

# Moderate beer consumption and the blood coagulation in patients with coronary artery disease

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**Abstract.** Gorinstein S, Zemser M, Lichman I, Berebi A, Kleipfish A, Libman I, Trakhtenberg S, and Caspi A (Hebrew University of Jerusalem; Kaplan Hospital, Rehovot; Israel). Moderate beer consumption and the blood coagulation in patients with coronary artery disease. *J Intern Med* 1997; **241**: 47–51.

**Objectives.** To evaluate the influence of a short period of moderate beer consumption on the status of the thrombotic activity in patients with coronary artery disease (CAD).

**Subjects and design.** From 28 patients with two- or three-vessel CAD 22 were randomly assigned to an experimental group (EG) and six to control group (CG). Before and after completion of the study every one of the 28 patients was examined and a wide range of laboratory tests was performed.

**Setting.** A University Hospital in Israel.

**Intervention.** Of the EG, 22 patients consumed 330 mL of beer day<sup>-1</sup> (20 g of alcohol) for the 30-day period in addition to the usual antiatherosclerotic

diet. Patients of the CG did not consume alcohol beverages.

**Main outcome measures.** Fibrinogen, prothrombin time (PT), coagulant activity of Factor VII (F VIIc) and Factor VII antigen (F VIIag), and plasminogen activator inhibitor (PAI) levels were studied.

**Results.** After the investigation a statistically significant decrease was found in F VIIc ( $P < 0.01$ ) and F VIIag ( $P < 0.001$ ) and to a lesser extent a decrease in the value of PAI. Fibrinogen and PT remained unchanged in the EG also.

**Conclusions.** Even a short period of moderate beer consumption results in a decrease in thrombotic activity. The only sensitive tests were F VIIc and F VIIag. The decrease in thrombotic activity may be the main cause of decreased mortality in patients with CAD who consume moderate quantities of alcoholic beverages.

**Keywords:** fibrinogen, prothrombin time, Factor VII, plasminogen activator inhibitor, blood coagulation, coronary artery disease, alcohol consumption.

## Introduction

Coronary artery disease (CAD) is the main cause of morbidity and mortality in Western industrialized countries. There are epidemiological studies which indicate that consumption of moderate quantities of alcohol reduce the morbidity and mortality from CAD [1–7].

Many authors who investigated the role of alcohol consumption (including beer and wine) in preventing CAD found increases in the high density lipoproteins (HDL) and antioxidants and decreases in the low-density lipoproteins (LDL) [2, 5, 8–11]. Reduction in

the risk of CAD can be related to the prevention of clotting or thrombosis. It was found that alcohol decreases both platelet aggregation and the circulating fibrinogen level [1].

It is generally agreed that in fatal acute transmural myocardial infarction more than 90% of patients have associated coronary thrombosis – the basis of intravenous thrombolytic therapy which revolutionized the treatment of these patients [12–22]. Therefore it is impossible to expect a significant decrease in mortality from CAD without a decrease in the thrombotic activity. The use of prothrombin time (PT) and the measurement of

fibrinogen levels was widely recommended in the evaluation of the status of blood coagulation [23, 24]. But recently some authors have used additional tests [25–29]. This work reports on the influence of short-term moderate beer consumption on blood coagulation in patients with CAD through PT and fibrinogen measurements, and additional tests such as Factor VII and plasminogen activator inhibitor (PAI) levels.

## Materials and methods

### *Type of beer used*

The Maccabee beer which was used in these experiments was prepared using a standard industrial technological process with 70% malt, 17.5% sorghum and 12.5% sugar. The analysis was done by conventional analytical methods acceptable in the beer industry.

### *Clinical data*

We examined 69 male patients between the ages of 51 and 73 years. All of them presented with well-documented CAD and from them 28 patients were chosen who met the following criteria: (1) the patients had undergone coronary angiography which revealed two- or three-vessel CAD and in consequence had undergone coronary bypass surgery. The clinical manifestations of CAD had appeared at least 2 years before surgery but the patients had been stabilized with anginal syndrome following surgery; (2) the patients consumed alcoholic beverages only occasionally not more frequently than once in 2–3 months and no more than 20 g of alcohol day<sup>-1</sup>; (3) these patients were not taking drugs which influenced the status of the anticoagulant system. The 28 patients who met the criteria were divided randomly between the experimental group (22 patients) and the control group (six patients).

All patients in both the experimental and control groups consumed the usual Israeli diet rich in vegetables and fruits and with limited quantities of fats as recommended for patients with CAD. The daily consumption was about 1500 kcal.

Before and after completion of the investigation

every patient was examined. Their systolic and diastolic blood pressure (BP), heart rate and weight were recorded and a wide range of laboratory tests including measurement of lipids, glucose, proteins, urea, uric acid, creatinine, liver function and others were carried out.

Measurement of Factor VII and PAI levels were performed as follows: (a) the coagulant activity of Factor VII (F VIIc) was determined by the extent of correction obtained in the prothrombin time when patients' plasma was added to substrate plasma severely deficient in Factor VII (Sigma, USA); (b) the quantitative determination of the Factor VII antigen (F VIIag) was carried out by the enzyme-linked immunosorbent assay – Elisa (Asserachrom Ag, Stago, France); (c) the quantitative determination of PAI was carried out by the synthetic chromogenic substrate method (Stachrom PAI, Stago, France).

