SEDENTARINESS AS A PREDICTOR OF PREMATURE VASCULAR AGING IN THE CURRENT YOUNG GENERATION

SEDENTARISMUL CA PREDICTOR AL ÎMBĂTRÂNIRII VASCULARE PREMATURE LA TINERII GENERAȚIEI ACTUALE

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Keywords: physical training, sedentariness, hemodynamic parameters, vascular ageing, aortic pulse wave velocity.

Cuvinte cheie: antrenament fizic, sedentarism, parametrii hemodinamici, vârsta, viteza undei pulsatile din aortă.

Abstract

Background. The modern society that has become increasingly technological generates by itself impairments regarding human health, especially for the young people who replace an active lifestyle with a sedentary one.

Purpose: The study aims to demonstrate the negative impact of sedentary lifestyle for young people on the blood vessels, as a predictor of premature vascular ageing and an early development of the disease.

Methods: The study comprise: a group of athletes (S=35) and a group of young non-athletes (T=41). In comparing the two groups were analyzed the hemodynamic parameters: the systolic (SBP),the diastolic blood pressure (DBP), the mean arterial pressure (MAP), the pulse pressure (PP) and the aortic pulse wave velocity (PWVao), all of them correlated with age and heart rate (HR).

Results: The values of the hemodynamic parameters obtained were: group S with a mean age of 40.7 years vs group T 29.1 years (p=0.015); SBP: group S 112.5mmHg vs group T 139.5mmHg (p <0.001); DBP: group S 67.1 mmHg vs group T 83.9 mmHg (p <0.001); MAP: group S 82.5 mmHg vs group T 102.4 mmHg (p <0.001); PP: group S 46.1 mmHg vs group T 55.4 mmHg (p=0.008); PWVao: group S 5.9 m/s vs group T 8.5 m/s (p <0.001); HR: group S 65.3 beats/min vs group T 68.2 beats/min (p=0.047).

Conclusions: The study clearly demonstrated, that physical exercises performed regularly, significantly influence the elasticity of the blood vessels, validated through a far better hemodynamic parameters in the group of athletes.

Rezumat

Introducere. Societatea actuală din ce în ce mai tehnologizată generează după sine şi costuri în ceea ce priveşte sănătatea oamenilor şi în mod special ale tinerilor care înlocuiesc un stil de viaţă activ cu unul sedentar.

Scop: Studiul şi-a propus să demonstreze influenţa negativă a lipsei de mişcare a tinerilor, asupra vaselor de sânge, ca factor predictor al îmbatranirii premature şi a instalării timpurii a bolilor morbide ale societăţii.

Material şi metodă: În studiu au fost inclusi un lot de de sportivi (S) cu o medie de vârsta de 40.7 ani (*n*=35) şi un lot de tineri nesportivi (T) cu o medie de vârstă de 29.1ani (*n*=41). In compararea celor două loturi au fost urmăriţi parametrii hemodinamici (tensiunea sistolică (SBP), diastolică (DBP), medie (MAP), presiunea pulsului (PP), velocitatea unei pulsatile aortice (PWVao), corelaţi cu vârsta şi frecvenţa cardiacă (HR). Indicii hemodinamici urmăriţi în studiu au fost analizati cu ajutorul aparatului TensioMed *Arteriograf*.

Rezultate: Valorile medii ale parametrii hemodinamici obţinuti în urma studiului au fost: lotul de *sportivi* cu o valoare medie de vârsta de 40.7 ani: SBP: 112.5mmHg, DBP: 67.1 mmHg, MAP 82.5 mmHg, PP 46.1 mmHg, PWVao 5.9 m/s,HR 65.3 bătăi/min. Lotul de *tineri nesportivi*, cu o medie de vârstă de 29.1ani: SBP: 139.5mmHg, DBP: 83.9 mmHg, MAP 102.4 mmHg, PP 55.4 mmHg, PWVao 8.5 m/s, HR 68.2 bătăi/min.

Concluzii: Studiul a demonstrat clar că exercitiile fizice efectuate în mod regulat influenţează considerabil elasticitatea vaselor de sânge, lucru validat prin parametrii hemodinamici mult mai buni la lotul de sportive decat la tinerii nesportivi..

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Background

The current modern society that is becoming more and more technologized generates costs regarding human health and especially young people who replace an active lifestyle with a sedentary one.

