is the period from 75 to 89 years, over 90 years old are long-lived. In this regard, postoperative ventral hernias (POVH) in patients over 60 years are becoming increasingly important. However, this category of patients is difficult due to the involutional changes in the functioning of systems and organs, a large number of concomitant chronic pathologies, and the presence of several diseases causes the development of the syndrome of mutual aggravation. All this affects the quality of life of patients, and this is especially important in the postoperative recovery period. Therefore, individual assessment of the state of health should be carried out as well as social adaptation and the indicators of quality of life should be measured during the rehabilitation period [2, 5].

Although age is not a contraindication to surgery decrease in the adaptive capacity of the body increases the risk of both early complications in the postoperative period and the risk of anesthesia requiring more careful preparation and long-term care after and lots of surgeons refuse to operate such patients. [7]. Age features in the form of a violation of the morphogenesis of the connective tissue form additional minor anomalies of the heart.

The valvular prolapses and additional chords are attributed to the small anomalies of the heart; they disrupt the rhythm of the heart. This is especially important to take into account in patients with ischemic disease, since the risk of hemodynamic disturbances is high and, as a result, the risk of sudden death increases [6, 11]. There is also an acute issue in the choice of anesthesia, as even a brief anesthesia enhances mental disorders that are not taken into account by anesthesiologists. And for large and giant ventral hernias, considerable time is required for the operation [10].

The formation of hernias of the anterior abdominal wall and recurrences is determined by a multifactorial mechanism. The factors contributing to the formation of hernias include the healing of postoperative wounds through suppuration, ascites, obesity and smoking. And in the study of Klinka and Junge [13]. It was proved that the formation of hernias is associated with the pathology of collagen synthesis. It was also noted that most often hernias occur in patients with dysplastic disorders in the connective tissue (hemorrhoids, varicose veins, perineal tears, congenital dislocation of the thigh, aortic aneurysm, mitral valve prolapse, pneumosclerosis, bladder or small bowel diverticulosis, kidney cysts, Ehlers–Danlos syndrome) [13, 14].

The main component of connective tissue is collagen. Aging is a slowdown and a violation of its synthesis. At the beginning of the 20th century the well-known physiologist A.A. Bogomolets said that connective tissue has its own age. It is known that a change in the metabolism of the connective tissue leads to the formation of collagen fibers with a

predominance of type III collagen. Collagen type III reduces the possible stretching force, due to the chaotic arrangement of the fibers. Normally, this type of collagen is contained in the first days of wound regeneration, and then type I collagen predominates, which is stronger and more dense in structure and forms dense scar tissue.

However, it is also noted that such replacement takes place not only during the formation of a connective tissue scar, but also in the dead liver tissue cells, artery walls, ligaments and muscles during aging of the body, by reducing the enzymes necessary for structuring [1, 3, 8]. Therefore, even with hernias of small size (up to 5 cm) in patients of elderly and senile age there is a high risk of recurrence.

As a preventive measure of relapse, it is necessary to use an implant with stacking on no less than 5 cm wider than the edges of the hernia gate, to use the elastic properties of the implant and better sprouting of the connective tissue in the first stages of scar formation. At the same time, modern requirements for implants are a decrease in the volume of a foreign body in the tissues over time [9, 15].

Dysplasia of the connective tissue is polysystemic lesion in the human body. If there is at least one concomitant disease that develops as a result of dysplasia, patients have a high chance of recurrence of the hernia in the future [4].

The aim of our study was to analyze the risks of recurrence of postoperative ventral hernias, taking into account the age-related anatomy and associated diseases in elderly and senile patients. Taking into account the risks, develop the optimal method of hernioplasty in this category of patients.

MATERIALS AND METHODS

The study included 34 patients of elderly and senile age with comorbid diseases, of varying degrees of manifestation, operated on for the administration of POVH of various sizes. Patients were distributed by gender and age, 21 women (61.8%, Table 1). All patients were divided into 2 groups: 1st group included patients operated on with a modified mesh implant, 2d group patients were operated on with a standard-shaped mesh implant.

In both groups we used implant (Progrip™ from Covidien, France) that does not require additional fixation to the tissues. This type of implant is fixed to the tissues using micro-hooks of polylactic acid, which are resolved within 15 months after the operation. During this period of time the mesh implant reliably grows into tissues and provides protection against relapse.

All patients were operated on in a planned manner, the presence of concomitant diseases in the compensation stage was a prerequisite. This category of patients was carefully examined in the preoperative period. All patients underwent standard preoperative examination as a preparation for surgery: EKG (22), ultrasound examination of vessels (17) and abdominal organs (20), computer tomography of abdominal organs (8) and chest (1), abdominal radiography (5), spirometry (4), esophagogastroduodenoscopy (4).

Concomitant diseases that were caused by connective tissue dysplasia were the following: arrhythmias caused by small heart defects, lower limb varicose veins, pneumosclerosis, chronic obstructive pulmonary disease (COPD), and kidney cysts. (Table 2).

Two patients from the second group with a standard implant had a recurrent postoperative ventral hernia. One of the patients had a history of pneumosclerosis, another according to EKG had mitral valve prolapse related to minor heart defects. In both cases there were diseases associated with disorders of collagen metabolism. Most likely the hernia recurrence in the late postoperative period was associated with implant placement and dysplasia of the connective tissue served as a complicating factor.

Two patients felt foreign body sensation that can be due due to the increase in body mass index and the increase of intra-abdominal pressure in the postoperative period.

DISCUSSION AND CONCLUSIONS

Thus, this implant meets all the requirements that apply to modern types of implant:

1. Lightweight material is used which is partially absorbed over time.
2. Less allergenic than other implants.
3. The seamless technique of implanting the endoprosthesis excludes additional trauma to the tissues including the nerves which most often causes discomfort and foreign body sensation in patients in the postoperative period.
4. The use of this implant reduces the duration of the operation by an average of 15–20 minutes due to self-fixation to the tissues that is important aspect especially in elderly patients.

REFERENCES

1. **Kanungo M.**//Aging Biochemistry. – 1982. – P. 121–151
2. **Kulichenko of L.L. Ivakhnenko I.** In the Characteristic of somatic pathology at people of advanced and senile age//the Volgograd scientific and medical magazine. – 2012. – No. 1. – P. 88–90
3. **Lazarenko V. A., Ivanov I. S., Tsukanov A. V., Ivanov A. V., Goryainova G. N., Scraps E. G., Tarabrin D. V., Gafarov G.N.** Architectonics of collagenic fibers in skin and an aponeurosis at patients

Table 1. *Gender and age classification*

	1st group, modeled by Progrip™		2nd group, Progrip™		Total
	60 to 74 years old	Above 75 years old	60 to 74 years old	Above 75 years old	
Women	8	4	7	2	21 (61,8%)
Men	4	1	7	1	13 (38,2%)
Total	12	5	14	3	34 (100%)

Table 2. *Concomitant diseases*

Concomitant diseases	1st group	2d group	Total
Coronary heart disease	17	17	34
Hypertonic disease	15	15	30
Arrhythmias	10	12	22
Diabetes	1	3	4
Obesity	15	9	24
Lower limb varicose veins	9	8	17
Hypothyroidism	1	0	1
Pneumosclerosis	7	2	9
Cholelithiasis	1	0	1
Oncology	6	3	9
COPD	2	2	4
Kidney cysts	2	2	4
Peptic ulcer of a stomach / duodenum	0	4	4
Prostate hyperplasia	0	2	2
Pancreatitis	1	1	2

with ventral hernias and without hernial disease//the Kursk scientific and practical bulletin "Chelovek I Ego Zdorovye". – 2014. – No. 2. – P. 41–45

4. **Lyakhovetsky B.I., Glazkova L. K., Peretolchina T. F.** Dysplasia of connecting fabric: role of collagenic proteins terms (review of literature)//Russian magazine of skin and venereal diseases. — 2012. — No. 3. — P. 19–22.
5. **Mamchits L.P.** State of health and quality of life of people of advanced and senile age//Problem of health and ecology. – 2014. – No. 5. – P. 116–120
6. **Maslovka M. V., Lollini V. A.** An undifferentiated dysplasia of connecting fabric and small anomalies of heart as a predictor of development of violations of a rhythm in patients with coronary heart disease//the VGMU Bulletin. – 2014. – V. 13. – No. 3. – P. 68–76
7. **Mudrakovskaya E. V., Gorelik S., Kolpakova of N.A.** Structure of the accompanying pathology at patients of advanced and senile age with urological diseases//the Messenger of new medical technologies. – 2013. – V. XX. – No. 1. – P. 101–103
8. **Severin E. S.** Biochemistry. – M.: GEOTAR-media. – 2016. – P. 687–700
9. **Slavin L. E, Chugunov A. N., Borisova I. Yu., Shakirova A.Z., Aliullova R. R.** The features of connecting fabric influencing results of surgical treatment of hernias of a stomach//the Kazan medical magazine. – 2013, volume 94. – No. 1. – P. 86– 89
10. **Solenkova A. V., Bondarenko A. A., Lubnin A. Yu., Dzyubanova N.A.** Postoperative cognitive changes at patients of advanced and senile age//Anesthesiology and resuscitation. – 2012. – No. 4. – P. 13–19
11. **Tsaregorodtsev A. G.** Dysplasia of connecting fabric: pathology of vessels, reasons of sudden death//Siberian medical magazine (Tomsk). – 2009. – No. 1. – P. 34–39.
12. **Teal V. A, Breutov A. V., Breutova R.A.** A social and hygienic research of quality of life of the elderly people living in various social conditions// Modern researches of social problems (the online scientific magazine). — 2012. — No. 12(20)
13. **Klink C.D., Junge K., Binnebösel M. et al.** Comparison of long-term biocompability of PVDF and PP meshes // J. Invest. Surg. — 2011. — Vol. 24. – N 6. — P. 292–299
14. **Radu1 P., Brătucu M., Garofil1 D., Goleanu V., Popa F., Strâmbu V.** The Role of Collagen Metabolism in the Formation and Relapse of Incisional Hernia // Chirurgia. – 2015. – № 3. – P. 224–230
15. **Vega-Ruiz V., Garcia-Urena M.A., Diaz-Godoy A. et al.** Surveillance of shrinkage of polypropylene mesh used in the repair of ventral hernias // Cir. Esp. — 2006. — Vol. 80. – N 1. — P. 38–42

MODELING OF THE IMPLANT FOR VENTRAL HERNIAS

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ABSTRACT — The issue associated with hernioplasty of ventral hernias does not cease to be relevant. And even the opposite with the development of technologies and new materials for implantation, there are more and more questions, which one to choose. Our study included the ProgripTM self-gripping implant, which showed good biocompatibility properties and was also convenient to use. However, the long-term results of treatment were not satisfactory due to relapse. In this regard, a simulated implant was developed and implemented in practice.

KEYWORDS — postoperative ventral hernia, material for implants.

THE RELEVANCE OF RESEARCH

One of the first, and most common, surgical pathologies where alloplastic materials for prosthetics began to be used are hernias. Surgery for hernia of the anterior abdominal wall was initially crippling and with high mortality, therefore, in many countries of the ancient world, hernia repair was prohibited. A new stage using prosthetics began in the early twentieth century with the help of implants made of silver, gold, various metals.

But in the postoperative period, the use of implants from these materials caused severe complications. After World War 2, research began on the possibility of using polymeric synthetic materials in medicine. One of the first in 1959 F.C.Usher proposed the use of polypropylene for medical purposes [1, 2, 3]. The use of mesh implants, although reduced the risk of recurrence of the hernia, however, up to 30% of patients again seek surgical help. Therefore, the question of choosing a mesh implant and the method of its application remains open [4].

In the process of research it was proved that the implant of the cellular structure, better than monolithic or perforated, which was used initially. Through the cellular structure, connective tissue grows faster, forming the skeleton of the anterior abdominal wall, from the formation of which depends on the development of relapse in the future. The duration and quality of the ingrowth of the prosthesis into the surrounding tissues are influenced by both the physical properties of the prosthesis, such as the size and shape of the pores, the specific weight, density and structure of the material used, and the characteristics of the human body [5].

The formation of a connective tissue scar depends on the collagen metabolism at different stages of the wound process, with a change in the ratio of the amount of collagen I and type III [6, 7].

Formed frame, consisting of an implant and connective tissue, should ensure the strength and elasticity of the anterior abdominal wall. In accordance with this, the requirements for "ideal" implants were formulated, one of which is biocompatibility, which includes the absence of allergic reactions, sensitization, inflammation and rejection. The materials from which the implants are made must retain elastic properties throughout the lifetime, physical and chemical properties after sterilization, and should not be toxic and carcinogenic to humans [8, 9].

Currently, hernioplasty uses implants of three main materials:

1. Polytetrafluoroethylene (PTFE) — microporous material, the pore size is 10 microns, which ensures flexibility and elasticity. But at the same time, microporosity impairs the ingrowth of the mesh into the surrounding tissues and encapsulation occurs. As a result of the encapsulation, the elastic properties are lost, as well as the displacement of the mesh prosthesis. Therefore, these types of implants are almost not used [8, 10].

2. Polypropylene (PP) — light macroporous consisting of monofilament. This type of implant is well integrated into the surrounding soft tissue, thanks to the size of pores, the penetration of macrophages, vessels and fibroblasts is not difficult. However, a thin connective tissue capsule is again formed around the prosthesis, forming a rough scar with imperfect implant growth. And the processes of degradation of the material cause a loss of physical properties.

The reduction of the prosthesis occurs up to 50% of the original size with a displacement of the implant, which can lead to a recurrence of the hernia. A number of studies have established that the severity of the inflammatory reaction and the activity of fibrosis in the implantation zone directly depend on the amount of polypropylene [11, 12, 13].

3. Polyester (PE) — is a light and elastic macroporous material using a special type of multi-thread weaving. Due to this structure, good germination of connective tissue is ensured and does not cause inflammatory reactions [14, 15].

Recently, composite mesh implants have appeared, using two-component materials with a hydrolyzing component and a reduced amount of polypropylene, teflon or polyester. Such implants can be used for intra-abdominal plastics, as additional coatings are used that do not cause adhesion and the formation of adhesions of the abdominal organs with an implant [16].

Composite implants can also include self-locking mesh prostheses, which are fixed to the tissues with the help of adhesive coatings or micro-hooks, which dissolve over time [17]

Covidien's Progrip implant has shown good results with few neuralgia, inflammatory reactions and recurrences in the postoperative period. The advantages of this implant is that it is self-gripping, due to micro-hooks from polylactic acid, which dissolve within 15 months after the operation, while for the ingrowth of the grid it is necessary 2-4 months. Microhooks provide reliable fixation of the mesh and distribute the load evenly over the entire surface of the mesh, unlike suture fixation [18, 19, 20, 21].

Thus, the goal of our study was to determine the effectiveness of the use of the ProgripTM self-gripping implant.

Materials and methods.

The study included 66 patients operated on for postoperative ventral hernia. The first group of patients consisted of persons up to 60 years old, the second group includes patients older than 60 years old (Table 1). In each group, patients were operated on using a standard-shaped ProgripTM self-gripping implant (subgroup B) and a modeled one (subgroup A).

Self-gripping implant was used since the fixation of the implant occurs evenly in contrast to the implants which need to be fixed to the tissues with additional material around the perimeter. When changing the shape of the implant, the physical tension of the muscles of the anterior abdominal wall was taken into account.

The implant of the standard form — oval, removes the transverse load from the aponeurosis of the rectus abdominis muscles due to fixation of the rectus muscles to the back wall of the vagina and compensation of the tensile force working on the seam rupture, distributing it unevenly. Within the boundaries of the rectus abdominis muscles, the standard implant stops compensating for the stretching force, making the muscle-aponerotic tissues not expandable.

And the fixation points A1, A2, B1 and B2 are at the same time the points of application of tensile transverse forces and forces directed from the inside of the abdominal cavity, which leads to tearing of the tissue in a given area or tearing the implant. In the modified implant, there is a cut on the opposite sides of the implant along the longitudinal axis, due to which only the longitudinal load remains, and the lack of transverse stretching force reduces the load at points D1 and D2. This prevents tissue rupture and implant detachment, and consequently reduces the risk of recurrence (Fig. 1.).

According to the Chevrel J.P. and Rath A.M. (1999), the study included patients SmW1–4R0–2 where "Sm" means the median localization. Patients with mixed and lateral localization of the defect were excluded since it is impossible to use the simulated implant under this localization. The width of the hernial defect — "W" and the number of relapses — "R" did not matter in the selection of patients. The width of the hernial ring varied from 4 to 25 cm. The most frequent were patients with the size of the hernia gate W3 (10–15 cm) — 23 people (34.8%).

In terms of the number of relapses there were patients both after midline laparotomies and undergoing surgical interventions for postoperative hernia, including alloplasty. Recurrent hernias were present in 21 (31.8%) patients, in other cases hernioplasty was performed for the first time.

The primary defect of the anterior abdominal wall was formed as a result of planned and emergency surgical interventions. The most frequent operations were hernia of the anterior abdominal wall (white hernia of the abdomen, umbilical hernia, ventral hernia) — 10 people (15.2%), which later became postoperative ventral hernias reaching the size of the hernia gate 25 cm.

The period of treatment of patients for help from the onset of the hernial defect varied greatly and ranged from 6 months to 10 years. During the year only 23 people asked for help (34.8%), which once again confirms the medical illiteracy of patients and careless treatment of their health.

The volume of the examinations carried out in the preoperative period met all the requirements of preparation for chronic diseases, if necessary additional examinations were prescribed in the form of ultrasound examination (USI) of the abdominal organs and kidneys, vessels (veins and arteries) and heart; spirometry, radiography, computer tomography. Tha risk assessment of the development of venous thromboembolic complications (VTEC) was also carried out on the Caprini scale.

In the postoperative period all patients received adequate analgesia on the first day after surgery;

Table 1. *The distribution of patients in groups*

	1st group	2d group	Total
Modeled (simulated) implant	14	17	31
Standard implant	18	17	35
Total	32	34	66

currence was recorded in 6 (9.1%) patients. However, only one patient under 60 years of age had a relapse with a simulated implant, the cause of the recurrence was the failure to follow the clinical guidelines in the first 6 months after the surgery. In the remaining 5 (7.5%) cases no reliable data on the cause of the relapse was obtained (Table 2).

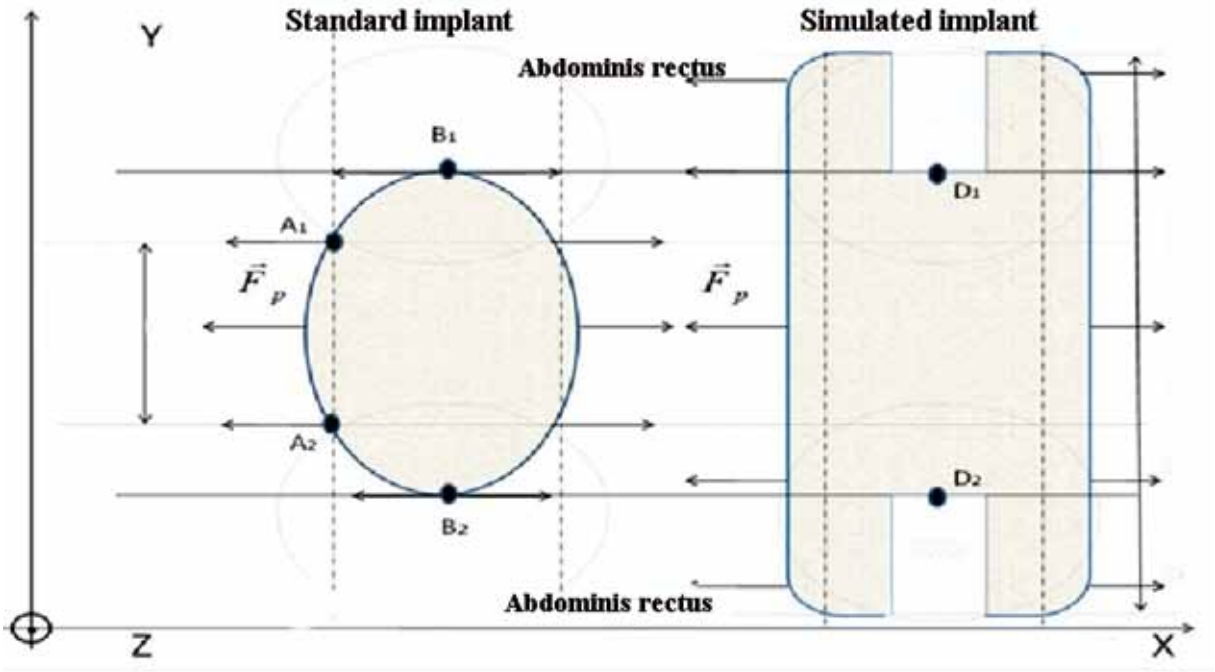

Fig. 1. *Simulated and standard implants*

further analgesia was performed according to indications. If necessary, antibiotic therapy and prevention of thromboembolic complications were prescribed. Used tactics of early activation of patients using a bandage.

In the postoperative period all patients received adequate analgesia on the first day after surgery; further analgesia was not according to indications. If necessary antibiotic therapy and thromboembolic complications were prescribed, same tactics on patients with the bandage.

In the immediate postoperative period postoperative wound suppuration occurred in patients with a history of secondary wound healing after surgery despite the ongoing massive antibiotic therapy and daily wound dressings. Complications associated with the formation of seroma and suppurative hematoma were also conservatively resolved; no additional surgery was required (Table 2).

In the late postoperative period the follow-up period for patients was from 2 to 8 years. Disease re-

Table 2. *Complications in the early and late postoperative period*

	1st group		2d group		Total
	A	B	A	B	
Postoperative wound suppuration	0	1	0	1	2
Suppurative hematoma	0	1	0	0	1
Seroma	1	0	1	0	2
Foreign body sensation	0	0	0	2	2
Relapse	1	2	0	3	6

Despite of the volume of performed examinations it was impossible to avoid the complications of chronic diseases completely. Even with the condition of early activation of patients on the 6th day after hernioplasty, one patient in the 2nd group experienced acute intestinal obstruction associated with adhesions in the abdominal cavity. On the background of the ongoing conservative therapy positive dynamics were useless. The patient underwent surgery in the volume

of laparotomy, adhesions dissection, nasointestinal intestinal intubation. The implant was retained during surgery. Further postoperative period showed no interest.

CONCLUSION

The simulated (modeled) implant shows good results of treatment in the long term in both young and old patients, its introduction and use in a wide surgical practice can be recommended for postoperative ventral hernias of the middle localization.

REFERENCES

1. **Zagdoun J.:** L'utilisation des plaques de nylon dans la chirurgie des hernies inguinales. Mem Acad Chir. 1959. P. 747–753
2. **Amid PK, Lichtenstein IL, Shulman AG, Hakakha M.** Minerva Biomaterials for "tension-free" hernioplasties and principles of their applications. Chir. 1995. 50 (9): 821–6.
3. **Protasov A.V., Bogdanov D.Yu., Magomadov R.K.** Practical aspects of modern hernioplasty. M .: RUSAKI. 2011. C.6–31
4. **Poulose B.K., Shelton J., Phillips S., et al..** Epidemiology and cost of ventral hernia repair: making the case for hernia research. Hernia. 2012. 2: 179–183
5. **Procter L., Falco E.E., Fisher J.P., Roth J.S.** Abdominal wall hernias and biomaterials: Bioengineering research of chronic wounds. 1st ed. Berlin Heidelberg: Springer Verlag. 2009. P. 425–447
6. **Lazarenko V.A., Ivanov I.S., Tsukanov A.V., Ivanov A.V., Goryainova G.N., Obedkov E.G., Tarabrin D.V., Gafarov G.N.** Architectonics collagen fibers in the skin and aponeurosis in patients with ventral hernias and without hernial disease. Kursk scientific and practical bulletin "Man and his health." 2014. 2: 41–45.
7. **Slavin L. Ye., Chugunov A. N., Borisova I. Yu., Shakirova A.Z., Aliullova R. R.** Features of connective tissue affecting the results of surgical treatment of abdominal hernias. Kazan Medical Journal. 2013. 1 (94): 86–89
8. **Sovtsov SA, Pryakhin A.N., Shestopalova I.S.** Main principles and materials for prosthetic plastics of external abdominal hernias. Chelyabinsk: study guide. 2009. P. 12–25
9. **Bilsel Y., Abci I.** The search for ideal hernia repair: mesh materials and types. International Journal of Surgery. 2012. 10: 317–321
10. **Saberski E.R., Orenstein S.B., Novitsky Y.W.** Anisotropic evaluation of synthetic surgical meshes. Hernia. 2011. 15: 47–52
11. **Kalmin OV, Nikolsky V.I., Fedorova M.G., Titova E.V., Yangurazova E.V.** Morphological changes of tissues in the area of operation during the implantation of xenopericardium and polypropylene mesh at different times after surgery. Saratov Scientific Medical Journal. 2012. 4: 1008–1012
12. **Bachman S., Ramshaw B.** Prosthetic material in ventral hernia repair: how do I choose? Surgery Clinic. 2008. 88: 101–112
13. **Tobias A.M, Low D.W.** The use of subfascial vicryl mesh buttress to aid in the closure of massive ventral hernias following damage-control laparotomy. Plastic and reconstructive surgery. 2009. 3. (112): 766–776
14. **Mikhin I.V., Kukhtenko, Yu.V., Panchishkin A.S.** Large and giant postoperative ventral hernia: the possibilities of surgical treatment (literature review). Bulletin of the Volgograd State Medical University. 2014. 2 (50): 8–16.
15. **Gaboyan A.S., Klimov A.E.** Non-tension methods of plastics hernia of the abdomen using modern allografts. M: 2008. P. 21
16. **Brown C.N., Finch JG.** Which mesh for hernia repair?. About annals of the royal college of surgeons of England. 2010. 92: 272–278
17. **Vorst A.L., Kaoutzanis C., Carbonell A.M., Franz M.G.** Evolution and advances in laparoscopic ventral and incisional hernia repair. J. Gastrointenstinal surgery. 2015. 7 (11): 293–305.
18. **Smirnova, E.D., Protasov, A.V., Shukhtin, N.Yu., Titarov, D.L., Navid, M.N.** Allogeneoplasty using a non-latching implant. News of Tula State University. Natural Sciences. 2011. 1: 265–272.
19. **1. Hopson S.B., Miller L.E.** Open ventral hernia repair using ProGripTM self- gripping mesh. International J. of Surgery. 2015. 23 (A): 137–140
20. **16. Verhels J, Goede B., Kleinrensink G.J., Jeekel J. Et al.** Open incisional hernia repair with a self-gripping retromuscular Parietex mesh: A retrospective cohort study. Internetional journal of surgery. 2015. 13: 184–188
21. **Wang Y., Zhang X** Short-term results of open inguinal hernia repair with self-gripping Parietex ProGrip mesh in China: A retrospective study of 90 cases. Asian journal of surgery. 2016. 4 (39): 218–224

MRI IN THE DIAGNOSIS OF ASCARIASIS OF THE SMALL INTESTINE IN ADULTS

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INTRODUCTION

In the world about 1.5 billion people suffer of ascariasis and its symptoms. Ascariasis is the result of a harmful invasion of the Ascaris lumbricoides — a worm from a group of nematodes. Basically, ascarids parasitize in the small intestine, but with the ability to migrate from their usual habitat, in turn, can lead to the defeat of other organs — the lungs, the heart and the brain. Single-and multi-component infections cause human illness, which causes complications from mild to severe and even fatal cases [2]. From the side of the digestive system, there are described such life-threatening complications as intestinal obstruction, acute cholangitis, biliary obstruction, liver abscesses, appetite, acute pancreatitis, perforation of the intestine, mesenteric ischemia, granulomatous peritonitis and even bowel gangrene. As a rule, ascariasis often affects children, but not the exception is and infection of adults. Clinical manifestations are due to toxic reactions, immunological responses and manifestations of obstruction due to the presence of adult nematodes in the gastrointestinal tract. [3–5]. Most of these neglected tropical diseases are found in areas with poor sanitation and hygiene; However, an increase in the number of trips and migrations made infections, also more common in non-endemic areas.

For your consideration we would like to present the following clinical case:

CASE PRESENTATION

The patient G., 17.11.1967 enrolled on 12.04.18 in the medical center "Diamed" with complaints of periodic constipation, pain in the left iliac region, general weakness, loss of appetite, bloating, considers himself ill for about 6 months when the complaints first appeared. For 6 months he did not apply for medical assistance. From the anamnesis it is known: hepatitis, tuberculosis and sexually transmitted diseases are not relevant. Allergostable.

In 2000 the operation was performed: resection of the stomach by Bilroth–II due to ulceration of the stomach.

Objectively: the general condition of a patient of moderate severity. Skin and visible mucous of the usual color. Peripheral lymph nodes are not palpable. Breathing vesicular over the entire surface of the pulmonary fields. Ps 18 per min. Heart activity is rhythmic. AT 140/80 mm. ht Art.. The abdomen is soft, sensitive in the left iliac region, takes part in the act of breathing. Physiological exits are periodic constipation. S-m of Pasternatsky is negative on both sides. The liver and spleen are not enlarged.

Local: palpation of the stomach is soft, sensitive in the left iliac region. Percussion — box sound in the right half of the abdomen. The tumor is not palpated. Peripheral lymph nodes are not palpable.

12.04.18 — Hepatitis B (Quick test on HBsAg — negative

12.04.18 — Hepatitis C (Quick test on a / t to HCV) — negative

12.04.18 — HIV test 1 and 2 types (qualitatively) — negative

12.04.18 — Quick Test for Syphilis (CITO-TEST Syphilis) — Negative

12.04.18 — Review X-ray of chest organs # 2481 — right, extended non-structural root in the projection of the I–II intercostal shadow with fuzzy contours.

12.04.18 — X-ray examination of abdomen # 2481 — under the right dome of the diaphragm, the inflated loops of the intestine. Free gas, bowls of Kloybera — not detected.

12.04.18 — Ultrasound examination of abdomen: Splenomegaly.

12.04.18 — MRI of abdomen: Considering the anamnestic data (postoperative surgical intervention for stomach ulcers) and obtained visualization data, it is necessary to conduct a differential diagnosis between: secondary (acquired adhesive disease) dolichosigma; nonplastic lesion of the large intestine. Enteritis. Splenomegaly. Chronic pancreatitis. But it is not possible to exclude ascariasis of the small intestine (see Fig. 1).

12.04.18 — Consultation of the therapist: CHD. Cardiosclerosis is atherosclerotic. Syndrome of dysfunction of the sinus node (sinus bradycardia) CH and Art. Splenomegaly. Chronic pancreatitis.

12.04.18 — Echocardiography: slight expansion of the ascending department of the aorta. Hypertrophy of LS. Dilatation of LP. Degenerative changes in

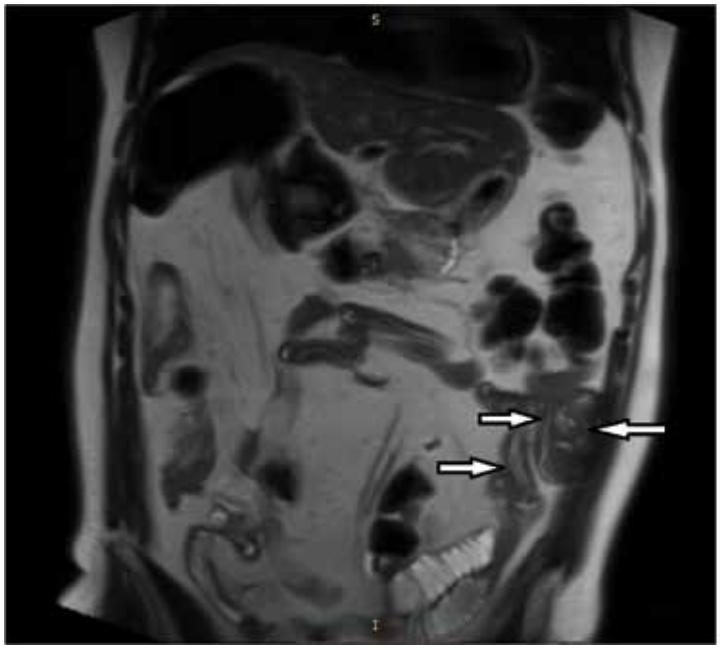

Fig. 1.

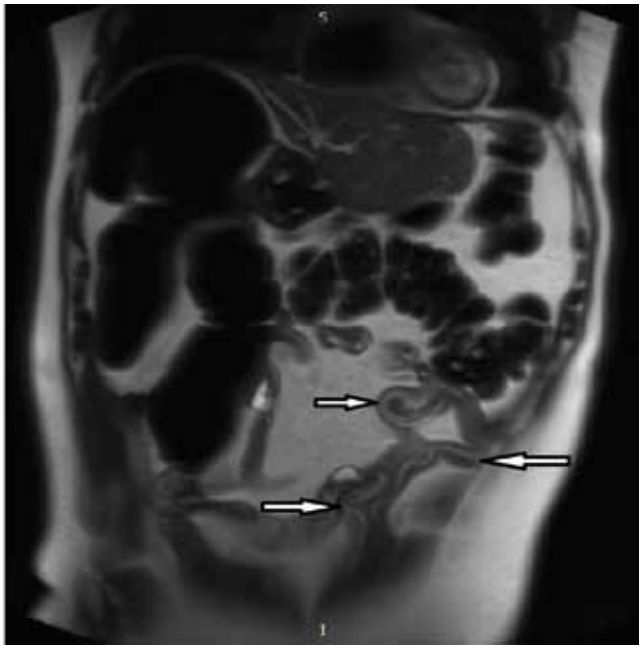

Fig. 2.

the aorta, AK, MK. Insignificant insufficiency of MK. Mobile MPP without signs of bypass. LH (at the time of inspection) does not have. Pericardium is free. SZM — saved.

13.04.18 — VFEGDS: Condition after resection of the stomach in the B–II. In the small intestine, an ascaster tangle is visualized.

13.04.18 — VFCS: Partial review due to the presence of large amounts of feces. The large intestine is inspected to the transverse colon. Subsequent review was not conducted due to inadequate training. In the sigmoid mucosa of the mucous membrane with ulcers. Take a biopsy.

