

BLOOD VISCOSITY AND THE OVERNIGHT FAST

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ABSTRACT

A 12-hour overnight fast in 17 subjects did not result in a significant increase in blood viscosity, as occurs after a 24-hour fast. The usual preoperative fast does not therefore appear to have any adverse rheological effect. However, when it is necessary to prolong the fast, intravenous fluids should be given to prevent the expected increase in blood viscosity which then might have clinical effects as a result of decreased organ perfusion.

INTRODUCTION

SAFETY IN ELECTIVE ANAESTHESIA demands complete abstinence from both food and drink for a minimum of 6 hours to avoid aspiration of stomach contents, one of the grave complications of anaesthesia. However, delays in the operating schedule often result in patients being inadvertently subjected to fasting for much longer than the usual 10–12-hour overnight period. Recently we reported¹ that blood viscosity and haematocrit increased significantly in subjects who refrained from food and drink for 24 hours. This could reduce blood flow to vital organs²⁻⁵ by increasing peripheral resistance and reducing cardiac output. Therefore fasting, depending on duration, might have deleterious clinical effects. The purpose of this study was to determine whether a 12-hour overnight fast also increases blood viscosity and haematocrit.

MATERIALS AND METHODS

Seventeen volunteers, 13 of them male, aged 18 to 63 years, were investigated. Blood was sampled in the evening before supper (after the usual breakfast and lunch) and again at 7 a.m. after an overnight fast of 12 hours. Seven ml was drawn with a minimum of venous compression and transferred into glass tubes containing a dried mixture of two per cent potassium oxalate and three per cent ammonium oxalate. After gentle mixing, the samples were placed in cracked ice

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and transferred to the laboratory where the following investigations were done:

Blood viscosity was determined in duplicate at five shear rates (230, 115, 46, 23 and 11.5 secs^{-1}), in a cone-plate microviscometer (Brookfield LVT*)⁶ thermostatically controlled at 37°C.

Haematocrit was measured after spinning in an Adams Autocrit centrifuge at 12,000 g for five minutes.

RESULTS

At all except one of the five shear rates studied (23 secs^{-1}) the blood viscosity was higher after the overnight fast than before. However, none of these increases were statistically significant (Table I).

Mean haematocrit increased by 3.2 per cent during the overnight fast, from 44.1 ± 4.0 (S.D.) to 45.5 ± 3.2 per cent, an increase of minimal significance ($p < 0.05$, 1-tailed test) (Table I).

DISCUSSION

The results indicate that after a 12-hour overnight fast there is no significant increase in blood viscosity compared with the control values obtained when subjects are not fasting. The routine overnight fast before elective surgery should therefore not be rheologically harmful. Nevertheless, as a result of fasting, there was a slight but definite haemoconcentration as expressed by a small statistically significant increase in haematocrit. This degree of haemoconcentration apparently was not sufficient to produce a significant increase in blood viscosity. On the other hand, we have shown that blood viscosity did increase by a statistically significant 16.5 per cent as a result of a 24-hour fast.¹ Therefore, prolongation of the "nil per mouth" order for patients whose operation is delayed for more than 12 hours could bring them into the range when

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TABLE I
EFFECT OF A 12-HOUR OVERNIGHT FAST ON BLOOD VISCOSITY AND HAEMATOCRIT
(means \pm S.D. of 17 subjects)

	Blood viscosity (centipoises)					Haematocrit per cent
	220	Shear rate (sec ⁻¹)			11.5	
		115	46	23		
Control (evening)	4.33 ± 0.51	4.75 ± 0.43	5.49 ± 0.58	7.23 ± 0.79	9.62 ± 0.32	44.1 ± 4.0
Fasting (morning)	4.75 ± 0.55	4.78 ± 0.48	5.77 ± 0.62	7.08 ± 0.79	9.72 ± 1.38	45.5 ± 3.2
Percentage change	+9.7	+3.0	+5.1	-2.1	+1.0	+3.2
p*	n.s.	n.s.	n.s.	n.s.	n.s.	0.05

*probability; Student's t-test for paired observations (1-tailed test of increase).

increased haemoconcentration, among other factors, would be expected to increase blood viscosity. This is likely to be of clinical importance, particularly in aged, ill or polycythaemic patients in whom the increase in blood viscosity could further reduce the blood flow to, and therefore the perfusion of vital organs.⁷

Increased blood viscosity may contribute to the impairment of myocardial function and oxygen utilization that occurs with increases in free fatty acids, another effect of fasting.^{8,9} It might also be related to the tendency to arrhythmia noted in fasting rats anaesthetized with either halothane or diethyl ether,¹⁰ and/or to the inhibition of renal function and the depletion of liver glycogen stores^{11,12} reported during prolonged fasting. It is not unreasonable to suggest, therefore, that the depression of kidney and liver function induced by general anaesthesia¹³⁻¹⁵ might be accentuated by prolongation of the preoperative fast.

We conclude that, while an overnight fast of the usual duration does not increase blood viscosity significantly, prolongation of the fast for more than 12 hours may very well do so. Therefore, when the preoperative period is lengthy, supplementary fluids should be given, particularly to older patients and others with relatively high haematocrit values.

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RÉSUMÉ

Un jeûne nocturne, d'une durée de 12 heures, imposé à 17 jeunes sujets en bonne santé, n'a pas provoqué d'accroissement significatif de la viscosité sanguine, contrairement à ce que l'on observe lorsque le jeûne dure 24 heures; on en conclut donc que le jeûne pré-opératoire habituel n'induit probablement pas d'effet rhéologique défavorable. Cependant, lorsque le jeûne est appelé à se prolonger au-delà d'une douzaine d'heures, il devient nécessaire d'administrer des liquides par voie veineuse pour prévenir l'augmentation de la viscosité sanguine qui pourrait avoir des effets néfastes sur la perfusion tissulaire.