



ABSTRACT

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MAIN AGE-RELATED CUTANEOUS CHANGES IN MEN GROUNDED ON THE RESULTS OF ULTRASONIC DIAGNOSTICS

Introduction. An extremely important task of modern medical science is to preserve the health of the population. Various age violations are found in men, such as changes in the functional activity of different systems and organs. Age-related changes have a negative influence on health state, the course of different diseases, and life quality.

Materials and Methods. 120 men aged 25–64 years were examined. They were divided into four clinical groups according to the age of patients: I group – 25–34 years old, II group – 35–44 years old, III – 45–54 years old, and IV – 55–64 years old. We proposed the use of Cratal and Quercetin medications for 30 days for men from group III, and Tiocetam-Forte for 30 days for men from group IV. Ultrasound examination and dopplerography were performed. For statistical analysis, the paired Student's t-test was used. Statistical analysis was performed using STATISTICA 6.1 software.

Results. The reduction in thickness of the different layers of the skin in men of older age groups was registered. Low levels of flow velocity (its maximum and average figures), as well as high resistance index and pulse activity index, were observed in males of mature age. In cases, when antioxidants, nootropics, and vasoprotectives were prescribed for prophylaxis, flow velocity (its maximum and average figures) increased in skin vessels, while resistance index and pulse activity index decreased.

Conclusions. It was shown in the investigation that the use of antioxidants, nootropics, and vasoprotectives were effective for the prevention of skin aging and blood-flow violations in it in males of older age groups.

Keywords: aging, skin, blood flow, men.

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ОСНОВНІ ВІКОВІ ЗМІНИ ШКІРИ У ЧОЛОВІКІВ ЗГІДНО РЕЗУЛЬТАТІВ УЛЬТРАЗВУКОВОЇ ДІАГНОСТИКИ

Вступ. Надзвичайно важливим завданням сучасної медичної науки є збереження здоров'я населення. У чоловіків виявляються різні вікові порушення, такі як зміни функціональної діяльності різних систем і органів. Вікові зміни негативно впливають на стан здоров'я, перебіг різних захворювань, якість життя

Матеріали і методи. Обстежено 120 чоловіків віком від 25 до 64 років. За віком пацієнтів сформовано чотири клінічні групи: I група – 25–34 роки, II група – 35–44 роки, III – 45–54 роки, IV – 55–64 роки. Чоловікам III групи нами запропоновано застосування препарату «Кратал» і «Кверцетин» протягом 30 днів, а чоловікам IV групи – «Тіоцетам-форте» протягом 30 днів. Проведено ультразвукове дослідження та доплерографія. Для статистичних підрахунків використовували парний t-критерій Стьюдента. Статистичні підрахунки проводили за допомогою програмного забезпечення STATISTICA 6.1.

Результати. Зафіксовано зменшення товщини різних шарів шкіри у чоловіків старших вікових груп. Також у них виявлено низькі рівні швидкості течії (її максимальні та середні показники), а також високі індекс резистентності та індекс пульсової активності. У випадках, коли з профілактичною метою призначали антиоксиданти, ноотропи та ангіопротектори, у судинах шкіри зростала швидкість кровотоку (її максимальний і середній показники), знижувався індекс резистентності та індекс пульсової активності.

Висновки. У дослідженні показано, що застосування антиоксидантів, ноотропів та ангіопротекторів було ефективним для профілактики старіння шкіри та порушень кровотоку в ній у чоловіків старших вікових груп.

Ключові слова: старіння, шкіра, кровообіг, чоловіки.

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INTRODUCTION / ВСТУП

An extremely important task of modern medical science is to preserve the health of the population. Various age violations are found in men, such as changes in the functional activity of different systems and organs. Age-related changes have negative influence on health state, the course of different diseases, and life quality [1]. As we see the prolongation of active life in males, who continue working after the age of 55–60, this problem becomes very important and urgent.

Aging has its reflection on many organs and

systems, which is the reason for many diseases (especially dermatological diseases and age-related aesthetic defects). The main reasons for cutaneous age-related changes are metabolism and vascular violations. They are caused by many factors of endogenous and exogenous origin: alcoholism, smoking, environmental pollution, professional hazards, diet, hormonal violations, nervous system changes, including stresses and autonomic dysfunction. As a result, changes in adaptation and homeostasis are seen, which is the reason for inflammation and other cutaneous pathologies [2, 3, 4].

A lot of scientific articles present information about skin changes in females, which are caused by aging and a decrease in estrogen levels. Mainly they show information about cutaneous changes in females of menopausal age. These aesthetic defects include wrinkles, skin atrophy, and rosacea [2, 5]. Some scientific studies prove skin involution, which starts from the age of 35 years old. The scientists describe different phases of the menstrual cycle and the related changes in microcirculation [2].