13.04.18 — Consultation of the gastroenterologist: Askaridosis with intestinal defeat. Partial intestinal obstruction. Condition after resection of the stomach by Bilroth–II. Chronic pancreatitis, phase n / remission. Splenomegaly

CONCLUSION

Thus, taking into account the data of additional studies in the patient G., 1967. Diagnosis of ascariasis of the small intestine (further gastroduodenitis), however, despite a small number of [6–7] reports in research and scientific literature devoted to MRI abdominal studies, our specialists suspect this pathology, the pathognomonic symptom of the "lace" is hypertensive in T2SE mode, T2fsSE sequences are linear forms of inclusion in the lumen of the small intestine, which are visualized mainly in the left half of the abdomen (see Fig. 2).

This supplementary method may be useful in patients with suspected ascariasis, especially in adulthood.

REFERENCES

1. **Pullan RL, Smith JL, Jasrasaria R, Brooker SJ.** Global numbers of infection and disease burden of soil transmitted helminth infections in 2010. Parasites Vectors. 2014;7:37. doi: 10.1186/1756-3305-7-37. [PMC free article] [PubMed] [Cross Ref]
2. **Taylor-Robinson DC, Maayan N, Soares-Weiser K, Donegan S, Garner P.** Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin, and school performance. Cochrane Database of Syst Rev. 2015;7 [PMC free article] [PubMed]
3. **Das AK.** Hepatic and biliary ascariasis // J. Global Infect Dis. — 2014. — 6. — 65-72. doi: 10.4103/0974-777X.132042.
4. Ascaris lumbricoides in the nasogastric tube after operation on a patient with the diagnosis of acute mesenteric ischemia: case report / A.C. Cicek, D. Cundogdu, S. Direkel, C. Oztuc // Turkive Parazitol. Derg. — 2013. — № 37 (3). — P. 212-215.
5. Intrahepatic Duct Stones Harboring Ascariasis Ova: A Case Report / C.F. Lee, W.C. Lee, R.C. Wu, T.C. Chen // Medicine (Baltimore). — 2016. — № 95 (12): e3139. doi: 10.1097/MD.0000000000003139
6. **Ding ZX, Yuan JH, Chong V et-al.** 3 T MR cholangiopancreatography appearances of biliary fscariasis. Clin Radiol. 2011; 66 (3): 275-7. Doi: 10.1016/j.crad.2010.11.004 – Pubmed citation
7. **Sinha R, Rajesh A, Rawat S et-al.** Infections and infections. Clin Radiol. 2012;67 (5): 495-504. Doi:10.1016/j.crad.2011.10.022 – Pubmed citation

ILIOFEMORAL THROMBOSIS AS A MANIFESTATION OF HEMATOGENOUS THROMBOPHILIA IN A NEWBORN WITH CONGENITAL CLUBFOOT. A CASE FROM PRACTICE

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The method of choice for treating congenital clubfoot in children is the unique Ponseti technique. Its essence consists in the staged removal of the front and middle part of the foot in the median position by weekly changing the plaster casts. Equinus is removed by percutaneous achillotomy under local anesthesia followed by a plaster cast applied for 3 weeks in the position of hypercorrection. Despite the surgical intervention under local anesthesia, the child passes all hematological tests. At the slightest change in blood tests, the patient consults.

We have treated 1300 patients with congenital clubfoot for the period from 2009 to 2018. Such a manifestation of a hematological disease was diagnosed for the first time. A child from 2 pregnancies, proceeding without pathology, 2 births at 37 weeks with a weight of 2800 g, height 48 cm. The Apgar score is 8/9 points. Immediately after birth, 2-stage clubfoot was diagnosed and the Ponseti treatment started on the 5th day of life (fig 1). A month later from the start of treatment, achillotomy was performed from 2 sides and gypsum *boots* were applied to the up/3 thigh for 3 weeks. On the 10th day after achillotomy, a slight swelling of the dorsum of the right foot appeared, which did not increase. The plaster edges were slightly disassembled and there were no further problems. After 3 weeks plaster casts were removed and Mitchell braces were applied in the position of the back flexion of 10° and 60° lead. Three days after setting the braces, the parents noticed a marble-bluish pattern on the right lower extremity and an increase in the length of the right thigh and lower leg as compared to the left side (fig 2). Doppler ultrasound of the vessels of the lower extremities was performed and thrombosis of the external iliac vein on the right was diagnosed. The patient was consulted by vascular surgeons and referred for treatment to the hematology unit (fig 3). Hematologists recommended to continue treatment in braces. The patient received anticoagulant therapy with recanalization of a blood clot up to 90%!

Fig.1. *Congenital 2-sided club foot*

Fig.2. *Beginning of ileofemoral thrombosis*

Local status: normalization of the skin came after 3 weeks from the start of treatment, the circumference of the right thigh and lower leg ceased to differ from the left lower extremity after 2 months from the start of anticoagulant therapy. The feet after the correction were in the correct position (fig 4).

Given the early debut of hematogenous thrombophilia, long-term anticoagulant therapy, the prog-

Fig.3. *Stage resolution*

Fig.4. *Complete recanalization of thrombus*

nosis from the point of view of hematologists is not very favorable. But Despite this, the Ponseti technique helped to completely heal a child with congenital club-foot, almost without violating the mode of wearing braces after achillotomy.

RECURRENT BRONCHITIS IN CHILDREN: STATE OF THE PROBLEM

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Great interest of many researchers and practitioners to the problem of recurrent bronchitis is displayed not only by high frequency of occurrence in young children, but also by a number of vexed questions about classification, the difficulties of differential diagnosis, the possibility of modifying into other nosological forms at later stages of life.

Today, there are some changes in the clinic of the disease, which depend on several etiological factors, that cause airway hyperreactivity. A variety of categories in children with recurrent bronchitis (RB) is due to the multifactorial nature of the disease.

The diseases of the respiratory system still remain an actual problem of pediatrics and occupy one of the first places in the structure of childhood morbidity. One of the prevalence lesions of the lower respiratory tract are bronchitis, which develop in 50% of children [1,3]. The frequency of recurrent bronchitis is 16.4 cases per 1000 children [5]. In modern classification it is noted, that RB usually occurs in children of the first 4–5 years of life. According to many authors, this nosology is most often registered under 7 years old [1,4].

Recurrent bronchitis is a multifactorial, environmentally dependent disease, the main pathogenetic link of which is recurrent inflammation in the mucous membrane of the bronchial tree, which is caused by a decrease in local protection factors and the general immunological resistance of the organism. It should be noted, that respiratory viral infections with repeated episodes of the broncho-obstructive syndrome, form bronchial hyperreactivity, which determines the probability of phenotypic realization of asthma in younger children [4].

In the basis of the age limit are features of the respiratory and immune systems, which are largely connected with the processes of their development and maturation. According to the literature, intensive processes of growth and differentiation of lung tissue elements take place in the first years of a child's life, and morphogenesis is considered completed by 6–7 years old [1, 2]. At the age of 1–6 years, the immune response to infectious antigens is reoriented from the prevalence of the Th2–way of the response, which is typical for younger children, to the Th1 response, typical for the infectious process in adults [3].

The biocenosis of the upper respiratory tract in babies is also in formation process. At that, the microbial paysage is very unstable, polymorphic, dependent on the environment and varies with the age of the child, becomes similar of an adult only at the age of 5–8 years [5]. The lower respiratory tract in younger children is often involved in respiratory infections with the development of bronchial obstruction syndrome, which determines the severity of patient status and often causes hospitalization. According to the literature, the frequency of expressed clinical signs of bronchial obstruction in case of recurrent bronchitis is 70–80% [1].

In the foreign literature isolated phenotypes, that have both clinical and prognostic value. By debut and duration, there is a transitory obstruction, which is observed in children only in the first three years of life, and persistent, which is observed in the first 6 years of life. The development of obstructive bronchitis in children after three years of life is considered as late starting and is divided into atopic and non-atopic phenotype, that is, in combination with and without atopy [4, 5]. Analysis of the information, obtained during long-time observation showed, that lung function in children with transitory obstruction was changed from birth, even before the first episode. The risk of developing asthma in this group is not great. In contrast, lung function in children with persistent obstruction at birth is intact and, at the same time, there is a high risk of developing asthma [4, 5].

Research in recent years separated the most significant factors ,which induce the development of recurrent bronchitis in children: age-related features of the respiratory tract and chest; respiratory infection (respiratory syncytial viruses, influenza and parainfluenza viruses, adenovirus, mycoplasma); features of local immunity; social factors (passive smoking, early attendance of kindergarten); environmental factors; aggravated obstetric, perinatal anamnesis, hereditary and allergic anamnesis, comorbidity of ENT, and other foci of chronic infection, thymomegaly [2, 5].

Currently, there is a consensus about the main role of infection in development and exacerbation of recurrent bronchitis. The greatest importance in the etiology of bronchitis from infectious factors are viruses (95% of cases) and viral-bacterial associations.

The bacterial nature of the disease (pneumococcus, hemophilic bacillus) is second, then fungi and protozoa, and in some cases may be atypical flora (mycoplasma, chlamydia, pneumocysts, legionella). The leading place among viruses is occupied by respiratory syncytial (RS) viruses, adenoviruses. More seldom, enteroviruses, morbilli virus, cytomegaloviruses, coronarovirus, ECHO viruses, Coxsackie viruses cause of bronchitis [1, 3].

There are reports, that children with atopic phenotype of obstructive syndrome are genetically predisposed to the persistent course of some viral and atypical (RS viruses, adenoviruses, parainfluenza, bokaviruses) infections [3,4]. The respiratory viruses damage the ciliated epithelium of mucous membrane in the respiratory tract, increase its penetrability to allergens, toxic substances, and the sensitivity of the irritating receptors of submucous tissues of the bronchi, which causes an increase in bronchial hyperreactivity [1, 2, 4].

The development of inflammation, which can be caused by infectious, toxic, allergic, and physical effects, takes the main place in the pathogenesis of airway hyperreactivity. The cytokine system is the initiator of a cascade of reactions, which leads to releasing of new mediators and cell migration to the inflammatory focus, transforming the "vicious circle", predisposing to prolonged bronchial obstruction and superinfection [1]. Inflammatory processes that develops by viruses, lead to edema of the mucous membrane, hypersecretion of viscous mucus, disturbance of mucociliary transport [2].

Therefore, disturbance in the drainage function of the bronchial tree conduces to colonization with pathogenic microflora [1, 2]. Besides, viruses inhibit the activity of macrophages and reduce local nonspecific immunity. As a result, conditions are created for bacterial or mixed superinfection (viral-bacterial), that leads to development of protracted inflammatory process [2]. Currently, the question is being discussed: is asthma realized by recurrent respiratory tract infection, or are children predisposed to bronchial asthma, because they have an altered level of interferon or another cytokine response [3, 4]? Great importance in the development of RB is given to ante- and perinatal factors. In children born by mothers with preeclampsia, hypertension, diabetes, risk of developing early transient, persistent obstruction, antibiotics during parturition can cause both early transient and persistent obstruction is increased [1, 5].

Thus, given data evidences, that the etiopathogenesis of RB is complex, not all of its links have been studied enough. Further research in this way will optimize the criteria for predicting the risk of RB in children.

REFERENCES

1. **Savenkova N. D.** Recurrent bronchitis in children: state of the problem / N. D. Savenkova, A. A. Jumagaziev, D. A. Bezrukova // Astrakhan Medical Journal. – 2014. – V. 9, № 1. – p. 29–37.
2. **Antipkin, Y. G.** Recurrent bronchitis in children: controversial questions / Y. G. Antipkin, V. F. Lapshin // Health of Ukraine. – 2008. – Vol. 18, No. 1. – P. 19–20.
3. **Geppe, N. A.** Causes of bronchial obstruction in children and the directions of therapy / N.A Geppe, N.A. Seliverstova, V.S. Malyshev, N.G. Mashukova, N.G. Kolosova // Russian Medical Journal. – 2011. – Vol. 19, No. 22. – P. 1333–1404.
4. **Barry, R. J.** Factors contributing to risks for pediatric asthma in rural Saskatchewan / R.J. Barry, W. Pickett, D.C. Rennie, A. Senthilselvan, D.W Cockcroft., J.A. Lawson // Ann Allergy Asthma Immunol. – 2012. – Vol. 109, № 4. – P. 255–259.
5. **Deiuliis, J.** Pulmonary T cell activation in response to chronic particulate air pollution / J.A. Deiuliis, T. Kampfrath, J. Zhong, S. Oghumu, A. Maiseyeu, L.C. Chen, Q. Sun, A.R. Satoskar, S. Rajagopalan // Am. J. Physiol. Lung. Cell. Mol. Physiol. – 2012. – Vol. 302, № 4. – P. 399–409.

CLINICAL AND ANAMNESTIC ASPECTS OF ATOPIC DERMATITIS IN CHILDREN

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Atopic dermatitis is an actual problem of pediatrics, because in most cases its debut occurs in early childhood and in 60–70% of children itdevelops in the first year of life [1].

Atopic dermatitis is one of the prevalent allergic diseases of childhood, it occurs in interval from 10 to 28% among children of economically developed countries, the fraction of atopic dermatitis in the structure of allergic diseases is 50–70%. The steady progressive increase of children's atopic dermatitis sickness rate in recent years, the unfavorable pathomorphism of its clinical process, the increase in the number of disabling forms are just some aspects that determine the high relevance of the problem [2, 3].

Atopic dermatitis (AtD)in children is the beginning of the "atopic march". Thus, 40-50% of children with atopic dermatitis develop bronchial asthma, pollinosis and / or allergic rhinitis in after years [4].

Currently, there has been some success in studying of etiology and pathogenesis of atopic dermatitis. However, many aspects of this pathology remain unclear. The studying of various aspects of atopic dermatitis' formation and the prognostic significance of risk factors in children is relevant, timeous and perspective in further improvement of the diagnosis, treatment and prevention of this pathology [5].

The object of research is evaluation of the anamnestic data and disease clinic of atopic dermatitis in children.

We explored the clinical data of AtD for 80 medical historiesof early and preschool age children, who received hospital treatment and examination in allergology'sdepartment of N.N. Silischeva Regional Children's Clinical Hospital in 2017–2018. Complaints, anamnesis, clinical characteristics and comorbidities were inspected. The diagnosis of atopic dermatitis was established on the basis of clinical and diagnostic criteria, including the SCORAD index (scoring of atopic dermatitis), which considers the extension of skin rashes, their morphology, the severity of symptoms andgravity of the patient's subjective feelings:

$$SCORAD = A/5+7B/2+C,$$

where A — the sum of skin lesions' severity scores, B — the sum of the intensity scores of AtD's symptoms, C — the sum of subjective symptoms (itching, sleep disturbance) scores.

Criteria for inclusion of patients in research: children, age from 1–6 years, atopic dermatitis, voluntary informed written consent of the parents to participate in research.

Exception criteria: therapy with systemic and / or topical corticosteroids for 14 days before the date of inclusion in research; having of chronic diseases in the stage of decompensation or incomplete remission; past illnessesof infectious and inflammatory genesis for the last month. If necessary, all examined children were received the gastroenterologist consultation.

Statistical processing of the results was done by using the Microsoft Excel and Statistica 6.0 applied statistical programs. In each group of homogeneous data, the mean value (M) and the mean value error (m) were calculated. The degree of veracityin differences of indicators was determined using Student's t-criterion. The studying of relation between the signs was done by calculating of Spearman rate correlation coefficient (r). Differences in averages and correlations were considered veraciouswith $p < 0.05$.

Analysis of the perinatal factors of children showed that pregnancy in mothers was with gestosis (59 children — 73.7%), threat of abortion (62–77.5%), ARVI (28–35%), using of antibiotics (12–15%). During pregnancy and after, there was vaginal candidiasis in mothers, in the treatment of which local antifungal therapy was used.

All children were from wealthy families. Both girls and boys had AtD, but the proportion of girls was some more (48 girls — 60% and 32 boys — 40%, accordingly), what is explained by the ontogenetic internals of the organism.

Bottle feeding was at most of children (48 children — 60%), and breast-feeding — at 32 children (40%).

Atopic dermatitis occurs more often among the country population (62.5%) than among the urban population (37.5%). This trend allows tosay, that number of diseases in the country population is associated with specific lifestyle, insufficiency of medical information and prophylactic activity in patients with chronic dermatoses, for the development of special preventive programs for complex health improvement.

Diffuse AtD was in 45% of children, local — in 55%. According to the gravity of AtD: a mild — 12.5% of children, middle severity — 77.5%, grave — in 10% of children.

Allergological anamnesis revealed a heritable burden of allergic diseases at both of the mother's and father's lines (and their relatives), and was noted in 72 interviewed parents (90%). In anamnesis of the examined children quite often was allergy 77.5% in the form of spots, papules, urticaria, erythema on the skin, on antibacterial drugs: penicillins — 18.7%, cephalosporins — 10%; vitamins — 15%; antihistamine drugs — 5%. Food allergies were detected in 35% of children, the most significant of which were proteins of cow's milk, chicken eggs, cereals and fish. Some children have hypersensitivity not to one, but to several food allergens.

Frequent complaints of patients with AtD were: itching of the skin and skin rash with varying expression (in 100% of patients). Rash was characterized by dry skin (95% of children), skin hyperemia, often on the cheeks — in 80% of children, peeling — 95%, soaking — 5%, cracks and scratching on the skin — in 97.5% of children, little edema on the face — 80% and hands — 20%, accordingly. Frequent localizations of changes on the skin were: face (60%), superior and inferior extremities (12.5% and 10%), less frequent changes were observed in the skin of the body and the whole body (9% and 8.5% accordingly).

Other related allergic diseases were identified in 25% of children: bronchial asthma — 7% of children, allergic rhinitis — 12%, allergic rhinoconjunctivitis — 1% of children. 35% of children had a varying degrees of gastrointestinal dysfunction in anamnesis, which were classified as *irritable bowel syndrome*, 15% of children had biliary dyskinesia, 15% had gastritis, gastroduodenitis, 3,7% had reactive pancreatitis, 2,5% — reactive hepatomegaly, in 2,5% — hepatosplenomegaly, giardiasis — in 3,7% of children, amebiasis — in 6,2% of children, helminthic invasions in 31,2% of children. We suspect, that a comorbid pathology of the digestive tract disrupts the digestive processes of substances with intact antigenic properties, and determines the development of food sensitization and the progression of the disease. Diagnosis of atopic dermatitis in children causes serious difficulties. Correct interpretation and scrupulousevaluation of anamnesis, clinical symptoms, laboratory methods of research, allow to detect the allergic nature of the disease.

Absolute eosinophilia was detected in 80% of the examined children, andinmore young childrenit was determined more often. The analysis of total IgE in the serum showed that it was noticeably elevated in children with AtD (110.7 ± 111.2 IU/ml), while in healthy children it was 34.1 ± 27.6 IU/ml ($p < 0.001$). The levels of several cytokines (IL–4 and IFN2) were analyzed for verification of Th2-dependent immune response. Thus, in children with AtD, veracious increase in serum of IL–4 (10.8 ± 5.9 pg/ml, $p < 0.05$) and decrease IFN2(14.6 ± 3.4 pg/ml, $p < 0.01$) were established, in comparing with healthy children (serum IL–4 is 6.9 ± 1.27 pg/ml; IFN2 — 17.9 ± 2.6 pg/ml).

Next research in this way will optimize the criteria for prognostication the risk of atopic dermatitis and the search for optimal treatment and rehabilitation technologies, will allow to carry timely correction of disorders and dynamic monitoring of patients, considering individual medical, social and psychological characteristics of patients, risk factors of their vital activity.

REFERENCES

1. **Sehgal V.N., Srivastava G., Dogra S.** Atopic dermatitis: current options and treatment plan // Skinmed. – 2010 – № 8 (6). – P. 335–344.
2. **Schneider L., Tilles S., Lio P. et al.** Atopic dermatitis: A practice parameter update 2012 J Allergy ClinImmunol 2013; 131: 295–9.
3. **Kubo A., Nagao K., Amagai M.** Epidermal barrier dysfunction and cutaneous sensitization in atopic diseases // J. Clin. Invest. – 2012 – Vol. 122 – P. 440–447.
4. **Zheng T., Yu J., Oh M.H., Zhu Z.** The atopic march: progression from atopic dermatitis to allergic rhinitis and asthma. Allergy Asthma Immunol Res. 2011; 3: P. 67–73.
5. **Baranov A.A., Djumagaziev A.A., Bezrukova D.A.** Pathogenetic basis of the formation of atopic pathology in children // Astrakhan Medical Jurnal. 2010 T.5. №1. – P. 7–11.

CONTEMPORARY METHODOLOGICAL APPROACHES TO DIAGNOSING BONE TISSUE DISTURBANCES IN CHILDREN WITH TYPE I DIABETES

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ABSTRACT — This article focuses on issues related to bone tissue diagnostics in children with type I diabetes (different length of disease history). The results of densitometry with automatic calculation of the Z-criterion, allowed evaluating the bone tissue mineral density in the lumbar spine. The quantitative and qualitative specifics of the jaw bone tissue were based on orthopantomography and cone-beam computed tomography. The mineral and bone metabolism status was studied based on the laboratory-test data (total calcium, ionized calcium, phosphorus, alkaline phosphatase, calcitonin, osteocalcin, parathyroid hormone, 25 OH vitamin D, β-CrossLaps). The earlier stages of the disease were found to feature an increase in the bone tissue remodeling rate along with escalating bone formation intensity. The children with a long history of type 1 diabetes revealed slower bone remodeling with bone resorption dominating over bone formation, as well as a significant decrease in the mineral density with the bone tissue structure demonstrating the dominance of the criteria like *within the expected age norm* and *low mineral density with respect to the average age norm*.

KEYWORDS — type 1 diabetes, osteodensitometry, cone-beam computed tomography, orthopantomography, bone metabolism.

INTRODUCTION

The results of epidemiological studies carried out by the International Diabetes Federation in more than one hundred countries all over the world in the past forty years showed that type 1 diabetes is the leading condition among endocrine pathologies in children, and the current trend points at a steady increase in the incidence. These data served the basis for adopting regulatory and legal international acts aimed at combating type 1 diabetes in children (St. Vincent Declaration of WHO, 1989; Weimar Initiative, 1997; UN Resolution, 2007) [1, 22, 24].

The worst part of type 1 diabetes developing in childhood is that the pathology affects almost all the body organs and systems; the latent nature of endocrinopathy while clinical symptoms are manifested at complete depletion of the pancreatic function; early development of severe specific complications; disturbed sexual and physical development followed with limited capacity and early disability; reduced life quality and life expectancy; premature mortality. The WHO experts claim (2012) that in case type 1 diabetes develops in childhood, such patients' life expectancy is only 50% that of the average value, while patients do not usually live beyond the age of 40. The challenge of early identification as well as high prevalence of type 1 diabetes in children explain the urgency in terms of solving problems associated with early endocrinopathy detection [2, 4, 9, 16, 23, 27].

The available scientific literature points that bone tissue is the key link in the phosphoric-calcium homeostasis system, which can be maintained through multilevel physiological systems including operational and regulatory structures that, via neurohumoral mechanisms, interact closely with each other [3, 8, 11, 12, 14, 17, 25].

Despite a lot of respective studies carried out, the data on bone tissue mineral density and phosphorus-calcium metabolism in children's type 1 diabetes are scarce and still being accumulated. There is a lot of great research and pragmatic value in the fact that, compared with the data from densitometric studies, the data on calcium-phosphorus bone metabolism obtained through lab tests are more sensitive and reveal a faster response to changes in the intensity of bone formation (bone resorption). It stands a proven fact that morphological and functional shifts observed in type 1 diabetes in the child's body correlate with changes in the calcium-phosphorus metabolism and bone mineral density. The results of laboratory and X-ray diagnostics tests for metabolic disorders of children's bone tissue with different history of type 1 diabetes will allow establishing the trend and identifying the intensity of bone formation reactions, the protective-compensatory mechanisms status, the likelihood of complications development, thus confirming the need to stick to the

principles of approaching the body as a holistic system [5, 13, 34].

All the above has laid the grounds for the aim of this study.

Aim of study:

Improving the methodological approaches in the early-stage diagnostics of type 1 diabetes in children based on phosphorus-calcium metabolism and bone mineral density.

MATERIALS AND METHODS

The study implied laboratory-clinical, X-ray examination comprising 114 children (aged 7 to 12) suffering from type 1 diabetes and undergoing treatment in the Endocrinology Department of the Filippsky Child Clinical Hospital (City of Stavropol, Russia). The duration of endocrinopathy in children diagnosed with type 1 diabetes varied from eight months to ten years. Given the disease history duration, all the patients were divided into three groups: Group 1 — duration of type 1 diabetes up to one year (n = 33, 28.9%); Group 2 — the disease duration 1–5 years (n = 39; 34.2%); Group 3 — suffering from type 1 diabetes for 5–10 years (n = 42, 36.9%). The comparison group included 35 healthy and basically healthy children (Yu.E. Veltischev, 1994) falling into the same age group.

The densitometric measurement of the bone mineral density relied on the dual-energy X-ray absorptiometry in the lateral and frontal projection of the lumbar spine with morphometric analysis. The examinations were performed employing the Lunar iDXA densitometer using a cadmium-zinc-telluride detector array and the High-definition direct-digital narrow-angle fan-beam technology. The enCORE™ GE Lunar software was operated on the Windows XP Professional and included a special pediatric program with age and sex normative indicators installed, which allowed a reliable assessment of quantitative changes in the child's bone system. In pediatrics, Dual-energy X-ray absorptiometry (DXA) is the gold standard for studying bone mineral density. The following bone system parameters were evaluated through the X-ray scanning:

— Area – the scanned section projection area (cm^2);

— BMC – the Bone Mineral Content (g);

—BMD – the Bone Mineral Density, i.e. the volume of the mineralized bone as per unit of the scanned area (BMD = BMC/Area) (g/cm^2).

The bone mineral density estimation (hydroxyapatite quantity per a bone surface unit) using the DXA method is an integral measurement of the cortical and trabecular bone, whereas the densitometric result is expressed as an index of the standard deviation in relation to the normative value. Following the recommendations of the International Society for Clinical Densitometry, BMD in the pediatric DXA protocol is assessed with the Z-score, which is the standard deviation value of the actual bone mineral density with respect to the average age norm, while the terms *osteopenia*, *osteoporosis* are not employed in the DXA outcomes analysis.

The following evaluation criteria using the Z-score were used: Z-score values below one standard deviation (<-1SD) are described as *normal mineral density*; Z-score from one (-1SD) to two (-2SD) standard deviations are defined as *within the expected average age norm*; Z-score below two standard deviations (<-2 SD) are referred to as *low mineral density relative to the average age or below the expected age norm*. The spine bone tissue mineral density data were compared with the reference database of the Lunar iDXA densitometer and the national standards (Scheplyagina L.A. et al, 2004).

Orthopantomography (OPG) of the jaw bones was performed on an ORTHOPHOS XG 3 DS digital orthopantomograph. The OPG analysis focused on evaluating the height, shape and condition of the cortical plate of the alveolar process and interalveolar septa, the degree of expansion of the periodontal gap, the bone tissue resorption in the jaws and in the interalveolar septa. The resorption degree of the jaw body and interalveolar septa was described with the following features: excessive transparency of the bone substance, thinned bone trabeculae, thinned cortical layer, local bone loss, restructured fiber arrangement in the bone substance. The *Fuchs index* (the quantitative index of the decrease in the alveolar bone height) the resorption degree in the interalveolar septa was established relative to the tooth root length (Fig. 1). The Fuchs index evaluation codes included: 0 — missing tooth due to periodontal pathology, or tooth outside of the bone tissue; 1 — bone resorption exceeding ⅔ of the root length; 2 — bone resorption up to ⅔ of the root length; 3 — bone resorption up to ⅓ root length; 4 — no resorption in the alveolar process. The calculation formula:

$$\text{Fuchs index} = \frac{(n \cdot 0) + (n \cdot 1) + (n \cdot 2) + (n \cdot 3) + (n \cdot 4)}{\text{number of teeth}}$$

Scoring scale: 0 points — the interalveolar septum bone resorption reaches the tooth root apex; 0.25 points — bone resorption is above ⅔ of the root length; 0.5 points — bone resorption from ⅓ to ⅔ of the root length; 0.7 points — bone resorption up to ⅓ of the root length; 1 point — no loss of bone tissue in the interalveolar septa.

The X-ray index was used to identify the bone tissue destruction degree in the alveolar part with respect to the tooth root total length (Fig. 2). The calculation of the values and their ratios was performed with the AutoCAD Architecture software (2018 Version, 2D format).

The quantitative assessment of the mandible cortical layer was done with the mandibular cortical index (MCI) (by Klemetti E., 1994). The cortical layer was measured on both sides below the foramen mentale using a quadriplying magnifying glass bearing a millimeter grid (step — 0.1 mm) (Fig. 3).

The qualitative evaluation of the cortical plate below the foramen mentale was performed following the E. Klemetti method (1994) using the following morphological types: C1 — the inner border of the cortical plate is clear and even; C2 — the cortical layer boundary has single semilunar defects with the cortical plate dissection on one or both sides; C3 — the border is unclear, uneven, the cortical plate is multilayered, porous, with numerous defects (Fig. 4).

The cone-beam computed tomography (CBCT) was performed on a 21-slice digital panoramic PaX-i3D SC device featuring the function of a computer tomograph and FOV cephalostat with accessories subject to the scanning protocol for Sim Plant. The processing, storage and export of the X-ray images were done with the Ez Dent-i™ software; the multiplanar reconstruction and 3D reconstruction — with 3D tomography Ez Dent-iT™ software for 3D diagnostics; viewing of the saved data with an import option — using the Viewer software [6, 15, 19, 28, 31, 33]. The tomographic section thickness was 1 mm, the reconstruction step — 1 mm, the rotation step — 1 mm, the reconstruction mode was set as BONE and STDN (standard) [7, 21, 30, 32]. The radiological density of the mandibular bone was examined based on mathematical reconstruction of the attenuation coefficients expressed in Hounsfield units (HU) [10, 18, 20, 26, 29, 35]. The areas for the investigation we selected included the mandibular body at the second molar and the mandibular angle (C. Ulm, 2009). The cortical bone thickness was measured at the foramen mentale level (Fig. 5).

The COBAS 6000 Hoffmann-LaRoche Diagnostics analyzer for biochemical and immunochemical analysis (with commercial test kits) was employed to detect the level of inorganic phosphorus, calcium (total, ionized), activity of the bone isoenzyme of alkaline phosphatase (AP) in all the patients' blood serum. The contents of serum immunoreactive parathyroid hormone (PTH), osteocalcin, calcitonin, 25-hydroxyvitamin D were determined via solid-phase enzyme immunoassay (EIA) using Vector-Best commercial test systems. The optical density of the samples was recorded on an enzyme-linked plate analyzer Statfax 4200. The bone resorption was assessed based on the serum levels of the degradation product of the C-terminal telopeptide of type I collagen spiral proteins (β-CrossLaps) using the «Serum CrossLapsTMElisa» diagnostic test systems (96 catalog number AC-02F1). The statistical data processing was performed employing the StatPlusV25 software application package using parametric and nonparametric methods.

RESULTS AND DISCUSSION

Table 1 shows the radiographic features of the jaw bone tissue status in the groups involved.

Table 2 shows the radiological density of the mandibular body bone tissue in the groups under examination.

The outcome analysis reveals that the increase in the duration of type 1 diabetes in children comes along with a significant decrease in the radiographic density of bone tissue in the mandibular angle (body), a decrease in the interalveolar septa height and the width (thickness) of the mandible cortical layer, associated with an increase in the share of patients featuring a slightly (type C2) or severely damaged (type C3) cortical layer (Fig. 6).

Thus, the children with an endocrinopathy history of up to one year (the Fuchs index for the group 0.87 ± 0.06; X-ray index 0.03 ± 0.01; MCI 3.7 ± 0.1; X-ray density, body of lower jaw 263.5 ± 102.8HU; X-ray density, angle of lower jaw 539.1 ± 126.3 HU) and from 1 to 5 years (the Fuchs index for the group 0.75 ± 0.07; X-ray index 0.08±0.01; MCI 3.5±0.2; X-ray density, body of lower jaw 39.2±127.4 HU; X-ray density, angle of lower jaw 156.3±71.8 HU) revealed a uniform, insignificant, generalized decrease in the interalveolar septa height (less than ⅓ of the root length), combined with an early degree of resorption (3–8%) of the bone tissue. The children with a 5–10 year-long history of type 1 diabetes (the Fuchs index for the group 0.68 ± 0.08; X-ray index 1.14±0.02; MCI 3.4±0.1; X-ray density, body of lower jaw 126.7±133.8 HU; X-ray density, angle of lower jaw 5,6±37,4 HU) featured a uniform generalized decrease in the interalveolar septa height (within ⅓ of the root length) at the initial resorption degree (14%) of bone tissue.

