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AN IMPROVED APPARATUS FOR VENOUS OCCLUSION PLETHYSMOGRAPHY

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UDC 615.471:616.14-008.1-073.173

KEY WORDS: venous occlusion plethysmography.

The method of venous occlusion plethysmography (VOP) is finding ever widening application in both physiological and clinical research [1, 2, 6]. The principle of the method is recording changes in the volume of a segment of the limb when the outflow of blood from the limb is blocked by compressing the veins with a pneumatic cuff. The cuff is inflated under a sufficient pressure to obstruct the veins completely but, at the same time, not to prevent the flow of arterial blood into the test segment. It has been shown [4, 5] that these demands are met by a pressure of about 50 mm Hg.

In the investigation described below the VOP method was used in the modification in [7]. Mercury–rubber transducers were mounted on the test limb. The electrical resistance of the transducer, proportional to changes in its length, was connected into one arm of a Wheatstone bridge. After amplification, the signal thus obtained was recorded by an automatic writer (N327-3).

It was considered useful to have not only a graph showing the change in volume of the limb segment, but also graphs of the rate of change of volume and of a logarithm of this value relative to time in order to study the time course of processes taking place during application (and, correspondingly, removal) of occlusion. For this purpose, the plethysmograph curve itself is recorded in the first channel of a three-channel automatic writer. The signal from the plethysmograph after passage through a signal differentiator (an operational amplifier was used), built to the circuit in [3], is led to the second channel of the automatic writer. The third channel records the signal from the plethysmograph of the passage through a logarithmic signal amplifier [3]. The circuit connecting the plethysmograph (from Loosco, The Netherlands), differentiator, and logarithmic signal amplifier to the three-channel automatic writer is illustrated in Fig. 1.

The apparatus described above, because it uses a differentiator (the first derivative of the change in volume of the limb segment in time is recorded), can determine more accurately and demonstratively the rates of change of limb volume (the rate of the arterial inflow when occlusion is applied and the rate of venous outflow when the occlusion is removed). The logarithmic device was introduced for the following reasons. The venous outflow curve is closely similar to a monoexponential curve or to a combination of two consecutive curves.

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 0007-4888/82/9305-0556$07.50

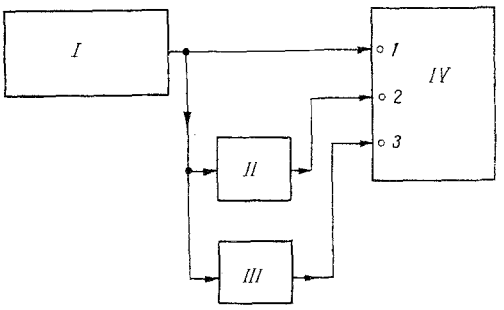

Fig. 1. Functional diagram of connection of differentiator, logarithmic signal amplifier, and plethysmograph to three-channel automatic writer. I) Plethysmograph; II) differential signal amplifier; III) logarithmic signal amplifier; IV) automatic writer; 1, 2, 3) 1st, 2nd, and 3rd channels respectively of automatic writer.