On the other hand, there is not much information about blood flow and skin structure changes in males from different age groups. Investigation of M. Gniadecka shows the ultrasonography changes in the dermis, which are associated with aging [1, 6]. This investigation describes changes in photoaged skin in males and females, such as subepidermal low echogenic band and thickening of the papillary dermis. The author proves the association between age and increased thickness on exposed sites in cases of skin photoaging. But skin thickening is also registered in young people, probably those who underwent increased ultraviolet exposure. The article shows only changes in photoaged skin, still the manifestations of natural skin aging were not examined.

C. Zane, R. Capezzera, R. Sala, et al. showed a reduction of skin thickness as well as an increase of the subepidermal low-echogenic band thickness as a result of skin photodamage during echography [1, 6]. The authors proposed using Metvix under occlusion and exposure to red light for skin photodamage. The changes in cases of natural skin aging were not observed, and their correction was not proposed.

The ultrasound examinations performed by E. P. Tierney, C. W. Hanke, J. Petersen et al. showed an increase in SLEB in all anatomic sites as well as a decrease in total skin thickness in males and females as a result of skin photoaging [6]. The scientists proposed using ablative fractional photothermolysis as an effective treatment of photoaging, which is a rather expensive method of correction.

Some investigations showed the effectiveness of mesotherapy for skin rejuvenation, proved by skin-targeted ultrasound [2, 5]. The evaluation of age-related dermal changes and a subepidermal low-echogenic band was found in cases of skin aging before the start of treatment. The thickness of the epidermis was not evaluated in the examined population.

To sum up, the literature review shows different age-related changes in males and females during ultrasound investigation, which is probably the result

of screening the population with both signs of natural skin aging and skin photoaging. The growing interest of males in being good-looking and preventing skin aging prompted us to investigate the blood flow and main skin changes in males of different ages, so that new prophylactic methods could be elaborated.

Objective. The primary objective was to study blood flow and skin thickness in men of different age groups. The secondary objective was to evaluate the efficacy of the proposed correction methods for blood flow violations in the skin.

Material and Methods. 120 men aged 25–64 years were examined. They formed four clinical groups according to the age of patients: I group – 25–34 years old (31 persons), II group – 35–44 years old (34 persons), III – 45–54 years old (27 persons), IV – 55–64 years old (28 persons). Inclusion criteria were as follows: male, aged 25–64 years, absence of dermatological diseases, signed informed consent. Exclusion criteria were signs of skin photoaging.

Ultrasound examination and dopplerography were performed according to the method of S. A. Vasilchenko et al. [7]. A non-invasive method of in vivo study of tissues, such as ultrasound, compares favorably with the opportunity to quantify the structures of the skin and in the last 10–20 years, has been actively developing thanks to the emergence of high-frequency sensors. Color Doppler Mode mapping is used for the evaluation of vascularization. The Ultrasound Diagnostic Apparatus SA 8000 Live (produced by Medison) was used. Blood flow was measured in the temporal area. Average and maximal flow velocity, resistance index, and pulse activity index were measured.

As no significant violations were registered by dopplerography and ultrasound examination of the skin in males from Group I and Group II during the first study stage, men aged 25–44 did not need any prophylactic or corrective measures. We elaborated the main methods of treatment for different age-related changes. We proposed the use of Cratal 1 tablet orally three times per day during 30 days and Quercetin 1 g orally 2 times per day during 30 days for men from Group III, and Tiocetam-Forte 1 tablet orally 3 times per day during 30 days for men from group IV. A vasoprotective was chosen, because males from third group had violations in blood flow. Nootropic and antioxidant medicines were chosen in order to normalize the changes in sympatho-adrenal and vagal-insular systems and in order to normalize blood flow in the whole organism as well as skin in particular [5]. The use of nootropic medicine can contribute to the normalization of interactions

between different levels of the hypothalamic-pituitary-adrenal system, which can improve blood flow in the skin as well as in other organs.

The study was in line with the ethical principles of the Helsinki Declaration. The permission for the investigation was received from the Local Ethics Committee of State Institution "Dnipropetrovsk Medical Academy of the Ministry of Health of Ukraine", Dnipro. All subjects, who participated in the study, signed the informed consent form before the start of the study.

Data processing. For statistical analysis, the paired Student's t-test was used. Shapiro–Wilk test was used for data distribution (the significance level = 0.01). The differences between the data were considered significant at $p < 0.05$ (except the Shapiro–Wilk test). Statistical analysis was done using STATISTICA 6.1 software (StatSoftInc., serial № AGAR909E415822FA).

Results. The results of ultrasonic examinations of skin thickness in men from different groups are presented in Table 1.