The results of the study of computer tomograms of cross-sections of the alveolar part of the mandible of healthy children allow to visualize the integrity of the trabecular packet, wide cortical plates (vestibular, lingual, palatine), the presence of interconnected wide trabeculae (Fig. 7a). In the studied images of bone sections in children with experience of type 1 diabetes from 1 to 5 years, damage to the trabecular packet

Fig. 1. *The method of quantitative determination of the degree of resorption of interalveolar partitions relative to the length of the root (Fuchs index)*

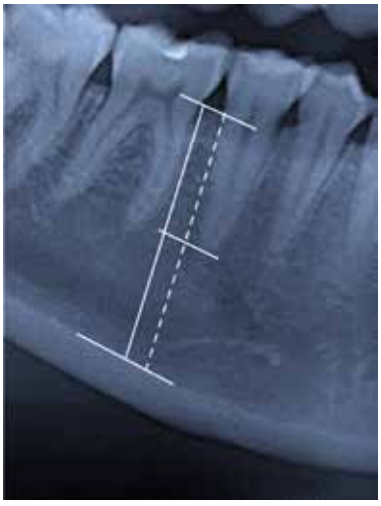

Fig. 2. *The method of quantitative determination of the degree of bone tissue destruction of the alveolar part relative to the root length (X-ray index)*

Fig. 3. *Method of quantitative determination of the thickness of the cortical layer of the lower jaw in the region of the mental opening (mandibular-cortical index, MCI)*

Fig. 4. *Method of qualitative assessment of the type of cortical plate of the lower jaw*

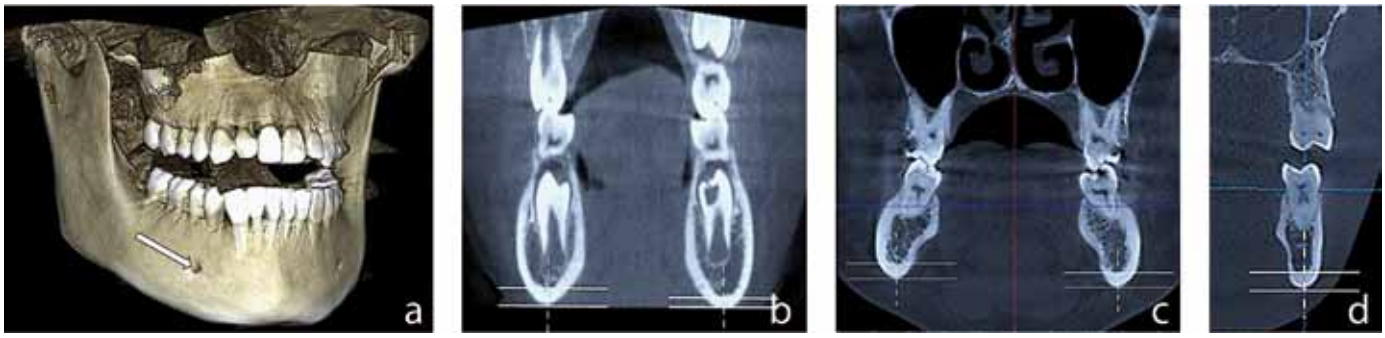

Fig. 5. *Cone-beam computed tomography in the region of premolars, angle of mandible (a). Determination of the thickness of the cortical layer on the frontal sections (b, c, d)*

(free-standing, destroyed trabeculae), thinning of the cortical plates from the vestibular surface is observed (Fig. 7b). Evaluation of computer tomograms of the mandibular cross-sections of children with experience of type 1 diabetes from 5 to 10 years revealed the following violations of microarchitecture of the bone tissue: destruction of the trabecular packet, multi-layer (stratification) of the cortical plate, the presence of thinned bone trabeculae not related to each other (Fig. 7c).

Systematizing the jaw bones X-ray data, we can state that increased bone resorption is most prominent

Table 1. *The radiographic features of the jaw bone tissue status in the groups involved, (M±m)*

Object of study	Research groups			
	Comparison group	First group	The second group	Third group
Fuchs index, (points)				
Upper jaw	1,0	0,83±0,03*	0,72±0,02*	0,64±0,05*
Lower jaw	1,0	0,92±0,04*	0,79±0,05*	0,71±0,04*
The averaged index	1,0	0,87±0,06*	0,75±0,07*	0,68±0,08*
X-ray index, (points)				
Upper jaw	0,0	0,02±0,01*	0,06±0,01*	1,13±0,02*
Lower jaw	0,0	0,05±0,01*	0,11±0,02*	1,16±0,01*
The averaged index	0,0	0,03±0,01*	0,08±0,01*	1,14±0,02*
Mandibular-cortical index, MCI, (mm)				
Lower jaw	3,8±0,3	3,7±0,1*	3,5±0,2*	3,4±0,1*
Frequency of occurrence of cortical plate types, (%)				
Lower jaw	C1 – 74,3 C2 – 25,7 C3 – 0	C1 – 57,6 C2 – 42,4 C3 – 0	C1 – 30,8 C2 – 53,8 C3 – 15,4	C1 – 23,8 C2 – 40,5 C3 – 35,7

Note: ** – p≤0.05 is statistically significant in comparison with the parameters of patients in the comparison group.*

Table 2. *The radiological density of the mandibular body bone tissue in the groups under examination, (M±m)*

Object of study	Research groups			
	Comparison group	First group	The second group	Third group
The mandibular body in the region of the 35 tooth, (Hounsfield units, HU)				
Average value, (M)	348,1	263,5*	39,2*	-126,7*
Standard deviation, (SD)	108,7	102,8*	127,4*	133,8*
Width of the window	71,0-669,0	37,0-422,0*	-83,0-198,0*	-271,0-23,0*
The angle of the lower jaw, (Hounsfield units, HU)				
Average value, (M)	736,4	539,1*	156,3*	5,6*
Standard deviation, (SD)	149,1	126,3*	71,8*	37,4*
Width of the window	372,0-1097,0	238,0-794,0*	106,0-429,0*	-46,0-73,0*
The thickness of the cortical layer of the lower jaw, (mm)				
	2,8±0,4	2,5±0,1**	2,1±0,2**	1,7±0,3**

Note: ** – p≤0,001 is statistically significant in comparison with the patients of the comparison group; ** – p≤0.005 is statistically significant in comparison with the patients of the comparison group.*

in children with a history of diabetes of type 1 exceeding 5 years, which has its course along with insufficient metabolic control, whereas the alveolar bone loss degree exceeds the similar values for the mandible in all the examined groups. An analysis of the qualitative indicators of the bone tissue (based on OPG and CBCT) in children of Group 3 points at the generalized nature of inflammatory-destructive changes that are manifested as a uniform decrease in the interalveolar septa height (within ⅓ of the root length); a widening periodontal gap; a density decrease and disturbed microarchitectonics of the bone tissue in the jaws body (increased transparency of the bone substance, thinned bone trabeculae, restructured fiber arrengement, indistinctness, porosity, multilayered cortical plate all over, large-mesh pattern of the spongy bone).

Deteriorated periodontological status in children diagnosed with type 1 diabetes along with long-term chronic hyperglycemia results in disorganized morphology of the periodontium. Reduced compensation of endocrine pathology along with an increasing history of type 1 diabetes in children is combined with

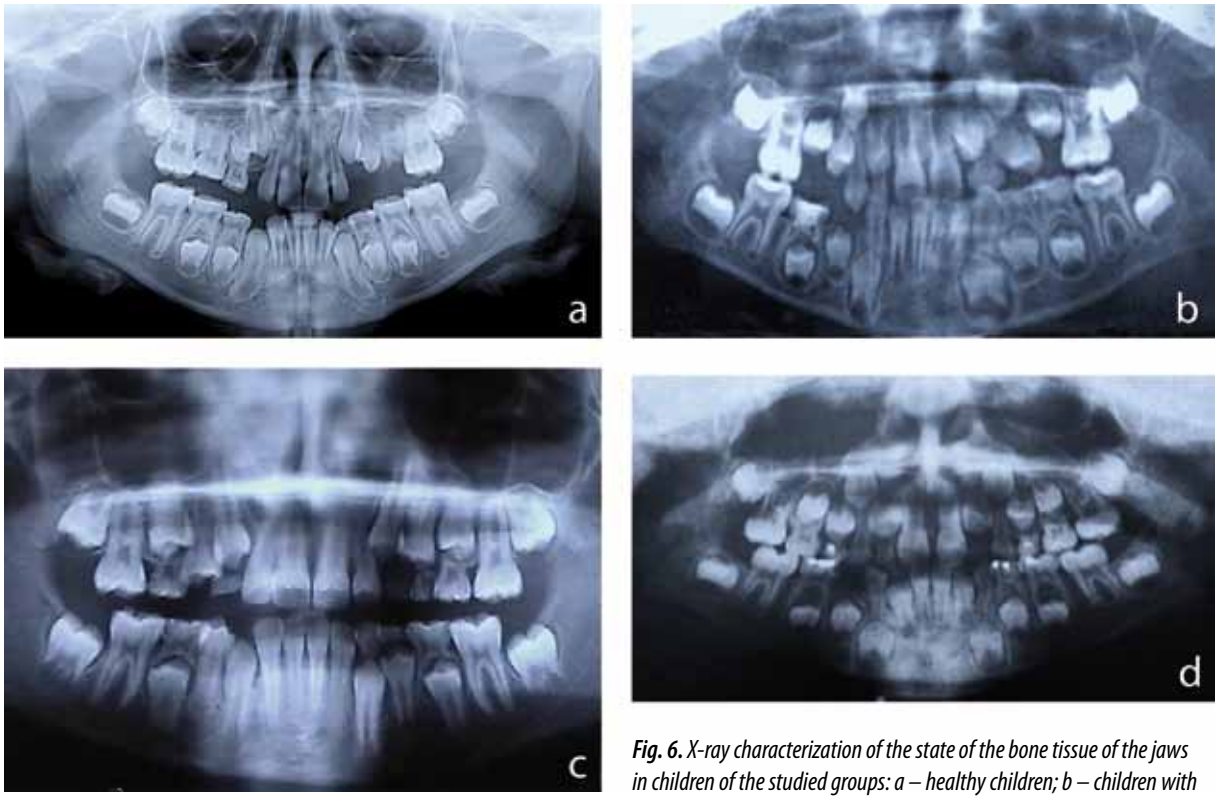

Fig. 6. *X-ray characterization of the state of the bone tissue of the jaws in children of the studied groups: a – healthy children; b – children with experience of type 1 diabetes less than a year; c – children with the experience of type 1 diabetes from 1 year to 5 years; d – children with experience of type 1 diabetes from 5 to 10 years*

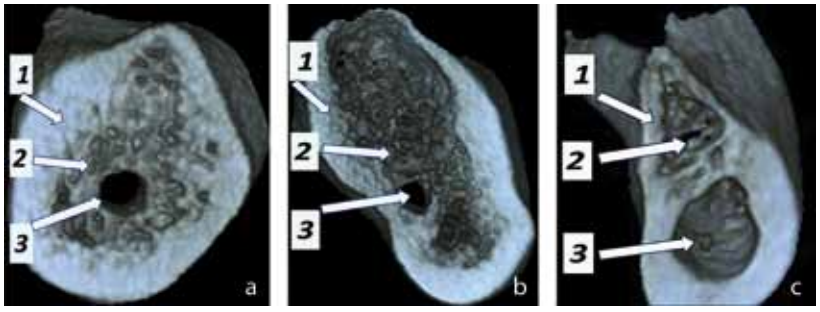

Fig. 7. *Cone-beam computed tomography cross-section of the alveolar part of the mandible of a healthy child (a) and a child with experience of type 1 diabetes from 1 year to 5 years (b) and a child with experience of type 1 diabetes more than 5 years (c): 1 – cortical lamina, 2 – bone trabeculae, 3 – mandibular canal*

intensified bone resorption and remodeling, progressing proteolytic degradation that correlates with uncontrolled destruction of the intercellular matrix, which manifests through disturbed barrier, protective, cushioning, trophic and plastic functions of the periodontal tissues. Experts have found that one of the most common bone tissue complications in case of diabetes mellitus is a decrease in the mineral density. Since there are no complaints reported regarding decreasing bone density in children with type 1 diabetes (or as such issues may be difficult to define), identification of this parameter is an important criterion when diagnosing endocrinopathy and assessing the rate of bone complications development.

The results of studies focusing on the bone mineral density in the lumbar spine using the DXA method allowed identification of the following structure in the bone tissue: the patients of Group 1 — within the age norm 29 (87.9%) children; within the expected age norm — 4 (12.1%) children; Group 2 — within

age norm — 13 (33.3%) children; within the expected age norm — 17 (43.6%) children; low mineral density compared to the average age norm — 9 (23.1%); Group 3 — within the expected age norm — 24 (57.1%) children; low mineral density compared to the average age norm — 18 (42.9%) children. The recommendations adopted by the International Society for Clinical Densitometry (ISCD, 2005) say that children's (adolescents') increase in bone mass is mainly due to prominent bone mineralization against an increase in the growing body's skeleton size. Given this, the obtained BMD values are to be compared with the bone age, body length or put against the standards that allow calculating the Z-score mathematically in view of the age and body length. Interpretation of the skeleton bones densitometric parameters in children (adolescents) will take applying regional (populational) databases (standards) calculated with a large sample pool and specific for a particular geographic area (population). The age, sex, ethnicity, race, genetics, hormonal background, health status and physical activity, as well as the nutrition, growth, etc. have been proven to have a significant influence on the bone mass increase. Our study used the pediatric reference database included in the Lunar iDXA densitometer software. Systematization of the obtained results allows stating that an increase in the history of type 1 diabetes in children comes along with a significant decrease in the bone mineral density (Z-score <-1SD), while the bone tissue structure reveals the prevalence of the criteria like *within the expected age norm and low mineral density compared to the average age norm*. A statistically significant decrease in the bone mineral density in children with a history of type 1 diabetes exceeding five years points, as we see it, at absolute insulin deficiency of pancreatic β-cells and an early debut of endocrine pathology during the bone tissue growth and development, which serves an impetus for osteopenic syndrome development.

Table 3 shows the calcium-phosphorus metabolism and the parameters of calcium-regulating hormones in the blood serum of the children within the studied groups.

The results of studying the serum phosphorus-calcium metabolism in children with type 1 diabetes revealed a bidirectional dynamic in view of the endocrinopathy history. In case of an increasing history of type 1 diabetes, the serum levels of total (Ca_{total}) and ionized calcium (Ca^{2+}) are below the reference values at normal levels of inorganic phosphorus (P) (i.e. within the physiological limits). An increasing history of type 1 diabetes comes along with an increase in the ratios of C_{atotal}/P and Ca^{2+}/P, while the dependence of Ca_{total}/P varies within the reference intervals, and Ca^{2+}/P goes beyond the normative values, correlating with the severity of metabolic disturbances. The obtained outcomes are consistent with the data claiming that a decrease in the bone mineral density in children with type 1 diabetes features a compensatory increase in the intensity of bone development, which is confirmed by a progressive decrease in the blood levels of Ca^{2+}.

Wave-like fluctuations in the alkaline phosphatase levels (AP) within the normative values show that the earlier stages of endocrinopathy are associated with a growing rate of the bone tissue remodeling. The later stages of type 1 diabetes showed a decrease in the activity of AP, a marker of bone tissue development and a parameter for bone metabolism evaluation, which points at a decrease in the bone development intensity and gradual prevalence of bone resorption in the body.

Regulation of bone tissue remodeling is an extremely complex and multilevel process, while the most significant regulatory factors include parathyroid hormone, osteocalcin and calcitonin. Children with a type 1 diabetes history of up to one year have parathyroid hormone and calcitonin levels that are virtually no different from those of healthy children, which proves the intactness of the hormonal regulation mechanisms at earlier stages of the endocrinopathy. A sharp rise in the parathyroid hormone level in children with a history of type 1 diabetes from 1 to 5 years should be viewed as compensatory hyperparathyroidism, which helps maintain proper blood calcium levels through inhibiting calcium excretion in the urine and stimulating the osteoclasts activity. Besides, along with insulin deficiency and hypocalcemia, increased production of parathyroid hormone is one of the key factors in diabetic osteopenia pathogenesis. In children with a history of type 1 diabetes exceeding 5 years, a significant reduction in the parathyroid hormone content down to the reference values indicates an improper response of the calcium-regulating hormone to hypocalcemia. The calcitonin level, which is a functional parathyroid hormone antagonist, is within physiological values in children with a history of type 1 diabetes ranging from 1 to 5 years. A sharp increase in the calcitonin level in children with a history of type 1 diabetes beyond 5 years should be seen, on the one hand, as a compensatory response aimed at reducing bone resorption, while on the other — as a total result of discoordination in the mechanisms ensuring bone remodeling.

A prominent increase in the osteocalcin content (biochemical marker of bone development) in children whose history of type 1 diabetes falls in the groups of up to 1 year, and between 1 to 5 years, as we see it, points at an increased osteoblasts and

Table 3. *The state of calcium-phosphorus metabolism and parameters of calcium-regulating hormones in blood serum in children of the study groups, (M±m)*

Indicators, units of measurements	Reference intervals	Research groups			
		Comparison group	First group	The second group	Third group
Ca total, mmol/l	2,12-2,55	2,39±0,03	2,30±0,04*	2,21±0,02*	2,01±0,03*
Ca ++, mmol/l	1,12-1,32	1,23±0,02	1,17±0,02*	1,06±0,01*	0,98±0,02*
P, mmol/l	1,12-2,05	1,76±0,05	1,82±0,02*	1,68±0,04*	1,88±0,03*
Ca total / P	1/0,5-1/1,2	1/0,7	1/0,8	1/0,8	1/0,9
Ca ++ / P	1/1,10-1/1,50	1/1,43	1/1,56	1/1,58	1/1,92
The alkaline phosphatase, U/L	145,0-560,0	391,64±13,41	556,13±17,43*	302,75±9,81*	188,42±15,67*
Calcitonin, pg/ml	0,0-10,0	5,37±0,29	6,98±0,34*	3,63±0,47*	22,18±1,66*
Osteocalcin, ng/ml	2,80-41,00	30,38±2,96	104,51±7,26*	136,26±11,84*	24,27±1,68*
Parathyroid hormone, pg / ml	11,00-65,00	28,23±4,06	37,84±1,43*	69,07±3,51*	18,14±0,16*
25 OH vitamin D, nmol / l	27,70-107,00	47,63±1,84	35,06±2,38*	38,19±1,27*	29,34±1,91*

Note: ** – p≤0.05 is statistically significant in comparison with the parameters of patients in the comparison group.*

Table 4. *The level of the C-terminal telopeptide of type I collagen in the serum of children in the study groups, (M ± m), (ng / ml))*

Reference intervals	Research groups			
	Comparison group	First group	The second group	Third group
0,101 - 0,580	0,106±0,03	0,187±0,026*	0,266±0,049*	0,127±0,014*

Note: ** – p≤0.05 is statistically significant in comparison with the parameters of patients in the comparison group*

odontoblasts metabolic activity, stimulation of bone mineralization, potentiation of histomorphometric rearrangement and the rate of the *young* bone development. A significant decrease in the osteocalcin level as a prognostic indicator of increased osteoporosis and demineralization in children with the endocrinopathy history beyond 5 years, reveals decreased bone development, predominance of bone resorption under *immature* bone development deficiency, and disturbed ossification (bone tissue development). A decrease in the content of 25 hydroxyvitamin D in children with type 1 diabetes along with an increasing history of the endocrinopathy within the reference intervals, stands proof to some *tension* in the mechanisms ensuring the calcium phosphoric and bone metabolism maintenance. A decrease in the 25 hydroxyvitamin D level down to the minimum threshold values potentiates the disturbance in the calcium absorption into the intestine, thereby increasing the parathyroid hormone level (secondary hyperparathyroidism) and the osteoclasts activity.

We believe that insulin deficiency is the main pathogenetic mechanism in the diabetic osteopathy development and disturbed bone tissue metabolism in type 1 diabetes. Insulin has been proven to stimulate cell growth in different tissues, amino acid transport, protein biosynthesis, to have a direct stimulatory effect on collagen and hyaluronate synthesis, as well as an anabolic effect on bone tissue metabolism. Besides, insulin is involved in osteoblasts differentiation, prolongs the absorption of calcium and amino acids in the intestine, and enhances their incorporation into the bone tissue. Absolute insulin deficiency in case of type 1 diabetes will inhibit the osteoblasts activity, reduce collagen production by osteoblasts, which is necessary to develop the bone matrix and its mineralization, and potentiates metabolic acidosis, which increases the osteoclasts activity.

The results of biochemical studies focusing on bone metabolism markers in children with a history of type 1 diabetes exceeding 5 years have revealed, on the one hand, the dissociation of bone remodeling towards slower bone metabolism and, on the other, the predominance of resorption along with a decreasing bone development intensity. The range of the identified metabolic disorders observed at longer treatment

course of the endocrinopathy in children can be attributed to early manifestations of bone tissue damage.

Table 4 shows the level of collagen type I C-terminal telopeptide, as a marker of collagen type I degradation and disorganization of the extracellular matrix, in the blood serum of the children belonging to the groups within this study.

Progressive increase in the β-CrossLaps level, which correlates with an increase in the osteocalcin content in children with a history of type 1 diabetes of up to 1 year, and ranging within 1 to 5 years, indicates activation in the bone remodeling mechanisms with resorption predominance, increased degradation of interstitial type I collagen along with increasing clinical manifestations of the endocrinopathy as well as structural and functional destructive changes in insulin-producing β cells of the islets of Langerhans. A significant decrease in the β-CrossLaps level, accompanied with a decrease in the osteocalcin content in children with a history of the endocrine pathology above than 5 years, reveal the development of irreversible degenerative-dystrophic changes in the pancreas β-islet cells, a decrease in the extracellular matrix of active destruction, bone metabolism reduction, the predominance of resorption over bone development, as well as the *young* bone tissue development deficit combined with disturbed ossification.

CONCLUSIONS

1. The blood serum in children at their early stage of developing type 1 diabetes, features an increase in the ratio gradients of Ca_{total}/P and Ca^{2+}/P, the alkaline phosphatase activity, the levels of calcitonin, osteocalcin, parathormone, β-CrossLaps along with a decrease in the levels of calcium (total, ionized) and 25 hydroxyvitamin D, which points at an increase in the bone remodeling rate that correlates with an increase in the bone development intensity. The later stages of the endocrinopathy show a further increase in Ca_{total}/P and Ca^{2+}/P, the calcitonin level with decreasing calcium (total, ionized), the alkaline phosphatase activity, osteocalcin, parathyroid hormone and 25 hydroxyvitamin D, and β-CrossLaps, which is indicative of slowing bone remodeling with bone resorption predominance over bone development.

2. In children with type 1 diabetes, an increase in the endocrinopathy history has been registered to come along with a significant decrease in the bone mineral density (Z-score <-1SD), with bone tissue structure showing the prevalence of the criteria such as *within the expected age norm* and *low mineral density in relation to the average age norm*. A statistically significant decrease in the bone mineral density in children with a history of type 1 diabetes exceeding 5 years indicates absolute insulin deficiency of the pancreatic β-cells, an early debut of endocrinopathy during the bone tissue growth and development, which is the impetus towards developing the osteopenic syndrome.

3. An increase in the history of type 1 diabetes in children involves a significant deterioration in the periodontological status, which is due to hormonal changes, disturbed salt-water exchange, and metabolic disorders. It is proven that as type 1 diabetes in children progresses, the bone tissue radiological density in the mandible angle decreases; the interalveolar septa height goes down and so does the mandible cortical layer width (thickness); there is also disturbed microarchitectonics of the bone tissue in the jaws body (bone substance increased transparency, thinned bone trabeculae, restructured fiber arrengement, indistinctness, porosity, multilayered cortical plate all over, large-mesh pattern of the spongy bone), while there is an increas in the share of children with insignificantly (type C2) or severely damaged (type C3) mandibular cortical layer.

4. The children diagnosed with type 1 diabetes, reveal disturbed bone metabolism at the later stages of the endocrinopathy, while such disturbance features a low level of bone metabolism, a decrease in the bone resorption activity and bone development, destruction of trabecular structure, a change in the extracellular matrix structure which is due to a disturbed balance between the bone proteins tissue synthesis and degradation, which involves the development of irreversible dystrophic changes. An increase in the history of type 1 diabetes, combined with poor metabolic control, increase the risk of developing not diabetic osteopenia alone yet also other specific diabetic complications.

REFERENCES

1. **Bykov I.M., Ivchenko L.G., Domenyuk D.A., Kostyukova N.Y., Storozhuk A.P., Ilijev D.M.** Features of free radical oxidation and antioxidant protection in children with sugar diabetes of the first type. Kuban Scientific Medical Bulletin. 2017; (4): 27–38. (In Russ., English abstract). DOI: DOI:10.25207/1608-6228-2017-24-4-27-38.

2. **Bykov I.M., Ivchenko L.G., Domenyuk D.A., Kostyukova N.Y., Storozhuk A.P., Ilijev D.M.** Salivary the level of proinflammatory cytokines in children with autoimmune diabetes mellitus in different phases of compensation endocrinopathy. Kuban Scientific Medical Bulletin. 2017; 24(4): 39–48. (In Russ., English abstract). DOI: 10.25207/1608-6228-2017-24-4-39-48.

3. **Davydov B.N., Gilmiyarova F.N., Domenyuk D.A., Ivchenko L.G.** Clinical and diagnostic significance of the activity of matrix metalloproteinase and their tissue inhibitors in assessing the condition of periodontal tissues in children with type 1 diabetes

mellitus. Part I. Children's dentistry and prevention. 2017; Vol. XVI; 4 (63): 14–19. (In Russ.)].

4. **Davydov B.N., Gilmiyarova F.N., Domenyuk D.A., Ivchenko L.G.** Clinical and diagnostic significance of the activity of matrix metalloproteinase and their tissue inhibitors in assessing the condition of periodontal tissues in children with type 1 diabetes mellitus. Part II. Children's dentistry and prevention. 2018; Vol. XVII; 1 (64): 37–46. (In Russ.)].

5. **Davydov B.N., Gilmiyarova F.N., Domenyuk D.A., Ivchenko L.G.** Optimization of diagnostics of type I diabetes in children according to the results of cytomorphological studies of buccal epithelium and processes of oxidative stress in the oral cavity. Children's dentistry and prevention. 2017; Vol. XVI; 3(62): 9–18. (In Russ.)].

6. **Davydov B.N., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A.** Radiological and morphometric methods for comprehensive assessment of cephalo-odontologic status in dental patients (Part I). The Dental Institute. 2017; 75(2):58–61. (In Russ.).

7. **Davydov B.N., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A.** Radiological and morphometric methods for comprehensive assessment of cephalo-odontologic status in dental patients (Part II). The Dental Institute. 2017; 76(3): 32–35. (In Russ.).

8. **Domenyuk D.A., Davydov B.N., Gilmiyarova F.N., Ivchenko L.G., Vedeshina E.G.** Diagnostic and prognostic value of crystalline structures of the oral fluid in children with anomalies of occlusion. Children's dentistry and prevention. 2017; Tom XXI; 2(61): 9–16. (In Russ.)].

9. **Domenyuk D.A., Tashueva L.V., Zelensky V.A., Ivancheva E.N.** Evaluation of microvasculature tissues viability after the imposition of removable orthodontic appliances in children and adolescents // Archiv EuroMedica, 2013. – Vol. 3. – № 1. – P. C. 5–9.

10. **Domenyuk D., Porfyriadis M., Dmitrienko S.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – Т. 8. – № 1.– С. 19–24.

11. **Domenyuk D.A., Davydov B.N., Vedeshina E.G., Dmitrienko S.V.** Perfection of diagnostic methods of dentoalveolar anomalies by results of studying functional shifts in the system of oral homeostasis (Part I). The Dental Institute. 2016; 71(2): 74–77. (In Russ.)].

12. **Domenyuk D.A., Davydov B.N., Vedeshina E.G., Dmitrienko S.V.** Perfection of diagnostic methods of dentoalveolar anomalies by results of studying functional shifts in the system of oral homeostasis (Part II). The Dental Institute. 2016; 72(3): 58–60. (In Russ.)].

13. **Domenyuk, D.A.** Study of the spectrum of dental composites biological activity in model experiments in vitro / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis, I.A. Bazikov, F. N. Gilmiyarova // Medical news of North Caucasus. 2016. – Vol. 11. – № 2. – P. 179–183. (In Russ.) DOI: 10.14300/mnnc.2016.11031.

14. **Domenyuk, D.A.** Semiquantitative evaluation of caries microflora in patients with dental and alveolar abnormalities and different severity of morphofunctional disturbances / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis // Medical news of North Caucasus. 2015. – Vol. 10. – № 3. – P. 238–241. (In Russ.) DOI: 10.14300/mnnc.2015.10055.

15. **Domenyuk D.A., Davydov B.N., Dmitrienko S.V., Lepilin A.V., Fomin I.V.** Study of morphology, methods of comparison of tooth and alveolar arcs by results of anthropometry and cellular-beam computer tomography (Part I). The Dental Institute. 2018; 79(2): 68–72. (In Russ.)].

16. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** The diagnostic significance of the clinical functional and immunological studies in assessing the effectiveness of complex therapy of chronic gingivitis (Part I). The Dental Institute. 2017; 74(1): 46–47. (In Russ.)].

17. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** The diagnostic significance of the clinical functional and immunological studies in assessing the effectiveness of complex therapy of chronic gingivitis (Part II). The Dental Institute. 2017; 75(2): 30–33. (In Russ.)].

18. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Teeth sizes in their correlation with parameters of dentofacial arches and maxillofacial area based on native cranial preparations examination. Kubanskij nauchnyj medicinskij vestnik. 2016;(2):71–79. (In Russ.) DOI:10.25207/1608-6228-2016-2-71-79.

19. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.

20. **Domenyuk D.A., Davydov B.N., Dmitrienko S.V., Porfyriadis M.P., Budaychiev G.M.-A.** Variability of cephalometric indices in men and women with mesocefalic form of the head and various constitutional types of face (Part I). The Dental Institute. 2018; 78(1): 70–73. (In Russ.)].

21. **Domenyuk D.A., Davydov B.N., Dmitrienko S.V., Porfyriadis M.P., Budaychiev G.M.-A.** Variability of cephalometric indices in men and women with mesocefalic form of the head and various constitutional types of face (Part II). The Dental Institute. 2018; 79(2): 82–85. (In Russ.)].

22. **Gilmiyarova F.N., Davydov B.N., Domenyuk D.A., Ivchenko L.G.** Influence of severity of type I diabetes mellitus in children on dental status and immunological, biochemical parameters of blood serum and oral fluid. Part I. Periodontology. 2017; Vol. XXII; 2 (83): 53–60. (In Russ.)].

23. **Gilmiyarova F.N., Davydov B.N., Domenyuk D.A., Ivchenko L.G.** Influence of severity of type I diabetes mellitus in children on dental status and im-

munological, biochemical parameters of blood serum and oral fluid. Part II. Periodontology. 2017; Vol. XXII; 3 (84): 36–41. (In Russ.)].

24. **Ivchenko L.G., Domenyuk D.A.** Diagnosis of immunometabolic disorders in children with type I diabetes mellitus. Kuban Scientific Medical Bulletin. 2017; 1(2): 73–82. (In Russ., English abstract). DOI:10.25207/1608-6228-2017-2-73-82.

25. **Karslieva A.G., Domenyuk D.A., Zelensky V.A.** Mixed saliva trace element composition in children with dentoalveolar anomalies through apparatus-involved treatment // Archiv EuroMedica, 2014. – Vol. 4. – № 1. – P. 29–35.

26. **Korobkeev, A.A.** Changes in the structural elements of the temporomandibular joint with distal occlusion / A.A. Korobkeev, D.A. Domenyuk, E.G. Vedeshina, V.V. Konov, O.Yu. Lezhnina, Ya.A. Korobkeeva // Medical news of North Caucasus. 2017. – Vol. 12. – № 1. – P. 72–76. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12020.

27. **Kulikova, N.G.** Evaluation of the effectiveness of pharmaco-physiotherapeutic treatment of catarrhal gingivitis on the results of the condition of mucosal immunity of oral cavity in women in the postpartum period / N.G. Kulikova D.A. Domenyuk, V.A. Zelensky, A.S. Tkachenko // Medical news of North Caucasus. 2017. – Vol. 12. – № 4. – P. 417–421. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12117.

28. **Lepilin A.V., Fomin I.V., Domenyuk D.A., Dmitrienko S.V.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 37–38.

29. **Porfyriadis M.P., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A., Davydov B.N.** Features of tactics and principles orthodontic treatment of patients with dental arches asymmetry caused by different amounts of antimeres (Part I). The Dental Institute. 2017; 77(4): 64–68. (In Russ.)].

30. **Porfyriadis M.P., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A., Davydov B.N.** Features of tactics and principles orthodontic treatment of patients with dental arches asymmetry caused by different amounts of antimeres (Part II). The Dental Institute. 2018; 78(1): 56–61. (In Russ.)].

31. **Porfyriadis M.P., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A., Davydov B.N.** Features of tactics and principles orthodontic treatment of patients with dental arches asymmetry caused by different amounts of antimeres (Part III). The Dental Institute. 2018; 79(2): 88–92. (In Russ.)].

32. **Shkarin V.V., Domenyuk D.A., Dmitrienko S.V., Porfyriadis M.P., Fomin I.V.** Modern approaches to the determination of the angle of teeth inclination in the diagnosis and planning of orthodontic treatment. Kuban Scientific Medical Bulletin. 2018; 25(2): 156–165. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2018-25-2-156-165.

33. **Shkarin V., Domenyuk D., Lepilin A., Fomin I., Dmitrienko S.** Odontometric indices fluctuation in people with physiological occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 12–18.

34. **Vedeshina E.G., Domenyuk D.A.** Buccal epithelium reactivity indicators as markers of morphological and functional impairment in patients with dentoalveolar pathology. Kuban Scientific Medical Bulletin. 2016; (4): 23-32. (In Russ., English abstract). DOI:10.25207/1608-6228-2016-4-23-32.

35. **Zelensky, V.A.** Integral indicator for orthodontic carequality control / V.A. Zelensky, D.A. Domenyuk, M.V. Baturin, I.V. Zelensky, A.V. Kokareva, A.V. Zenina // Medical news of North Caucasus. 2014. – Vol. 9. – № 1. – P. 80–83. (In Russ., English abstract). DOI: 10.14300/mnnc.2014.09022.

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MODERN POSSIBILITIES OF NON-DRUG TECHNOLOGIES IN THE TREATMENT OF MYOPIA IN CHILDREN

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We developed a technique for combined treatment of myopia by electrostimulation and laser action on oculomotorand ciliary muscles. Magnetic-laser device for ophthalmology "Milt-F with the irradiation of the region of the ciliary muscle in zones 3 and 9 hours was used. Percutaneouselectrostimulation was carried out after 20 minutes. After laser irradiation with the apparatus "Amplipulse-5D" in the form of continuous action by a series of modulated vibrations. Sessions of laser and electrostimulation were conducted daily by a course of 10 procedures.

Eighty patients (160 eyes) with low grade myopia aged 7 to 16 years were monitored. The first main group consisted of 48 patients (96 eyes, 28 girls and 20 boys) who received combined treatment according to the developed method. The second control group of 32 patients (64 eyes, 18 girls and 14 boys) received traditional treatment. To assess the effectiveness of the treatment, visometry was performed without correction and with correction to the measurement of the positive part of the relative accommodation and the position of the nearest point of clear vision.

A significant improvement in the visual functions of vision was established during the combined treatment in all patients of the main group. At the same time, an increase in uncorrected visual acuity was observed on average 0.26 D, (0.25 ± 0.011), and a decrease in the maximum correcting lens force was 0.5–1.0 dpt. against the background of the complete disappearance of the spasm of accommodation. The course of physiotherapy influenced the state of the tone of accommodation by increasing the function of the ciliary muscle and relaxation of the habitual tonus of accommodation. At the same time, the work of the accommodative apparatus of the eye is normalized, which contributes to an increase in visual acuity.

