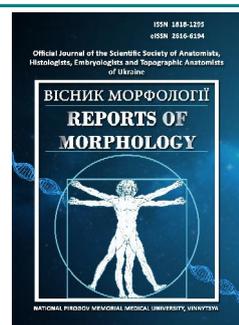




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Discriminant models of the possibility of benign nevi occurrence and features in men depending on the characteristics of anthroposomatotypological indicators

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The multifactorial nature of the origin and development of nevi is the subject of debate so far. One way to understand this process and get an answer to this question is to use a constitutional method of research. The purpose of the study is to build and analyze discriminant models of benign nevi occurrence possibility in men depending on the characteristics of the structure and size of the body. For Ukrainian men aged 22 to 35 years with benign nevi (34 with melanocyte benign simple nevi; 27 with melanocyte benign dysplastic nevi; 14 with melanocyte benign congenital nevi; 17 with nonmelanocyte benign nevus) determined anthropometric indicators according to the scheme of Bunak V. V. (1941), components of the somatotype according to the Heath-Carter scheme (1990), as well as indicators of the component composition of body weight according to Matejko formulas (1921). The control group consisted of anthropometric and somatotypological indicators of 82 practically healthy men of the same age group selected from the data bank of the Research Center of National Pirogov Memorial Medical University, Vinnytsya. Discriminant analysis was performed in the licensed statistical package "Statistica 5.5". With the help of discriminant analysis, reliable models of the possibility of benign nevi depending on the characteristics of anthropometric and somatotypological indicators are built. It was found that healthy and patients with benign nevi of men can reliably interpret the obtained classification indicators between healthy and sick, and between patients with melanocyte simple or dysplastic nevi and other groups of benign nevi (discriminant function covers 75.7 % of cases; Wilks' Lambda statistics=0.125; $p < 0.001$). Between groups of benign nevi, reliable interpretation of the obtained classification indicators is possible only between patients with melanocyte simple or dysplastic nevi and melanocyte congenital or non-melanocyte nevi (discriminant function covers 48.4 % of cases; Wilks' Lambda statistics=0.662; $p < 0.001$), however, the totality of all anthropological variables has little discrimination. The models of healthy and sick men include the skinfold thickness (42.8 %), girth sizes (28.6 %), shoulder width and endomorphic component of the somatotype (14.3 % each); and among men with benign nevi, only girth sizes of the body. The greatest contribution to discrimination in models of healthy and sick men is made by the circumference of the forearm at the top, the width of the shoulders and the skinfold thickness on the side; and among patients with benign nevi - chest girth on inspiration. The obtained results indicate a significant influence of environmental factors on the occurrence of benign nevi.

Keywords: skin diseases, benign nevi, anthropometric indicators, body circumference, transverse body dimensions, skinfold thickness, somatotypological indicators, Ukrainian men, discriminant models.

Introduction

Cancer of the skin is of particular interest to the scientific community. In particular, this is due primarily to their

multifactorial nature of origin, namely the various influences of external environmental factors. These factors become

more or less relevant depending on the type of pathology under consideration [19].

If we are talking about melanocyte pathologies (tumors based on melanin-producing tissue), such as nevi or melanoma, then such a factor as insolation comes to the fore [1]. However, new research data allow a deeper assessment of other factors that deserve attention. In this case, this applies to anthropometric data of the person, such as height, weight, body size, etc. [5, 11].

One possible explanation for this interaction may be the theory of direct involvement of adipose tissue in leptin metabolism, a complex and multi-chain process that includes various human systems and organs - brain, thyroid, adrenal, pancreas and others. In turn, leptin is one of the key factors in triggering melanocyte proliferation [10]. In turn, the amount of adipose tissue is directly related to the dimensions of the human body [2, 7].

The use of such a powerful research method as anthropometric can thus be a promising tool to find answers to questions about the possibility of occurrence, course of melanocyte pathologies, including nevi - pathologies of the skin and mucous membranes, much less studied than melanoma.

In addition, scientometric databases contain only isolated data on the prevalence of nevi, which complicates the understanding and overall assessment of the problem. Thus, it is noted that the prevalence of congenital melanocyte nevi, depending on the data of various studies ranges from 0.5 % to 31.7 %, and giant congenital melanocyte nevi occur in 1 in 20 thousand-500 thousand live births. The prevalence of melanocyte nevi among men and women is quite heterogeneous and is 2 to 3, respectively, and the average size of nevi varies between 3-4 cm; also melanocytic nevi are more common in African and Japanese ethnic groups [2].

