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Comparison the effect of aerobic and resistance exercises in Sari elderly sedentary men on coagulation and fibrinolytic factors

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ABSTRACT

The aim of this study was the comparison the effect of aerobic and resistance exercises on elderly men coagulation and fibrinolytic factors. This study subjects included 36 apparently healthy elderly men. The protocol used in this study was reviewed and approved by Sari University's Institutional Review Board prior to participant recruitment and all participants provided written informed consent prior to beginning the study. As assessed by a medical history questionnaire, each participant was free of cardiovascular and neurological diseases, severe musculoskeletal injuries and low back pain. Firstly Subjects were tested between 8:00 and 10:00 h, according to the regular training. For measuring fibrinogen, pt and ptt the Coagulation method and for d-dimer measurement the Elisa was used. The platelet number analyzed via Diatron abacus machine. The Stago machine used for measuring the fibrinogen, pt and ptt. Results indicated that human hemostatic system affected by physical activity. The effect of aerobic training on Fibrinogen, prothrombin time, Partial thrombo-plastin time and Platelets number after 24 hour of latest training session remains permanent and these factors decreased due to aerobic training. The obtained results show the presence of active thrombin in about 50% of the vein thrombi. It is not found in the blood clot obtained in vitro. Thrombin in the vein thrombi evokes blood platelets aggregation and converts fibrinogen into fibrin.

INTRODUCTION

The vein wall during thrombophlebitis shows higher activity of the tissue factor and lower activity of the plasminogen activators than the wall of unchanged vein (1). Interaction of coagulation factors of the inflammatory changed vein wall with plasma coagulation factors, platelets and leucocytes results in formation of parietal thrombus (2, 3). Further thrombus condition is determined by the relation of coagulation factors activity to activity of fibrinolytic system factors. Activity of the vein thrombus haemostatic system components is still unknown.

Coagulation, fibrinolytic and caseinolytic methods were used to determine the factors mentioned above. Plasma coagulation and fibrinolytic factors, including strategic substrates for the haemostatic system such as blood platelets, fibrinogen and fibrin were the substrates for the vein thrombus haemostatic components. The employed methods allow evaluating the real effect of thrombus haemostatic factors on the coagulation – anticoagulation balance in circulating blood so important in examinations of pathobiochemistry and in diagnosis and treatment of venous thromboembolic disease (4, 5, 6).

Cardiovascular disease (CVD) is the largest cause of death in women, and the risk of developing CVD increases after menopause. Because thrombosis is thought to be a cause of most acute cardiovascular events, abnormalities in endogenous coagulation and fibrinolysis may play an important role in the risk of an acute cardiovascular event. Aging is also associated with adverse changes in both coagulation and fibrinolysis. For instance, postmenopausal women exhibit higher fibrinogen levels and lower levels of endogenous fibrinolysis [manifested as higher tissue plasminogen activator (tPA) antigen and lower plasminogen activator inhibitor-1 (PAI-1) activity and antigen. as compared with premenopausal women, which may partially explain their higher risk of CVD. Menopause is associated with a number of conditions that reduce the quality of life of this population of women (7,8,9).

Physical activity and physical fitness have consistently been linked to lower CVD rates in women. In fact, an inverse association between physical activity and total mortality, as well as a 50% reduction in risk of myocardial infarction, has been observed in physically active postmenopausal women. In addition to the numerous other benefits provided by regular physical activity, one of the mechanisms mediating the cardio protective effect may be changes in the haemostatic system, particularly fibrinolysis. Cross-sectional studies report greater fibrinolytic activity in physically active as compared with inactive individuals, including postmenopausal women. Longitudinal evidence also supports this notion. However, the fibrinolytic and coagulation response to short-term aerobic ergo meter training has not been investigated in sedentary postmenopausal women. Shelly found that in postmenopausal women, a single session of endurance exercise elicited a short-term, favorable decrease in triglycerides independent of initial blood concentration. Fairy found that short-term exercise (15 weeks) may have beneficial effects on C-reactive protein (CRP) and other cardiovascular risk factors: resting heart rate (RHR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) in postmenopausal breast cancer survivors. De Souza et al. have previously shown that the adverse age-associated differences in plasma fibrinogen concentrations and the endogenous fibrinolytic system in sedentary healthy women are either attenuated or absent in highly physically active women (10, 11, 12, 13, 14, 15). The beneficial effects of regular physical activity were shown on coagulation and fibrinolytic function but the effect of short-term aerobic ergo meter training has not been investigated in sedentary postmenopausal women. Therefore, our study was aimed to determine the effect of 12 session sub maximal aerobic and resistance training on specific coagulation and fibrinolytic factors in elderly men.

MATERIAL AND METHODS

This study subjects included 36 apparently healthy elderly men. The protocol used in this study was reviewed and approved by Sari University's Institutional Review Board prior to participant recruitment and all participants provided written informed consent prior to beginning the study. As assessed by a medical history questionnaire, each participant was free of cardiovascular and neurological diseases, severe musculoskeletal injuries and low back pain. Firstly Subjects were tested between 8:00 and 10:00 h, according to the regular training. Participants attended having performed no vigorous exercise in the 24 h prior to testing and with diet standardized for 48 h proceeding in each test. Players were required to consume 500 ml of water 2 h prior to testing to ensure dehydration. Thereafter the subjects consumed no fluid so as to control for the possible influence of hydration status on performance. Subjects participated in the test 30 min after having a standard breakfast. All subjects completed familiarization trials of the virtual task in the rested state on a minimum of previous laboratory visits. For measuring fibrinogen, pt and ptt the Coagulation method and for d-dimer measurement the Elisa was used. The platelet number analyzed via Diatron abacus machine. The Stago machine used for measuring the fibrinogen, pt and ptt. The aerobic training group uses the ergo meter for 30 min with 65% HR_{max} for first 2 weeks (first 6 sessions) and 75% HR_{max} for 35 min in second 2 week (last 6 sessions) that heart rate controlled with polar watch.