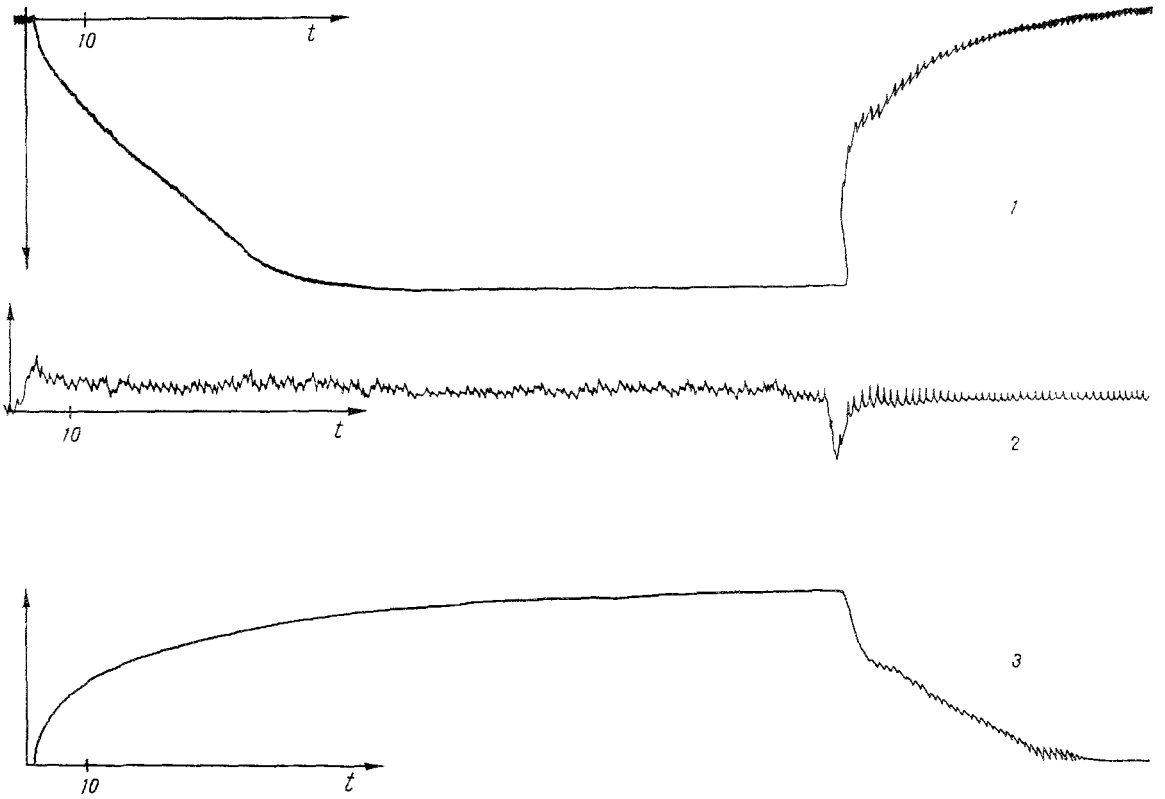

Fig. 2. Example of synchronous recording of signals from plethysmograph, differentiator, and logarithmic signal amplifier by automatic writer. 1) Curve showing change in volume (in first channel of automatic writer); 2) curve of rate of change of volume (second channel); 3) curve of logarithm of change of volume (third channel).

To discover the precise values of these exponents and to work with them, it is convenient to use a semilogarithmic scale, by means of which these exponential curves are converted into straight lines, and for that reason a logarithmic signal amplifier was introduced.

An example of synchronous recording of all three curves (change of volume, rate of change of volume, and logarithm of change of volume) is illustrated in Fig. 2.

The use of this apparatus has proved useful in studies of the peripheral circulation by the VOP method in healthy subjects and also in patients with disturbances of the peripheral circulation.

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ROLE OF SEX HORMONES IN THE MECHANISM OF THE EFFECT OF MONOAMINES ON LH-RH LEVEL IN THE HYPOTHALAMUS

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UDC 612.826.4.018:577.175.829-06:612.616.31

KEY WORDS: castration; monoamines; hypothalamus; LH-RH.

Evidence has been obtained that monoamines of the CNS take part in the regulation of pituitary gonadotrophic function [3, 7]. The sex hormones play an important role in this situation. However, most research has been devoted to the study of the effect of sex steroids on secretion of luteinizing hormone (LH), and there have been only isolated studies of the changes observed under these circumstances in the content of LH releasing hormone (LH-RH) in the hypothalamus [4, 5].

The aim of the present investigation was to study the effect of monoamines (noradrenalin, serotonin, dopamine) on the LH-RH content in the arcuate nuclei (AN) and median eminence (ME) of the hypothalamus and also in the preoptic region (PO) of intact and castrated male rats. It is in these regions that the bodies of neurons which secrete LH-RH are located. The blood levels of LH-RH and LH were determined at the same time.

EXPERIMENTAL METHOD

Adult male rats were used, and some of them were castrated 2 weeks before the experiment. In a stereotaxic apparatus noradrenalin bitartrate (NA), dopamine (DA), or serotonin creatinine-sulfate (5-HT) in a dose of 10 or 20 μg in 2 or 4 μl, respectively, of physiological saline, was injected into the third ventricle of the animals of the experimental group. Animals of the control group received physiological saline. The animals were killed 15 min later and the brain was removed and cut into sections on a freezing microtome. The structures for testing were removed from sections 300 μ thick by the puncture method [6]. The

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(Presented by Academician of the Academy of Medical Sciences of the USSR N.A. Yudaev.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 93, No. 5, pp. 18-20, May, 1982. Original article submitted October 16, 1981.

0007-4888/82/9305-0558$07.50