The prevalence of dysplastic nevus in the Caucasian population is from 2 to 18 % [7].

Particular attention is paid to nevi due to the emergence of studies that confirm the relationship between the presence of nevi and the development of their degeneration into dangerous and high-lethal melanocyte skin pathologies, such as melanoma or neurodermal melanosis [8].

According to Alikhan A. and co-authors [2], the risk of malignancy of nevi with subsequent melanoma is from 1 to 5 % (for small and giant congenital nevi, respectively), and for neurodermal melanosis from 2.5 to 45 % (for giant congenital nevi).

Analysis of the database of 2159 cases of melanoma revealed that 1.3 % of them occurred on the background of congenital melanocyte nevi [3], and according to other studies for dysplastic nevus is from 34 to 59 % [7] and from 18 to 20 % depending on the type of melanoma spread [17].

It has also been found that genetically, nevi significantly increase the risk of basal cell carcinoma and squamous

cell carcinoma [6].

Observations of 57 patients with nevi for 5.5 years revealed that 3.5 % of them developed melanoma during this period. The researchers estimated the risk of 5-year melanoma in this cohort of individuals was 4.8 % (95 % CI: 1.9-11.5%) [21].

Given the lack of work to study the relationship between anthropometric indicators and the frequency of nevi and the clinical importance of nevi as a prognostic factor for melanoma, there is an urgent need for clinical research to study it and the possibility of further practical application in practice.

The purpose of the study is to build and analyze discriminant models of benign nevi occurrence possibility of in men depending on the characteristics of the structure and size of the body.

Materials and methods

92 Ukrainian men aged 22 to 35 with benign nevi (34 with melanocyte benign simple nevi; 27 with melanocyte benign dysplastic nevi; 14 with melanocyte benign congenital nevi; 17 with non-melanocyte benign nevi) on the basis of the Military Medical Clinical Center of the Central Region and the Department of Dermatology and Venereal Diseases with a course of postgraduate education National Pirogov Memorial Medical University, Vinnytsya conducted clinical, laboratory and pathohistological examinations. The diagnosis of nevi was established according to a two-stage algorithm for the classification of pigmented tumors, which was adopted at the First World Congress of Dermatoscopy (Rome, 2001) [16].

All patients signed an informed consent to participate in the study. Committee on Bioethics of National Pirogov Memorial Medical University, Vinnytsya (protocol № 10 From 26.11.2020) found that the studies do not contradict the basic bioethical standards of the Declaration of Helsinki, the Council of Europe Convention on Human Rights and Biomedicine (1977), the relevant WHO regulations and laws of Ukraine.

All men with benign nevi were determined by anthropometric indicators according to the scheme of Bunak V. V. (1941), somatotype components according to the Heath-Carter scheme (1990), as well as indicators of the component composition of body weight according to the formulas Matejko (1921) [9]. The control group consisted of anthropometric and somatotypological indicators of 82 practically healthy men of the same age group were selected from the data bank of the research center of the National Pirogov Memorial Medical University, Vinnytsya.

Discriminant analysis was performed in the licensed statistical package "Statistica 5.5".

Results

Taking into account the indicators of body structure and size in practically healthy and patients with benign nevi of men, discriminant function covers 75.7 % of cases. Among

healthy and benign nevi men, the discriminant variables are the skinfold thickness (SFT) on the thigh (GBD), on the side (GB) and on the chest (GGR), endomorphic component of somatotype (FX), chest circumference on inspiration (OBGK1) and forearms at the top (OBPR1), as well as shoulder width (ACR). The largest contribution to discrimination between the healthy and benign nevi groups of men among the above indicators is the forearm girth in the upper part, shoulder width and SFT on the side. The set of all anthropological and somatotypological variables has a pronounced (Wilks' Lambda=0.125; $p < 0.001$) discrimination between groups of healthy and benign nevi men.