The resistance training group performed the 6 movements (3 movements for upper extremity and 3 movements for lower extremity) including: chest press, lat pull, triceps with halter, squat, quadriceps and hamstrings in first 2 week (first 6 sessions) with 40% of 1-RM and second 2 week (last 6 sessions) with 60% of 1-RM that each of movements performed in 3 sets with 8 repetitions. Rest intervals between repetitions and sets were 1 to 1.5 minutes. Aerobic training group warmed up with 5 minutes biking on the ergo meter and afterward performed his main program. For active recovery period, those biking 5 min on the ergo meter and last 10 minutes includes the stretching movements.

Statistical analysis

The paired t-test and sample t-test an alpha level of (0.05) was used in determining statistical significance using the SPSS program for Windows, version 18.0.

RESULTS

Demographic information of subjects is shown in table 1. The dependent t test results for Fibrinogen, prothrombin time, Partial thromboplastin time and Platelets number in aerobic and control groups are shown in table 2. Table 3 shown the dependent t test results for Fibrinogen, prothrombin time, Partial thromboplastin time and Platelets number in control and resistance groups.

Table1. Demographic information of subjects

Variables	Groups		
	Aerobic	Resistance	Control
Age (yrs)	66±3.7	66.5±3.4	67.7±4.1
Height (cm)	167±1.2	167±3.44	168±1.21
Weight (kg)	67.2±6.6	68.1±6.6	69.31±3.2
Fat percent	23.4±2.1	22±2.9	22.3±2.1
BMI (kg/m^2)	25±3.2	22.5±3.2	24.4±1.1
Systolic blood pressure (mm Hg)	117±4.3	117±3.3	111±6.6
Diastolic blood pressure (mm Hg)	76±9.1	78±9	78±9.9

Table2. The dependent t test results for Fibrinogen, prothrombin time, Partial thromboplastin time, Platelets number in aerobic and control groups

Variables	Groups	Statistics Stages	Mean differences	SE	P
Fibrinogen	Control	Pre test- post test	-2.2	3.7	0.221
	Aerobic		23.4	3.99	0.001●
prothrombin time	Control		-0.4	0.397	0.433
	Aerobic		-0.5	0.42	0.013●
Partial thromboplastin time	Control		-0.3	0221	0.072
	Aerobic		3.1	0.567	0.004●
Platelets number	Control		-2.4	173.5	0.820
	Aerobic		-25.7	229.1	0.001●

● *Significant*

Table3. The dependent t test results for Fibrinogen, prothrombin time, Partial thromboplastin time and Platelets number in control and resistance groups

Variables	Groups	Statistics Stages	Mean differences	SE	P
Fibrinogen	Control	Pre test- post test	-2.3	3.15	0.099
	Resistance		28.5	2.8	0.001 ●
prothrombin time	Control		0.6	0.491	0.129
	Resistance		3.12	0.87	0.020●
Partial thromboplastin time	Control		-0.33	0.130	0.071
	Resistance		0.95	0.34	0.001●
Platelets number	Control		-3.10	178.4	0.412
	Resistance		8.88	37.96	0.027●

● *Significant*

DISCUSSION

Results indicated that human hemostatic system affected by physical activity. The effect of aerobic training on Fibrinogen, prothrombin time, Partial thrombo-plastin time and Platelets number after 24 hour of latest training session remains permanent and these factors decreased due to aerobic training.

The obtained results show the presence of active thrombin in about 50% of the vein thrombi. It is not found in the blood clot obtained in vitro. Thrombin in the vein thrombi evokes blood platelets aggregation and converts fibrinogen into fibrin (16).

Hirudin, as a specific inhibitor of thrombin abolishes its aggregating and coagulating activity in the vein thrombus. Thrombin found in the vein thrombus is bound to fibrin, which makes it resistant to inactivating effect of antithrombin III and heparin. Thrombin found in the thrombus may contribute to the vein thrombus enlargement. Fibrin bound thrombin may also evoke rethrombosis observed after thrombolytic treatment of thrombi. Occurrence of rethrombosis was observed after thrombolytic treatment of coronary vessels thrombosis. So, the simultaneous treatment with thrombolytic drugs and direct thrombin inhibitors, such as hirudin or synthetic inhibitors is reasonable (17, 18, 19, 20, 21, and 22).

The high activity of tissue factor and high antiheparin activity of the vein thrombi promote prothrombin activation and active thrombin formation. Migrating cells such as macrophages, granulocytes and blood platelets are the most probable source of the tissue factor activity and antiheparin factors (23, 24).

Increased coagulative activity of the vein thrombi is balanced to some extent by marked activity of plasminogen activators, high activity of plasmin (plasminogen), as well as absence of antiplasmins.

Vein thrombus is characterized by high activity of tissue factor, high antiheparin activity and presence of active thrombin. High coagulative potential of vein thrombus is balanced to a certain grade by high fibrinolytic potential: high activity of plasminogen activators and high activity of plasmin (plasminogen), as well as absence of antiplasmins activity (25).

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