Studies have shown that combined treatment of children with myopia allows to stabilize the accommodation capabilities of the organ of vision. The improvement and stabilization of visual acuity is apparently facilitated by an improvement in the circulation of the retina, choroid, ciliary and oculomotor muscles, stimulating the photoreceptors of the macular region and enhancing the central fixation of the retina. Thus, it can be considered that an increase in visual functions with a change in refraction along all meridians with a tendency to emmetropy suggests that this state of instability is unstable, which in turn causes *interest* in the urethral oculomotor muscles in maintaining a certain radius of curvature of the cornea.

Conclusion. Combination treatment of myopia using an electrostimulation laser should be considered as one of the effective methods of treating myopia in children. At the same time, remission persists for 5–6 months, which requires a repeat course of restorative therapy. An optimal regimen for the implementation of therapeutic and prophylactic rehabilitation measures for myopia in children may be considered a combined application of the above method with a frequency of at least twice a year, which will help prevent the progress of myopia in children.

PHYSICAL FACTORS IN TREATING MANDIBULAR FRACTURES

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ABSTRACT — Physiotherapy employed to treat lower jaw fractures helps improve the blood supply and innervation at the fracture area, also reducing periodontal tissues inflammation, which results in a lower likelihood of developing respective complications.

KEYWORDS — fracture, mandible, physiotherapy, periodontal issues, disturbed blood supply, neurotrophic disturbances.

INTRODUCTION

The number of complications in mandibular fractures remains high even despite newer and more efficient treatment methods [2, 3, 8, 12, 16, 17, 18, 24, 25]. Mandibular fracture complications are largely due to issues affecting the local and general blood circulation, innervation, odontogenic infection foci at the fracture spot, etc. [4,13]. The recent decades have been witnessing an increasing use of physiotherapy in treating patients with various pathologies [6, 7, 11, 14, 19, 20, 21, 22, 23], which can be accounted for by the advanced devices and methods that are available now to deliver this type of treatment, as well as by an increase in allergic responses to medications. Our studies revealed high efficiency of physiotherapy methods applied to mandibular fracture cases in order to prevent and treat complications [2, 3, 8, 9, 12, 16].

Aim of study:
to identify the efficiency of physiotherapy in preventing and treating mandibular fractures complications.

MATERIALS AND METHODS

The study involved patients with mandibular fractures who were staying at the Maxillofacial Department of Municipal Hospital #9 of the City of Saratov (Russia) and undergoing treatment involving various types of physiotherapy. The treatment implied using the ATOS, AMO-ATOS-E, Magnetic Sympathocor, Miovolna physiotherapy devices. Apart from the conventional clinical methods, the mandibular artery blood flow was studied as well as assessment carried out for the autonomic nervous system activity, neurotrophic issues at the trigeminal nerve supply, and for periodontal tissues.

DISCUSSION

While treating the 85 patients with mandibular fractures at the angle and body, we used the effect of the travelling alternating magnetic field (TAMF) of the ATOS device with a frequency of 10 Hz. Each daily session was 20 minutes with an entire course of 8–10 sessions. The control group included 15 patients whose treatment implied using the Polyus-1 device (the alternating magnetic field (AMF) induction of 20 mT), and another 15 patients, whose treatment was based on using the UHF-80 device (power — 40 W). All the patients underwent rheographic examination of the mandibular artery through the treatment.

The rheography performed after 9–11 days revealed that the blood circulation recovery in the mandibular artery was significantly speedier in case of using TAMF (the ATOS device), compared to the effect of the UHF field and the AMF of the Polyus 1 Device. So, when exposed to TAMF of 10 Hz, the rheographic index (RI) went up from 0.052±0.0077 to 0.092±0.015 ($p < 0.05$). During that, the treatment with the AMF of the Polyus-1 device resulted in an insignificant RI increase, while the course of the UHF therapy produced a higher RI increase if matched against AMF yet it was less significant compared to the TAMF effect. When using TAMF to treat patients with mandibular fractures, the rheogram amplitude increased from 2.67±0.36 to 4.25±0.73. Under the AMF influence wrought by the Polyus-1 device, the amplitude did not change significantly; UHF therapy caused a significant increase in the rheogram amplitude yet it was still lower than that from the TAMF effect. A visual analysis of the rheograms from the TAMF treatment confirmed the quantitative analysis data. The rheographic curve on the injure side was approaching the correct shape, with a pointed tip. The incisure was shifting towards the rheogram base, while there was also an emerging dicrotic wave observed.

Recovery of the blood supply delivered to the tissues at the fracture spot is one of the major factors determining the positive effect TAMF has on reparative osteogenesis. The use of the TAMF device (ATOS) helped bring down to 6% the number of patients with mandibular fractures at the body and the angle, who developed chronic traumatic osteomyelitis (vs. 13% in the comparison group).

Since a mandibular fracture is considered a stressful impact it causes significant changes in the autonomic nervous system functioning. This manifests itself through an increase in the sympathetic link activity, which is reflected in the cardiovascular system, and leads to general and regional blood circulation issues. As for the patients with mandibular fractures accompanied with an extreme degree of sympathicotonia, then the comprehensive treatment aimed at improving their autonomic nervous system activity included traveling pulsed magnetic field (TPMF) in the upper sympathetic cervical ganglia projection on both sides, which allowed periodical blockage of the ganglia activity with TPMF through the self-induction. The treatment course implied using the AMO-ATOS magnetic therapy device as well as the Magnetic Sympathocor traveling magnetic field emitter. The TPMF exposure mode was as follows: 60 mT induction, frequency 1 Hz – in the first two days; frequency 5 Hz – on Days 3 and 4; frequency 10 Hz – on Days 5 and 6. The physiotherapy sessions were held daily for 15–20 minutes [5, 15]. The patients were examined on Day 7 into the treatment.

Our method used as a part of the comprehensive treatment for 40 cases with mandibular fractures, allowed a quick arrival at the patients' vegetative status equilibrium. This was to be seen from the data reflecting the heart rate, blood pressure, vegetative Kerdo index, Hildebrant index, the eyeball-heart and the epigastric reflexes, orthostatic and clinostatic tests, the Baevsky-method based cardiointervalography [1] as well as the catecholamine blood levels. According to rheovasography, the autonomic nervous system improvement could be also observed through the recovered regional blood flow in the lower alveolar artery, evidence to that being a decrease in V_{max} (reflects improved blood flow in the systole) and V_{min} (reflects a significantly improved blood flow in the diastole; depends on the vascular walls tone). At the same time, the V_{min} values (7.3 [3.4–16]) differed significantly from similar values in the comparison group (15.2 [8–18.8]) and approached the normal range. The blood flow recovery in the lower jaw came along with shorter local symptoms relief time (pain, swelling) and normalization of the body temperature. At the same time, mandibular fractures complications, in cases where magnetic therapy was used in the cervical sympathetic ganglia region, were observed in 5% of the cases only (during conventional treatment — in 16.3% of patients). There was no chronic issue development registered, whereas 6.7% of those receiving conventional treatment developed a subsequent transition from inflammation to chronic traumatic osteomyelitis.

A fractured mandible entails an injury of the inferior alveolar nerve which causes neurotrophic disorders, standing behind fracture complications. According to our data, 78% of the cases revealing complicated mandibular fractures had the trigeminal nerve affected. In order to correct neurotrophic disorders, 66 patients with complicated and uncomplicated mandibular fractures underwent treatment with the Miovolna (electrostimulator analgesic) device as part of the entire comprehensive treatment they were offered. The device was used following our special method [10] 7–15 minutes per day at the fracture spot, as well as distally (at the foramen mentale), and, if necessary, with an intraoral electrode. The voltage amplitude range was 15.2–17.6 V; the current frequency 6.4–10.0 Hz. The amplitude was brought up daily by 0.3–0.5 V; the entire course included 3–10 sessions.

Using this method of physiotherapy offered a significant analgesic effect. On Day 10 of electrical neurostimulation (ENS), the pain intensity in all the patients having fractures with no sensory-paresthetic issues was (average on a scale) minimal and measured next to the no pain mark (0 points), while during the conventional treatment the same value was the level of moderate pain (2±0.12 points). Patients with complicated fractures with hypoesthesia symptoms, had the pain intensity indicators not exceeding 2±0.12 points (moderate pain), whereas a similar factor in the comparison group reached the level of severe pain (3±0.16 points). After the ENS, the need for analgesics decreased significantly, and a pronounced lasting pain-relieving effect was observed (excellent and good results), whereas in the comparison group patients, pain sensations lasted in 87% cases. Sensory paresthetic disorders following the ENS featured a 17% decrease in the area and in the severity of the skin numbness in the lower lip as well as in the chin (compared with the status as of the admission date). On Day 10 after the ENS, the uncomplicated fracture cases, the average EOD (electroodontodiagnosis) value for the teeth located in the fracture gap was 56.5±4.92 CU, while the neighboring teeth had it back to normal (52±2.91

CU). That means that the excitability threshold following the physiotherapy was significantly lower (by 23%) than a similar index after the conventional treatment and fell within normal limits. After the electrical neurostimulation, the average electrical excitability indices in the cases with complicated fractures were 65.3±3.57 CU, which was much below (4 times as low) than in case of using the conventional treatment. The electrophysiological parameters got back to normal, which could be seen from the ENMG data as well as from the trigeminal SSEP registration. Physiotherapy promoted consolidation of the mandible fragments. A densitometry test performed at the fracture area a month after the injury revealed that the optical density index was I = 0.96±0.06, which reflects a better consolidation rate of bone fragments if matched against the conventional types of treatment (I = 0.84±0.07).

Given the above, nerve fibers electrical stimulation used within comprehensive treatment for mandibular fractures, leads to correction of neurotrophic issues, which brings back to the norm all the types of sensitivity, reduces the pain duration and intensity after the injury, and increases the rate of bone fragments consolidation.

Having determined the role of inflammatory periodontal diseases in the development of mandibular fracture complications (soft tissues suppuration, bone wounds, traumatic osteomyelitis) when treating patients with fractures accompanied with periodontal diseases, we used comprehensive therapy in 80 cases. That included physiotherapy procedures focusing on periodontal tissue and using the AMO-ATOS-E device on a daily basis, with the entire course including 8–10 sessions combined with treating periodontal pockets with the Cycloferon liniment. The dynamic magnetic therapy (DMT) was performed with the magnetic field rotatining alternately in opposite directions with a 1.0–1.5 min rotation exposure as per each direction, the frequency of rotation being 10 Hz. The transcutaneous electrical neurostimulation (TENS) was performed at a voltage amplitude ranging from 15.2 to 17.6 V, where the current frequency was 6.4–10.0 Hz.

Using combined effects on periodontal tissue in patients with mandibular fractures allowed reducing the severity of inflammatory and destructive processes affecting periodontal tissues by the time of removing the splint. This could be seen from the periodontal indices: the mean PMA index value was 29.8±1.1 (vs. 48.5±1.4 in the comparison group), PI – 1.8±0.12 (2.9±0.09 in the comparison group). The improved blood circulation in the periodontal tissues reflected the level of tissue perfusion studied via laser Doppler flowmetry. After the treatment, it was 0.304±0.009 (vs. 0.223±0.014 in the comparison group). The comprehensive treatment entailed an improved level of cytokines in the periodontal pockets, which manifested itself through a decrease in the levels of pro-inflammatory cytokines IL-1ß, IL-8, TNFα, γ-INF (these indices were significantly lower compared to the patients who received conventional treatment), and an increase in the anti-inflammatory cytokine IL-4 level, which was significantly higher compared to the same factor at admission, and in case of the conventional treatment. The cytomorphological studies also reflected the immune response activation and the absence of the inflammatory and destructive progress in the periodontal tissues.

The relief of periodontal tissue inflammation in patients with mandibular fractures combined with gingivitis and periodontitis reduced the number of respective complications. Comprehensive therapy offered to patients with periodontal inflammation issues, for instance, led to a decrease in the number of mandibular fracture complications bringing them down almost 2 times compared with patients who were given the conventional orthopedic treatment.

CONCLUSION

Physiotherapy methods that exercise a beneficial effect on tissues blood supply and innervation can be employed to treat patients with fractured mandibles both to prevent and to treat complications. The said treatment allows reducing the pain intensity and duration as well as bringing down the rate of complications in fractured mandible cases.

REFERENCES

1. **Baevskij, R. M., Kirillov O.I., Kleckin S.Z.** Mathematical analysis of changes in heart rate under stress. M.: Nauka, 1984. – 221 s.
2. **Bahteeva G.R.** Features of the course and treatment of fractures of the lower jaw, accompanied by damage to the third branch of the trigeminal nerve: Diss.. – Volgograd., 2010. –24 s. (In Russ.).
3. **Erokina N.L.** Modern methods of examination and substantiation of pathogenetic treatment of inflammatory periodontal diseases in patients with fractures of the mandible: Diss. – Volgograd, 2009. – 38 s. (In Russ.).
4. **Erokina N.L., Lepilin A.V., Zaharova N.B., Rogatina T.V., Lyapina YA.A., Prokof'eva O.V., Lukashov V.A.** The Use of cytological studies of periodontal pockets of periodontitis patients with fractures of the mandible to select the method of immobilization. Saratovskij nauchno-medicinskij zhurnal. 2011 – T.7, № 4 –S. 905–909. (In Russ.).

5. **Erokina N.L., Lepilin A.V., Prokof'eva O.V., Rogatina T.V., Sojher M.G., ZHilkina O.V.** Way of correction of vegetative disorders in patients with mandibular fractures. Saratovskij nauchno-medicinskij zhurnal. - Izd-vo SGMU. – 2012. - №2. – S. 424 – 428. (In Russ.).
6. **Kirichuk V.F., Lepilin A.V., Apal'kov I.P., Erokina N.L.** Microcirculatory disorders in patients with chronic generalized periodontitis and their correction by EHF therapy. Byulleten' sibirskoj mediciny. 2003. № 2. S. 99. (In Russ.).
7. **Kirichuk V.F., SHirokov V.YU., Erokina N.L., Goloseev S.G., Govorunova T.V.** Microcirculatory link of the hemostatic system in patients with chronic generalized periodontitis in combination with diseases of the gastroduodenal region and its dynamics in combined EHF therapy. Parodontologiya. 2005. № 1. S. 21–25. (In Russ.).
8. **Lepilin A.V.** Prevention and pathogenetic treatment of purulent infectious complications of traumatic injuries of the bones of the face: Diss. M.: MMSI im. N.A. Semashko, 1995. – 43 s. (In Russ.).
9. **Lepilin A.V., Rajgorodskij YU.M., Nozdrachev V.G., Erokina N.L.** Dynamic magnetotherapy in the complex treatment of phlegmon of the maxillofacial region and mandible fractures. Stomatologiya. 2007. T. 86. №5. S. 55–57. (In Russ.).
10. **Lepilin A.V., Erokina N.L., SHolomov I.I., Bahteeva G.R.** A Method of treating damage to the lower alveolar nerve in the mandibular fractures. Patent for invention RUS 2332245 09.04.2007. (In Russ.).
11. **Lepilin A.V., Rajgorodskij YU.M., Ostrovskaya L.YU. Erokina N.L., Konnov V.V., CHadina T.V.** Application dental complex CAP -"PERIODONTIST" in the treatment of periodontal disease. Stomatologiya. 2008. № 5. S. 39. (In Russ.).
12. **Lepilin A.V., Erokina N.L.** Optimization of treatment of patients with mandibular fractures in combination with inflammatory periodontal disease. Dental YUg. 2008. № 10. S. 28. (In Russ.).
13. **Lepilin A.V., Erokina N.L., Titorenko V.A., Ostrovskaya L.YU., Bisultanov H.U.** Periodontal Status of patients with mandibular fractures in combination with inflammatory diseases of periodontium in dynamics of treatment. Saratovskij nauchno-medicinskij zhurnal. 2008. T. 4. №1. S. 115–118. (In Russ.).
14. **Lepilin A.V., Rajgorodskij YU.M., Erokina N.L., Rogatina T.V., Lyapina YA.A., Lukashov V.A.** The Influence of dynamic magnetic therapy dental complex CAP – "PERIODONTIST", percutaneous electroneurostimulation apparatus "Jovana" and the remedy "Traumeel s" on hemostasis and regional circulation in patients with inflammatory periodontal diseases in complicated fractures of the mandible. Parodontologiya. 2009. №2. S. 54–60. (In Russ.).
15. **Lepilin A.V., Erokina N.L., Rajgorodskij YU.M., Prokof'eva O.V., Bahteeva G.R., Rogatina T.V.** Method of treatment of patients with mandibular fractures. Patent for invention RUS 2481130 12. 03.2012. (In Russ.).
16. **Lepilin A.V., Erokina N.L., Fishchev S.B., Bahteeva G.R., Rogatina T.V.** Analysis of the causes of complications of mandibular fractures. Parodontologiya. 2017. T. 22. №3. S. 60-63 (In Russ.).
17. **Bouchard C.** Open Reduction with Internal Fixation of Mandibular Angle Fractures: A Retrospective Study. M. Mansouri //J Can Dent Assoc.- 2017 Jan;82:h3.
18. **Radabaugh J.P., Horn A.V., Chan S.A.** Patient compliance following isolated mandibular fracture repair. Laryngoscope. – 2017/ Mar 21. doi: 10.1002/lary.26556.
19. **Kulikova, N.G.** Evaluation of the effectiveness of pharmaco-physiotherapeutic treatment of catarrhal gingivitis on the results of the condition of mucosal immunity of oral cavity in women in the postpartum period / N.G. Kulikova, D.A. Domenyuk, V.A. Zelensky, A.S. Tkachenko // Medical news of North Caucasus. 2017. – Vol. 12. – № 4. – P. 417–421. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12117.
20. **Agarkov, N. M.** Mathematical prediction of phlegmon development in acute odontogenic osteomyelitis of jaws in terms of blood and systemic immunity / N.M. Agarkov, S.N. Gontarev, D.A. Domenyuk, V.A. Zelensky, K.F. Makkonen, E.P. Afanasova, A.V. Ivanov, T.I. Subbotina // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 62–65. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13018.
21. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** The diagnostic significance of the clinical functional and immunological studies in assessing the effectiveness of complex therapy of chronic gingivitis (Part I). The Dental Institute. 2017; 74(1): 46–47. (In Russ.)].
22. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** The diagnostic significance of the clinical functional and immunological studies in assessing the effectiveness of complex therapy of chronic gingivitis (Part II). The Dental Institute. 2017; 75(2): 30–33. (In Russ.)].
23. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** Use of low-intensive laser therapy in the complex treatment of generalized cataral gingivitis in women. Periodontology. 2017; Vol. XXII; 1 (82): 45–51. (In Russ.)].
24. **Karpov S. M., Gandylyan K. S., Karakov K. G., Zelenskiy V. A., Porfiriadis M. P., Khachaturyan E. E., Domenyuk D. A., Chalaya E. N.** Maxillofacial trauma as the cause of neurophysiological CNS disorder. Medical news of North Caucasus. 2015. – Vol. 10. – № 4. – P. 361–365. (In Russ., English abstract). DOI – http://dx.doi.org/10.14300/mnnc.2015.10088

25. **Gandylyan K. S., Karpov S. M., Romanenko I. S., Karakov K. G., Zelenskiy V. A., Porfiriadis M. P., Khachaturyan E. E., Domenyuk D. A., Chalaya E. N.** During different clinical forms of acute odontogenic inflammatory diseases. Medical news of North Caucasus. 2015. – Vol. 10. – № 4. – P. 394–398. (In Russ., English abstract). DOI: 10.14300/mnnc.2015.10096

MICROBIOLOGICAL VERIFICATION FOR THE USE OF THERMOPLASTICS IN PROSTHETIC TREATMENT OF DENTITION ISSUES IN CHILDREN

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Aim: to study of the spectrum, the occurrence rate and the pathogenicity features of microorganisms that are found on removable laminar dentures made of thermoplastics and acrylic plastics that are used to design prosthetics for children with prematurely lost teeth.

To complete the task set for the study, we carried out an orthopedic treatment using removable laminar dentures for 75 children (aged 5 to 15) with dentition issues. As far as the premature tooth loss etiology was concerned, the leading cause behind that was complicated tooth decay (69 children); 5 children had defects of posttraumatic origin, while another child was found to have multiple congenital edentulism. All the children had removable laminar dentures made for them — 43 patients had the dentures performed from acrylic plastics, 32 — from a thermoplastic belonging to polyamides (nylon). The dentures under study were in the respective children's continuous use for 3–5 months.

To study the contamination of the removable acrylic prostheses with microorganisms, the samples were taken from the base surface with a sterile cotton swab, area — 1 cm^2. The material was delivered to the bacteriological laboratory within 1 hour. In the laboratory, the material was subjected to culture titration in sodium chloride 10^{-2}, 10^{-4} isotonic solution. The inoculation onto solid nutrient medium was performed from the initial and subsequent dilutions. The microorganisms cultivation was carried out under respective aerobic, anaerobic and microaerophilic conditions in a thermostat at a temperature of 37° C for 24–48 hours. To carry out a comprehensive study of aerobic and anaerobic microflora, the inoculation was done onto both Russian-made and foreign nutrient media (BBL®, US). The anaerobes type was determined on the API systems by the French company *bio Mérieux* (API 20 A); streptococci — API 20 Strept; staphylococci — API 20 Staph; H.pylori — API 20 Campy. The blood media Schaedler Agar and Columbia Agar were used for studying hemolytic activity, whereas egg yolk & salt agar medium — for lecithinase activity. Besides, the bacteria capacity to inactivate lysozyme, and to produce catalase, RNAase, caseinase and urease were

INTRODUCTION

The available scientific literature holds it that dentofacial anomalies and deformations in child population are the top-rated maxillofacial issues observed currently [10]. The data reported regarding the dentition defects prevalence vary a lot ranging from 5.45% to 49.69%, depending on the area. Early extraction of temporary and permanent teeth (most often due to complicated decay) is an important etiological factor behind the development of dentition deformations [1, 4]. Clinical manifestations of early tooth loss feature diversity and depend on the location, the history, the accompanying occlusion pathology, the child's age, etc. [3]. Early tooth loss leads not only to disorders, both morphological and functional, which manifest themselves through a change in the tongue position (infantile swallowing, mouth breath), developing poor habits, disturbed facial aesthetics and speech articulation [2, 7]. The most common orthopedic treatment in pediatric practice is prosthetics with removable laminar dentures. Orthopedic structures designed to compensate for dentition defects have an adverse effect on the oral cavity microbiocenosis, the mucous membrane and the periodontal tissue. A significant degree of denture colonization with bacterial and fungal agents may result in allergization, disrupted terms and the process of the patient's adjustment to the denture, as well as prosthetic stomatitis [5, 6, 8, 9]. Recently, there has been considerable interest in bacterization affecting the basis of dentures made of various materials.

also identified. The experimental data were processed employing the STATISTICA (Stat Soft Russia) and BIOSTAT application software.

RESULTS

When studying the microflora from the bases of acrylic plastics dentures, 14 microorganisms genera were detected, 3 of which showed signs of pathogenic capacity (Staphylococcus spp., Bacillus spp., Peptostreptococcus spp.). However, the surface of the thermoplastic dentures brought only 7 microorganisms genera ($p < 0.01$) while bacteria of the Streptococcus spp., Peptostreptococcus spp., Porphiromonas spp., Bifidobacterium spp., Veillonella spp., Micrococcus spp., Leptotrichium spp., Actinomyces spp. genera were not to be detected. Besides, no pathogenic microbes were found. Apart from that, the frequency of identifying Bacillus spp., Peptostreptococcus spp., Candida spp. in patients using acrylic dentures was significantly higher compared to the cases using thermoplastic dentures. In quantitative terms, there were more microorganisms detected on the dentures made of acrylic plastic. Here comes the respective data: Peptostreptococcus spp. — 7.2 CFU/cm^2; Bifidobacterium spp. — 6.7 CFU/cm^2; Peptococcus spp. and Actinomyces spp. – 6.3 CFU/cm^2; Veillonella spp. — 6.2 CFU/cm^2; Porphiromonas spp. — 5.8 CFU/cm^2; Leptotrichium spp. — 5.3 CFU/cm^2; Streptococcus spp. — 5.2 CFU/cm^2; Micrococcus spp. — 4.4 CFU/cm^2; Staphylococcus spp. — 4.2 CFU/cm^2. The following microorganisms were identified in quantities below 4 CFU/cm^2 (which is the normal value): Lactobacillus spp., yeast-like fungi of the Candida spp. genus, Bacillus spp., the Enterobacteriaceae spp. family. As for the surface of thermoplastic dentures, only 4 types of microorganisms were identified there in amounts exceeding 4 CFU/cm^2, namely: Peptostreptococcus spp. — 6.2 CFU/cm^2; Peptococcus spp. — 6.02 CFU/cm^2; Staphylococcus spp. — 4.9 CFU/cm^2; the Enterobacteriaceae spp. family — 4.2 CFU/cm^2, with smaller amounts isolated for Lactobacillus spp. — 4.0 CFU/cm^2; Bacillus spp. — 3.8 CFU/cm^2; Candida spp. — 3.2 CFU/cm^2. Three types of microorganisms demonstrating the signs of pathogenicity (hemolytic and lecithinase activity) were detected on dentures fabricated of acrylic plastics: Staphylococcus spp., Bacillus spp., and Peptostreptococcus spp.

CONCLUSIONS

1. The microbiological study stands proof to a wide range of microorganisms colonizing the base surface of removable laminar dentures worn by children.
2. The frequency of identifying different bacteria genera and yeast-like fungi, including those with signs of pathogenic activity, depends on the material used to manufacture the denture.
3. The surface of acrylic dentures is colonized by twice as many microorganisms genera as that of thermoplastic dentures.
4. Unlike acrylic dentures, no bacteria with signs of lecithinase and hemolytic activity were identified on the surface of nylon prostheses, which – from a microbiological standpoint – presents quite a serious reason favoring the use of thermoplastics as a structural material to manufacture removable laminar dentures for children.

REFERENCES

1. **Domenyuk D.A., Davydov B.N., Gilmiyarova F.N., Ivchenko L.G., Vedeshina E.G.** Diagnostic and prognostic value of crystalline structures of the oral fluid in children with anomalies of occlusion. Children's dentistry and prevention. 2017; Tom XXI; 2(61): 9–16. (In Russ.)].
2. **Domenyuk D.A., Tashueva L.V., Zelensky V.A., Ivancheva E.N.** Evaluation of microvasculature tissues viability after the imposition of removable orthodontic appliances in children and adolescents // Archiv EuroMedica, 2013. – Vol. 3. – № 1. – P. C. 5–9.
3. **Domenyuk D.A., Davydov B.N., Vedeshina E.G., Dmitrienko S.V.** Perfection of diagnostic methods of dentoalveolar anomalies by results of studying functional shifts in the system of oral homeostasis (Part I). The Dental Institute. 2016; 71(2): 74–77. (In Russ.)].
4. **Domenyuk D.A., Davydov B.N., Vedeshina E.G., Dmitrienko S.V.** Perfection of diagnostic methods of dentoalveolar anomalies by results of studying functional shifts in the system of oral homeostasis (Part II). The Dental Institute. 2016; 72(3): 58–60. (In Russ.)].
5. **Domenyuk, D.A.** Study of the spectrum of dental composites biological activity in model experiments in vitro / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis, I.A. Bazikov, F. N. Gilmiyarova // Medical news of North Caucasus. 2016. – Vol. 11. – № 2. – P. 179–183. (In Russ.) DOI: 10.14300/mnnc.2016.11031.
6. **Domenyuk, D.A.** Semiquantitative evaluation of caries microflora in patients with dental and alveolar abnormalities and different severity of morphofunctional disturbances / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis // Medical news of North Caucasus. 2015. – Vol. 10. – № 3. – P. 238–241. (In Russ.) DOI: 10.14300/mnnc.2015.10055.
7. **Domenyuk D., Porfyriadis M., Dmitrienko S.** Major telerenthengogram indicators in people with

various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 19–24.

8. **Karslieva A.G., Domenyuk D.A., Zelensky V.A.** Mixed saliva trace element composition in children with dentoalveolar anomalies through apparatus-involved treatment // Archiv EuroMedica, 2014. – Vol. 4. – № 1. – P. 29–35.
9. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1–1. – P. 66-69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.
10. **Shkarin V.V., Davydov B.N., Domenyuk D.A., Dmitrienko S.V.** Non-removable arch orthodontic appliances for treating children with congenital maxillofacial pathologies - efficiency evaluation // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 97–98.

SPECIFIC FEATURES OF ORAL CAVITY MICROBIOCENOSIS IN CHILDREN USING NON-REMOVABLE ORTHODONTIC APPLIANCES

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INTRODUCTION

In modern Orthodontics, which is viewed as an integral part of dentistry, non-removable appliances are the most widespread approach as they allow moving and keeping under control the teeth position in the sagittal, frontal and transversal planes [2, 7]. Growing fundamental knowledge, extensive clinical experience, and advanced technology have led to the development of bracket systems that meet not functional requirements alone yet also aesthetic ones [1, 10]. Experts have proven that orthodontic treatment comes along with a high level of microbial contamination on the teeth surface, dental systems and the tongue, which can trigger the development of the oral cavity dysbacteriosis [3, 4, 5, 6, 8, 9]. Studying the oral cavity microflora in patients undergoing orthodontic treatment is of great interest not only for researchers but for practicing experts as well since it allows preventing the development of complications associated with a sharp increase in the potentially pathogenic microorganisms titer.

Aim of study:
to evaluate the qualitative and quantitative composition of aerobic microorganisms representing the oral microbiota in patients with dental issues through their orthodontic treatment with bracket-based appliances.

To complete the objectives, a study was carried out focusing on the range and quantity, as well as on the presence of microorganisms' pathogenicity factors in the gingival groove contents, dental plaque, in scraping from the tongue back mucosa and in saliva. The study involved 86 school students aged 12–18 with various occlusion issues. The children were examined prior to, and through the orthodontic treatment (treatment course – 8–18 months). The control group included children of the same age undergoing a routine examination and who did not require orthodontic treatment. The sampling and the microbiological study were performed employing the respective classical methods. The work was carried out at the Microbiology Department, Stavropol State Medical University. The data were processed with the STATISTICA (Stat Soft Russia) and BIOSTAT application software.

RESULTS

When the non-removable orthodontic appliances were installed, reliable qualitative changes in the microorganism status were identified in children in two biotopes — saliva and dental plaque. In the saliva of adolescents aged 12–18, 93% of the cases were found to have streptococci; in 71% of the cases — lactobacilli; in 56% — staphylococci (including Staphylococcus aureus); less than 48% were yeast-like fungi of the Candida genus, and enterobacteria. The prevalence of these microorganisms was 8–43% lower, compared to similar rates in healthy children.

In 73% of the cases the dental plaque was found to contain streptococci, which is 34% above the normal value. Less than 49% were yeast-like fungi of the Candida genus, staphylococcus and lactobacillus; the prevalence of these microorganisms was 18–32% lower compared to the normal values. Besides, Staphylococcus aureus was identified, which is not to be found in the healthy participants.

From the point when the non-removable orthodontic appliances were installed and for one year into the treatment, there were dynamic quantitative changes going on in terms of the oral aerobic microflora. The saliva, for instance, developed a higher concentration of Candida yeast-like fungi increased by 2 logs (from 3 to 4.9 lg CFU/ml) and lactobacteria by 1.6 logs (from 4.2 to 5.8 lg CFU/ml). The enterobacteria concentration went down from 4 to 3 lg CFU/ml. The streptococci and staphylococci

concentration was comparable to that of healthy people. Staphylococcus aureus and enterobacter were detected, which were not found in healthy adolescents. The dental plaque, when compared with the normal values, had a higher concentration of Candida, which increased by 1 log (from 2 to 3 lg CFU/g); besides, Staphylococcus aureus was found to appear. The staphylococcus and enterobacteria concentration was comparable with the normal range values. The gingival groove had a concentration of bacilli and Candida similar to that in healthy people. The amount of enterobacteria went down from 3 to 1.9 lg CFU/g, whereas the staphylococci level went up from 1.2 to 2.1 lg CFU/g. Enterobacter, diphtheroids and Staphylococcus aureus appeared, though, which had not been there in the healthy school students. The scraping from the back of the tongue were shown to have Enterobacter and Staphylococcus aureus, as well as an increased amount in the enterobacteria contents (by 4 logs — from 2 to 6.3 lg CFU/g) and streptococci (by 1 log — from 5 to 6 lg CFU/g) if compared to healthy children. The concentration values for Neisseria and Staphylococcus were comparable with the normal ones. The Candida concentration fell from 2.5 to 1.5 lg CFU/g, lactobacilli — from 3.1 to 2.1 lg CFU/g.

The systematic analysis of the obtained data suggests that orthodontic treatment is associated not only with changes in the oral aerobic microflora range leaning towards a lower prevalence of normal flora and a higher level of potentially pathogenic microflora, yet also entails specific quantitative changes. Besides, such changes in the microbial pattern can trigger dental complications in patients undergoing treatment with non-removable orthodontic appliances.

REFERENCES

1. **Davydov B.N., Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Biometric justification of main linear dimensions of the dental arches in orthodontic treatment tactics' development using edgewise orthodontic technique (Part I). The Dental Institute. 2016;1(70):76–78. (In Russ.).
2. **Davydov B.N., Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Biometric justification of main linear dimensions of the dental arches in orthodontic treatment tactics' development using edgewise orthodontic technique (Part II). The Dental Institute. 2016;2(71):66–67.
3. **Domenyuk, D.A.** Study of the spectrum of dental composites biological activity in model experiments in vitro / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis, I.A. Bazikov, F. N. Gilmiyarova // Medical news of North Caucasus. 2016. – Vol. 11. – № 2. – P. 179–183. (In Russ.) DOI: 10.14300/mnnc.2016.11031.
4. **Domenyuk, D.A.** Semiquantitative evaluation of caries microflora in patients with dental and alveolar abnormalities and different severity of morphofunctional disturbances / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis // Medical news of North Caucasus. 2015. – Vol. 10. – № 3. – P. 238–241. (In Russ.) DOI: 10.14300/mnnc.2015.10055.
5. **Domenyuk D.A., Davydov B.N., Gilmiyarova F.N., Ivchenko L.G., Vedeshina E.G.** Diagnostic and prognostic value of crystalline structures of the oral fluid in children with anomalies of occlusion. Children's dentistry and prevention. 2017; Tom XXI; 2(61): 9–16. (In Russ.)].
6. **Domenyuk D.A., Tashueva L.V., Zelensky V.A., Ivancheva E.N.** Evaluation of microvasculature tissues viability after the imposition of removable orthodontic appliances in children and adolescents // Archiv EuroMedica, 2013. – Vol. 3. – № 1. – P. C. 5–9.
7. **Domenyuk D., Porfyriadis M., Dmitrienko S.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 19–24.
8. **Domenyuk D.A., Davydov B.N., Vedeshina E.G., Dmitrienko S.V.** Perfection of diagnostic methods of dentoalveolar anomalies by results of studying functional shifts in the system of oral homeostasis (Part I). The Dental Institute. 2016; 71(2): 74–77. (In Russ.)].
9. **Karslieva A.G., Domenyuk D.A., Zelensky V.A.** Mixed saliva trace element composition in children with dentoalveolar anomalies through apparatus-involved treatment // Archiv EuroMedica, 2014. – Vol. 4. – № 1. – P. 29–35.
10. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1–1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.