For healthy and patients with benign nevi of men, classification indicators (Df) have been determined, which can be used to classify the subjects as healthy or patients with benign nevi. Below in the form of equations is the definition of classification indicators, where the attribution to healthy men is possible at a value of Df close to 166.2; to men with melanocyte simple nevi - at a Df value close to 159.7; to men patients with melanocyte dysplastic nevi - at a Df value close to 156.1; to men with melanocyte congenital nevi - at a Df value close to 167.6; to men with non-melanocyte nevi - at a Df value close to 168.8:

Df (for healthy men) = $GBD \times 1.157 - GB \times 0.460 - FX \times 6.371 + OBGK1 \times 1.005 + ACR \times 3.026 + OBPR1 \times 4.311 - GGR \times 0.804 - 166.2$;

Df (for men with melanocyte simple nevi) = $GBD \times 0.194 + GB \times 1.323 - FX \times 14.59 + OBGK1 \times 1.579 + ACR \times 1.925 + OBPR1 \times 3.795 + GGR \times 0.191 - 159.7$;

Df (for men with melanocyte dysplastic nevi) = $GBD \times 0.311 + GB \times 1.193 - FX \times 14.94 + OBGK1 \times 1.814 + ACR \times 1.869 + OBPR1 \times 2.959 - GGR \times 0.006 - 156.1$;

Df (for men with melanocyte congenital nevi) = $GBD \times 0.143 + GB \times 1.027 - FX \times 14.00 + OBGK1 \times 1.835 + ACR \times 2.054 + OBPR1 \times 3.000 + GGR \times 0.217 - 167.6$;

Df (for men with non-melanocyte nevi) = $GBD \times 0.299 + GB \times 1.052 - FX \times 14.42 + OBGK1 \times 1.737 + ACR \times 2.021 + OBPR1 \times 3.468 + GGR \times 0.256 - 168.8$;

where (here and hereafter), SFT - in mm; somatotype components - in points; circumferential body dimensions - in cm; body diameters - in cm

The statistical significance of discriminant functions of healthy and patients with benign nevi of men was determined using the criterion χ^2 . The results of the χ^2 test indicate that taking into account the established anthropometric and somatotypological indicators it is possible to reliably interpret the obtained classification indicators between healthy and sick for all groups of benign nevi of men, as well as between men with melanocyte simple or dysplastic nevi and other groups.

Taking into account the indicators of anthropo-somatotypological indicators only in patients with benign nevi of men discriminant function covers 48.4 % of cases. Among men with benign nevi, the discriminant variables are upper arm circumference (OBPR1), inspiratory chest

circumference (OBGK1), and expiratory chest circumference (OBGK2). The greatest contribution to discrimination between groups of men with benign nevi in men is chest girth on inhalation. The totality of all anthropological and somatotypological variables has a slight (Wilks' Lambda=0.662; $F_{(9,207)}=4.241$; $p < 0.001$) discrimination between groups of men with benign nevi.

Below in the form of equations is the definition of classification indicators, where the attribution to men of patients with melanocyte simple nevi is possible with a Df value close to 118.8; to men patients with melanocyte dysplastic nevi - at a Df value close to 111.7; to men with melanocyte congenital nevi - at a Df value close to 123.2; to men with non-melanocyte nevi - at a Df value close to 124.4:

Df (for men with melanocyte simple nevi) = $OBPR1 \times 6.004 + OBGK1 \times 2.676 - OBGK2 \times 2.175 - 118.8$;

Df (for men with melanocyte dysplastic nevi) = $OBPR1 \times 5.181 + OBGK1 \times 2.842 - OBGK2 \times 2.196 - 111.7$;

Df (for men with melanocyte congenital nevi) = $OBPR1 \times 5.318 + OBGK1 \times 3.111 - OBGK2 \times 2.415 - 123.2$;

Df (for men with non-melanocyte nevi) = $OBPR1 \times 5.767 + OBGK1 \times 2.988 - OBGK2 \times 2.393 - 124.4$.

The results of the χ^2 test indicate that, taking into account the established anthropometric and somatotypological indicators, a reliable interpretation of the obtained classification indicators is possible only between patients with melanocyte simple or dysplastic nevi and other groups of benign nevi.

Discussion

Anthropometric researches about study the characteristics of certain dimensions or weights in people with nevi are not available in scientometric databases for the last decade. However, the results of examinations of persons with other types of skin pathology are quite encouraging.

A history of 70 Iraqi people with non-melanocyte skin cancer showed the following distribution: most people were 56-70 years old, illiterate, married, and working with a sufficient income. 11.4 % of respondents had a burdensome family history, and 62.9 % spent more than 4 hours in the sun every day. 72.9 % did not smoke and 98.6 % did not drink alcohol; 45.7 % had 1 blood group and slightly more than half of the participants had normal values of body mass index [1].