The inactive lifestyle, the lack of physical training, they all have negative consequences regarding the damage done to the vascular wall structure, resulting in early structural changes that generate the loss of vascular elasticity and thus the appearance of blood pressure. [1,2,3] The loss of vascular elasticity is a vascular wall stiffening phenomenon that operates in a "boomerang" system type: the loss of vascular elasticity leads to arterial hypertension which acts in a negative way further emphasizing arterial wall stiffness. [4,5,6]

This context is structured around the idea that movement and especially physical training act as a delay factor of the complex arterial stiffening phenomenon, becoming a prevention and also a therapeutic method for cardiovascular morbidity. The lack of physical training or sedentariness is considered by some authors an important predictor of cardiovascular mortality, independent of other risk factors . [7,8]

Purpose

The study aims to demonstrate the negative impact of sedentary lifestyle for young people on the blood vessels, as a predictor of premature vascular ageing and an early development of the disease

Material and method

Objectives

- Educating young people for an active lifestyle, even one that involves sport;
- Improving the physical qualities through constant training,
- Improving the hemodynamic parameters and through this, the regression of vascular aging and preventing its early apparition

Subjects and Procedure

The study included a group of athletes (S) with an average age of 40.7 years (n=35) and a group of young people (T) with an average age of 29.1 years (n = 41). The inclusion in the study was done only after a freely given consent by each participant in the study, with respect for individual rights.

We used the Arteriograph, that offers us information about blood function by analyzing the pulse wave and by measuring the arterial stiffness. All the patients were tested dressed in dorsal position, by applying the sleeve at about the same level on the right arm of each study participant. The patients are not allowed to talk, gesticulate or sleep during the measurement. Before the evaluation, the patients had to comply with some standard rules related to sleeping, eating, smoking, alcohol. [9,10]

The Statistical analysis was performed using the Microsoft Office XP Excel and SPSS v.17 programmes. For the numerical variables we have calculated the central tendency and dispersion indicators and presented them as histograms and line graphs; the differences between the independent variables were analyzed using the ANOVA test followed by the parametric significance t-unpaired test. The differences between the variables originating from the same patients were analyzed using the t-paired test. To refine the comparisons between the two groups the post-hoc Scheffe test was applied. [11]

Results

In the comparison of the two groups we followed the hemodynamic parameters, the systolic blood pressure (SBP), the diastolic blood pressure (DBP), the mean arterial pressure (MAP), the pulse pressure (PP), the pulse wave velocity (PWVao) correlated with age and heart rate (HR), weight, height and BMI. The hemodynamic indices followed in the study were analyzed using the TensioMed arteriography device.

Table 1. Age

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
Age	SPORT	35	40.7	17.70	2.99	0.015
	YOUNG	41	29.1	14.50	2.26	

As it can be seen in the table 1, the values regarding age are significantly higher at the SPORT group compared to the YOUNG group with 11.6 years ($p=0.015$, $\alpha=0.05$).

Table 2. Height

Variable	Group	N	Average value	$p^{semnif.}$
Height	SPORT	35	170	0.31
	YOUNG	41	163	

The values regarding height in table 2 are not statistic significant between the two groups.

Table 3. Weight

Variable	Group	N	Average value	$p^{semnif.}$
Weight	SPORT	35	67,68	0.02
	YOUNG	41	66	

We have obtained no significant result regarding the weight, both of the group have an average value of 67 kg.

Table 4. The aortic pulse wave velocity (PWVao)

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
PWVao	SPORT	35	5.9	0.42	0.07	<0.001
	YOUNG	41	8.5	1.83	0.29	

A difference can be seen regarding the average values of the PWVao,(Table2)_ values that are significantly higher at the YOUNG group compared to the SPORT group with 2.6 m/s ($p<0.001$, $\alpha=0.001$).

Table 5. The systolic blood pressure (SBP)

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
SBP	SPORT	35	112.5	6.58	1.11	<0.001
	YOUNG	41	139.3	23.80	3.72	

The SBP values are significantly higher at the YOUNG group compared to the SPORT group with 26.8 mmHg ($p<0.001$, $\alpha=0.001$).

Table 6. The diastolic blood pressure (DBP)

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
DBP	SPORT	35	67.1	7.02	1.19	<0.001
	YOUNG	41	83.9	14.67	2.29	

As we can see from table 4, the DBP values are significantly higher at the YOUNG group compared to the SPORT group with 16.8 mmHg. ($p<0.001$, $\alpha=0.001$).