CLINICAL MANIFESTATIONS OF COMPLICATIONS ARISING THROUGH ORTHOPEDIC TREATMENT OF DENTITION ISSUES WITH REMOVABLE LAMINAR NYLON DENTURES

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ABSTRACT — The recent years have been witnessing the expansion of technologies for manufacturing removable dentures made of nylon materials. Aim of study: to identify the most significant complications affecting the effectiveness of dentition issues orthopedic treatment with removable laminar nylon dentures as well as to propose a respective prevention. Clinical methods were employed to examine 75 patients who underwent dentition orthopedic treatment with removable dentures of various designs. As a result, the clinical manifestations were identified for major complications when using nylon dentures, and a method for their prevention was proposed.

KEYWORDS — nylon dentures, dentition issues.

INTRODUCTION

Dentition issues are among the most common pathologies in orthopedic dentistry, while lack of timely treatment facilitates the development of deformed dentition, as well as temporomandibular joint and masticatory muscles pathologies [1–18, 28, 31, 35, 36, 39, 41, 45]. Despite the relatively high current level of orthopedic dental care and its continuous progress, rehabilitation of patients suffering from dentition defects still remains rather relevant [19, 20, 21, 22, 29, 32, 34, 37, 42, 44].

The treatment of dentition issues is based on various removable dentures [23, 24, 25, 26, 30, 33, 38, 40, 43]. Lately, technologies for producing removable orthopedic devices manufactured of nylon have become quite common. At the same time, there is no sufficient data regarding the effectiveness of removable nylon dentures, their fixation, their effect on the substructure tissues, as well as the type and severity of complications, the result of that being controversial recommendations and adverse clinical outcomes, which offers a rationale for this study.

Aim of study:
to identify the most significant complications affecting the effectiveness of dentition orthopedic treatment with removable laminar nylon dentures, and to propose a preventive method.

MATERIALS AND METHODS

75 patients (aged 40–80) with dentition issues were examined at the Orthopedic Dentistry Department of V.I. Razumovsky Saratov State Medical University through the years of 2010 – 2017. Depending on the proposed denture type, all the patients were divided into three groups. Patients of Group 1 were given conventional acrylic laminar prostheses fabricated with the Ftorax acrylic base material, with metal clammers (comparison subgroup). The patients of Group 2 had nylon laminar dentures made of Flexy-J material, with periodontal clammers, following the standard method. In Group 3, the patients were offered nylon laminar dentures (Flexy-J material, with periodontal clammers) subject to our proposed method, which allows preventing any damage to the gingival mucosa at the supporting teeth area. The point of the method implies shifting the support level of the clammer dental part towards the tooth equator, and the alveolar part – towards the alveolar processes or the alveolar part of the jaw, and creating a pre-set sub-clammer free space (Russian Federation invention patent #2557133) [27].

The patients underwent clinical examination prior to placing the dentures, on the day the dentures were placed, after 3 and 6 months, as well as 1 and 2 years after the dentures placement. The atrophy degree of the toothless prothetic bed area was evaluated following the Sadykov et al method. The study results were recorded in the individual examination cards and also entered a computer database in order to obtain a comparative evaluation and to sum up the final treatment outcome. The statistical analysis was performed with the statistical STATISTICA 12 package.

RESULTS AND DISCUSSION

To identify the relationship among the patients' masticatory system clinical features, age, gender and their distribution depending on the dentures type, we analyzed contingency coefficient in view of Cramer's V. The analysis revealed that there was a statistically significant link between the type of the dentures proposed and factors like age, gender and the character of dentition imperfection, which allowed identifying the main differences among the groups given the patients' distribution.

Analyzing the distribution by age, we could see that in all the three groups patients of an older age prevailed. However, in Group 1, prevailing were patients belonging to the age category of 71–80 (41.67%), while in Groups 2 and 3, those aged 61–70 represented the majority (38.46% and 56%, respectively). Analyzing the patients' distribution by gender, we could see that Group 1 had an equal number of males and females, while in Groups 2 and 3 females prevailed — 53.85% and 68%, respectively.

Analyzing the distribution of patients depending on the dentition issues showed that Group 1 had equal numbers of those with combined and terminal dentition defects; as for Groups 2 and 3, patients with combined dentition defects prevailed, thus comprising 50% and 44%, respectively.

A clinical examination carried out as part of dynamic follow-up observation 3 months after the dentures were placed revealed that three patients (12.5%) in Group 1 had inflammatory changes of the gingival mucosa at the retainer teeth, which was due to the traumatic effect of the curved part of the wire clammer (0.9±0.3, mild gingivitis according to the gingival index (GI)). An examination in Group 2 helped identify 2 patients (7.7%) with inflammatory changes in the gingival mucosa due to the traumatic effect of the nylon clammer shoulder (0.8±0.04, mild gingivitis, GI). In Group 3, though, the patients could have the dentures developing no issue.

A clinical examination carried out 6 months after placing the dentures showed that 6 patients (25%) of Group 1 developed inflammatory changes of the gingival mucosa at the retainer teeth through the traumatic effect of the clammer (1.1±0.02, moderate gingivitis, GI), and another 8 patients (33.3%) had their dentures not fitting properly to the supporting tissues. A similar examination in Group 2 helped detect 5 patients (19.2%) experiencing marginal periodontal inflammatory changes, which were due to the clammer traumatic effect (1.2±0.02, moderate gingivitis, GI). The patients of Group 3, though, used the dentures with no trouble experienced. A comparison of the average GI values revealed a statistically significant difference for the Fisher criterion $p = 0.0022$; for the Van der Waerden criterion $p = 0.0156$.

A clinical examination performed 1 year into wearing the dentures in Group 1 identified 7 people (29.2%) with inflammatory changes of the gingival mucosa at the retainer teeth (1.5±0.01, moderate gingivitis, GI). Also, four people (16.7%) had dentures fitting improperly the supporting tissues while another patient (4.2%) had the denture cracked at the base. In Group 2, 6 patients (23.1%) had gingival margin inflammation at the retainer teeth (1.7±0.02, moderate gingivitis, GI) with another 6 patients (23.1%) featuring improperly fitting dentures. In Group 3, 5 (20%) patients were found to have their dentures fitting improperly yet none of them had developed gingival margin inflammation at the supporting teeth. A comparison of the average GI values revealed a statistically significant difference for the Fisher criterion $p<0.0001$; for the Van der Waerden criterion $p = 0.0039$.

One more examination, carried out two years after the dentures were installed, showed that 9 patients (37.5%) in Group 1 had gingival margin inflammatory changes at the retainer teeth as a result of the traumatic effect wrought by the clammer curved shoulder (1.98±0.04, moderate gingivitis, GI). Six more patients (25%) had a mismatch between the denture basis and the supporting tissues area, while 2 more of the said group (8.3%) had the denture basis breakage, and another one (4.2%) — a clammer break. An examination in Group 2 showed that 8 people (30.8%) had gingival margin inflammatory changes at the retainer teeth caused by the nylon clammer shoulder (1.9±0.007, moderate gingivitis, GI). Besides, 5 patients (19.2%) had their dentures misfitting the supporting area tissues. Note to be made that 2 patients had lost some of the false teeth out of the denture base. In Group 3, four patients (16%) had a misfit between the denture and the supporting area with another patient having lost false teeth out of the denture. However, no patient was found to have developed any gingival inflammatory change at the retainer teeth. When compared, the average GI index revealed no statistically significant difference, which suggests that the changes were of a similar nature.

Apart from the above, in order to follow the progression of the gingival damage through wearing the removable dentures, we carried out an analysis of the contingency tables for the Interpretation of the GI sign with other signs revealing the quality of the orthopedic treatment. The analysis involved the data obtained through the entire follow-up period. It

showed that the patients of Group 1, wearing acrylic laminar dentures, had the largest number of cases, as well as the severity of gingival inflammatory issues at the retainer teeth, throughout the follow-up. Notable is the fact that through the entire observation period no patient of Group 3, where they were offered modified clammers, developed any respective gingival margin changes. We also found that an increase in the frequency and degree of gingival margin damage caused by the dentures resulted in the patients' poorer subjective assessment of the denture placement performance as well as triggered more complications.

A comparative analysis of the subjective and objective data obtained through the study showed that the patients of Group 3 performed the best in terms of aesthetics, comfort wearing the dentures, and the adjustment time, which was the shortest in their case (9.5±0.2 days; $p<0.0001$ for Fisher and Van der Varden). The two years of follow-up in Group 1 identified 26% of the patients to have gingival inflammatory changes at the retainer teeth due to the damage caused by the clammer curved shoulder, and another 8.3% of the cases with various types of denture breakage. In Group 2, gingival inflammatory changes at the supporting area were to be found in 20.2% of the patients as a result of the traumatic effect from the clammer, and 3.8% cases had their dentures failed. In Group 3, though, the two years of observation revealed no traumatic effect on the gingival mucosa at the supporting teeth, while only 2% of the cases had their dentures broken down.

It should be noted that through the follow-up period, 25% of Group 1 cases needed the denture basis to be relocated; the same procedure was required in Group 2 as well yet in 14.1% of the cases, while in Group 3 it was 12% of the cases only who required this. The comparative data for the degree of tissue atrophy at the prosthetic bed through the entire follow-up can be seen Table 1.

Table 1 shows that the patients in Groups 2 and 3 had a lower degree of atrophy compared to those of Group 1. It was no earlier than 1 year into wearing the dentures that Groups 2 and 3 patients developed a degree of atrophy comparable to that in Group 1 proof to that being the lacking statistical significance of the average difference. Notable here is that the patients of Groups 2 and 3 revealed no significant difference in the atrophy rates through almost all the stages of observation, which indicates a similar pattern of change.

A Pearson correlation analysis was performed in order to evaluate the interrelation between atrophy and other indicators (Table 2).

Table 2 reveals a positively significant correlation between atrophy and GI indices in Groups 1 and 2, which means the progress of atrophic changes due to the damage caused to the gingival margin at the retainer teeth area, and which was not to be observed in patients of Group 3. Also, all the three groups had a positively significant relationship among atrophy processes. This suggests that the atrophic changes in the underlying tissues, regardless of localization, lead to misfit of the denture basis that in turn facilitates atrophy.

The above data stands proof to the fact that regardless of the denture type atrophic changes in the denture supporting tissues will not stop and affect the orthopedic treatment quality. During that, dentures made of thermoplastic polymeric material wrought a more gentle effect on the supporting area tissues and caused a lower degree of atrophy compared with acrylic dentures.

CONCLUSION

As could be seen from the data above, the analysis of treating dentition issues with removable dentures made of thermoplastic polymeric materials helped identify the most significant complications affecting the effectiveness of orthopedic treatment. Talking of removable laminar nylon dentures, major complications included damage to the mucous membrane underlying the clammer at the retainer teeth, which entails impaired aesthetics, worsening in the dentures fixation, and a misfit between the denture basis and the prosthetic bed tissues.

At the same time, when the removable nylon denture construction technology that we proposed was employed, it allowed avoiding complications that the dental alveolar clammer could have had on the gingival mucosa at the retainer teeth, also resulting in a lower need for reconstructing the denture basis (down to 12%), which is 13% and 2.1% below the similar factor in Groups 1 and 2, respectively, and which increases the efficiency of treating dentition issues with nylon polymers-based removable dentures.

REFERENCES

1. Variability of cephalometric parameters of men with orthognathic and direct bites / S.N. Sheludko, L.V. Muzurova, V.V. Konnov, M.V. Mikheeva // Saratov Journal of Medical Scientific Research. – 2014. – Vol. 10, No. 1. – p. 52–55.
2. **Korobkeev, A.A.** Changes in the structural elements of the temporomandibular joint with distal occlusion / A.A. Korobkeev, D.A. Domenyuk, E.G. Vedeshina, V.V. Konnov, O.Yu. Lezhnina, Ya.A. Korobkeeva // Medical news of North Caucasus.

Table 1. *Average values for tissues atrophy at the prosthetic bed through different follow-up intervals*

Observation stage	Group (M ± m)			Wilcoxon criterion		
	1	2	3			
	n=24	n=26	n=25	p*	p**	p***
Atrophy volume (mm^3)						
After 1 day	14.7 ± 0.3	13.6 ± 0.2	13.5 ± 0.2	0.0018	0.0007	0.8842
After 6 months	145.9 ± 4.2	82.3 ± 3.04	81.8 ± 3.2	< 0.0001	< 0.0001	0.9596
After 1 year	196.6 ± 4.6	212.98 ± 4.6	206.2 ± 4.7	0.2657	0.5015	0.2783
After 2 years	302.9 ± 4.3	273.9 ± 4.6	267.6 ± 4.6	0.0002	< 0.0001	0.4606
Atrophy height (mm)						
After 1 day	0.012 ±0.0003	0.0085 ±0.0003	0.008 ±0.0003	< 0.0001	< 0.0001	0.4394
After 6 months	0.49 ± 0.01	0.18 ± 0.003	0.17 ± 0.003	< 0.0001	< 0.0001	0.0308
After 1 year	0.67 ± 0.02	0.52 ± 0.02	0.50 ± 0.02	0.0001	< 0.0001	0.8478
After 2 years	0.79 ± 0.02	0.66 ± 0.03	0.65 ± 0.02	0.0024	0.0008	0.9842

Note: *For Wilcoxon criterion:*
p – difference between Groups 1 and 2; p** – difference between Groups 1 and 3; p*** – difference between Groups 2 and 3.*

Table 2. *Correlation analysis to compare atrophy with the other quantitative indicators*

Quantitative indicators	Groups					
	Group 1		Group 2		Group 3	
	Atrophy volume	Atrophy height	Atrophy volume	Atrophy height	Atrophy volume	Atrophy height
Gingival index (GI)	r = 0.917 p < 0.0001	r = 0.735 p < 0.0001	r = 0.963 p < 0.0001	r = 0.851 p < 0.0001	——	——
Denture fixation index by Ulitovsky & Leontiev	r = 0.900 p < 0.0001	r = 0.919 p < 0.0001	r = 0.873 p < 0.0001	r = 0.853 p < 0.0001	r = 0.822 p < 0.0001	r = 0.810 p < 0.0001
Atrophy volume	——	r = 0.929 p < 0.0001	——	r = 0.933 p < 0.0001	——	r = 0.947 p < 0.0001
Atrophy height	r = 0.929 p < 0.0001	——	r = 0.933 p < 0.0001	——	r = 0.947 p < 0.0001	——

Note: *r – Pearson correlation coefficient; p – statistical significance for Pearson coefficient.*

2017. – Vol. 12. – № 1. – P. 72–76. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12020.

3. **Listopadov MA, Lepilin A.V., Konnov V.V.** Using tomography to diagnose anatomical and topographic changes in the temporomandibular joints in distal occlusion // Saratov Journal of Medical Scientific. – 2011. –T.7., №1. – p. 307–308.
4. Changes in the functional state of the chewing muscles in the treatment of patients with distal occlusion according to electromyography / A.V. Lepilin, V.V. Konnov, M.A. Listopadov, A.R. Arushanyan // Saratov Journal of Medical Scientific Research. – 2010. – V. 6, № 3. – p. 671–674.
5. Methods of examination of patients with pathology of the temporomandibular joints and masticatory muscles / A.V. Lepilin, V.V. Konnov, E.A. Bagaryan, N.A. Batusov // Saratov Journal of Medical Scientific Research. - 2011. – Vol. 7, No. 4. – P. 914–918.
6. Evaluation of the functional status of patients with defects of the upper dentition included / M.V. Afanasov, A.A. Bizyaev, V.V. Konnov, A.Yu. Perunov, S.A. Krechetov // Saratov Journal of Medical Scientific Research. – 2013. – V. 9, № 3. – P. 364–366.
7. Clinical manifestations of the pathology of the temporomandibular joints and masticatory muscles in patients with impaired occlusion of the teeth and dentition / A.V. Lepilin, V.V. Konnov, E.A. Bagaryan, A.R. Arushanyan // Saratov Journal of Medical Scientific Research. – 2010. – Vol. 6, No. 2. – P. 405–410.

8. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
9. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).
10. **Domenyuk D.A., Ilijev D.M., Budaychiev G.M-A., Vedeshina E.G., Dmitrienko S.V.** Optimization of diagnostics and planning of orthodontic treatment of patients with dentofacial anomalies based on the results of morphometric studies of the anterior dental arch. Kubanskij nauchnyj medicinskij vestnik. 2017; 25(5): 14–21. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-5-14-21.
11. Clinical features of temporomandibular joint dysfunction in patients with mesial occlusion complicated by dentition defects / V. Konnov, D. Razakov, S. Salnikova, R. Mukhamedov, E. Pylaev, S. Konnov, V. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 27–32.
12. Clinical image of temporomandibular joint dysfunction in patients with dentition defects complicated with displaced mandible / S.V. Konnov, E.N. Pichugina, V.V. Konnov, A.A. Bizyaev, S.N. Salnikova, A.R. Arushanyan, V.A. Mikailova // Archiv EuroMedica. 2018. T. 8, № 1. C. 42–43.
13. **Dmitrienko S.V., Domenyuk D.A.** Dentoalveolar specifics in children with cleft palate during primary occlusion period // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 33–34.
14. **Domenyuk D., Porfyriadis M., Dmitrienko S.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica. 2018. – T. 8, № 1. – C. 19–24.
15. Functional status of masticatory muscles at occlusion disturbances accompanied with displaced mandible / S.V. Konnov, D.Kh. Razakov, V.V. Konnov, A.R. Arushanyan, R.N. Mukhamedov, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 41–42.
16. Improving odontometric diagnostics at jaw stone model examination / D.A. Domenyuk, A.V. Lepilin, I.V. Fomin, S.V. Dmitrienko // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 34–35.
17. Radiological specifics of temporomandibular joint structure in case of dentition issues complicated with distal occlusion / S.V. Konnov, A.A. Bizyaev, V.V. Konnov, E.V. Pichugina, S.N. Salnikova, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 39–40.
18. Specifics of occlusion disturbances in adults with distal occlusion due to dentition defects / S.V. Konnov, A.R. Arushanyan, V.V. Konnov, D.Kh. Razakov, R.N. Mukhamedov, E.N. Pichugina, V.A. Mikailova // Archiv EuroMedica. – 2018. T. 8, № 1. – C. 40–41.
19. Modern methods of controlling the phonetic adaptation of patients to orthopedic dentures / A.A. Bizyaev, V.V. Konnov, A.V. Lepilin, D.N. Maslennikov, N.D. Bizyaeva // Saratov Journal of Medical Scientific Research. - 2011. –T. 7, No. 2. – p. 474–477.
20. **Bizyaev A.A., Googe L.A., Konnov V.V.** Prosthetics of patients with the absence of the front teeth of the upper jaw, taking into account the angle of inclination of the palatal vault // Russian Dental Journal. – 2008. – №1. – P.24–25.
21. Causes of impaired speech function, depending on the design of bridges of the anterior part of the upper dentition / A.A. Bizyaev, V.V. Konnov, L.V. Muzurova, M.V. Solovyov, N.A. Batusov // Saratov Journal of Medical Scientific Research. – 2010. – Vol. 6, No. 1. – P. 134–136.
22. Cytogenetic effects of orthopedic structures / Polukhina N.V., Durnova N.A., Konnov V.V., Salnikov V.N., Salnikova S.N., Sheremetyeva A.S. // Saratov Medical Journal. – 2012. – V. 8., №2. – p. 300–303.
23. Comparative analysis of clinical and functional adaptation to partial dentures based on nylon and acrylic plastics / V.V. Konnov, M.R. Harutyunyan // Modern problems of science and education. – 2015. – № 3 .; URL: http://science-education.ru/ru/article/view?id=17324 (appeal date: 03/18/2018).
24. Clinical and functional assessment of the use of partial removable laminar prostheses based on polyoxymethylene with retaining clasps and acrylic plastic basis / V.V. Konnov, M.R. Harutyunyan // Modern problems of science and education. – 2015. – № 2–1 .; URL: http://science-education.ru/ru/article/view?id=17383 (appeal date: 03/18/2018).
25. Clinical aspects of the use of clasp prostheses with a metal and polyoxymethylene carcass / V.V. Konnov, M.R. Harutyunyan // Modern problems of science and education. – 2015. – № 5 .; URL: http://science-education.ru/ru/article/view?id=22123 (appeal date: 03/18/2018).
26. Methods of orthopedic treatment of dentition defects (review) / V.V. Konnov, M.R. Arutyunyan // Saratov Journal of Medical Scientific Research. – 2016. – Vol. 12, No. 3. – P. 399–403.
27. Patent for invention No. 2557133 Russian Federation, IPC A61C13 / 007. A method of manufacturing a partial removable nylon prosthesis with periodontal clamps / Konnov VV, Arutyunyan MR, Nagapetyan A.A. – No. 2014125629/14, Appl. 06.24.2014, publ. 07/20/2015, Byul. № 20. – 9 p.
28. **Borodina V.A., Domenyuk D.A., Veisgeim L.D., Dmitrienko S.V.** Biometry of permanent occlusion dental arches - comparison algorithm for real and design indicators // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 25–26.
29. **Davydov B.N., Dmitrienko S.V., Domenyuk D.A., Porfiriadis M.P, Budaychiev G.M.-A.** Results of integrated estimation of the functional state of the dentistry system in patients with physiological occlusion of tooth rows (Part I). The Dental Institute.

2017; 77(4):78–82. (In Russ.).

30. **Davydov B.N., Dmitrienko S.V., Domenyuk D.A., Porfiriadis M.P, Budaychiev G.M.-A.** Results of integrated estimation of the functional state of the dentistry system in patients with physiological occlusion of tooth rows (Part II). The Dental Institute. 2018; 78(1):50–53. (In Russ.).

31. **Domenyuk D.A., Ilijev D.M., Budaychiev G.M-A., Vedeshina E.G., Dmitrienko S.V.** Optimization of diagnostics and planning of orthodontic treatment of patients with dentofacial anomalies based on the results of morphometric studies of the anterior dental arch. Kubanskij nauchnyj medicinskij vestnik. 2017; 25(5): 14–21. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-5-14-21.

32. **Domenyuk D.A., Dmitrienko S.V., Vedeshina E.G., Risovanny S.I., Porfyriadis M.P., Budaychiev G.M-A.** Methods of biometrical diagnostics in transversal direction in patients with mesognathic type of dental arches. Kubanskij nauchnyj medicinskij vestnik. 2017; 24(6): 26–34. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-6-26-34.

33. **Domenyuk D.A., Dmitrienko S.V., Vedeshina E.G., Porfyriadis M.P., Budaychiev G.M-A.** Analytical approach in evaluating the relations of odontometric indicators and linear parameters of dental arcs in people with various face types. Kubanskij nauchnyj medicinskij vestnik. 2018; 25(1): 73–81. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2018-25-1-73-81.

34. **Domenyuk D.A., Porfyriadis M.P., Ilijev D.M., Budaychiev G.M-A., Vedeshina E.G., Dmitrienko S.V.** Dimensional and topographic features of the elements of the temporomandibular joint with mesial occlusion complicated by dentition defects. Kubanskij nauchnyj medicinskij vestnik. 2017;24(4);54–64. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-4-54-64.

35. **Domenyuk D.A., Lepilin A.V., Fomin I.V., Dmitrienko S.V.** Improving odontometric diagnostics at jaw stone model examination // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 34–35.

36. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Efficiency evaluation for integrated approach to choice of orthodontic and prosthetic treatments in patients with reduced gnathic region // Archiv EuroMedica. – 2015. – Vol. 5. – № 2. – P. 6–12.

37. **Domenyuk D.A., Tashueva L.V., Zelensky V.A., Ivancheva E.N.** Evaluation of microvasculature tissues viability after the imposition of removable orthodontic appliances in children and adolescents // Archiv EuroMedica, 2013. – Vol. 3. – № 1. – P. C. 5–9.

38. **Domenyuk, D.A.** Semiquantitative evaluation of caries microflora in patients with dental and alveolar abnormalities and different severity of morphofunctional disturbances / D.A. Domenyuk, E.G. Vedeshina, V.A. Zelensky, K.G. Karakov, M.P. Porfiriadis // Medical news of North Caucasus. 2015. – Vol. 10. – № 3. – P. 238–241. (In Russ.) DOI: 10.14300/mnnc.2015.10055.

39. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, V.V. Konnov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019

40. **Karslieva A.G., Domenyuk D.A., Zelensky V.A.** Mixed saliva trace element composition in children with dentoalveolar anomalies through apparatus-involved treatment // Archiv EuroMedica, 2014. – Vol. 4. – № 1. – P. 29–35.

41. **Lepilin A.V., Fomin I.V., Domenyuk D.A., Dmitrienko S.V.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 37–38.

42. **Shkarin V., Domenyuk D., Lepilin A., Fomin I., Dmitrienko S.** Odontometric indices fluctuation in people with physiological occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 12–18.

43. **Shkarin V.V., Davydov B.N., Domenyuk D.A., Dmitrienko S.V.** Non-removable arch orthodontic appliances for treating children with congenital maxillofacial pathologies – efficiency evaluation // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 97–98.

44. **Vedeshina E.G., Domenyuk D.A., Dmitrienko S.V.** Correlation between shapes and sizes of dentofacial arches and their stable parameters. Kubanskij nauchnyj medicinskij vestnik. 2016;(3):33–38. (In Russ.) DOI:10.25207/1608-6228-2016-3-33-38.

45. **Vedeshina E.G., Domenyuk D.A., Dmitrienko S.V.** Determining torque and angulation of permanent teeth in cases of brachygnathic dental arches depending on dentition type. Kubanskij nauchnyj medicinskij vestnik. 2015;(6):23–30. (In Russ.) DOI:10.25207/1608-6228-2015-6-23-30.

SPECIFIC FEATURES OF THE TEMPOROMANDIBULAR JOINT FUNCTIONAL STATUS IN CASE OF FREE-END EDENTULOUS SPACE BASED ON FUNCTIONOGRAPHIC DATA

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Introduction. Following different types of data, dentition issues in adult patients account for 70 to 90% of cases and are rated among the major etiological factors behind temporomandib-ular pathology [1, 3, 4, 6, 9, 10]. Free-end edentulous space results in more prominent masticatory changes and, in case of lacking due treatment, get complicated with pathologies – both in the temporomandibular joint and in the masticatory muscles [2, 5, 7, 8].

Aim: to study functional changes in the temporomandibular joint and in the masticatory muscles in cases with free-end edentulous space based on functionographic data.

Materials and methods. A survey has been carried out involving 31 patients with free-end edentulous space, aged 40 to 60. All the patients were divided into two groups. Group 1 included 16 people with bilateral free-end edentulous space whereas those of Group 2 (15 persons) had it unilateral.

The temporomandibular joint functional status was evaluated with the Kleinrok-Khvatova functionography method based on the mandible movements oral record performed with a functionography.

Results. An analysis of the functionograms obtained from Group 1 revealed abnormal gothic arch and gothic angle (100–110°). The gothic angle was 91.13 ± 5.27° ($p < 0.05$) and fea-tured asymmetry, change in the length and the sides alignment, a smooth top, and an improper mid-sagittal line of the metal plate. The gothic arch had one or two sides shorter, while the lateral movements were asymmetrical and curved. The occlusion field was asymmetrical. The front oc-clusion movement line was short, curved and did not coincide with the mid-sagittal line of the metal plate.

In Group 2, the gothic angle was 83.13 ± 4.69° ($p < 0.001$), while there was some dis-turbed alignment and side length observed. The angle top was smooth. The gothic arch featured shorter sides (two of them), while the lateral movements were asymmetrical and curved. The occlusion field was asymmetrical. The conventional occlusion point identified aside from the mid-sagittal line of the metal plate. The lower jaw's anterior occlusion movement demonstrated a change in the course as well as a longer path.

Conclusions. The above-said means that patients with free-end edentulous space revealed disturbed values pertaining to the gothic arch and the gothic angle. In Group 2, the issues were much more prominent compared to the other group. This can be explained by the fact that in case of bilateral free-end edentulous space, the posterior mandible displacement is accompanied with a more symmetrical shift of the mandible heads within the mandibular fossa, while in case of unilateral free-end edentulous space it is asymmetrical shift of the mandible heads that prevails.

REFERENCES

1. **Domenyuk D.A., Porfyriadis M.P., Dmitrienko S.V.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 2. – P. 19–24.
2. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.
3. Functional status of masticatory muscles at occlusion disturbances accompanied with displaced mandible / S.V. Konnov, D.Kh. Razakov, V.V. Konnov, A.R. Arushanyan, R.N. Mukhamedov, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 41–42.
4. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
5. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).

6. **Korobkeev, A.A.** Changes in the structural elements of the temporomandibular joint with distal occlusion / A.A. Korobkeev, D.A. Domenyuk, E.G. Vedeshina, V.V. Konnov, O.Yu. Lezhnina, Ya.A. Korobkeeva // Medical news of North Caucasus. 2017. – Vol. 12. – № 1. – P. 72–76. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12020.

7. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.

8. **Lepilin A.V., Fomin I.V., Domenyuk D.A., Dmitrienko S.V.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 37–38.

9. Radiological specifics of temporomandibular joint structure in case of dentition issues complicated with distal occlusion / S.V. Konnov, A.A. Bizyaev, V.V. Konnov, E.V. Pichugina, S.N. Salnikova, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 39–40.

10. **Shkarin V., Domenyuk D., Lepilin A., Fomin I., Dmitrienko S.** Odontometric indices fluctuation in people with physiological occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 12–18.

ANATOMICAL FEATURES DETERMINING THE OPTIMAL INCLINATION ANGLE OF THE FRONT TEETH PALATAL FACETS

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Introduction. Dentition defects are among the main causes behind maxillofacial functional disorders, which lead to dentition and occlusion deformations, morphological changes in the temporomandibular joints as well impaired chewing, speech articulation and the aesthetics [1, 4, 6, 8, 9]. Localizing such defects in the upper jaw anterior area poses considerable difficulties when modeling prosthetic teeth, namely, recreating the inclination of the upper anterior teeth palatal facets in order to restore the aesthetics, speech, the sagittal incisor path, and an optimal dentition opening related to the temporomandibular joint function [2, 3, 5, 7, 10].

Aim of study — to identify anatomical features determining the optimal inclination angle of the front teeth palatal facets at upper anterior bounded edentuous space.

Materials and methods. We examined 150 people, aged 19–25, with intact dentition and orthognathic occlusion. Anatomical impressions were obtained and jaw cast models made where the inclination angles were measured for the alveolar, middle and palatal third of the anterior part of the palatal vault, as well as the inclination angles of the upper jaw anterior teeth palatal facets. The measurements were taken with a respectively developed device (useful model patent of the Russian Federation, #53141) following the method of determining the inclination angles of the upper jaw front teeth palatal facets when designing dentures. To measure the angle determining the palatal vault inclination and the anterior teeth palatal facets inclination, the ratio was determined for the palate height at the intercanine level line to the distance from the intercanine line to the central incisors.

Results. The cast models were used to identify and mark the point of palatal vault greatest depth perpendicular to the point of the median palatine suture intersects with a line drawn at the level of the alveolar process tops between the second premolars and the first molars. A strip of foil was put from this point to the top of the incisor papilla, which helped determine the anterior palatal vault length. This length was divided into three equal parts — alveolar, middle and palatal.

The study revealed that the inclination angle of the front teeth palatal facets varied from 34° to 55°, whereas the inclination angle of the mid-third of the anterior palatal vault was equal to the palatal facets inclination angle of the anterior teeth with an average precision of 84%, and ranged from 32° to 57 ± 2°.

This means that restoring the angle of the denture mid-part inclination towards the horizontal plane, which is equal to the inclination angle of the mid-third of the palatal vault anterior part, we will recover the optimal conditions for correct speech articulation and aesthetics, which will prompt the patient's adjustment to the denture.

Conclusions. The above allows concluding that the palatal facets inclination angle of the front teeth is equal to the inclination angle of the anterior

palatal vault mid-third. The data obtained concerning the inclination will play a decisive role when developing individual cast models to design the palatal surface of a fixed dental prosthesis. The technique in question allows employing fixed dentures to obtain optimal and reliable parameters for restoring the upper front teeth in case part or all of them are missing. The obtained data are valid for an orthognathic occlusion with no transversal or sagittal issues.

REFERENCES

1. **Domenyuk D.A., Porfyriadis M.P., Dmitrienko S.V.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 2. – P. 19–24.
2. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.
3. Clinical features of temporomandibular joint dysfunction in patients with mesial occlusion complicated by dentition defects / V. Konnov, D. Razakov, S. Salnikova, R. Mukhamedov, E. Pylaev, S. Konnov, V. Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – p. 27–32.
4. Radiological specifics of temporomandibular joint structure in case of dentition issues compli-cated with distal occlusion / S. Konnov, A. Bizyaev, V. Konnov, C. Pichugina, S. Salnikova, A. Khodorich, V. Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – p. 39–40.
5. Specifics of occlusion disturbances in adults with distal occlusion due to dentition defects // S. Konnov, A. Arushanyan, V. Konnov, D. Razakov, R. Mukhamedov, C. Pichugina, V. Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – p. 40–41.
6. Functional status of masticatory muscles at occlusion disturbances accompanied with displaced mandible / S. Konnov, D. Razakov, V. Konnov, A. Arushanyan, R. Mukhamedov, A. Khodorich, V. Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – p. 41–42.
7. Clinical image of temporomandibular joint dysfunction in patients with dentition defects issues complicated with displaced mandible / S. Konnov, C. Pichugina, V. Konnov, A. Bizyaev, S. Salnikova, A. Arushanyan, V. Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – p. 42–43.
8. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
9. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).
10. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.