For 30 consecutive days all of the 22 patients in the experimental group consumed 330 mL of Maccabee beer (about 20 g of alcohol) every day. The six patients in the control group did not consume alcoholic beverages during the 30-day period of our investigation.

In order to verify the statistical significance of various parameters the standard Student–Fisher test was used.

## Results

The content of Maccabee beer is shown in Table 1. The data were within an acceptable range of commercial beer.

Clinical and laboratory data are summarized in Table 2. According to the results presented in Table 2 the heart rate, the systolic and diastolic blood pressure and the weight of the patients were not statistically significantly different after the 30-day investigation as compared to their values before the study.

The results which characterize the status of the haemostatic factors are shown in Table 2 and Figs 1 and 2. There are no statistically significant changes in the level of fibrinogen and PT. The fibrinogen levels (mmol L<sup>-1</sup>) in the blood before the study began ranged from 10.98–17.32 and on completion of the investigation ranged from 10.35–17.52. The PT (%) for the patients before and after the investigation was 83–100 and 86–100, respectively (Table 2).



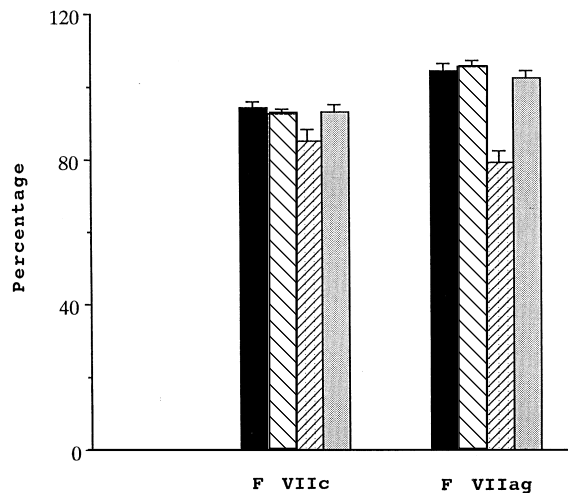


Fig. 1 Factor VIIc and VIIag levels in the control and tested groups before (□ and ■, respectively) and after experiment (▨ and ▩, respectively). Mean  $\pm$  standard deviation (vertical lines). Only changes in tested group were significant ( $P < 0.01$  and  $P < 0.001$ , respectively).

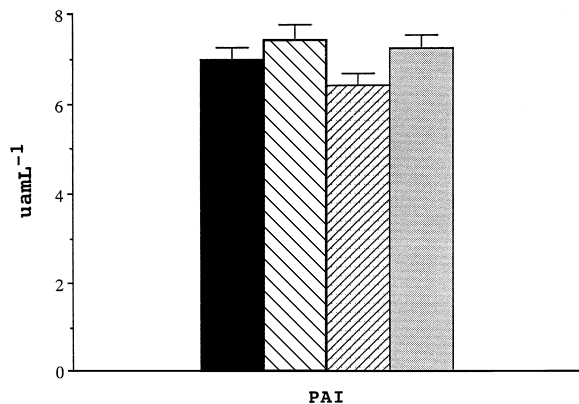


Fig. 2 Plasminogen activator inhibitor (PAI) levels in the control and tested groups before (□ and ■, respectively) and after the experiment (▨ and ▩, respectively). Mean  $\pm$  standard deviation (vertical lines). Changes in the tested group were significant ( $P < 0.05$ ).

## Discussion

The major risk factors of CAD are high levels of LDL in blood, hypertension, smoking and others. Less is known about indicators of blood coagulation which related to this disease [30–32]. Thus a high level of F VIIc is associated with an increased risk of dying from CAD [30, 33]. Some authors have found a high PAI activity in patients with CAD [34–36].

Many epidemiological studies show that moderate alcohol consumption leads to a decrease in the morbidity and mortality from CAD [1–7].

It is well known that one of the major complications of CAD is myocardial infarction (MI) – the main cause of death from this disease. But the major reason for MI is the closing of the coronary arteries by a thrombus [12, 13, 15]. Therefore if we take into consideration the fact that patients who consume moderate levels of beer, show a decrease in mortality from CAD, this leads to the conclusion that there have been positive changes in the status of blood coagulation.

We did not find statistically significant changes in the levels of fibrinogen and PT after the investigation, but we did find statistically significant changes in F VIIc and F VIIag and to a lesser extent in PAI levels: in all of these tests we noted a decrease in their value, which indicates a decrease in the thrombogenic activity. The decrease in Factor VIIag levels was slightly more than the corresponding activity and no apparent explanation was found. Therefore we examined an additional group of 11 patients and obtained the same data.

The results of this investigation leads to the following conclusions: (a) a moderate beer consumption does not influence the clinical status of patients with CAD; (b) most basic laboratory tests remained unchanged; (c) even a short-term period of moderate beer consumption results in a decrease in thrombogenic activity; (d) among the tests which we used to determine the status of blood coagulation the only F VIIc and F VIIag showed any change; (e) lowering the thrombogenic activity in patients with CAD as a result of moderate beer consumption may be the main cause of the decreased mortality from this disease.

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