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Functional Readiness Of Platelets In Young People Who Regularly Visited The Section Of Unarmed Combat In Their Youth.

Medvedev IN*.

Russian State Social University, st. V. Pika, 4, Moscow, Russia, 129226

ABSTRACT

The formation and development of the human body is largely determined by the activity of platelet hemostasis, which in turn determines the adequate rheological properties of blood. However, platelet functions may vary depending on the living conditions, including the intensity of the exercise that is experienced. At young people who regularly attended the section of hand-to-hand combat at the age of 18-22 years and subsequently stopped training, a stable low functional platelet activity was revealed. For 26-35 years, their platelet aggregation was at a low level, without experiencing significant fluctuations, which is apparently due to the constancy of their sensitivity to exogenous influences. The optimally low activity of platelets causes a small amount of circulating aggregates of various sizes in their bloodstream, which has a positive effect on tissue microcirculation in the body of a young person who has previously been physically trained regularly.

Keywords: platelet activity, young age, physical activity, blood rheology, platelet activity.

Corresponding author

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INTRODUCTION

The success of the ontogeny of an organism largely depends on the adequacy of blood flow to various tissues of the body, which is associated with the functional state of the hemostasis system [1-3]. In this regard, the formation and development of the human body is largely determined by the activity of platelet hemostasis, which in turn determines the adequate rheological properties of blood [4,5]. At the same time, platelet functions may vary depending on the living conditions, including the intensity of the exercise that is being tested [6,7]. At the same time, the activity of platelet functions in young people who have no bad habits, who in the past regularly trained in the section of unarmed combat, but subsequently reduced the intensity and frequency of training, remains insufficiently studied. The dynamics of the aggregation activity of their platelets under the influence of various inductors and their combinations present in the blood flow conditions has not been evaluated. In this cohort of young people, the severity of in vivo intravascular platelet activity in vivo, which determines the liquid properties of blood and its fluidity through the vessels, was also not previously evaluated. In this regard, the research goal was formulated: to determine the activity of platelet functions in healthy young people who do not have bad habits, who left regular training in the section of unarmed combat.

MATERIALS AND METHODS

The study was approved by the local ethics committee of the Russian State Social University on September 14, 2016 (protocol №19). The study was conducted on the basis of the Russian State Social University.

The study group included 67 healthy young men of 26–35 years old who regularly trained in student years in the section of hand-to-hand combat, and currently have left regular training sessions, reducing them to the level of morning short-term and irregular exercises (23 people 26–27 years old, 22 people 30-31 year, 22 people 34-35 years). The control group consisted of 147 young people aged 18–22 who regularly exercise physically in the general physical training section. The level of intraplatelet lipid peroxidation (LPO) was determined by the basal level of malonic dialdehyde (MDA) in the reduction reaction of thiobarbituric acid and by the level of acylhydroperoxides (AGP), catalase and superoxide dismutase. The platelet count in capillary blood in the Goryaev chamber was counted. The products of platelet phospholipid labilization - coagulation activators (F3 – platelets) were evaluated by the method with the calculation of the platelet activity index. The duration of platelet aggregation (AP) was determined by a visual micromethod using as inducers ADP (0.5×10^{-4} M), collagen (1: 2 dilution of the main suspension), thrombin (0.125 U/ml), ristomycin (0.8 mg/ml), Adrenaline (5×10^{-6} M), as well as combinations of ADP and adrenaline, ADP and collagen, adrenaline and collagen to simulate real blood flow conditions. The intravascular activity of platelets was determined visually using a phase contrast microscope. Statistical processing of the obtained results was carried out using Student's t-test.

RESULTS AND DISCUSSION

An assessment of the baseline state of the young people included in the study group showed that the estimated total functional and biochemical values of all the subjects were within the physiological norm.

The level of the primary products of LPO-AHP in platelets of healthy 26-27 year old young people who previously trained in the hand-to-hand combat section was at a level of 2.03 ± 0.29 D_{233} /10^9 platelets, not changing significantly by 34-35 years and at this age was 2.07 ± 0.25 D_{233}/10^9 platelets (in the control 1.98 ± 0.17 D_{233} /10^9 platelets). At the same time, the level of basal MDA in platelets - the end product of POL in 26-27 years of the surveyed was 0.50 ± 0.18 nmol / 109 platelets, also remaining at this level up to 34-35 years of life (0.53±0.24 nmol/10^9 platelets) at control level 0.49±0.16 nmol/10^9 platelets. The activity of catalase and superoxide dismutase in the blood plates of healthy young people tested did not experience significant changes from 26–27 years (9620.0±189.6 IU/10^9 platelets and 1650.0±12.5 IU/10^9 platelets, respectively) to 34–35 years (9560.0±205.3 IU/10^9 platelets, 1640.0±19.6 IU/10^9 platelets, respectively) with an activity value of these enzymes in the control of 9646.0±158.6 IU/10^9 platelets, 1690.0±19.7 IU/10^9 platelets, respectively).

At the same time, the level of platelet activity index at 26-27 years in the examined corresponded to 21.2±0.30%, remaining at this level in the examined older people, not differing from the control values (20.5±0.13%). One can think of stability at the age of 26-35 years in healthy young people who had previously

been physically trained in the blood plates of the level of labilization products of platelet phospholipids - blood clotting activators. So, in young people at the age of 26-27 years old, included in the study, AT under the influence of collagen developed over 35.2±0.14 s (in control 34.6±0.17s), being at a similar level in the older subjects. Similar activity of AP at this age in young people who ceased regular training in the hand-to-hand combat section was noted under the influence of ADP (46.2±0.12 s, in control 46.2±0.12 s) and ristomycin (48.6±0.20 s, in control 49.0±0.15 s). Later, thrombin and adrenaline AP developed, at 26-27 years old, 57.2±0.14 s and 105.2±0.34 s, respectively (in control 56.2±0.15 s and 104.4±0.23 s, respectively), without significant change in the older. At the age of 26-27 years with combined use of inductors in AP physically exercising young people, for ADP+adrenaline - 37.2±0.18s, for ADP+collagen - 26.3±0.12s, for adrenaline + collagen - 29.6 ± 0.18s, remaining stable to 34 -35 years old (in control 37.1±0.18 s, 27.7±0.15 s and 29.9±0.16 s, respectively).