THE FUNCTIONAL STATUS OF MASTICATORY MUSCLES AT DISPLACED MANDIBLE BASED ON ELECTROMYOGRAPHIC DATA

S. Konnov, A. Arushanyan, E. Pichugina, N. Bulkina, V. Konnov, M. Vorobyeva

Introduction. The functional status of the temporomandibular joint and masticatory muscles depends on the dentition integrity, on the type of dentures used to compensate for the dentition issues, on the type and nature of the respective occlusion disorders, and on the degree of complications, the most severe of them being a displaced mandible [1, 2, 5, 8, 10]. One of the reliable methods for assessing masticatory muscles functional disorders is electromyographic examination [3, 4, 6, 7, 9].

Aim of study — to investigate electromyographic data obtained through studying mastica-tory muscles in adult patients featuring dentition issues complicated with a displaced mandible.

Materials and methods. We carried out electromyographic examination of the masticatory muscles in 60 patients (aged 30 to 55) suffering from dentition issues complicated with posterior mandible dislocation. The patients were divided into two groups. Group 1 included 30 patients who had had the pathology for more than a year, while the other group includ-

ed patients whose history of the disorder was under one year. The control group included 19 persons with orthognathic occlusion with neither dentition defects nor dentures. The masticatory muscles biopotential was evaluated through the surface electromyography method on a Neuromian model 4 01 device. The electromyographic study of the masticatory, temporal and suprahyoid muscles was performed while the mandible remained in the physiological rest position, as well as in the state of conventional occlusion of the teeth.

Results. Based on the electromyographic data, the control group patients' masticatory muscles featured coordinated work with no sign of spontaneous activity at rest. At the conventional occlusion, the biopotentials amplitude indices for the masticatory muscles were 601.36 ± 11.21 μV; for the temporal muscles — 419.76 ± 4.09 μV, and for suprahyoid — 406.48 ± 9.71 μV. The electromyographic data for the main group showed a decrease in the biopotentials amplitude for the masticatory and temporal muscles down to 349.48 ± 7.85 μV ($p < 0.01$) and 289.23 ± 3.11 μV ($p < 0.001$), as well as an increase of these indicators for suprahyoid muscles up to 498.89 ± 5.71 ($p < 0.05$). The patients of Group 2 had their masticatory and temporal muscles amplitudes decreased to 543.63 ± 4.71 μV ($p < 0.01$) and 379.12 ± 9.11 μV ($p < 0.05$), whereas an increase was observed for the suprahyoid muscles (up to 448.96 ± 7.65 μV; $p < 0.05$). When in the state of relative physiological rest, the mandible electromyography showed some spontaneous activity in the masticatory muscles, which was up to 110 μV, while chewing resulted in a disturbed rhyth-mic phase change.

Conclusions. Given the above, the electromyographic examination of adult patients with dentition issues complicated with posterior mandible dislocation revealed a decreasing biopotentials amplitude for the masticatory and temporal muscles; the biopotentials amplitude for the suprahyoid muscles featured an increase at compressed dentition, while a longer history of the pathology and lack of due treatment resulted in greater alterations in the masticatory muscles.

REFERENCES

1. **Domenyuk D.A., Porfyriadis M.P., Dmitrienko S.V.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 2. – P. 19–24.
2. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.
3. Clinical features of temporomandibular joint dysfunction in patients with mesial occlusion complicated by dentition defects / Valery Konnov, Damir Razakov, Svetlana Salnikova, Rustam Mukhamedov, Edward Pylaev, Sergey Konnov, Vezifa Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – P. 27–2.
4. Radiological specifics of temporomandibular joint structure in case of dentition issues compli-cated with distal occlusion / Sergey Konnov, Alexey Bizyaev, Valery Konnov, Catherine Pichugina, Svetlana Salnikova, Angelica Khodorich, Vezifa Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – P. 39–40.
5. Specifics of occlusion disturbances in adults with distal occlusion due to dentition defects // Sergey Konnov, Anoush Arushanyan, Valery Konnov, Damir Razakov, Rustam Mukhamedov, Catherine Pichugina, Vezifa Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – P. 40–41.
6. Functional status of masticatory muscles at occlusion disturbances accompanied with displaced mandible / Sergey Konnov, Damir Razakov, Valery Konnov, Anoush Arushanyan, Rustam Mukhamedov, Angelica Khodorich, Vezifa Mikailova // Archiv EuroMedica. – 2018. – vol. 8. – num.1. – P. 41–42.
7. Clinical image of temporomandibular joint dysfunction in patients with dentition defects issues complicated with displaced mandible / Sergey Konnov, Catherine Pichugina, Valery Konnov, Alexey Bizyaev, Svetlana Salnikova, Anoush Arushanyan, Vezifa Mikailova // Archiv euromedica. – 2018. – vol. 8. – num.1. – P. 42–43.
8. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of denti-tions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
9. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the tem-poromandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).
10. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.

TOPOGRAPHY CHANGES IN THE TEMPORO-MANDIBULAR JOINT IN EDENTUOUS MOUTH

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Introduction. Complete loss of teeth leads to a change in the jaws spatial ratio, including the development of senile progeny. This condition can include either distal or mesial shift of the mandible, which is accompanied with certain structural changes in the temporomandibular joint topography [1–5]. Even though mesial mandible shift is far less common in clinical practice, still the respective issues involving diagnostics and treatment remain relevant since a combination of facial and intraoral signs revealing a mesial shift, as well as thus induced functional disorders, require a comprehensive approach to treatment and following up on the cases.

Aim of study: to identify the temporomandibular joint topography features in edentuous patients, which is also accompanied with the mandible mesial shift.

Materials and methods. We carried out a comprehensive examination and treatment of 24 edentuous patients, whereas the condition was accompanied with the mandible mesial shift. The comparison group included 32 patients with dentition defects yet without the lower jaw shift. All patients underwent temporomandibular joint tomography performed on a universal X-ray unit ORTHOPHOS 3 (SIEMENS). The obtained data was analyzed followed the method we proposed for analyzing temporomandibular joint zonograms.

Results. The zonogram analysis showed that the comparison group patients had the mandibular joint space equal to 2.4 ± 0.3 mm in its anterior part; 3.2 ± 0.6 mm in the upper section; and 3.8 ± 0.2 mm in the posterior part. The tomogram analysis carried out in the main group revealed a joint space narrowing up to 1.1 ± 0.4 mm ($p < 0.05$) in the anterior part, whereas in its upper section there was a widening noted (up to 4.8 ± 0.7 mm; $p < 0.001$), as well as in the posterior section (up to 5.4 ± 0.5 mm; $p < 0.05$).

All the patients of the main group first used removable laminar dentures for 3–4 months in order to improve the topographic interaction in the temporomandibular joint structure, which allowed gradual recovery in the interalveolar distance and the lower face height; restoring the canine guidance and balanced occlusion; reproducing the specified mandibular movements (right and left), which in turn facilitated coordinating the masticatory muscles and temporomandibular joint function. Further on, all the patients were given removable orthopedic dentures in a constructive occlusion controlled via tomography.

Following the treatment, tomographic images were taken again for the temporomandibular joint. An examination of these showed that the width of the joint space in the anterior section was 2.1 ± 0.5 mm ($p < 0.001$), in the upper section — 3.5 ± 0.4 mm ($p < 0.01$), whereas in the posterior section it was 4.1 ± 0.6 mm ($p < 0.001$).

Conclusions. The above means that edentuous patients who also feature the mandible mesial shift, have certain topographic changes in the temporomandibular joint — narrowed joint space in the anterior section and its widening in the upper and posterior sections. Orthopedic treatment allows improving the ratio between the temporomandibular joint parts as well as ensuring proper occlusion pattern while using removable dentures.

REFERENCES

1. **Domenyuk D.A., Porfyriadis M.P., Dmitrienko S.V.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 2. – P. 19–24.
2. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.
3. Functional status of masticatory muscles at occlusion disturbances accompanied with displaced mandible / S.V. Konnov, D.Kh. Razakov, V.V. Konnov, A.R. Arushanyan, R.N. Mukhamedov, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 41–42.
4. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
5. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).

6. **Korobkeev, A.A.** Changes in the structural elements of the temporomandibular joint with distal occlusion / A.A. Korobkeev, D.A. Domenyuk, E.G. Vedeshina, V.V. Konnov, O.Yu. Lezhnina, Ya.A. Korobkeeva // Medical news of North Caucasus. 2017. – Vol. 12. – № 1. – P. 72–76. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12020.

7. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.

8. **Lepilin A.V., Fomin I.V., Domenyuk D.A., Dmitrienko S.V.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – P. 37–38.

9. Radiological specifics of temporomandibular joint structure in case of dentition issues compli-cated with distal occlusion / S.V. Konnov, A.A. Bizyaev, V.V. Konnov, E.V. Pichugina, S.N. Salnikova, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – P. 39–40.

10. **Shkarin V., Domenyuk D., Lepilin A., Fomin I., Dmitrienko S.** Odontometric indices fluctuation in people with physiological occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – P. 12–18.

X-RAY SPECIFICS OF THE TEMPOROMANDIBULAR JOINT IN PATIENTS WITH FREE-END EDENTUOUS SPACE

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Introduction. The temporomandibular joint (TMJ) is the most important part of the dentition. In case left untreated, free-end dentition issues may get complicated with a mandibular posterior displacement as well as lead to morphological and functional changes in the TMJ [1, 3, 6, 7, 10].

The topography of the temporomandibular bone elements is an important criterion determining the choice of the complex treatment to be administered to patients with impaired occlusion relations in the teeth and dentition complicated with a displaced mandible. The mandible head displacement range is determined at the stage of developing a constructive occlusion controlled with tomograms and in view of its location in the temporal bone's mandibular fossa [2, 4, 5, 8, 9].

Aim of study. — to use X-ray data to study the anatomical and topographic features of the TMJ in patients with free-end dentition issues.

Materials and methods. The study involved 59 patients with free-end edentuous space who were divided into two groups. Group 1 included 29 patients with free-end dentition issues and with no mandible displacement, while Group 2 was comprised of 30 patients with displaced mandible.

To ensure objective evaluation of the TMJ bone elements, lateral tomography (by N.A. Ryabuhina) was used. Following this technique, determining the Frankfurt horizontal plane on the TMJ lateral tomogram was followed with identifying the mandible head shape, the depth of the temporal bone mandibular fossa, the articular tubercle height, the angle of its posterior ramp towards the horizontal line, as well as the joint space width.

Results. In Group 1, the TMJ zonograms showed that 53.3% of the patients had the mandible head of ovoid shape; 33.4% of the cases had it club-shaped, with it being cylindrical in another 13.3% of the patients. In the other group, however, the predominant shapes were cylindrical (39.3%) and club-shaped, which accounted for 37.9%. Only 22.8% of the patients in Group 2 were found to have ovoid-shaped mandible head. The mandible head was of the same shape bilaterally (the left and the right sides) in 69.7% of the patients, whereas only in 30.3% of the patients had their two mandibular sides different.

The mandible head width in Group 1 was 10.91 ± 0.61 mm on the right side and 11.20 ± 0.71 mm on the left. In Group 2, this value was 10.59 ± 0.59 mm and 10.81 ± 0.73 mm, respectively. The patients in Group 1 had the articular tubercle height at 11.92 ± 0.25 mm on the right and 11.92 ± 0.27 mm on the left. In Group 2, the height of the articular tubercle on the left side was 10.01 ± 0.43 mm, while on the right side it was 10.79 ± 0.85 mm. The angle of the temporal bone articular tubercle posterior ramp towards the line drawn from the articular tubercle apex to the lower edge of the auditory canal was 60.32 ± 1.7° on the right and 60.93 ± 1.30° on the left in patients of Group 1, while in Group 2 it was 60.00 ± 2.65° and 59.80 ± 2.97°, right and left, respectively.

The bone tissue structure in the temporal articular tubercle revealed no significant difference when compared in the two groups. The joint space, which is a projection of the articular disc and that of the articular surface cartilage, had a shape of a clearly outlined irregular arch. In Group 1, the anterior joint space was 2.51 ± 0.2 mm on the right and 2.32 ± 0.19 mm on the left; the posterior joint space was 4.81 ± 0.2 mm on the right and 4.91 ± 0.22 mm on the left. The posterior joint space exceeded the anterior one 0.49 ± 0.04 times on the left and 0.51 + 0.05 on the right. When examining the tomographic images in Group 2, we could see that the right-side posterior joint space was 4.3 ± 0.52 mm, while its left counterpart was 4.72 ± 0.91 mm; the anterior joint space was 3.90 ± 0.28 mm and 3.75 ± 0.21 mm on the right and left, respectively. The distance from the mandibular fossa bottom to the top of the mandible head was 5.81 ± 0.53 on the right and 5.24 ± 0.84 mm on the left side.

Conclusions. The lateral tomograms revealed that free-end dentition issues with a displaced mandible result in anatomical and topographic changes in the TMJ — shortening in the articular tubercle height; narrowed mandible head; joint space reduction in its posterior part, and its widening in the anterior part; as well as an impaired symmetry of the mandible heads location.

REFERENCES

1. **Domenyuk D.A., Porfyriadis M.P., Dmitrienko S.V.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 2. – P. 19–24.
2. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.
3. Clinical image of temporomandibular joint dysfunction in patients with dentition defects complicated with displaced mandible / S.V. Konnov, E.N. Pichugina, V.V. Konnov, A.A. Bizyaev, S.N. Salnikova, A.R. Arushanyan, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – P. 42–43.
4. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of denti-tions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
5. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).
6. **Korobkeev, A.A.** Changes in the structural elements of the temporomandibular joint with distal occlusion / A.A. Korobkeev, D.A. Domenyuk, E.G. Vedeshina, V.V. Konnov, O.Yu. Lezhnina, Ya.A. Korobkeeva // Medical news of North Caucasus. 2017. – Vol. 12. – № 1. – P. 72–76. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12020.
7. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, L.D. Weisheim, V.V. Konov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019.
8. Prevalence of temporal-mandibular joint pain dysfunction syndrome among students of the Saratov State Medical University named after VI Razumovsky / E.N. Pichugin, D.H. Razakov, N.N. Pichugina, E.S. Popko, D.A. Domenyuk, V.A. Mikayilova // Journal of Scientific Articles Health and Education in the XXI Century. – 2017. – Vol. 19, No. 10. – P. 120–122.
9. Radiological specifics of temporomandibular joint structure in case of dentition issues compli-cated with distal occlusion / S.V. Konnov, A.A. Bizyaev, V.V. Konnov, E.V. Pichugina, S.N. Salnikova, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – P. 39–40.
10. The effectiveness of orthopedic methods of treatment of patients with dentition defects complicated by distal occlusion depending on the topographic features of the temporomandibular joint / V.V. Konnov, E.N. Pichugin, A.R. Arushanyan, A.A. Bizyaev, V.A. Mikayilova // Modern orthopedic dentistry. – 2017. – № 28. – P. 39–41.

THE CONSTRUCTION PECULIARITIES OF ARTIFICIAL DENTAL ARCHES OF FULL REMOVABLE PROSTHESIS WITH USING OF TEETH MODELS AND ALVEOLAR ARCHES

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ABSTRACT — The aim of the study was to substantiate the method of setting artificial teeth according to the models corresponding to the gnathic and dental types of the face. This study included two main stages. First of all, the results of a study of patients in the comparison group were analyzed, which included 287 patients with physiological occlusion of permanent teeth. The main group included 27 elderly people with a complete absence of teeth. Considering the complexity of measuring the depth of the dental arch, we used mathematical calculations to determine it. The Huygens formula was used which showed the relationship between the height of the segment and the length of the arc and chord. Nine basic variants of comparison the dental models and alveolar arches were offered. To people with mezognathic microdontal types of dental arches the models of small arches with an inter-arches distance of 4 mm were recommended. In the dolichognathic microdontal type, the narrow arches are used with a distance between the central points of the patterns of 6 mm, and with dolichognathy and normodentism, the distance between them is 9 mm. The average size of the arches models with a distance of 4 mm between them is recommended for people with a brachygnathy and dental microdentism, with a 6 mm gap for mezognathic normodontal types, and 9 mm for dolichognathic macrodontal types of dental arches.

KEYWORDS — odontometry, the research methods of dental arches, craniometry, the defects of dentition.

INTRODUCTION

The issues of setting artificial teeth in making the removable prostheses for patients are devoted a sufficient importance in the specialized literature. The specialists pay a particular attention to the individual morphological features of the maxillofacial area in different age periods [3, 4]. The methods of selecting the artificial tooth sizes by diagonal facial dimensions are shown and dental and interdental indexes are established [2, 10, 12]. The sexual and racial features of dental arches in people with physiological occlusion have been established, which can be used for prosthetic and orthodontic treatment [20].

Nevertheless, the choice of the designed shape of the dental arch requires the detailed analysis. At present time, the relationship between the size of the face and the parameters of the dental arches has been convincingly proved, which is important in the orthopedic dentistry and orthodontics clinic when choosing methods of treatment [9]. The patterns of dental arches are proposed to determine the dimensions of metal arches depending on the gnathic type of the face. From the entire variety of dental arches sizes, three main patterns were defined. The metal arches of large sizes are recommended to be used in the treatment of people with mezognathic macrodontal, brachygnathic normo- and marodontal types of dental arches, the width of which is more than 62 mm in the place of second molars [6, 16, 17].

With the complete absence of teeth, the main guideline for setting artificial teeth is the alveolar arch. It should be noted that the dimensions of the alveolar arches have been studied by researchers in people with physiological occlusion and their correlation with the parameters of the dental arches has been shown [18]. An important factor in the setting of artificial teeth is an incline of teeth in the vestibular-lingual direction (torques or angles of inclination) [5, 7, 8]. Changes in the shape of dental arches are determined in people with anomalies of occlusion, which requires the additional methods of diagnosis and determination of the location of the key teeth [1, 11, 13, 15, 19]. The necessity and effectiveness of using X-ray methods of investigation in people with defects of dental arches is shown [14].

Thus, the analysis of the literature showed that each gnathic type of face corresponds to the same types of dental and alveolar arches. At the same time, the different values of torques of the medial incisors do not allow the combination of arched patterns in the construction of artificial dental arches. The additional researches are required to determine the distance between the central points of the dental and alveolar arches, depending on the facet type.

The aim

The substantiation of the technique of setting artificial teeth according to the patterns corresponding to gnathic and dental types of face.

Materials and research methods

This study included two main stages. First of all, the results of a study of patients in the comparison group were analyzed, which included 287 patients with physiological occlusion of permanent teeth. The main group included 27 elderly people with a complete absence of teeth.

All patients under morphometry of the face were measured two basic sizes: the width and the diagonal of the face. The width of the distal section was measured between the tragus points located at the top of the tragus of the auricle (t-t). The diagonal of the face was measured from the tragus point to the subnasal (low-nosed) point (t-sn).

Taking into account the received data, the type of face was determined. The diagonal dimensions of the face were the indicators of the dental type. The dimensions of diagonals from 122 to 130 mm on both sides of the face were characteristic of normodontic facial types and corresponded to the normodont type of the dental system. The change in the indicator to a smaller or larger side made it possible to classify a person's type as a micro- or a macro-type, respectively. The gnathic index of the face was determined by the gnathic index. At the same time, the arithmetic meaning was determined from the diagonals of the right and left sides, the percentage of which to the width of the distal part of the face with the obtained numerical values from 83 to 93 characterized the mezognathic type of face. The value of the gnathic index more than 93 was found with people of dolichongnathic type, and with a decrease in the index, the brachygnathic type of face was determined, which agrees with the literature data.

With physiological occlusion, facial types, as a rule, corresponded to the types of dental arches, which allowed us to distinguish three basic forms: narrow, medium and wide. Narrow dental arches predominated in people with mezognathic microdontal, and dolichognathic normo- and micro-dental types of dental arches. Wide dental arches were defined in people with mesognathic macrodont, brachygnathic normo- and macrocondal type of dental arches. With mezognathic normodontic, dolichognathic macrodontal and brachynagic microdontal types of dental arches, their shape approximated to the average size.

A study on gypsum models of the jaws was conducted in people's comparison group, in order to develop patterns of dental and alveolar arches. The odontometry was performed according to the generally accepted methods in odontology and dentistry. Vestibular-lingual and mesial-distal dimensions of tooth crowns were measured. The length of the dental arch was calculated as the sum of the width of the crowns of 14 teeth. The length of the anterior section of the dental arch was determined by the sum of 6 anterior teeth.

The sizes of dental and alveolar arches were estimated. Transverse parameters were measured between fangs and second molars. The diagonal measurements in the anterior part were estimated from the distance from the intercutter point to the point located on the tearing tubercle of the fang from the vestibular side near the occlusal contour of the crown (the junction of the dental arch of the anterior and lateral sections).

Studying the alveolar arches, the measuring points were placed from the lingual (palatine) surface in the interdental spaces. The linear parameters of the alveolar arches were measured in the same way as in the dental arches (Fig. 1).

Taking into consideration the complexity of measuring the depth of the dental arch, we used mathematical calculations to determine it. The Huygens formula was used, which shows the relationship between the height of the segment and the length of the arch and chord. As applied to the dental arch, the formula looked like this:

$$D_{1\text{-}3} = \sqrt{[(9 \cdot L^2)+(6 \cdot L \cdot W_{3\text{-}3})-(15 \cdot W_{3\text{-}3})]}/64,$$

where $D_{1\text{-}3}$ — the depth of the arch; L — the length of the arch (the sum of the teeth sizes); $W_{3\text{-}3}$ is the width of the arch in the fang area.

The obtained data served as the main reference for the construction of a circle for the location of the front teeth. In accordance with the law of circle geometry, its diameter determined the ratio of the length of the segment chord to the sinus of the central angle. In our case, the chord was the width of the dental arch in the fang area, and the value of the central angle corresponded to the double arctangent of the ratio of the arch depth to its width (circle diameter = $W_{3\text{-}3}$ / sin α; here, $\alpha = 2 \cdot \text{arctg}\, D_{1\text{-}3}/W_{3\text{-}3}$).

The circumference was the basis for designing the individual shape of the arch (dental or alveolar). After the construction of the circle, the positions of the fangs were determined on both sides of the central point of the arch by a distance that is equal to the frontal-fang diagonal. On the continuation of the diameter of the circle, a value equal to the depth of the arch was plotted. From the showed point on both sides the segments were laid, in combination, corresponding to the width of the arch in the molars area. The locations of the fangs and molars were joined by straight lines, from the middle of which the perpendicular lines were constructed, the size of which was the sum of the width and the diagonal of the dental arch. From the obtained points, the points of the fangs and molars were connected by a divider (Fig. 2).

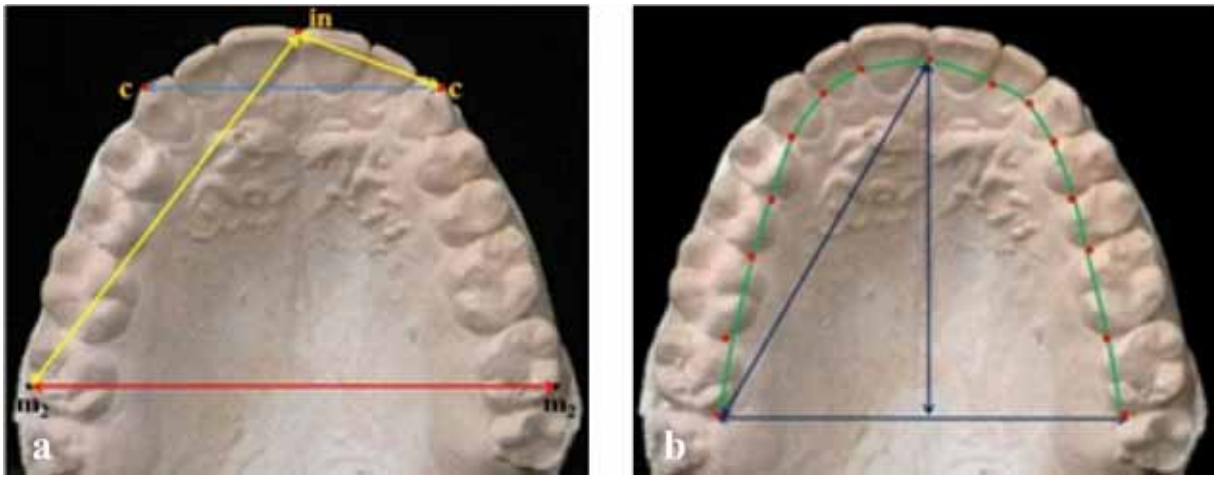

Fig.1. Linear parameters and measuring points for the biometrics of the dental arch (a) and the alveolar arch (b)

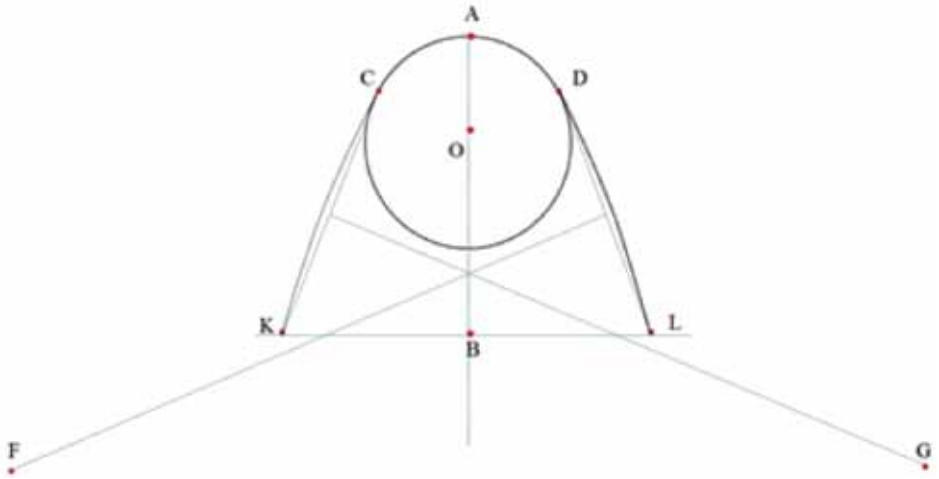

Fig.2. The individual dental arch, built by mathematical modeling

Using the method of cone-beam computed tomography the distance between the central points of the dental and alveolar arch was determined by the method. In this case, the perpendicular to the occlusal plane was lowered from the location of the alveolar arch in the region of the medial incisors and the distance from the intersection of these lines to the vestibular surface of the occlusal contour of the incisor was measured.

The statistical processing of data was carried out on a personal computer using a generally accepted software package.

RESULTS AND DISCUSSION

The results of the study of patients in the comparison group and the biometry of gypsum models of the jaws, taking into account the forms distinguished by us, are presented in Table 1.

Unreliable differences in the indexes were revealed by such an indicator as the depth of the alveolar arch, which is explained by the same reasons as in the analysis of dental arches.

The obtained sizes of dental and alveolar arches allowed us to make templates of three kinds, which we used to construct artificial dental arches.

For comparing the two templates the great importance has an inter-arch distance. The analysis of the measurements carried out on the images of the cone-beam computer tomogram showed three main variants, caused by the values of the angle of inclination (torques) of the cutters. The high values of torques were found in people with mezognathic macrodontal, dolichognathic normo- and macrodontal types of dental arches. In these cases, the distance between them was 9.0 ± 1.0 mm. The low values

Table 1. *The main parameters of dental arches (in mm), taking into account their shape*

The main parameters of alveolar arches	Sizes of alveolar arches (in mm) with the form:		
	narrow	medium	wide
The length of anterior alveolar arch	39,66 ± 0,32	41,41 ± 0,36	44,00 ± 0,41
The width of anterior alveolar arch	29,67 ± 0,24	32,16 ± 0,26	35,72 ± 0,32
The depth of anterior alveolar arch	13,17 ± 0,37	13,47 ± 0,39	14,00 ± 0,41
The radius of anterior alveolar arch	14,88 ± 0,21	16,81 ± 0,23	18,74 ± 0,25
The length of complete alveolar arch	102,62 ± 0,98	108,16 ± 1,01	110,98 ± 1,19
The width of complete alveolar arch	45,84 ± 0,41	47,44 ± 0,47	52,40 ± 0,52
The depth of complete alveolar arch	42,86 ± 0,37	43,79 ± 0,39	43,12 ± 0,42
The diagonal of complete alveolar arch	48,61 ± 0,29	49,82 ± 0,41	50,47 ± 0,35

of torques were found in people with mezognathic microdontal, brachignathic normo- and microdontal types of dental arches. The inter-arch distance was 6.0 ± 1.0 mm. The standard values of torques were with mezognathic normodont, dolichognathic microdontal and brachignathic macrodontal types of dental arches and the distance between them was 4.0 ± 1.0 mm.

The variants of the distance between the teeth with different inclinations of teeth are shown in Fig. 3.

The proposed models were recommended for setting artificial teeth in the articulator and used by the dentist during the testing of the laboratory stages of manufacturing the prosthetic construct (Fig. 5).

CONCLUSION

Thus, 9 basic variants of comparison of dental and alveolar arches models were offered. In people with mezognathic microdontal types of dental arches, the models of small arches with an inter-arch distance of 4 mm were recommended. In the dolichognathic microdontal type, narrow arches are used with a distance between the central points of the patterns of 6 mm, and with dolichognathic and normodontism, the distance between them is 9 mm. The average size of the arch models with a distance of 4 mm between them is recommended for people with brachygnathy and dental microdontism, with a 6 mm gap for mezognathic normodontal types, and 9 mm for dolichognathic macrodontal types of dental arches. Wide models of arches with short distances were used in the prosthetics of people with brachygnathic normodontal type of face. With brachygnathic macrodontal facial type, a distance of 6 mm is recommended, and for the mezognathic face type the distance is 9 mm.

REFERENCES

1. **Borodina V.V., Domenyuk D.A., Weisheim L.D., Dmitrienko S.V.** Biometry of permanent occlusion dental arches – comparison algorithm for real and design indicators // Archiv EuroMedica. 2018. V. 8. № 1. P. 25–26.
2. **Gorelik E.V., Dmitrienko S.V., Izmailova T.I., Krayushkin A.I.** Features of craniofacial complex in different age periods // Morphology. 2006. № 4. P. 39.
3. **Dmitrienko S.V., Ivanov L.P., Milikevich V.Yu., Lobodina L.A.** Classification of defects in dentition in children and methods of orthopedic treatment // Stomatology. 1994. № 4. P. 61.
4. **Dmitrienko S.V., Ivanov L.P., Sorokoumova G.V.** The impact of baby teeth with caries and the necessity for preventive prosthetics of preschool children with functional disorder of the stomach // Stomatology. 1999. № 3. P. 37.
5. **Dmitrienko S.V., Krayushkin A.I., Dmitrienko D.S., Efimova E.Yu.** Topographic and anatomical features of the structure of bone tissue of the incisive-mandibular segments // Stomatology. 2007. P. 86. № 6. P. 10–12.
6. **Dmitrienko S.V., Domenyuk D.A., Kochkonyan A.S., Karslieva A.G., Dmitrienko D.S.** Modern classification of dental arches // Archiv EuroMedica, 2014. V.4. № 2. P. 14–16.
7. **Dmitrienko S.V., Domenyuk D.A., Kochkonyan A.S., Karslieva A.G., Dmitrienko D.S.** International between sagittal and transversal sizes of maxillary dental arches // Archiv EuroMedica, 2014. V.4. № 2. P. 10–13.
8. **Dmitrienko S.V., Domenyuk D.A., Vedeshina E.G.** Shape individualization in lower dental arches drawn on basic morphometric features.// Archiv EuroMedica, 2015. V. 5. № 1. P. 11.
9. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Efficiency evaluation for integrated approach to choice of orthodontic and prosthetic treatments in patients with reduced gnathic region // Archiv EuroMedica. 2015. V. 5. № 2. P. 6–12.
10. **Domenyuk D.A., Vedeshina E G., Dmitrienko S.V.** Correlation of dental arch major linear parameters and odontometric indexes given physiological occlusion of permanent teeth in various face types // Archiv EuroMedica. 2016. V. 6. № 2. P. 18–22.
11. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Mistakes in Pont (Linder-Hart) method used for diagnosing abnormal dental arches in transversal plane // Archiv EuroMedica. 2016. V. 6. № 2. P. 23–26.