At the same time, no association was found between body mass index or waist circumference and the risk of glioma in adulthood. In young people, there is an association only with the body mass index (higher rates are associated with an increased risk of glioma). For women of all ages, there is a reduced risk of glioma in people with severe somatotype [5].

Taking into account age, height and height-to-sitting height ratios are significantly associated with the risk of melanoma (RR=1.40, 95 % CI=1.06-1.86 for ≥ 0.533 vs. < 0.518 ; P for trend=0.02). An association has also been

found between a large type of somatotype during menarche and the risk of melanoma [11].

P. H. Lahmann and co-authors [12] conducted a 16-year follow-up of more than 1,000 individuals, of whom more than 500 developed skin cancer (334 - basal cell carcinoma, 188 - squamous cell carcinoma, 28 - melanoma). Statistical data showed a significant association between the risk of squamous cell carcinoma and melanoma and growth in men and basal cell carcinoma and growth in women.

Similar data were obtained from Nurses' Health (117,863 individuals) and Health Professionals Follow-up Study (51,111 individuals), which found an increased risk of basal cell and squamous cell skin cancer with an increase in height every 10 cm [13].

K. D. Meyle and others [14] analyzed the database of the Copenhagen School Register of Medical Records of 1930-1989 (372,636 people). During the observation period, 2329 people developed skin melanoma. The analysis of anthropometric indicators established a connection between the increased risk of melanoma and growth at the age of 7-13 years and birth weight.

An analysis of the literature on the relationship between the risk of melanoma and human growth clearly indicates its existence. This is confirmed by researchers from the United States, Norway, Canada, Israel, Italy and Australia [20].

A group of scientists analyzed 9 publications, which totaled almost a million people, of whom more than 50,000 developed non-melanocyte skin cancer. Statistical analysis of the data showed a nonlinear feedback between body mass index and non-melanocyte cancer risk (RR=0.88, 95 % CI: 0.85-0.91, I²=71.2 %, P-nonlinearity <0.001) [23].

Long-term follow-up of 71,645 women, more than 13,000 of whom developed nonmelanocyte skin cancer, revealed the factors most closely associated with the pathology. A body mass index greater than 25 kg/m² and a waist-to-thigh ratio greater than 0.80 are associated with a reduced risk of non-melanocytic cancer, only in the absence of excessive sun exposure [4].

Rezaiian F. and co-authors [18] found significant correlations between visceral fat percentage and waist circumference and risk of nonmelanocyte skin cancer by logistic regression analysis (OR: 1.10, 95 % CI: 1.024-1.190, p=0.01 and OR: 1.04, 95 % CI: 1.007-1.080, p=0.018, respectively).

One way or another, the values of body mass index, body fat and non-fat body mass are associated with the risk of cancer of the stomach, esophagus, liver, pancreas, lungs and uterus [22].

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Thus, given the data of the above studies, and taking into account the known pathophysiological mechanisms, it becomes obvious that obesity is one of the key places in the trigger mechanism of both melanocyte and non-melanocyte skin tumors [10].

In the analysis of discriminant equations of healthy and patients with benign nevi men depending on anthropo-somatotypological indicators, we found that a reliable interpretation of the obtained classification indicators between healthy and patients with benign nevi, and between patients with melanocyte simple or dysplastic nevi and others benign nevi (discriminant function covers 75.7 % of cases; statistics Wilks' Lambda=0.125; p<0.001). In the analysis of discriminant equations only between men with benign nevi men found only slight discrimination (discriminant function covers 48.4 % of cases; statistics Wilks' Lambda=0.662; p<0.001) between patients with melanocyte simple or dysplastic nevi and melanocyte congenital or neonatal melanocytes.

Discriminant models in healthy and benign nevi male include SFT (42.8 %), girth (28.6 %), body diameter and somatotype components (14.3% each); and among men with benign nevi - only comprehensive body size (100 %). Moreover, the greatest contribution to discrimination in healthy and benign nevi of men is made by the girth of the forearm at the top, shoulder width and SFT on the side; and between groups of patients with benign nevi - chest girth on inspiration.

The high percentage of participation in SFT models and body circumference indicate a significant influence of environmental factors on the occurrence of this multifactorial disease [15].