Table 7. The mean arterial pressure (MAP)

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
MAP	SPORT	35	82.5	6.98	1.18	<0.001
	YOUNG	41	102.4	16.73	2.61	

The MAP values are significantly higher at the YOUNG group compared to the SPORT group with 19.9 mmHg ($p<0.001$, $\alpha=0.001$)

Table 8. The pulse pressure (PP)

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
PP	SPORT	35	46.1	5.64	0.95	0.008
	YOUNG	41	55.4	15.14	2.36	

As we can see from the table 6 , the PP values are significantly higher at the YOUNG group compared to the SPORT group with 9,3 mmHg ($p=0.008$, $\alpha=0.01$)

Table 9. The heart rate (HR)

Variable	Group	N	Average value	Std. Deviation	Std. Error	$p^{semnif.}$
HR	SPORT	35	65.3	9.36	1.58	0.047
	YOUNG	41	68.2	11.80	1.84	

The heart rate values are significantly lower at the SPORT group compared to the YOUNG group with 2.9 beats/minute ($p=0.047$, $\alpha=0.05$).

Discussion

Regarding the FC (pulse), the age parameter influences the group of young people even if they don't have a lifestyle which involves sport. I think it would have been an interesting comparison at this parameter between 2 middle aged groups that are relatively close.

I wish to point out that during the measurement, none of the subjects where under any medication and that the cardiac and vascular differences are in this case due to a stressful and disorderly lifestyle, but physical training prevents the installation of early vascular changes as we can see in the group of athletes and if some changes were already installed, it appears that physical exercise stops the arterial stiffening process provided that it is practiced daily.

The influence of physical training is even more important when it is started at an early age by increasing the optimum operating parameters: respiratory, circulatory , metabolic , etc.

As a prerequisite to the quality of life, health and wellbeing , physical exercise should be included in everyone's lifestyle, preventing the installation of some diseases that could early occur caused by a sedentary lifestyle.

It is believed that, the health of the organism is highly influenced by the quality of the circulatory system, by the quality of blood vessels and this quality is maintained by coordinated physical exercise. A good circulation causes the other functions of the body to function well and the degradation of the circulatory system caused by a sedentary lifestyle involves the dysfunction of various organs that will turn over time into real diseases (such as cardiovascular diseases, chronic kidney diseases, diabetes , etc.)

There is apparent a small difference of 2.6 m/s between the two groups involving PWVao, however is very important from the point of view of vascular elasticity, as the optimum values for this parameter are lower or equal to 7 m/s; the normal values are between 7-9 m/s; high values between 9.7 to 12 m/s and pathological values above 12 m/s. [12,13,14] It can be noticed that the group of young people is approaching the upper limit of normal, although the group is at a relatively early age, demonstrating the enormous effect of physical training on vascular elasticity even at a relatively advanced age.

According to recent studies that have established the normal values of PWV at healthy individuals , the PWV at the group of athletes places them in terms of vascular elasticity at normal values typical to their age of < 30 years. In other words, we talk in metaphorical terms about "a vascular youth" of the athletes whose biological age is almost twice the age of their arteries. [13]

Compared to the group of athletes, the young people included in the study with the PWV values places them at the age level of 50-59 years; so we speak of an early installed "vascular ageing" through lack of physical exercise and probably by associating other factors of sedentary lifestyle. [13]

From a numerical point of view, the TAS parameter compared with the two groups presents higher differences. The difference is even more important as it is observed that the group of young people is approaching the lower limit of grade 1 hypertension according to ESC/ESH guidelines, in which the optimal value is listed at 120 mmHg, 120-129mmHg normal, 130-139 mmHg normal high, 140 -159 mmHg arterial hypertension grade 1. [12] According to the results above, it appears that coordinated physical exercise expresses its beneficial effect by majorly reducing the SBP [12]

Regarding the TAD parameter, the difference of 16.8 mmHg is relatively important given that this parameter is hardly influenced by other factors (diet, medication, etc). In this case, the group of young people is situated around the normal high limit (85-89 mm Hg), which represents something to be concerned about if we take into account the average young age of 29.1 years. [12]

The mean arterial pressure is situated at the same level as the two tension parameters, with significantly lower values compared to the young people group.

Regarding the tension parameters, it was found that the best blood pressure is present at the athlete subjects with the highest degree of training, by comparison, the young people group has a relatively higher value demonstrating the major influence of physical exercise in preventing the appearance of arterial hypertension even at early ages and through this, the co-morbidities associated with this hypertension. [12]

The pulse pressure (PP) is defined as PP= SBP – DBP, is situated regarding the pathology (cardiovascular risk) at values above 60 mmHg, especially if associated with an upper limit of normal or slightly increased TAD (the TAD reflecting the aortic wall damping function degradation) . [12] This parameter shows a slightly apparent oscillation between the two groups: the group of athletes and young people group, but from the point of view of the significance regarding the arterial wall the difference of 9.3 mmHg is distinguishable, taking into account that the PP is a major predictor of cardiovascular events . [15,16,17]

Conclusions

The study demonstrates that the sedentary lifestyle for young people has a negative impact on the blood vessels, as a predictor of premature vascular ageing and an early development of the disease

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