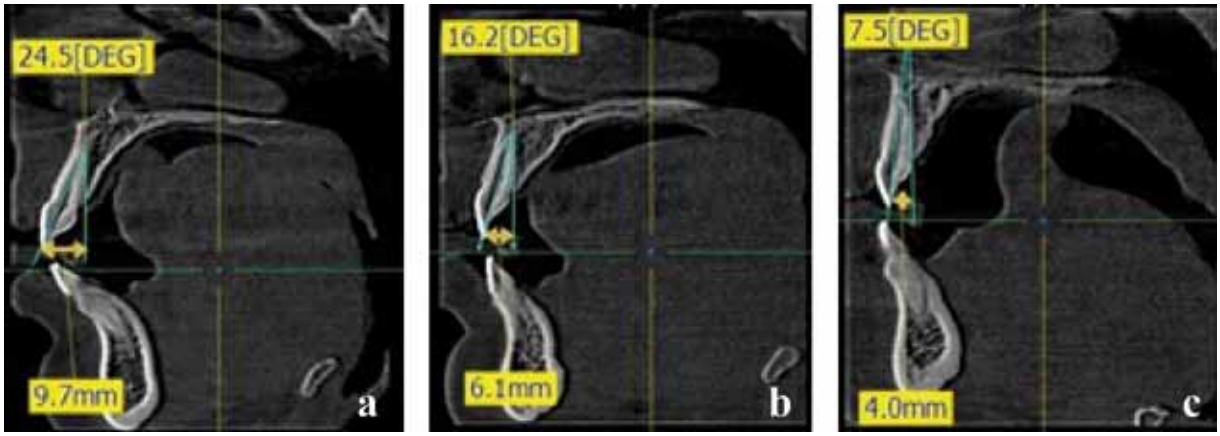

Fig. 3. Variants of distance between high (a), standard (b) and low (c) torques. Variants for comparing arches patterns are shown in Fig. 4

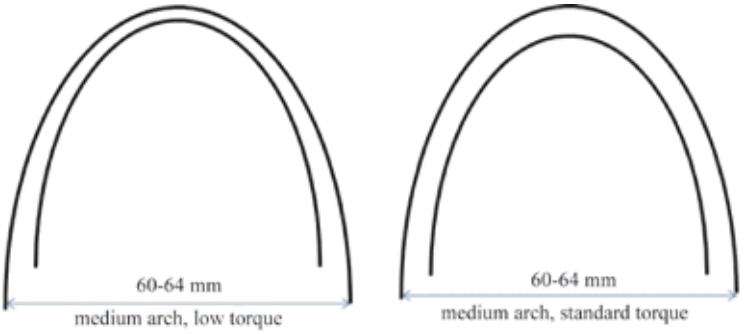

Fig. 4. Variants of the location of medium arch models at low (a) and standard (b) torques

Fig. 5. Variants of designing artificial dental arches according to the models of alveolar and dental arches taking into account gnathic and dental type of face

12. **Domenyuk D.A., Shkarin V.V., Porfiriadis M.P., Dmitrienko D.S., Dmitrienko S.V.** Classification of facial types in view of gnathology // Archiv EuroMedica, 2017. V. 7. № 1. P. 8–13.
13. **Domenyuk D.A., Shkarin V.V., Porfiriadis M.P., Dmitrienko D.S., Dmitrienko S.V.** Algorithm for forecasting the shape and size of dental arches front part in case of their deformations and anomalies //Archiv EuroMedica, 2017. V.7. № 2. P. 105–110.
14. **Domenyuk D.A., Dmitrienko S.V. Porfyriadis M.P.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica. 2018. V. 8. № 1. P. 19–24.
15. **Domenyuk D.A., Lepilin A.V., Fomin I.V., Dmitrienko S.V., Budaychiev G.M-A.** Improving odontometric diagnostics at jaw stone model examination // Archiv EuroMedica. 2018. V. 8. № 1. P. 34–35.
16. **Korobkeev A.A., Domenyuk D.A., Shkarin V.V., Dmitrienko S.V., Weisheim L.D., Konnov V.V.** Anatomical features of the interdependence of the main parameters of the dental arches of the upper and lower jaws // Medical Newspaper of the North Caucasus. 2018. V.13. № 1. P. 66–69.
17. **Lepilin A.V., Fomin I.V., Domenyuk D.A., Dmitrienko S.V., Budaychiev G.M-A.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion // Archiv EuroMedica, 2018. V.8. № 1. P. 37–38.
18. **Shkarin V.V., Domenyuk D.A., Porfiriadis M.P., Dmitrienko D.S., Dmitrienko S.V.** Mathematical and graphics simulation for individual shape of maxillary dental arch //Archiv EuroMedica, 2017. V. 7. № 1. P. 60–65.
19. **Shkarin V.V., Porfiriadis M.P., Domenyuk D.A., Dmitrienko D.S., Dmitrienko S.V.** Setting reference points for key teeth location in case of abnormal dental arch shape //Archiv EuroMedica, 2017. V.7. № 2. P. 111–117.
20. **Shkarin V.V., Domenyuk D.A., Lepilin A.V., Fomin I.V., Dmitrienko S.V.** Odontometric indexes fluctuation in people with physiological occlusion // Archiv EuroMedica, 2018. V.8. № 1. P. 12–18.

REASONING FOR THE APPLICATION OF VIOLET LASER PHYSIOTHERAPY DEVICE FOLLOWING SURGERIES IN THE ORAL CAVITY

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ABSTRACT — Preventing purulent complications in the postoperative period is an important issue that a maxillofacial surgeon has to face. This study offers a view on the clinical dynamics as well as on some laboratory data obtained from cases where violet-range wavelength laser was used after oral surgeries. A five-day course of treatment (wavelength of 405 nm) led to no microflora observed in 86.3% of the cases.

KEYWORDS — laser therapy, violet radiation spectrum, postoperative complications, microbiological study.

After an oral surgery, it is important to prevent postoperative complications, including those of infection & inflammatory nature. This is associated with microorganisms and chronic sites of infection in the mouth (odontogenic, tonsillogenic, etc.) [1, 2, 9].

One of the most common complications following tooth extraction is alveolitis, where the occurrence, as different authors claim, varies between 3.4 and 42.8% [3, 4, 5].

A number of researchers investigating the etiology of alveolitis point at trauma- and infection-associated factors since once a tooth has been extracted the socket becomes subject to additional infection coming from the oral cavity flora [4, 6]. Alveolitis is more often due to staphylococci and streptococci. In case of inflammation developing in the tooth socket, its granulation and epithelization will slow down significantly [7, 11].

Nowadays, various physiotherapeutic methods appear a promising remedy to be employed for treating and preventing inflammation issues [10, 11, 12, 13, 14, 15, 16, 17, 18, 19].

Our earlier study into bacteria photoinactivation without a photosensitizer under the influence of laser and non-laser LED violet spectrum radiation (in vitro experiments) revealed the destruction of microorganisms from laser radiation with a wavelength of 405 nm [8]. This substantiates the relevance of studying the efficiency of a violet laser device in order to prevent oral cavity postoperative complications.

Aim

to explain the use of the violet spectrum laser physiotherapy device after tooth extraction to prevent and treat postoperative complications.

Materials and methods

We examined and treated 162 patients with acute and chronic odontogenic issues in the oral cavity, whereas 32 of the patients had acute periostitis; 56 — exacerbated chronic periodontitis; 7 — pulpitis of semi-impacted embedded dystopic teeth; 67 — hampered eruption with abnormal tooth position. All the participants were on inpatient treatment in the dental department of Saratov City Clinical Hospital #9. 92 of the examined patients were females (58%) with males accounting for the remaining pool 70 (42%); the patients' age ranged from 18 to 65 (mean age 32±3 yrs). Exclusion criteria — general somatic diseases, allergies, and pregnancy. The patients underwent surgery, which implied tooth extraction; all the cases were given a 5-day postoperative course of anti-microbial therapy (Ceftriaxone, 1 g once a day, intramuscular injection).

All the patients were divided into two groups — based on the physiotherapeutic treatment given in the postoperative period — similar by the nosological diseases. The first (main) group included 80 patients who received a postoperative course of violet spectrum laser therapy performed with the Lazurit device (OOO TRIMA, Saratov). The device output power at beaming 1 cm was 150 mW. The daily procedures were performed through sterile curved adjutages with a scattered beam from a distance of 1 cm from the center of the wound surface (the extracted tooth socket), the laser beam power density being at 90–100 mW/cm^2, continuously for 5 minutes, course — 5 days. The sec-

ond group (comparison group) included 82 patients who were undergoing conventional physiotherapeutic treatment (UHF therapy; UHF-60 device, MedTeKo, Mytischi) in their postoperative period. The condenser plates (3.6 cm in diameter each) were installed on the respective side after molars and premolars were extracted – one in the projection of molars, the other in the frontal jaw projection; after canine teeth and incisors were extracted, the plates were located in the upper or lower jaw alveolar process projection, right and left of the median line. The distance between the plates was observed strictly at 3.6 cm, with a gap of 1.5–2 cm. The irradiation power was 30–40 W. The patients underwent the procedure once a day for 10 minutes, the course being 5 days.

On the day of the surgery, just like after the five days of the physiotherapeutic treatment, all the patients underwent general clinical examination as well as microbiological tests, which included a traditional bacteriological study identifying the isolated pure bacterial cultures. The culture was obtained with the Gold sectoral method on a solid medium. Counting the number of the grown colonies was performed visually. A decadic logarithm with a table was used for the conversion of the colony forming units (CFU) number. A set of morphological, culture and biochemical features were used to identify the species of the isolated bacteria. The biochemical identification of pure streptococci and gram-negative bacteria strains was carried out through the STAFI-test 16, STREPTO-test 16 (Czech Republic), API (France) and MicroTax (Austria) test systems. The clinical follow-up went on for a month after the patients were discharged from the hospital.

The obtained results were given statistical processing employing the Microsoft Excel software package with the calculation of arithmetic mean values and the standard deviation. Fisher's exact test was used to compare the intergroup data distribution, while Student's t-test served to evaluate clinical scores. The outcomes were considered reliable at $p < 0.05$.

RESULTS

The patients in Group 1 reported no pain on Day 3.45±0.17 in the average. A clinical examination revealed that the postoperative edema of the face soft tissues at the surgery site resolved on Day 4.05±0.20.

All the patients had a clot in the tooth socket, while marginal epithelialization was observed on Day 5.45±0.23. Where multi-rooted teeth were extracted, the mucosa socket revealed full closure on Day 19.05±0.45; the cases with single-root teeth showed the same effect on Day 14.75±0.24. Within these terms, all the patients' X-ray images showed a bone pattern development.

As for Group 2, when a poll was conducted among them on Day 6 (Day 5 of physiotherapy) after the hospitalization, they reported lack of pain on Day 4.25±0.20. Examinations showed that postoperative edema in them resolved on Day 4.65±0.19.

In Group 2 patients, the clot in the tooth socket remained for a longer time, while marginal epithelialization was observed on Day 6.75±0.16. Follow-up examinations after their discharge from hospital showed that complete mucosa closure after the extraction of multi-rooted teeth was observed on Day 22.65±0.43, whereas the cases with single-root teeth extracted reached the same effect on Day 17.21±0.18. Only 89.8% of the patients were found to have a bone pattern within the same timeframe (Table 1).

A composition and concentration test of the wound fluid microflora during the surgery in Group 1 showed the presence of St. epidermidis (10^2 to 10^3) in 16 (20%) of the patients; St. viridians (concentration — 10^4) in 8 (10%) patients; St. aureus (concentration — 10^3) in 10 (12.5%) patients; Str. spp (concentration — 10^2 to 10^4) in 11 (13.8%) cases, and C. albicans (concentration — 10^2 to 10^3) in 9 (11.3%) patients; no microflora was detected in 26 (32.4%) patients.

After the treatment, 6.2% of the cases (five patients) were found to have St. epidermidis, whereas its concentration did not exceed 10^2; one patient was diagnosed with St. viridians (concentration of 10^2); St. aureus (concentration — 10^2) was found in 2 patients, with another 2 patients having Str. spp (concentration — 10^2), and one patient had C. albicans (concentration — 10^2). The remaining patients had no microflora detected (Table 2). The outcome shows no microflora identified after the treatment in 86.3% (69 people) of Group 1 patients, the explanation, as we see it, being the bactericidal effect of the Lazurit laser device [8].

Before the treatment, the Group 2 patients' microflora revealed neither qualitative nor quantitative significant difference if put against the patients of Group 1.

After a five-day course of treatment, a respective test carried in both groups showed pathogenic and potentially pathogenic microflora present in 11 patients of Group 1; as for Group 2, it was 23 patients who were found to have similar microflora.

The clinical examinations that we carried out revealed postoperative complications, such as alveolitis, in one patient Group 1 and in 3 patients Group 2, who were given further antibacterial therapy and socket curettage, with the Levomekol ointment further applied regularly via tamponing (Fig. 1).

Table 1. *Clinical features reflecting postoperative response in patients' tissues*

	Pain remaining	Postoperative soft tissue edema resolution	Beginning of marginal epithelialization
Group 1 (n=80)	3.45 ± 0.17*	4.05±0.20*	5.45±0.23*
Group 2 (n=82)	4.25 ± 0.20	4.65±0.19	6.75±0.16

Note : ** – p≤0.05 statistically significant compared to Group 2 patients' values*

Table 2. *Microflora at the surgery site through the treatment stages (Group 1; n=80)*

Microorganisms	No microflora identified abs. (%)		Microflora present abs. (%)	
	Prior to treatment	After a 5-day course of treatment	Prior to treatment	After a 5-day course of treatment
a) staphylococcus epidermidis	64 (80%)	75 (93.8%)*	16 (20%)	5 (6.2%)*
b) staphylococcus viridians	72 (90%)	79 (98.8%)*	8 (10%)	1 (1.2%)*
c) staphylococcus aureus	70 (87.5%)	78 (97.5%)*	10 (12.5%)	2 (2.5%)*
d) streptococcus spp	69 (86.2%)	78 (97.5%)*	11 (13.8%)	2 (2.5%)*
e) candida albicans	71 (88.7%)	79 (98.8%)*	9 (11.3%)	1 (1.2%)*

Note: ** – p≤0.05 statistically significant compared to the values before treatment*

Table 3. *Microflora at the surgery site after the treatment*

	No microflora identified	Microflora present
Group 1 (n=80)	69*	11*
Group 2 (n=82)	59	23

Note: ** – p≤0.05 statistically significant compared to Group 1 patients after treatment*

CONCLUSION

After tooth extraction and treatment, which included violet spectrum laser therapy (wavelength — 405 nm) the sockets recovered in shorter periods with a lower degree of prominence, while surrounding tissues' response (edema and pain) was stopped in a faster fashion. In 86.3% of the cases the postoperative wounds produced no culture growth (before the treatment some microflora was detected in all the patients), our explanation residing in the bactericidal effect of the laser, which was demonstrated in experiments in vitro, and where the elimination of microorganisms was due to the violet spectrum laser radiation [8].

The above suggests that violet spectrum laser therapy (wavelength — 405 nm; Lazurit device) used to treat patients after tooth extraction operation is a procedure that is effective, painless, safe and easy to perform, as well as it can be recommended as a method to be employed in dental clinics and maxillofacial hospitals.

Fig. 1. *Carrying out the procedure of laser therapy with violet spectrum light using the "Lazurit" apparatus*

REFERENCES

1. **Dragalina, A. A.** Ways of increase of efficiency of diagnostics and treatment of odontogenic phlegmon of the maxillofacial region: abstract. dis. . Cand. med. Sciences. // Yekaterinburg, 2004. – 20 P.
2. **Yu V; Ivanov, N.. Frolov; A. L. Kirillov** Medical errors in dentistry and their prevention; physician practice / Collection of papers of the XII international conference /under the General; ed;; A. Kozlov; St. Petersburg;: FEW;, 2007. – P. 216–217.

3. **Aituar, E. K.** Morphological changes of the tissues in alveolata and periostitis of the jaws / pressing. Vopr. theoretic. and klinich. medicine. – Karaganda. 1970. – P. 170.
4. **Amirkhanov, M. T.** The restructuring of the bone tissue in orthopedic surgery // Mater. X Vseross. scientific.-pract. Conf. – 2003. – P. 400–401.
5. **Tsimbalistov A. B., Starina G. B., E. D., Liquid, etc..** Density analysis .of bone to stages of treatment of patients with generalized periodontitis / Mater. IX all-Russian. scientific.-pract. Conf. Tr. VIII Congress of the Old.-Moscow, 2003 – P. 250–252.
6. **Azov, S. H.** Therapy "alveololabial" / Mater. V Dagestan Republican scientific. - pract. Conf. dentists.-Makhachkala. 1970. - p. 62–64.
7. Inhibition of alveolar osteitis in mandibular tooth extraction sites using platelet-rich plasma / J. L. Rutkowski, J. W. Fennell, J. C. Kern et al. // J. Oral Implantol. 2007. - Vol. 33, N 3. - P. 116–210.
8. **Lepilin A. V., Raigorodsky Yu. M., Grigoriev D. A., Erokhina N. L., Kasyan, I. A., A. Abdrashitova** X Comparative study of bactericidal properties of led and laser radiation the violet region(405 nm) of the spectrum on bacteria of the oral cavity / Physiotherapy, balneology and rehabilitation 2016, t-15, No. 4, Pp. 202–206.
9. **Lepilin A. V., Zakharova N. B., Fedotenkova D. A., Tereshina N. E.** The value of the cellular composition cytokineproducing activity of cells discharge in patients with acute odontogenic inflammatory diseases of maxillofacial region// Saratov scientific medical journal, 2015, No. 2 p. 173–177.
10. **Lepilin A. V., Raigorodsky Yu. M., Bakhteeva, G. R., Fedotenkova D. A., Ramazanov A. H.** The use of electrical stimulation and laser therapy in the treatment of patients with fractures of the mandible./ Physiotherapy, balneology and rehabilitation, Publishing house "Medicine", №2, 2014. - P. 22–25.
11. **Lepilin A.V., Erokina N. L., Bakhteeva, G. R., Fedotenkova D. A., Decina L. A.** Laser therapy in complex treatment of patients with osteomyelitis of the jaws. Dental Forum, A. 55, No. 4, 2014. – P. 18.
12. **Lepilin A. V., Raigorodsky Yu. M., Ostrovskaya L. Yu., Erokina N. L.** The use of dental complex «Cap-periodontist" in the treatment of periodontal diseases / Medical alphabet 2010. Vol. 2. No. 5. P. 44–48.
13. **Kulikova, N.G.** Evaluation of the effectiveness of pharmaco-physiotherapeutic treatment of catarrhal gingivitis on the results of the condition of mucosal immunity of oral cavity in women in the postpartum period / N.G. Kulikova, D.A. Domenyuk, V.A. Zelensky, A.S. Tkachenko // Medical news of North Caucasus. 2017. – Vol. 12. – № 4. – P. 417–421. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12117.
14. **Agarkov, N. M.** Mathematical prediction of phlegmon development in acute odontogenic osteomyelitis of jaws in terms of blood and systemic immunity / N.M. Agarkov, S.N. Gontarev, D.A. Domenyuk, V.A. Zelensky, K.F. Makkonen, E.P. Afanasova, A.V. Ivanov, T.I. Subbotina // Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 62–65. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13018.
15. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** The diagnostic significance of the clinical functional and immunological studies in assessing the effectiveness of complex therapy of chronic gingivitis (Part I). The Dental Institute. 2017; 74(1): 46–47. (In Russ.)].
16. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** The diagnostic significance of the clinical functional and immunological studies in assessing the effectiveness of complex therapy of chronic gingivitis (Part II). The Dental Institute. 2017; 75(2): 30–33. (In Russ.)].
17. **Domenyuk D.A., Gilmiyarova F.N., Vedeshina E.G., Ivchenko L.G.** Use of low-intensive laser therapy in the complex treatment of generalized cataral gingivitis in women. Periodontology. 2017; Vol. XXII; 1 (82): 45–51. (In Russ.)].
18. **Karpov S. M., Gandylyan K. S., Karakov K. G., Zelenskiy V. A., Porfiriadis M. P., Khachaturyan E. E., Domenyuk D. A., Chalaya E. N.** Maxillofacial trauma as the cause of neurophysiological CNS disorder. Medical news of North Caucasus. 2015. – Vol. 10. – № 4. – P. 361–365. (In Russ., English abstract). DOI – http://dx.doi.org/10.14300/mnnc.2015.10088
19. **Gandylyan K. S., Karpov S. M., Romanenko I. S., Karakov K. G., Zelenskiy V. A., Porfiriadis M. P., Khachaturyan E. E., Domenyuk D. A., Chalaya E. N.** During different clinical forms of acute odontogenic inflammatory diseases. Medical news of North Caucasus. 2015. – Vol. 10. – № 4. – P. 394–398. (In Russ., English abstract). DOI: 10.14300/mnnc.2015.10096

DYNAMIC ELECTRICAL NEUROSTIMULATION IN COMPREHENSIVE TREATMENT OF TEMPOROMANDIBULAR JOINT PAIN SYNDROME IN PATIENTS WITH OCCLUSION ISSUES

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ABSTRACT — Occlusion issues contribute to the development of muscle-and-joint dysfunction and, in case lack of timely treatment, to pain development in the temporomandibular joint and masticatory muscle area. Aim: to evaluate the efficiency of dynamic electrical neurostimulation in stopping pain syndrome in patients with occlusion disorders. Clinical and functional research methods were employed to examine 56 patients with occlusion disorders complicated with temporomandibular joint pain syndrome. The use of dynamic electrical neurostimulation allowed stopping the pain syndrome, which facilitated rehabilitation.

KEYWORDS — electrical neurostimulation, pain syndrome.

INTRODUCTION

A complex interaction of occlusion, masticatory muscles and temporomandibular joint, coordinated and controlled by the central nervous system, maintains the entire proper chewing function [3, 7, 16, 26, 32]. Occlusion issues will disturb consistency in the dentofacial system, and the nature of the change will inevitably affect both the function and the morphology in the chewing muscles as well as in the temporomandibular joint, at the same time triggering the development of muscle-and-joint dysfunction [1, 4, 8, 17, 25, 31].

69.6% of temporo-mandibular joint dysfunction cases are accompanied with pain syndrome. The medication methods that are used currently to stop pain syndrome feature a wide range of side effects. Speaking of physiotherapeutic methods, of particular interest here is the method of dynamic electrical neurostimulation (DENS), which is based on the effect coming from neuron-like electric impulse aimed at acupuncture points and reflexogenic areas [35]. While the device is functioning, the output impulse parameters are registered thus excluding the development of the body's resistance to the therapeutic effect, which, in turn, adds to the therapy effectiveness.

Aim: to evaluate the efficiency of dynamic electrical neurostimulation in stopping pain syndrome in patients with occlusion disorders.

MATERIALS AND METHODS

The survey involved 56 patients (aged 25 to 59) suffering from occlusion disorders complicated with temporomandibular joint and chewing muscles pain syndrome. The patients underwent clinical, X-ray and graphic examination [2, 9, 10, 13, 18, 23, 27]. The nature of the dentition's occlusal interrelation was evaluated via the occlusiogram index [5, 6, 11, 19, 22, 28, 36]. The masticatory muscles functional status was evaluated through an electromyographic examination [12, 15, 21, 29, 34]. We modified the M. Helkimo clinical dysfunction index to identify and evaluate the muscle-and-joint dysfunction degree as well as the pain syndrome severity [14, 20, 24, 30, 33].

The patients were divided into two groups – Group 1 included 30 patients who underwent dynamic electrical neurostimulation (with a DiaDENAS-PC device, used in the *Therapy* mode, frequency range – 10 to 200 Hz, with the minimal, comfortable or the maximal intensity; stable, labile and labile-stable way) to relieve the pain syndrome, which limited the mandible movements (Fig. 1a–d).

The 26 patients of Group 2 were administered the following painkillers: Voltaren or Diclofenac, 25 mg 3 times a day; muscle relaxants (Sirdalud) were used as well, 1 mg 3 times a day.

For the patients of Group 1, the areas exposed to the effect of the device's built-in electrodes were the areas described directly in the patients' complaints

Fig. 1. *Setting the frequency range. Standby mode: a) 20 Hz, b) 77 Hz, c) 140 Hz, d) 200 Hz*

Fig. 2. *The impact of the device DENAS in the area of direct projection of the complaint in the area of the chewing muscles. Therapy Mode*

(Fig. 2) — cervical collar, trigeminal and auricular points 1, 7, 8, 84, 97.

The exposure intensity was minimal, comfortable or maximal, and was easily selected depending on the patient's age and pain sensitivity. The patients' orthopedic treatment was carried out in two stages with preliminary surgical, orthodontic and orthopedic preparation. The obtained data were processed via the variation-statistical method. The reliability difference criterion was estimated based on the Student's table.

RESULTS AND DISCUSSION

The proposed examination type allowed revealing pain syndrome of varying degree in all the patients. During that, 53.6% of the patients had a mild degree of dysfunction, while moderate and severe dysfunction was detected in 39.3% and 7.1% of the patients, respectively.

Regardless of the muscle-and-joint dysfunction severity, the DiaDENAS-PC device proved to ensure a high analgesic effect when stopping pain syndrome. Depending on the pain syndrome severity, a respective pattern was designed when using the device. The muscle-and-joint dysfunctions covered the following direct complaint projection areas – the parotid region, the masticatory muscle region, and the external pterygoid and supra-hyoid muscles. At a frequency of 20 Hz, the analgesic effect was reached mainly in 15–25 minutes to last up to 3–5 hours. The frequencies of 60, 77 and 140 Hz allowed the analgesic effect to appear in an average of 3–10 minutes yet for a shorter duration – up to 1.5 hours on the average.

The procedure lasted from 8–10 minutes up until the pain symptom subsided. The entire course included 8–10 procedures. A frequency of 200 Hz allowed a rapid arrest of the pain syndrome, whereas the analgesic effect lasted from several minutes to an hour.

However, in 4 cases, a frequency of 20 Hz used further produced an increase in the analgesic effect duration (up to 6 hours).

In case of a mild painful syndrome, 20 Hz of frequency were enough to reach an analgesic effect in 15–20 minutes. At a moderate degree, the analgesic effect was at its top determined at a frequency of 140–200 Hz, which further was followed by 20 Hz, whereas analgesic effect lasted longer then — up to 6 hours (in 4 cases). A severe pain syndrome was stopped at a frequency of 200 Hz, and once the pain stopped a frequency of 20 Hz was applied for another 5–10 minutes. The analgesic effect duration thus extended reaching its maximum of 5.5 hours (in 4 cases). Note to be made that a course embracing 5–10 sessions offered a more stable analgesic effect.

The use of medications led to a relief in the pain syndrome within 20–35 minutes and required repeated intake up to 2–3 times a day; in four cases (with severe pain syndrome) – up to 4 times a day.

Once the pain was relieved, a clinical lengthening of the tooth crown was performed via surgical treatment; the occlusal plane was leveled through orthodontic extrusion or intrusion of teeth. The interalveolar height was restored with an occlusal splint. The comprehensive treatment was completed with dental prosthetics and selective teeth grinding. During the orthodontic intervention, 6 cases revealed exacerbated pain syndrome, which required an additional course of electrical neurostimulation. After the prosthetics, a repeated course of treatment was carried out to fix the result. The electromyographic activity in masticatory and temporal muscles went up accordingly up to 594.62±11.78 μV and 433.86±9.42 μV, while in the suprahyoid muscles it went down to 394.48±6.54 μV.

An examination of the maxillofacial region in the groups allowed identifying functional disorders of the temporomandibular joint and masticatory muscles, which were accompanied with pain syndrome.

Dynamic electrical neurostimulation helped stop the pain syndrome at various degrees of dysfunction, at the same time recovering proper functioning in the masticatory muscles as well as in the temporomandibular joint, which facilitated orthodontic and orthopedic treatment. The recovery of the masticatory muscles functional status was confirmed both clinically (extended mouth opening) and via masticatory muscles electromyographic data.

During that, the electromyographic activity in the masticatory and temporal muscles increased to approach the normal values, while it revealed a decrease in the suprahyoid muscles. The muscles palpation produced no pain, which meant that the active trigger points and zones were ameliorated. For the highest and lasting effect, the treatment was delivered in a 5–10-procedure course. Each session lasted for 15–25 minutes. No adaptation was observed in case of long-term and multiple-course dynamic electrical neurostimulation. Moreover, a combination of frequencies added to the therapeutic effect, reducing the time prior to analgesia and prolonging the analgesic action, which is definitely important in case of long-term pain syndrome treatment.

In case of medication treatment, there was pain relief observed yet, given the huge range of side effects, multiple intakes and the drug burden, electrical neurostimulation appears much more preferable.

An electromyographic study revealed a decrease in the electromyographic activity of the masticatory and temporal muscles down to 554.75±14.37 μV and 405.86±8.12 μV, respectively, as well as an increase in suprahyoid muscles activity (up to 412.37±5.24 μV). At the lower jaw's relative physiological rest, the electromyograms revealed a spontaneous activity in the masticatory muscles, which reached 160 μV.

Through the treatment, the nature of occlusion contacts was changing as well. This was especially obvious through orthodontic preparation. At the beginning of treatment, the occlusiogram index was 69.54±1.05 conventional units, through the orthodontic treatment – 41.67±3.67 conventional units, after the prosthetic care – 71.30±1.87 conventional units ($p<0.05$). Changing the nature of occlusion interrelations through the orthodontic treatment could promote the pain syndrome exacerbation.

CONCLUSION.

The use of dynamic electrical neurostimulation relieves pain syndrome of varying severity and facilitates comprehensive treatment. Combining the frequencies will increase the therapeutic effect while shortening the time leading to the analgesic end-point and prolonging the effect itself. The drug burden and a huge range of side effects coming from medication therapy allow claiming the respective advantage that electrical neurostimulation can offer potentially.

REFERENCES

1. A method of assessing the occlusal relationship of the teeth and dentition / E.N. Pichugin, A.R. Arushanyan, V.V. Konnov, D.H. Razakov, V.N. Salnikov // Journal of Scientific Articles Health and Education in the XXI Century. - 2016. - Vol. 18, No. 11. - P. 52-54.
2. **Borodina V.A., Domenyuk D.A., Veisgeim L.D., Dmitrienko S.V.** Biometry of permanent occlusion dental arches - comparison algorithm for real and design indicators // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 25-26.

3. Clinical features of temporomandibular joint dysfunction in patients with mesial occlusion complicated by dentition defects / V. Konnov, D. Razakov, S. Salnikova, R. Mukhamedov, E. Pylaev, S. Konnov, V. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 27–32.
4. Clinical image of temporomandibular joint dysfunction in patients with dentition defects complicated with displaced mandible / S.V. Konnov, E.N. Pichugina, V.V. Konnov, A.A. Bizyaev, S.N. Salnikova, A.R. Arushanyan, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 42–43.
5. **Davydov B.N., Dmitrienko S.V., Domenyuk D.A., Porfiriadis M.P, Budaychiev G.M.-A.** Results of integrated estimation of the functional state of the dentistry system in patients with physiological occlusion of tooth rows (Part I). The Dental Institute. 2017; 77(4):78–82. (In Russ.).
6. **Davydov B.N., Dmitrienko S.V., Domenyuk D.A., Porfiriadis M.P, Budaychiev G.M.-A.** Results of integrated estimation of the functional state of the dentistry system in patients with physiological occlusion of tooth rows (Part II). The Dental Institute. 2018; 78(1):50–53. (In Russ.).
7. **Davydov B.N., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A.** Factors determining choice of metal arches and braces specification in edgewise technique-based orthodontic treatment (Part I). The Dental Institute. 2015; 69(4):92–93. (In Russ.).
8. **Davydov B.N., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A.** Factors determining choice of metal arches and braces specification in edgewise technique-based orthodontic treatment (Part II). The Dental Institute. 2016; 70(1):54–57. (In Russ.).
9. **Davydov B.N., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A.** Radiological and morphometric methods for comprehensive assessment of cephalo-odontologic status in dental patients (Part I). The Dental Institute. 2017; 75(2):58–61. (In Russ.).
10. **Davydov B.N., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A.** Radiological and morphometric methods for comprehensive assessment of cephalo-odontologic status in dental patients (Part II). The Dental Institute. 2017; 76(3): 32–35. (In Russ.).
11. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** Teeth sizes in their correlation with parameters of dentofacial arches and maxillofacial area based on native cranial preparations examination. Kubanskij nauchnyj medicinskij vestnik. 2016;(2):71–79. (In Russ.) DOI:10.25207/1608-6228-2016-2-71-79.
12. **Domenyuk D.A., Vedeshina E.G., Dmitrienko S.V.** The use of craniometric and morphological studies in the assessment of structural elements of the temporomandibular joint. Kubanskij nauchnyj medicinskij vestnik. 2017;1(1):33–40. (In Russ.) DOI:10.25207/1608-6228-2017-1-33-40.
13. **Domenyuk D., Porfyriadis M., Dmitrienko S.** Major telerenthengogram indicators in people with various growth types of facial area // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 19–24.
14. **Domenyuk D.A., Ilijev D.M., Budaychiev G.M-A., Vedeshina E.G., Dmitrienko S.V.** Optimization of diagnostics and planning of orthodontic treatment of patients with dentofacial anomalies based on the results of morphometric studies of the anterior dental arch. Kubanskij nauchnyj medicinskij vestnik. 2017; 25(5): 14–21. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-5-14-21.
15. **Domenyuk D.A., Dmitrienko S.V., Vedeshina E.G., Risovanny S.I., Porfyriadis M.P., Budaychiev G.M-A.** Methods of biometrical diagnostics in transversal direction in patients with mesognathic type of dental arches. Kubanskij nauchnyj medicinskij vestnik. 2017; 24(6): 26–34. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-6-26-34.
16. **Dmitrienko S.V., Domenyuk D.A.** Dentoalveolar specifics in children with cleft palate during primary occlusion period // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 33–34.
17. **Domenyuk D.A., Dmitrienko S.V., Vedeshina E.G., Porfyriadis M.P., Budaychiev G.M-A.** Analytical approach in evaluating the relations of odontometric indicators and linear parameters of dental arcs in people with various face types. Kubanskij nauchnyj medicinskij vestnik. 2018; 25(1): 73–81. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2018-25-1-73-81.
18. **Domenyuk D.A., Porfyriadis M.P., Ilijev D.M., Budaychiev G.M-A., Vedeshina E.G., Dmitrienko S.V.** Dimensional and topographic features of the elements of the temporomandibular joint with mesial occlusion complicated by dentition defects. Kubanskij nauchnyj medicinskij vestnik. 2017;24(4);54–64. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2017-24-4-54-64.
19. **Domenyuk D.A., Lepilin A.V., Fomin I.V., Dmitrienko S.V.** Improving odontometric diagnostics at jaw stone model examination // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 34–35.
20. Functional status of masticatory muscles at occlusion disturbances accompanied with displaced mandible / S.V. Konnov, D.Kh. Razakov, V.V. Konnov, A.R. Arushanyan, R.N. Mukhamedov, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 41–42.
21. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part I). The Dental Institute. 2017; 74(1):92–94. (In Russ.).
22. **Konnov V.V., Davydov B.N., Vedeshina E.G., Domenyuk D.A.** The morphology of the temporomandibular joint in normal occlusion and distal occlusion complicated by defects of dentitions (Part II). The Dental Institute. 2017; 75(2): 66–69. (In Russ.).
23. **Korobkeev, A.A.** Changes in the structural elements of the temporomandibular joint with distal occlusion / A.A. Korobkeev, D.A. Domenyuk, E.G. Vedeshina, V.V. Konnov, O.Yu. Lezhnina, Ya.A. Korobkeeva // Medical news of North Caucasus.

2017. – Vol. 12. – № 1. – P. 72–76. (In Russ., English abstract). DOI: 10.14300/mnnc.2017.12020.

24. **Korobkeev, A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man / A.A. Korobkeev, D.A. Domenyuk, V.V. Shkarin, S.V. Dmitrienko, V.V. Konnov // Medical news of North Caucasus. 2018. – Vol. 13. – № 1–1. – P. 66–69. (In Russ., English abstract). DOI: 10.14300/mnnc.2018.13019

25. **Lepilin A.V., Fomin I.V., Domenyuk D.A., Dmitrienko S.V.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 37–38.

26. Musculo-articular dysfunction and its relationship with occlusive disorders / V.V. Konnov, E.N. Pichugina, E.S. Popko, A.R. Arushanyan, E.V. Pylaev // Modern problems of science and education. – 2015. – № 6. – p. 131.

