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Beta Thromboglobulin and Alcohol Consumption

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SUMMARY: Beta Thromboglobulin plasma levels were measured in three groups of hospital patients; a control group (n=13) of non-drinkers, and test groups of patients who from their medical history regularly consumed either moderate amounts (80-200G/24 hours n=31) or large amounts (200G/24 hours n=10) of alcohol. Significant differences were detected between the control group, and both groups of drinkers. A correlation was demonstrated between the amount of alcohol consumed and the plasma Beta Thromboglobulin.

It is necessary to consider a patient's drinking habits when interpreting Beta Thromboglobulin levels.

Introduction

Beta Thromboglobulin (Beta TG) is a platelet specific protein[1] whose plasma concentration reflects intravascular platelet aggregation and release[2]. Elevated levels have been described in such conditions as deep-vein thrombosis[3], diabetic microangiopathy[4], and myeloproliferative disorders[5]. It has been suggested that the measurement of Beta TG is a useful index of *in vivo* platelet activation[6] which may correlate with thrombus formation, particularly in the microcirculation, and be of use in the diagnosis of thromboembolic disorders[3].

The ingestion of alcohol impairs the platelet release reaction and leads to reduced platelet survival. Thrombocytopenia may supervene if the marrow is unable to compensate for the reduced platelet life span by an adequate increase in effective thrombopoiesis[7]. Even when a normal platelet count is maintained there is an increased platelet turnover of ATP, possibly indicating an increased energy requirement for the repair of ethanol induced cell damage[8]. In this situation an increase in circulating platelet release products might occur which would be reflected in an elevated plasma level of Beta TG. In this paper we describe the investigation of blood platelets and plasma levels of Beta TG in non-alcoholic and alcoholic patients.

Patients and Methods

Male patients admitted to a General Medical Ward were asked for details of their drinking habits as part of the routine history taken at initial assessment. Those patients with a moderate alcohol consumption (80—200G/24 hours) formed one test group, and those with a heavy alcohol consumption (>200G/24 hours) formed the second test group, most of whom had been admitted specifically for the treatment of their alcohol abuse. Patients who claimed a zero alcohol consumption formed the control group.

Patients suffering from any condition which might exacerbate intravsacular platelet release were eliminated from the study.

Control and experimental group patients underwent venepuncture as soon as possible after admission using a polypropylene syringe fitted with a 19 gauge needle. Particular attention was paid to the sampling conditions, ensuring that a maximum of 10mls of blood was taken without venous stasis and a two millilitre aliquot dispensed into a pre-cooled tube containing anticoagulant and antiplatelet reagent within three minutes of venepuncture[9]. The sample tubes were transmitted to the laboratory in a mixture of crushed ice and water, separation of the plasma carried out in a refrigerated centrifuge within one hour of venepuncture, and the samples frozen at —20°C for up to four weeks before processing.

Cell counts were performed on a "Sequestrene" blood sample within two hours of venepuncture using a Coulter ZF6 system (Coulter Electronics Ltd, Harpenden, Herts) to measure the red cell parameters, and the method of Dacie and Lewis[10] for the whole blood platelet count using ammonium oxalate as diluent and an "Improved Neubauer" counting chamber.

Beta TG was measured by radioimmunoassay, using ^{125}iodine labelled Beta TG in a modification of the protocol of Ludlam and Cash[9], in accordance with the instructions issued by the Radiochemical Centre, Amersham, for use with their assay kit. Counting was performed with an automatic gamma scintillation counter (MSC 120D, J & P Engineering (Reading) Ltd).

Table 1
Results of Platelet Counts and Beta Thromboglobulin Assays for Control and Test Groups

No	Diagnosis	Alcohol G24hrs	Platelets x 109/l	BTG ng/ml
GROUP ONE—ZERO				
1	Viral Inf		139	24
2	Drop Attacks		263	16
3	Hypertension		161	24
4	Reiter's Synd		180	17
5	Viral Inf		207	54
6	Abdo pain		197	30
7	Influenza		134	32
8	Bronchitis		298	21
9	Ulnar Palsy		289	18
10	Obesity		143	19
11	Eczema		131	56
12	Headaches		184	10
13	Orchitis		259	27
GROUP TWO—MODERATE				
14	Hepatitis	80	110	26
15	Chest Pain	100	283	16
16	Grand Mal	200	239	36
17	Hypertension	120	190	46
18	Gastritis	160	255	74
19	Gonorrhoea	60	142	86
20	Spherocytosis	100	277	68
21	Viral Inf	80	243	56
22	Alcohol Abuse	160	147	58
23	Obesity	60	194	21
24	Ulcerative Colitis	80	161	100
25	Chest Inf	140	177	17
26	Gastritis	100	176	60
27	Obesity	20	277	18
28	Alcohol Abuse	100	283	68
29	Alcohol Abuse	160	226	16
30	Alcohol Abuse	140	288	66
31	Alcohol Abuse	190	173	50
32	Alcohol Abuse	170	175	48
33	Alcohol Abuse	200	230	22
34	Alcohol Abuse	100	231	68
35	Obesity	80	107	26
36	Alcohol Abuse	120	180	42
37	Alcohol Abuse	160	175	34
38	Alcohol Abuse	90	237	100
39	Eczema	120	394	41
40	Alcohol Abuse	200	288	62
41	Alcohol Abuse	120	237	76
42	Obesity	80	187	91
43	Obesity	80	210	111
44	Ulnar Palsy	80	174	35
GROUP THREE—HEAVY				
45	Gastro Enteritis	300	150	64
46	Alcohol Abuse	400	147	102
47	Epilepsy	274	183	88
48	Alcohol Abuse	480	133	102
49	Alcohol Abuse	284	183	36
50	Alcohol Abuse	400	239	146
51	Alcohol Abuse	300	251	220
52	Alcohol Abuse	360	179	44
53	Alcohol Abuse	240	222	28
54	Alcohol Abuse	240	234	119

