The Effect of the Change of Position on the Nonesterified Fatty Acids

The step from decubitus supine to orthostatism produces liberation of catecholamines[1,2]. The release is preferentially of norepinephrine (NE)[3,4] due to the activation of the sympathetic reflex in order to produce compensatory arteriolar constriction. We have suggested to prove this release of norepinephrine by the behaviour of nonesterified fatty acids (NEFA) after the change of position. The determination of NEFA, heart rate and blood pressure before and after the change of position, and before and after of injection of NE is called 'the Biochemical postural test'[5,6] useful for the study of postural hypotension.

Materials and methods. The basal levels of NEFA were determinated in 30 normal subjects lying down and after 10 min standing. Heart rate and blood pressure were taken in 23 persons affected by postural hypotension (PH) while in bed and every 2 min for 10 after standing, basal NEFA were also determined after 10 min standing. Later on, behaviour of the heart rate and blood pressure were studied in 16 of those subjects while in bed and after an injection of 5 μg of NE disolved in 1 ml of saline solution, every 2 min for 10 min; basal NEFA and after 10 min of injection were also determined. This NEFA determination was done by DOLE and MEINERTZ method[7].

Results. The postural change produces a significative increment of 18.8% NEFA in normal persons (Figure 1).

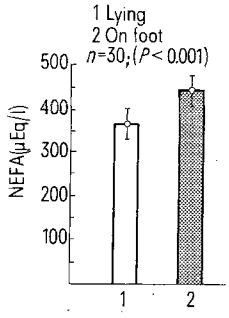

Fig. 1. Effect of postural change on plasmatic nonesterified fatty acids in 30 normal persons. Mean ± SEM.

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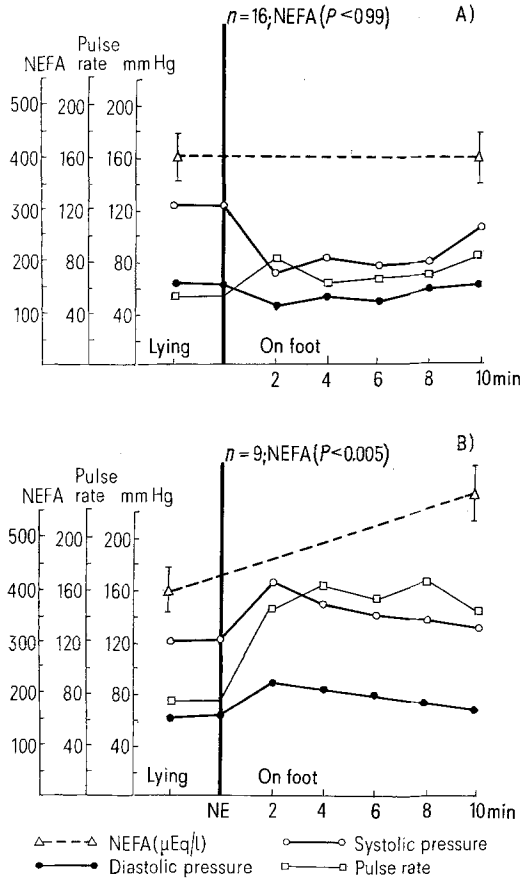

Fig. 2. A) Effect of postural change on NEFA, pulse rate and blood pressure in 16 patients with postural hypotension (PH). B) Effect of injection of norepinephrine (5 μg) on NEFA, pulse rate and blood pressure in 9 patients with PH.

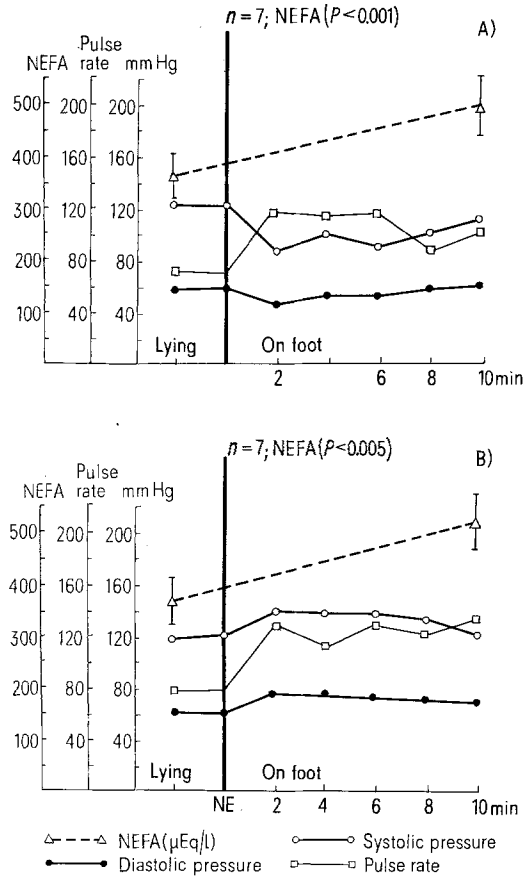

Fig. 3. A) Effect of postural change on NEFA, pulse rate and blood pressure in 7 patients with PH. B) Effect of injection of Norepinephrine (5 μg) on NEFA, pulse rate and blood pressure in 7 patients with PH.

