EFFECT OF ADRENALIN ON PLATELET ADHESIVENESS IN VITRO AND IN VIVO

Yu. P. Nikitin and V. S. Mel'nikova

UDC 612.111.7.014.46:615.357.452

Experiments on dogs and rabbits have shown that adrenalin increases the adhesiveness of platelets both in vitro and in vivo.

According to reports in the literature, intravascular thrombosis may be facilitated by increased adhesiveness of the platelets occurring in several diseases [4, 6, 10]. The causes of this increase have not been sufficiently explained. One possible factor increasing platelet adhesiveness is adrenalin [1, 2, 9].

The effect of adrenalin on the adhesiveness of platelets in vitro and in vivo was studied in this investigation.

EXPERIMENTAL METHOD

The method of Moolten and Vroman, as modified by Bobek and Chepelak [3], was used. Experiments in vitro were carried out with blood of healthy dogs aged 1.5-3 years. Blood was taken from a vein into a silicone-treated vessel containing 3.8% sodium citrate solution in the ratio of 9:1. The citrated blood was poured into 6 tubes in a volume of 1.8 ml each. To the first tube was added 0.2 ml physiological saline (control). To the other five tubes were added the same volume of adrenalin solution in physiological saline in concentrations of 0.01, 0.1, 1, 10, and 100 μg/ml, respectively. After incubation for 15 min at room temperature the total number of platelets per mm^3 citrated blood and the number of adhesive platelets were determined. From the numerical values obtained, the index of platelet adhesiveness was calculated. Altogether 10 investigations were carried out.

TABLE 1. Effect of Adrenalin on Adhesion of Platelets in Vitro

Index	Content	Adrenalin concentration (in μg/ml)				
		0.01	0.1	1	10	100
Total number of platelets (in thous./mm^3)	206±10	206±13	205±10.5	205±15.4	195±10	
P		>0.5	>0.5	>0.5	>0.5	
Number of adhesive platelets (in thous/mm^3)	32±2.2	33±4	39±7	52±9	65±8.6	Сплошь агрегаты
P		>0.5	>0.5	<0.05	<0.01	
Index of adhesiveness	1.12±0.02	1.14±0.03	1.14±0.07	1.36±0.04	1.53±0.1	
P		>0.5	>0.5	<0.001	<0.01	

Department of Clinical Laboratory Diagnosis and Experimental Laboratory, Novokuznetsk Postgraduate Medical Institute. (Presented by Academician of the Academy of Medical Sciences of the USSR N. A. Fedorov.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 69, No. 3, pp. 17-18, March, 1970. Original article submitted March 14, 1969.

Experiments in vivo were performed on 21 rabbits weighing 2-3 kg. A 0.1% solution of adrenalin hydrochloride was injected subcutaneously at the rate of 0.1 ml/kg body weight. Platelet adhesiveness was determined before and 1 h after injection of adrenalin.

EXPERIMENTAL RESULTS

The results of the experiments in vitro are shown in Table 1. With adrenalin in concentrations of 0.01 and 0.1 μg/ml no significant changes were found in the total number of platelets or in their adhesiveness. In higher concentrations of adrenalin, the number of platelets was unchanged but the number of adhesive platelets and the index of adhesiveness both increased. With an adrenalin concentration of 100 μg/ml, all the platelets were adhesive, and it was therefore impossible to count them in the chamber.

In vivo, after injection of adrenalin the total number of platelets remained within normal limits, but the number of adhesive platelets increased significantly (by 1.8 times). The index of adhesiveness of the platelets also rose significantly (from 1.29 to 1.49; $P < 0.001$).

Adrenalin thus increases platelet adhesivenss both in vitro and in vivo. This action of adrenalin is possibly due to its ability to transform ATP into ADP. ADP, of course, is one of the leading factors producing platelet adhesion [5, 7, 8].

LITERATURE CITED

1. L. M. Metal'nikov, in: Proceedings of a Conference on Coagulation of the Blood [in Russian], Baku (1966), p. 193.
2. V. P. Mishchenko and O. N. Yakubenko, Lab. Delo, No. 8, 478 (1967).
3. K. Bobek and V. Chepelak, Klin. Med., No. 6, 93 (1959).
4. N. G. Ardlie, R. L. Kinlough, and C. J. Schwartz, Brit. Med. J., 1, 888 (1966).
5. R. Hordysty and R. A. Hutton, Brit. J. Haemat., 12, 764 (1966).
6. E. A. Murphy and J. F. Mustard, Circulation, 25, 117 (1962).
7. J. F. Mustard, Brit. J. Haemat., 12, 1 (1966).
8. J. R. O'Brien, Nature, 202, 1188 (1964).
9. J. R. Vaughan, G. I. Ingram, and R. D. McClure, Quad. Coagul., 11, 143 (1966).
10. H. P. Wright, J. Path. Bact., 53, 255 (1941).