Table 1 – Skin thickness according to male ages (mm) ($M \pm m$)

Skin thickness area		Group I	Group II	Group III	Group IV
frontal area	epidermis	0.145 ± 0.002	0.130 ± 0.002*	0.131 ± 0.002*	0.125 ± 0.002*
	dermis	1.91 ± 0.02	1.71 ± 0.02*	1.61 ± 0.03*†	1.52 ± 0.02*† ‡
	dermis + epidermis	2.08 ± 0.03	1.85 ± 0.03*	1.80 ± 0.04*	1.64 ± 0.02*† ‡
	hypoderm	0.89 ± 0.02	0.87 ± 0.02	0.79 ± 0.02*†	0.76 ± 0.03*†
temporal area	epidermis	0.145 ± 0.004	0.126 ± 0.003*	0.126 ± 0.004*	0.108 ± 0.003*†
	dermis	1.97 ± 0.02	1.61 ± 0.02*	1.56 ± 0.03*†	1.41 ± 0.02*† ‡
	dermis + epidermis	2.11 ± 0.02	1.76 ± 0.04*	1.71 ± 0.03*	1.58 ± 0.03*† ‡
	hypoderm	0.89 ± 0.02	0.88 ± 0.02	0.79 ± 0.01*†	0.78 ± 0.02*†
buccal area	epidermis	0.16 ± 0.002	0.14 ± 0.002*	0.14 ± 0.004*	0.13 ± 0.005*
	dermis	1.71 ± 0.02	1.52 ± 0.03*	1.53 ± 0.03*	1.51 ± 0.03*
	dermis + epidermis	1.85 ± 0.02	1.66 ± 0.03*	1.64 ± 0.03*	1.61 ± 0.04*
	hypoderm	1.17 ± 0.02	1.14 ± 0.02	1.08 ± 0.02*	1.00 ± 0.03*† ‡
chin area	epidermis	0.16 ± 0.004	0.15 ± 0.003	0.14 ± 0.003*†	0.13 ± 0.004*†
	dermis	2.21 ± 0.02	1.92 ± 0.04*	1.63 ± 0.03*†	1.51 ± 0.03*† ‡
	dermis + epidermis	2.40 ± 0.03	2.05 ± 0.03*	1.81 ± 0.04*†	1.67 ± 0.03*† ‡
	hypoderm	0.98 ± 0.02	0.96 ± 0.03	0.89 ± 0.01*	0.82 ± 0.02*† ‡

Notes: * – significant differences ($P < 0.05$) compared to results obtained in Group I; † – significant differences ($P < 0.05$) compared to results obtained in Group II; ‡ – significant differences ($P < 0.05$) compared to results obtained in Group III

Males from elder age groups had reduced thickness of the epidermis and dermis. It was particularly observed in the facial temporal area.

Dopplerography results found in men from Groups I-IV are shown in Table 2. Figure 1 shows the changes of resistance index, pulse-activity index, and blood flow velocity. Figure 1 presents the results of the study before the use of the proposed prophylactic measures and after the prophylactic course.

Discussion. The literature review showed different measurements during ultrasound

investigation in the population according to age. Some investigators described the reduction of the thickness of different skin layers; others represented the opposite tendencies. These differences can be explained by the fact that people with photodamaged skin were included in study groups.

Males with signs of skin photoaging were excluded from our investigation, which resulted in the proven tendency for skin thinning with increasing age. That is why our study showed the thickness reduction of the different skin layers in aging men.

Table 2 – Dopplerography characteristics in males of different ages ($M \pm m$)

Indicators	Group I	Group II	Group III	Group IV
Maximum flow velocity, cm/s	6.05 ± 0.07	6.10 ± 0.03	5.91 ± 0.04†	5.44 ± 0.05*†‡
Average flow velocity, cm/s	3.62 ± 0.03	3.58 ± 0.05	3.51 ± 0.03*	3.24 ± 0.05*†‡
Pulse activity index, units	1.61 ± 0.03	1.62 ± 0.03	1.79 ± 0.03*†	1.90 ± 0.05*†
Index of resistance, units	0.96 ± 0.02	0.93 ± 0.02	1.04 ± 0.03*†	1.21 ± 0.04*†‡

Notes: * – significant differences ($P < 0.05$) compared to results obtained in Group I; † – significant differences ($P < 0.05$) compared to results obtained in Group II; ‡ – significant differences ($P < 0.05$) compared to results obtained in Group III

When comparing the first and the second groups, no significant differences were found in flow velocity and other blood flow indexes (Table 2). Men from Group III showed a high resistance index, high pulse-activity index, and low flow velocity, when compared with the first two groups. These data prove the violated blood vessel elasticity. Very low figures of flow velocity were observed in males from Group III. These males also had very high resistance index and pulse activity index. The decrease in blood

flow in men from Group III and Group IV was observed in the investigation. These data substantiated the need for elaboration of new blood flow improvement methods in men of elder age groups.