Conclusion

1. Reliable discriminant models developed on the basis of anthropometric and somatotypological indicators allow to predict with high probability the possibility of benign nevi in Ukrainian men, as well as to separate melanocyte simple or dysplastic nevi (discriminant function covers 75.7 % of cases; statistics Wilks' Lambda=0.125; p<0.001). In the analysis of only sick men, significant slight discrimination between melanocyte simple or dysplastic nevi and melanocyte congenital or non-melanocyte nevi is possible (discriminant function covers 48.4% of cases; statistics Wilks' Lambda=0.662; p<0.001).

2. Discriminatory equations in healthy and patients with benign nevi men include SFT (42.8 %) and girth sizes (28.6 %); and between sick men - only the comprehensive size of the body.

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ДИСКРИМІНАНТНІ МОДЕЛІ МОЖЛИВОСТІ ВИНИКНЕННЯ ТА ОСОБЛИВОСТЕЙ ПЕРЕБІГУ ДОБРОЯКІСНИХ НЕВУСІВ У ЧОЛОВІКІВ ЗАЛЕЖНО ВІД ОСОБЛИВОСТЕЙ АНТРОПО-СОМАТОТИПОЛОГІЧНИХ ПОКАЗНИКІВ

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Мультифакторіальна природа виникнення та розвитку невусів є предметом дискусій вчених дотепер. Одним зі шляхів розуміння цього процесу і отримання відповіді на дане питання є застосування конституціонального методу дослідження. Мета дослідження - побудувати та провести аналіз дискримінантних моделей можливості виникнення доброякісних невусів у чоловіків залежно від особливостей показників будови та розмірів тіла. Українським чоловікам віком від 22 до 35 років, хворим на доброякісні невуси (34 із меланоцитарними доброякісними простими невусами; 27 із меланоцитарними доброякісними диспластичними невусами; 14 із меланоцитарними доброякісними вродженими невусами; 17 із немеланоцитарними доброякісними невусами) проведено визначення антропометричних показників за схемою Бунака В. В. (1941), компонентів соматотипу за схемою Хім-Картера (1990), а також показників компонентного складу маси тіла за формулами Матейко (1921). Контрольну групу склали антропометричні та соматотипологічні показники 82 практично здорових чоловіків аналогічної вікової групи відібрані з банку даних науково-дослідного центру Вінницького національного медичного університету ім. М. І. Пирогова. Дискримінантний аналіз проведено в ліцензійному статистичному пакеті "Statistica 5.5". За допомогою дискримінантного аналізу побудовані достовірні моделі можливості виникнення доброякісних невусів в залежності від особливостей антропометричних і соматотипологічних показників. Встановлено, що у здорових і хворих на доброякісні невуси чоловіків можлива достовірна інтерпретація отриманих показників класифікації як між

здоровими та хворими, так і між хворими на меланоцитарні прості або диспластичні невуси та іншими групами доброякісних невусів (дискримінантна функція охоплює 75,7 % випадків; статистика Wilks' Lambda=0,125; $p<0,001$). Між групами доброякісних невусів достовірна інтерпретація отриманих показників класифікації можлива лише між хворими на меланоцитарні прості або диспластичні невуси та меланоцитарні вроджені або немеланоцитарні невуси (дискримінантна функція охоплює 48,4 % випадків; статистика Wilks' Lambda=0,662; $p<0,001$), однак сукупність усіх антропологічних змінних має незначну дискримінацію. До складу моделей у здорових і хворих чоловіків входять товщина шкірно-жирових складок (42,8 %), обхватні розміри тіла (28,6 %), ширина плечей та ендоморфний компонент соматотипу (по 14,3 %); а між хворими на доброякісні невуси чоловіками - лише обхватні розміри тіла. Найбільший внесок у дискримінацію в моделях здорових і хворих чоловіків вносять обхват передпліччя у верхній частині, ширина плечей та товщина шкірно-жирової складки на боку; а між хворими на доброякісні невуси - обхват грудної клітки на вдиху. Отримані результати вказують на значний вплив факторів зовнішнього середовища на виникнення доброякісних невусів.

Ключові слова: захворювання шкіри, доброякісні невуси, антропометричні показники, обхватні розміри тіла, поперечні розміри тіла, товщина шкірно-жирових складок, соматотипологічні показники, українські чоловіки, дискримінантні моделі.