27. **Porfyriadis M.P., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A., Davydov B.N.** Features of tactics and principles orthodontic treatment of patients with dental arches asymmetry caused by different amounts of antimeres (Part I). The Dental Institute. 2017; 77(4): 64–68. (In Russ.)].

28. **Porfyriadis M.P., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A., Davydov B.N.** Features of tactics and principles orthodontic treatment of patients with dental arches asymmetry caused by different amounts of antimeres (Part II). The Dental Institute. 2018; 78(1): 56–61. (In Russ.)].

29. **Porfyriadis M.P., Vedeshina E.G., Dmitrienko S.V., Domenyuk D.A., Davydov B.N.** Features of tactics and principles orthodontic treatment of patients with dental arches asymmetry caused by different amounts of antimeres (Part III). The Dental Institute. 2018; 79(2): 88–92. (In Russ.)].

30. Radiological specifics of temporomandibular joint structure in case of dentition issues complicated with distal occlusion / S.V. Konnov, A.A. Bizyaev, V.V. Konnov, E.V. Pichugina, S.N. Salnikova, A.S. Khodorich, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 39–40.

31. Specifics of occlusion disturbances in adults with distal occlusion due to dentition defects / S.V. Konnov, A.R. Arushanyan, V.V. Konnov, D.Kh. Razakov, R.N. Mukhamedov, E.N. Pichugina, V.A. Mikailova // Archiv EuroMedica. – 2018. – T. 8, № 1. – C. 40–41.

32. **Shkarin V., Domenyuk D., Lepilin A., Fomin I., Dmitrienko S.** Odontometric indices fluctuation in people with physiological occlusion // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 12–18.

33. **Shkarin V.V., Davydov B.N., Domenyuk D.A., Dmitrienko S.V.** Non-removable arch orthodontic appliances for treating children with congenital maxillofacial pathologies – efficiency evaluation // Archiv EuroMedica, 2018. – T. 8. – № 1. – C. 97–98.

34. **Shkarin V.V., Domenyuk D.A., Dmitrienko S.V., Porfyriadis M.P., Fomin I.V.** Modern approaches to the determination of the angle of teeth inclination in the diagnosis and planning of orthodontic treatment. Kuban Scientific Medical Bulletin. 2018; 25(2): 156–165. (In Russ., English abstract). DOI: 10.25207 / 1608-6228-2018-25-2-156-165.

35. The role of dynamic electroneurostimulation in the complex treatment of muscle and articular dysfunction of patients with deformations of the dentition and bite / D.H. Razakov, V.V. Konnov, A.R. Arushanyan, E.N. Pichugina, E.S. Popko // Modern problems of science and education. – 2015. – № 6. – p. 199.

36. **Zelensky, V.A.** Integral indicator for orthodontic carequality control / V.A. Zelensky, D.A. Domenyuk, M.V. Baturin, I.V. Zelensky, A.V. Kokareva, A.V. Zenina // Medical news of North Caucasus. 2014. – Vol. 9. – № 1. – P. 80–83. (In Russ., English abstract). DOI: 10.14300/mnnc.2014.09022.

NEAR-FIELD MICROWAVE SENSING OF HUMAN SKIN: PHYSIOLOGICAL PATTERN

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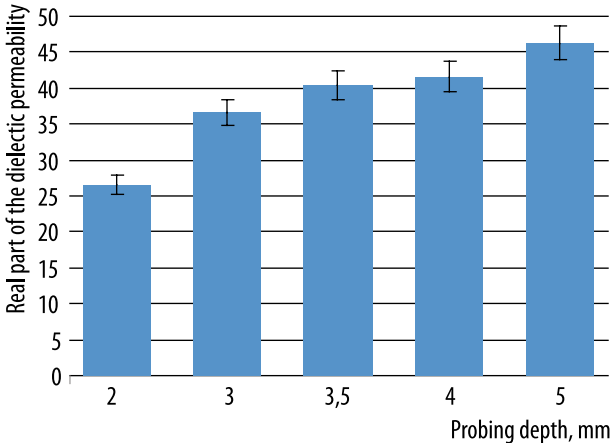

Fig. 1. *Profile of dielectric permeability in healthy people (in rel. un.)*

The skin remained the subject of histological examination for a long time, as it is difficult to visualize [2, 5]. Existing methods (for example, optical coherence tomography, IR thermography, etc.) allow to study only the surface and the nearest subsurface structures of the skin, and the deep structure of the latter is difficult for non-invasive study [5]. In this regard, the work on profiling the skin by its dielectric properties attracts attention [1–4], however, this information is isolated and fragmentary. This is, in particular, due to the lack of available diagnostic tools for assessing the dielectric characteristics of the skin and other tissues [2, 4]. In this regard, the aim of the study was to study the possibilities of near-field microwave sensing in assessing the structure of human skin.

Material and methods. The study, which included a single microwave sounding, was performed in 35 healthy volunteers. Near-field microwave sensing of tissues was performed using a special installation created at the Institute of applied physics of the Russian Academy of Sciences (Nizhny Novgorod), as well as specialized software that matches the installation with a PC and allows to calculate the real part of the dielectric permeability [1, 2]. The dielectric characteristics of the skin were evaluated at depths of 2 to 5 mm using a series of probes. Measurements were performed on the forearm at a single point. The data were processed in the software package Statistica 6.1.

Results. It was found that the real part of the dielectric permeability of human skin monotonically elevates with increasing depth of sensing (Fig. 1), showing a tendency to increase by 1.74 times when comparing the parameter values obtained at depths of 2 and 5 mm ($p<0.05$). This is due to the fact that the value is cumulative, and each subsequent value includes the previous as well as the contribution made by tissues from the previous to the current level of sensing. On the basis of the data obtained, a linear mathematical model of the change in the dielectric permeability of the skin is constructed, which sufficiently describes its subsurface profile (determination coefficient — 0.94). The linear regression equation, which allows to predict the value of dielectric permittivity at other sensing depths, is presented in the following form:

$$y = 6.4125 \cdot x + 15.844,$$

where y — real part of dielectric permeability, x — depth of sensing.

Conclusion. Our research allowed to establish a picture of the deep distribution of the dielectric permeability of the skin of healthy people, which can serve as a physiological microwave pattern for the study of subsurface tissues, including various layers of the skin and the nearest subcutaneous structures. It is shown that the real part of the dielectric permittivity elevates monotonically with an increase in the sensing depth in the range from 2 to 5 mm in increments of 0.5 to 1 mm. This work is particularly supported with RFBR grant (№18-42-5200053 p_a).

REFERENCES

1. **Kostrov A.V., Smirnov A.I., Yanin D.V. et al.** Resonanse near-field microwave diagnostics of non-homogenous medium // Izvestia RAS. Ser. Phys. - 2005. – Vol. 69, №12. – P. 1716–1720.
2. **Martuseivch A.K., Yanin D.V., Bogomolova E.B., Galka A.G., Klemenova I.A., Kostrov A.V.** Possibilities ands perspectives of the use of microwave tomography in the estimation of skin state // Biomedical Radioengeering. – 2017. – №12. – P. 3–12.
3. **Reznik A.N., Yurasova N.V.** Near-field microwave tomography of biological medium // J. of Technical Physics. – 2004. – Vol. 74. – P. 108–116.
4. **Semenov S.** Microwave tomography: Review of the progress towards clinical applications // Philos. Trans A Math Phys. Eng. Sci. – 2009. – Vol. 367. – P. 3021–3042.
5. **Turchin I.V.** Methods of optic biomedical visualization: from subcellular structures to tissues and organs // Uspekhi fizicheskikh nauk. – 2016. – Vol. 186, №5. – P. 550–567.

SYMPTOMATIC EPILEPSY IN DUAL TEMPORAL PATHOLOGY. CASE REPORT ANALYSIS

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ABSTRACT — Dual pathologies are quite often observed in patients with epilepsy during neuroimaging. In a study by V. Salanova et al. 37 (15.4%) of 240 patients with lesional temporal epilepsy had dual pathology presented on MRI. Several other authors (S. Eriksson et al.) report the prevalence of dual pathology from 5% to 30% in pharmacoresistent temporal epilepsy. In most cases seizure semiology as well as data from interictal and ictal EEG help to identify pathological process which causes seizures. However, in some cases one pathology might disguise another, thus clinical data and results of other additional investigation methods might direct a clinician the wrong way. This article is dedicated to one of those clinical cases.

CASE REPORT

A 27-year-old man with a first in his life generalized tonic-clonic seizure (GTCS) during sleeping at night 9/10 June 2010 was urgently referred to a central district hospital. A brain CT reveals a cyst of right temporal lobe and Silvian fissure (Fig. 1). In fact the first seizure of the patient dated Novem-ber 2009 when he displayed an inadequate behavior episode which was evaluated by the surrounding witnesses as a consequence of alcohol consumption. Patient didn't apply for medical assistance.

Patient is right-handed, is the only child in the family, was born from normal pregnancy, according to birth term. Early development with no abnormalities. Graduated from school with average points. After graduation worked as an auxiliary worker.

EEG was performed and focal epileptiform activity was detected. Carbamazepine was prescribed. Patient was seen by his general practitioner. In February 2013 he presented for the first time to the Regional Center of Neurosurgery and Neurology in Uzhhorod with the history of regular once or twice a week complex partial seizures. Seizure began with epigastric aura and followed by ambulatory automatisms, periodically secondary-generalized seizures appeared (4 times in 2–3 months). As an antiepileptic therapy patient took carbamazepine 400 mg twice a day. Neurologic deficit and intellectualmnestic disorders were absent.

EEG was performed; focal epileptiform activity over right frontotemporal area was detected. (Fig. 2)

According to clinical features of temporal seizures, presence of congenital brain development defect on CT — subarachnoid cyst of temporal lobe and lateral sulcus of right hemisphere, EEG data — epileptiform activity over frontotemporal area, diagnosis was determined: symptomatic epilepsy with complex partial temporal and secondary-generalized tonic-clonic seizures. An arachnoid cyst of the right temporal lobe was evaluated as possible aetiology of seizures. Antiepileptic therapy was modified.

In a period from February 2013 to January 2016 patient was taking several different anticonvulsants such as carbamazepine in maximum daily dose of 1000 mg, lamotrigine in maximum daily dose of 400 mg, levetiracetam in maximum daily dose of 1000 mg, valproate in maximum daily dose of 2000 mg, topiramate in maximum daily dose of 400 mg — all with no effect. The last scheme of medication taking included valproate 1000 mg twice a day and levetiracetam 500 mg twice a day. EEG was regularly performed and epileptiform activity over right temporal area was still detected.

Even though patient was recognized as pharmacoresistent in end of 2013, he wasn't selected as a candidate for epilepsy surgery, because surgical treatment of temporal lobe cysts of the brain is minimally effective if they don't cause mass effect (F. Van Der Meche, R. Braakman, 1983; U. Mayr, F. Aichner, G. Bauer et al., 1982; G.R. Harsh, M.S.B. Edwards, C.B. Wilson, 1986). Only after the verification of ineffectiveness of five main antiepileptic drugs (CBZ, VPA, LEV, TPM, LTG) patient was referred to high Tesla MRI of the brain, which was performed 27.04.2016 (Fig. 3).

Low-grade tumor of the medial parts of right temporal lobe was detected, lying medially from arachnoid cyst of the temporal lobe.

During the reviewing of the CT results from 2010 it was found out that tumor was present at that time but was accepted by radiologist as a cyst adjoined brain tissue. Epileptologist evaluated the case by the same way also. Considering potentially high eliptogenity of the tumor presurgical eval-uation began. 24-hour video-EEG monitoring was performed. Focal epileptiform activity was regu-larly detected over the right frontotemporal area on interictal EEG (Fig. 4).

The patient was operated on 25.06.2015, total

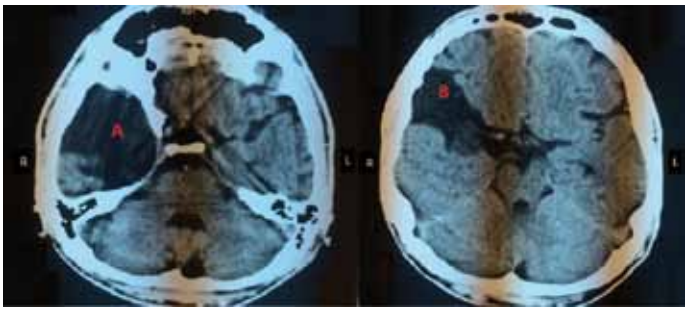

Fig. 1. *Spiral CT scan of the patient's brain dated 10.06.2010, cyst of the pole of right temporal lobe and Silvian fissure. A – cyst of the pole of right temporal lobe; B – cyst of the right Silvian fissure*

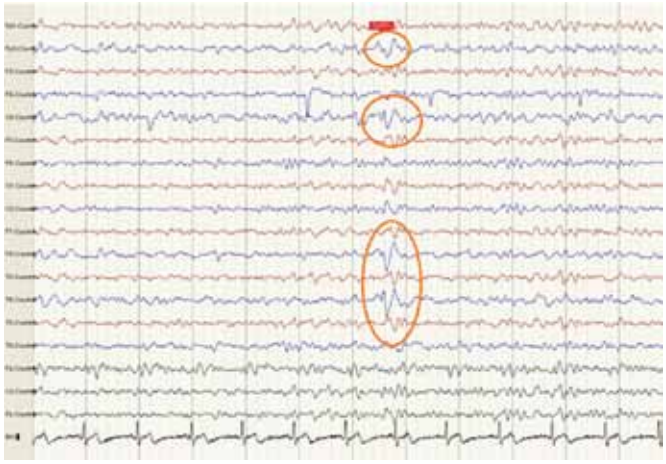

Fig. 2. *EEG of patient dated 06.02.2013, monopolar average montage, focal epileptiform slow spike-wave activity over right frontotemporal area (C4, F8, T4, and minimal expression in Fp2. Artifact in F4.)*

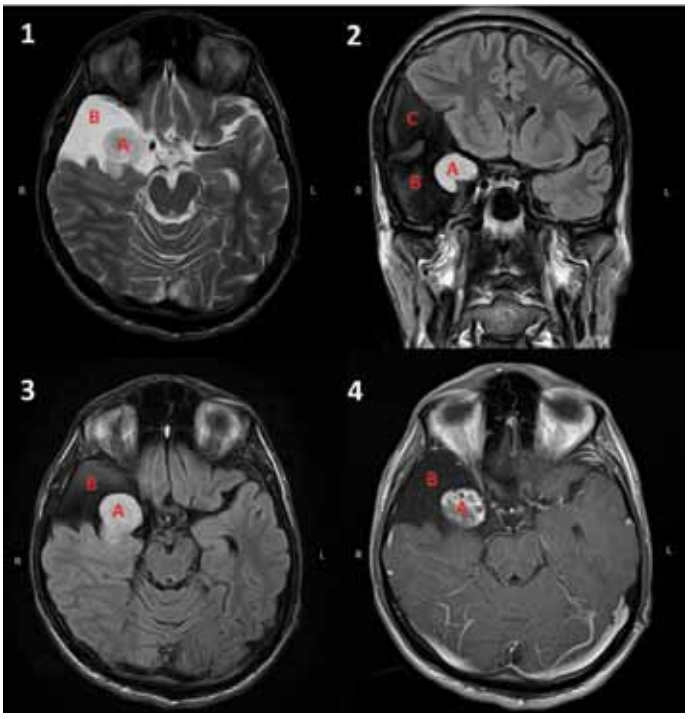

Fig. 3. *High Tesla MRI of the brain dated 27.04.2016. It was revealed a few pathological pro-cesses: cyst of right temporal lobe (A) and Silvian fissure of right hemisphere (C), low-grade in-tracerebral tumor (B). 1 – T2 axial; 2,3 – FLAIR coronal; 3 – FLAIR axial; 4 – T1c*

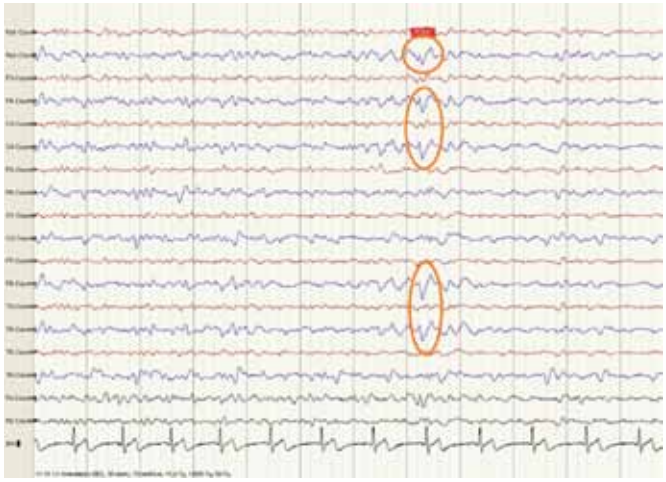

Fig. 4. *EEG dated 12.05.2016 (fragment of video-EEG monitoring). Monopolar average mon-tage, focal epileptiform slow spike-wave activity over right fron-totemporal area (C4, F4, F8, T4, minimal expression in Fp2). In comparison with monitoring in 2010 the onset of general non-specific changes was admitted*

removal of the tumor was performed. Postoperative period without complications and additional neurological deficit. Pathology conclusion — astrocytoma, grade II. There was no seizures in post-operative period.

03.10.2016 patient presented for the follow-up (4,5 months after surgical procedure). No seizures, including auras, admitted. Continues taking valproate 1000 mg twice a day and levetiracetam 500 mg twice a day. Patient also presented high Tesla MRI of the brain (Fig. 5), which shows total

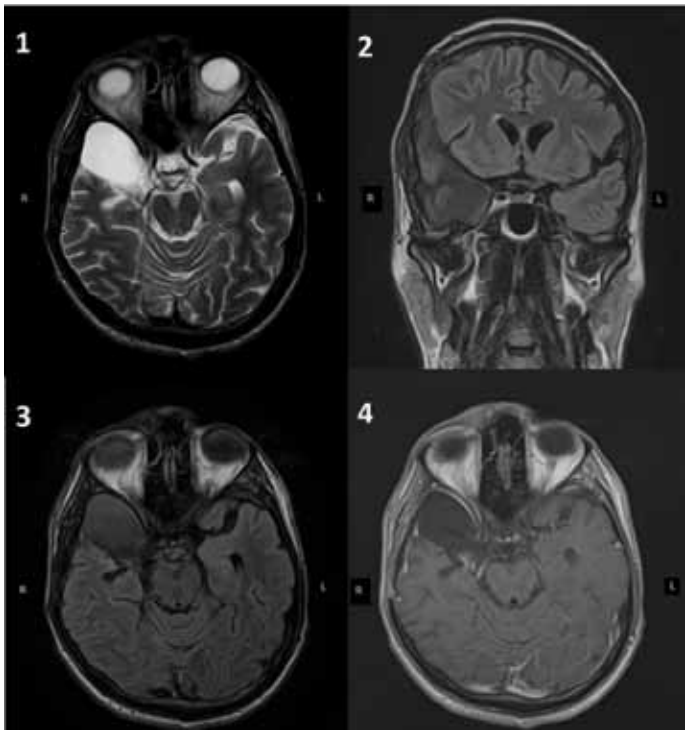

Fig. 5. *High Tesla MRI of the brain dated 07.09.2016. Presents the condition after the surgical procedure because of the tumor in medial parts of right temporal lobe. Signs of left masses are ab-sent. 1 – T2 axial; 2,3 – FLAIR coronal; 3 – FLAIR axial; 4 – T1c*

re-moval of the tumor. Follow-up EEG was also performed (Fig. 6). It presents positive clear dynamics, though a few single epileptiform occurrences keep over the right frontotemporal area.

Gradual dose reduction of valproate to 500 mg twice a day was started. Repeat EEG and consultation after 3 months with the aim of possible discontinue of anticonvulsants and follow-up MRI of the brain with IV contrast after 12 months were proposed.

Patient presents the combination of two potentially epileptogenic CNS disorders: a — cyst of the pole of temporal lobe and lateral sulcus of right hemisphere; b — low-grade tumor of the medial parts of right temporal lobe. The uniqueness of this case is not in its rare combination of dual pathology but in coincidence of localization of both pathological processes, that was the reason of late discovery of the tumor, as a main etiological process of epilepsy of this patient.

The conclusion of this case might work as a recommendation — always recheck the etiology of epilepsy after recognizing the patients as pharmacoresistent and perform high Tesla MRI, regardless other factors. This patient, even having concordance of all signs and symptoms: temporal seizures, cyst of the pole of temporal lobe and lateral sulcus of right hemisphere, focal epileptiform activity over right frontotemporal area — presented with different etiology of epilepsy. This mistake influenced

Fig. 6. *EEG dated 03.10.2016 (post-op). Monopolar average montage. Positive dynamics are expressed but minimal focal slow spike-wave activity (A) and local slowness (B) over right fronto-temporal are still present*

treatment strategy and took away the time of surgical procedure.

REFERENCES

1. **R.Salanova, O.Markand, R.Worth** Temporal lobe epilepsy: analysis of patients with dual pathology. Acta Neurologica Scandinavca. Volume 109, Issue 2 February 2004, P. 126–131
2. **S.H. Erikkson, C.Nordborg, B.Rydenhag, K.Malmgren** Parenchymal lesions in pharmacoresistant temporal lobe epilepsy: dual and multiple pathology. Acta Neurologica Scandinavca. Volume 112, Issue 3 September 2005 P. 151–156
3. **F. Van Der Meche, R. Braakman** Arachnoid cysts in the middle cranial fossa: Cause and treatment of progressive and non-progressive symptoms. J Neurol Neurosur Psychiatry 46: 1102–7, 1983
4. **U. Mayr, F. Aichner, G. Bauer et al.** Supratentorial extracerebral cysts of the middle cranial fossa: A report of 23 consecutive cases of so-called temporal lobe agenesis syndrome. Neurochirurgia 25: 51–6, 1982
5. **G.R. Harsh, M.S.B. Edwards, C.B.** Wilson Intracranial arachnoid cysts in children. J Neurosurg 64: 835–42, 1986

IMPLEMENTATION AND EFFECTIVENESS OF A PREVENTIVE PROGRAM AT THE CLINIC OF A GENERAL PRACTITIONER IN PATIENTS WITH ARTERIAL HYPERTENSION AND CEREBRAL DISORDERS

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ABSTRACT — 130 arterial hypertension patients of Stage II with the achieved eutonia who were on the dispensary observation by the general practitioner were studied. Risk factors, clinical signs of cerebral disturbances, rigidity of the vascular were evaluated in all patients. During a year of observation in-depth individual preventive consulting was provided to patients two times. It turned out that active dispensary observation of arterial hypertension patients with implementation in the area of responsibility of the general practitioner of individual consulting allowed not only achieving target values of arterial pressure, improving elastic and tonic properties of the vascular wall, reducing intensity of the endothelial dysfunction but reducing intensity of such modified risk factors as excessive consumption of salt with food, sedentary lifestyle and smoking. The experience shows that to reinforce the educational skills in arterial hypertension patients with cerebral disturbances it's necessary to perform in-depth preventive consulting (no less than 2–3 times per year), which finally increases compliance with performance of medical recommendations.

KEYWORDS — arterial hypertension, vascular wall stiffness, risk factors, cerebral disorders.

INTRODUCTION

In the development and progress of diseases of the circulatory system, risk factors play an important role. Late detection and inadequate correction of these risk factors increases the likelihood of cardiovascular complications [2, 7, 5]. Moreover, vascular lesions of the brain are a complication, usually of uncontrolled arterial hypertension (AH), leading to neurological, psycho-emotional, cognitive impairment, as a result of which patients lose their ability to work and social adaptation [4]. Preventive measures to combat risk factors are crucial in reducing the prevalence of hypertension, as well as increase patient commitment to perform medical appointments in the outpatient unit. Scientific studies [3, 8] showed that one of the main methods that increase the completeness and accuracy of medical appointments is to educate patients. Based on this, the purpose of this study was to study the effectiveness of in-depth preventive counseling by the general practitioner in patients with arterial hypertension.

MATERIALS AND METHODS

130 patients (male — 29, female — 101; average age 58.1 ± 1.1 years) of stage II hypertension were examined, who were under observation at a general practitioner and received combined antihypertensive therapy. All hypertensive patients had signs of chronic cerebral blood supply disorders, with the initial manifestations of insufficient blood supply to the brain in 31 people, dyscirculatory encephalopathy (DE) stage I — 56, DE stage II — 43 people. A neurological examination, anthropometry, control of blood pressure and questioning to identify risk factors for cardiovascular diseases were conducted, the lipid spectrum of blood plasma and the level of fasting glucose were determined [6]. All surveyed performed a contour analysis of the pulse wave and a sample with reactive hyperemia (occlusive test) using the photoplethysmographic method [1]. Based on the contour analysis of the pulse wave (apparatus *Angioskan-01*), the following indicators were calculated: biological age of the vascular system (VA, years), stiffness index (SI, m/s), central systolic blood pressure (Spa, mm Hg) , augmentation index (Alp 75,%), normalized for pulse rate (CP = 75 beats/min), reflection index (RI,%). To assess endothelial dysfunction, a test was performed with reactive hyperemia with determining the occlusion index by amplitude (IRA, cond. Units) and phase shift (SF, ms) between the channels. Within the framework of follow-up, during the year, patients underwent in-depth individual preventive counseling twice (initially and after 6 months). The training program consists of a cycle of structured 2 sessions of 60 minutes duration with a frequency of 2 times a week. The content of each lesson involves the alternation of informative and the active part. The latter is a discussion of the information provided, the calculation of

individual risk factors, training patients with specific health monitoring skills. The classes are aimed at studying the causes, symptoms of high blood pressure and exacerbations of diseases, risk factors for the development of complications of the disease, the basics of self-monitoring of blood pressure, first-aid self-help with increasing blood pressure, the basics of healthy nutrition in hypertension, the role of physical activity and the main groups of antihypertensive drugs used in the treatment of hypertension . After 6 months, the severity of risk factors, the level of blood pressure were assessed, and after 12 months, the severity of cerebral disorders and the dynamics of photoplethysmography indices were assessed.

The normal distribution of the sample was determined by the Kolmogorov-Smirnov criterion. In data processing, the arithmetic average of the standard deviation (M ± SD) was calculated for the quantitative traits. Comparison of the two groups by quantitative scales was carried out on the basis of the non-parametric Mann-Whitney test. The analysis of the dynamics of indicators was carried out on the basis of non-parametric criteria (Wilcoxon, Mac-NeiMar) [9]. The level of statistical significance was recorded at 0.05. Statistical data processing was carried out using the statistical package Statistica 10.

RESULTS

Before the beginning of in-depth preventive counseling, the level of blood pressure was 136.6 ± 1.1/ 82.5 ± 1.1 mm Hg. According to the survey, the use of table salt (> 5 g/day) was detected in 36 (27.7%), overweight and obesity (BMI — 27.1 ± 0.4 kg/m^2) — in 108 (83.1%), tobacco smoking — in 34 (26.1%), alcohol abuse — in 21 (16.1%), low physical activity — in 43 (33.1%), hypercholesterolemia (level of total blood plasma cholesterol — 6.6 ± 0.2 mmol/l) — in 32 (24.6%), diabetes mellitus and impaired glucose tolerance (plasma glucose level — 7.1 ± 0.3 mmol/l) — in 19 (14.6%). When evaluating the clinical signs of cerebral disorders, headache was present in 92 (70.8%), dizziness — in 54 (41.5%), noise and tinnitus — in 68 (52.3%), sleep disturbance — in 81 (62, 3%), increased fatigue — in 72 (55.4%), decreased memory and attention — in 94 (72.3%).

During the contour analysis of the pulse wave there was an increase in RI (44.8 ± 2.0%), Alp 75 (18.6 ± 1.3%), Spa (137.0 ± 2.0 mm Hg), which testified to an increase in the tone of small resistive arteries and stiffness of the arterial wall; The level of the IS was 8.0 ± 0.1 m/s, VA — 57.1 ± 1.7 years. When conducting an occlusive test, a decrease in IRA was recorded - 1.4 ± 0.3 conv. units, SF — minus 5.7 ± 0.4 ms, indicating a pronounced endothelial dysfunction.

Thus, prior to the initiation of in-depth preventive counseling, hypertensive patients with cerebral disorders often detected overweight and obesity, physical inactivity, excessive consumption of salt with food, smoking, hypercholesterolemia, alcohol abuse and hyperglycemia, which were combined with a deterioration of the elasto-tonic vascular properties. walls and severe endothelial dysfunction.

Individual preventive counseling was conducted for all patients and its effectiveness was evaluated twice with a multiplicity between examinations of 6 months. So, after 6 months ,in patients with hypertension with cerebral disorders, the level of blood pressure was 132.4 ± 1.5 / 81.3 ± 0.8 mm Hg. Among risk factors, 6.1% (p <0.05) had a reduction in the use of table salt with food, 5.3% had overweight and obesity (BMI — 30.8 ± 0.5 kg/m^2), 7.6% — of low physical activity, in 4.6% — hypercholesterolemia (total plasma cholesterol level — 6.5 ± 0.1 mmol/l), in 4.6% — hyperglycemia and impaired glucose tolerance (glucose level blood plasma — 6.9 ± 0.3 mmol/l), in 5.3% there was a refusal to smoke tobacco, in 0.7% — from alcohol, while maintaining signs of cerebral disorders.

After 12 months, in patients with hypertension with cerebral disorders, the level of blood pressure was 134.1 ± 1.9/82.2 ± 1.2 mm Hg. 10.8% (p <0.05 compared with the initial values) of patients had a reduction in the use of table salt with food, 1.5% — overweight and obesity (BMI — 30.8 ± 0.5 kg/m^2), 9.2% (p <0.05 compared with the initial values) were hypo-dynamic, 6.9% (p <0.05 compared to the initial values) had quit smoking, 0.7% — from alcohol consumption, 5.3% normalized lipid metabolism (blood plasma cholesterol level — 6.2 ± 0.1 mmol/l), and 3.8% - carbohydrate metabolism (blood plasma glucose level — 7.5 ± 0), 4 mmol/l). When assessing clinical recognition Cerebral disorders in 9.2% (p <0.05 compared with the initial values) of the patients showed a decrease in the severity of headache, in 16.8% (p <0.05 compared to the initial values) — dizziness, in 20, 4% (p <0.05 compared with the initial values) — sleep disorders, 2.4% — noise and tinnitus, 2.4% — cognitive disorders (memory and attention).

When conducting a contour analysis of the pulse wave in patients of this group against the background of normal central systolic pressure in the aorta Spa (137.3 ± 2.2 mm Hg) and the stiffness index SI (7.8 ± 0.1 m/s; p <0, 05 compared with the initial values), there was a decrease in RI (42.1 ± 1.8%), Alp 75 (17.6 ± 1.1%), VA (56.1 ± 1.4 years). According to the data of the occlusal test, an increase in the indices of the occlusion index in the amplitude of IRA (1.8 ± 0.2 conv. Units) and in the SF (-6.9 ± 0.7 ms) was

recorded, which indicated an improvement in endothelial function.

DISCUSSION

Prior to the beginning of in-depth preventive counseling of hypertension patients with disorders of cerebral circulation, obesity, excessive consumption of salt with food, smoking, alcohol abuse, hyperglycemia and hypercholesterolemia were often detected, which were combined with the deterioration of the elasto-tonic properties of the vascular wal land manifested in endothelial dysfunction.

Six months after the in-depth preventive counseling in patients with hypertension with cerebral disorders, there was a decrease in the severity of controlled risk factors, such as sedentary lifestyle, increased salt intake, overweight and obesity, and smoking. After a year of follow-up, patients with hypertension with cerebral disorders showed a further decrease in the severity of modifiable risk factors, which was combined with a decrease in the severity of complaints of cerebral character and improvement in the elasto-tonic properties of the vascular wall and decrease in endothelial dysfunction.

CONCLUSION

As a result of the introduction of in-depth preventive counseling of hypertensive patients with cerebral disorders at the general practitioner, after 12 months of observation, not only thetarget blood pressurewas achieved, improved elastone-tonic properties of the vascular wall, reduced severity of endothelial dysfunction, but also reduced manifestation of risk factors, such as excessive use of salt with food, physical inactivity, tobacco smoking was detected. As experience shows, as part of follow-up observation, it is necessary to conduct in-depth preventive counseling more often (at least 2–3 times a year) for hypertensive patients with cerebral disorders, which contributes to increasing their knowledge of the disease and rehabilitation methods, which ultimately leads to the implementation of the prescribed recommendations.

REFERENCES

1. AngioScan-01 Diagnostic complex for analyzing the state of the cardiovascular system. User Guide, AngioScanElektronis LLC, 2012. – P.1–110.
2. **End, A.V.** Risk factors for cardiovascular diseases in rural areas according to epidemiological studies: literature review / A. Terminal // Cardiovascular therapy and prevention. – 2016. – Vol.15, № 6. – P. 66–71
3. Assessment of the effectiveness of health schools for patients with arterial hypertension as a preventive medical service in primary health care: a manual for doctors / A.M. Kalinin [and others]. – Ministry of Health of the Russian Federation. – 2003. – 18 p.
4. **Oschepkova, E.V.** Register of arterial hypertension / E.V. Oshchepkova, P.Ya. Dovgalevsky, V.I. Gridnev // Therapeutic Archive. – 2007. – V.79, № 1. – P.46–48.
5. The prevalence of behavioral risk factors for cardiovascular diseases in the Russian population according to the results of the ESSE-RF / U.A. Balanova [et al.] // Preventive medicine. – 2014. – N 5. – P.42–52.
6. Recommendations for the management of patients with arterial hypertension with metabolic disorders // Cardiological Bulletin. – 2014. – №1 – Volume XX (XXII). – p.19.
7. **Shalnova, S.A.** Lessons from the OSCAR study: "Epidemiology and features of treatment of high-risk patients in real clinical practice 2005–2006." S.A. Shalnova, A.D. Deev // Cardiovascular therapy and prevention. – 2007. – Vol. 6, № 1. – P. 47–53.
8. School of health for the patient is the most important factor in the quality of medical care / Mikhailova N.V. [et al.] // Disease prevention and health promotion. – 2004. – № 2. – p. 3–10.
9. Epidemiology and statistics as tools of evidence-based medicine / Ye.A. Kornysheva [et al.]. – Ed. 2nd, – Tver: TGMA, 2009. – p. 80.