The use of vasoprotectives in males from the third group led to a decrease in resistance index and pulse activity index, and an increase in the maximum and average flow velocity (Fig. 1).

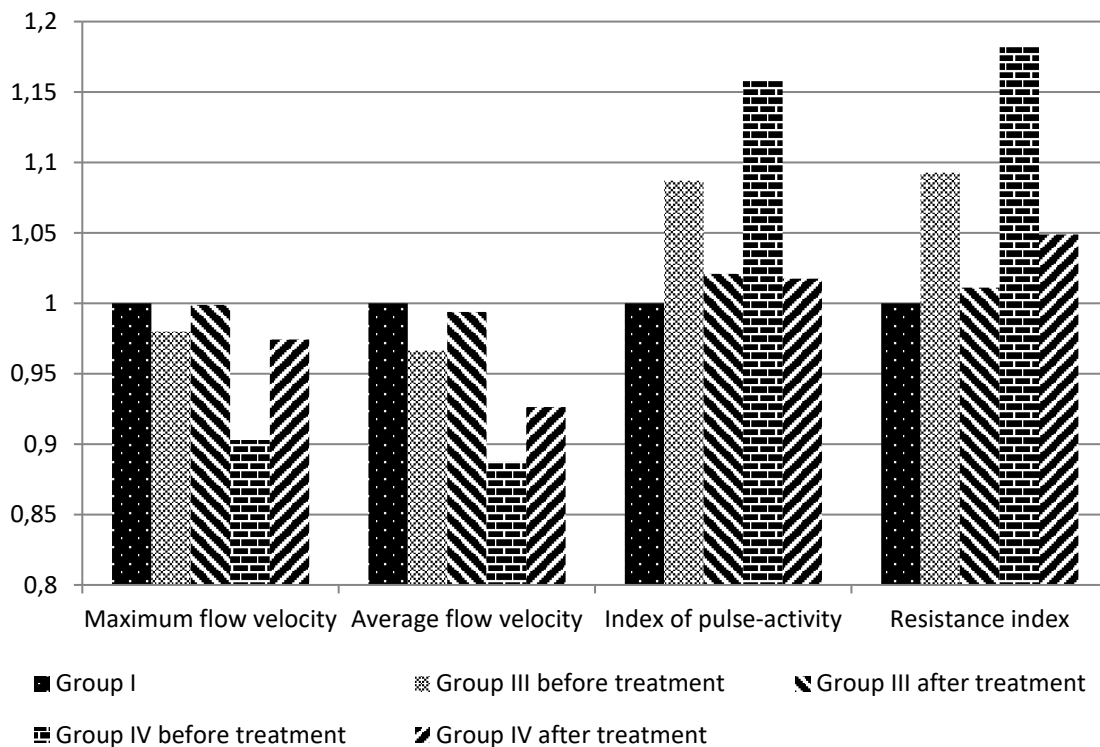


Figure 1 – Dopplerography indices in men of different ages (the results of Group I were taken as 1)

According to Figure 1, nootropics and antioxidants used for prophylactic purposes in males of Group IV helped to reduce resistance index and pulse activity index, as well as to increase the flow velocity (its maximum and average figures).

These data show the efficacy of antioxidants, nootropics, and vasoprotectives for prophylactic purposes in males of mature age.

As a result of the study, the following practical recommendations could be done: in order to prevent

age-related cutaneous changes, Cratal 1 tablet orally three times per day during 30 days and Quercetin 1 g orally 2 times per day during 30 days is

CONCLUSIONS / ВИСНОВКИ

The study showed a decrease in thickness of different skin layers in healthy males caused by aging, as well as the violations in blood flow, which was proved by the decreased blood flow velocity and

recommended for men aged 45–54 years. Tiocetam-Forte 1 tablet orally 3 times per day during 30 days is recommended for men aged 55–64 years.

elevated resistance index and pulse activity index in 45–65 years old males. The prescription of vasoprotectives, antioxidants, and nootropics for prophylactic purposes significantly improved skin blood flow in males aged 45–64 years.

CONFLICT OF INTEREST / КОНФЛІКТ ІНТЕРЕСІВ

The authors declare no conflict of interest.

CONNECTION WITH THE RESEARCH WORK / ЗВ'ЯЗОК З НАУКОВО-ДОСЛІДНОЮ РОБОТОЮ

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AUTHOR CONTRIBUTIONS / ВКЛАД АВТОРІВ

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