The content of discoid platelets in the blood of healthy young people who had previously regularly trained in hand-to-hand combat totaled 26.27 years of life totaled 84.2 ± 0.12%, not significantly differing from values at other ages included in the observation group (Table). The number of disco-echinocytes, spherocytes, sphero-echinocytes and bipolar forms of platelets, also remained stable in their bloodstream from 26 to 35 years. As a result, the sum of active forms of platelets also did not change significantly. In the blood of young people who were previously physically trained in the unarmed combat section, the levels of free-circulating small and large platelet aggregates did not have reliable dynamics, reaching 2.9 ± 0.18 and 0.08 ± 0.004 per 100 free platelets by 34–35, respectively. The number of platelets involved in the process of aggregation in the patients also did not change between 26 to 35 years, amounting to 6.1 ± 0022% by the end of the observation.

Table. Intravascular platelet activity in healthy young people in their youthful years regularly trained in the section of unarmed combat

Platelet forms and variants of their aggregates	People who trained in the section of hand-to-hand combat in youthful years			Control, n=147, M±m
	26-27 years, n=24	30-31 years, n=25	34-35 years, n=23	
Discocytes, %	84.2±0.12	83.1±0.16	83.6±0.21	85.1±0.10
Disco-echinocytes, %	10.3±0.26	10.9±0.17	10.3±0.24	9.1±0.14
Spherocytes, %	2.8±0.15	3.1±0.22	3.0±0.17	2.9±0.15
Sphero-echinocytes, %	1.6±0.18	1.8±0.15	1.9±0.12	1.8±0.18
Bipolar forms, %	1.1±0.17	1.1±0.24	1.2±0.15	1.1±0.10
Sum of active forms, %	15.8±0.18	16.9±0.22	16.4±0.24	14.9±0.15
The number of platelets in the aggregates, %	5.9±0.26	5.5±0.15	6.1±0.22	5.8±0.12
The number of small units of 2-3 platelets per 100 free platelets	2.8±0.16	3.0±0.19	2.9±0.18	2.8±0.14
The number of medium and large aggregates, 4 or more platelets, per 100 free-lying platelets	0.07±0.009	0.08±0.007	0.08±0.004	0.06±0.012

Note: the reliability between the evaluated groups of the examined was not revealed.

DISCUSSION

The rheological properties of blood are largely dependent on a large number of factors, which, of course, include regular exercise [8-10]. The study revealed that healthy young people 26–35 years of age in the past regularly trained physically in the section of unarmed combat, showed consistently normal levels of platelet antioxidant activity and a low level of POL in them, which largely determines their blood platelet activity [11,12]. Obviously, this is largely due to the low level of sensitivity of platelet receptors to exogenous influences, including von Willebrand factor - a cofactor for adhesion of platelets with simultaneous constancy

of the number of receptors to it - (GPI в) on the surface of blood plates [13-15]. A small number of receptors on the platelet membranes is a consequence of complex adaptive reactions of the body in the patients, ensuring that optimal adaptation of platelet hemostasis to functioning conditions is maintained [16].

Evaluation of AP using a number of isolated inductors and their combinations in young people 26-35 years old, attending the section of unarmed combat in their student years, made it possible to state the constancy of the aggregative function of the blood platelets. When platelet aggregation agonists — collagen and thrombin AP — are influenced in many respects, the platelet activation mechanism via phospholipase C, which stimulates the phosphoinositol pathway through diacylglycerol and protein kinase C and phosphorylation of the contractile system proteins [17, 18], is largely realized. Similarly, consistently low AP in the examined young people was also noted with weak aggregation inducers - ADP and adrenaline, interacting with their membrane receptors and causing the required level of expression of fibrinogen receptors (GPIIv-IIIa), with constant stimulation of phospholipase A_2, which causes a stable low metabolism of arachidine isacididogenic isohydrophilic acid. blood plates [19,20].

Evaluation of antibodies with combinations of inductors showed their mutually potentiating action, confirming the patterns found in the study of antibodies with isolated agonists [21]. The stability of the activity of the enzyme systems of platelets, including thromboxane formation, secretion of ADP and ATP and functional readiness of the actin-myosin complex [22].

The consistently low level of intravascular platelet activity identified by young people in the past regularly practicing physically in the unarmed combat section indirectly indicated that the physiological level of aggregation inducers (primarily thrombin, ADF, adrenaline) remained in their blood with a low constant sensitivity of platelets [23] . It can be thought that in healthy young people, 26–35 years of age, who regularly trained physically at the age of 18–22 years old, a small number of active forms of platelets and their aggregates remain in the bloodstream, which further confirms the reduced activity of their receptors.

CONCLUSION

At 26-35 year old young people who trained at the age of 18-22 years in the section of hand-to-hand fighting there is a low aggregation of platelets, without experiencing significant fluctuations, which is apparently due to the high perfection of their regulatory mechanisms that ensure their response to exogenous influences. Low platelet activity provides a small amount of freely circulating aggregates of various sizes in the bloodstream, having a positive effect on tissue microcirculation in the body of a young person who had previously regularly trained in the hand-to-hand combat section.

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