EFFECT OF EXHAUSTIVE ERGOMETRIC EXERCISE ON BLOOD COAGULATION, PLATELET ADHESIVENESS AND FIBRINOLYTIC ACTIVITY IN UNTRAINED YOUNG MEN AND WOMEN

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Summary : Exhaustive bicycle ergometric exercise in 20 untrained male and female medical students in the age group of 18–25 yrs resulted in significant changes in clotting and prothrobmin time, platelet adhesiveness and fibrinolytic activity. Clotting and Prothrombin time were reduced while platelet adhesiveness and fibrinolytic activity were increased in both the sexes.

Key words : exhaustive ergometric exercise clotting time prothrombintime fibrinolytic activity platelet adhesiveness

INTRODUCTION

Effect of exercise on blood coagulation has been observed in the past by several workers. Physical exercise is known to accelerate intrinsic clotting system, (1, 2, 4, 13). Increased body temperature and secretion of adrenaline causes hyper-coagulability in normal healthy subjects. Strenuous physical exercise leads to a significant changes in blood clotting mechanism (15). The present work was undertaken to confirm and extend the study on effect of exhaustive ergometric exercise on certain coagulation parameters and platelet adhesiveness.

MATERIALS AND METHODS

Whole blood clotting time, prothrombin time, platelet adhesiveness and fibrinolytic activity were estimated in 10 healthy untrained males and 10 females in the age group of 18–25 years. Subjects were asked to come after taking light breakfast and were instructed not to smoke if they were smokers. Exercise was performed on the bicycle ergograph till the subjects got exhausted and could no longer keep pace with pedalling rate of 60 revolutions/min. Total work done in watts was calculated. Pre-exercise samples were collected from anti-cubital vein with all aseptic precautions. 6 *ml* of blood was withdrawn, 1 *ml* of blood was used for whole blood clotting time by Lee & White method (8) done in duplicate and average was taken. 2.4 *ml* was taken in a plastic tube which contained

0.6 *ml* of 3.8% sod. citrate. This was used for platelet adhesiveness and prothrombin time. Platelet adhesiveness was done by Wright's (16) and prothrombin time by Quick's one stage method (11). Remaining blood was used for fibrinolytic activity by Fearnley's method (5). Prothrombin time and fibrinolytic activity were also done in duplicate and average taken.

Subjects were then asked to do exercise by pedalling bicycle ergograph at the rate of 60/min which was monitored by metronome. When the subjects got exhausted and could no longer maintain the desired speed, they were asked to stop the exercise and immediately the same amount of blood was withdrawn. All the tests were then repeated.

RESULTS

It is apparent from Table I that reduction in clotting, prothrombin and dilute clot lysis time were statistically significant after exercise in both the sexes. While Table II shows an increase in platelet adhesiveness.

TABLE I : Effect of exhaustive ergometric exercise on clotting time, prothrombin time and fibrinolytic activity in both sexes.

S.No.	*Parameters*		*Mean*	*S.D.*	*'t' Value*	*Significance*
1.	Clotting time in min					
	Males					
		B.E.	3.45	±0.28	4.66	Significant
		A.E.	3.11	±1.2		(P >0.05) df = 9
	Females					
		B.E.	5.02	±1.09	3.062	Significant
		A.E.	3.54	±1.16		(P >0.05) df = 9
2.	Prothrombin time in sec					
	Males					
		B.E.	15.2	±2.30	0.614	Not significant
		A.E.	10.9	±2.02		(P >0.05) df = 9
	Females					
		B.E.	14.8	±2.04	6.457	Highly significant
		A.E.	11.3	±2.63		(P >0.01) df = 9
3.	Clot lysis time in hrs					
	Males					
		B.E.	5.32	±0.51	6.529	Highly significant
		A.E.	3.57	±1.50		(P >0.01) df = 9
	Females					
		B.E.	4.40	±1.11	5.480	Highly significant
		A.E.	3.03	±0.56		(P >0.01) df = 9

B.E. = Before exercise
A.E. = After exercise

TABLE II : Effect of exhaustive ergometric exercise on platelet adhesiveness in both sexes.

S.No.	Parameters		Mean	S.D.
1.	Platelet adhesiveness in percentage			
	Males			
		B.E.	47.11	±18.0
		A.E.	63.53	±15.77
	Females			
		B.E.	14.19	±12.28
		A.E.	51.34	±12.20

B.E. = Before exercise
A.E. = After exercise

DISCUSSION

Reduction in whole blood clotting time immediately after exercise both in males and females has been in agreement with the findings of Rizza (12), Egeberg (4), Thomson and Poller (13). Thomson (14) also observed hypercoagulability after exercise. Shortening of the activated partialt hromboplastin time and euglobulin clot lysis time was observed by Vogt *et al.* (15). This has been explained on the basis of rise in plasma levels of factor VIII and XII rapidly after exercise (12, 4, 7, 2, 9). Hawkey *et al.* (6) demonstrated increased plasma level of catecholamines and also factor VIII after exhaustive exercise.

Increased prothrombin activity in both males and females after exercise has been in agreement with findings of Poller *et al.* (10). Raised level of factor XII as reported by Iatridis and Ferguson (7) could possibly account for the reduced prothrombin time.

Reduction in prothrombin time has been found to be highly significant in females. This may be due to raised level of female sex hormones after exercise. Preparations of oestrogen and progesterone cause a rise in plasma levels prothrombin complex factors and reduction in antithrombin III concentration causing shortening of prothrombin time.

Increased platelet adhesiveness after exercise observed in present study is in agreement with the findings of Rizza (12), Egeberg (4), Thomson and Poller. (13). Clayton and Cross (3) also reported similar findings which they explained on the basis of increased level of adrenaline. Sex has no effect on variation in platelet adhesiveness in the present work.

There is increased fibrinolytic activity after exercise as evidenced by reduced dilute clot lysis time. Similar observations were made by Poller *et al.* (10). This has been

explained on the basis of raised level of plasminogen activators and factors VIII (12, 4, 2, 9, 6). Iatridis and Ferguson (loc. cit) demonstrated a raised level of factor XII after exercise. This factor plays an important role in rise of plasminogen activator. Further study is necessary to find out the exact mechanism of acceleration of intrinsic system and if besides factor VIII and XII and catecholamine, other factors also contribute towards acceleration of intrinsic clotting system.

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