Research Article

Platelet aggregation, plasma fibrinogen level and euglobulin clot lysis time in male hypertensive patients

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Abstract

The present study was conducted at S. R. T. R. Medical College, Ambajogai. Fifty hypertension cases and 50 controls were taken according to different age groups. Platelet aggregation, plasma fibrinogen level and euglobulin clot lysis time were compared with age matched control and also cases were compared amongst themselves depending upon the duration of hypertension. Analysis of results showed a statistically significant increase in platelet aggregation and plasma fibrinogen level in all the hypertensive cases when compared with age matched control. Euglobulin clot lysis time showed a statistically significant decrease (increase in fibrinolysis) in all the hypertensive cases when compared with age matched control. When the increase in Euglobulin clot lysis time (decrease in fibrinolysis) was correlated with duration of hypertension, it was found that the decrease in fibrinolysis varies directly with increase in duration of exposure.

Key Words: Hypertension, platelet aggregation, plasma fibrinogen level, euglobulin clot lysis time

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INTRODUCTION

Hypertension is an important worldwide public health challenge because of its high frequency and concomitant risk of cardiovascular and kidney diseases. Higher the level of blood pressure, more likely are the chances of developing cardiovascular diseases prematurely through acceleration of atherosclerosis.It has become increasingly evident that components of coagulation and fibrinolytic pathways are primary and secondary predictors of cardiovascular events. The close association of these markers with cardiac outcome and the common cardiovascular risk factors raises the possibility that such indices are not mere markers or consequences of thrombosis but rather might be significantly contribute to the pathogenesis of arterial thrombotic diseases.[1] The fibrinogen concentration is raised after stroke and myocardial infarction has been known for many years. Recent work however suggests that fibrinogen concentration is raised before such events. Fibrinogen concentration has got positive co-relation with nearly all other cardiovascular risk factors that are age, hypertension, hyperlipoproteinemia smoking, diabetes, body mass index, stress and lack of physical activity.[2] Hence to assess the thrombogenic and fibrinolytic status in male hypertensive patients, we have estimated platelet aggregation, plasma fibrinogen level and euglobulin clot lysis time in these patients.

MATERIAL AND METHODS

The present study was conducted at S. R. T. R. Medical College, Ambajogai between the periods of January 2006 to June 2006. All the three tests were carried out in 100 males in the age group of 35 – 75 years. Out of which 50 were hypertensive and 50 served as controls.Patients having cardiovascular disease or myocardial infarction and patients on oral anticoagulants, antiplatelet and non-steroidal anti-inflammatory drugs were excluded from the study. Nine ml blood was collected and mixed with 1 ml of 3.8% trisodium citrate. Platelet rich plasma was separated by centrifuging this blood sample at a rate at 1300 rpm for 15 minutes. Remaining sample was centrifuged further at 3000 rpm for 5 minutes and this supernatant plasma was used to

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estimate fibrinolytic activity and fibrinogen level. Platelet aggregability was measured by the method given by O'Brien J. R.[3] using ADP as platelet aggregating factor. Plasma fibrinolytic activity was measured by euglobulin clot lysis time as described by Fearnley[4] in 1957 and E-Kowalski et al.[5] Plasma fibrinogen concentration was determined by the precipitation method described by Wootton.[6] The results were subjected to unpaired student 't' test and 'F' ratio (ANOVA test)[7] to find out the statistical significance according to age and duration of history of hypertension respectively.

RESULTS

There were 50 males included in cases and control groups in this study. Baseline characters were comparable in both the groups. As indicated in Table 1, platelet aggregation showed significant increase in hypertensive patients in all the four age groups. As shown in Table 2, plasma fibrinogen level showed significant increase in hypertensive group irrespective of age. Euglobulin clot lysis time showed significant decrease in hypertensive group, as depicted in Table 3. When we compared euglobulin clot lysis time, platelet aggregation and plasma fibrinogen level amongst the cases depending upon duration of hypertension only euglobulin clot lysis time showed significant difference with increased duration of hypertension as indicated in Table 4.

Table 1: Comparison of platelet aggregation (Optical Density difference) between cases and control belonging to different age groups

Groups	35 – 45 years		46 – 55 years		56 – 65 years		≥ 66 years	
	Cases	Control	Cases	Control	Cases	Control	Cases	Control
No. of Cases	12	11	15	15	15	15	08	09
Mean	0.06	0.03	0.05	0.03	0.06	0.03	0.05	0.03
SD	0.02	0.01	0.01	0.02	0.03	0.02	0.01	0.01
't' test	4.54		3.50		3.26		4.16	
Significance	p < 0.001 (V. H. S.)		p < 0.01 (H. S.)		p < 0.01 (V. H. S.)		p < 0.001 (H. S.)	