In 16 persons with PH no significative change in NEFA and heart rate is produced (Figure 2A), while in 7 other persons the increase of NEFA and the heart rate after the postural change is significative (Figure 3A). An increment of the heart rate, blood pressure and NEFA is observed in 9 of the 16 persons group after the injection of NE (Figure 2B) while in the 7 persons group no change of blood pressure occurred but the heart rate and NEFA were increased (Figure 3B).

Discussion. The increase of NEFA after the postural change is due to lipolysis produced by catecholamines release, specially of NE in the sympathetic postganglionic endings. The release of NE by the adrenal glands is minimal after postural change[3,4]. The types of responses obtained in our subjects with PH, make possible 2 different typs of PH:

1. Asympathetic PH, by the breaking of the sympathetic reflex arch, causes no, or very small, release of NE in the sympathetic way, and PH with no or very small increase of heart rate and lipolysis (Figure 2A). The injection of NE in these cases raises the blood pressure and heart rate and produces lipolysis (Figure 2B).

2. PH of efector organ, in which the reflex arch is normal with good release of NE (the lipolysis is correct) but little response of the arteriole occurs (PH) (Figure 3A). The injection of NE in these cases has no influence on the blood pressure but the heart rate increases and produces lipolysis (Figure 3B).

Resumen. El cambio postural ocasiona un aumento significativo de los ácidos grasos libres plasmáticos. El test bioquímico postural propuesto es útil para distinguir hipotensión ortostática asimpáticotónica de la de órgano efector.

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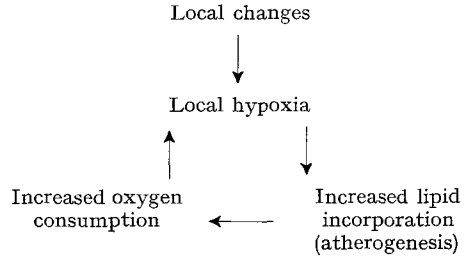
Proteins and Atherosclerosis

Several previous investigations have hypothesized that hypoxia at the blood-tissue interface is implicated in the initiation of atherosclerosis[1–3]. However, it is still not known what could bring about such a condition. We have recently postulated[4] that a reduction in the diffusion rate of oxygen from the blood to the vascular wall may be responsible for the hypoxic state, and that this decrease is due to increased levels of the plasma proteins. In vitro studies have shown that variations of albumin and γ-globulin over normal physiological ranges can result in a large decrease in the diffusivity of oxygen[5]. In addition, a correlation of proteins and age indicates that variations of the plasma proteins naturally occur with normal ageing in humans[6], which could possibly result in a continuous decrease of oxygen transport through the plasma.

The hypoxia-atherosclerosis has been well summarized in a diagram by Lazzarini-Robertson[7]:



Lazzarini-Robertson has named this 'the vicious cycle' and has suggested that the local changes which result in hypoxia may be due to hemodynamic changes. The purpose of our experiment was to determine if local changes brought about by increased plasma proteins would result in increased atherogenesis.

Thirty Dutch-belted rabbits were divided into 3 groups of 10. One group had serum albumin levels temporarily raised 1–2 g/100 ml from a normal value of approximately 4 g/100 ml by i.m. injections of isotonic concentrated albumin solution every 10–14 days for 6 months. A second group had serum γ-globulin levels raised to 130–150% of the normal value of approximately 0.75 g/100 ml by i.m. injections of isotonic contrated γ-globulin solution over the same time period. A third group was used as a control and all 3 groups were fed a 1% cholesterol rabbit chow, which has been found to result in atherosclerotic lesions in 3 to 4 months. Rabbit albumin was used to avoid immunological damage. However, human γ-globulin was used in order to see if the foreign

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Table I. Thicknesses of Aortae

Group	Thickness (mm)
No injections	0.387 ± 0.063
Albumin injections	0.456 ± 0.047
γ-globulin injections	0.606 ± 0.060

Table II. Lesion coverage of aortae

Group	Arch (%)	Thoracic (%)	Abdominal and Below (%)
No injections	62.5	18.3	15.8
Albumin injections	78.2	49.7	35.5
Gamma-globulin injections	86.1	49.7	22.4