Results

The Beta TG assay showed a coefficient of variation within batch of 3.4% and between batches of 10.52%. The results for the control group (26.8ng/ml with a standard deviation of ± 13.9ng/ml) coincide well with the previously published normal range of 10-65ng/ml[1].

The results of platelet counts and Beta TG assays are given in Table I, and a comparison of these results between patient groups, using the dependent and independent 't' statistics is presented in Table II. Although there are no significant differences in platelet counts between the groups, and no patient, even in the heavy drinking group, was thrombocytopenic, differences in Beta TG levels are noted between all groups. This difference is especially marked ($P<0.025$) between the control and heavy drinking groups, and a correlation was demonstrated (Fig. 1). ($r=0.39$; $0.05<p<0.01$) between alcohol consumption and Beta TG for both drinking groups.

Discussion

The prevalence of alcoholism amongst people admitted to hospital is six times greater than in the general population[1].

Excessive alcohol consumption causes an increase in total thrombopoiesis and megakaryocyte mass with reduced platelet survival, and thrombocytopenia when the marrow cannot compensate effectively[7]. Elevated levels of circulating platelet release products might thus be detected in heavy drinkers and hence a proportion of hospital patients might show unexpectedly high plasma Beta TG levels.

This study demonstrates significant differences in Beta TG levels between the non-drinking control group and both groups of drinkers. The correlation demonstrated between the platelet count and the Beta TG level has been described previously both in normal patients and in those with myeloproliferative disorders and secondary thrombocytosis[5], but there was also a significant correlation of Beta TG with the amount of alcohol consumed ($0.05>p>0.01$).

Table II
Analysis of Platelet Count and Beta Thromboglobulin Assay Results

		Group One Non-Drinkers	Group Two Moderate (<200g/24hrs) Drinkers	Group Three Heavy (>200g/24hrs) Drinkers	"t" Tests GP 1 v 2	GP 2 x 3	GP 3 v 1
BTG	mean	26.76	52.83	58.19	dependent to: — 1.26	— 1.71	2.34
	S.D	13.88	27.27	94.90	0.05>p 0.25>p	0.05>p >0.01	0.05>p >0.01
PLATELETS	mean	198.84	215.03	192.10	independent to : — 0.80	— 1.09	— 0.30
	S.D	60.05	61.21	42.10	>0.25 >0.20	0.20>p >0.15	0.40>p >0.30

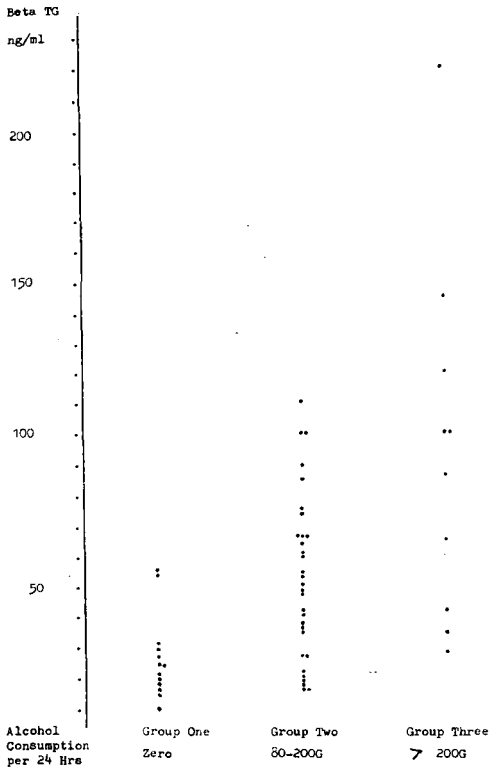

Fig. 1 Beta Thromboglobulin Level. Distribution in the three patient groups

We conclude that excessive alcohol consumption has a significant effect on the level of circulating platelet release products. When employing any diagnostic procedure every effort must be made to minimize the incidence of both false positive and false negative results; it is thus important to consider a patient's alcohol intake when attempting to interpret a beta thromboglobulin level as a direct index of platelet activation in the investigation of thromboembolic disorders.

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Notes