Table 2: Comparison of plasma fibrinogen level (mg %) between cases and control belonging to different age group

Groups	35 – 45 years		46 – 55 years		56 - 65 years		≥ 66 years	
	Cases	Control	Cases	Control	Cases	Control	Cases	Control
No. of Cases	12	11	15	15	15	15	08	09
Mean	367.91	272.27	355.58	273.00	336.33	284.00	362.50	280.00
SD	22.81	43.21	26.91	29.20	33.23	40.32	55.10	29.89
't' Test	6.70		8.01		3.88		3.90	
Significance	P < 0.001		P < 0.001		P < 0.001		P < 0.001	

Table 3: Comparison of euglobulin clot lysis time (minutes) between cases and control belonging to different age group

Groups	35 – 45 years		46 – 55 years		56 – 65 years		≥ 66 years	
	Cases	Control	Cases	Control	Cases	Control	Cases	Control
No. of cases	12	11	15	15	15	15	08	09
Mean	124.17	158.64	122.67	157.00	125.00	151.67	131.88	155.65
SD	12.03	13.98	7.99	19.80	13.76	19.43	19.99	13.57
't' Test	6.35		6.27		4.35		2.90	
Significance	P < 0.001		P < 0.001		P < 0.001		P < 0.05	

Table 4: Comparison of euglobulin clot lysis time, platelet aggregation and plasma fibrinogen level amongst the cases depending upon duration of hypertension

Parameters	1 day – 4 years	5 – 9 years	>9years	F ratio	Significance
No. of cases	24	19	07		
Euglobulin clot lysis time	120.2	125	142.85	11.58	H. S.
Platelet aggregation	0.06	0.06	0.051	0.67	N. S.
Plasma fibrinogen	351.19	362.89	338.57	1.38	N. S.

DISCUSSION

The increase in platelet aggregation in hypertensive patients can be explained with the following pathophysiological alterations in hypertension-

1. Plasma levels of NO are reduced in patients with essential hypertension.[8]
2. Biosynthesis of prostacyclin which is a vasodilator, a natriuretic and potent inhibitor of platelet aggregation is also impaired in hypertension.[9]Thus there occurs an imbalance in endothelium derived relaxing factor (EDRF) and endothelium derived contracting factor(EDCF) in hypertension.[10]

3. Platelet hyper reactiveness and adhesiveness could be due to alteration in platelet membrane phospholipids.[10]
4. According to Peter C. Elwood[11] , patients showing sustained myocardial infarction have larger and more dense platelets than controls. Platelet activity is greater in large and dense platelets.
5. Fibrinogen binds to receptors on the platelet membrane which in turn is a precondition for aggregation in vivo.[12]
6. In hypertension, sympathetic activity is accelerated causing increase in Nor-Epinephrine and Epinephrine.[13] These acts as primary platelet aggregating agent.[14]
7. Free radical level is also increased in hypertensionthat also act as primary aggregating agent.[14]

The basis for increased fibrinogen concentration in patients with essential hypertension is not clear. But it is suggested that, plasma volume tends to be lower in hypertensive patients when compared to normotensive controls. This haemoconcentration may cause abnormally increased plasma fibrinogen.[15]It may be argued that the increase in plasma fibrinogen level was simply due to a response to stress as fibrinogen is known to be an acute phase reactant.[16] Atherosclerosis also bear similarities to an inflammatory process leading to increase in acute phase protein, fibrinogen.[12] Euglobulin clot lysis time is inversely proportional to fibrinolytic activity suggesting that in our study fibrinolytic activity is increased. This increase in fibrinolytic activity may possibly reflect a compensatory effort on the part of body to dislodge the platelets.[17] Euglobulin clot lysis time shows highly significant increase (decrease fibrinolysis) as duration of hypertension increases. This suggests that as duration of hypertension increases, there are more chances of development of thrombotic complications.

CONCLUSIONS

Our findings indicate that, the increase in platelet aggregation and plasma fibrinogen level in all age groups is suggestive of thrombotic state in hypertension.There is decrease in Euglobulin clot lysis time (increase in fibrinolysis) in all hypertensive patients irrespective of their age groups.The highly significant increase in Euglobulin clot lysis time (decrease in fibrinolysis) is suggestive of increased thrombotic complications as duration of hypertension increases.

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